The Effects of Common Ownership on Customer-Supplier Relationships

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Abstract

I find common institutional ownership in a customer and its supplier increases the duration of their supply chain relationship, particularly when the common ownership is long-term and vertical frictions are greater. Using an instrument constructed around a shock to common ownership following a large mutual fund scandal, I find evidence of a causal relationship from common ownership to relationship longevity. To shed light on channels of vertical cooperation, I show that common ownership increases innovative and financial collaboration between the firms, as well as inventory management efficiency. Overall, results provide evidence that common ownership in a customer and its supplier strengthens their supply chain relationship.

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1 Introduction

In supply chain relationships, collaboration between trade partners often creates valuable relationship rents. However, holdup costs can prevent these synergies from ever taking place – each party fears investing in the relationship for fear that, once investment are made, the other party will act opportunistically to capture all relationship rents. Thus, the question of how to facilitate cooperation between vertical trade partners is a classic problem. I find that common institutional ownership in a customer and its supplier can facilitate supply chain cooperation, leading to longer, stronger relationships. Specifically, I document causal evidence that common ownership of vertical trade partners strengthens the interaction between the firms, both in terms of the relationship length and the transaction magnitude of the relationship. While prior work finds negative effects of common ownership – e.g., Matvos & Ostrovsky (2008) argue common ownership can lead to bad acquisitions,[1] and Azar, Schmalz, & Tecu (2018) and Azar, Raina, & Schmalz (2018) find that common ownership reduces product market competition – this paper suggests a bright side by showing that common ownership lengthens customer-supplier relationships, fosters innovative and financial cooperation between the firms, and enhances inventory efficiency.

We might expect common ownership to have these synergistic effects on vertical relationships because such an ownership structure can modify the firms' objective functions, particularly in cases where supply chain coordination produces greater economic benefits. As discussed by Hansen and Lott (1996), common owners do not care about individual firm value maximization, per se, but rather care about joint value maximization of the companies in their portfolio. This portfolio-level focus aligns the incentives of the commonly-held companies. While Hansen and Lott devote their empirical analysis to mergers and acquisitions, they discuss the natural extension to supply chain relationships. In the case of

[1]Matvos & Ostrovsky show that common owners are more likely to vote in favor of acquisitions with negative acquirer returns, but Harford et al. (2011) show that these stakes are too low to materially affect the outcome of the acquisitions.

a customer and supplier, common ownership should lead trade partners to reduce transaction costs in order to attain joint value maximization.

Common ownership is distinct from other ownership arrangements shown to affect supply chain relationships (e.g., vertical integration, corporate equity stakes), because common ownership stakes through third parties is arguably simpler and less expensive than vertical integration or corporate equity stakes. While vertical integration may make sense in the case of a customer which purchases the bulk of a suppliers output, it likely would not make sense when only a small portion of the supplier's output is purchased by a single customer. While corporate equity stakes can strengthen supply chain relationships, they rarely occur (Fee, Hadlock, & Thomas, 2006). Further, the process of establishing an equity stake is often costly, complex, time-consuming, and requires disclosure, making equity stakes expensive and fairly illiquid (Billett, Elkamhi, & Floros, 2015). By contrast, common ownership by institutional investors involves lower transaction costs, less expensive disclosure, and more flexibility, making this a relatively inexpensive means of aligning supply chain goals.

My empirical approach is along three dimensions: First, I document an association between common ownership and vertical relationship strength, in terms of relationship duration and transaction size. Second, I find causal evidence that common ownership strengthens customer-supplier relationships by examining a shock to common ownership. Third, I examine channels through which common ownership leads to stronger supply chain relationship.

Cursory evidence shows a relationship between common ownership and relationship duration, as well as between common ownership and transaction size. Cross-sectional tests confirm stronger results in cases where theory predicts greater holdup costs. However, because of endogeneity between common ownership and vertical relationship strength, the baseline results only show association. To establish causality, I instrument common ownership using the approach of Antón and Polk (2014). Their approach exploits a mutual fund scandal in late 2003 that created variation in common ownership plausibly exogenous to the underlying characteristics of the portfolio firms themselves. The instrumental variable (IV)

results based on this shock provide evidence that common ownership lengthens the duration of customer supplier relationships.

Next, I shed light on *how* common ownership strengthens supply chain ties, leading to longer relationships. First, common ownership affects innovative collaboration between the firms, resulting in the customer and supplier citing each other's patents more frequently, suggesting greater knowledge spillover/transfer between the firms. I also find that common ownership increases supplier R&D. We know customers want to promote supplier investment in the relationship (e.g., Raman & Shahrur, 2008), but theory suggests that holdup costs are especially high in the face of complex transacted goods. Greater supplier R&D, then, suggests reduced holdup costs. Second, common ownership increases financial cooperation between the firms, as shown by reduced use of trade credit. Large customers often demand extensive trade credit, at the detriment of small suppliers (e.g., Murfin & Njoroge, 2014), so reduced trade credit suggests more mutually beneficial trade credit policies between the firms. Third, common ownership improves inventory management efficiency, as shown by increased inventory turnover for both firms. Better supply chain coordination reduces the need to carry excess inventory (e.g., Cannon & Homburg, 2001; Heikkila, 2002), so better inventory management signals improved coordination between the customer and supplier. Together, the results show that common ownership enhances customer-supplier collaboration and strengthens their relationship.

2 Background and Hypotheses

A standard assumption in financial economics is that value maximization is the ultimate goal of a firm and its managers. However, prior literature has established that shareholders may not unanimously desire value maximization if markets are not perfectly competitive (Ekern & Wilson, 1974; Nielsen, 1976; Hart, 1979; Grossman & Stiglitz, 1977; Long 1972; Merton & Subrahmanyam, 1974; Radner, 1974). Thus, shareholders' objective func-

tions may not always reflect individual firm value maximization. In the spirit of alternative objective functions, Hansen and Lott (1996) analyze the preferences of shareholders in the face of product market imperfections and diversified portfolios. When shareholders hold diversified portfolios, they want portfolio maximization rather than firm maximization. In this case, in order to maximize shareholder wealth, firms should seek portfolio maximization. If portfolio firms have the ability to affect each other's profits, seeking portfolio maximization should lead them to internalize between-firm externalities. In other words, common ownership could induce firms to interact differently than they would if each firm was seeking individual value maximization. More recently, Azar (2017) theoretically addresses firm behavior in the presence of common ownership. He shows, in equilibrium, managers incorporate the portfolio incentives of their voting shareholders in their firm decisions. Importantly, this result can arise without direct communication between asset managers and firm managers.

Recent empirical papers explore how common institutional ownership affects outcomes of mergers and acquisitions (Hansen & Lott, 1996; Matvos & Ostrovsky, 2008; Harford et al., 2011), return correlations (Antón & Polk, 2014), and CEO pay incentives (Antón, Ederer, Gine, & Schmalz, 2016). Perhaps most closely related to my paper are studies addressing how common ownership affects industry competition. He and Huang (2017) find that same-industry common ownership leads to higher market share growth for commonly held firms. Azar, Schmalz, and Tecu (2018) look at common ownership in the U.S. airline industry and find evidence of higher ticket prices due to industry market power facilitated by common ownership. Azar, Raina, and Schmalz (2016) find higher prices for banking products due to higher common ownership. Azar (2012) looks at network connectivity of firms due to common ownership. He finds a negative relationship between overall network connectivity and industry markups, and argues that this is consistent with a partial vertical integration story. However, he does not examine vertical relationships explicitly. Thus, an open question in the empirical literature is how common ownership affects vertical relationships.[2]

[2]Cici, Gibson, and Rosenfeld (2015) examine effects of common ownership between a bank and its borrower, which is one very specific (and unique) type of vertical connection, but do not look at supply chain

Of course, the idea that ownership structure in general can influence customer-supplier relationships is not new. A stream of literature is devoted to vertical integration, and situations where merging with a trade partner is advantageous (e.g., Lafontaine & Slade, 2007; Gans & Wolak, 2013). Even in the absence of vertical integration, ownership structure can have strong effects on vertical relationships. Fee et al. (2006) show that when the customer owns an equity stake in its supplier, the relationship lasts longer.

My study differs from prior studies about ownership and vertical relationships because I analyze common ownership of customer-supplier dyads by third parties —institutional investors —rather than ownership of one of the firms by the other. This is a distinct difference, because common ownership stakes through third parties is much less extreme than vertical integration, and less costly for the firms themselves than a direct equity stake by one party in the other, making this a relatively inexpensive means of aligning supply chain goals. The primary focus of this paper is to provide evidence that common ownership can help forge economic ties between a customer and supplier. Understanding how this could take place requires answering three questions:

1. *Why would it be beneficial for common owners to foster stronger vertical relationships?*

The simple answer is that stronger customer-supplier relationships could create supply chain value, leading to higher returns for the institutional investors. To describe how this value could be created, I draw from the decades-old literature on transaction costs, vertical integration, and strategic vertical relationships. Transaction cost economics, pioneered by Williamson (1971, 1979, 1985), focuses on how frictions prevent companies from efficient vertical collaboration. Specifically, problems arise due to costly bargaining and opportunistic behavior. Ideally, these problems could be resolved through contracting, but contracting is incomplete, particularly when relationship assets are highly specific, goods are complex, or uncertainty is high. Because of these holdup problems, in many situations it becomes

interactions between operating companies. Further, arguing endogeneity is not an issue in their setting, they do not address it, while my paper addresses endogeneity directly.

advantageous —or even necessary —for firms to collaborate along the supply chain at a level beyond a price-based market exchange. Dyer and Singh (1998) note four ways that a vertical partnership can create value: a) investment in relationship-specific assets, b) knowledge exchange, c) combining innovative resources, and, d) lower transaction costs due to better relationship governance mechanisms. When one or more of these ways offer an opportunity for value creation, collaboration is economically beneficial, because it creates value that the partners could not create individually (i.e., relationship rents). In such situations, common owners would have incentive to exert influence on their portfolio firms to forge bonds beyond price-based market transactions.

2. *If a stronger vertical relationship is economically beneficial to the companies, why is common ownership necessary to facilitate it?*

This second question can be addressed with arguments from transaction cost economics and the incomplete contracting literature (Grossman & Hart, 1986). While vertical collaboration between companies can be mutually beneficial, these close ties build relationship rents. Relationship rents create value that could be captured by either party, generating strong incentives for each party to behave opportunistically. This in turn destroys the collaborative spirit of the relationship —or more accurately, precludes strong collaboration from ever taking place. Thus, to create the relationship rents discussed above, the partnership must have effective governance mechanisms in place to deter opportunistic behavior by either of the parties. Dyer and Singh (1998) distinguish between two broad classes of governance mechanisms in supply chain partnerships: third-party enforcement and self-enforcing agreements. Third-party enforcement usually refers to contractual agreements. While contracts can be a sufficient governance mechanism in situations characterized by less uncertainty and little relationship-specific investment, their effectiveness is often severely limited by contracting costs. These costs include financial costs, time, inability to fully specify the necessary terms, high monitoring costs, and higher adjustment costs in response to market changes. The alternative to contracts is self-enforcing agreements, which can bypass the problems

of more coercive mechanisms. Because of this, self-enforcing mechanisms can be preferable to contracts. Self-enforcing methods include things such as equity structure or physical investment in relationship-specific assets which align the economic interests of the parties, or personal trust gained through experience or reputation. Having a self-enforcement mechanism can be crucial, because even in situations where collaboration can create economic rents, strong relationships are difficult to implement due to the overhanging question of how the rents should be split among the parties (Corsten & Kumar, 2005).

This paper focuses on a self-enforcing mechanism which has not been explicitly examined in the literature —common ownership as a result of institutional investment in both the customer and the supplier. I categorize this as a self-enforcing mechanism, using Dyer and Singh's terminology, because facilitating or strengthening a vertical relationship through common ownership would take place through aligned incentives, instead of through a legal contract or other designated third-party. Rather, since the goal of the firm is to maximize shareholder value, having a high level of common ownership would create or solidify the commonality of the firms' economic goals. This in turn should reduce opportunistic behavior and facilitate stronger and smoother supply chain partnerships.

3. *If common ownership acts as a mechanism through which two firms can achieve joint profit maximization, rather than individual profit maximization, how does common ownership differ from ownership by a single common party, i.e., vertical integration?*

In other words, if common ownership acts as a "bonding agent" between a customer and a supplier, what distinguishes it from other bonding agents previously analyzed in the literature, such as vertical integration and corporate equity stakes? First, institutional common ownership is not clearly motivated by a desire to influence the supply chain relationship, so isolating this effect is illuminating. Second, in the case of common ownership facilitating the relationship, incentives to collaborate come from a third party, not from a hierarchical or contractual agreement. Third, the relationship would not be subject to anti-competition laws as vertical mergers could be. Finally, equity alliances are costly (Gulati, 1995), so

common ownership could be a means of influence without the costly or long-term nature of vertical integration or acquiring a corporate equity stake. Likely, integration and equity stakes are more viable options in more dominant customer-supplier relationships (e.g., when the customer comprises the vast majority of the supplier's sales), while common institutional ownership can be effective in less severe situations where frictions exist but more extreme actions are economically infeasible.

3 Data and Methodology

3.1 Data

To identify customer-supplier relationships, I use the Compustat Segment Customer data. Statement of Financial Accounting Standard (SFAS) No.14 requires firms to report all customers comprising 10% or more of their total sales, though many firms opt to report significant customers below this threshold as well. The Segment database includes the names of customers as well as the supplier sales to these customers.[3] My sample of Segment data runs from 1976-2016, and includes 28,620 supplier-customer pairs. I merge the Segment data with firm-level controls from Compustat.

Data on institutional ownership is from the Thomson Reuters 13F database. This database includes institutional investors with over $100 million in assets under management, which includes pension funds, endowments, insurance companies, bank trusts, mutual funds, hedge funds and independent advisors. The ownership data from Thomson runs from 1980-2012,[4] and reports institutions' holdings at the end of each calendar quarter. I merge Thomson with CRSP's quarterly database for shares outstanding and stock price data.

[3] In the raw Segment data, customer names are in text format and must be matched to their Compustat gvkeys for coding. I thank Edward Fee, Janet Gao, and Yixin Liu for graciously providing matched customer-supplier data.

[4] Thomson Reuters 13F data is available for years after 2012, but the reliability of recent data (since 2013) has been questioned. See wrds-web.wharton.upenn.edu for details.

3.2 Measuring Common Ownership

To compute my common holding measures, I first identify institutions that hold shares in both the supplier and the customer at a given point in time (measured quarterly with the 13F filings). These institutions are labeled common owners. To create continuous measures capturing the magnitude of common ownership, I use two variables from prior literature, which I label *CO-product* and *Common value.* For both measures, a higher value reflects a greater amount of common ownership and reflects the magnitude of the ownership stakes by common owners in both firms. The first measure is *CO-product*, the product of the proportion of supplier shares held by common owners and the proportion of customer shares held by common owners, that is:

$$\Big(\frac{\Sigma_k H_{c,k}}{H_c} \times \frac{\Sigma_k H_{s,k}}{H_s}\Big), \tag{1}$$

across k common owners, where H denotes shares of the customer or supplier, denoted c and s, respectively. This variable was previously used by Hansen and Lott (1996) to measure common ownership in the target and acquirer in mergers and acquisitions.

The second common ownership measure is *Common value*, the proportion of value outstanding held by common owners:

$$\frac{\Sigma_k (V_{s,k} + V_{c,k})}{V_s + V_c}, \tag{2}$$

across k common owners, where V denotes the value of either the customer or supplier, calculated as number of shares $\times$ share price. *Common value* is used by Antón and Polk (2014), who address how common ownership affects the commonality of stock returns. All common ownership characteristics are calculated for each quarter, then averaged to create an annual figure. In all specifications, common ownership is measured with a one-year lag.[5]

[5]The one-year ownership lag is based on the supplier's fiscal year-end, since the Segment data is reported by the supplier, and thus reflects its fiscal year. Because the ownership data is measured at calendar-year

3.3 Dependent Variable

Analyzing the effects of common ownership on vertical relationships requires a measure of relationship strength. Optimally, the measure would capture the longevity of the relationship as well as its magnitude. To capture these two dimensions of relationship strength, I analyze relationship survival, using an indicator for the customer-supplier relationship ending as my main dependent variable. This indicator captures the longevity of the relationship by reflecting relationship duration. It also reflects the magnitude of the relationship because of the nature of the sample: since the supplier only reports sales to major customers, all customer-supplier relationships in the sample are significant transactions. My main dependent variable is *Relationship end*. To construct *Relationship end*, I follow Fee et al. (2006), and follow a customer-supplier pair from the first time it appears in the sample through the last time it appears. I mark this last year as the relationship end. Also following Fee et al., I mark the last year as missing if that year is also the last year one of the firms appears in Compustat, since I can no longer observe whether the relationship continues. Thus, *Relationship end* is an indicator equal to one if an observation is the last year a customer-supplier pair appears in my sample, zero if the relationship continues next year, and missing if an observation is a firm's last year in Compustat. While the indicator is an imperfect measure of when the relationship ends —in some cases, the relationship may no longer be reported because sales to the customer have fallen below the 10% threshold —the indicator does capture the last year of significant trade between the two firms, and is likely highly correlated with the true relationship end, as noted by Fee et al. (2006).

In some specifications, I use as a dependent variable the natural logarithm of the proportion of sales sold by the supplier to the customer, that is, $Log(R_{s,c}/R_s)$, where R is the revenue of the supplier. This variable is not always reported by the supplier, so these specifications have fewer observations.

quarters, I match supplier quarters to the nearest calendar-year quarter (e.g., a supplier quarter ending in May will be matched to quarterly institutional ownership in June).

3.4 Control Variables and Specifications

We would expect customer-supplier relationships with larger transactions to last longer, all else equal, since these are cases where the supplier depends more heavily on the customer. In all specifications using *Relationship end* as the dependent variable, I control for the sales dependence of the supplier on the customer, measured as the natural logarithm supplier sales to the customer as a proportion of total supplier sales. When transaction size is not reported in a given year, but the relationship has not ended, I use the most recent sales dependence measure. Trade relationships also likely last longer when alternative vertical partners are scarce, so I control for the industry concentrations of the supplier and of the customer, calculated at the 4-digit SIC level. Bargaining power could also affect trade relationships, so I include controls for market share, log firm size, and log firm age. To capture unobservable, time-invariant characteristics of the firms and their relationships, all linear probability model (LPM) specifications use either relationship fixed effects (fixed effects for the customer-supplier pair) or industry fixed effects (fixed effects for the customer's industry and the supplier's industry), as well as year fixed effects. Because fixed effects are problematic in nonlinear models, in Cox hazards model specifications I allow the baseline hazards to differ across industries and year in lieu of using fixed effects. Finally, in hazards models and LPM specifications with industry fixed effects rather than relationship fixed effects, I control for the log of relationship tenure, measured as the log of one plus the number of years since the customer-supplier pair appeared in my sample.[6]

Throughout the paper, I use LPM specifications and nonlinear specifications (Cox hazards models or probit models). Because the main dependent variable (*Relationship end*) is binary, the nonlinear specifications are statistically more precise, but the LPM has two important advantages: 1) it allows the use of fixed effects, which are known to be problematic in nonlinear models (e.g., Greene, 2002); and, 2) it facilitates easier interpretation of the effect

[6]When I use relationship fixed effects, I exclude the log of relationship tenure, because this variable has a mechanically positive relationship with relationship end. That is, in a given customer-supplier pair, the later in the sample the observation, the more likely that it will be the last year.

size. For these reasons, I use LPM specifications alongside nonlinear models, and discuss coefficient magnitudes from the LPM specifications.

3.5 Summary Statistics

Table 1 reports summary statistics for the variables of interest and the control variables, computed at the customer-supplier-year observation level. Panel A shows that customers tend to have a higher market share, hold more assets, and are older than suppliers. This reflects the nature of the sample: since suppliers are required to report customers comprising over 10% of their sales, the sample is skewed toward smaller suppliers and larger customers. Panel B shows that a customer accounts for 20% of the supplier's sales on average, and the average relationship lasts approximately 3.65 years. Panel C shows ownership data. In 31% of the customer-supplier-year observations, there is a positive level of common institutional ownership, though this proportion increases in the later part of my sample when institutions account for a larger proportion of aggregate stock market ownership. Across all customer-supplier pairs, the average level of *CO-product* is 0.02 and the average level of *Common value* is 0.06 (6 % of value outstanding is held by common owners). Across customer-supplier pairs with a positive level of common ownership, the average levels of *CO-product* and *Common value* are 0.08 and 0.19 (not reported).

4 Panel Regression Results

4.1 Baseline Results

Baseline results are shown in Table 2. In the first two columns, I regress *Relationship end* on common ownership and control variables using linear probability models. These two columns differ in the measure of common ownership: column 1 uses *Common value* and column 2 uses *CO-product*. Both linear probability models include year and relationship

fixed effects. Columns 3 and 4 use Cox proportional hazards models, stratified so that the baseline hazards differ across supplier industry, customer industry, and year. Standard errors in all specifications are clustered at the customer-supplier relationship level. Results show that the relationship is less likely to end when the sales dependence of the supplier is high. Further, relationships with longer tenure are less likely to end. The betas for the control variables generally indicate that relationships last longer when the firms have higher market share, are larger, or are younger.

Across all four specifications in Table 2, the coefficient on common ownership is negative and significant, indicating higher levels of common ownership associate negatively with the relationship ending. In terms of magnitude, moving from one standard deviation below the mean for *CO-product* to one standard deviation above the mean corresponds to a 2.59% reduction in the probability of the relationship ending. This is significant, relative to the unconditional probability of the relationship ending, 21.23%. Similarly, moving from one standard deviation below the mean for *Common value* to one standard deviation above the mean corresponds to a 2.58% reduction in the probability of the relationship ending.

Common ownership is associated with stronger vertical relationships not only in terms of relationship longevity, but in the magnitude of the relationship as well. In Table 3, the dependent variable is *Sales dependence*. Observations are limited to years where the supplier reports the amount of sale to the customer. Results here corroborate the results of Table 2: When there is a higher level of common ownership, the relationship is stronger.

4.2 Cross-Sectional Tests

The baseline results in the previous section reflect a positive relationship between common ownership and relationship strength. If the relationship is causal, then we should see stronger results for certain cross-sectional characteristics. I confirm this by exploiting heterogeneity across several dimensions of the sample to perform cross-sectional tests. For brevity, details and tabulated results are available in the Internet Appendix. First, I find re-

sults are stronger for long-term common ownership, consistent with long-term owners having more influence over (long-term) supply chain considerations (Table A1, Panel A). Results are also stronger when common ownership is only calculated across common owners holding at least 1% of each firm's shares outstanding (Panel B). I also find qualitatively similar results using the *GGL* measure of common ownership proposed by Gilje, Gormley, and Levit (2018) (Panel C). Further, results are stronger with greater input complexity and specificity: results are stronger in industries with more relationship-specific goods and services, and with higher supplier R&D intensity (Table A2). Finally, I show that results are not driven by relationships with a dominant customer: results remain strong in the subsample where supplier size is most similar to customer size, and when the customer is most dependent on the supplier (Table A3).

5 Instrumental Variable Results

5.1 2003 Mutual Fund Scandal

Baseline results show a strong *correlation* between common ownership and relationship strength. Further, results exploiting heterogeneity among common owners and cross-sectional results are consistent with a causal story – results are stronger for long-term owners and in the face of vertical frictions. However, these results cannot confirm a causal relationship. Instead, the relationship between common ownership and relationship strength could reflect institutions investing in both firms *because* of their strong relationship, implying reverse causality.

To address endogeneity, I instrument common ownership in a two-stage regression framework, using an instrument first used by Antón and Polk (2014) and also used by Antón et al. (2016). The instrument is constructed around a large mutual fund scandal which began in 2003. Beginning in September of that year, news came out that funds from around 25 mutual fund families were accused of late trading and market timing. At the time, these

fund families held $236.5 billion in assets under management, approximately 25% of the aggregate assets under management by U.S. mutual funds (Antón et al., 2016). The scandal news led to significant withdrawals from these fund families over the next months and years. These fund families saw outflows until December 2006, which amounted to 14% the first year and 21% the second year (Kisin, 2011). The large outflows from these institutions represent a plausibly exogenous shock to common ownership, since the shock occurred due to fund management practices unrelated to the firms in the funds' portfolios. These outflows, in turn, reduced the common ownership stakes by the fund families involved, which reduced the overall level of common ownership, as I illustrate later in Table 4.

To construct an instrument capturing the effects of this shock, I follow Antón and Polk (2014) and use the proportion of total common ownership held in the scandal fund families at the time of the scandal (*Ratio*) as an instrument for common ownership in the following years. I also use the level of common ownership at the time of the scandal (*CoVal, Sep-03*) as an instrument in the first stage, similar to the strategy of Antón and Polk.[7] In case the shock to common ownership adversely affected firm returns, which could in turn have an adverse effect on vertical relationships, I control for annual stock returns of the customer and supplier as well. The first-stage specification is

$$Common\ value_{i,t+2003} = \lambda_j + \mu_t + \beta_1 Ratio_{i,Sep.\ 2003} + \beta_2 CoVal_{Sep-03} + \gamma X_{i,t} + \epsilon_{i,t} \qquad (3)$$

Thus, the first stage predicts common ownership in the years following the scandal using *Ratio*, the level of common ownership in September 2003, control variables, and industry and year fixed effects. For my IV results, I use only *Common value* to measure common ownership, since *CO-product* cannot be meaningfully converted to a ratio.[8]

[7] Antón and Polk include *CoVal, Sep-03* in the second-stage of their regressions as well as in the first stage. I include it only in the first stage, because 1) the level of common ownership in September 2003 should only affect relationship strength variables through its correlation with current common ownership, and 2) including it in the second-stage confounds interpretation of the common ownership beta, due to strong collinearity between common ownership and its lagged value. However, results are qualitatively similar if *CoVal, Sep-03* is included in both stages, as reported in Table A4 of the Internet Appendix.

[8] Since *CO-product* is the product of two proportions, dividing *CO-product* calculated over the subset of

To illustrate the relevance of the instrument, Table 4 shows the level change (from September 2003 levels) in *Common value* for customer-supplier pairs in existence in a given year whose relationship began in or before 2003 (the year of the scandal). The sample is split between "high scandal pairs" —customer-supplier pairs with an above-median *Ratio* value —and "low scandal pairs" —customer-supplier pairs with a below-median *Ratio* value.[9] For every year from 2004-2008, the change from 2003 levels is lower for high scandal pairs than for low scandal pairs, and the difference is always significant statistically and economically.

To test the relevance of the instrument in a multivariate framework, Table 5 shows results for annual regressions of *Common value* on *Ratio*, with control variables and fixed effects included. As expected, for years 2005-2007, *Ratio* is significantly negatively associated with the level of common ownership, reflecting how the outflows from the scandal families reduced common ownership. In 2004, *Ratio* is *positively* associated with *Common value*. As noted by Payanides and Thomas (2017), outflows from implicated families resulted from announcements made over a two-year window. Quite possibly, an insufficient amount of time had passed since the scandal for outflows to strongly affect the level of common ownership, particularly since my measure of *Common value* is averaged across all quarters of the year and many of the outflows took place later. Early supplier fiscal year-ends also partly explain the positive coefficient on *Ratio* for 2004 - for customer-supplier pairs in which the supplier has an early fiscal year, common ownership is calculated using holdings data before or coincident with the scandal. Conversely, for customer-supplier pairs in which the supplier has a late fiscal year (ending in February-May), the coefficient on *Ratio* becomes negative. Because 2004 levels of *Common value* did not yet reflect the effects of the scandal, I use the IV to predict *Common value* in years 2005-2007 (corresponding to relationship-years 2006-2008) for my two-stage results. However, results are substantially unchanged if I use *Common value* in years 2004-2007 (corresponding to relationship-years 2005-2008).

scandal funds by total *CO-product* does not create a real ratio.

[9]The median is calculated across customer-supplier pairs with a positive level of scandal common ownership. In Table 4, "low scandal pairs" includes firms which had a positive level of common ownership but no scandal common ownership, thus the unequal number of "high scandal pairs" and "low scandal pairs."

In the 2SLS results I restrict the sample to customer-supplier relationships in existence by 2003, with at least one common owner at the time of the scandal. Within this sample, some customer-supplier pairs have a positive level of *Common value* but a *Ratio* of zero (no common ownership by scandal funds in September 2003), and others have both a positive level of *Common value* and a positive level of *Ratio*. I report IV results for two samples:

- The *Positive CO* sample includes customer-supplier relationships in existence by 2003 that had a positive level of common ownership in September 2003.
- The *Positive Scandal CO* sample includes customer-supplier relationships in existence by 2003 that had a positive level of scandal common ownership in September 2003.

5.1.1 Expectation for magnitudes

Because the mutual fund scandal led to variation in common ownership (Table 4) for reasons plausibly exogenous to customer-supplier relationships, then the IV results using this shock should provide a useful means of establishing a link between common ownership and supply chain relationship strength. However, the shock may not be as useful for deriving the exact magnitude of the relationship: If engagement between the portfolio companies and the firms is the mechanism or one of the mechanisms through which common ownership affects customer-supplier relationships, then even a small change in common ownership could lead to large effects. Losses in common ownership resulting from the scandal could lead to large changes in engagement with the firms, particularly if involvement in the scandal further distracted fund managers from attention to their portfolio firms. Thus, we might expect the IV results to be skewed somewhat higher than OLS results.[10] Because the subsample used for the 2SLS results is different from the baseline results in Table 2 and uses industry, rather than relationship fixed effects, I provide OLS results over the same sample and with the same fixed effects for comparison with the main 2SLS results.

[10] I thank an anonymous reviewer for this insight.

5.2 IV results for *Relationship End*

Table 6 shows full 2SLS results for regressions predicting *Relationship End*. Panel A uses a linear probability model and Panel B uses a probit specification. Column 1 of Panel A shows the first-stage results for the *Positive CO* sample. The instruments, *Ratio* and *CoVal, Sept-03*, are statistically significant, and have a strong F-statistic. The first stage easily passes the underidentification test as well, suggesting strong instruments. The second stage results in column 2 show that instrumented *Common value* has a negative effect on the probability of the relationship ending, and is significant at the 5% level. Column 3 shows OLS results for comparison. While the 2SLS coefficient is somewhat larger than the equivalent OLS coefficient as expected, the two coefficients are relatively similar in magnitude. Columns 4-6 repeat these results for the *Positive Scandal CO* subsample. These results are mirrored in Panel B using probit models, where instrumented common ownership is statistically significant across all specifications.

In Table 7, I use the mutual fund scandal shock to construct a difference-in-differences test. The treated sample includes customer-supplier pairs with an above-median ratio (*Hi ratio*) of scandal common ownership to total common ownership in September 2003, and the control sample includes customer-supplier pairs with a below-median ratio. The pre-period is years 2000-2002, and the post-period is 2006-2008. The variable of interest is the interaction between the treatment group and the post period (*Hi ratio* $\times$ *post*). In this framework, the treatment group had a higher level of scandal ownership, and so experienced a greater negative shock to common ownership. Therefore, we would expect customer-supplier relationships in the treatment group to have a greater probability of ending in the post-period than customer-supplier relationships in the control group. This is confirmed in Table 7. The interaction term is positive and significant, meaning that the probability of the relationship ending is greater for treatment firms after the shock.

In the Internet Appendix (Table A4), I perform robustness checks for the IV results. I

show the results are qualitatively robust to 1) 2SLS results using only the instruments, without control variables or fixed effects (Panel A); 2) 2SLS results using only the instruments, industry fixed effects, and year fixed effects; 3) using only *Ratio* as an instrument, excluding *CoVal,Sept-03* from both stages; 4) including *CoVal,Sept-03* in both stages, rather than using it as an exogenous first-stage instrument; and 5) restricting the computation of common ownership to common owners holding at least 1% stake in each firm. Results support the findings in Tables 6 and 7.

In Table 8, I use the 2SLS framework with *Sales dependence* as the dependent variable, since from Table 3, we would also expect common ownership to affect the magnitude of the relationship between the customer and its supplier. However, the sample used for the IV results is restricted to customer-supplier pairs already in existence by 2003; for these pairs, we might not expect significant opportunities for further increases in transaction size in 2006-2008, since the relationship is likely already well-established. Consistent with this intuition, in Columns 1 and 2, using the sample of supply-chain relationships established in or before 2003, the coefficient on common ownership is positive, but not statistically significant. However, when I relax the requirement that the relationship began by 2003, results become positive and strongly statistically significant, in columns 3-4.

Overall, the results in this section corroborate the conclusion from the baseline results: common ownership strengthens customer-supplier relationships, as evidenced by a greater probability of customer-supplier relationship survival and greater transaction size. By using a plausibly exogenous shock (the 2003 mutual fund scandal) to exploit variation in common ownership unrelated to vertical relationships, the IV results provide a much stronger causal argument.

5.3 Evidence on Channels

The IV results in Tables 6-8 provide evidence that common ownership strengthens trade relationships. Consistent with theory, OLS results discussed in Section 4 show the

association between common ownership and relationship survival is stronger in relationships more likely to be plagued by vertical frictions (product specificity, high R&D intensity, mutual dependence, etc.). However, thus far I have not explicitly examined channels through which commonly owned customers and suppliers maintain longer relationships. In this section I explore that question, using IV results to make a stronger causal argument. While it may be impossible to identify all precise channels at work, I provide evidence that common ownership affects innovation sharing among trade partners, inventory efficiency, and trade credit policy.

5.3.1 Innovation and innovation diffusion

Since vertical frictions are greater in the face of input specificity and complexity, facilitating greater cooperation in innovation could lead to stronger, longer relationships. I examine this hypothesis in this subsection. In short, regressions looking at patent-citing activity support this hypothesis, as do regression on R&D activity and patenting activity, though to a lesser extent. These results are discussed in the following paragraphs and tabulated in Table 9, which shows second-stage results using IV analysis.

Because I am interested in innovation sharing between the customer and supplier, I examine cases of one firm's patents citing its trade partner's patents. Patenting data is retrieved from the Kogan, Papanikolaou, Seru, and Stoffman (2016) database. The data identifies the patent's inventory, assignee, technology class, and references to other patents it cites. I refer to Kogan et al. (2016) for further details on the data. Patent citations are frequently used in the literature as a measure of innovation diffusion. For example, Jaffe, Trajtenberg, and Henderson (1993) and Thompson and Fox-Kean (2005) use the location of patent citations to identify how geography affects knowledge spillover, and Kostovetsky and Manconi (2017) use patent citations to examine how common ownership affects innovation diffusion.[11] Panel A analyzes innovation diffusion between the customer and supplier, as

[11]Note that Kostovetsky and Manconi do not examine information diffusion in the context of customer-supplier relationships specifically.

indicated by cases of the firms citing each other's patents. The dependent variable is the log of 1 + the number of times the customer (supplier) cites the supplier's (customer's) patents. Consistently, higher levels of common ownership (instrumented with the scandal IV) lead to more patent cross-citing, suggesting more innovation spillover and cooperation between the firms.

Next, I examine the relationship between common ownership and R&D activity. When suppliers sell goods and services tailored to the needs of their customers, customers want to encourage supplier investment in the relationship (e.g., Raman & Shahrur, 2008), but holdup costs are especially high with complex inputs. Thus, if common ownership reduces holdup costs between the customer and supplier, we would expect greater supplier investment. I examine the effects of common ownership on both supplier R&D intensity and customer R&D intensity in Panel B of Table 9, where R&D intensity is defined as R&D expenses scaled by firm assets. The coefficients for supplier R&D intensity confirm a positive relationship between common ownership and supplier R&D. Results for customer R&D are insignificant, but this is not entirely unexpected, since the supplier produces the goods in the relationship.

Finally, in Panel C I use a different measure of innovation as the dependent variable, the log of 1 + the number of patents of either the customer or supplier the customer issues in a given year. The coefficient on *Common value* is positive for customer patents, and reaches statistical significance in column 4, but results are mixed for suppliers.

5.3.2 Inventory turnover

Next, I examine the inventory management efficiency of both the supplier and customer. When supply chain partners collaborate more closely, both firms are able to carry smaller inventory amounts, reducing inventory carry costs (e.g., Cannon & Homburg, 2001; Heikkila, 2002). If common ownership leads to greater trust and communication between the supplier and customer, we might expect the trade partners to collaborate better in terms of

inventory management, leading to efficiency gains for both firms. In Table 10, the dependent variable is inventory turnover for the supplier (columns 1-2) and the customer (columns 3-4). Consistently, the coefficient on common ownership is positive and statistically significant, indicating that stronger ties forged by common ownership improve inventory efficiency for both firms.

5.3.3 Trade credit

Finally, since common ownership supports the survival of vertical relationships, we might expect to see effects on the firms' trade credit policy. In Table 11, I examine how common ownership affects the supplier's accounts receivable and the customer's accounts payable. A limitation of this section is that the trade credit data is at the firm level, not the relationship level, and thus is a course measure of trade credit policy between the firms. Panel A shows the effects on the supplier's accounts receivable. The dependent variable is either accounts receivable turnover (AR turn) or accounts receivable scaled by total supplier assets (AR). Results in all specifications suggest fewer trade receivables. AR turn is higher and AR is lower with greater common ownership, meaning the supplier has fewer receivables when common ownership is higher. Existing papers (e.g., Fabbri & Klapper, 2016; Murfin & Njoroge, 2014) suggest that large customers often force trade credit concessions from their small suppliers to the detriment of the suppliers. Finding that common ownership reduces supplier receivables is consistent with common ownership helping to limit this sort of predatory payable policy. Results for customers in Panel B are insignificant, which is unsurprising since a given supplier comprises a smaller portion of the customer's COGS relative to the portion of supplier's sales coming from the customer.

6 Discussion of Economic Mechanisms

I find empirically that common ownership leads to longer and stronger supply chain relationships, and that some of the channels common ownership affect include innovative collaboration, inventory management, and trade credit policies. However, a remaining question is the precise mechanism through which common owners influence the customer-supply dyads to promote better supply chain cooperation. While providing direct, statistical empirical evidence is challenging, here I briefly discuss some of potential economic mechanisms through which common ownership could affect supply chains:

First, investors engage directly with portfolio companies. Behind-the-scenes engagement with firm management occurs frequently among institutional investors: Dimson, Karakas, and Li (2015) analyze the engagements of a large institutional investor, reporting that engagement dialogues with 4,186 target companies in 2014 alone, including in-person conversations, telephone calls, emails, and letters. Large institutional investors state directly that they engage with companies in their portfolio. Importantly, even passive investors are not passive owners (Appel, Gormley, & Keim, 2016). For example, on its website Vanguard, coining their funds as often "near-permanent investors" of the firms in their portfolios, states that they see engagement with firms as more valuable than voting power: "Significant analysis and effort are put into discussions with the directors and managers of the companies in which we invest... We believe these engagements, more so than voting, provide an opportunity to fully understand issues and target feedback and messaging to companies."[12] Through these types of engagement discussions with management and/or board members, institutional investors could discuss supply chain issues with both the customer and supplier, establishing an external tie between the firms and an incentive to collaborate.

Second, commonly-owned customers and suppliers may be more likely to have a common board member. Both He and Huang (2017) and Azar (2012) provide evidence that

[12]https://about.vanguard.com/investment-stewardship/policies-and-guidelines/

common ownership increases the probability of an interlocking board. He and Huang make a causal argument, showing that following a positive shock to common ownership, firms are more likely to have an interlocking board member. An interlocking board member could facilitate information sharing between the customer and supplier, as suggesting by He and Huang.

Third, "doing nothing" could be a mechanism through which common ownership leads to stronger supply chain relationships (Schmalz, 2018). A myopic investor may place pressure on a firm to squeeze its supplier for favorable terms, which would hurt the supply chain relationship, potentially resulting in short term gains for the investor at the expense of a long-term successful supply chain relationship. For example, in their paper on labor relations and takeover threats, Pagano and Volpin (2005) suggest that incumbent managers enjoying "the quiet life" – that is, enjoying control but having a minimal equity stake in the firm – will have an incentive to make favorable long-term contracts with their suppliers. A (potentially myopic) large owner, without a stake in the supplier, may provide a check on such actions, but an owner with a stake in the supplier as well may not mind sharing wealth with the supplier. I find that long-term common ownership has a stronger association with relationship survival (Table A1 of the Internet Appendix). While this result is only suggestive, it is consistent with long-term owners being more supportive of long-term supply chain relationships.

Finally, to the extent that management and shareholder proposals relate to supply-chain related issues, common owners could influence firms through their voting stakes. For example, the number of shareholder proposals about sustainability across the supply chain has increased significantly in recent years.[13]

[13]For example, *Ceres* reports a total of 131 proposals related to the supply chain within the U.S. food, beverage, and food retail industries in 2011-2017 (https://www.ceres.org/news-center/blog/shareholders-target-food-sector-supply-chain-risks), and a *Wall Street Journal* interview discusses how institutional investors collaborate to demand increased reporting about sustainability issues across the supply chain (https://deloitte.wsj.com/cfo/2017/03/27/as-shareholders-sharpen-their-focus-on-governance-investor-relations-can-help/?ns=prod/accounts-wsj).

7 Conclusion

Supply chains benefit from collaboration between trade partners, but, without a mechanism to bond the customer and supplier, holdup problems prevent this collaboration from taking place. In this paper, I address the question of whether common institutional ownership can facilitate stronger relationships between customers and suppliers. I first document an association between common ownership and vertical relationship strength. Using an instrumental variable constructed around a plausibly exogenous shock to common ownership – a large mutual fund scandal in 2003 – I provide evidence that the relationship is causal: common ownership by institutional investors increases the longevity of vertical relationships. I find evidence suggesting that common ownership strengthens customer-supplier relationships, at least in part, by strengthening innovative and financial ties between the firms, and improving inventory efficiency. These results shed light on an ownership mechanism which can smooth supply chain frictions and strengthen vertical ties between customers and suppliers. Additionally, this paper enhances our understanding of how common ownership can influence interactions between firms.

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Table 1: Summary Statistics

Customer and supplier firm data come from the Compustat segment file. The sample period is 1981-2013. Observations are at the customer-supplier-year level. In Panel A, industry concentration for the supplier and the customer is the Herfindahl index computed for Compustat firms at the four-digit SIC code level. Market share is calculated as the firm's revenues as a percentage of its industry's total revenues. Assets are total book assets in millions of dollars. Age is the number of years since the firm appeared in Compustat. In Panel B, proportion of sales is the sales from the supplier to the customer as a proportion of total supplier sales. Relationship tenure is the number of years since the customer-supplier pair first appeared in the Compustat sample. In Panel C, common ownership measures are computed using 13F holdings data from Thomson Reuters. Percent with common ownership is the proportion of observations where at least one institution holds shares in both the supplier and the customer. CO-product is the product of the proportion of supplier shares held by common owners and the proportion of customer shares held by common owners. Common value is the proportion of total market value held by 13F investors.

Panel A: Supplier and customer characteristics

	N	Mean	Median	Stdev.	Min	Max
Supplier industry concentration	81,049	0.26	0.20	0.20	0.02	1.00
Customer industry concentration	81,049	0.25	0.19	0.20	0.02	1.00
Supplier market shares	81,049	0.06	0.01	0.16	0.00	1.00
Customer market share	81,049	0.25	0.17	0.24	0.00	1.00
Supplier assets	81,049	1,305	113	7,243	1.00	484,931
Customer assets	81,049	50,803	15,443	125,651	1.00	3,510,975
Supplier age	81,049	13.19	9.00	12.19	0.00	63.00
Customer age	81,049	30.17	33.00	16.31	0.00	63.00

Panel B: Relationship characteristics

	N	Mean	Median	Stdev.	Min	Max
Proportion of sales	59,757	0.20	0.15	0.18	0.00	1.00
Relationship tenure	81,049	3.69	2.00	4.60	0.00	36.00

Panel C: Ownership characteristics

	N	Mean	Median	Stdev.	Min	Max
Percent with common ownership	81,049	0.31				
CO-product	81,049	0.02	0.00	0.07	0.00	0.69
Common value	80,888	0.06	0.00	0.13	0.00	0.86

Table 2: Baseline Results

Regressions of *Relationship end* on common ownership. Columns 1 and 2 show linear probability models, while columns 3 and 4 are Cox proportional hazards models. Columns 1 and 3 use common value (proportion of total market value of the supplier and the customer held by common owners) to measure common ownership, while columns 2 and 4 use CO-product (proportion of supplier's shares outstanding held by common owners × proportion of customer's shares outstanding held by common owners). All common ownership measures are lagged one year. *, **, and *** denote significance at the 10%, 5%, and 1% levels, respectively. t-statistics are shown in parentheses, computed from standard errors clustered at the customer-supplier relationship level.

Dependent variable - Indicator for relationship end

	LPM		Cox	
	(1)	(2)	(3)	(4)
Common ownership	−0.097***	−0.173***	−0.352***	−0.576***
	(−3.48)	(−3.85)	(−3.16)	(−2.84)
Sales dependence	−0.099***	−0.099***	−0.312***	−0.312***
	(−22.86)	(−22.87)	(−19.99)	(−20.06)
Relationship length			−0.237***	−0.236***
			(−14.97)	(−14.98)
Supplier HHI	0.004	0.007		
	(0.16)	(0.25)		
Customer HHI	−0.031	−0.031		
	(−0.62)	(−0.62)		
Supp. market share	−0.078**	−0.076**	−0.450**	−0.450**
	(−2.46)	(−2.41)	(−2.11)	(−2.11)
Cust. market share	−0.121**	−0.120**	−0.536***	−0.524***
	(−2.26)	(−2.24)	(−4.24)	(−4.16)
Supplier log assets	−0.012***	−0.012***	−0.063***	−0.063***
	(−3.14)	(−3.01)	(−7.56)	(−7.62)
Customer log assets	−0.008	−0.008	−0.016	−0.017
	(−1.29)	(−1.27)	(−1.33)	(−1.46)
Supplier log age	0.165***	0.163***	0.015	0.014
	(21.74)	(21.46)	(0.92)	(0.84)
Customer log age	0.190***	0.188***	0.007	0.007
	(11.35)	(11.24)	(0.39)	(0.42)
CO measure	Common value	CO-product	Common value	CO-product
Relationship FEs	Yes	Yes		
Year FEs	Yes	Yes		
Stratified by inds, year			Yes	Yes
Adj. r-square	0.166	0.166		
N	58132	58278	68916	69063

Table 3: Sales dependence

Regressions of *Sales dependence* on common ownership. Column 1 uses common value (proportion of total market value of the supplier and the customer held by common owners) to measure common ownership, while column 2 uses CO-product (proportion of supplier's shares outstanding held by common owners × proportion of customer's shares outstanding held by common owners). All common ownership measures are lagged one year. *, **, and *** denote significance at the 10%, 5%, and 1% levels, respectively. t-statistics are shown in parentheses, computed from standard errors clustered at the customer-supplier relationship level.

Dependent variable - Sales dependence

	(1)	(2)
Common ownership	0.101	0.322***
	(1.35)	(2.35)
Relationship length	0.032**	0.032**
	(2.55)	(2.53)
Supplier HHI	0.158**	0.159**
	(2.55)	(2.53)
Customer HHI	0.027	0.033
	(0.20)	(0.26)
Supp. market share	−0.036	−0.039
	(−0.43)	(−0.46)
Cust. market share	0.508***	0.505***
	(3.78)	(3.76)
Supplier log assets	−0.093***	−0.094***
	(−9.00)	(−9.18)
Customer log assets	0.136***	0.135***
	(7.75)	(7.72)
Supplier log age	−0.175***	−0.173***
	(−8.17)	(−8.11)
Customer log age	−0.058*	−0.058*
	(−1.70)	(−1.70)
CO measure	Common value	CO-product
Relationship FEs	Yes	Yes
Year FEs	Yes	Yes
Adj. r-square	0.763	0.763
N	52570	52674

Table 4: How the Scandal Affected Common Ownership Levels
Univariate analysis of changes in common value resulting from the 2003 mutual fund scandal. The table compares changes in the level of common value for each year for high scandal pairs (customer-supplier pairs with an above-median ratio of common value held by scandal funds) and low scandal pairs (those with a below-median ratio of common value held by scandal funds). The analysis is restricted to customer-supplier relationships beginning in 2003 or earlier, and to pairs with a positive level of common ownership. *, **, and *** denote significance at the 10%, 5%, and 1% levels, respectively.

Change (from 2003) in total common value, by year

	2004	2005	2006	2007	2008
High scandal pairs					
Mean	1.46%	-1.38%	2.31%	3.32%	3.68%
Median	1.10%	0.62%	2.15%	1.68%	1.57%
Stdev	6.79%	11.93%	9.68%	10.28%	13.91%
Obs	409	326	261	210	180
Low scandal pairs					
Mean	2.83%	3.14%	4.79%	6.37%	6.20%
Median	1.83%	2.41%	3.41%	4.76%	4.00%
Stdev	6.40%	9.28%	10.52%	11.34%	11.48%
Obs	596	460	353	274	223
Difference:	-1.37%***	-4.53%***	-2.47%***	-3.04%***	-2.52%**

Table 5: Testing the Relevant Timing for the Instrument
Regressions of common value on the instrument in various years. Ratio is the proportion of common value held by fund families involved in the September 2003 scandal. Column 1 shows the regression predicting common value in 2004 (corresponding to observations in 2005), Column 2 for 2005, Column 3 for 2006, and Column 4 for 2007. Controls for sales dependence, log relationship tenure, market share, log assets, and log age are included, but suppressed for presentation. All models include fixed effects for the customer's industry and the supplier's industry. *, **, and *** denote significance at the 10%, 5%, and 1% levels, respectively. t-statistics are shown in parentheses, computed from robust standard errors.

Dependent variable - Common value

	2004	2005	2006	2007
Ratio	0.047^{**}	-0.104^{***}	-0.136^{***}	-0.147^{***}
	(2.06)	(−3.17)	(−3.72)	(−2.61)
Common value in Sept. 2003	0.904^{***}	0.901^{***}	0.888^{***}	0.856^{***}
	(41.05)	(24.78)	(20.18)	(14.06)
Customer stock return	−0.009	−0.014	-0.054^{**}	0.008
	(−0.67)	(−0.40)	(−2.18)	(0.16)
Supplier stock return	-0.010^{**}	−0.005	0.017	−0.029
	(−2.38)	(−0.49)	(1.21)	(−1.31)
Other controls?	Yes	Yes	Yes	Yes
Industry FEs?	Yes	Yes	Yes	Yes
Adj. r-square	0.916	0.801	0.803	0.724
N	883	748	568	460

Table 6: IV Results Using the 2003 Mutual Fund Scandal

Panel A shows 2-stage regression results using a linear probability model, where the dependent variable is an indicator for the customer-supplier relationship ending in the current year. Ratio is the proportion of common value held by fund families involved in the September 2003 scandal. The sample period is 2006-2008 (corresponding to common value in 2005-2007). Columns 1 and 2 show the first and second stage results for all customer-supplier pairs with positive common ownership in September 2003. Column 3 shows OLS results for the same sample. Columns 4 and 5 limit the sample to those pairs with positive scandal common ownership in September 2003. Column 6 shows OLS results for this subsample. Panel B is identical, but uses a probit specification. Controls for sales dependence, log relationship tenure, industry concentration, market share, log assets, and log age are included, but suppressed for presentation. The LPM models include fixed effects for the customer's industry, the supplier's industry, and for the year, while the probit models use dummy variables for industries and year. *, **, and *** denote significance at the 10%, 5%, and 1% levels, respectively. In Panel A, t-statistics are shown in parentheses, and are computed from standard errors clustered at the customer-supplier relationship level. In Panel B, z-statistics are shown in parentheses.

Panel A: Dependent variable – Indicator for relationship end, linear probability model

	Positive CO			Positive Scandal CO		
	1SLS	2SLS	OLS	1SLS	2SLS	OLS
Ratio	-0.186^{***}			-0.248^{***}		
	(-5.29)			(-6.77)		
CoVal, Sept-03	0.673^{***}			0.603^{***}		
	(12.34)			(9.45)		
Common value		-0.365^{**}	-0.247^{***}		-0.400^{**}	-0.264^{**}
		(-2.46)	(-2.72)		(-2.30)	(-2.48)
Customer stock return	-0.049^{***}	-0.038	-0.032	-0.058^{***}	-0.050	-0.041
	(-4.95)	(-0.97)	(-0.84)	(-5.12)	(-1.09)	(-0.91)
Supplier stock return	$-0.0132**$	-0.023	-0.021	-0.012^{*}	-0.034	-0.032
	(-2.35)	(-0.94)	(-0.86)	(-1.88)	(-1.06)	(-1.00)
Other controls?	Yes	Yes	Yes	Yes	Yes	Yes
Industry FEs	Yes	Yes	Yes	Yes	Yes	Yes
Industry level	4-digit SIC	4-digit SIC	4-digit SIC	4-digit SIC	4-digit SIC	4-digit SIC
Year FEs?	Yes	Yes	Yes	Yes	Yes	Yes
1st-stage F statistic	88.76^{***}			68.30^{***}		
Underidentification test	73.76^{***}			51.58^{***}		
Adj. R square	0.852	0.191	0.193	0.833	0.226	0.228
N	1276	1276	1276	1056	1056	1056

Panel B: Dependent variable – Indicator for relationship end, probit

	Positive CO			Positive Scandal CO		
	1SLS	2SLS	Probit	1SLS	2SLS	Probit
Ratio	-0.184^{***}			-0.241^{***}		
	(-8.74)			(-10.26)		
CoVal, Sept-03	0.677^{***}			0.602^{***}		
	(29.21)			(21.80)		
Common value		-2.225^{***}	-1.113^{**}		-3.333^{***}	-1.803^{***}
		(-2.86)	(-2.10)		(-3.45)	(-2.94)
Customer stock return	-0.039^{***}	-0.338	-0.282	-0.041^{***}	-0.243	-0.148
	(-3.32)	(-1.19)	(-1.01)	(-3.00)	(-0.73)	(-0.45)
Supplier stock return	-0.010	-0.075	-0.63	-0.011	-0.213	-0.202
	(-1.49)	(-0.52)	(-0.44)	(-1.22)	(-1.05)	(-1.01)
Other controls?	Yes	Yes	Yes	Yes	Yes	Yes
Industry FEs	Yes	Yes	Yes	Yes	Yes	Yes
Industry level	2-digit SIC	2-digit SIC	2-digit SIC	2-digit SIC	2-digit SIC	2-digit SIC
Year FEs?	Yes	Yes	Yes	Yes	Yes	Yes
1st-stage F statistic	454.45^{***}			311.27^{***}		
Underidentification test	501.57^{***}			375.38^{***}		
Adj. R square	0.820			0.794		
N	1049	1049	1049	862	862	862

Table 7: Differences in Differences Specification Difference in difference regression results, where the dependent variable is Relationship end. Hi ratio is an indicator for the customer-supplier pair having a high (above median) ratio of common ownership concentrated in scandal funds. Hi ratio x post is the interaction between Hi ratio and the post-period (2006-2008). The pre-period is 2000-2002. Controls for sales dependence, log relationship tenure (in column 1), industry concentration, market share, log assets, and log age are included, but suppressed for presentation. Column 1 includes fixed effects for the customer's industry, the supplier's industry, and the year. Column 2 includes fixed effects for the relationship pair and for the year. t-statistics are shown in parentheses, and are computed from standard errors clustered at the customer-supplier relationship level.

Dependent variable - Relationship end		
Hi ratio	-0.013	
	(-0.85)	
Hi ratio $\times$ post	0.053^{**}	0.079^{***}
	(2.26)	(2.98)
Other controls	Yes	Yes
Industry FEs	Yes	
Relationship FEs		Yes
Industry level	4-digit SIC	
Year FEs	Yes	Yes
Adj. r-square	0.149	0.185
N	5402	4581

Table 8: Sales % to Customer: IV Results

Panel A shows 2-stage regression results, where the dependent variable is the logarithm of the proportion of supplier sales sold to the customer. The sample period is 2006-2008 (corresponding to common value in 2005-2007). Column 1 shows the second stage results for the sample of customer-supplier relationships with positive common ownership in September 2003, while Column 2 limits the sample to pairs with positive scandal common ownership in September 2003. Columns 3 and 4 are identical, but relax the restriction that the customer-suppleir relationship was first reported in or before 2003. Controls for sales dependence, log relationship tenure, industry concentration, market share, log assets, and log age are included, but suppressed for presentation. All models include fixed effects for the customer's industry, the supplier's industry, and for the year. *, **, and *** denote significance at the 10%, 5%, and 1% levels, respectively. t-statistics are shown in parentheses, and are computed from standard errors clustered at the customer-supplier relationship level.

Panel A: Dependent variable – Log Sales %

	Rel. began by 2003		Rel. began anytime	
	Pos. CO	Pos. Scandal CO	Pos. CO	Pos. Scandal CO
Common value	0.212	0.299	0.974***	0.924**
	(0.47)	(0.63)	(2.44)	(2.19)
Other controls?	Yes	Yes	Yes	Yes
Industry FEs	Yes	Yes	Yes	Yes
Industry level	4-digit SIC	4-digit SIC	4-digit SIC	4-digit SIC
Year FEs?	Yes	Yes	Yes	Yes
Adj. R square	0.482	0.510	0.457	0.497
N	1038	862	1972	1655

Table 9: Innovative Activity - IV Results

Panels A, B, and C show 2-stage regression results with measures of innovative activity as the dependent variables. The sample period is 2006-2008 (corresponding to common value in 2005-2007). Panel A shows 2-stage regression results, where the dependent variable is the log of 1 + number of cross patent citations. Columns 1 and 2 focuses on cases of the supplier citing the customer's patents, and columns 3 and 4 focus on cases of the customer citing the supplier's patents. Columns 1 and 3 show second stage results for the sample of customer-supplier pairs with positive common ownership in September 2003, while columns 2 and 4 limit the sample to those pairs with positive scandal common ownership in September 2003. Panel B is identical, but the dependent variable is supplier or customer R&D intensity (R&D scaled by firm assets). Panel B is also identical, but the dependent variable is the log of 1 + the number of patents by either the supplier (columns 1 and 2) or the customer (columns 3 and 4). Controls for sales dependence, log relationship tenure, returns, industry concentration, market share, log assets, and log age are included, but suppressed for presentation. All models include fixed effects for the customer's industry, the supplier's industry, and for the year. *, **, and *** denote significance at the 10%, 5%, and 1% levels, respectively. For the linear probability models, t-statistics computed from standard errors clustered at the customer-supplier relationship level are shown in parentheses.

Panel a: Dependent variable – Log number of cross citations

	Supplier cites customer		Customer cites supplier	
	Pos. CO	Pos. Scandal CO	Pos. CO	Pos. Scandal CO
Common value	0.782	1.597**	0.706	1.287**
	(1.30)	(2.19)	(1.65)	(2.37)
Other controls?	Yes	Yes	Yes	Yes
Industry FEs	Yes	Yes	Yes	Yes
Industry level	4-digit SIC	4-digit SIC	4-digit SIC	4-digit SIC
Year FEs?	Yes	Yes	Yes	Yes
Adj. R square	0.358	0.393	0.298	0.329
N	1363	1118	1363	1118

Panel B: Dependent variable – R&D intensity

	Supplier R&D		Customer R&D	
	Pos. CO	Pos. Scandal CO	Pos. CO	Pos. Scandal CO
Common value	0.173**	0.095	−0.006	−0.019
	(2.08)	(1.15)	(−0.34)	(−0.98)
Other controls?	Yes	Yes	Yes	Yes
Industry FEs	Yes	Yes	Yes	Yes
Industry level	4-digit SIC	4-digit SIC	4-digit SIC	4-digit SIC
Year FEs?	Yes	Yes	Yes	Yes
Adj. R square	0.565	0.592	0.746	0.764
N	1130	976	1130	976

Panel C: Dependent variable – Log number of patents

	Supplier patents		Customer patents	
	Pos. CO	Pos. Scandal CO	Pos. CO	Pos. Scandal CO
Common value	−0.351	0.204	0.925	1.441*
	(−0.505)	(0.24)	(1.45)	(1.68)
Other controls?	Yes	Yes	Yes	Yes
Industry FEs	Yes	Yes	Yes	Yes
Industry level	4-digit SIC	4-digit SIC	4-digit SIC	4-digit SIC
Year FEs?	Yes	Yes	Yes	Yes
Adj. R square	0.625	0.654	0.897	0.900
N	1363	1118	1363	1118

Table 10: Inventory turnover - IV Results Using the 2003 Mutual Fund Scandal
2-stage regression results, where the dependent variable is the logarithm of supplier or customer inventory turnover. The sample period is 2005-2008 (corresponding to common value in 2004-2007). In columns 1 and 2, the dependent variable is supplier inventory turnover. Column 1 uses the sample of customer-supplier relationships with positive common ownership in September 2003, and column 2 limits the sample to customer-supplier relationships with positive scandal common ownership in September 2003. Columns 3 and 4 are identical, but the dependent variable is customer inventory turnover. Controls for common value in September 2003, sales dependence, log relationship tenure, returns, industry concentration, market share, log assets, and log age are included, but suppressed for presentation. All models include fixed effects for the customer's industry, the supplier's industry, and for the year. *, **, and *** denote significance at the 10%, 5%, and 1% levels, respectively.

Dependent variable - Inventory turnover

	Supplier		Customer	
	Pos. CO	Pos. Scandal CO	Pos. CO	Pos. Scandal CO
Common value	1.254***	1.370***	0.615***	1.118***
	(2.72)	(2.72)	(2.22)	(4.35)
Other controls?	Yes	Yes	Yes	Yes
Industry FEs	Yes	Yes	Yes	Yes
Industry level	4-digit SIC	4-digit SIC	4-digit SIC	4-digit SIC
Year FEs?	Yes	Yes	Yes	Yes
Adj. r-square	0.693	0.704	0.763	0.811
N	1185	960	1330	1092

Table 11: Trade credit - IV Results Using the 2003 Mutual Fund Scandal
Panel A shows 2-stage regression results, where the dependent variable is either the logarithm of supplier accounts receivable turnover or the logarithm of supplier accounts receivable scaled by supplier assets. The sample period is 2006-2008 (corresponding to common value in 2005-2007). In columns 1 and 2, the dependent variable is accounts receivable turnover. Column 1 uses the sample of customer-supplier relationships with positive common ownership in September 2003, and column 2 limits the sample to customer-supplier relationships with positive scandal common ownership in September 2003. In columns 3 and 4, the dependent variable is accounts receivable scaled by supplier assets. Column 3 uses the sample of customer-supplier relationships with positive common ownership in September 2003, and column 4 limits the sample to customer-supplier relationships with positive scandal common ownership in September 2003. Panel B is identical, but the dependent variable is either customer accounts payable turnover or accounts payable scaled by customer assets. Controls for common value in September 2003, sales dependence, log relationship tenure, returns, industry concentration, market share, log assets, and log age are included, but suppressed for presentation. All models include fixed effects for the customer's industry, the supplier's industry, and for the year. *, **, and *** denote significance at the 10%, 5%, and 1% levels, respectively.

Panel A: Supplier accounts receivable

	Log AR turn		Log AR/assets	
	Pos. CO	Pos. Scandal CO	Pos. CO	Pos. Scandal CO
Common value	0.311	0.472*	−0.859***	−0.898**
	(1.42)	(1.79)	(−2.72)	(−2.34)
Other controls?	Yes	Yes	Yes	Yes
Industry FEs	Yes	Yes	Yes	Yes
Industry level	4-digit SIC	4-digit SIC	4-digit SIC	4-digit SIC
Year FEs?	Yes	Yes	Yes	Yes
Adj. R square	0.588	0.576	0.686	0.677
N	1362	1117	1361	1116

Panel B: Customer accounts payable

	Log AP turn		Log AP/assets	
	Pos. CO	Pos. Scandal CO	Pos. CO	Pos. Scandal CO
Common value	−0.124	−0.067	0.213	0.098
	(−0.68)	(−0.32)	(0.89)	(0.37)
Other controls?	Yes	Yes	Yes	Yes
Industry FEs	Yes	Yes	Yes	Yes
Industry level	4-digit SIC	4-digit SIC	4-digit SIC	4-digit SIC
Year FEs?	Yes	Yes	Yes	Yes
Adj. R square	0.886	0.900	0.824	0.922
N	1358	1113	1360	1115

Internet Appendix for "The Effects of Common Ownership on Customer-Supplier Relationships"

A-1. Cross-Sectional Tests

In this section, I document cross-sectional tests briefly discussed in Section 4.2 of the paper.

A-1.1 Heterogeneity in Common Ownership

If the relationship from common ownership to relationship longevity is causal, then we should be able to exploit heterogeneity in ownership to see stronger results. Shorter-term common owners should have a weak or nonexistent association with vertical relationship strength, since their ownership stakes are probably too short-lived to affect supply chain considerations, while long-term owners should have more influence. In Panel A of Table A1, I calculate common ownership separately for two groups of common owners, those who have held both firms in their portfolios for more than seven quarters (the median), and those who have held both firms for seven quarters or less. As expected, long-term common ownership is strongly and negatively associated with *Relationship end* across all specifications. Short-term common ownership is significant in the *Common value* specifications, but the coefficients are generally smaller. The differences are statistically different in all specifications except the hazards model using *Common value*.

We might also expect the the effects of common ownership to be stronger when the common owners hold significant stakes in both firms. In Panel B of Table A1, common ownership is calculated only across common owners holding at least 1% of both the customer's and supplier's shares outstanding. Results are statistically significant, and coefficients are larger than those in the baseline results in Table 2.

In Panel C, I use the GGL measure proposed by Gilje, Gormley, and Levit (2018). Specifically, GGL is calculated as

$$GGL_{\%}(A,B) = \sum_{i=1}^{I} \alpha_{i,A}\beta_{i,A}\alpha_{i,B}, \tag{1}$$

where A and B denote the two firms, i denotes a common owner of both firms, α denotes the proportion of the firm's shares outstanding held by each common owner, and β denotes the proportion of common owner i's portfolio the firm's stock comprises. Since GGL is bidirectional, I calculate GGL for both the customer and supplier, and take the average. Results are qualitatively similar to those in Table 2.

A-1.2 Input complexity and asset specificity

Transaction cost economics predicts greater transaction costs when the relationship is specific —that is, when the goods and services sold to the customer from the supplier are tailored for the customer (Williamson, 1979, 1985). Specificity in the relationship creates a situation where goods are more valuable within the relationship than outside of it. This creates relationship rents which both the customer and supplier want to capture, increasing the risk of haggling costs and opportunism (Lafontaine & Slade, 2007).

To test whether results are stronger in the face of asset specificity, I use cross-sectional splits by industry. Brown, Fee, and Thomas (2009) show that relationships with suppliers in the business services and computers industries are predominantly specific in nature. I split the sample along these industries in Table A2. Panel A uses a linear probability model, while Panel B uses a hazards model. For brevity, results are shown for *Common value* only, but results are similar using *CO-product* instead. In both panels, the first two columns split the sample by whether the supplier belongs to one of these industries. In the linear probability models, the relationship between common ownership and *Relationship end* is significant and negative in both columns, but, as expected, the results are stronger both economically and statistically for the *specific* subsample of relationships. The hazards models show a similar pattern, though the difference between the coefficients across the *specific* and *non-specific* samples is not statistically significant. The last two columns of the panels split the sample based on whether the customer is a retailer, since we would expect transactions with retailers to be more homogenous and less prone to vertical frictions. Consistent with this intuition,

I find no relationship between common ownership and *Relationship end* for the *retail* subsample, but strong negative results for the *non-retail* subsample. The difference between the common ownership coefficients in the *retail* and *non-retail* subsamples are statistically different for both the LPM and hazards specifications.

If common ownership fosters vertical relationships by reducing frictions between customers and suppliers, we would expect the relationship between common ownership and *Relationship end* to be stronger when vertical frictions are greater. Transaction cost economics predicts that complexity in inputs, products, or design increase transaction costs and create vertical frictions (Williamson, 1979, 1985). Further, incomplete contracting theory predicts contractual frictions arise in the face of poorly delineated property rights (Grossman & Hart, 1986). To identify customer-supplier relationships plagued by more severe frictions due to complexity and incomplete contracting, I look at the research and development (R&D) intensity of the supplier, following prior literature (Lafontaine & Slade, 2007). High R&D has also been used to capture frictions due to contractual incompleteness, since relationships involving R&D activities likely have difficulty delineating property rights (Fee, Hadlock, & Thomas, 2006).

To test whether results are stronger in the face of high R&D, I interact common ownership measures with an indicator for supplier R&D intensity (R&D scaled by total assets) being above the sample median. These results are shown in Panel C of Table A2. Because R&D-intensity tends to be sticky across firms, I include industry fixed effects rather than relationship fixed effects. The high R&D indicator is always insignificant. The interaction between high supplier R&D and common ownership is negative in the LPM specifications, consistent with the association between common ownership and relationship strength being stronger in the face of contractual frictions. While the interaction term is not significant in the hazards specifications, the direction of the coefficients is consistent with the OLS models. Further, the interaction term is significant in (unreported) results without industry stratifications.

A-1.3 Relative relationship power

In the customer-supplier data, customers tend to be very large relative to the supplier due to the nature of reporting requirements. If the customer wields a great deal of market power, the supplier could be dominated by the customer and we might observe long-lasting (dominant) relationships. If such relationships also tend to have higher common ownership (perhaps because of correlated returns), then we might see a spurious association between common ownership and *Relationship end*. To show this is not the case, I repeat the baseline regression for 1) the subsample of observations where the supplier is at least 10% the size of the customer (as measured by total assets) and 2) the subsample where the supplier supplies at least 2% of the customer's COGS. As shown in Table A3, common ownership remains significant for these subsamples, helping to rule out a market power-driven story.

A-2. IV Robustness Checks

In this section, I present alternative versions of the 2SLS results. Panel A of Table A4 presents 2SLS results with only the two instruments (no fixed effects or control variables), and Panel B presents 2SLS results with only industry and year fixed effects but no control variables. Results remain qualitatively the same. Results are also qualitatively similar when using the full set of controls and fixed effects but using only *Ratio* as an instrument (Panel C), or using *CoVal, Sept-03* in both stages (Panel D). Finally, to show the results are not driven by common owners with small stakes in the firms, Panel E presents 2SLS results where common ownership is calculated across common owners holding at least 1% of each firm's shares outstanding. Results remain qualitatively the same.

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Table A1: Common ownership variations

Panel A shows regressions splitting common ownership between long-term common owners (who have held both firms' stock longer than the median common owner) and short-term common owners (who have held both firms' stock for a shorter time than the median common owner). In Panel B, common ownership measures are calculated only across common owners holding at least 1% of each firm's shares outstanding. Panel C uses the average GGL measure for the customer and the supplier, using the measure proposed by Gilje, Gormely, and Levit (2018). Controls for sales dependence, industry concentration (for the linear probability models), market share, log assets, log age, and log relationship tenure (for the hazards models) are included, but suppressed for presentation. All common ownership measures are lagged one year. *, **, and *** denote significance at the 10%, 5%, and 1% levels, respectively. t-statistics are shown in parentheses, computed from standard errors clustered at the customer-supplier relationship level.

Panel A - Splits between short- and long-term common ownership

	LPM		Cox	
	(1)	(2)	(3)	(4)
Long CO	-0.251^{***}	-0.136^{***}	-1.192^{***}	-0.475^{***}
	(-3.52)	(-3.87)	(-3.37)	(-2.97)
Short CO	-0.087	-0.060^{*}	-0.250	-0.231
	(-1.21)	(-1.81)	(-0.50)	(-1.10)
CO measure	Common value	CO-product	Common value	CO-product
Other controls	Yes	Yes	Yes	Yes
Relationship FEs	Yes	Yes		
Year FEs	Yes	Yes		
Stratified by inds, year			Yes	Yes
Adj. r-square	0.166	0.166		
N	58237	58050	69024	68833

Panel B - Minimum 1% CO stakes

	LPM		Cox	
	(1)	(2)	(3)	(4)
Common ownership	-0.177^{***}	-0.656^{***}	-0.612^{***}	-2.276^{***}
	(-3.52)	(-3.87)	(-3.37)	(-2.97)
CO measure	Common value	CO-product	Common value	CO-product
Other controls	Yes	Yes	Yes	Yes
Relationship FEs	Yes	Yes		
Year FEs	Yes	Yes		
Stratified by inds, year			Yes	Yes
Adj. r-square	0.328	0.328		
N	58249	58270	69034	69056

Panel C - Using GGL

	LPM		Cox
	(1)	(2)	(3)
Avg. GGL	-0.029^{**}	-0.022^{*}	-0.162
	(-2.39)	(-1.89)	(-1.42)
Other controls	Yes	Yes	Yes
Relationship FEs		Yes	
Firm FEs (S&C)	Yes		
Year FEs	Yes	Yes	
Stratified by inds, year			Yes
Adj. r-square	0.213	0.166	
N	62403	58132	68916

Table A2: Input specificity

Panels A and B show regressions for subsample splits between high/low asset specificity and retail/no retail relationships. Panel A uses linear probability models while Panel B uses Cox proportional hazards models. The "specific" subsample includes relationships where the supplier's industry is business services (SIC codes 7300-7399) or computers (SIC codes 3570-3577). The "retail" subsample includes relationships where the customer is in a retail or wholesale industry (SIC codes 5000-5999). Panel C shows regressions predicting relationship end, using an interaction term between common ownership and an indicator for high supplier R&D intensity (defined as being above the sample median). Columns 1 and 2 use linear probability models while columns 3 and 4 use Cox proportional hazards models. Controls for sales dependence, industry concentration (for the linear probability models), market share, log assets, log age, and log relationship tenure (for the hazards models) are included, but suppressed for presentation. *, **, and *** denote significance at the 10%, 5%, and 1% levels, respectively. t-statistics are shown in parentheses, computed from standard errors clustered at the customer-supplier relationship level.

Panel A: Subsample splits on industry specificity, LPM

	Spec.	Non-spec.	Retail	Non-retail
Common ownership	-0.254^{***}	-0.070^{**}	-0.023	-0.130^{***}
	(-3.07)	(-2.36)	(-0.59)	(-3.43)
CO measure	Common value	Common value	Common value	Common value
Other controls	Yes	Yes	Yes	Yes
Relationship FEs	Yes	Yes		
Year FEs	Yes	Yes		
Adj. r-square	0.167	0.165	0.183	0.159
N	8133	49999	13634	44498

Panel B: Subsample splits on industry specificity, Cox

	Spec.	Non-spec.	Retail	Non-retail
Common ownership	-0.817^{**}	-0.298^{**}	-0.075	-0.468^{***}
	(-2.40)	(-2.53)	(-0.38)	(-3.53)
CO measure	Common value	Common value	Common value	Common value
Other controls	Yes	Yes	Yes	Yes
Stratified by inds, year			Yes	Yes
N	10353	58563	53173	68916

Panel C - Interactions with high supplier R&D intensity

	LPM		Cox	
	(1)	(2)	(3)	(4)
Common ownership	0.015	−0.005	−0.540*	−0.350***
	(0.34)	(−0.20)	(−1.70)	(−2.20)
High supplier R&D	0.003	0.004	−0.062	−0.062
	(0.68)	(0.86)	(−1.34)	(−1.33)
High supplier R&D × CO	−0.061	−0.046*	−0.050	−0.001
	(−1.30)	(−1.80)	(−0.13)	(−0.00)
CO measure	CO-product	Common value	CO-product	Common value
Other controls	Yes	Yes	Yes	Yes
Industry FEs	Yes	Yes		
Year FEs	Yes	Yes		
Stratified by inds, year			Yes	Yes
Adj. r-square	0.118	0.118		
N	64406	64267	69063	68916

Table A3: Ruling out a Dominant Customer Effect
Panel A reports regressions for the subsample where the supplier is at least 10% the size of the customer, based on total assets. Panel B reports regressions for the subsample where the supplier supplies at least 2% of the customer's COGS. The dependent variable is relationship end. Columns 1 and 2 use linear probability models while columns 3 and 4 use Cox proportional hazards models. Controls for proportion of sales, length of relationship (for hazards models), industry concentration (for the linear probability models), market share, log assets, and log age are included, but suppressed for presentation. *, **, and *** denote significance at the 10%, 5%, and 1% levels, respectively. t-statistics are shown in parentheses, computed from standard errors clustered at the customer-supplier relationship level.

Panel A: Subsample, supplier's assets ≥ 10% of customer's assets

	LPM		Cox	
	(1)	(2)	(3)	(4)
Common ownership	-0.242^{***}	-0.133^{***}	-0.949^{***}	-0.586^{***}
	(−3.70)	(−2.93)	(−2.81)	(−2.82)
CO measure	CO-product	Common value	CO-product	Common value
Other controls	Yes	Yes	Yes	Yes
Relationship FEs	Yes	Yes		
Year FEs	Yes	Yes		
Stratified by inds, year			Yes	Yes
Adj. r-square	0.337	0.337		
N	10277	10268	12505	12496

Panel B: Subsample, supplier accounts for ≥ 2% of customer's COGS

	LPM		Cox	
	(1)	(2)	(3)	(4)
Common ownership	-0.257^{***}	-0.113^{***}	-1.661^{***}	-0.925^{***}
	(−3.52)	(−2.40)	(−3.49)	(−3.23)
CO measure	CO-product	Common value	CO-product	Common value
Other controls	Yes	Yes	Yes	Yes
Relationship FEs	Yes	Yes		
Year FEs	Yes	Yes		
Stratified by inds, year			Yes	Yes
Adj. r-square	0.342	0.342		
N	8664	8643	10637	10616

Table A4: Variations of IV Results Using the 2003 Mutual Fund Scandal
Panel A shows 2-stage regression results using a linear probability model, where the dependent variable is an indicator for the customer-supplier relationship ending in the current year. No fixed effects or controls are used. Ratio is the proportion of common value held by fund families involved in the September 2003 scandal. The sample period is 2006-2008 (corresponding to common value in 2005-2007). Columns 1 and 2 show the first and second stage results for all customer-supplier pairs with positive common ownership in September 2003. Columns 3 and 4 limit the sample to those pairs with positive scandal common ownership in September 2003. Panel B is identical, but fixed effects for industries and year are added. In Panel C, both fixed effects and controls are used, but only one instrument, Ratio, is used. In Panel D, both fixed effects and controls are used, but the common ownership is only calculated across common owners holding at least 1% of each company's shares outstanding. In Panels C and D, controls for sales dependence, log relationship tenure, industry concentration, market share, log assets, and log age are included, but suppressed for presentation. *, **, and *** denote significance at the 10%, 5%, and 1% levels, respectively. t-statistics are shown in parentheses, and are computed from standard errors clustered at the customer-supplier relationship level.

Panel A: 2SLS results with no FEs or controls

	Positive CO		Positive Scandal CO	
	1SLS	2SLS	1SLS	2SLS
Ratio	-0.120^{***}		-0.134^{***}	
	(-6.78)		(-6.70)	
CoVal, Sept-03	0.903^{***}		0.879^{***}	
	(36.28)		(26.74)	
Common value		-0.090^{*}		-0.150^{**}
		(-1.85)		(-2.48)
Other controls?	No	No	No	No
Industry FEs	No	No	No	No
Year FEs?	No	No	No	No
1st-stage F statistic	668.15^{***}		483.25^{***}	
Underidentification test	199.38^{***}		149.09^{***}	
Adj. R square	0.710	0.000	0.649	0.000
N	1419	1419	1180	1180

Panel B: 2SLS results with FEs, no other controls

	Positive CO		Positive Scandal CO	
	1SLS	2SLS	1SLS	2SLS
Ratio	-0.164^{***}		-0.216^{***}	
	(-4.73)		(-5.85)	
CoVal, Sept-03	0.816^{***}		0.739^{***}	
	(23.44)		(15.46)	
Common value		-0.256^{***}		-0.339^{***}
		(-3.10)		(-3.16)
Other controls?	No	No	No	No
Industry FEs	Yes	Yes	Yes	Yes
Industry level	4-digit SIC	4-digit SIC	4-digit SIC	4-digit SIC
Year FEs?	Yes	Yes	Yes	Yes
1st-stage F statistic	275.12^{***}		119.77^{***}	
Underidentification test	158.28^{***}		83.49^{***}	
Adj. R square	0.822	0.102	0.794	0.130
N	1401	1401	1166	1166

Panel C: 2SLS results using one instrument

	Positive CO		Positive Scandal CO	
	1SLS	2SLS	1SLS	2SLS
Ratio	-0.175^{***}		-0.270^{***}	
	(-3.63)		(-5.60)	
Common value		-0.882^{*}		-0.776^{**}
		(-1.89)		(-2.34)
Other controls?	Yes	Yes	Yes	Yes
Industry FEs	Yes	Yes	Yes	Yes
Industry level	4-digit SIC	4-digit SIC	4-digit SIC	4-digit SIC
Year FEs?	Yes	Yes	Yes	Yes
1st-stage F statistic	13.20^{***}		10.61^{***}	
Underidentification test	6.31^{**}		19.73^{***}	
Adj. R square	0.762	0.150	0.758	0.202
N	1276	1276	1056	1056

Panel D: 2SLS results with CoVal, Sept-03 in 2nd stage

	Positive CO		Positive Scandal CO	
	1SLS	2SLS	1SLS	2SLS
Ratio	-0.186^{***}		-0.248^{***}	
	(-5.29)		(-6.77)	
CoVal, Sept-03	0.673^{***}	0.361	0.603^{***}	0.328
	(12.34)	(1.15)	(9.49)	(1.27)
Common value		-0.850^{*}		-0.821^{**}
		(-1.96)		(-2.29)
Other controls?	Yes	Yes	Yes	Yes
Industry FEs	Yes	Yes	Yes	Yes
Industry level	4-digit SIC	4-digit SIC	4-digit SIC	4-digit SIC
Year FEs?	Yes	Yes	Yes	Yes
1st-stage F statistic	27.96^{***}		45.79^{***}	
Underidentification test	16.83^{***}		22.64^{***}	
Adj. R square	0.852	0.165	0.833	0.204
N	1276	1276	1056	1056

Panel E: 2SLS results with minimum 1% stake

	Positive CO		Positive Scandal CO	
	1SLS	2SLS	1SLS	2SLS
Ratio	-0.179^{***}		-0.237^{***}	
	(-5.11)		(-6.37)	
CoVal, Sept-03	0.676^{***}		0.614^{***}	
	(12.38)		(9.49)	
Common value		-0.353^{**}		-0.366^{**}
		(-2.39)		(-2.13)
Other controls?	Yes	Yes	Yes	Yes
Industry FEs	Yes	Yes	Yes	Yes
Industry level	4-digit SIC	4-digit SIC	4-digit SIC	4-digit SIC
Year FEs?	Yes	Yes	Yes	Yes
1st-stage F statistic	88.99^{***}		72.08^{***}	
Underidentification test	311.79^{***}		50.50^{***}	
Adj. R square	0.850	0.191	0.832	0.228
N	1276	1276	1050	1050