Customer Concentration, Cost Structure, and Performance

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Abstract

We examine how suppliers' relationship-specific cost structure decisions affect future performance. We argue that suppliers can avoid risk by choosing more flexible cost structures (less fixed-to-variable costs) or commit resources by choosing more rigid cost structures (more fixed-to-variable costs). Analyzing cost data from a sample of manufacturing firms, we document that suppliers with greater customer concentration make relationship-specific investments with less flexible cost structures. Our primary findings suggest that suppliers making relationship-specific investments with more flexible cost structures outperform those with more rigid ones. We also find that, while suppliers' competitive environment has no effect on the relative profitability of their relationship-specific cost structure decisions, suppliers in more competitive industries make less flexible relationship-specific investments, further exacerbating the risk associated with higher customer concentration. Our results suggest that a risk avoidance strategy outperforms a commitment strategy in the context of relationship-specific cost structure decisions.

JEL: M41; L25.
Keywords: customer concentration; cost structure; transaction cost economics; competition.

I. Introduction

Understanding the effect of customer concentration on firms' decisions has become increasingly important for both researchers and practitioners as customer bases become more concentrated. Transaction cost economics (TCE) predicts that firms with greater customer concentration are likely to make more relationship-specific investments in an effort to decrease the customer's cost of buying from the supplier relative to the customer making the product themselves or buying from another supplier. These relationship-specific investments will exhibit different proportions of fixed-to-variable costs depending on managers' cost structure decisions. More rigid (i.e. less flexible) cost structures, those with higher proportions of fixed-to-variable costs, allow firms to generate higher profits when sales are strong, but result in lower profits when sales are weak. Thus, the quality of managers' relationship-specific cost structure decisions depends on their ability to accurately gauge the benefits and risk associated with making these investments.

In this study, we examine how supplier firms' relationship-specific cost structure decisions affect future performance. We focus on firms' cost structure decisions because they are one of the most important strategic choices that managers make as they directly affect current and future profitability (Holzhacker, Krishnan, and Mahlendorf 2015a). Traditional wisdom in managerial accounting suggests that managers choose more flexible (higher proportion of variable-to-fixed costs) cost structures when they face greater risk (Garrison, Noreen, and Brewer 2011). However, recent research has found that the choice of more rigid cost structures can be a beneficial strategy for firms facing certain types of risk. Banker, Byzalov, and Plehn-Dujowich (2014) develop a theoretical model, which predicts that firms may benefit from more rigid cost structures when the cost of not meeting customer demand outweighs the cost of

maintaining idle capacity. Thus, while making relationship-specific investments with more flexible cost structures may help suppliers avoid the risks associated with the loss of strong customers, the need to meet the ongoing demands of major customers may outweigh the desire to avoid this risk and lead suppliers to commit greater resources leading to more rigid cost structures.

Prior studies have documented the benefits and risk associated with making relationship-specific investments. Patatoukas (2012) examines the financial benefits to having strong customers. Using DuPont analysis, he documents that firms with higher customer concentration have better operating performance and their stock prices react positively to changes in customer concentration. Irvine, Park, and Yildizhan (2016) extend Patatoukas (2012) by examining the effect of relationship length on the association between customer concentration and finical financial performance. They find that suppliers exhibit higher profits as the age of the relationship between the strong customer and supplier increases, and note that one reason for this finding is that suppliers make relationship-specific SG&A investments with less flexible cost structures, in the early stages of the relationship. However, Irvine et al. (2016) do not explore whether the cost structure of relationship-specific investments has any impact on suppliers' future performance.

Using data from a sample of U.S. manufacturing firms from 1993 through 2012, we extend prior research by examining the effect of relationship-specific cost structure decisions on suppliers' future profitability.[1] Our focus on a single industry sector, rather than on a broader sample of businesses, allows us to avoid the problem of inter-industry variation in cost structure noted in prior research (Balakrishnan, Labro, and Soderstrom 2014). For example,

[1] We end our sample in 2012 because we require three years of subsequent data for future performance tests, which we discuss in the Data and methodology section.

manufacturing overhead consists of fixed and variable costs, which are recorded in a manufacturing firms' cost of goods sold (COGS). Thus focusing on an overly broad sample of firms can create comparability issues when analyzing different types of costs.[2]

Given our focus on the manufacturing sector, we begin our analysis by examining the effect of customer concentration on cost structure in our setting. Using firm-specific cost structure models similar to those developed in Irvine et al. (2016), we measure cost elasticity as a firm's log change in costs divided by its log change in revenue from the prior year. Our results indicate that higher levels of customer concentration are negatively associated with SG&A, COGS, and operating cost (OC) elasticities, which suggests that suppliers with strong customers make relationship-specific investments that consists of greater fixed-to-variable costs (i.e. less flexible cost structures). While Irvine et al. (2016) document this results for SG&A costs only, our finding that customer concentration is associated with less flexible COGS is consistent with our assertion of greater comparability of cost categories in our setting.

Our primary analysis focuses on the effect of suppliers' relationship specific cost structure decisions on future profitability. A key implication of Irvine et al. (2016) is that suppliers that invest more in relationship-specific fixed assets are at greater risk to recognize future losses should the relationship end before the supplier can recoup their fixed cost investments. Holzhacker et al. (2015b) explain that more flexible cost structures allow managers to guard against financial risk, which in our setting would apply to losing a major customer or to a major customer exerting their bargaining power to negotiate a more favorable deal. Studies from the TCE literature such as Williamson (1979) posit that relationship-specific investments

[2] An example of this issue is the difference in composition of cost of goods sold (or cost of sales) across industries. In manufacturing firms, cost of goods sold includes direct materials, direct labor, and manufacturing overhead, while the cost of goods sold for retail firms may include wholesale markups, etc. The composition of cost of goods sold also differs within the Compustat database (according to its data definitions), reducing comparability across industries within the same Compustat line item.

may expose suppliers to greater risk as strong customers use their superior bargaining power to extract rent from suppliers by threatening to stop buying from the supplier.[3] To the extent that these relationship-specific investments have more rigid cost structures, this will increase the risk of rent extraction by strong customers as suppliers will have greater difficulty adjusting cost downward should a strong customer leave. However, Kang, Mahoney, and Tan (2009) point out that the conventional view of Williamson (1979) ignores that managers may be willing to make these investments because they foresee positive spillovers or believe these investments will strengthen the bond between the customer and supplier, reducing the probability of defection (Kang et al. 2009; Dekker, Sakaguchi, and Kawai 2013).[4]

Given the conflicting theory on the relative profitability of flexible versus rigid relationship-specific cost structures, we exploit variation in these decisions and examine their effect on supplier firms' future performance. We define the flexibility of relationship-specific investments as the interaction of a supplier's customer concentration with its cost elasticity. Suppliers with more elastic cost are interpreted to have more flexible cost structures and as customer concentration increases, the firms' relationship-specific investments are defined as being more flexible. We then examine the effect of this flexibility on future performance, defined as return on assets (ROA) in the subsequent three years (following Gunny 2010; Eldenburg et al. 2011). Our findings indicate that suppliers that make more flexible relationship-specific investments outperform those that chose more rigid relationship-specific investments.

[3] For example, Walmart recently made news when they attempted to use their superior bargaining power to force additional storage fees and extended payment terms on their supplier network (Pettypiece and Townsend, 2015). While some vendors have chosen to take legal action in order to prevent the unilateral imposition of new costs by Walmart, other vendors, particularly those in more competitive industries, are left with little recourse given the potential for Walmart to retaliate by reducing product orders or by simply ending their customer relationship entirely.

[4] For example, investments in customized machinery allow suppliers to provide custom orders for specific customers at lower costs relative to their competitors. Similarly, investments in specialized inventory management systems support more efficient production and logistics planning within the relationship.

Importantly, we control for the age of the suppliers relationships with their strong customers, using the method developed by Irvine et al. (2016), and find that the flexibility of the suppliers' relationship-specific investments is incremental to that of relationship age.

As a cross-sectional test, we examine how suppliers' competitive environment affects the association between relationship-specific cost structure decisions and future performance. Theory posits that suppliers operating under higher competition face greater operating risks because customers have more substitute suppliers to buy from (Dhaliwal et al. 2016). Measuring suppliers' product market competition using the firm's three digit SIC Herfindahl-Hirschman Index (*HHI*) and the product market fluidity score (*Fluid*) developed by Hoberg, Phillips, and Prabhala (2014), we find no evidence that product market competition affects the relative profitability of relationship-specific cost structure decisions. However, we do observe that suppliers in more competitive industries make less flexible relationship-specific investments than those in less competitive industries. This implies that competition exacerbates the risk associated with higher customer concentration through greater cost rigidity.

In supplemental analysis, we explore whether less flexible (more rigid) relationship-specific investments lead to improved relationships with strong customers as suggested by prior literature (Jia 2013). We find no evidence that more rigid relationship-specific investments improve future sales growth to strong customers or the subsequent duration of the relationship between suppliers and their strong customers. Furthermore, our findings are robust to alternative models of testing cost structure decisions, separately examining SG&A and COGS flexibility, and the use of different sample periods.

Our study contributes to the accounting literature in a number of ways. First, we add to the cost structure literature (see Banker et al. 2016) by examining the performance consequences

of relationship-specific cost structure decisions.[5] Drawing from managerial accounting and TCE theory, we argue that suppliers facing higher customer concentration can either manage risk through more flexible (i.e. more elastic) cost structures or make greater commitments to their strong customers by choosing more rigid cost structures. We examine the relative profitability of a risk avoidance versus a commitment strategy in the context of strong customers where there is high demand for relationship-specific investments. Our finding that the decision to make more flexible relationship-specific investments is positively associated with future performance informs the accounting literature about the effect of cost structure decisions on future profitability.

Second, we extend the literature on the determinants of cost structure decisions (Banker 2014, Holzhacker et al. 2015a and 2015b, Hall 2016) by examining the effect of competition. Particularly, we complement Irvine et al. (2016) by documenting that suppliers operating under higher competition make less flexible relationship-specific investments than suppliers operating under lower competition. Theory suggests that suppliers facing higher competition may commit more resources to their strong customers because of relatively weaker bargaining power or as a strategy to bind the strong customer to the supplier. While we cannot speak to the *ex ante* reasoning for these investment decisions, our finding that more rigid (i.e. less flexible) relationship-specific investments result in less profitable future performance suggests that strategies that seek to bind strong customers through greater investments in fixed costs are relatively less successful than those that avoid risk through more flexible costs.

[5] Balakrishnan et al. (1996) examine the performance effects of JIT investment and find that firms with greater customer concentration have lower accounting returns to JIT adoption. Aboody et al. (2014) examine the effect of firms' overall cost structure decisions and find that more rigid cost structure are associated with higher future earnings (on average), but lower earnings when there is a negative revenue shock. By contrast, our study examines the effect of relationship-specific cost structure decisions on future performance in light of theoretical predictions derived from the TCE literature.

Third, our findings complement those of Patatoukas (2012) and Irvine et al. (2016) by contributing to the understanding of how customer concentration affects firm performance. Patatoukas (2012) finds that financially healthy firms benefit from customer concentration through higher levels of ROA and Irvine et al. (2016) documents that these benefits increase with the length of the relationship with firms' strong customers. Our results contribute to these studies by documenting that the cost structure impact of relationship-specific investments affects ability of firms to profit from strong customer relationships. While customer concentration has the potential to improve performance, a key implication of our study is that managers should prefer a risk management strategy to a commitment strategy by choosing relationship-specific investments that result in more flexible cost structures.

Finally, our findings help to bridge the gap between financial and managerial accounting research by providing insights about one of the mechanisms that affects the relationship between customer concentration and supplier firm risk. Dhaliwal et al. (2016) find that customer concentration increases suppliers' cost of capital, particularly for firms at higher risk of customer defection. Our results add to their findings by suggesting that relationship-specific cost structure decisions may contribute to the documented higher cost of capital since prior research finds that higher levels of operating leverage are associated with higher cost of capital (Lev 1974; Mandelker and Rhee 1984).

The rest of the paper is organized as follows: Section II provides an overview of relevant literature and motivates our research questions. Section III describes our empirical methodology, while Section IV presents and discusses our results. Section V provides concluding remarks.

II. Literature review and research questions

Customer concentration

Customer concentration refers to the number and relative size of customers that contribute to a firm's revenues. As a higher proportion of overall revenues is contributed by a firm's major (i.e. largest) customers, that firm is said to exhibit a higher level of customer concentration (Patatoukas 2012). The Statement of Financial Accounting Standards (SFAS) 131 (FASB 1997) requires that firms disclose the presence of any and all customers who contribute 10% or more of enterprise-wide revenue, either to a single segment or across multiple segments. The FASB and SEC's decision to mandate major customer disclosure reflects the idea that the existence of major customers is important in helping investors to assess firm risk (Dhaliwal et al. 2016). Despite the perceived risks, Patatoukas (2012) documents an upward trend in customer concentration since SFAS 131 became effective.

While prior studies suggest that relationship-specific investments lower suppliers' profitability (Lustgarten 1975), Patatoukas (2012) focuses on firms with positive operating performance and documents that firms with higher customer concentration exhibit higher ROA, lower SG&A expenses, and better asset turnover rates. Irvine et al. (2016) further these findings by extending their sample to include firms with negative operating performance. They find that the positive effect of customer concentration on operating performance increases with the length (in time) of the relationship between suppliers and their major customers, possibly due to suppliers making relationship-specific investments, with more rigid costs structures, in the earlier part of the relationship. However, they do not examine why firms would be willing to sacrifice profits early in the relationship and whether this decision is good for suppliers, especially since doing so will decrease profits even more if their strong customers leave before the supplier can recoup their initial investment.[6]

[6] While both customers and suppliers make relationship-specific investments, we focus on suppliers' investments because of the risk attributed to suppliers (from the TCE literature), and because data for customers are only

Relationship-specific investments

TCE focuses on whether a transaction is more efficiently performed within a firm or by an outside supplier (Geyskens, Jan-Benedict, and Kumar 2006), and provides a number of insights as to why suppliers choose to engage in relationship-specific investments. TCE suggests that customer firms will contract with outside suppliers for a certain product because the outside supplier can achieve higher product quality and lower product costs through specialization and economies of scale. However, transactions costs are created when customers buy from outside suppliers instead of making the product themselves. To lower these transaction costs, customers and suppliers engage in relationship-specific investments (Williamson 1979), which are assets that are customized for a particular user or transaction, and would lose at least part of their value if the relationship were terminated (Jia 2013).

Cost structure

Managers' investment decisions affect the firm's cost structure, or the relative proportion of variable-to-fixed costs that a firm incurs from production. Cost structure decisions are one of the most important decisions that managers make because they directly affect firm profitability, with more rigid cost structures (i.e. higher proportions of fixed costs) leading to greater reductions in profits when sales decline, but higher profits when sales increase. The traditional view of cost structure strategy is that firms take steps to offset increased operating and environmental risk by adopting less rigid cost structures to minimize the potential downside risk associated with fluctuations in sales (Banker et al. 2014).

Consistent with the traditional view of cost structure strategy, Kallapur and Eldenberg (2005) find that hospitals chose more flexible (less rigid) cost structures, by increasing their ratio

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available for a small subset of publicly traded companies. Additionally, in contrast to the requirement for suppliers, the public companies that are listed as strong customers are not required to list their strong suppliers.

of variable-to-fixed costs, after a change in Medicare reimbursement policy that increased the uncertainty of hospital's revenues. Similarly, Holzhacker et al. (2015b) find that hospitals facing greater demand uncertainty and financial risk adapt more flexible cost structures by adjusting their procurement decisions to use greater outsourcing, leasing of equipment and a greater share of contract labor. However, contrary to the traditional view of cost structure strategy, Banker et al. (2014) document that demand uncertainty, measured as the standard deviation of changes in sales, is positively associated with more rigid cost structures for a sample of manufacturing firms. They develop a model predicting that firms will prefer more rigid cost structures when facing demand uncertainty in order to capitalize on periods of unusually high demand. More generally, their study implies that other types of firm-level risk may have similarly "counterintuitive" effects on firm cost structure decisions.

Development of research questions

Relationship-specific investments and cost structure

Following the logic of TCE theory, suppliers and customers make relationship-specific investments to lower the transactions costs of trading with each other. Suppliers compete with each other through their ability to lower transaction costs or increase transaction values. Some supplier-level relationship investments that help to achieve this goal include investing in specialized inventory management systems, hiring dedicated customer service personnel, expanding delivery capabilities, and procuring machinery to meet customized orders. The managers of supplier firms can choose how to make these relationship-specific investments, affecting the firm's cost structure with their choices. For example, customer service personnel can be full-time employees or temporary hourly contractors, delivery trucks and specialized

equipment could be purchased or leased, and the manufacturing of custom products can be done in-house or outsourced.

The TCE literature posits that suppliers bear greater risk when making these investments because the customer typically has stronger relative bargaining power. Thus, suppliers can choose to manage risk by adopting more flexible cost structures (Kallapur and Eldenberg 2005) or commit more resources by choosing more rigid cost structures in hopes of recognizing higher demand from strong customers (Banker et al. 2014). An additional risk associated with making relationship-specific investments with more rigid cost structures is that the fixed costs associated with these investments likely adjust downward more slowly than those of non-relationship specific investment because these investments lose value if put to alternative use (if they have any alternative use at all).[7] In their study on the relationship between relationship life cycle and firm profitability, Irvine et al. (2016) examine a sample of firms from various industries and document that firms make more fixed costs SG&A investments earlier in their relationship with strong customers. They do not, however, find the same relationship for cost of goods sold (COGS).

The examples of relationship-specific investments given earlier can affect both SG&A and COGS cost structures. For example, the decision to insource (outsource) deliveries would make SG&A costs more rigid (flexible) while the decision to purchase (lease) equipment for meeting specialized orders would make COGS costs more rigid (flexible). Since we focus our study on manufacturing firms with differing relationship lengths, we examine the effect of customer concentration on cost structure as an empirical question.

[7] Downward adjustments refer to the reduction of costs when activity declines. Fixed costs (inherently) adjust downward more slowly than variable costs, and the speed that fixed costs adjust downward depends on the type of fixed cost. For example, selling a machine with a very specialized use will be harder than selling a machine with a generic use.

Performance outcomes

Next we examine how the cost structure of relationship-specific investments affects subsequent performance. Williamson (1996) argues that relationship-specific investments without safeguards are a form of poor management. While TCE theory focuses on the existence of a formal contract between a supplier and customer as the typical form of an economic safeguard, a number of studies document that it is common for suppliers to make relationship-specific investments without formal contracts (Rokkan, Heide, and Wathne 2003; Kang et al. 2008). From a managerial accounting perspective, a major economic safeguard would be to choose more flexible cost structures to guard against the risk of losing a major customer since costs would adjust downward more quickly should the major customer leave.

Rather than focusing on safeguards, recent TCE studies have focused on the advantages of relationship-specific investments. Kang et al. (2009) extend TCE theory by explaining that one reason suppliers make relationship-specific investments without formal contracts is because their managers have foresight into the potential benefits of making these decisions. Consistent with the intuition of Banker et al. (2014), if managers foresee an increase in demand from a strong customer as a potential benefit, they will make relationship-specific investments with more rigid cost structures. Additionally, Jia (2013) posits that although relationship-specific investments put suppliers at greater risk should the buyer leave, certain types of relationship-specific investments can bind customers to their suppliers. Thus investing in more relationship-specific fixed costs could serve to increase customer switching costs and create barriers to entry for competing suppliers, which reduces the probability of customer defection (Dekker, Sakaguchi, and Kawai 2013).

On one hand, choosing a risk avoidance strategy by making relationship-specific investments with more flexible cost structures may be more profitable as it safeguards against the loss of a major customer. On the other hand, a commitment strategy, where managers make relationship-specific investments with a greater proportion of fixed-to-variable costs may be more profitable as profits will increase by more as sales to strong customers increase. Since theory is mixed on whether a risk avoidance or commitment strategy is, on average, more profitable, we follow prior studies (Gunny 2010; Eldenburg et al. 2011; Hall 2016) and compare the relative profitability of each strategy by examining their effect on future performance. If a risk avoidance (commitment) strategy is preferable then relationship-specific investments with more flexible cost structures will be positively (negatively) associated with future performance.

III. Data and methodology

Sample

We build our sample using major customer information reported in the Compustat Segment Files, which include data on customer name, type, and revenue contributed to the supplier firm. Following Banker et al. (2014), we restrict our sample to manufacturing firms (two digit SIC Codes 20 – 39). We also require that the supplier report at least one major customer.[8] We develop a 20-year sample beginning in 1993 and ending in 2012 because we require enough leading data to calculate future return on assets.

After compiling our sample of supplier firms with customer concentration data, we gather additional financial information related to suppliers' operating costs and sales revenue (*REV*)

[8] While SFAS 131 requires companies to disclose any and all customers who contribute ten percent or more of company-wide revenue, firms often choose to disclose customers who contribute less than ten percent of company-wide revenues based on the importance of such customers to the company (Patatoukas 2012). Following prior literature, our analysis uses information about all disclosed major customers regardless of the percentage of revenue contributed by each customer.

from Compustat. Following Banker et al. (2014) and Irvine et al. (2016), we focus on three cost categories: total operating costs (OC), selling, general, and administrative costs (*SGA*), and cost of goods sold (*COGS*).[9] We control for the potential impact of outliers on our analysis by truncating observations with values of *REV, OC, SGA,* and *COGS* in the highest and lowest 0.5% of the distribution. While we exclude observations, which are missing total operating cost data, we do not exclude observations missing any of the two sub-categories of operating costs (*SGA* or *COGS*). Additionally, we restrict our sample to firms with sufficient data to calculate return on assets (*ROA)* for year t+1 in order to facilitate comparability between our main tests and performance tests. We are left with a final sample of 26,438 firm-year observations across the entire sample period. Table 1 reports a description of the sample composition by industry. Observations from firms in the electronic equipment and components industry, industrial/commercial machinery and computer equipment industry, and chemicals and allied products industry make up slightly more than 50% of the sample.

< Insert Table 1 About Here >

Descriptive statistics

Table 2 presents descriptive statistics for variables used in the study. Differences in numbers of observations across variables are attributable to missing data. The average (median) firm in our sample reported sales revenue of $1,311 ($109) million dollars and total operating costs of $1,188 ($107) million. Table 3 reports correlations among the variables used in our multivariate tests. Spearman (Pearson) correlations are reported in the upper (lower) diagonal.

< Insert Tables 2 and 3 About Here >

Model specification

[9] We follow Kama and Weiss (2012) in using operating costs (OC), defined as revenue minus operating income, as a summary measure of total firm costs. As we discuss later, inferences are unchanged when separately analyzing COGS and SG&A cost rigidity.

We construct our customer concentration variable (*CC*) by adopting the measure developed by Patatoukas (2012). This measure allows us to capture both the total number of major customers present within a firm's customer base and their relative importance within the firm's revenue stream. The resulting measure of firm *i's* customer concentration in year *t*, essentially a weighted-average index of customer-specific revenue to total firm revenue, is described by the following equation:

$$CC_{it} = \sum_{j=}^{J} \left(\frac{Sales_{ijt}}{Sales_{it}}\right)^2 \quad (1)$$

where $Sales_{ijt}$ represents firm *i*'s sales to customer *j* in year *t* and $Sales_{it}$ represents total sales for firm *i* in year *t*. Average (median) *CC* is 0.142 (0.073) for our sample of firms. Detailed variable descriptions are provided in Appendix A.

Following the methodology proposed in prior research (Irvine et al. 2016), we examine our research questions using a firm-specific cost elasticity measure. The elasticity of costs with respect to sales of a firm in year *t* is calculated as the log-change in cost between year *t-1* and year *t* divided by the log-change in sales from year *t-1* to *t* as defined the equation below:

$$Elasticity\ (Cost) = \frac{ln(Cost_t) - ln(Cost_{t-1})}{ln(Sales_t) - ln(Sales_{t-1})} \quad (2)$$

Firm-specific elasticities are separately calculated for each cost category (*OC, SGA,* and *COGS*). We then examine our research questions regarding the relationship between customer concentration and cost structure using the following regression specification:[10]

$$Elasticity(Cost_{it}) = \beta_0 + \boldsymbol{\beta_1 RankCC_{it}} + \beta_2 MVE_{it} + \beta_3 AGE_{it} + \beta_4 GROWTH_{it} + \beta 5 FLEVit + \beta_6 CONGLO_{it} + \Sigma\gamma_{1\text{-}19} IndFE_{it} + \varepsilon \quad (3)$$

[10] We use yearly Fama-MacBeth (1973) and Newey-West-adjusted t-statistics to estimate results for equations (3) through (7) in order to account for serial correlation in our customer concentration measure. The Newey-West adjustment adjusts the Fama-MacBeth t-statistics for serial correlation (up to three lags) in the time-series of estimated coefficients. Our inferences are robust to the use of pooled cross-sectional regressions and clustering standard errors by firm and year.

We estimate equation (4) using three separate specifications of the *Elasticity(Cost)* term: total operating costs (*OC Elasticity*), selling, general, and administrative costs (*SGA Elasticity*), and cost of goods sold (*COGS Elasticity*). *RankCC* is defined as the decile rank of a firm's customer concentration measure for year *t*. We construct the variable *RankCC* by first calculating the value for *CC* as described in equation (1) for each firm-year observation. We then rank each firm-year observation into deciles based on their *CC* score and scale the decile rank so that the measure takes a value between 0 and 1. We also include controls for a firm's market value of equity (*MVE*), age (*AGE*), annual sales growth (*GROWTH*), and leverage ratio (*FLEV*). We include an indicator variable set equal to one if the firm reports at least two business segments, and 0 otherwise (*CONGLO*). Our model also includes controls for industry fixed effects (*IndFE*).

The slope coefficient β_1 in this regression equation provides an estimate of the relationship between customer concentration and firm cost structure. A negative coefficient suggests that customer concentration leads to firms adopting a more rigid cost structure (i.e. greater fixed costs) while a positive coefficient suggests that customer concentration leads to firms adopting a more elastic cost structure (i.e. less fixed costs).

To examine the relative profitability of managers' relationship-specific cost structure decisions, we analyze the impact of these decisions on future firm performance. Future firm performance is measured using return on assets (*ROA)* in years *t+1* through *t+3*. We utilize our measure of operating cost structure flexibility (*OC Flexibility)* to test this relationship. *OC Flexibility* is defined as the decile rank of a firm's operating cost elasticity measure for year *t* scaled from 0 to 1, with 0 indicating firms with the least elastic (i.e. least flexible) operating cost structure and 1 indicating the firms with the most elastic (i.e. most flexible) operating cost structure. We also adopt the measure of relationship duration (*LINKAGE*) from Irvine et al.

(2016) as an additional control for our performance tests. *LINKAGE* is calculated as the weighted average duration of strong customer relationships at the end of year *t*. Our resulting future performance regressions are specified below:

$$ROA_{it+n} = \beta_0 + \mathbf{\beta_1 OC\ Flexibility_{it}} + \mathbf{\beta_2 RankCC_{it}} + \mathbf{\beta_3 RankCC_{it} * OC\ Flexibility_{it}} + \beta_4 MVE_{it} + \beta_5 AGE_{it} + \beta_6 GROWTH_{it} + \beta_7 FLEV_{it} + \beta_8 CONGLO_{it} + \Sigma\gamma_{1\text{-}19} IndFE_{it} + \varepsilon \quad (4a)$$

$$ROA_{it+n} = \beta_0 + \mathbf{\beta_1 OC\ Flexibility_{it}} + \mathbf{\beta_2 RankCC_{it}} + \mathbf{\beta_3 RankCC_{it} * OC\ Flexibility_{it}} + \beta_4 ln(LINKAGE_{it}) + \beta_5 lRankCC_{it} * ln(LINKAGE_{it}) + \beta_6 MVE_{it} + \beta_7 AGE_{it} + \beta_8 GROWTH_{it} + \beta_9 FLEV_{it} + \beta_{10} CONGLO_{it} + \Sigma\gamma_{1\text{-}19} IndFE_{it} + \varepsilon \quad (4b)$$

IV. Empirical results

Regression results

Customer concentration and cost structure

Table 4 presents our results on the effect of customer concentration on cost structure. Estimates of equation (3) for each of the three cost elasticity categories, operating costs (*OC*), SG&A costs (*SGA*), and cost of goods sold (*COGS*) are provided. Columns 1 through 3 present estimation results for continuous values of our dependent variables while columns 4 through 6 present estimation results for decile-rank transformed values of these same variables. The coefficient for the variable of interest, *RankCC*, (β_1) is negative and significant in the estimates of all three cost categories, indicating that firms with greater customer concentration have less elastic costs structures. While Irvine et al. (2016) document this effect only for SG&A costs, we find a significant negative relationship between *RankCC* and *COGS Elasticity*. Since our sample includes only manufacturing firms as compared to the broader sample utilized by Irvine et al. (2016), this result suggests differences between manufacturers and other types of firms in terms of the relationship between customer concentration and cost structure. The results presented in Table 4 are consistent with supplier firms making relationship-specific investments with more

fixed-to-variable costs, which benefit the firm should sales to strong customers continue and/or increase in the future. The sign and direction of our control variables are consistent with those shown in Irvine et al. (2016).[11]

< Insert Table 4 About Here >

Future performance

Next, we test the impact of relationship-specific cost structure decisions on future performance. Results for our estimates of equations (4a) and (4b) are presented in Table 5. The coefficient on the interaction term *RankCC * OC Flexibility* (β_3) captures the combined effect of the firms relationship-specific cost structure decision on future firm performance. We observe positive and statistically significant β3 coefficients in years *t+1*, *t+2,* and *t+3* (columns 1-3). Our results persist after controlling for relationship duration (*LINKAGE*) (columns 4-6). This result indicates that adopting a more flexible cost structure for relationship-specific investments yields superior future performance. Complementing the results of Irvine et al. (2016), our results indicate that the positive association between relationship length and returns to customer concentration extend to subsequent years.

< Insert Table 5 About Here >

Supplier industry competition

We also examine the extent to which competitive pressures impact the effect of relationship-specific cost structure decisions on future performance. A number of prior studies argue that suppliers in more competitive product markets are at higher risk when facing greater customer concentration because strong customers have access to more alternative suppliers (Dhaliwal et al. 2016), thereby increasing the risk of defection and lowering the supplier's

[11] Given our consistent results for all cost categories, we focus on total operating costs (*OC)* when reporting results for the remainder of our analyses. We obtain qualitatively similar results when we conduct our analyses using sales, general, and administrative costs (*SGA*) and cost of goods sold (*COGS*).

relative bargaining power (Bucknix and Van den Poel 2005; Hall and Porteus 2006). Thus, our finding that adopting more flexible relationship-specific investments is a more profitable strategy for firms may be affected by competitive pressures since suppliers at greater risk for strong customer defection would benefit more from adopting a risk avoidance strategy. However, it is unclear whether competitive pressures may also constrain suppliers in their ability to adopt more flexible cost structures. Therefore, we examine the effect of product market competition on suppliers' relationship-specific cost structure decisions in addition to our future performance tests.

To test the effect of competition we adopt two proxies: industry concentration and product market fluidity. We use each firm's three digit SIC Herfindahl-Hirschman Index (*HHI*) in year *t* to measure industry concentration. Lower (higher) values of *HHI* indicate fewer (more) market participants and lower (higher) levels of competition. As an alternative measure we adopt the text-based measure of product market fluidity (*Fluid*) developed by Hoberg, Phillips, and Prabhala (2014), which captures changes in the rivals' products relative to a firm's own products.[12] Higher values of *Fluid* indicate greater potential for new market entrants and competitive threats. More detailed explanations of each of these competition measures are presented in Appendix A.

We examine our research question related to competitive pressures and future performance using subsample analysis, dividing each subsample at the median value of *HHI*. Equation (4b) is estimated for each subsample and coefficients are compared using t-tests from a fully interacted model.[13] Results of these estimations are reported in Table 6. We again focus our

[12] For more detail on the calculation of the Fluidity scores see Hoberg et al. (2014). Fluidity scores are downloaded from Gordon Phillip's website at http://www.rhsmith.umd.edu/industrydata/. We thank Hoberg, Phillips and Prabhala for allowing access to their data.
[13] We follow Kama and Weiss (2013) in using this methodology.

attention on β_3, the coefficient on the interaction term *RankCC * OC Flexibility*. Estimates of β_3 are not significantly different between our low and high competition subsamples for any year (*t+1* through *t+3)*. This suggests that the performance benefits of adopting a more flexible cost structures for relationship-specific investments do not vary due to industry competition. We find a qualitatively similar pattern of results when we build our subsample using median splits of product market fluidity (*FLUID)* rather than *HHI*, although we do not tabulate the results for brevity.

<Table 6 About Here>

While we find no incremental impact of competition for our performance tests, managers of firms operating under higher competition may make different relationship-specific cost structure decisions given their lower relative bargaining power. To test this assertion, we use the following regressions:

$$\begin{aligned} Elasticity(Cost_{it}) = {} & \beta_0 + \boldsymbol{\beta_1 RankCC_{it}} + \boldsymbol{\beta_2 HighComp_{it}} + \boldsymbol{\beta_3 RankCC_{it} * HighComp_{it}} \\ & + \beta_4 MVE_{it} + \beta_5 AGE_{it} + \beta_6 GROWTH_{it} + \beta_7 FLEV_{it} + \beta_8 CONGLO_{it} \\ & + \Sigma\gamma_{1\text{-}19} IndFE_{it} + \varepsilon \end{aligned} \quad (5a)$$

$$\begin{aligned} Elasticity(Cost_{it}) = {} & \beta_0 + \boldsymbol{\beta_1 RankCC_{it}} + \boldsymbol{\beta_2 HighFluid_{it}} + \boldsymbol{\beta_3 RankCC_{it} * HighFluid_{it}} \\ & + \beta_4 MVE_{it} + \beta_5 AGE_{it} + \beta_6 GROWTH_{it} + \beta_7 FLEV_{it} + \beta_8 CONGLO_{it} \\ & + \Sigma\gamma_{1\text{-}19} IndFE_{it} + \varepsilon \end{aligned} \quad (5b)$$

HighComp (*HighFluid*) is an indicator variable set to 1 if a firm has an *HHI* (*FLUID)* value below the sample median in year *t.* All other variable definitions are the same as those previously described.

Results for estimations of equations (5a) and (5b) are presented in Table 7. In each equation, the coefficient β_3 relates to our variable of interest: *RankCC * HighComp* or *RankCC * HighFluid*. Columns 1 and 3 present estimation results for untransformed values of *OC Elasticity* while columns 2 and 4 present estimation results for decile-rank transformed values for *OC*

Elasticity and our controls. Results show a significant negative coefficient on β_3 for all estimations reported in Table 7. These results suggest that competitive pressures lead firms to adopt relationship-specific investments with less flexible (i.e. more rigid) cost structures. Taken together, the results from Tables 6 and 7 suggest that high customer concentration firms in more competitive markets end up worse off than those in less competitive markets because, on average, they make relationship-specific investments with more rigid cost structures even though more flexible cost structures yield better performance.

< Insert Table 7 About Here >

Additional tests

In addition to our main tests, we examine two potential areas where customer concentration and cost structure may contribute positively to firm performance that may not be fully reflected in our ROA tests: growth in sales to strong customers and relationship duration. Theory suggests that firms choosing a commitment strategy are likely to develop deeper relationships, resulting in longer relationship durations and higher shares of sales to strong customers (Joskow 1987). Table 8, Panel A, reports results for the following regression specification:

$$\begin{aligned} \textit{Sales Growth}_{it+n} = {} & \beta_0 + \boldsymbol{\beta_1 OC\ Flexibility_{it}} + \boldsymbol{\beta_2 RankCC_{it}} + \boldsymbol{\beta_3 RankCC_{it} * OC\ Flexibility_{it}} \\ & + \beta_4 MVE_{it} + \beta_5 AGE_{it} + \beta_6 GROWTH_{it} + \beta_7 FLEV_{it} + \beta_8 CONGLO_{it} \\ & + \Sigma\gamma_{1\text{-}19} IndFE_{it} + \varepsilon \end{aligned} \qquad (6)$$

We calculate growth in sales to strong customers (*SC Sales Growth*) for years *t+1*, *t+2*, and *t+3* and estimate equation (6) separately for each year. Our estimation of equation (6) shown in Table 8, Panel A, suggests that relationship-specific investments do not yield increased sales growth to strong customers. In fact, firms that maintain higher levels of operating cost flexibility realize increased sales growth to strong customers in year *t + 1*. More specifically, if the investments

made to increase cost structure rigidity are in service of specific strong customer relationships (i.e. relationship-specific investments), our results suggest that these investments are not justified by any performance improvement related to sales growth to the intended strong customers.

<Insert Table 8 About Here>

Since Irvine et al. (2016) document that relationship length increases the profitability of having more concentrated customers, we examine the effect of relationship-specific cost structure decisions on the duration of these relationships as a possible mechanism for these investments to benefit suppliers. Table 8, Panel B reports estimation results for the following regression equation:

$$\begin{aligned} ln(LINKAGE_{it+n}) = {} & \beta_0 + \boldsymbol{\beta_1 OC\ Flexibility_{it}} + \boldsymbol{\beta_2 RankCC_{it}} \\ & + \boldsymbol{\beta_3 RankCC_{it} * OC\ Flexibility_{it}} + \beta_4 ln(LINKAGE_{it}) + \beta_5 MVE_{it} \\ & + \beta_6 AGE_{it} + \beta_7 GROWTH_{it} + \beta_8 FLEV_{it} + \beta_9 CONGLO_{it} + \Sigma\gamma_{1\text{-}19} IndFE_{it} + \varepsilon \end{aligned} \quad (7)$$

Ln(LINKAGE), the natural log of the previously defined *LINKAGE* variable, is calculated for years *t+1* through *t+3* and equation (7) is separately estimated for each year.[14] Our results suggest that the cost structure of relationship-specific investments does not impact on the duration of strong customer relationships. In untabulated tests, we identify a subsample of supplier-customer pairs with available Compustat data. Using duration tests similar to the ones used by Raman and Shahrur (2008), we find qualitatively similar results.

Robustness checks

We check the robustness of our documented relationship between customer concentration and cost structure using an alternative, log-linear cost model proposed in prior research (Kallapur and Eldenburg 2005; Banker et al. 2014) where log-changes in costs are regressed on concurrent log-changes in sales revenues along with controls for GDP growth and firm size (in total

[14] We log-transform *LINKAGE* due to the skewness of the variable, but our result are robust to using the untransformed measure as well.

assets).[15] We report the results of these robustness checks in Table 9. Specifically, column (1) presents the re-examination of the main relationship between customer concentration and cost structure, while columns 2 and 3 re-examine the effect of competition on this relationship. Results from these alternative cost structure models are consistent with our inferences and support the robustness of our results.

<Insert Table 9 About Here>

We also test the robustness of our results by re-examining our main performance results using SG&A and COGS flexibility in place of operating cost flexibility in Equation 4b. These results are reported in Table 10. The coefficient on *RankCC * SGA Flexibility* is positive and statistically significant in years t+2 and t+3 while the coefficient on *RankCC * COGS Flexibility* is positive and significant for all three years. These results support our main finding that risk avoidance through greater cost structure flexibility in relationship-specific investments positively affects future performance.

<Insert Table 10 About Here>

In untabulated results, we use a number of alternative measures and regression specifications. For our cost structure tests (Tables 4 and 7), we replace our main customer concentration variable with either the raw *CC* score from Patatoukas (2012) or an indicator variable for whether the firm has at least one customer which accounts for more than 10 percent of its sales as alternative measures of customer concentration. For our performance tests (Tables 5 and 6), we redefine operating performance as earnings before interest and income tax or earnings before extraordinary items, both deflated by total assets. We also rerun all of our tests

[15] See Banker et al. (2014) for a more complete description of the log-linear model specification. Standard errors are clustered by firm and year as suggested by Peterson (2009).

excluding years prior to 1997 (the effective year of SFAS 131). Our results are qualitatively unchanged when using these alternative measures and specifications.

V. Conclusion

We examine the performance consequences of relationship-specific cost structure decisions. Analyzing cost data for a sample of U.S. manufacturing firms from 1993-2012, we find that suppliers making relationship-specific investment with more flexible cost structures (a greater degree of variable-to-fixed costs) outperform those making more rigid relationship-specific investments. We also find that suppliers' competitive environment has no effect on the relative profitability of their relationship-specific cost structure decisions, but that suppliers in more competitive industries make less flexible relationship-specific investments, which may exacerbate the risk associated with higher customer concentration. Additional analysis indicates that relationship-specific investments with more rigid cost structures increase neither future sales to strong customers nor the length of the customer-supplier relationship. Overall, our findings suggest that a risk avoidance strategy outperforms a commitment strategy in the context of relationship-specific cost structure decisions.

This study contributes to the literature on cost structure by documenting the effects of a specific type of cost structure decision on future performance. Our findings inform the current discussion about the relative advantages of choosing more flexible versus more rigid cost structures (Holzhacker et al. 2015b, Banker et al. 2014). We also identify product market competition as an environmental factor influencing relationship-specific cost structure decisions. Additionally, we extend the customer concentration literature (Patatoukas 2012; Irvine et al. 2016) by documenting that the cost structure of relationship-specific investments affects the profitability of strong customer relationships. Finally, our results have implications for financial

accounting research through identifying cost structure as a potential explanation for previously observed increases in financial risk and cost of equity capital associated with higher levels of customer concentration (Dhaliwal et al. 2016).

Our findings should be interpreted with two caveats. First we recognize that the decision to make relationship-specific investments are joint decisions between customers and suppliers. We cannot observe the negotiation process, thus we cannot infer how much of the observed cost structure decision is due to supplier versus customer preferences. As a result, we cannot extend our inferences to assess the quality of managers' first-best preferences about relationship-specific cost structure. Second, we follow prior cost structure literature and focus our study to a specific industry (Banker et al. 2014; Holzhacker et al. 2015a; Holzhacker et al. 2015b). Thus, our findings may not fully extend to other industries. Future studies may wish to investigate the relation between relationship-specific cost structure decisions and performance in other types of industries or firm level characteristics that affect mangers' cost structure decisions.

References

Aboody, D., S. Levi, and D. Weiss. 2014. *Operating Leverage and Future Earnings*. Working paper, University of California – Los Angeles and Tel Aviv University.

Balakrishnan, R., E. Labro, and N. S. Soderstrom. 2014. Cost structure and sticky costs. *Journal of Management Accounting Research* 26 (2): 91-116.

Balakrishnan, R., T.J. Linsmeier, and M. Venkatachalam. 1996. Financial benefits from JIT adoption: Effects of customer concentration and cost structure. *The Accounting Review* 71(2): 183-205.

Banker, R. D., D. Byzalov, and J.M. Plehn-Dujowich. 2014. Demand uncertainty and cost behavior. *The Accounting Review* 89(3): 839-865.

Banker, R. D., D. Byzalov, S. Fang, and L. Yi. 2016. *Cost behavior research*. Retrieved from https://ssrn.com/abstract=2882713.

Buckinx, W., and D. Van den Poel. 2005. Customer base analysis: partial defection of behaviourally loyal clients in a non-contractual FMCG retail setting. *European Journal of Operational Research* 164(1): 252-268.

Dekker. H.C., J. Sakaguchi, and T. Kawai. 2013. Beyond the contract: Managing risk in supply chain relations. *Management Accounting Research* 24(2): 122-139.

Dhaliwal, D.S., J.S. Judd, M.A. Serfling, and S.A. Shaikh. 2016. Customer concentration risk and the cost of equity capital. *Journal of Accounting and Economics* 61(1): 23-48.

Eldenburg, L.G., K.A. Gunny, K.W. Hwee, and N. Soderstrom. 2011. Earnings management using real activities: Evidence from nonprofit hospitals. *The Accounting Review* 86(5): 1605-1630.

Financial Accounting Standards Board (FASB). 1997. *Disclosures about Segments of an Enterprise and Related Information*. Statement of Financial Accounting Standards No. 131. Norwalk, CT: FASB.

Garrison, R., E. Noreen, and P. Brewer. 2011. *Managerial Accounting*. 14th edition. New York, NY: McGraw-Hill.

Geyskens, I., J. E.M. Steenkamp, and N. Kumar. 2006. Make, buy, or ally: A transaction cost theory meta-analysis. *Academy of Management Review* 49(3): 519-543.

Goodman, T.H., M. Neamtiu, N. Shroff, and H.D. White. 2014. Management forecast quality and capital investment decisions. *The Accounting Review* 89(1): 331-365.

Gunny, K.A. 2010. The relation between earnings management using real activities manipulation and future performance: Evidence from meeting earnings benchmarks. *Contemporary Accounting Research* 27(3): 855-888.

Hall, C. 2016. Does ownership structure affect labor decisions? *The Accounting Review*, 81(6): 1671-1696

Hall, J., and E. Porteus. 2000. Customer service competition in capacitated systems. *Manufacturing & Service Operations Management* 2(2): 144-165.

Hoberg, G., G. Phillips, and N. Prabhala. 2014. Product market threats, payouts, and financial flexibility. *Journal of Finance* 69(1): 293-324.

Holzhacker, M., R. Krishnan, and M.D. Mahlendorf. 2015a. The impact of changes in regulation on cost behavior. *Contemporary Accounting Research* 32(2): 534-566.

Holzhacker, M., R. Krishnan, and M.D. Mahlendorf. 2015b. Unraveling the black box of cost behavior: An empirical investigation of risk drivers, managerial resource procurement, and cost elasticity. *The Accounting Review* 90(6): 2305-2335.

Irvine, P.J., S.S. Park, and Ç. Yildizhan. 2016. Customer-base concentration, profitability, and the relationship life cycle. *The Accounting Review* 91(3): 883-906.

Jia, N. 2013. Competition, governance, and relationship-specific investments: Theory and implications for strategy. *Strategic Management Journal* 34(13): 1551-1567.

Joskow, P.L. (1987). Contract duration and relationship-specific investments: Empirical evidence from coal markets. *American Economic Review*, 77(1), 168-185.

Kallapur, S., and L. Eldenburg. 2005. Uncertainty, real options, and cost behavior: evidence from Washington State hospitals. *Journal of Accounting Research* 43 (5): 735-752.

Kama, I., and D. Weiss. 2013. Do earnings targets and managerial incentives affect sticky costs? *Journal of Accounting Research* 51(1): 201-224.

Kang, M., J. T. Mahoney, and D. Tan. 2009. Why firms make unilateral investments specific to other firms: The case of OEM suppliers. *Strategic Management Journal* 30(2): 117-135.

Klein, B., R.G. Crawford, and A.A. Alchian. 1978. Vertical integration, appropriable rents, and the competitive contracting process. *The Journal of Law and Economics* 31(2): 297-326.

Lev, B. 1974. On the association between operating leverage and risk. *Journal of Financial and Quantitative Analysis* 9(4): 627-641.

Lustgarten, S.H. 1975. The impact of buyer concentration in manufacturing industries. *The Review of Economics and Statistics* 57(2): 125-132.

Mandelker, G.N., and S.G. Rhee. 1984. The impact of the degrees of operating and financial leverage on systematic risk of common stock. *Journal of Quantitative Finance and Analysis* 19(1): 45-57.

Merchant, K.A. 1990. The effects of financial controls on data manipulation and management myopia. *Accounting, Organizations, and Society* 15(4): 297-313.

Patatoukas, P.N. 2012. Customer-base concentration: Implications for firm performance and capital markets. *The Accounting Review* 87(2): 363-392.

Peterson, M.A. 2009. Estimating standard errors in finance panel data sets: Comparing approaches. *Review of Financial Studies* 22(1): 435-480.

Pettypiece, S., and M. Townsend. 2015. *Wal-Mart's suppliers are finally fighting back*. Retrieved from http://www.bloomberg.com/news/articles/2015-09-11/wal-mart-sparks-battle-with-suppliers-over-margin-squeezing-fees

Raman, K., and H. Shahrur. 2008. Relationship-specific investments and earnings management: Evidence on corporate suppliers and customers. *The Accounting Review* 83(4): 1041-1081.

Rokkan, A.I., J.B. Heide, and K.H. Wathne. 2003. Specific investments in marketing relationships: Expropriation and bonding effects. *Journal of Marketing Research* 40(2): 210-224.

Williamson, O.E. 1979. Transaction-cost economics: The governance of contractual relations. *Journal of Law and Economics* 22(2): 233-261.

Williamson, O.E. 1996. *The mechanisms of governance.* New York, NY: Oxford University Press.

APPENDIX A
Variable definitions

REV	Total revenues (in millions)
OC	Total operating costs [revenue minus operating income] (in millions)
SGA	Selling, general, and administrative costs (in millions)
COGS	Cost of goods sold (in millions)
TA	Total assets (in millions)
OC Elasticity	Elasticity of total operating costs for a firm defined as $\frac{(OC_t/OC_{t-1})}{(REV_t/REV_{t-1})}$
SGA Elasticity	Elasticity of sales, general, and administrative costs for a firm defined as $\frac{(SGA_t/SGA_{t-1})}{(REV_t/REV_{t-1})}$
COGS Elasticity	Elasticity of cost of goods sold costs for a firm defined as $\frac{(COGS_t/COGS_{t-1})}{(REV_t/REV_{t-1})}$
OC Rigidity	Decile rank of the operating cost elasticity measure (*OC Elasticity*) scaled to range from 0 to 1, with 1 indicating the firms with the most rigid (i.e. least elastic) operating cost structure and 0 indicating the firms with the least rigid (i.e. most elastic) operating cost structure.
CC	Customer concentration score for firm *i* in year *t* (CC_{it}) equals $\sum_{j=}^{J}\left(\frac{Sales_{ijt}}{Sales_{it}}\right)^2$ where $Sales_{ijt}$ represents firm *i*'s sales to customer *j* in year *t* and $Sales_{it}$ represents total sales for firm *i* in year *t*
RankCC	Decile rank of the customer concentration variable CC scaled to range from 0 to 1.
ROA	Return on assets defined as net income divided by total assets
HHI	Herfindahl-Hirschman Index calculated using three digit SIC code
Fluid	Product market fluidity score for firm *I* in year *t* equals $\left(N_{i,t}\cdot\frac{D_{t-1,t}}{\|D_{t-1,t}\|}\right)$ where $N_{i,t}$ is a vector indicating which from among all unique product-related words are used by firm *i* during year *t* and $D_{t-1,t}$ is the aggregate change vector which captures overall changes in word usage between year *t-1* and year *t*.
HighComp	High industry concentration indicator variable equals 1 if the firm's HHI is below the sample median, 0 otherwise.
HighFluid	High product market fluidity indicator variable equals 1 if the firm's product market fluidity is above the sample median, 0 otherwise.
SC Sales Growth	Annual sales growth rate for sales to strong customers for a firm.
RC Sales Growth	Annual sales growth rate for sales to customers other than strong customers (i.e. regular customers) for a firm.
LINKAGE	Weighted average duration of a firm's strong customer relationships at the end of year *t*.
MVE	Market value of equity.
AGE	Firm age measured as the number of years since the first year the firm appears in the Compustat Annual Fundamentals database.
GROWTH	Annual sales growth rate between years *t-1* and *t* for a firm.
FLEV	Leverage ratio measured as assets divided by market value of equity for a firm.
CONGLO	Indicator variable equal to 1 if the firm reports at least to business segments and 0 otherwise.
Δln	Log change operator

TABLE 1
Sample composition by industry

2-Digit SIC Code	Industry Name	N	% of Sample
20	Food and Kindred Products	1,295	4.90%
21	Tobacco Products	62	0.23%
22	Textile Mill Products	354	1.34%
23	Apparel and Other Finished Products Made from Fabrics and Similar Materials	693	2.62%
24	Lumber and Wood Products, Except Furniture	242	0.92%
25	Furniture and Fixtures	321	1.21%
26	Paper and Allied Products	482	1.82%
27	Printing, Publishing, and Allied Industries	389	1.47%
28	Chemicals and Allied Products	4,710	17.82%
29	Petroleum Refining and Related Industries	249	0.94%
30	Rubber and Miscellaneous Plastic Products	680	2.57%
31	Leather and Leather Products	232	0.88%
32	Stone, Clay, Glass, and Concrete Products	261	0.99%
33	Primary Metal Industries	764	2.89%
34	Fabricated Metal Products, Except Machinery and Transportation Equipment	833	3.15%
35	Industrial and Commercial Machinery and Computer Equipment	3,563	13.48%
36	Electronic and Other Electrical Equipment and Components, Except Computer Equipment	5,479	20.72%
37	Transportation Equipment	1,383	5.23%
38	Measuring, Analyzing, and Controlling Instruments; Photographic, Medical, and Optical Goods; Watches and Clocks	3,801	14.38%
39	Miscellaneous Manufacturing Industries	645	2.44%
Total		26,438	100%

Table 1 presents the industry composition for the sample of firm-year observations used in this study. The sample consists of manufacturing firms (SIC 2000 - 3999) that report at least one strong customer in the Compustat Customer Segment database. Observations with values of REV, OC, SGA, or COGS in the highest and lowest .5% of the distribution are truncated.

TABLE 2
Descriptive statistics

				Percentiles		
Variable	**n**	**Mean**	**Std. Dev.**	**25th**	**50th**	**75th**
REV	26,438	$1,310.75	$4,524.16	$23.72	$109.13	$573.61
OC	26,438	$1,187.70	$4,162.10	$27.83	$106.94	$524.70
SGA	24,710	$302.85	$1,270.58	$9.24	$30.42	$119.63
COGS	26,438	$844.65	$3,153.12	$15.19	$68.09	$348.65
TA	26,438	$1,559.55	$6,115.13	$27.80	$111.38	$580.56
EBIT	26,437	$150.11	$759.17	-$1.28	$4.92	$45.17
OC Elasticity	26,438	0.784	1.732	0.512	0.881	1.075
SGA Elasticity	24,562	0.656	3.280	0.101	0.683	1.185
COGS Elasticity	26,430	0.891	2.157	0.606	0.950	1.208
CC	26,438	0.142	0.182	0.023	0.073	0.187
MVE	26,438	4.942	2.308	3.359	4.857	6.454
AGE	26,438	2.323	0.927	1.792	2.485	3.091
GROWTH	26,438	0.212	0.655	-0.035	0.095	0.274
FLEV	26,438	2.137	43.993	1.271	1.667	2.440
CONGLO	26,438	0.383	0.486	0	0	1
HHI	26,438	0.168	0.155	0.058	0.128	0.201
FLUID	14,204	6.479	3.603	3.862	5.693	8.290
ROA	26,446	-0.056	0.360	-0.091	0.041	0.112
LINKAGE	15,400	3.274	2.704	1.000	2.271	4.000

Table 2 presents descriptive statistics for the sample used in the study. *REV* equals a firm's total revenue in year *t*. *OC* equals a firm's total operating costs (in millions) in year *t*. *SGA* equals a firm's selling and general costs (in millions) in year *t*. *COGS* equals a firm's cost of goods sold (in millions) in year *t*. *TA* equals a firms total assets (in millions) in year *t*. *EBIT* equals a firms earnings before interest and taxes in year *t*. Variables measured in monetary units are CPI adjusted using 1982-84 as the base year. *OC Elasticity* is calculated as the change in log-OC for firm *i* from year *t-1* to year *t*. *SGA Elasticity* is calculated as the change in log-SGA for firm *i* from year *t-1* to year *t*. *COGS Elasticity* is calculated as the change in log-COGS for firm *i* from year *t-1* to year *t*. *CC* is the measure of a firm's customer concentration following Patatoukas (2012) for year *t*. *MVE* equals a firm's market value of equity for year *t*. *AGE* equals a firm's age in year *t*. *GROWTH* equals a firm's annual sales growth rate between year *t-1* and year *t*. *FLEV* equals a firm's leverage ratio in year *t*. *CONGLO* equals 1 if the firm reports at least two business segments, 0 otherwise. *HHI* is a firm's Herfindahl-Hirschman Index for year *t* based on the firm's three digit SIC code. *FLUID* is a firm's product market fluidity score for year *t*. *ROA* equals a firms return on assets in year *t*. *LINKAGE* is the weighted average duration of a firm's strong customer relationships at the end of year *t*. Detailed variable definitions are presented in Appendix A.

TABLE 3
Correlations of main variables

Variable Name	1	2	3	4	5	6	7	8	9	10	11	12
1.OC Elasticity		0.558**	0.580**	0.137**	-0.069**	0.088**	0.041**	0.090**	0.092**	0.121**	-0.125**	0.084**
2. SGA Elasticity	0.580**		-0.036**	0.150**	-0.069**	0.108**	0.002	0.132**	0.035**	0.056**	-0.060**	0.030**
3.COGS Elasticity	0.584**	-0.016**		0.015**	-0.008	0.011	0.018*	0.027**	0.044**	0.058**	-0.044**	0.038**
4. ROA	0.054**	0.033**	0.010**		-0.095**	0.390**	0.192**	0.261**	0.112**	-0.042**	-0.223**	0.105**
5. CC	-0.027**	-0.023**	0.006**	-0.089**		-0.055**	-0.073**	-0.005	-0.135**	-0.105**	0.125**	-0.076**
6. MVE	0.026**	0.017**	-0.006	0.332**	-0.045**		0.218**	0.159**	0.266**	0.129**	0.089**	0.047**
7. AGE	-0.002	-0.013**	-0.005	0.185**	-0.075**	0.205**		-0.164**	0.312**	0.169**	-0.324**	0.173**
8. GROWTH	0.004	0.011	-0.002	0.011**	0.057**	0.073**	-0.218**		-0.047**	-0.053**	0.128**	-0.090**
9. CONGLO	0.025**	0.008	0.004**	0.154**	-0.128**	0.261**	0.298**	-0.080**		0.229**	-0.159**	0.186**
10. FLEV	0.001	0.005	-0.002	0.012	-0.001	0.007	-0.002	0.009	-0.004		-0.262**	0.218**
11. FLUID	-0.049**	-0.032**	-0.007**	-0.238**	0.140**	0.118**	-0.264**	0.154**	-0.169**	0.007**		-0.391**
12. HHI	0.021**	0.015**	0.002**	0.088**	-0.034**	0.032**	0.126**	-0.056**	0.128**	0.004	-0.275**	

**,* indicate statistical significance at the 1 and 5 percent levels, respectively. Significance levels are two-tailed for all variables. Spearman correlations are reported above the diagonal and Pearson correlations are reported below the diagonal. Detailed variable definitions are presented in Appendix A.

TABLE 4
In-sample validation of effect of customer concentration on cost structure

	(1) OC Elasticity	(2) SGA Elasticity	(3) COGS Elasticity	(4) Rank(OC Elasticity)	(5) Rank(SGA Elasticity)	(6) Rank(COGS Elasticity)
RankCC	**-0.205*** **	**-0.227*** **	**-0.124*** **	**-0.057*** **	**-0.054*** **	**-0.028*** **
	(-5.27)	**(-3.89)**	**(-2.96)**	**(-7.48)**	**(-6.70)**	**(-4.34)**
MVE	0.021***	0.036***	-0.001	-	-	-
	(3.57)	(3.35)	(-0.21)			
AGE	-0.014	-0.046	-0.000	-	-	-
	(-1.20)	(-1.44)	(-0.01)			
GROWTH	-0.011	0.036	-0.028*	-	-	-
	(-0.92)	(1.30)	(-1.78)			
FLEV	0.001	0.003	0.000	-	-	-
	(1.26)	(1.17)	(0.48)			
Rank(MVE)	-	-	-	0.006***	0.012***	-0.002
				(6.35)	(9.93)	(-1.40)
Rank(AGE)	-	-	-	0.001**	-0.001	0.002**
				(2.15)	(-0.88)	(2.44)
Rank(GROWTH)	-	-	-	0.007***	0.010***	0.004**
				(3.54)	(5.39)	(2.82)
Rank(LEV)	-	-	-	0.006***	0.002**	0.004***
				(6.48)	(2.26)	(4.97)
CONGLO	0.045	0.043	0.044	0.030***	0.002	0.022***
	(1.24)	(0.82)	(1.20)	(4.40)	(0.24)	(4.48)
ΣIndustryFE	included	included	included	included	included	included
n	26,438	24,562	26,430	26,438	24,562	26,430
Avg. R^2	0.0247	0.0245	0.0215	0.0723	0.0642	0.0411

Table 4 presents results of yearly Fama-MacBeth (1973) regressions for equation (3) as described on page 16. We examine elasticities related to three types of costs: operating costs (*OC Elasticity*), selling, general, and administrative costs (*SGA Elasticity*), and cost of goods sold (*COGS Elasticity*). Columns (1) through (3) report estimations using untransformed values for *OC Elasticity*, *SGA Elasticity*, *COGS Elasticity*, *MVE*, *AGE*, *GROWTH*, *CONGLO*, and *LEV*. Columns (4) through (6) report estimations using rank transformed values for these same variables. IndustryFE are industry fixed effects based on the firm's two digit SIC code. Newey-West -adjusted t-statistics are presented in parentheses below the coefficients. *, **, and *** denote statistical significance at the 10, 5, and 1% levels, respectively. Detailed variable definitions are presented in Appendix A.

TABLE 5

Main results: Effect of relationship-specific cost structure on future performance

	(1) ROA_{t+1}	(2) ROA_{t+2}	(3) ROA_{t+3}	(4) ROA_{t+1}	(5) ROA_{t+2}	(6) ROA_{t+3}
OC Flexibility	**0.032**	**0.023**	**-0.011**	**0.006**	**0.012**	**0.017**
	(1.16)	**(1.00)**	**(-0.43)**	**(0.13)**	**(0.36)**	**(0.47)**
RankCC	**-0.215*** **	**-0.238*** **	**-0.288*** **	**-0.278*** **	**-0.302*** **	**-0.317*** **
	(-10.10)	**(-7.17)**	**(-8.42)**	**(-6.79)**	**(-6.81)**	**(-3.99)**
RankCC * OC Flexibility	**0.186*** **	**0.224*** **	**0.286*** **	**0.200*** **	**0.256*** **	**0.208*** **
	(4.79)	**(4.93)**	**(5.79)**	**(3.21)**	**(5.35)**	**(3.06)**
ln(LINKAGE)	-	-	-	0.016	0.016	0.002
				(1.65)	(1.04)	(0.16)
*RankCC * ln(LINKAGE)*	-	-	-	0.059***	0.061**	0.091**
				(3.35)	(2.49)	(2.34)
MVE	0.049***	0.046***	0.050***	0.050***	0.044***	0.047***
	(16.08)	(11.70)	(10.44)	(8.33)	(7.08)	(6.26)
AGE	0.061***	0.065***	0.057***	0.062***	0.067***	0.053***
	(6.36)	(5.54)	(4.75)	(5.61)	(5.44)	(3.95)
GROWTH	-0.042**	-0.051***	-0.071***	-0.039*	-0.045***	-0.067***
	(-2.70)	(-4.11)	(-3.80)	(-1.95)	(-2.83)	(-3.50)
FLEV	-0.001	0.000	0.000	-0.000	-0.000	0.002
	(-1.32)	(0.33)	(0.75)	(-0.10)	(-0.42)	(1.07)
CONGLO	0.031**	0.042***	0.049***	0.021	0.029*	0.044***
	(2.22)	(3.15)	(3.79)	(1.32)	(2.02)	(3.46)
ΣIndustryFE	included	included	included	included	included	included
n	26,438	24,450	22,471	15,396	14,218	13,090
Avg. R^2	0.1181	0.1094	0.1010	0.1561	0.1593	0.1497

Table 5 presents results of yearly Fama-MacBeth (1973) regressions for equations (4a) and (4b) as described on page 18. We examine return on assets (ROA) for years *t+1*, *t+2*, and *t+3*. IndustryFE are industry fixed effects based on the firm's two digit SIC code. Newey-West-adjusted t-statistics are presented in parentheses below the coefficients. *, **, and *** denote statistical significance at the 10, 5, and 1% levels, respectively. Detailed variable definitions are presented in Appendix A.

TABLE 6

Effect of competition on the relation between relationship-specific cost structure and future performance

	ROA_{t+1}			ROA_{t+2}			ROA_{t+3}		
	(1)	**(2)**		**(3)**	**(4)**		**(5)**	**(6)**	
	Low Competition	**High Competition**	**Δ**	**Low Competition**	**High Competition**	**Δ**	**Low Competition**	**High Competition**	**Δ**
OC Flexibility	**0.008**	**-0.014**		**0.029**	**0.022**		**0.029**	**0.032**	
	(0.37)	**(-0.12)**		**(1.02)**	**(0.43)**		**(0.48)**	**(0.49)**	
RankCC	**-0.250*****	**-0.319*****		**-0.199*****	**-0.383*****		**-0.233****	**-0.377*****	
	(-4.40)	**(-3.93)**		**(-3.12)**	**(-5.66)**		**(-2.27)**	**(-3.65)**	
RankCC * OC Flexibility	**0.215*****	**0.209**		**0.172****	**0.285*****		**0.206**	**0.182***	
	(3.27)	**(1.27)**		**(2.09)**	**(3.95)**		**(1.36)**	**(1.80)**	
ln(LINKAGE)	0.026**	0.010		0.029*	0.006		0.022	-0.002	
	(2.53)	(0.42)		(2.01)	(0.19)		(1.40)	(-0.14)	
*RankCC * ln(LINKAGE)*	0.043	0.064**		0.040	0.070		0.043	0.112**	
	(1.44)	(2.08)		(1.14)	(1.68)		(0.98)	(2.54)	
MVE	0.039***	0.060***	‡	0.034***	0.055***	‡	0.040***	0.054***	†
	(6.13)	(7.24)		(6.55)	(6.33)		(5.77)	(5.02)	
AGE	0.045***	0.077***		0.057***	0.073***		0.062***	0.051*	
	(4.72)	(3.29)		(4.47)	(4.17)		(5.75)	(2.01)	
GROWTH	-0.108	-0.021		-0.059*	-0.038*		-0.079	-0.074***	
	(-1.22)	(-0.95)		(-1.78)	(-1.93)		(-1.01)	(-3.52)	
FLEV	-0.002	0.001		0.002	-0.001		0.002	0.002	
	(-1.39)	(0.62)		(0.96)	(-0.34)		(1.31)	(0.45)	
CONGLO	0.013*	0.024		0.020*	0.036		0.014	0.075***	
	(1.90)	(0.65)		(2.02)	(1.46)		(0.89)	(3.32)	
ΣIndustryFE	included	included		included	included		included	included	
n	7,644	7,752		7,066	7,152		6,506	6,584	
Avg. R^2	0.2108	0.2032		0.2265	0.2162		0.2075	0.2272	

Table 6 presents results of yearly Fama-MacBeth regressions for equation (4b) as described on page 18. We examine return on assets (ROA) for years *t+1, t+2,* and *t+3.* Subsamples are constructed based on supplier industry competition levels as measured using the Herfindahl-Hirschman Index (HHI). Firm-year observations with HHI scores above the sample median are assigned to the low competition subsample while firm-year observations with HHI scores below the sample median are assigned to the high competition subsample. IndustryFE are industry fixed effects based on the firm's two digit SIC code. Newey-West-adjusted t-statistics are presented in parentheses below the coefficients. *, **, and *** denote statistical significance at the 10, 5, and 1% levels, respectively. † and ‡ are used to denote statistically significant differences in model coefficients at the 5 and 1% level, respectively. Detailed variable definitions are presented in Appendix A.

TABLE 7

Effect of supplier industry competition on relationship-specific cost structure decisions

	(1) OC Elasticity	(2) Rank (OC Elasticity)	(3) OC Elasticity	(2) Rank (OC Elasticity)
RankCC	**-0.102***	**-0.017**	**-0.035**	**-0.014**
	(-1.94)	**(-1.62)**	**(-0.58)**	**(-0.96)**
HighComp	**0.063**	**0.019****	-	-
	(1.34)	**(2.17)**		
RankCC * HighComp	**-0.206****	**-0.078*****	-	-
	(-2.59)	**(-5.09)**		
HighFluid	-	-	**-0.086**	**-0.022****
			(-1.44)	**(-2.31)**
RankCC * HighFluid	-	-	**-0.202****	**-0.076*****
			(-2.19)	**(-5.78)**
MVE	0.022***	-	0.033***	-
	(3.63)		(4.38)	
AGE	-0.016	-	-0.036	-
	(-1.37)		(-1.54)	
GROWTH	-0.011	-	-0.006	-
	(-0.91)		(-0.33)	
FLEV	0.001	-	0.000	-
	(1.29)		(0.20)	
Rank(MVE)	-	0.007***	-	0.008***
		(6.40)		(6.13)
Rank(AGE)	-	0.001*	-	-0.000
		(1.76)		(-0.36)
Rank(GROWTH)	-	0.007***	-	0.007**
		(3.50)		(2.45)
Rank(FLEV)	-	0.006***	-	0.007***
		(6.26)		(4.61)
CONGLO	0.043	0.028***	0.068**	0.034***
	(1.22)	(4.31)	(2.36)	(5.84)
ΣIndustryFE	included	included	included	Included
N	26,438	26,438	14,199	14,199
Avg. R^2	0.027	0.0762	0.0322	0.0938

Table 7 presents results of yearly Fama-MacBeth regressions for equations (5a) and (5b) as describe on page 21. These tests examine the impact on supplier industry competition on the relationship between customer concentration and firm cost structure. We examine operating cost elasticity (*OC Elasticity)* as our dependent variable. Columns (1) and (3) report estimations using untransformed values for *OC Elasticity*, *MVE*, *AGE*, *GROWTH*, *CONGLO*, and *LEV*. Columns (2) through (4) report estimations using rank transformed values for these same variables. IndustryFE are industry fixed effects based on the firm's two digit SIC code. Newey-West-adjusted t-statistics are presented in parentheses below the coefficients. *, **, and *** denote statistical significance at the 10, 5, and 1% levels, respectively. Detailed variable definitions are presented in Appendix A.

TABLE 8

Sales growth and relationship duration results

Panel A: Strong customer sales growth			
	(1)	**(2)**	**(3)**
	SC Sales Growth$_{t+1}$	***SC Sales Growth$_{t+2}$***	***SC Sales Growth$_{t+3}$***
OC Flexibility	**-0.167*** **	**-0.003**	**0.004**
	(-3.76)	**(-0.07)**	**(0.08)**
RankCC	**-0.709*** **	**-0.307*** **	**-0.253*** **
	(-9.64)	**(-3.98)**	**(-5.41)**
RankCC * OC Flexibility	**0.225*** **	**-0.061**	**-0.021**
	(3.20)	(-0.67)	(-0.20)
MVE	-0.005**	-0.005	-0.011***
	(-2.56)	(-1.30)	(-2.91)
AGE	-0.016	-0.003	0.005
	(-1.34)	(-0.27)	(0.28)
GROWTH	0.089***	-0.007	-0.003
	(4.50)	(-0.40)	(-0.27)
FLEV	-0.000	0.000	0.000
	(-0.12)	(0.22)	(0.64)
CONGLO	-0.032*	-0.024*	-0.027**
	(-2.00)	(-1.95)	(-2.25)
ΣIndustryFE	included	included	included
n	26,425	19,111	15,710
Avg. R^2	0.0603	0.0428	0.0384

Table 8, panel A presents results of yearly Fama-MacBeth regressions for equation (6) as described on page 22. These tests examine the impact of customer concentration and firm cost structure on future total sales growth to strong customers (*SC Sales Growth).* IndustryFE are industry fixed effects based on the firm's two digit SIC code. Newey-West-adjusted t-statistics are presented in parentheses below the coefficients. *, **, and *** denote statistical significance at the 10, 5, and 1% levels, respectively. Detailed variable definitions are presented in Appendix A.

Panel B: Strong customer relationship duration			
	(1)	**(2)**	**(3)**
	ln(LINKAGE$_{t+1}$)	***ln(LINKAGE$_{t+2}$)***	***ln(LINKAGE$_{t+3}$)***
OC Flexibility	**-0.002**	**0.015**	**-0.008**
	(-0.19)	**(1.26)**	**(-0.59)**
RankCC	**-0.005**	**0.005**	**-0.009**
	(-0.79)	**(0.46)**	**(-0.51)**
RankCC * OC Flexibility	**0.008**	**-0.002**	**0.035**
	(0.65)	**(-0.18)**	**(1.33)**
ln(LINKAGE$_t$)	0.708***	0.530***	0.420***
	(41.44)	(15.62)	(9.08)
MVE	-0.002*	-0.002*	0.003
	(-2.07)	(-1.86)	(0.77)
AGE	0.014***	0.015***	0.010**
	(5.68)	(4.02)	(2.58)
GROWTH	-0.002	0.000	0.001
	(-0.77)	(0.01)	(0.39)
FLEV	-0.001	-0.016	-0.014
	(-1.44)	(-1.02)	(-0.96)
CONGLO	-0.015***	-0.012**	-0.008
	(-3.88)	(-2.73)	(-1.63)
ΣIndustryFE	included	included	included
n	11,435	8,316	6,034
Avg. R^2	0.9322	0.9063	0.8932

Table 8, Panel B presents results of yearly Fama-MacBeth (1973) regressions for equation (7) as described on page 23. These results examine the impact of customer concentration and firm cost structure on the weighted average duration of a firm's strong customer relationships (*LINKAGE)* at the end of each of years *t+1, t+2,* and *t+3*. IndustryFE are industry fixed effects based on the firm's two digit SIC code. Newey-West-adjusted t-statistics are presented in parentheses below the coefficients. *, **, and *** denote statistical significance at the 10, 5, and 1% levels, respectively. Detailed variable definitions are presented in Appendix A.

TABLE 9
Robustness: Customer concentration and cost structure

	(1) Δln(OC)	(2) Δln(OC)	(3) Δln(OC)
Δln(REV)	0.672***	0.645***	0.582***
	(16.45)	(15.38)	(10.68)
RankCC * Δln(REV)	**-0.226*** **	**-0.141*** **	**-0.157*** **
	(-10.42)	**(-4.25)**	**(-3.73)**
HighComp * Δln(REV)	-	-0.021	-
		(-0.82)	
HighComp * RankCC * Δln(REV)	**-**	**-0.118*** **	-
		(-2.97)	
HighComp	-	0.018***	-
		(6.91)	
HighFluid * Δln(REV)	-	-	-0.091***
			(-2.89)
HighFluid * RankCC * Δln(REV)	**-**	**-**	**-0.132*** **
			(-2.68)
HighFluid	-	-	0.024***
			(8.51)
RankCC	0.040***	0.037***	0.037***
	(10.24)	(9.80)	(7.67)
Controls	included	included	included
Controls * Δln(REV)	included	included	included
ΣIndustryFE	included	included	included
ΣIndustryFE * Δln(REV)	included	included	included
N	26,446	26,446	14,204
Adj. R^2	0.6623	0.6655	0.6807

Table 10 presents OLS estimation results for robustness tests of our main tests from Table 4 and our supplier industry competition tests from Table 7. The symbol Δln represents the log change operator defined as the natural log of (X_{it} / X_{it-1}). We examine three types of costs: Operating costs (*OC*), selling, general, and administrative costs (*SGA*), and cost of goods sold (*COGS*). For brevity, only estimates for operating costs are presented. REV equals a firm's total revenue in year *t*. IndustryFE are industry fixed effects based on the firm's two digit SIC code. T-statistics are presented in parentheses below the coefficients. Standard errors are clustered by firm and year (Peterson 2009). *, **, and *** denote statistical significance at the 10, 5, and 1% levels, respectively. Detailed variable definitions are presented in Appendix A.

TABLE 10
Robustness: Effect of relationship-specific cost structure of SG&A and COGS on future performance

	(1) ROA_{t+1}	(2) ROA_{t+2}	(3) ROA_{t+3}	(4) ROA_{t+1}	(5) ROA_{t+2}	(6) ROA_{t+3}
RankCC	**-0.212*** **	**-0.252*** **	**-0.274*** **	**-0.259*** **	**-0.273*** **	**-0.332*** **
	(-3.83)	**(-5.42)**	**(-3.66)**	**(-7.57)**	**(-6.19)**	**(-5.39)**
SGA Flexibility	**0.039**	**0.013**	**0.013**	-	-	-
	(1.08)	**(0.65)**	**(0.50)**			
RankCC * SGA Flexibility	**0.097**	**0.188*** **	**0.150** **	-	-	-
	(1.50)	**(4.18)**	**(2.38)**			
COGS Flexibility	-	-	-	**-0.049**	**-0.027**	**-0.075** **
				(-1.33)	**(-0.79)**	**(-2.58)**
RankCC * COGS Flexibility	-	-	-	**0.154** **	**0.182*** **	**0.226*** **
				(2.66)	**(3.10)**	**(3.34)**
ln(LINKAGE)	0.018*	0.016	-0.001	0.018*	0.018	0.003
	(1.88)	(1.04)	(-0.14)	(1.94)	(1.23)	(0.21)
*RankCC * ln(LINKAGE)*	0.064**	0.066***	0.107***	0.059***	0.060**	0.090**
	(2.63)	(2.97)	(3.11)	(3.21)	(2.39)	(2.28)
MVE	0.045***	0.040***	0.044***	0.051***	0.046***	0.049***
	(8.31)	(7.28)	(6.49)	(8.23)	(6.92)	(6.14)
AGE	0.048***	0.060***	0.051***	0.062***	0.068***	0.054***
	(3.47)	(4.38)	(3.70)	(5.56)	(5.52)	(3.96)
GROWTH	-0.044	-0.059***	-0.046*	-0.039*	-0.046***	-0.068***
	(-1.60)	(-3.36)	(-1.79)	(-1.84)	(-2.86)	(-3.60)
FLEV	-0.000	0.000	0.001	-0.000	-0.000	0.002
	(-0.20)	(0.23)	(0.88)	(-0.25)	(-0.41)	(1.01)
CONGLO	0.028***	0.030*	0.043**	0.025	0.034**	0.046***
	(2.87)	(1.86)	(2.82)	(1.52)	(2.24)	(3.47)
ΣIndustryFE	included	included	included	included	included	included
n	14,234	13,137	12,083	15,389	14,213	13,085
Avg. R^2	0.1326	0.1487	0.1256	0.1518	0.1531	0.1464

Table 10 presents results of yearly Fama-MacBeth (1973) regressions for equations (4a) and (4b) as described on page 17. We examine return on assets (ROA) for years *t+1, t+2,* and *t+3. SGA Flexibility (COGS Flexibility)* is the decile rank of the SG&A (Cost of Goods Sold) elasticity measure scaled to range from 0 to 1 with 1 indicating the firms with the most elastic (i.e. most flexible) operating costs. IndustryFE are industry fixed effects based on the firm's two digit SIC code. Newey-West-adjusted t-statistics are presented in parentheses below the coefficients. *, **, and *** denote statistical significance at the 10, 5, and 1% levels, respectively. Detailed variable definitions are presented in Appendix A.