Does common ownership really increase firm coordination?

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Abstract

The paper takes a closer look at four different approaches the literature has used to identify the effects of common ownership on firm behavior. Across these alternatives, we identify one that is most promising, and we use it to re-evaluate the potential effects of common ownership on multiple firm outcomes. We find that the effects previous literature has attributed to common ownership appear to be caused by other factors, such as differential responses of firms (or industries) to the financial crisis. Overall, we conclude that there is little robust evidence that common ownership affects firm behavior, in spite of the large number of studies that offer evidence to the contrary.

1 Introduction

As has been well-documented, common ownership has increased substantially over the past three decades. This increase is due to a combination of consolidation in the asset-management industry and growth in index investing. Whereas only 17% of S&P500 firms had a blockholder that also owned a block in a competitor firm in 1990, this had increased to 82% by the end of 2015. A growing number of academic papers conclude that the rise in common ownership has caused cooperation among firms to increase and competition to decrease. This is because cross-owners, who have incentives to maximize returns across multiple firms in their portfolio rather than returns on any single firm, may either actively encourage cooperation between firms or put less pressure on firm managers to aggressively compete against their rivals.

Commensurate with this evidence, there have been several policy proposals to regulate common ownership. Elhauge (2016) suggests using existing antitrust law to assess mergers that result in increased cross-holdings within the same industry, and Posner, Morton and Weyl (2017) propose restrictions on the levels of institutional ownership, for example limiting them to 1% of two or more firms within an oligopolistic industry.[1] However, Rock and Rubinfeld (2017) point out that these recommendations may be misguided, and that the costs of institutional investors disengaging from corporate governance may outweigh the benefits.

A survey of the literature finds three published papers and 12 working papers written since 2017 that conduct empirical analyses of common ownership.[2] All of the published papers and 10 of the 12 working papers claim that common ownership has causal effects on firm behavior,

[1] Posner et al propose that institutions have the choice between: (1) owning no more than 1% of any firm in the industry and being entirely passive, and (2) owning a more consolidated block of just one firm in the industry.
[2] A complete list of the papers is provided in Table 1.

decreasing competition and/or increasing coordination between cross-owned firms. Based on this research, one could reasonably conclude that the trend in common ownership justifies the increased scrutiny by regulators. However, there are grounds for skepticism. On the theoretical side, Gilje et al (2018) and Lewellen and Lewellen (2018) question the incentives of institutions to encourage anti-competitive practices.[3] Consistent with such concerns, on the empirical side, Dennis, Gerardi and Schenone (2018) and Kennedy, O'Brien, Song, and Waehrer (2017) conduct detailed analyses of a single industry, and their findings cast doubt on the conclusion of Azar et al (2018) that common ownership across airlines resulted in anti-competitive practices.

Empirically identifying whether common ownership influences firm behavior is challenging. On an aggregate level, increases in common ownership have coincided with substantial consolidation within nearly every industry (see, e.g., Doidge, Karolyi and Stulz, 2017), and this trend could have caused shifts in profitability or investment. At the same time, the years around the 2008 financial crisis play a disproportionately large role in most studies of common ownership, and this event influenced firms in many ways.

The first objective of the paper is to evaluate the empirical approaches used in the literature to identify the effects of common ownership. We focus on four types of events used to identify exogenous shifts in cross-ownership: a broad sample of mergers between financial institutions, the Blackrock/BGI merger, additions to the S&P500, and reconstitutions of Russell 1000 / 2000 indices.[4]

[3] Gilje et al. point out that institutions may lack these incentives if the firms represent only small fractions of their portfolios. Lewellen and Lewellen show that while dollar cash-flows to institutions from promoting anticompetitive practices can be substantial, they tend to be small in the more concentrated industries.

[4] Several papers have also used mutual fund outflows. See Berger (2017) for an analysis of problems related to this instrument.

With a more thorough understanding of the advantages and shortcomings of each approach, we then revisit the conclusions of a variety of empirical studies that common ownership affects firm behavior. We are interested broadly in any form of explicit or implicit coordination between connected firms. Coordination could potentially take many forms and we do not have a strong prior on which is more likely. For example, rival firms could coordinate to increase profits by engaging in joint innovation, by maintaining higher product prices, or by lowering costs via decreases in investment or product quality. Several authors and policy makers cite the recent evidence on coordination between cross-owned firms in the broader debate on anticompetitive effects of common ownership.[5]

Conceptually, mergers between financial institutions, used in He and Huang (2017) and He et al. (2018), offer many advantages as a source of identification, and thus we focus first on this approach. As highlighted by prior literature, mergers influence cross-ownership but, compared to index additions, they are less likely motivated by policies or performance of the portfolio firms. Unlike the Blackrock-BGI merger alone, using a broader set of mergers allows for both cross-sectional and time-series variation, lessening concerns that they are correlated with other factors that might influence outcome variables. We identify 64 financial mergers that have the potential to affect common ownership.[6] The selection criteria are similar to those in He and Huang: we require that one partner in the merger holds a block in a firm while the other partner holds a block in the firm's industry peer. After merging, the newly-formed institution will be a significant cross-holder in the pair of firms.

[5] See, e.g., OECD Directorate for Financial and Enterprise Affairs Competition Committee, 'Common ownership by institutional investors and its impact on competition, background note by the secretariat.' December 5-6, 2017.
[6] This list is available upon request.

We find that the financial mergers cause substantial and lasting increases in cross-ownership for the pairs of affected firms. This makes it a strong instrument to identify the effects on coordination. We aggregate the cross-ownership stakes across cross-owners of each pair of firms, taking into account both the size of these stakes and their symmetry across the firms within each pair.[7] We name this measure the Cross-ownership Index (C-Index). We find that the C-Index for treatment pairs jumps discretely in the merger quarter while it remains unchanged for control firms.

The main challenge with using financial mergers for identification is that the treatment firms are clustered in time: while the merger events are distributed fairly evenly during the 1980-2015 sample period, close to half of the treatment firms are associated with mergers occurring during 2008 and 2009 (the largest of which is the Blackrock-BGI merger). This means that the post-merger period for these firms coincides with the aftermath of the financial crisis. This problem is compounded when control firms are sampled from different (aka 'unaffected') industries, as these industries could have responded differently to the crisis even in the absence of the merger event.[8] These concerns apply to any studies that use the Blackrock-BGI merger as the exogenous shock. We address this issue in two ways. First, we examine separately mergers outside of the 2008-2009 period, and second, we test the robustness of the results to alternative control samples, including the "untreated" industry peers.

Our findings are striking. First, consistent with prior studies, when we use the full merger sample including the crisis years, and a control sample comprised of firms from unaffected (i.e., different) industries, treatment firms exhibit significantly better financial performance relative to

[7] Cross-owners who have similar stakes in both firms, e.g., 5% in each firm, will be weighted more heavily than cases in which a cross-owner has a much larger stake in one of the firms, e.g., 9% and 1% holdings in the respective firms.
[8] By 'unaffected' industries we mean industries in which cross-ownership is not expected to increase as a result of the merger because the two merger partners do not hold blocks in different industry peers.

the control firms after the event. Consistent with conclusions of He and Huang, this suggests that cross-ownership improves performance, as might be expected if the affected firms engaged in tighter cooperation. There is also evidence of reduced investment in R&D, consistent with the hypotheses in Panayides and Thomas (2017) and Gutiérrez and Philippon (2017) that connected firms reduce investment as they face lower incentives to compete. These results disappear, however, when we use mergers outside of the financial crisis period, or when we select control firms from the same industries as the treated firms. A close examination of these results suggests that the findings based on samples that include the Blackrock-BGI merger are likely caused by the differential effects of the crisis on the treated versus control firms.

One reason for the lack of effects on firm-level financial performance or investment might be that these effects only materialize in the long run. To assess this possibility, we look for more direct evidence of cooperation among the pairs of affected firms, over a three-year period following the increase in cross-ownership. Here again, we find no evidence of increased cooperation. There is no evidence that firms that became cross-owned as a result of the merger are more likely to merge or to engage in joint ventures or strategic alliances. In fact, these events of more explicit coordination between any specific pair of firms are extremely rare, less than 0.1% of all potential firm pairs.

Finally, we examine the two alternative approaches the literature has used to identify exogenous shifts in cross-ownership: S&P500 additions and the reconstitution of the Russell indices. We conclude that neither of these two events are appropriate for this purpose. In both cases, there are obvious concerns about endogenous entry. Incremental to this concern, in the case of S&P500 additions, we find that the entry events affect institutional ownership on multiple levels that are inherently difficult to separate. While entry into the index does cause discrete shifts in cross-ownership, it is also associated with increases in total institutional ownership and with

discrete drops in block ownership. Index tracking institutions increase their ownership in the added firms, contributing positively to both total institutional ownership and to cross-holdings with other portfolio firms, and resulting in other blockholders decreasing their positions.

Russell index reconstitutions have the potential to somewhat lessen the concerns about endogenous index inclusion because the reconstitutions are more transparent and based on market capitalization alone. However, we find that they have no effect on cross-ownership on the institutional level, which disqualifies them as an instrument for studies of institutional cross-ownership. This is related to the fact that Russell reconstitutions affect holdings of mutual funds that track the Russell indices but not of 13F institutions, as previously documented by Schmidt and Fahlenbrach (2017).

Our main conclusion from this analysis is that there is little robust evidence that common ownership affects firm behavior. This is in spite of the large number of studies that offer evidence to the contrary. We highlight the channels through which certain instruments can erroneously suggest that common ownership has a causal effect on firm policies.

2 Literature overview

The recent concerns about the rising institutional ownership of U.S firms and its potential anticompetitive effects spurred a surge of new empirical research in this area. We list the most recent papers along with some key parameters of each in Table 1. This table highlights the broad set of firm outcomes the literature has examined and the variety of sources of identification used to isolate these effects.

Two initial studies examine the effects of common ownership on prices of airline tickets (Azar et al. (2018)) and banking products (Azar et al. (2016)), and both find evidence that common

ownership leads to anticompetitive outcomes. However, Kennedy et al. (2017) argue that after accounting for endogeneity of market shares in the measures of industry concentrations, there is no evidence that common ownership increases ticket prices (see also O'Brien and Waehrer (2017) and Dennis, Gerardi and Schenone (2018)).

If common ownership reduces competition, it may decrease firms' incentives to invest. Consistent with this prediction, Gutiérrez and Philippon (2017) find that industries with higher levels of cross-ownership exhibit unusually low investment levels. Similarly, Panayides and Thomas (2017) show that common ownership is negatively associated with firms' capital investment as well as with advertising and sales expenditures.

Another set of studies asks whether common ownership increases other types of coordination between connected firms, thus improving their outcomes. He and Huang (2017) find that increases in common ownership by blockholders increase market shares of the connected firms and improve their performance relative to competitors. They also find increases in the likelihood that the firms merge, enter into a joint venture, or form a strategic alliance. Similarly, Brooks, Chen and Zeng (2018) find increased merger likelihood for firms in which cross-owners own large blocks. However, Harford, Jenter, and Li (2011) point out that, in general, cross-owners' holdings are too small to incentivize them to influence merger outcomes. Finally, other papers find coordination along other dimensions. For example, Kostovestsky and Manconi (2018) find that increases in cross-ownership between pairs of firms increase the likelihood that those firms cite each other's patents, and Freeman (2018) provides evidence of tighter customer-supplier relationships among connected firms.

Several studies investigate the channel(s) by which common owners could potentially influence firm policy. Literature to date has considered two potential channels: managerial

incentives and "doing nothing" (i.e. refraining from pushing for more aggressive competitive strategies). With respect to managerial incentives, Anton et al. (2018) conclude that common ownership lowers CEOs' wealth-to-performance sensitivity, thus reducing their incentives to compete. However, Liang (2016) and Kwon (2017) examine the effect of common ownership on relative performance evaluation, and using different methodologies, arrive at contradictory conclusions. In a different context, He, Huang and Zhao (2018) investigate the effects of cross-ownership on shareholder voting and find that cross-holdings induce institutions to vote against management on governance proposals. They argue that common owners can pressure multiple companies within the industry to strengthen governance, leading to better overall outcomes.

Two points about this stream of literature are worth noting. First, most empirical papers find support for the hypothesis that common ownership affects firms' behavior, with the two papers on airlines as the only exceptions. Second, the literature has employed a wide variety of methodologies to investigate these effects, and the choices are not uniform across studies. For example, researchers have used in various contexts three types of events as instruments to identify exogenous changes in cross-ownership. Following Berger's (2017) criticism of mutual fund flows as a source of identification, our focus in this paper is on the remaining two instruments: mergers of financial-institution (including the Blackrock-BGI merger of 2009) and index reconstitutions (both S&P500 and Russell 1000/2000).

3 Data

Our primary source of data on institutional holdings is Thomson Reuters. For the earlier portion of our sample, the 1980 – 2012 period, we obtain data from the Thomson Reuters 13F Institutional Holdings dataset. Following information on the WRDS website regarding problems

with the more recent years of this dataset, we rely on the WRDS SEC Analytics Suite – 13F Holdings dataset for the 2013 – 2015 period.[9]

We clean these data along several dimensions. First, we identify the ten largest institutions each year based on total assets under management listed in the Thomson data, where institution represents the level at which Thomson records institutional holdings. For each of these institutions, we verify that there are no missing quarters, i.e., quarters in which the institution would plausibly be expected to own shares but there is no record in Thomson. For all quarters that we identify as missing, we search through the raw 13F data as provided on EDGAR, and we fill in any missing data.[10] Second, for each of these ten large institutions, we verify that holdings are consistent between the Thomson Reuters Institutional 13F Holdings dataset (covering the 1990 – 2012 period) and the WRDS SEC Analytics Suite – 13F Holdings dataset (covering the 2013 – 2015 period), ensuring that there is no sudden and unexplained change in holdings between the end of the Thomson data and the beginning of the WRDS data. Third, following Ben-David, Franzoni, Moussawi, and Sedunov (2018) we aggregate the holdings of Blackrock, which are listed under six different manager numbers, into a single entity. Fourth, given the importance of obtaining accurate holdings around the time of financial institution mergers, we manually check holdings around these periods to ensure that holdings are listed correctly.

In addition to ownership data, we obtain information on mergers, joint ventures, and strategic alliances from the Thomson Reuters Securities Data Company (SDC) database. Stock return data and information on S&P500 additions comes from CRSP. We use financial statement information

[9] See WRDS for more information: https://wrds-www.wharton.upenn.edu/pages/support/research-wrds/research-guides/research-note-regarding-thomson-reuters-ownership-data-issues/ .
[10] As discussed in Lowry, Rossi and Zhu (2018), EDGAR only contains 13F filings for 1999 and later, thus restricting this process to this period.

from Compustat, and information on Russell index reconstitution from FactSet. Samples used for the financial merger analysis are described in Section 5.1, and samples used for the index addition analysis are discussed in Sections 6.1 and 6.2.

4 Measurement of cross-ownership

Conceptually, cross-ownership represents the extent to which shareholders own multiple firms within an industry. The measurement of this begins at the firm-pair level, i.e., between each pair of rival firms. To implement it, we form a product of a shareholder's stakes in the two firms and aggregate the products across all common shareholders:

$$\textit{Pair-level C-Index}_{j,k} = \sum_{i=1}^{N} \mu_{i,j} * \mu_{i,k} \quad (1)$$

where $\mu_{i,j}$ ($\mu_{i,k}$) equals the ownership percentage of investor i in firm j (firm k). While an alternative would be to use an arithmetic average instead of a product, for example $\sum_{i=1}^{N}(\mu_{i,j} + \mu_{i,k})/2$, we choose a product-based measure as a baseline to account for symmetry between $\mu_{i,j}$ and $\mu_{i,k}$., i.e., the extent to which a shareholder owns a similar stake in both firms.[11]

This firm-pair measure can be aggregated across all of a firm's rivals to form a firm-level measure:

$$\textit{Firm-level C-Index}_{j} = \sum_{k=1}^{K} \sum_{i=1}^{N} w_k * \mu_{i,j} * \mu_{i,k} \quad (2)$$

where w_k represents the weight of each rival firm k. In our main empirical analyses, we use either equal-weighted or value-weighted measures (weighting by the market capitalization of the rival). Value weighting accounts for the fact that the same fractional ownership of the owner of

[11] In the case where investors 1 and 2 each own 50% of the firm, the two approaches will be equivalent, with average overlap equaling 0.5. However, in a case where investor 1 owns 90% and investor 2 owns 10%, the arithmetic average overlap again equals 0.5, whereas the geometric overlap equals a lower 0.09. Thus, the product based measure will be higher when a shareholder's ownership stakes are more symmetrically divided among the two firms.

firm j in a larger competitor k translates into a larger dollar stake in that competitor, and thus, stronger incentives to consider k's interests.

Finally, the firm-level measure can be aggregated across all firms in an industry to form an industry-level measure:

$$\textit{Industry-level C-Index} = \sum_{j=1}^{J} \sum_{k \neq j}^{K} \sum_{i=1}^{N} w_j * w_k * \mu_{i,j} * \mu_{i,k} \quad (3)$$

Deflating this measure by the squared holdings of manager i in firm j provides a measure that is analogous to the Modified Hirschmann-Herfindahl Index (MHHI) Delta developed by O'Brien and Salop (2000) and employed by Azar et al (2018).

$$MHHID = \sum_{j=1}^{J} \sum_{k \neq j}^{K} \frac{\sum_{i=1}^{N} w_j * w_k * \mu_{i,j} * \mu_{i,k}}{\sum_{i}^{N} \mu_{i,j} * \mu_{i,j}} \quad (4)$$

except that O'Brien and Salop use market shares as weights instead of w_j and w_k, (which in our main analyses represent firm market capitalization as a fraction of industry market capitalization), and they allow for cash flow rights of firm j's shareholders to differ from their control rights.[12]

Intuitively, the denominator in equation (4) measures ownership concentration across all shareholders of firm j while the numerator measures the extent of their cross-ownership in the firm's competitors. Roughly speaking, the ratio captures the relative weight that the more powerful shareholders of firm j put on the interests of firm j's competitors vs. the firm itself.

[12] Finally, we can express the MHHI as *MHHI = HHI + MHHI Delta.*

5 Financial-institutions mergers

5.1 Sample

We form a sample of financial institution mergers broadly following the criteria outlined in He and Huang, with several modifications. First, we download from the SDC mergers and acquisition database all mergers for which the announcement date is between 1980 and 2015, the target firm is incorporated in the U.S., the acquirer primary SIC code is between 6000 – 6999, and firm names are provided for both the target and acquirer firm. For each target firm and each acquirer firm across these deals, we use text matching algorithms to match to firm names provided in Thomson 13F data. We further impose the requirement that the target firm stops filing 13F statements within 15 months of the completion date of the merger. Throughout, we are careful to account for the fact that manager numbers in Thomson are recycled, and we manually check each merger to ensure accuracy. This process generates a sample of 248 financial institution mergers, 64 of which meet our criteria for the selection of treatment firms (described below).[13]

We construct both treatment and control samples around these financial institution mergers. We describe each sample here, and Appendix I provides an illustration. To construct the treatment sample, we identify firms that are likely to become cross-owned as a result of the financial-institution merger. The selection procedure follows two steps. First, we identify all firms in which one of the merger partners holds a block of 5% or more in the quarter prior to the merger announcement.[14] This list consists of 7,100 firms (41 firms in which both partners hold a block are deleted). Second, we form firm pairs (Firm1, Firm2), where both firms are from the same 3-digit

[13] There is a close overlap between our sample and that of He and Huang, Any deviations between the two samples likely stem from small differences in name matching algorithms or sample inclusion criteria. Our list of mergers is available upon request.

[14] We use the announcement date (rather than the completion date) to ensure that we define the treatment and control samples using only ex ante information.

SIC industry, Firm1 is block-held by one merger partner, and Firm2 is block-held by the other merger partner. This process yields 2,492 firm pairs (1,246 firm combinations) formed from 1,048 firms.[15] After requiring that ownership data is available in the quarter prior to the effective date of the merger, these numbers drop to 2,374 pairs (1,187 combinations), across 1,020 firms.

We construct two control samples for the treatment firms (Control Firms1 and Control Firms2) and one control sample for the treatment pairs (Control Pairs). For Control Firms1, we select all firms that are block-held by one of the merger partners prior to the merger but are not included in the treatment sample. This means that these control firms are from different industries than the treatment firms (i.e., unaffected industries, defined as industries in which the other merger partner holds no blocks). For Control Firms2, we select for each treatment firm a matched control firm in the quarter prior to the merger that (1) is in the same 3-digit SIC industry; (2) is block-held by a financial institution other than the merging institutions; and (3) is closest in market capitalization to the treatment firm. The number of firms in these control samples after requiring that ownership data is available in the quarter before the effective date of the merger is 3,440 (Control Firms1) and 1,006 (Control Firms2).

To construct the Control Pairs sample, for each treatment pair (Firm1, Firm2), we form a control pair (Firm1, Firm2'), where Firm2' is matched to Firm2 (from the treatment pair) using the Control Firms2 algorithm described above (i.e. matching on industry and market capitalization and requiring the existence of an institutional block). The Control Pairs sample consists of 2,342 firm pairs, half of which represent cases in which Firm1 is held by the target and half of which represent

[15] Each firm pair is included twice. For example, if Ford is blockheld by the target financial institution and General Motors is blockheld by the acquirer financial institution, then we will have (firm1, firm2 = Ford, GM) and (firm1, firm2 = GM, Ford).

cases in which Firm1 is held by the acquirer. Descriptive statistics for the treatment and control samples are in Table 2, and they are discussed below.

5.2 Identification challenges

As discussed above, the treatment sample consists of firms that are likely to become cross-owned by blockholders as a result of the financial-institution mergers. The key identifying assumption is that the financial-institution mergers are exogenous to the firms themselves, e.g., they were not caused by the firms' investment or product-market strategies. At least in the case of the Blackrock-BGI merger, this appears to have been the case (see discussion, for example, in Azar et al. (2018)). Below, we provide evidence suggesting that this requirement was similarly satisfied for other mergers.

One potential concern is that the occurrence of the financial-institution mergers was correlated with broader trends in the affected industries. To evaluate this, it is worthwhile to examine the distribution of the merger events over time, shown in Figure 1. As shown in Panel A, the incidence of mergers is distributed fairly evenly across the sample period from 1983 through 2010 (with a somewhat higher frequency during the 1990s).[16] However, as shown in Panel B, the number of the treated firms is concentrated in 2009, the year of the Blackrock-BGI merger. Based on the figure, 634 of the 1048 event-firms are associated with the Blackrock-BGI merger. This concentration is particularly problematic because this event coincided with the aftermath of the financial crisis, so any differential effects on treatment vs. control firms could be contaminated by how these firms responded to the crisis. To address this concern, throughout the analysis, we separately examine

[16] While our process of identifying financial mergers covers the 1980 – 2015 period, we find no events that satisfy our criteria after 2010.

three samples: the full sample of financial institution mergers, the Blackrock-BGI merger, and all mergers outside of the 2008-2009 period.

Table 2 shows the financial characteristics of the treatment and control samples in the fiscal year prior to the financial institution merger completion date. As described in detail in Section 5.1 and illustrated in Appendix I, the treatment sample consists of firms in which (1) one merger partner holds a block and (2) the other merger partner holds a block in at least one of its industry peers. Control Firms1 satisfy the first but not the second criterion and therefore come from different industries than the treatment firms. The table highlights a challenge with selecting the control sample this way: while Control Firms1 are similar in size to the treatment firms, they have substantially lower R&D ratios (0.02 vs. 0.07), higher book-to-market ratios (0.77 vs. 0.65) and higher ratios of PPE to total assets (0.40 vs. 0.30). If growth firms responded differently to the financial crisis than more mature firms, this discrepancy could bias any analyses based on a comparison between these samples. In addition, Control Firms1 have substantially higher market shares than Treatment Firms (0.22 vs. 0.06). This is likely hardwired since a smaller number of industry peers makes it less likely that the merger partner holds a block in the peers.

The composition of Control Firms2 (i.e., firms matched with Treatment Firms on size, industry, and institutional blocks) is less sensitive to these issues. They are matched on industry and size, and they appear similar on most characteristics. Exceptions include a somewhat lower institutional ownership and lower ROA. Going forward, we use Control Sample2 for the main analysis but include the alternative sample for comparison.

5.3 Cross-ownership changes around financial mergers

To assess the extent to which cross-ownership has a causal effect on various firm fundamentals, it is essential that the identifying event, in this case financial institution mergers, cause significant increases in cross-ownership for treated (but not control) firms. Figure 2 illustrates patterns in the pair-level C-Index, and Figure 3 in the firm-level C-Index. Corresponding tests are shown in Table 4. The distribution of the indices in the quarter prior to merger completion is shown in Table 3.

Looking first at Figure 2, Panel A includes all shareholdings in the C-Index, whereas Panel B includes only blockholdings. In both cases, we observe substantial and sudden increases in the C-Index in the event quarter. Using all stakes, the C-index (as calculated from eq. (1)) for the average firm jumps by 200 points (from 300 to 500) in quarter zero and remains above 400 throughout quarter 5. Using just blockholdings, the magnitude of the increase is similar in absolute terms (slightly less than 200 points) but much larger in percentage terms. It increases by a factor of four, from 50 to over 200, though it declines slightly to 150 by quarter five. To put these magnitudes in perspective, two cross-holders, each holding 5% stakes in each firm would result in an index of 50 (=25+25), so an increase of 150 would be equivalent to adding a third cross-holder with 12.25% stakes in each firm (150=12.25*12.5). For a median firm, the increase is smaller and corresponds to an additional cross-holder with two 6% stakes. Panel A in Table 4 shows that these increases are statistically significant, across the full sample, the Blackrock-BGI sub-sample, and the "All but 2008 and 2009" sub-sample.

Figure 3 shows the firm-level C-Index around the merger events. To construct the firm-level index, for each treatment firm, we average the pair-level indices across all of the firm's competitors, either equal-weighting (Panel A) or value-weighting (Panel B) them (see details in Section 4). The

figure shows a steady increase in the firm-level indices throughout the event horizon, but also a larger increase in quarter zero for the treatment firms. Not surprisingly, the firm-level effects are smaller than the pair-level effects in Figure 2 because the firms' cross-ownership with some (or most) of their industry peers (those not held by the merger partner) is unaffected by the mergers.[17] Nevertheless, Table 4 shows statistically significant effects between 2.07 points and 4.41 points depending on the specification. This is relative to the mean levels in quarter -1 of 44.8 points (equal-weighted) and 58.8 points (value-weighted). The effects are similar in magnitude across the different samples.

Overall, these results show that the merger events caused significant shifts in cross-ownership, particularly for pairs of firms held by the two merger partners. The effects on cross-ownership on firm- or industry level are significant but smaller in magnitude. This suggests that the merger setting is more likely to detect effects working through pair-level channels (such as cooperation or mergers) rather than industry-wide shifts in competition.

5.4 The effects of cross-ownership on firm choices

5.4.1 The effects on firm performance and investment

The literature has identified multiple channels through which cross-ownership could affect firm choices, and thus financial performance (see overview in Section 2). If cross-ownership between pairs of firms facilitates cooperation, this could lead to better outcomes for the connected firms even without having meaningful effects on industry-level competition. In addition, increases

[17] Also, some of the control pairs may also experience increases in cross-ownership if the merger partners hold stakes in them that are smaller than 5%.

in common ownership on the industry level could have anticompetitive effects, thus increasing firms' profitability via higher product prices or lower costs, or reducing investment.

To explore these effects, Table 5 examines measures of profitability and investment for the treatment and control firms during fiscal years -3 through 3 around the financial mergers. Panel employs Control Firms1 (which by definition come from different industries than the treatment firms), whereas Panel B employs Control Firms2 (which are in the same industries as treatment firms). We measure profitability as Return on Assets computed either using Income before Extraordinary Items (ROA1), or Operating Income (ROA2). We also examine stock returns during the fiscal year, both raw and industry adjusted. We measure investment as growth in total assets and R&D spending in proportion to total assets (in unreported regressions, we also examine other measures, including SG&A, marketing expenditures, and capital expenditures with similar results).

Because of the concerns about contamination due to the financial crisis, we repeat all tests for the full sample of financial institution mergers (top portion of each panel), the Blackrock-BGI merger (middle portion), and all mergers outside of the 2008 and 2009 period (bottom portion). There are two main takeaways from these tests. First, looking at Panel A of Table 5, where treatment firms are compared to control firms that come from different industries, both the full sample and the Blackrock-BGI sample show significant improvements in operating performance following the merger-induced increase in common ownership (coefficients on After*Treated). Moreover, these same samples also show some evidence of decreases in R&D. Second, these significant relations disappear once we focus on samples outside of the 2008-2009 period or use a control sample that consists of firms within the same industry as the treatment firms. Specifically, in the bottom portion of Panel A and in all of the samples in Panel B, we find no significant effects of changes in cross-ownership on any of the measures of performance or investment, with many of

the results flipping signs. These results highlight the difficulties with relying on the Blackrock-BGI event for identification or selecting control firms from different industries.

Figure 4 offers additional insights into the reasons for the contradictory results. The figure shows patterns in asset growth, R&D, profitability, and stock returns during the -3 to 3 fiscal year window around the merger year. The left and middle panels show the events associated with the Blackrock-BGI merger of 2009 while the right panel shows all events after excluding those in 2008-2009. The right panel confirms the main conclusions from Table 5: the pre- and post-event patterns in investment and performance are very similar for treatment firms and their industry-matched peers in Control Sample2, indicating no effects of cross-ownership.

It is noteworthy that the left-hand panels show that the treatment and control firms responded differently before the financial merger event. This is particularly true for Control Firms1, which are drawn from different industries. For example, ROA for Control Firms1 declines more strongly before the event and recovers less strongly thereafter. Given that the Blackrock-BGI merger occurred in 2009, it is likely that these differences reflect the varying effects of the financial crisis across different industries. Overall, tests that include the Blackrock-BGI merger could mistakenly attribute the effects of the crisis to cross-ownership changes.

5.4.2 The effects on mergers, joint ventures, and strategic alliances

This section focuses on two explicit channels of cooperation: mergers and strategic alliances / joint ventures. The hypothesis is that an increase in cross-ownership between a pair of firms increases the likelihood of these events for that pair of firms.

We download from Thomson Financial's SDC Mergers and Acquisition database all mergers, joint ventures, and strategic alliances between publicly traded firms, from 1980 to 2015. This

represents a total of 6,609 mergers and 13,721 joint ventures / strategic alliances. Panel A of Table 6 provides, as a baseline, descriptive statistics for the overall frequencies of these events for the Treatment Firms. Across our sample of 1,048 treatment firms, 28% engage in one of these events over the following three years. For the event to have been influenced by common ownership, it must be the case that the two firms belong to the same industry. After instituting this requirement, the percent decreases to 15%. Finally, for the event to be driven by cooperation, it must be the case that it occurs with a specific firm, i.e., with a firm that is owned by the partner financial institution (in the case of treatment firms). Clearly, this should further decrease the frequency substantially, and Panel B shows that this is the case.

Panel B shows the frequencies of mergers and joint ventures for both the Treatment Pairs and Control Pairs. The first observation worth noting from Panel B is that the probability that a given pair of industry peers experiences any of the three events is extremely low. Focusing on the Control Pairs as a baseline, we find that only 0.08% of Control Pairs experience an event during the three years after the financial merger. This corresponds to two events out of 2,448 Control Pairs. Similarly, we observe only two events prior to the financial merger (not tabulated). These low frequencies make it difficult to conduct meaningful statistical analysis.[18]

The second observation from Panel B is that the frequency of events is similarly low for the Treatment Pairs, 0.08%. Based on this comparison, there is no evidence that the treatment firms are more likely to engage in cooperation with those industry peers with which they have recently become connected via common owners (vs. with their other matched industry peers). These results

[18] The analysis is further complicated by survivorship biases stemming from the fact that one of the merging firms by definition delists after the merger. While joint ventures would have the advantage of not being subject to such issues, sample sizes prohibit us from conducting an analysis on these events. We observe no joint ventures for the control sample prior to the event, and only one for the treatment sample.

put into question the conclusions in the recent studies that common-ownership causes the connected firms to cooperate more strongly with each other, in particular via mergers, joint ventures, or strategic alliances.

6 Index additions

This section explores two alternative settings used in the literature to identify exogenous changes in cross-ownership: additions to the S&P500 index and Russell index reconstitutions. To briefly preview our findings, neither of these settings appears to be suitable for studies of cross-ownership. We highlight the reasons below.

6.1 Additions to S&P500

We obtain from CRSP the date on which any firm either joined or exited the S&P500 Index, over the 1980 – 2015 sample period. There are 873 such entries in total during the sample period, of which 714 have required Compustat data and available ownership data (from either Thomson or SEC Analytics Suite) in the quarter prior to index entry. We also create a benchmark sample, matched with the entering firms on 3-digit SIC codes and market capitalization in the quarter prior to entry.

One challenge with using S&P500 additions as an instrument is apparent from Table 7, Panel A, which shows the characteristics of the entering and benchmark firms. Not surprisingly, entering firms exhibit better financial performance than the benchmark firms: on average, they have higher ROA (0.21 vs. 0.16), higher stock returns (0.39 vs. 0.23), and lower book-to-market ratios (0.44 vs. 0.56). A matching algorithm would need to control for past performance of entering firms, in addition to their other attributes. This presents a challenge given the limited number of large

industry peers in some industries, and given that the selection criteria for inclusion to the S&P500 are not perfectly observed.[19]

A second obstacle to using these events for studies of cross-ownership is illustrated in Figure 5. While the additions appear to induce increases in cross-ownership in the entry quarter, they also cause increases in the overall institutional ownership in the same quarter. These two effects are closely linked: as institutions increase their holdings in the entering firms (because they are now part of the index), cross-ownership between these firms and any other firms in these institutions' portfolios mechanically goes up. An added complication (apparent from the bottom panel) is that the entry events are accompanied by significant declines in ownership by large (5 % or more) blockholders. To the extent that blockholders exert stronger influence on firms than smaller investors, this decline alone could affect firm policies independently of any changes in common ownership.

In sum, the entry events affect firms' ownership structure on multiple levels, and the different effects are inherently difficult (if not impossible) to separate. Given this (and the difficulties with controlling for factors that affect entry), S&P500 additions are not a useful setting for studies of cross-ownership.

6.2 Russell reconstitutions

The annual reconstitution of the Russell indices similarly influences ownership, so it is worthwhile to explore it as a potential instrument for cross-ownership research. Compared to entry

[19] According to the Dow Jones September 2018 documentation, discussion of the S&P500 index: "Constituent selection is at the discretion of the Index Committee and is based on the eligibility criteria. The indices have a fixed constituent company count of 500…. Sector balance, as measured by a comparison of each GICS sector's weight in an index with its weight in the S&P Total Market Index, in the relevant market capitalization range, is also considered in the selection of companies for the indices." https://us.spindices.com/documents/methodologies/methodology-sp-us-indices.pdf

into the S&P500, the criteria for inclusion into the Russell indices are more transparent; they are based only on market capitalization. This allows researchers to address the concern about endogenous index entry more effectively than in in case of S&P500 additions.

The Russell 3000 Index consists of the largest 3000 firms based on market capitalization, where the Russell 1000 includes the largest 1000 firms, and the Russell 2000 includes the subsequent 2000. A useful feature of Russell indices is that a firm's weight in the overall index increases discretely as the firm crosses the boundary from Russell 1000 to 2000. [20] We obtain from FactSet a sample of 2,081 firms that cross the 1000 boundary during the period of 1980 to 2015 (we refer to these events as entries to Russell 2000 from 1000). After requiring that Thompson data and Compustat data are available in the year prior to entry, we have 1,515 firm-years. Following the approach used in the S&P500 analysis, we form a benchmark sample, matching on 3-digit SIC industries and market capitalization in the year prior to entry. As shown in Panel B of Table 7, consistent with expectations, the entrants show extremely poor stock market performance in the year prior to entry, with the average stock return of -8% compared to 23% for benchmark firms. This points out the likely challenges of finding a good match.

Figure 6 illustrates why Russell additions are not a suitable instrument for cross-ownership research: based on the figure, there is no evidence that institutional ownership or cross-ownership increases in the entry quarters.[21] This is consistent with the evidence in Schmidt and Fahlenbrach (2017) who show that, while ownership by mutual funds tracking Russell indices increases at the

[20] This is because a firm at the top of the Russell 2000 represents a larger percentage of its respective index than a firm at the bottom of the Russell 1000. In contrast, market capitalizations change more smoothly around the boundary. Russell announces the new index additions on May 30th of each year, and they become effective on June 30th (see details in Appel et al (2016) and Chang, Hong, and Liskovich (2015)).

[21] As an aside, it is interesting to note that ownership (and cross-ownership) *declines* sharply prior to the Russell 2000 events. This decline coincides with extremely poor stock market performance in the year prior to entry, as reported in Table 7

1000 boundary, no such increase can be detected for broader categories of index funds or 13F institutions. It is therefore not surprising to see that cross-ownership by institutions is also unaffected by these events (as with S&P500 additions, the changes in institutional ownership and cross-ownership are mechanically linked). Assuming that institutions pay attention to their overall holdings, this fact alone disqualifies Russell reconstitutions as a potential instrument for cross-ownership changes.

7 Conclusions

The increasing propensity of institutional investors to own shares in rival firms has led both academics and policy makers alike to consider the potential consequences on the underlying firms. Of particular interest is the question of whether this shared ownership incentivizes the firms to compete less aggressively against each other or to cooperate more closely, as a way to maximize joint profits. A growing body of evidence suggests that the answer to these questions is yes, leading some to suggest limits on common ownership. However, there would likely be costs to limiting common ownership: many of the common owners represent large investors that provide many benefits, for example by pressuring firms toward better governance practices or, in the case of index funds, offering lower fees to individual investors. Given the high costs and benefits at stake, a careful examination of the issue is warranted.

Across four potential sources of identification, we conclude that only one represents a viable method of isolating the effects of common ownership. Specifically, we recommend using mergers between financial institutions outside of 2008-2009 to construct an instrument for changes in common ownership. We show that the alternative methods, which rely on the Blackrock-BGI merger, the S&P additions, or the reconstitutions of Russell indices can lead to spurious results.

Using the broad set of mergers, we find no evidence that common ownership causes increases in firm coordination, as measured by joint ventures, strategic alliances, or mergers between firms. We also find no evidence that it causes decreases in investment spending more generally. Finally, and perhaps most importantly, we find no evidence that it causes increases in operating performance or stock returns. We attribute prior findings regarding these factors to a combination of inappropriate instruments and inappropriate control samples.

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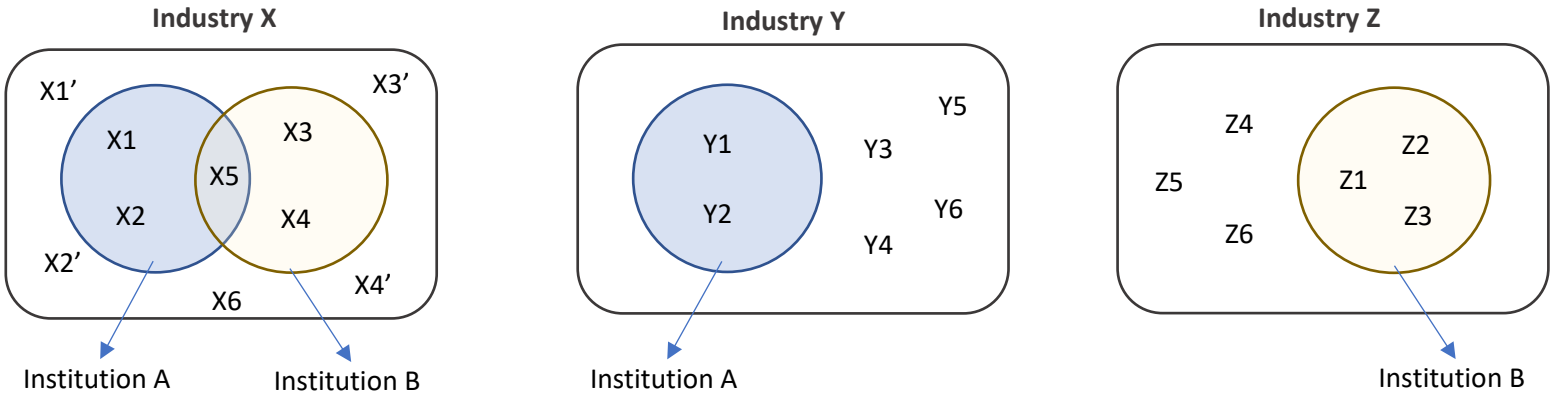
Appendix I: Sample construction for the financial-merger analysis: example. In this example, the universe consists of three industries (X, Y, and Z) and two merging institutions (A and B). Firms are numbered X1, X2, …, Y1, Y2, …, etc. *Treatment Firms* are firms that are block-held by one of the merger partners with some industry rivals being block-held by the other partner (firms block-held by both partners are excluded). *Control Firms1* are firms block-held by one merger partner with no industry rivals block-held by the other partner. *Control Firms2* are firms matched to Treatment firms based on industry and size (a matched firm to firm X1 is denoted as X1', etc.). The formation of *Treatment Pairs* and *Control Pairs* is shown in the table below.



FOR PAIR-LEVEL ANALYSES:

Treatment Pairs	Control Pairs
X1 - X3	X1 - X3'
X1 - X4	X1 - X4'
X2 - X3	X2 - X3'
X2 - X4	X2 - X4'
X3 - X1	X3 - X1'
X4 - X1	X4 - X1'
X3 - X2	X3 - X2'
X4 - X2	X4 - X2'

FOR FIRM-LEVEL ANALYSES:

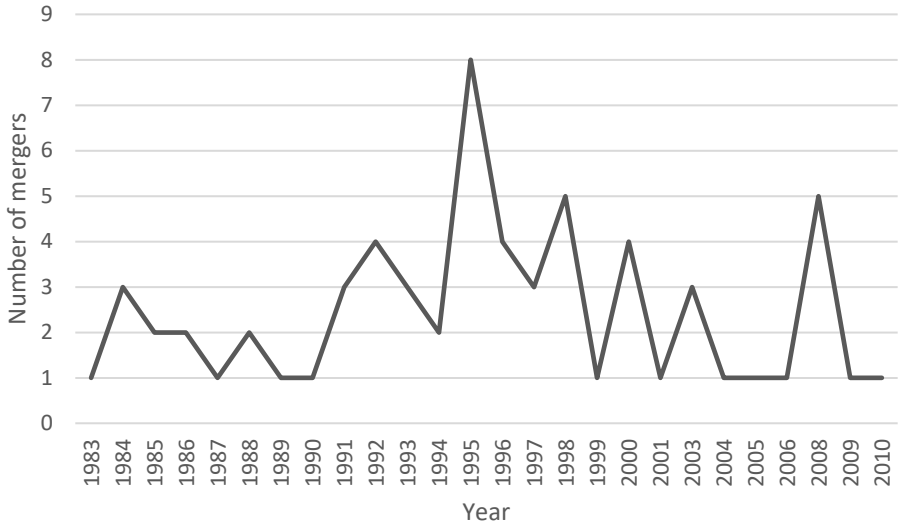
Treatment Firms: firms that are block-held by one of the merger partners with some industry rivals being block-held by the other partner (firms block-held by both partners are excluded).
X1, X2, X3, X4

Control Firms1: firms block-held by one merger partner with no industry rivals block-held by the other partner.
Y1, Y2, Z1, Z2, Z3

Control Frims2: firms matched to Treatment firms based on industry and size and not block-held by the merging institutions:
X1′, X2′, X3′, X4′

Figure 1: The frequency of financial-institution mergers and the number of treated firms by quarter. Panel A includes the 64 financial-institution mergers that satisfy our criteria for sample selection described in Section 5.1. Panel B includes the 1048 treatment firms and the 1246 treatment firm pairs.

Panel A: Financial institution mergers



Panel B: Treatment firms and firm pairs associated with the financial institution mergers

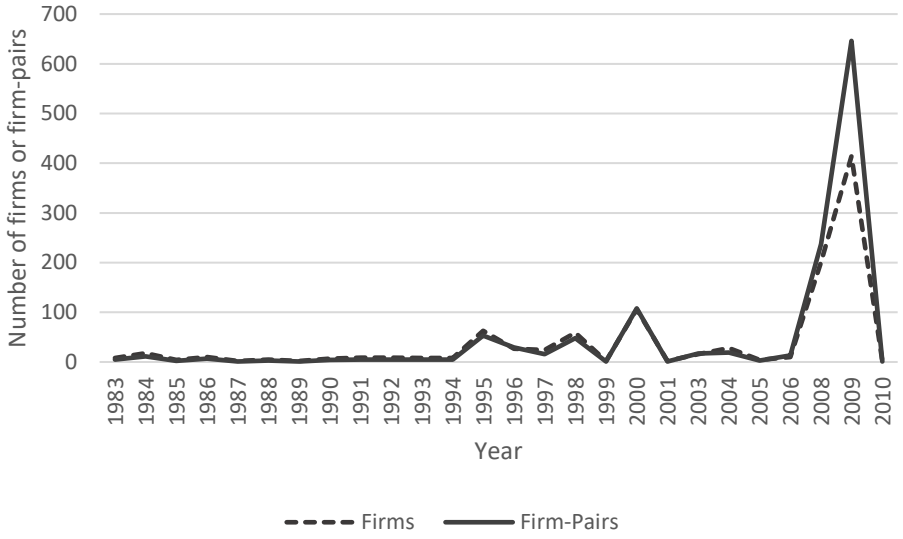
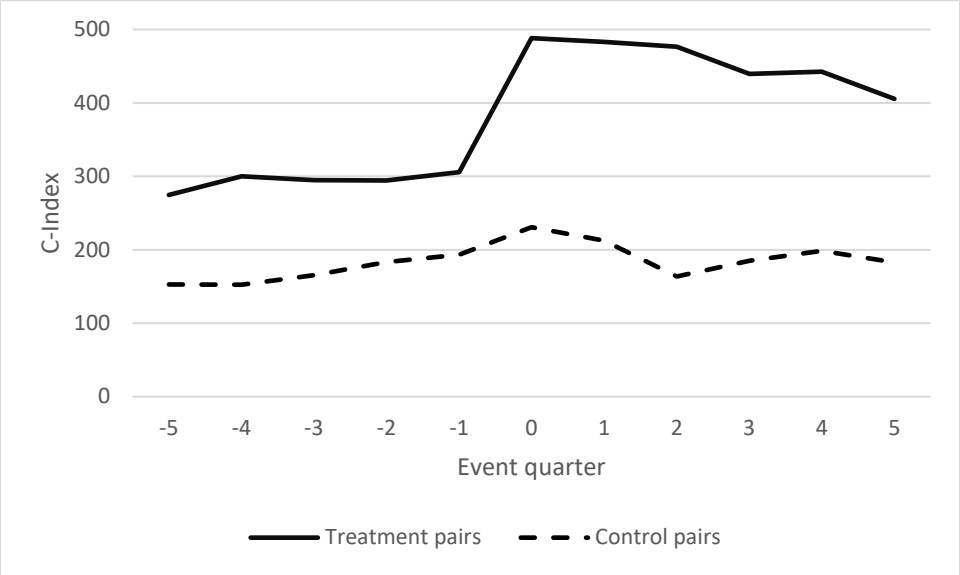


Figure 2: Pair-level Cross-ownership Index for treatment and control pairs around mergers of financial institutions. Treatment and Control Pairs are described in Section 5.1. Event quarters are quarter -5 to 5 around the quarter of the financial-institution merger effective date. Cross-ownership Index (C-Index) for a pair of firms (k,j) is constructed by summing up products of each common owner's (i) ownership stakes in the two firms: $\sum_i^N \mu_{ij} * \mu_{ik}$ (details are in Section 4). The products are multiplied by 10000. In the top figure, all ownership stakes of common owners are counted in the construction of the index. In the bottom panel, only 5% blocks are counted while cross-ownership involving smaller stakes is set to zero.

Panel A: Pair-level C-Index, computed using all shareholdings



Panel B: Pair-level C-Index, computed using block holdings

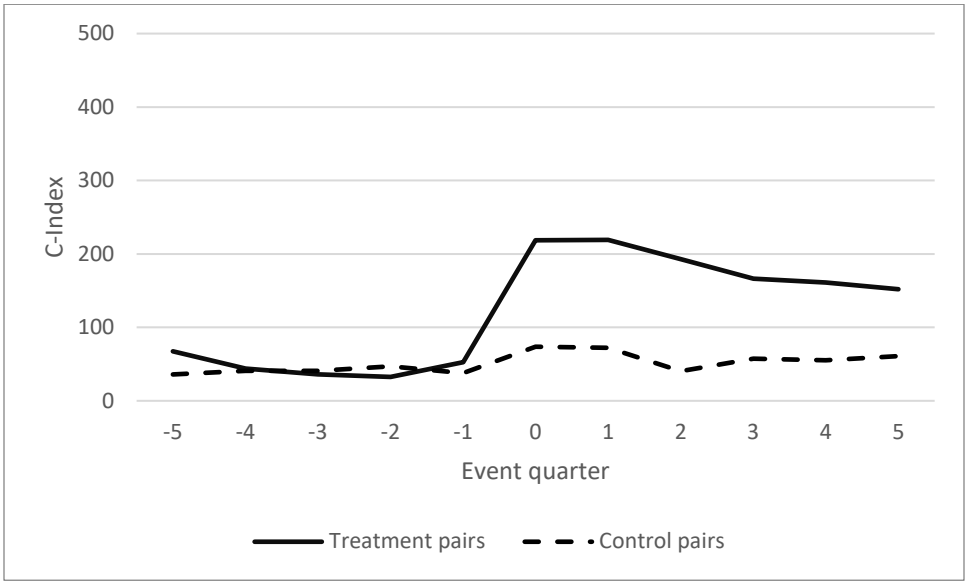
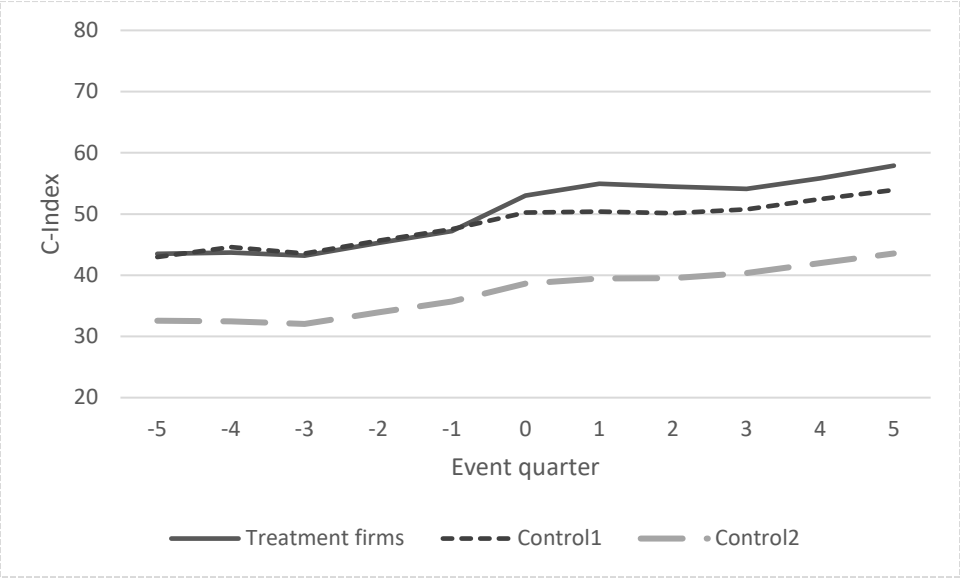


Figure 3: Firm-level Cross-ownership index for treatment and control firms around mergers of financial institutions. Treatment Firms, Control Firms1, and Control Firms2 are described in Section 5.1. Event quarters are quarter -5 to 5 around the quarter of the financial-institution merger effective date. Cross-ownership Index for a firm (j) is constructed by averaging the pair-level indices across all of firm j's competitors (k), either equal weighting or value-weighting the pair-level indices: $\sum_i^N \sum_k^K w_k * \mu_{ij} * \mu_{ik}$. Value-weighting is done using the competitor's market capitalization. The indices are multiplied by 10000. See details in Section 4.

Panel A: Equal-weighted Firm-level C-Index



Panel B: Value-weighted Firm-level C-Index

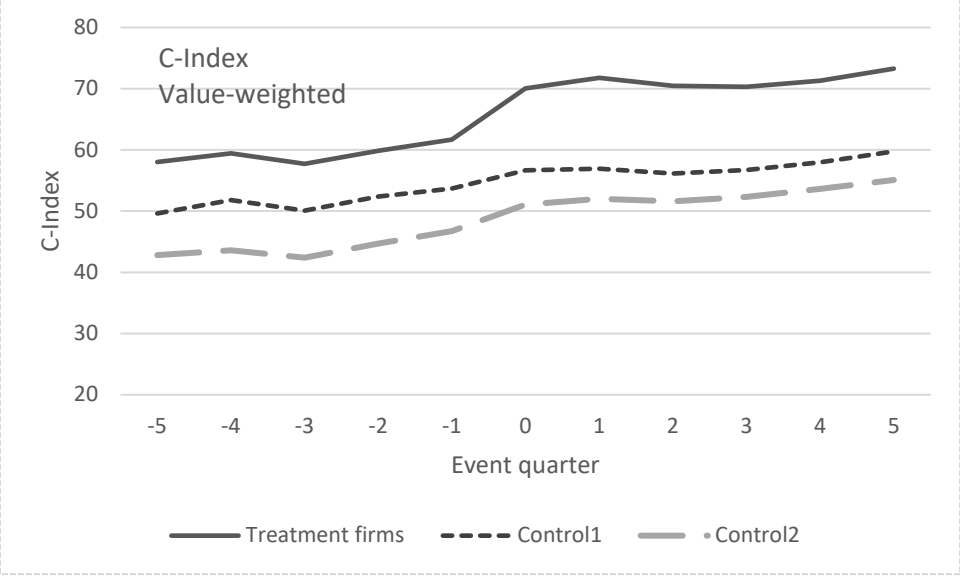
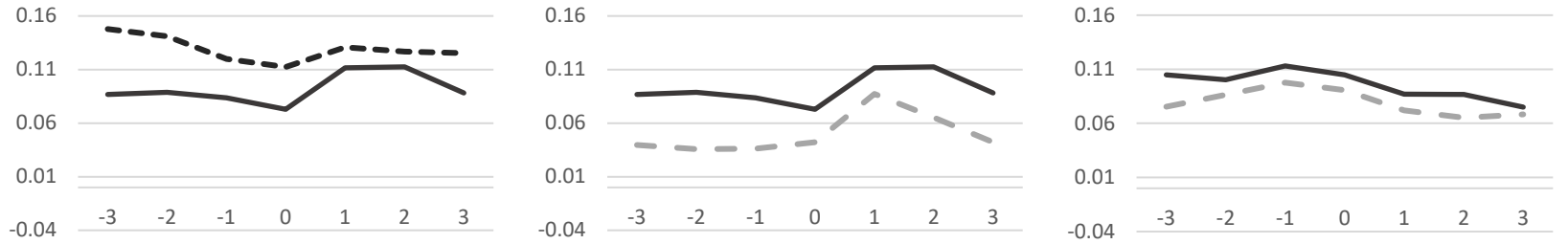


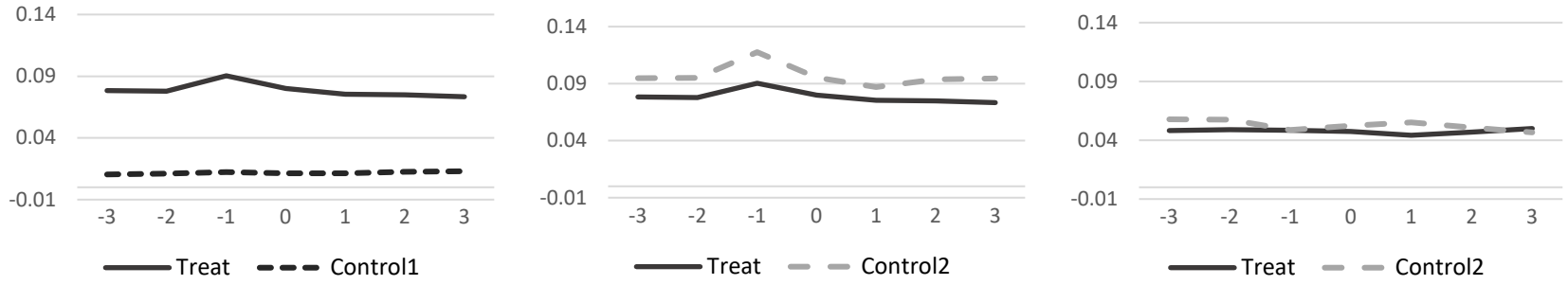
Figure 4: Firm performance and investment around financial-institutions mergers. The figure shows measures of investment and performance for Treatment Firms, Control Firms1, and Control Firms2 during fiscal years -3 to 3 around the year of financial-institution merger. The left and middle panels include the Blackrock-BGI merger of 2009; the right panel includes all mergers other than those in 2008 and 2009. Asset growth is growth in total assets. R&D is R&D scaled by total assets (missing values set to zero). ROA is operating income scaled by total assets. Stock return is the sum of monthly returns during the fiscal year.

Blackrock-BGI merger, with Control Firms1 **Blackrock-BGI merger, with Control Firms2** **All mergers except 2008-09, with Control Firms2**

Panel A: ROA



Panel B: R&D

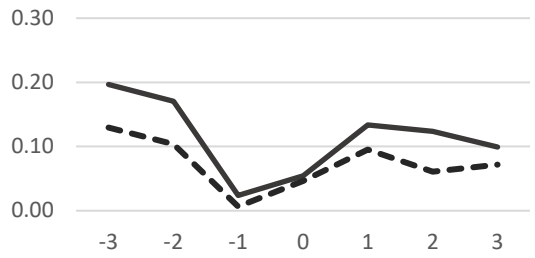


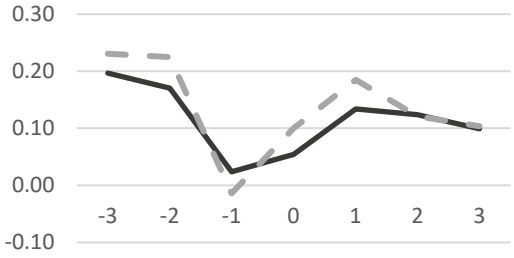
Blackrock-BGI merger, with Control Firms1

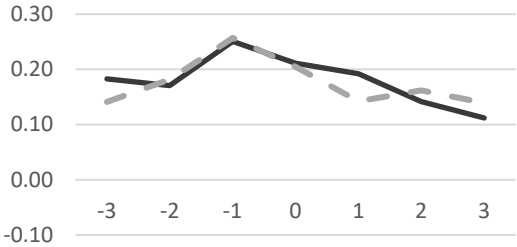
Blackrock-BGI merger, with Control Firms2

All mergers except 2008-09, with Control Firms2

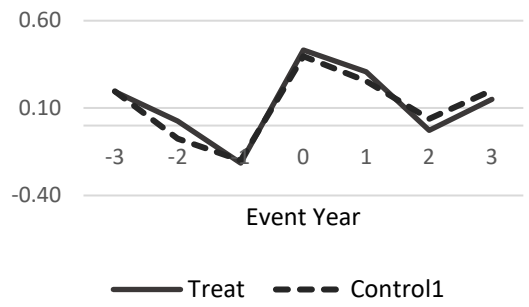
Panel C: Asset Growth

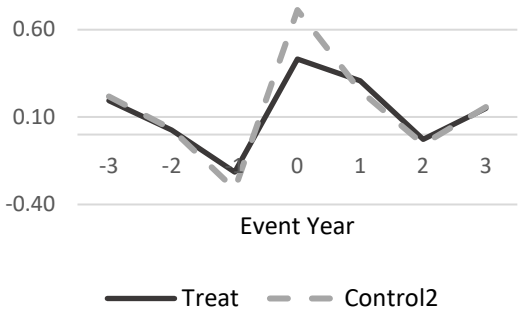






Panel D: Stock Returns





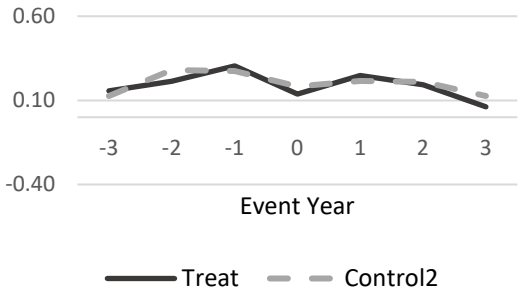


Figure 5: Firm-level Cross-ownership Index and institutional ownership around S&P500 additions. Entering Firms and Matched Firms are described in Section 6.1. Event quarters are quarters -5 to 5 around the entry quarter. Cross-ownership Index for a firm (j) is constructed by averaging the pair-level indices across all of firm j's competitors (k), either equal weighting or value-weighting the pair-level indices: $\sum_i^N \sum_k^K w_k * \mu_{ij} * \mu_{ik}$. Value-weighting is done using the competitor's market capitalization. The indices are multiplied by 10000. See details are in Section 4. Institutional ownership and Block ownership are expressed as a fraction of market capitalization.

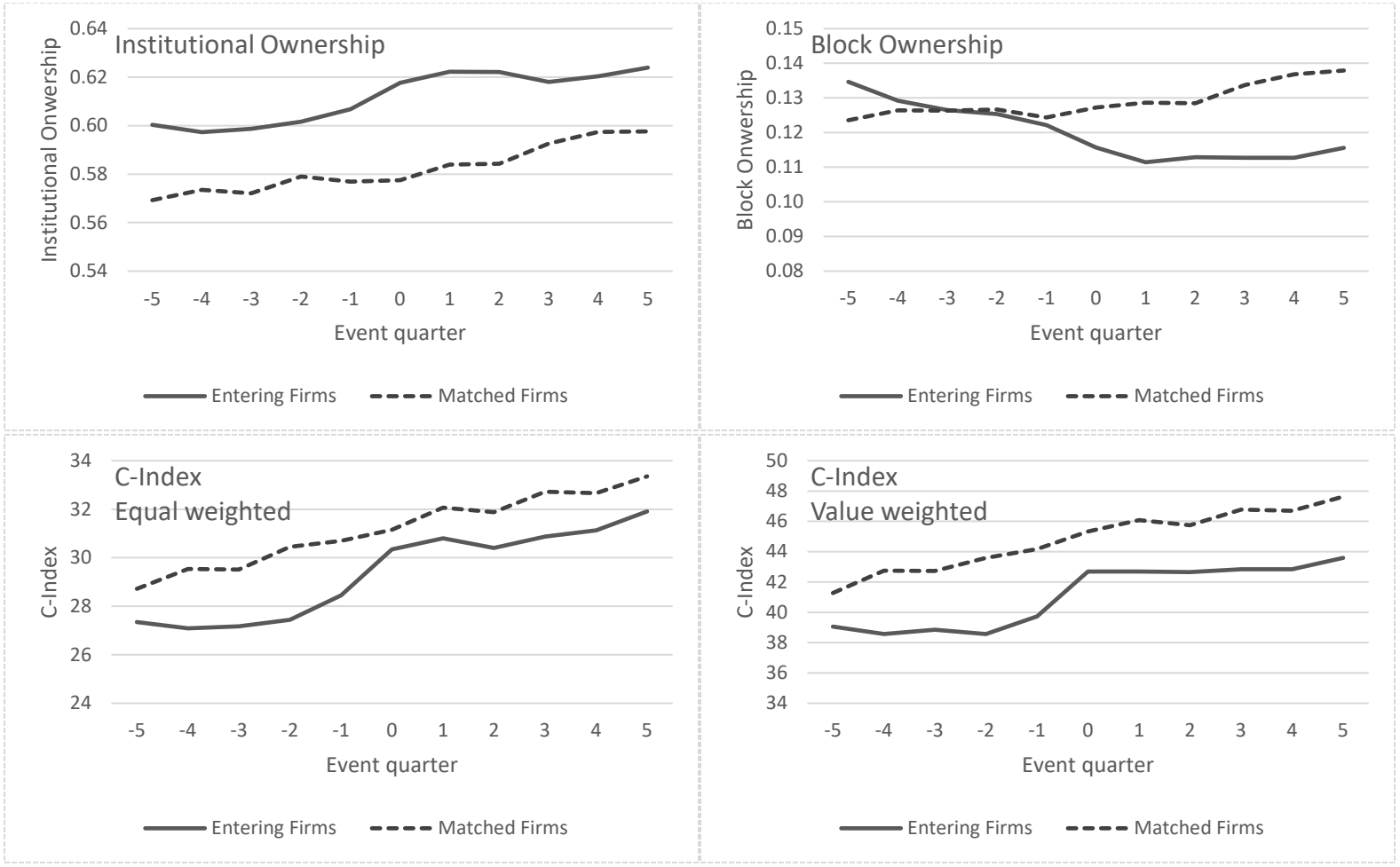


Figure 6: Firm-level Cross-ownership Index and institutional ownership around firms' entry to Russell2000 from Russell1000. Entering Firms and Matched Firms are described in Section 6.2. Event quarters are quarters -5 to 5 around the entry quarter. Cross-ownership Index for a firm (j) is constructed by averaging the pair-level indices across all of firm j's competitors (k), either equal weighting or value-weighting the pair-level indices: $\sum_i^N \sum_k^K w_k * \mu_{ij} * \mu_{ik}$. Value-weighting is done using the competitor's market capitalization. The indices are multiplied by 10000. See details in Section 4. Institutional ownership and Block ownership are expressed as a fraction of market capitalization.

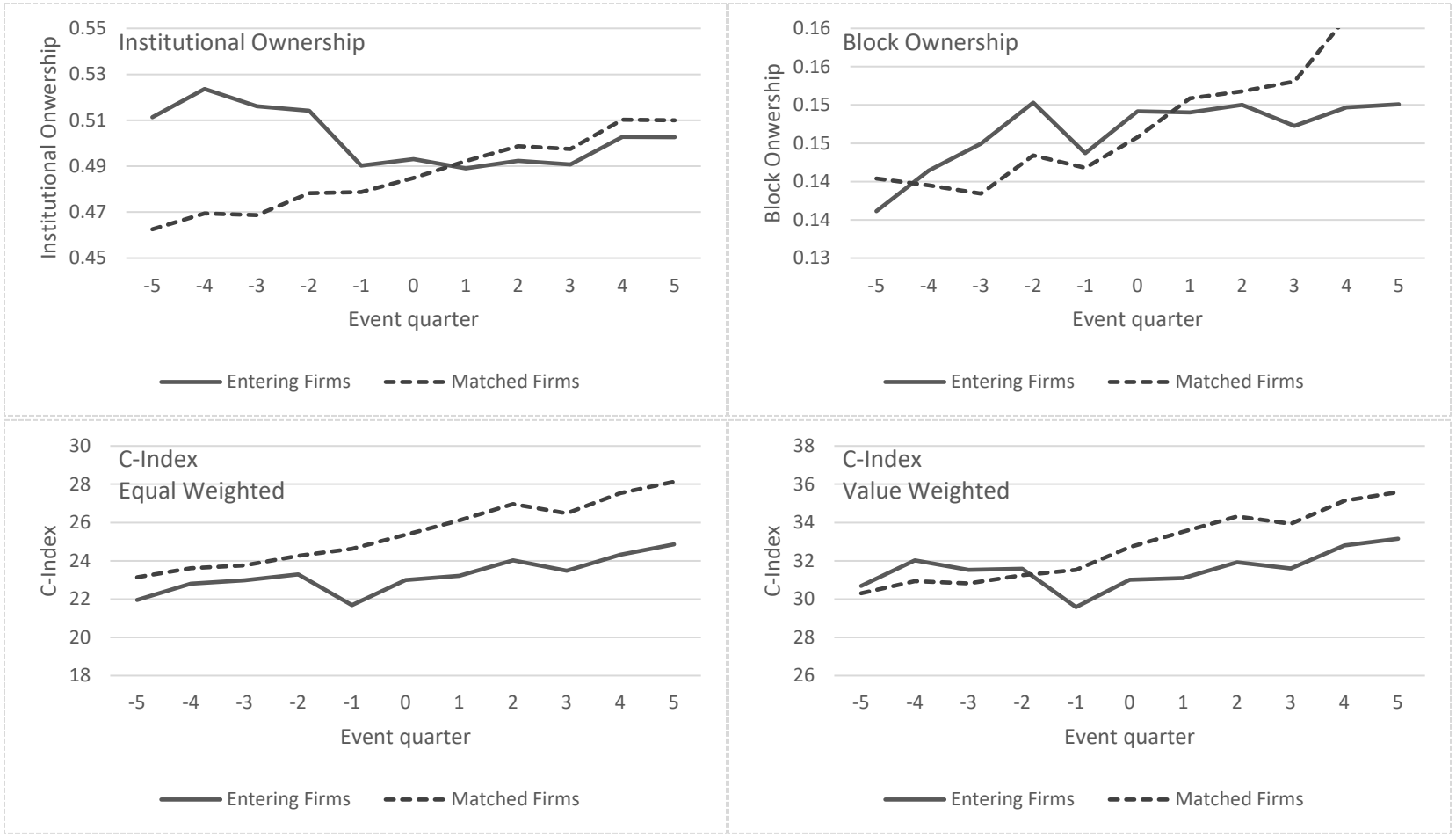


Table 1: Recent empirical studies of the effects of common ownership. This table lists papers on the effects of common ownership written since 2017 (earlier versions of these papers may have been circulated before 2017). The list was compiled based on a journal and SSRN search and is likely incomplete.

Study	**Outcome**	**Identification**	**Find effect**
Anton et al. (2018)	Managerial incentives	Blackrock-BGI merger	Yes
Azar et al. (2018)	Airline ticket prices	Blackrock-BGI merger	Yes
Azar et al. (2016)	Prices of banking products	Banks' ownership by index funds	Yes
Gutiérrez and Philippon (2017)	Investment	Cross-sectional regressions	Yes
Kostovetsky and Manconi (2018)	Patent citations	Russell reconstitution	Yes
Semov (2017)	Cash holdings	Mutual fund flows	Yes
Kwon (2017)	Relative Performance Evaluation	S&P500 Additions	Yes
Liang (2016)	Relative Performance Evaluation	Blackrock-BGI merger	Yes
Dennis et al. (2018)	Airline ticket prices	Cross-sectional regressions	No
Kennedy et al. (2017)	Airline ticket prices	Blackrock-BGI merger, Russell reconstitution, structural estimation	No
Brooks, Chen, Zeng (2018)	Merger likelihood	Russell reconstitution	Yes
He and Huang (2017)	Market shares, mergers, joint ventures, strategic alliances	Mergers of financial institutions	Yes
He, Huang, Zhao (2018)	Institutions' votes against management	Mergers of financial institutions	Yes
Freeman (2018)	Customer-supplier relationships	Mutual fund flows	Yes
Panayides and Thomas (2017)	Investment, SGA, advertising expenses	Mutual fund flows	Yes

Table 2: Financial characteristics of the treatment and control samples for the financial-merger analysis. The table shows descriptive statistics for the treatment and control firms for the analysis of the financial-institution mergers. All variables are for the last fiscal year ending prior to the effective date of the merger. The number of observations with non-missing asset data are 855 (Treatment), 3,066 (Control Firms1), and 844 (Control Firms2). B/M is the book-to-market ratio. R&D is the ratio of R&D expenditures to total assets with R&D set to zero wherever missing. PPE is the ratio of property, plant, and equipment plus inventory to total assets. Leverage is the ratio of long-term and short-term debt to total assets. ROA is the ratio of operating income to total assets. Institutional Own is the fraction of institutional ownership on total market capitalization. Block Own is the fraction of institutional block ownership to total market capitalization, with blocks defined as ownership stakes of at least 5% of equity.

	Treatment Firms		Control Firms1		Control Firms2	
	Mean	Median	Mean	Median	Mean	Median
Total Assets ($mil.)	3,309.14	512.65	4,424.28	771.03	3,704.20	331.25
Market Cap. ($mil.)	2,782.05	621.30	2,337.41	616.80	2,215.51	497.64
B/M	0.65	0.53	0.77	0.64	0.65	0.51
R&D	0.07	0.02	0.02	0.00	0.09	0.03
PPE	0.30	0.23	0.40	0.40	0.29	0.21
Leverage	0.27	0.23	0.33	0.33	0.26	0.20
Market Share	0.08	0.01	0.22	0.05	0.06	0.01
ROA(Operating)	0.10	0.12	0.12	0.12	0.06	0.10
Institutional Own	0.69	0.75	0.67	0.72	0.58	0.60
Block Own	0.25	0.24	0.25	0.23	0.21	0.18

Table 3: Descriptive statistics for the Cross-ownership Index: treatment and control samples for the financial-merger analysis. The table shows descriptive statistics for Cross-ownership Index (C-Index) for the treatment and control samples used in the analysis of financial institution mergers. Panel A shows pair-level C-Index for the Treatment and Control Pairs samples, and Panel B shows firm-level C-Index for the Treatment, Control1 and Control2 Firms samples described in Section 4. Cross-ownership Index for a pair of firms (k,j) is constructed by summing up products of each common owner's (i) ownership stakes in the two firms: $\sum_i^N \mu_{ij} * \mu_{ik}$. The products are multiplied by 10000. C-Index for a firm (j) is constructed by averaging the pair-level indices across all of firm j's competitors (k), either equal weighting or value-weighting the competitor's indices: $\sum_i^N \sum_k^K w_k * \mu_{ij} * \mu_{ik}$. Value-weighting is done using the competitor's market capitalization. See details in Section 4.

Panel A. Pair-level C-Index

	Mean	Median	Std Dev	Min	P25	P75	Max	N
All Ownership Stakes								
Treatment Pairs	345.3	62.2	781.0	0.0	12.4	266.1	4337.1	1,187
Control Pairs	249.1	35.7	671.2	0.0	5.9	149.6	4337.1	1,171
Block Ownership Stakes								
Treatment Pairs	56.7	0.0	223.9	0.0	0.0	0.0	1700.0	1,187
Control Pairs	46.2	0.0	221.2	0.0	0.0	0.0	1700.0	1,171

Panel B: Firm-level C-Index

	Mean	Median	Std Dev	Min	P25	P75	Max	N
Equally weighted C-Index								
Treatment Firms	44.8	45.0	31.3	0.3	14.9	66.2	170.5	1,020
Control Firms1	45.2	36.9	37.6	0.3	14.3	66.7	170.5	3,440
Control Firms2	34.1	29.0	26.8	0.3	11.4	51.5	170.5	1,006
Value-weighted C-Index								
Treatment Firms	58.8	58.2	38.3	0.0	24.9	86.0	178.3	1,020
Control Firms1	51.5	45.2	40.5	0.0	17.2	75.9	178.3	3,496
Control Firms2	44.2	36.7	34.7	0.0	14.7	66.3	178.3	1,006

Table 4: Difference-in-difference regressions of Cross-Ownership Index around mergers of financial institutions. The sample in Panel A consists of Treatment and Control Pairs described in Section 5.1 in quarters -5 to 5 around the quarter of the financial-merger effective date. The dependent variable is the pair-level Cross-ownership Index, constructed using either all ownership stakes or 5% blocks only. *Treat* equals one for Treatment Pairs and equal zero for Control Pairs. *After* is an indicator for quarters 0 to 5. The regressions include firm fixed effects and quarter fixed effects. The samples in Panels B and C include Treatment and Control Firms1 (Panel B) or Treatment and Control Firms2 (Panel C), described in Section 5.1 in quarters -5 to 5 around the merger effective date. The dependent variable is a firm-level Cross-ownership index, constructed either equal-weighting or value-weighting the competitor firms (see details in Section 4). *Treat* equals one for treatment and zero for control firms. *After* is an indicator for quarters 0 to 5. The regressions include firm fixed effects and quarter fixed effects. Standard errors are clustered on firm level. T-statistics are in parentheses.

	All Mergers		BGI-Blackrock		All but 2008 and 2009	
Panel A: Pair-level regressions						
	All Stakes	Blocks	All Stakes	Blocks	All Stakes	Blocks
Treat	102.89***	5.18	117.04***	5.25	67.21**	6.18
	(7.22)	(1.04)	(6.31)	(0.67)	(2.55)	(0.76)
After	164.24**	41.43**			6.91	-10.75
	(2.418)	(2.04)			(0.26)	(-0.64)
Treat*After	132.19***	129.92***	110.51***	135.24***	206.95***	109.86***
	(6.11)	(7.38)	(5.45)	(8.31)	(3.24)	(3.60)
N	23517	23517	12761	12761	6481	6481
Panel B: Firm-level regressions – Control Firms1						
	EW	VW	EW	VW	EW	WV
Treat	-0.90	-2.09**			0.08	-1.94
	(-1.35)	(-2.09)			(0.07)	(-1.04)
After	-0.82**	-1.2***			-0.42	-1.09**
	(-2.48)	(-2.78)			(-1.05)	(-2.03)
Treat*After	2.07***	3.94***	4.42***	5.76***	0.07	2.66***
	(4.11)	(5.78)	(4.23)	(4.41)	(0.11)	(2.81)
N	47332	47923	11539	11733	24272	24479
Panel C: Firm-level regressions – Control Firms2						
	EW	VW	EW	VW	EW	WV
Treat	0.97	1.41			2.75	2.40
	(0.74)	(0.65)			(1.57)	(0.80)
After	-2.06***	-1.80***			-2.35***	-3.56***
	(-4.26)	(-2.64)			(-3.28)	(-3.56)
Treat*After	2.29***	2.28***	3.50***	2.22	2.19***	4.00***
	(3.91)	(2.72)	(3.10)	(1.46)	(3.35)	(3.513)
N	21272	21273	8405	8405	8672	8673

Table 5: Difference-in-difference regressions of firm performance and investment around mergers of financial institutions. The table shows regressions of performance and investment measures for treated and control firms in fiscal years -3 to 3 around the merger of the financial institution. The samples of Treatment Firms, Control Firms1 and Control Firms2 are described in Section 5.1. *Treat* equals one for treatment firms and zero for control firms. *After* is an indicator for fiscal years 1 to 3. Panel A uses Control Firms1 and Panel B uses Control Firms2. Within each panel, the table shows separately regressions based on all mergers, the Blackrock-BGI merger, and all mergers except those in 2008 and 2009. *ROA1* is income before extraordinary items scaled by lagged assets, *ROA2* is operating income scaled by lagged assets, *ROA2 (ind. adj.)* is ROA2 industry adjusted using 2-digit SIC codes; *Stock Return (ind. adj.)* is the sum of raw (or industry adjusted using 49 Fama-French industries) monthly returns over the fiscal year; *R&D* is R&D expenditure scaled by total assets with missing values set to zero; *Asset Growth* the is growth rate in total assets. The regressions include firm fixed effects and year fixed effects. Standard errors in the return regressions are clustered on the year level; the remaining regressions are clustered on the firm level. T-statistics are in parentheses.

Panel A: Control Firms1

Dependent Variable:	ROA1 (Income before EI)	ROA2 (Operating Income)	ROA2 (ind. adj.)	Stock Return	Stock Return (ind. adj.)	R&D	Asset growth
Full Sample – Control Firms1							
Treated	-0.004	-0.003	-0.008	-0.008	-0.016	0.002	-0.007
	(-0.892)	(-0.675)	(-1.488)	(-0.707)	(-1.410)	(1.209)	(-0.679)
After	-0.006**	-0.006**	-0.006	0.017	0.003	0.001	-0.031***
	(-2.387)	(-2.475)	(-1.573)	(0.834)	(0.171)	(1.525)	(-4.600)
After*Treated	0.011**	0.011**	0.015**	-0.002	0.020	-0.003*	-0.002
	(2.372)	(2.413)	(2.347)	(-0.091)	(0.824)	(-1.946)	(-0.170)
N	25888	25665	22301	26456	26306	26456	25899
Blackrock-BGI merger – Control Firms1							
After	0.015	-0.004	-0.043***	0.087	-0.048	0.002	0.068***
	(1.469)	(-0.585)	(-4.039)	(0.546)	(-0.956)	(1.386)	(3.137)
After*Treated	0.014**	0.023***	0.031***	-0.058	-0.007	-0.007***	-0.018
	(1.977)	(3.248)	(3.131)	(-1.635)	(-0.132)	(-2.650)	(-1.153)
N	6855	6842	5915	6900	6855	6902	6856
All mergers except 2008 and 2009 – Control Firms1							
Treated	-0.007	-0.007	-0.005	-0.022	-0.013	0.000	0.004
	(-0.935)	(-0.886)	(-0.506)	(-1.344)	(-0.694)	(0.069)	(0.216)
After	-0.007**	-0.006*	-0.006	0.005	0.003	0.001	-0.034***
	(-2.163)	(-1.648)	(-1.147)	(0.261)	(0.156)	(1.262)	(-3.221)
After* Treated	0.006	-0.001	-0.001	0.044*	0.040*	0.002	0.010
	(0.765)	(-0.106)	(-0.143)	(1.940)	(1.955)	(0.584)	(0.409)
N	12330	12151	10622	12792	12758	12784	12339

Panel B: Control Firms2

Dependent Variable:	ROA1 (Income before EI)	ROA2 (Operating Income)	ROA2 (ind. adj.)	Stock Return	Stock Return (ind. adj.)	R&D	Asset growth
Full Sample – Control Firms2							
Treated	-0.008	-0.013	-0.026	-0.023	-0.018	-0.001	-0.032
	(-0.745)	(-1.031)	(-1.300)	(-1.213)	(-0.966)	(-0.139)	(-1.490)
After	-0.003	-0.008	-0.025	0.030	0.011	0.003	-0.011
	(-0.464)	(-1.244)	(-1.564)	(1.422)	(0.538)	(1.269)	(-0.670)
After*Treated	-0.007	-0.006	0.013	-0.022	-0.023	0.000	0.002
	(-1.015)	(-0.903)	(0.793)	(-1.020)	(-1.076)	(0.150)	(0.129)
N	11099	11033	10295	11419	11372	11405	11098
Blackrock-BGI merger – Control Firms2							
After	0.033**	0.022*	-0.039	-0.036	-0.120	-0.001	0.100***
	(2.183)	(1.861)	(-1.277)	(-0.142)	(-0.958)	(-0.198)	(3.235)
After*Treated	-0.026**	-0.017*	0.017	0.065	0.065	0.003	-0.006
	(-2.425)	(-1.679)	(0.471)	(0.686)	(0.721)	(0.636)	(-0.278)
N	4577	4575	4281	4664	4663	4667	4577
All mergers except 2008 and 2009 – Control Firms2							
Treated	-0.004	-0.006	-0.006	-0.045	-0.049	-0.003	-0.032
	(-0.332)	(-0.498)	(-0.305)	(-1.077)	(-1.131)	(-0.862)	(-1.030)
After	-0.002	-0.004	-0.024	0.046	0.018	0.002	-0.011
	(-0.269)	(-0.494)	(-0.832)	(1.532)	(0.689)	(0.856)	(-0.369)
After* Treated	0.002	-0.002	0.017	0.028	0.036	0.001	-0.024
	(0.211)	(-0.224)	(0.689)	(0.754)	(1.462)	(0.319)	(-0.767)
N	4239	4175	3926	4428	4424	4403	4238

Table 6: The analysis of mergers, joint ventures, and strategic alliances following financial-institution mergers. Panel A shows the overall frequency of mergers, joint ventures (JVs), or strategic alliances (SAs) for the Treatment Firms (with any partner or with an industry peer) within the three years following the financial institution merger. Panel B shows the frequency of these events for the Treatment Pairs (left column) and Control Pairs (right column).

Panel A: Descriptive statistics for the frequency of mergers, JVs, and SAs for Treatment Firms

	# Firms	*Percent*
# Treatment Firms in year -1	1,048	
Firms involved in a merger, JV, or SA in following 3 years	298	28.40%
Firms involved in a merger, JV or SA within same industry, in following 3 years	162	15.5%
JV and SA cases	62	5.9%
Merger cases	109	10.4%

Panel B: Pair-level analysis of mergers, JVs and SAs

	Treatment Pairs	Control Pairs
# pairs in year -1	1,246	2,448
# pairs involved in the event in years 1 to 3	1	2
Percent of pairs	0.08%	0.08%
Percent of all events involving Treatment Firm in years 1 to 3	0.67%	0.70%

Table 7: Descriptive statistics for the firms entering the S&P500 and the Russell2000 from Russell1000 from 1980 to 2015. All variables are for the last fiscal year prior to entry. Benchmark firms are firms matched with the entering firms in the quarter prior to entry on their 3-digit SIC code and market capitalization. There are 714 firms entering S&P500 and 1,515 firms entering Russell2000 with non-missing asset data in the preceding year. The corresponding numbers for benchmark firms are 571 and 1,247. *R&D* is the ratio of R&D expenditures to total assets with R&D set to zero wherever missing. *PPE* is the ratio of property, plant, and equipment plus inventory to total assets. *Leverage* is the ratio of long-term and short-term debt to total assets. *Market Share* is the fraction of the firm's sales to total 3-digit SIC industry sales. *ROA* is the ratio of operating income to total assets. *Stock return* is the sum of monthly returns over the fiscal year. *Institutional Own* is the fraction of institutional ownership on total market capitalization. *Block Own* is the fraction of institutional block ownership to total market capitalization, with blocks defined as ownership stakes of at least 5% of equity.

	Entering Firms		Benchmark Firms	
	Mean	Median	Mean	Median
Panel A: S&P500 additions				
Total Assets ($mil.)	9,248.94	2,517.11	11,787.26	2,991.00
Market Cap. ($mil.)	9,824.61	6,731.99	7,677.40	4,998.63
B/M	0.44	0.34	0.56	0.47
R&D	0.02	0.00	0.02	0.00
PPE	0.40	0.41	0.43	0.44
Leverage	0.33	0.30	0.35	0.31
Market Share	0.24	0.08	0.23	0.10
ROA(Operating)	0.21	0.20	0.16	0.15
Stock return	0.39	0.31	0.23	0.19
Institutional Own	0.62	0.63	0.58	0.61
Block Own	0.12	0.09	0.13	0.10
Panel B: Entries into Russell2000 from Russell1000				
Total Assets ($mil.)	2,196.18	781.94	1,229.79	430.25
Market Cap. ($mil.)	926.88	739.63	908.41	691.53
B/M	0.75	0.56	0.62	0.50
R&D	0.03	0.00	0.03	0.00
PPE	0.43	0.45	0.42	0.43
Leverage	0.34	0.33	0.31	0.29
Market Share	0.19	0.04	0.16	0.03
ROA(Operating)	0.14	0.13	0.15	0.15
Stock return	-0.08	-0.04	0.23	0.20
Institutional Own	0.47	0.46	0.50	0.49
Block Own	0.15	0.11	0.15	0.12