

Outsourcing through Purchase Contracts and Firm Capital Structure

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ABSTRACT

We examine firm and industry characteristics associated with outsourcing and the relation between outsourcing and capital structure using a unique database of outsourcing purchase contracts. We find that highly valued, profitable firms with high value-added per employee and suppliers farther away with higher competition, are more likely to outsource using purchase contracts. In addition, we document that firms that operate in industries with more severe import penetration and with fewer fixed assets are more likely to outsource using purchase contracts. Examining the outside purchase contract and leverage decisions, we find that the outsourcing decision is associated with less leverage. Our results are consistent with firms that choose to use purchase contracts using less leverage to mitigate the potential loss of relation-specific investments of contracting parties that can occur with financial distress or bankruptcy.

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1 Introduction

How do firms that significantly rely on other companies for production differ from those that do business more within their own operational infrastructure? Evidence from the electronics, pharmaceuticals, and automotive industries shows that the use of contract manufacturing has grown significantly. For example, the electronics industry once outsourced \$75 billion to contract manufacturers, representing 10 percent of total production (Plambeck and Taylor (2005)). Firms also have been signing extensive contracts with outside firms to run their communications and information technology operations. Despite this growth in outsourcing, we do not have systematic evidence on how outside contracting decisions are associated with firms' real and financial outcomes.¹

Using a unique database of outsourcing through purchase contracts collected from firm 10-K filings for a measure of external contracting intensity, we document a number of important characteristics of firms that use outside purchase contracts and empirically link the use of those contracts to real and financial decisions. We first examine a broad set of firm and industry characteristics and show that they are related to the decision to use outside purchase contracts. We next analyze the potential interactions of outside contracts with firm cash flows on the real side and capital structure on the financial side. We then examine how firms that choose to outsource through purchase contracts may use less leverage to mitigate the potential loss of relation-specific investments of contracting parties including suppliers and high value added workers.

We collect the data on outside purchase contracts using web crawling and text parsing of firm 10-Ks following the Securities and Exchange Commission (SEC) rule that requires

¹Grossman and Helpman (2005) develop a theoretical model of firms' decisions about when to vertically integrate. See Nunn and Treffer (2012) and Antràs (2013) for recent contributions to the international trade literature based on incomplete contracting and the property-rights theory of firm boundaries. Spencer (2005) and Helpman (2006) provide surveys of earlier studies on outsourcing and international trade. Also, see Handfield (1994), Levy (1995), and Monczka and Trent (2003) for the management literature on international outsourcing.

firms to report material purchase contracts to investors in their financial statements. These contracts include both traditional supply contracts and production and service contracts that outsource tasks like managing customer call centers, handling communications and information technology, and production of products. One prominent example of the long-term purchase contracting is Apple Inc. contracting for the production of its iPhones. The contracts we examine in this paper are any material long-term external contracts for production or inputs, including both domestic and international contracts.

1.1 Our Findings

We begin by documenting new evidence on the characteristics of U.S. firms that outsource, both cross-sectionally and over time. We next examine the real side implications for input costs and cash flow volatility and then examine how financial structure may differ for these outsourcing firms. Lastly, in the subsection following this section, we discuss how our findings on outsourcing decisions are consistent with the theory of the firm and firms choosing lower leverage to increase the incentives of suppliers to invest in relation-specific investments.

Our evidence shows that 47.5 percent of suppliers are in the U.S., 25.5 percent in Asia, and the remainder in Europe and other regions, and thus suppliers are not just international firms.² We find that firms that significantly rely on external contracting are larger in size, with lower fixed asset ratios and spend more on R&D than on capital investment, and have higher value-added per worker and suppliers farther away with higher competition. They are also geographically close to ports of entry, including seaports, hub airports with cargo services, and border crossings. On the industry side, these firms are more likely to be in high-technology industries and industries with higher competition and with high import

²Research from the Hackett Group, Inc. finds that domestic outsourcing has recently increased and many U.S. cities now make attractive alternatives to offshoring for corporate finance, IT, and other business service operations. See Reuters (2015), “The Hackett Group Research Alert: Many U.S. Cities Now Make Attractive Alternatives to Offshoring for Corporate Finance, IT, Other Business Service Operations,” available at <http://www.reuters.com/article/fl-hackett-group-idUSnBw196151a+100+BSW20150519>.

penetration. In particular, firms that have fewer fixed assets prior to China's entry into the WTO in 2001 and that operate in industries with high import penetration outsource significantly more using outside purchase agreements.

We also find that the use of outside purchase contracts is not simply industry-specific, as there is extensive within-industry variation in the use of purchase contracts. We thus examine within-industry characteristics between firms that use material long-term purchase contracts and those that rely on their own operations. We illustrate this point in Section 4, in which we provide detailed examples of three firms in the semiconductor industry that employ considerably different external contracting strategies.

On the real side of the firm's balance sheet, we examine firm inputs including the cost of goods sold (COGS) and sales and general administrative expenses (SG&A). We find that the COGS and SG&A of firms that use outside purchase contracts are significantly related to unanticipated demand shocks. This association with demand shocks is significant for firms in the industries with low industry leverage where outside purchase contracts are used more. The SG&A and COGS for firms that do not use purchase contracts extensively do not significantly respond to demand shocks. Examining cash flows, we find evidence that cash flows are significantly less volatile for firms with high purchase contract intensity versus matched firms with no or low amounts of purchase contracts.

We next examine the financial leverage of firms that use outside purchase contracts extensively compared to firms that do not have material purchase contracts. Despite the reduction in cash flow volatility, we find evidence that firms with greater external purchase contracts use less financial leverage. We show that labor force characteristics of outsourcing firms along with characteristics of suppliers, including supplier competition and supplier distance, can help explain the negative relation between outsourcing and leverage.

We recognize that firms using purchase contracts may choose less leverage for multiple

reasons. For example, managerial risk aversion may lead to low leverage and the extensive use of purchase contracts as well. We employ several methodologies that address this simultaneity to examine the association between the use of purchase contracts and financial leverage including propensity-score matched regressions and simultaneous regressions. The methods do not establish any causal relations as propensity-score matching is based on observable characteristics and simultaneous regressions do not aim at identifying causality. The analysis with simultaneous equations identifies the common factors that influence both outsourcing decisions and financial structure. Firm characteristics that are associated with more outside purchase contracts and less leverage include having more high value-added workers and locations close to a port of entry to the U.S., and that have suppliers farther away with higher competition. These results are consistent with the same underlying fundamental factors accounting for firms' tendency to use less leverage and more outside purchase contracts.

Our last analysis examines dynamic leverage adjustment of firms with high purchase contract intensity following plausibly exogenous shocks that increase firm market leverage. Using mutual fund flow-driven price pressure as exogenous variation in market valuation and thus market leverage following Coval and Stafford (2007) and Edmans, Goldstein, and Jiang (2012), we show that after leverage-increasing shocks, firms with high purchase contract intensity decrease more quickly their market leverage back to the previous levels than firms with no or low amounts of purchase contracts. We show that firms with high purchase contract intensity are more likely to issue equity in the subsequent years following the leverage-increasing mutual fund flow shocks.

1.2 Relation of Outsourcing Decisions to the Theory of the Firm

We now discuss how the results we document provide evidence on the theory of the firm and how firm organization interacts with their financial structure. Our results are consistent

with firms that choose to outsource through purchase contracts using less leverage to mitigate the potential loss of relation-specific investments of contracting parties that can occur with financial distress or bankruptcy. With incomplete contracts between the firm and its real side claimants, using outside contracts may affect financial structure. Grossman and Hart (1986) model how the decision to be vertically integrated versus maintain separate ownership can affect incentives to invest ex ante in relation-specific assets. In their model, if both parties' investments are important to later-stage outcomes, the firms will be less likely to vertically integrate and more likely to sign implicit or explicit contracts with suppliers.

We consider investment in relation-specific assets as in Grossman and Hart (1986) as a possible channel to explain the strong negative relation between outside contracts and leverage. Consistent with the notion of relation-specific investment on the supplier side, Apple Inc. for example writes that they look for suppliers who take the time to learn about and understand their business and who look for ways to add value. Their procurement strategy states:

Apple requires each of its suppliers to meet the highest standards for all goods and services. Our requirements include a commitment to rigorous quality assurance. ... The ideal suppliers are those who understand our culture and expectations. We value suppliers who take the time to learn about and understand our business and who look for ways to add value. These suppliers know the importance of making and meeting commitments and delivering the highest quality goods and services. Our business environment is competitive and fast-paced. Our suppliers must understand this dynamic and be agile and flexible in responding to changing business conditions. Above all, Apple values innovation. We appreciate suppliers who truly understand and share in our challenges, and who help us find the best possible solutions. (*Apple and Procurement*)³

In addition to the costs arising from incomplete contracts, related costs of financial distress on the contracting parties can include costs of searching for new business partners and costs arising from asymmetric information about new business partners' quality. In all of these

³The entire post of Apple Inc.'s procurement strategies on their website is available at <https://www.apple.com/procurement/>. Also, the intuition regarding suppliers' risk in making customer-specific investments is exemplified by Apple Inc.'s suppliers in a recent article, *Financial Times* (April 7, 2017), "The blessing and curse of being an Apple supplier" by Tim Bradshaw.

cases, increased leverage can increase the costs that occur in the event of financial distress or bankruptcy and thus can affect the investment incentives of suppliers.

Our purchase contracts data are likely to capture such contract-based relationships that are long-term and thus are more likely to involve relation-specific investments on the supplier side. This type of contract-based relationship is distinct from spot market purchases of inputs or vertical integration, which our purchase contracts do not capture. Spot market purchases are less likely to require relation-specific investments because they typically involve purchases of standardized products. Previous empirical studies (e.g., Kale and Shahrur (2007) and Banerjee, Dasgupta, and Kim (2008)) mainly use a database of supplier firms' principal customers—those that account for at least 10% of sales—from the business information file of Compustat, and thus are likely to include such spot market purchases.

In particular, material long-term contracts in manufacturing industries (i.e., contract manufacturing) can be directly affected by the financial stability of contracting parties due to higher levels of asset specificity. Given that contracts can be broken in bankruptcy, the expected duration of a contract, and thus the business relationship, will be shorter when firms have a higher probability of financial distress. If contracting parties invest in relation-specific assets, they are more likely to be concerned about financial distress in counter-party firms that would result in failure to use those assets. Therefore, lower leverage decreases the likelihood of financial distress and helps maintain the value of contracts and obtain better contractual terms. Our results are thus consistent with firms with more purchase contracts using less leverage to maintain the incentives of contracting parties to invest in relation-specific assets. Our results conceptually show that the effects of incomplete contracting go beyond ownership, extending to how firms with outside contracts finance operations.

1.3 Our Contributions

Our paper adds to several literatures. We first add to the outsourcing literature (see Antràs (2013) for recent contributions, and Spencer (2005) and Helpman (2006) for extensive surveys) by showing that there is a financial dimension to using outside purchase contracts that has not previously been studied. Eun and Wang (2016) also explore the financial dimension of international outsourcing. Focusing on industry-level international outsourcing, they find that industries that have more intense foreign outsourcing have less leverage, but this negative link is mitigated by foreign national characteristics, such as better developed legal environments and trade openness.

Second, we conceptually add to the incomplete contracting literature by showing results that are consistent with incomplete contracting and relation-specific assets influencing firm financing decisions. The previous literature on incomplete contracting, both the theoretical literature beginning with Grossman and Hart (1986) and empirical literature including Baker and Hubbard (2004), shows that residual rights of control affect firm ex ante incentives to invest in relation-specific assets and who should own the assets. However, this literature does not deal with how the assets should be financed and whether capital structure is influenced when firms choose not to integrate. Our paper shows that the same factors that are associated with the use of outside purchase contracts are also associated firm cash flows and capital structure, but generally with opposite signs.

We add to the literature by Titman (1984), Titman and Wessels (1988), Opler and Titman (1994), and Banerjee, Dasgupta, and Kim (2008), which shows that the low leverage encourages relation-specific investment by stakeholders to the firm. Allen and Phillips (2000) show that firms with product market relationships in which one party owns equity in another, experience better operating performance and more investment. Fee, Hadlock, and Thomas (2006) show that firms are more likely to invest in ownership positions in firms with

which they have business relations. Kale and Shahrur (2007) show that competition and the characteristics of customers and suppliers affect financial structure. We add to this literature by focusing on explicit contract-based customer and supplier relationships and uniquely differentiating long-term purchase contracts from open market purchases.

2 Purchase Contracts Data

We examine outside purchase contracts in public firms' 10-K filings from 2004 to 2017. We download the 10-Ks from the SEC's EDGAR website and extract the purchase contract data electronically. Our data begin in 2004, since the SEC issued a final rule on disclosure about off-balance sheet arrangements and aggregate contractual obligations in January 2003.⁴ This rule requires public companies other than small business issuers to provide an explanation of contractual obligations in a separately captioned subsection of the Management's Discussion and Analysis (MD&A) section. The SEC's final rule on disclosure about contractual obligations particularly includes the "purchase obligations" category.

Purchase obligations involve counter-parties delivering goods or services at specific dates in the future. They are thus similar to forward contracts and are not liabilities both conceptually and according to SEC regulations.⁵ Purchase obligations are firms' *promises* to purchase from their counter-parties with estimated amounts of cash outflows to the counter-parties within the pre-specified period. Supply contracts are tailored such that most payments occur in the future (on delivery of the product(s)) with some limited payments from purchaser to supplier made at time of signing. Therefore, purchase obligations represent the inputs to

⁴This rule is to implement Section 401(a) of the Sarbanes-Oxley Act of 2002. See Final Rule: Disclosure in Management's Discussion and Analysis about Off-Balance Sheet Arrangements and Aggregate Contractual Obligations, Securities Act Rel. No. 33-8182, Exchange Act Rel. 34-47264, Financial Reporting Rel. No. FR-67, International Series Rel. No. 1266, <http://www.sec.gov/rules/final/33-8182.htm> (Jan. 27, 2003).

⁵These contracts are best viewed as forward contracts, and also not as leases where products change hand today and payments occur later. Damodaran (2009) explicitly excludes purchase obligations in calculations of firm leases because leases are contracts whereby firms take delivery of a product or an asset up front. Even though purchase obligations are not regarded as liabilities, as we discuss later, to mitigate concerns related to these contracts being supplier financing, we additionally test the link between this measure and leverage by including accounts payable as part of total debt.

production that a firm will purchase in the future (Lee (2010)). At the time of delivery of the product, the firm chooses how to arrange payment, either financing through equity/debt or paying from cash reserves.

Purchase contracts are also considered executory contracts under American bankruptcy law. An executory contract is one in which continuing obligations exist on both sides of the contract at the time of the bankruptcy petition; one which commits both debtors and counter-parties to further performance. A trustee or debtor in possession may either assume any pre-petition executory contracts, preserving both debtor and counter-party obligations through the bankruptcy process, or reject it, thereby breaching the purchase contract as of the petition date. Therefore, suppliers may have concerns about the chances of financial distress and bankruptcy of the purchasing firms, and purchasing firms will thus have incentives to not have too much leverage.

For fiscal years ending on or after December 15, 2003, public firms (other than small business issuers) disclosed purchase obligations in their financial statements. Therefore, our primary sample includes all 10-K filers in the manufacturing sector between 2004 and 2017.⁶ Firms generally do not sub-categorize purchase obligations in their tabular disclosures, and sometimes provide limited information on the types of purchase obligations in the footnotes. For manufacturing firms, the most common types of purchase obligations are inventory purchase commitments and service agreements related to advertising, marketing, and IT.⁷ Firms disclose total amounts of purchase obligations broken down by specified periods (e.g., within one year, between one and three years, between three and five years, and beyond five years). Estimated payments due within one year must be disclosed.

For our measure of purchase contract intensity, we use a firm's estimated payment amount within the closest fiscal year under all of purchase contracts, normalized by cost of goods

⁶Our sample ends at the end of the calendar year 2017 with respect to 10-K reports dates. Therefore, approximately 40% of firms in our sample have fiscal years only up to 2016.

⁷See Lee (2010) for a discussion of cross-industry variation in types of purchase obligations.

sold. The definition of purchase obligations from Financial Accounting Standards explicitly excludes any contracts that have a remaining term of one year or less.⁸ Hence, a firm’s estimated payment amount within one year under all of purchase contracts is not a measure of contracts with maturity of one year or less, but rather the aggregate amount of fund transfers to other parties in a given fiscal year as part of the overall payment schedule.

Figure 1 shows an example of Apple Inc.’s purchase obligations disclosure reported in its 10-Ks. We present purchase obligations data for Apple Inc. for 2005, 2010, and 2015. From the data presented, we see that Apple Inc.’s purchase obligations have increased almost four-fold during each five-year period and 16-fold for the entire 10-year period.

We download firm 10-Ks via web crawling of the SEC EDGAR data repository and parse the documents to extract the purchase contracts data using PERL scripts. We provide the detailed collection procedure in Appendix A.⁹ We extract these data from tables or text for which search keywords indicate the presence of purchase contracts. The search keywords used are combinations of “*purchase*” and one of the following terms: “*obligation*”, “*commitment*”, “*agreement*”, “*order*”, and “*contract*”. From tables or text that include the search terms, we extract complete rows or sentences that contain purchase obligation amounts.

We study public manufacturing firms because of the frequency with which they use outside purchase contracts for production. Comparatively, purchase contracts in the retail and service sectors may exist just to supply finished goods that are then resold. We create our primary sample by merging all public manufacturing firms in the 10-K filings database with the CRSP/Compustat database using the central index keys (CIK). We exclude firms with revenues of less than \$50 million because these are regarded as small business issuers not required to disclose contractual obligations. This sample construction procedure yields 2,568

⁸See Statement of Financial Accounting Standards No. 47: Disclosure of Long-Term Obligations for the definition of an unconditional purchase obligation.

⁹Lee (2010) first collects and studies purchase obligations data. The description of his data can be found at [http://faculty.haas.berkeley.edu/klee/Kwang Lee Purchase Obligations Data.htm](http://faculty.haas.berkeley.edu/klee/Kwang%20Lee%20Purchase%20Obligations%20Data.htm). Williams (2012) uses similar data to explore supplier-customer relationships.

firms operating in 2-digit SIC code industries and about 20,000 firm-years for the sample period from fiscal year 2004 to 2017. We supplement this database with a supplier database created by obtaining supplier information from the Capital IQ database.

3 Descriptive Statistics for Purchase Contracting Firms

In this section, we present descriptive statistics showing the depth and breadth of purchase contracts. These statistics show the characteristics of firms that outsource through purchase contracts, and suggest potential economic links between contracting decisions and various financial variables. We present statistics on the outsourcing firms and their counter-parties.

3.1 Firm Summary Statistics

Table 1 presents summary statistics for our key variables including firm size as captured by the market value of assets, firm age, fixed asset ratios, profitability, market-to-book ratio, sales growth, cash flow volatilities, percentage foreign tax, location feasibility of purchasing inputs, value-added per worker, competition, and industry indicators for high-technology and extensive purchase contracting.

Table 1 compares key characteristics between firms with high purchase contract intensity and firms with no or low purchase contracting intensity. We assume that a firm that does not disclose an amount of purchase obligations in its 10-K has either no or low contractual purchase obligations.¹⁰ We test for significant differences between these groups. Purchase contract intensity (PC/COGS) is the dollar amount of purchase contracts divided by cost of goods sold. High PC/COGS equals one if a firm is in the highest tercile of PC/COGS in a given year, and zero otherwise. Overall, we find that nearly all variables are significantly different across firm years included in high PC/COGS vs. no or low PC/COGS groups.

¹⁰The SEC's final rule adopted the "reasonably likely" disclosure threshold that currently applies to other portions of MD&A disclosure. As stated in the SEC's 1989 MD&A Release, a company has an obligation to disclose prospective information in its MD&A "where a trend, demand, commitment, event or uncertainty is both presently known to management and reasonably likely to have material effects on the company's financial condition or results of operations".

We further note that firms with high purchase contract intensity have significantly lower leverage, and this is more pronounced when we use a strict measure of leverage that includes accounts payable as part of debt.

The table reveals that firms with higher purchase contract intensity are larger, older, and have higher profitability and market-to-book ratios than firms with lower intensity. Firms in the high PC/COGS group have lower fixed asset ratios on average and also in 2000 right before the Chinese import penetration started in 2001. This implies that how much fixed assets firms owned prior to the import penetration shock is likely associated with why some firms use purchase contracts extensively while others still rely on in-house production. We also find that firms with higher purchase contract intensity have lower cash flow volatility suggesting greater operating flexibility. Firms with higher purchase contract intensity are more likely to be located close to a port of entry indicating location feasibility and potentially lower cost of receiving products or services from counter-parties. The distance to a port of entry is likely to affect a large number of U.S. manufacturing firms that engage foreign suppliers, and thus is an important factor in decisions to increase or decrease the level of procurement through purchase contracts. Firms with higher purchase contract intensity have higher value-added workers than firms without contracts, indicating that high value-added employees represent the major part of the labor force in outsourcing firms after tasks that require low skills or standard technologies are likely outsourced. Lastly, firms with purchase contracts are in more competitive, high-technology industries and industries in which the median industry leverage is lower. We take into consideration of the latter industry characteristic for the firms with higher purchase contract intensity in our analysis by adjusting firm leverage with the industry leverage. Overall, the picture that emerges from these results is that firms that use long-term purchase contracts extensively are larger, more profitable and flexible, have more high value-added workers, and have lower market leverage than firms.¹¹

¹¹In an unreported analysis, we compare variances of market leverage and book leverage across highest,

3.2 Counter-party Statistics

We next examine purchase contracting strategies in depth by exploring customer and supplier relationships identified in the Capital IQ business relationship database. Previous studies use the input-output benchmark table from the Bureau of Economic Analysis (BEA) or customer data from the Compustat segment file to identify customer and supplier relationships. However, the input-output benchmark table represents interdependencies between industries, not between firms, and the Compustat customer data do not include business relationships with foreign or private domestic supplier firms, as the database only compiles information on major customers of public domestic supplying firms.

The Capital IQ database collects data on both domestic and foreign suppliers, including public and private suppliers. It provides information on revenue, assets, total number of employees, SIC code, and headquarters location from more than 20,000 news sources. We note that we cannot identify the extent to which each supplier supplies a given firm as suppliers are listed only by name and not by amount of goods or services supplied. We identify approximately 7,000 suppliers (3,715 unique suppliers, as some supply more than one firm) for 884 customer firms by merging our sample and the Capital IQ database with customer firms' CIK, ticker, or name. On average, customer firms in our sample have 7.82 suppliers.

Table 2 presents informative statistics for these suppliers including geographic region, industry sector, revenue, assets, capital and labor intensity, and product market competition. Our focus is on both domestic and international purchase contracts as we find that 47.5 percent of suppliers are from the U.S., 25.5 percent from Asia, 17.2 percent from Europe, 0.3 percent from Africa, 1.9 percent from Oceania, and 1.6 percent from countries the Capital IQ is unable to identify. Most are in the manufacturing sector (47.5%); other suppliers medium, and lowest terciles of the variance in purchase contract intensity. We find that firm-level variation in purchase contract intensity during our sample period is associated with firm-level variation in leverage.

are in the following industry sectors: services (17.2%), retail and wholesale trade (2.5%), transportation and utilities (3.2%), mining (2.0%), others (2.4%), and unknown (25.2%).

3.3 Industry Statistics

Table 3 displays industry descriptive statistics for outside purchase contracts in the manufacturing sector by 2-digit SIC code. The table shows that across all industries nearly 60 percent of manufacturing firms use outside purchase contracts, and the mean value of such contracting amounts is 10 percent of the total cost of goods sold. The last column shows that outside purchase contracts account for 16 percent of the total cost of goods sold within firms that have existing purchase contracts.

The table also shows that the use of outside purchase contracts is not restricted to high-technology industries. Purchase contract intensity is also high in food and kindred products, apparel and textile products, petroleum and coal products, and leather products. Importantly, in each industry there are generally 20-50% of manufacturing firms that do not have any material purchase contracts. These firms are either vertically integrated or have suppliers in spot markets, but in either case it is likely that there are less relation-specific investments between firms. This important difference between firms with and without contracting-based suppliers enables us to effectively examine the characteristics of firms that rely on contractual relationships with other firms and the possible economic links between the intensity of such relationships and financial variables.

4 Semiconductor Industry Case Study

Table 4 illustrates the relation between purchase contracts and leverage using detailed examples of three firms in the semiconductor industry. These firms are examined both cross-sectionally and over time. These three companies' purchase contracts reflect significantly different external contracting strategies.

The three companies in this industry case study include Marvel Technology, Fairchild and Xilinx. Marvell Technology is known as a leading fabless semiconductor company. Fairchild is a firm that almost exclusively manufactures its own semiconductors. Xilinx uses both its own manufacturing plants and outside contract manufactures but has substantially changed its volume of purchase contracts over time. Xilinx thus provides greater time-series variation in external contracting intensity. All three firms have comparable revenues and are similar in size. The table shows large cross-sectional differences between Fairchild, which owns and operates semiconductor facilities, and Marvell Technology, which outsources production of its semiconductors. Consequently, as shown in the columns for Fixed asset ratio and CAPX/sales, Fairchild has higher fixed asset and capital expenditure ratios than Marvell Technology. It is worth noting that Marvell Technology conducts more R&D, and has a higher market-to-book ratio but almost no financial leverage. The last firm in the table, Xilinx, has experienced variation in external production as well as in leverage over time. This case illustrates the within-firm time-series relation between amount of purchase contracts and financial leverage. Specifically, from 2006 to 2008 and from 2014 to 2016, when Xilinx had relatively lower PC/COGS, its financial leverage ratios were relatively higher.

It is also interesting to note that a sharp decrease in external purchase contracts occurs for all three firms during 2008, the year after the start of the financial crisis. This decrease indicates that firms are able to reduce the amount of goods and services they obtain from external sources in years when demand conditions deteriorate. Thus, outsourcing firms are able to adjust their leverage and the costs of their inputs as demand fluctuates.

We now analyze characteristics of which firms use purchase contracts extensively and then how the use of purchase contacts may result in differences in cross-sectional and time-series patterns of input costs and cash flows.

5 Purchase Contract Propensity

In this section, we report results for the prediction of outside purchase contracting. Because firms using external purchase contracts are not randomly selected, examining propensities to use purchase contracts is informative. Also, given contracting decisions and financial leverage variables we examine are both endogenous, we use the estimated propensities in later sections as a propensity-score matching analysis, one of the methods we use to mitigate selection problems.

Table 5 presents the purchase contract propensity regression results. Column 1 of the table shows results from a between-firm model in which the regression is at the firm level and each variable is collapsed into its time-series average. The purpose of this specification is to examine the cross-sectional heterogeneity in purchase contracting decisions. In Columns 2 to 4, we estimate panel regressions at the firm-year level for purchase contracting propensities using several different model specifications. In the first two specifications (Columns 1 and 2), we estimate a logit model with the dependent variable, High PC/COGS. It equals one if a given firm is in the highest tercile of PC/COGS in a given year and zero otherwise.¹² In the last two specifications (Columns 3 and 4), we estimate a linear probability model. We estimate standard errors that allow for heteroskedasticity and industry clustering for the firm-level regressions and industry-year clustering for the firm-year panel regressions. Depending on the column, we also include year and industry fixed effects.

The variables we consider to explain characteristics associated with high intensity of purchase contracting include the variables with summary statistics in Table 1 and the following additional variables: High import penetration, Fixed asset ratio in 2000, Supplier competition, and Supplier distance. The first two variables capture the potential costs of using

¹²In the additional analysis available from the authors, we split the sample into firms with and without purchase contracts. Firms with low amounts of purchase contracts and those with no purchase contracts are more similar given that firms with low purchase contracts do not have significant amounts of such contracts.

external contracts related to Chinese import penetration starting in 2001 and the extent to which firms have pre-existing fixed assets. The last two capture characteristics of suppliers.

As the results in the specifications of Table 5 are qualitatively similar, the following discussion applies to all specifications. Overall, the results confirm the previous results in our descriptive statistics for firms that use purchase contracts and those that do not. We find that high purchase-contracting firms are larger, more profitable, located close to major ports of entry, have higher market-to-book ratios and value-added per worker. Firms that operate in the industries that have high import penetration following China's entry into the WTO in 2001 and that have fewer fixed assets prior to the import penetration are also more likely to use external purchase contracts. These results show that outsourcing firms tend to engage in offshore procurement activities, especially in China, and the extent to which they owned fixed assets prior to the import penetration shock significantly explains the use of purchase contracts afterwards.¹³

Industry factors are also important in explaining a firm's use of purchase contracts. A firm is more likely to be a high purchase-contracting firm when its industry overall uses greater external purchase contracts. Also, a firm is more prone to rely on external contracts when its suppliers are in more competitive industries and the distance to suppliers is greater. Supplier competition and distance can capture higher risk contracts for suppliers, and thus these results are consistent with investing in relation-specific assets being riskier for them. We discuss this particular point more in detail in Section 7.2 when we examine related-party incentives.

Lastly, we examine whether industry leverage is an important determinant for purchase contracting decisions by including the median industry market leverage as one of the control

¹³In additional analysis, we also consider import penetration of suppliers' industries when predicting purchase contract propensity. Firms with suppliers in the industries that have high import penetration following China's entry into the WTO in 2001 are more likely to use external purchase contracts. This is consistent with outsourcing to China. However, this effect decreases significantly when the firms have greater fixed assets prior to the import penetration. The results are available in the online appendix, Table OA.1.

variables. The idea is that deviating from the level of industry leverage is costly and thus firms in the industries with overall high leverage may be more likely to use outside purchase contracts for the operating flexibility reason. We do not find evidence in this table that median industry leverage is associated with the use of outside purchase contracts.

6 Outsourcing, Cash Flows, and Financial Leverage

In this section, we examine potential economic links between outside purchase contracts and real side variables. We focus on cost management and cash flows. Specifically, we address two questions in this section. First, do firms that use purchase contracts manage their costs more flexibly? Second, is the use of outside purchase contracts associated with a decline in cash flow volatility given the increased flexibility in cost management?

We first examine how firms with material purchase contracts adjust input costs following demand fluctuations. To do this, we regress firm COGS and/or SG&A on a variable that captures downstream industry demand shocks faced by the firm. The idea is to investigate whether firms with outside purchase contracts can adjust input costs more flexibly when faced with demand fluctuations. We scale COGS and SG&A by average firm sales to avoid an effect from changes in sales over the period. We include firm fixed effects to focus on the firm-specific difference relative to the time series average in COGS and SG&A.

Table 6 compare firms with high amounts of purchase contracts to those with low and no purchase contracts in Panels A and B, respectively. In Panel A, we further divide the whole sample between firms in industries with low and high industry median leverage. The separate examination of cost management between firms in industries with low and high industry leverage is to test whether the effects we document arise in different types of industries and, in particular, whether they are more common within low- vs. high-leverage industries.

The estimated coefficients of the demand shock variable in Panel A show that the pur-

chase contracting firms' COGS, combined with their SG&A, varies significantly with demand shocks. When we analyze COGS and SG&A separately, we see that this effect is shown to be more associated with COGS than SG&A. We also find that the effects are only significant for firms in low-leverage industries but insignificant for high-leverage industries. Thus, in industries with high financial leverage, we do not see firms exercising operating flexibility. Our explanation for this result is that suppliers for the customer firms in high-leverage industries may be more worried about their sales being cut thus they provide less flexibility to the downstream purchase contract firms. We also note that the number of firms in the industries with higher leverage is smaller than that in the industries with lower leverage, as shown earlier in the summary statistics. Lastly, in Panel B we find that the effects are insignificant for firms without purchase contracts.

These results, along with our semiconductor industry case study and purchase contract propensity regressions, show that effects of purchase contracts exist both within industries and across industries. Overall, we find that firms with purchase contracts are able to adjust their costs of goods sold significantly when faced with changes in downstream industry demand and that this cost management effect is particularly found in industries with lower leverage. We further predict that this ability of purchase contracting firms to better match input costs to demand conditions will lead to less volatile cash flows.

In Table 7, we consider the standard deviation of the following 12 quarters' earnings after interest, taxes, depreciation, and amortization, scaled by sales instead of assets so that our results do not include the potential effect of fewer fixed assets in outside purchase contracting firms.¹⁴ We also present quarterly market leverage in this table. Using a matching estimator, we compare firms with high purchase contract intensity to firms with no or low purchase contracting in a nonparametric way within the same quarter. Our matching is based on multiple variables including firm size, age, market-to-book, asset tangibility, profitability,

¹⁴Our results are robust to using return on assets and to alternative numbers of quarters.

sales growth, the ratio of foreign tax paid, and competition.¹⁵ The purchase contracting variable considered in Table 7 is High PC/COGS. The control observations are the four nearest neighbors across the matching variables within the same FIC-25 code that have no or low purchase contracting.¹⁶ We choose closest neighbors within the same industry to help mitigate the concern that our results may come from industry characteristics.

Results in Columns 2 and 3 of Table 7 show that cash flow volatility for firms with high purchase contract intensity is lower in almost all quarters than for firms with no or low amounts of such contracts and significantly so for 33 among 45 quarters. If we collapse over all quarters, the standard deviation of cash flow is lower by 0.137 for firms with high contracting intensity. In particular, the reduction in cash flow volatility is much stronger in both magnitude and significance from 2009 to 2010, indicating that firms with outside purchase contracts were able to reduce their cash flow volatility when faced with the financial crisis.

One might expect that, given increased flexibility in managing costs and less volatile cash flows, firms with outside purchase contracts would use more debt and have higher leverage. We find the opposite result that leverage is lower for firms with outside purchase contracts in this table and later tables.

In Columns 4 and 5 of Table 7, we compare the market leverage of firms with high purchase contract intensity to that of firms with no or low purchase contracting using the matching estimator. When we collapse over all quarters, financial leverage is lower by 2.9% for firms with high contracting intensity and the difference is significant at the 1% level. Quarterly,

¹⁵We consider variables used in the leverage analysis later for the matching procedure. Some of the variables that are limited to explaining purchase contracting incentives such as close to a port of entry and value-added per employee, and that are likely subsumed by exact-industry matching such as high-tech and high purchase contracting industry indicators, are dropped. Our results are robust to using different matching variables.

¹⁶We choose four matches following Abadie and Imbens (2006) and also as used in Agrawal and Tambe (2016). Results are robust to using different numbers of nearest neighbors and different industry classifications including 3-digit SIC and 4-digit NAICS code industry classifications.

we also see that for all quarters, with many significantly so, financial leverage is lower for firms with high purchase contracting versus those with no or low purchase contracting.

7 Multivariate Evidence

7.1 Outside Purchase Contracts and Financial Leverage

We next examine the relation between the use of outside purchase contracts and firm capital structure on the financial side using a simple OLS framework. We recognize that both purchase contracting and leverage decisions are set jointly and thus account for this simultaneity in later tables. Table 8 presents the OLS regression results for the association between purchase contract intensity and both market leverage and book leverage. Control variables include measures of the extent of the firm's collateralizable assets measured by a firm's property, plant and equipment and other factors found to be important in examining leverage decisions in prior studies such as firm size, age, profitability, measures of firm growth (market-to-book ratio and sales growth), the ratio of foreign tax paid by firms, industry competition, and a high-technology industry indicator variable. Location feasibility of outsourcing, value-added per worker, and an industry indicator for extensive purchase contracting are included as additional controls. All control variables are lagged one year. Depending on the column, we also include year and industry fixed effects.

Results in Table 8 show that leverage decreases with purchase contract intensity in all specifications except book leverage without any control variables in Column 4. These results show that there is a strong negative association between purchase contracts and leverage, which is opposite to the view that less volatile cash flows of firms with purchase contracts may result in greater use of leverage. We find that a one standard deviation increase in outside purchase contract intensity is related to a 0.059 standard deviation decrease in market

leverage in Column 2.¹⁷ This economic magnitude is greater than the magnitude of the profitability effect (0.039). Importantly, as we control for fixed asset ratios, our results are not just picking up a reduced collateral effect given that firms with outside purchase contracts use fewer fixed assets.¹⁸

7.2 Related-party Incentives and Financial Leverage

We now explore the potential reasons for the negative association between leverage and outside purchase contracts. Specifically, we examine whether suppliers' investment in relation-specific assets with incomplete contracts is a possible channel that can explain our finding. The relationships that our purchase contracts data capture are more likely to be based on the relation-specific investment on the supplier side. We test this by considering measures of the extent to which suppliers are concerned that their customer firms will switch to other suppliers or fail to buy from them after they have made investments to serve the firms. These measures include the competition in the suppliers' industry (Supplier competition) and the difficulty of ensuring trust of suppliers over longer geographic distance (Supplier distance). Supplier competition is the industry median of firm-specific supplier competition. Supplier distance is the industry median of firm-specific distances to domestic or foreign suppliers based on the latitude and longitude information of suppliers' headquarters location.

To investigate how outside purchase contracting is possibly related to the incentives of contracting parties to invest in relation-specific assets, we split our sample into firms with and without purchase contracts. We compare the effects of the two variables that capture suppliers' concerns for contract instability on leverage between the two groups. Table 9 presents the results.

The first two columns of Table 9 compare the effects of supplier competition and distance

¹⁷Standard deviations of PC/COGS and Market leverage are 0.144 and 0.138, respectively.

¹⁸Consistently, we also find that firms with no debt (23.14% of observations in our sample) on average have significantly higher purchase contract intensity than firms with debt.

on market leverage. Columns 1 and 2 examine such effects for firms that have used outside purchase contracts and firms without these contracts, respectively. Columns 3 and 4 present the analogous test for book leverage. We find both in Column 1 for market leverage and Column 3 for book leverage that the effects of supplier competition and distance on leverage are significantly negative at the 1% level for firms with outside purchase contracts. By contrast, the effects of supplier competition and distance are insignificant for firms that have not used outside purchase contracts in both Columns 2 and 4. These firms without purchase contracts have suppliers that are likely to be from spot markets, if any, and thus the relationship is less likely to involve relation-specific investment. These results are consistent with the negative relation between outside purchase contracts and leverage being related to avoiding the potential impact of financial distress and bankruptcy on the contracting relation and thus increasing the incentives of suppliers to invest in relation-specific assets.

We also find that firm value-added per employee is negatively related to leverage for the set of firms that have purchase contracts (Columns 1 and 3) but not for those that do not use purchase contracts (Columns 2 and 4). This result is consistent with firms with purchase contracts using less leverage to preserve the incentives for high value-added employees to invest in relation-specific assets. Thus, the results are consistent with firms with purchase contracts also taking into consideration high value-added workers when making capital structure decisions, as they are implicit contracting parties (vs. explicit contracting parties – suppliers) whose value of relation-specific investment may be reduced in the event of bankruptcy or financial distress .

7.3 Propensity-score Matching

We recognize that we face the problem that both contracting and financing decisions may result from common factors like demand conditions or cost shocks. Empirical evidence from our data suggests that the use of outside purchase contracts is relatively more time

invariant than other corporate decisions. However, as previously shown, purchase contract intensity is associated with less cash flow variability, which in turn is likely to be related to financing decisions. Although we acknowledge that we cannot eliminate this endogeneity problem without using a natural shock to the use of purchase contracts, we address this issue by employing several methods including propensity-score matched regressions, simultaneous regressions, and lastly examining plausibly exogenous shocks to market leverage through unexpected mutual fund flows.¹⁹

We first present our propensity-score matching analysis in Table 10. To ensure that we compare groups of firms with similar observable characteristics, aside from their decisions to use purchase contracts, we restrict our sample to the firms in the highest tercile of PC/COGS and their nearest neighbors selected among firms that are not in the highest tercile of PC/COGS. For matching, we use propensity scores estimated in Column 2 of Table 5 without replacement.

Panel A of Table 10 shows the difference in means of the matching variables between the two groups of firms that have high PC/COGS and their nearest neighbors with no or low PC/COGS. Matching variables are the same set of control variables used in the previous propensity estimation regressions. 3,894 firm years with high PC/COGS are matched to 3,894 control firm years. As we do not observe significant differences in the matching variables between the two groups after the matching procedure, propensity-score matching alleviates a concern that firms with high PC/COGS are different in those observable characteristics from firms with no or low PC/COGS.

In Panel B of Table 10, we examine whether leverage differs between the two groups after controlling for the observable characteristics in Panel A. We begin with market leverage and

¹⁹In the online appendix, Table OA.2, we consider an OLS regression framework using multiple measures of leverage. We also instrument for a firm's contracting decision using distance to a port of entry including seaports, hub airports with cargo services, and border crossings. This location-based instrument captures the feasibility of purchasing products or services from suppliers in other states or countries far from the focal firm's main business location, and is less likely to have the first order effect in leverage decisions.

book leverage. We find in Rows 1 and 2 that for either market or book leverage, firms with high PC/COGS have approximately 2% less leverage than firms with no or low PC/COGS, but are otherwise similar.

A potential concern with examining market or book leverage is that our results may reflect outsourcing firms' substituting away from using short-term leverage toward the increased use of supplier financing as captured by the amount of purchase contracts. We address this concern by examining Rows 3 and 4 to see whether the results are present only for short-term leverage. We find that firms with high PC/COGS have less short-term leverage, as predicted above, although the magnitude and the significance of the effect weaken to 1% when only short-term leverage is considered. Furthermore, we find in a subsequent test that leverage reduction is more pronounced for long-term leverage, at 1.8%. The negative link between outside purchase contracts and leverage thus takes the form of a decrease in both short-term and long-term leverage, with a greater effect on long-term leverage. This implies that firms which materially use purchase contracts choose particularly low long-term leverage to decrease the chances of financial distress and bankruptcy.

We confirm this finding and the robustness of our results by considering two other measures of leverage: net leverage and an alternative measure of leverage that accounts for potential supplier financing. Net leverage is the market leverage net of cash. For Leverage with AP, we additionally include accounts payable as part of total debt. Including accounts payable mitigates the concern that purchase contracting firms have greater accounts payables, which can be viewed as a substitute for debt.²⁰ We consistently find in Rows 5 and 6 that leverage is significantly lower for firms with high PC/COGS than for firms with no or low PC/COGS, and that the effect is much stronger with these alternative measures, at 3.7% and 2.8%, respectively. Lastly in Rows 7 and 8, to account for possible effects of

²⁰We also note that lease obligations can be associated with purchase contract intensity. Our debt measure includes long-term (capitalized) lease obligations as part of long-term debt.

industry leverage, we consider industry-adjusted market leverage and book leverage. We find that the effects are similar to the results in Rows 1 and 2 when leverage is not adjusted for the industry median.

Overall, considering multiple different measures of leverage, we find that leverage for high purchase-contracting firms is significantly lower than for control firms with similar characteristics at the 1% level. In addition to these difference tests, in an unreported analysis we run regressions with each leverage measure as a dependent variable on High PC/COGS and all matching variables. The regression results are consistent with the results of the difference tests reported in Panel B.

7.4 Simultaneous Regressions

Our results for the propensity-score matching are based on controlling for observable characteristics. In this section, we consider simultaneous regressions in which we jointly predict purchase contracting and leverage to help identify the common factors that influence both outsourcing and leverage decisions. Specifically, we examine the simultaneous relation between purchase contracts and leverage using seemingly unrelated regressions (SUR) and analyze similar or differing effects of common factors on the two decisions. The SUR estimation also allows the residuals or omitted variables across the two decisions to be correlated so that we observe the meaningful correlation of them separately. Table 11 reports estimates of two sets of systems of specifications for purchase contracting and market or book leverage.

Columns 1 and 2 (3 and 4) of Table 11 present the system of panel regressions for High PC/COGS and market (book) leverage, respectively, with year fixed effects. We use the regression specifications in Table 5 and Table 8 for High PC/COGS and leverage, respectively. We report the correlation of residuals, Rho , of the two regressions for each system at the bottom of the table. Because the results for the two sets of equations are qualitatively similar, the following discussion applies to both sets of results.

We find that only firm size has the same significant positive effect for both purchase contracts and leverage, but almost all other variables, including firm profitability, sales growth, the ratio of foreign tax paid, distance to a port of entry, value-added per employee, and supplier competition and distance have significant opposite effects. Firms nearer to a port of entry have higher purchase contract intensity, consistent with having lower costs of outsourcing, but less leverage. Importantly, firms with higher value-added per worker and greater supplier competition and distance use more purchase contracts, but less leverage, consistent with the suggested channel of relation-specific investment. Some variables, such as firm age, market-to-book, and the high-tech industry indicator have effects on leverage but not on purchase contracts, while the indicator for high purchase contracting industry has a significant positive effect on purchase contracting but not on leverage.²¹

In summary, we observe that the signs of the variables that affect purchase contracts in the simultaneous systems are similar to those reported in Table 5. Larger firms with higher profitability and value-added per employee, that are close to a port of entry with suppliers farther away with higher competition, are more likely to use outside purchase contracts. Firms with higher profitability and value-added per employee, close to a port of entry, that have suppliers farther away, with higher supplier competition, are more likely to use less leverage. We thus see opposite signs on these common key variables for the outsourcing and leverage decisions, confirming the negative relation between these two variables shown in earlier analyses. It is worth noting as well that for all the simultaneous regressions that we consider, the correlation coefficients of the residuals (*Rho*) are significantly negative. This means that any omitted variables in our regression models overall have significant opposite

²¹We run analogous tests of simultaneous relations between purchase contracts and other measures of leverage including short-term vs. long-term, net leverage, and leverage with accounts payable. In the online appendix, Tables OA.3 and OA.4 report estimates for the four sets of systems of specifications for High PC/COGS and each leverage measure. The results with alternative measures of leverage are similar to the results with market or book leverage. For robustness, we also run analogous test of simultaneous relations between purchase contracts and market (book) leverage by replacing High PC/COGS with PC/COGS in the online appendix Table OA.5. The results are robust to this replacement of purchase contracting variable.

effects as well for the two dependent variables. This result further supports our conclusion that similar underlying fundamental factors account for firms' tendency to use less leverage when they rely on more outside purchase contracts.

7.5 Exogenous Shocks to Leverage and Leverage Adjustment

In this section, we examine differential responses in leverage adjustment between firms with high purchase contract intensity and firms with no or low purchase contracting after plausibly exogenous shocks to their market leverage. Following Coval and Stafford (2007) and Edmans, Goldstein, and Jiang (2012), we use mutual fund flow-driven price pressure as exogenous variation in market valuation of firms and thus market leverage. The mutual fund flow-driven price pressure has been widely used as a strong instrument in the literature including Phillips and Zhdanov (2013) and Williams and Xiao (2017).²² We consider market leverage for the contemporaneous quarters with firm-specific significant mutual fund outflows and subsequent quarters for the next two years after the outflows. We predict that significant mutual fund outflows from firms will increase their market leverage by decreasing market valuation of their equity. We then examine whether firms with high purchase contract intensity rebalance their market leverage more quickly than firms with lower contracting intensity to continue to preserve the incentives for related-parties to invest in relation-specific assets.

Table 12 presents the quarterly leverage adjustment results. Negative mfflow shock is an indicator variable that equals one if the unexpected mutual funds flow variable following Edmans, Goldstein, and Jiang (2012) for a given firm in a given quarter is in the lowest tercile. We interact the indicator variable for the significant mutual fund outflows with our measure of High PC/COGS. In Column 1, we find that the negative mutual fund flow shocks indeed increase market leverage in the contemporaneous quarters with the shocks. Columns

²²We thank Steven Xiao for making their measure available for the extended sample period.

2 through 7 present the similar tests for the first through sixth subsequent quarters to the shocks. We find that the effect of the negative mutual fund flow shocks on market leverage persists for about a year until the fourth subsequent quarters. More relevant to our context, we find throughout Columns 2 to 6 that the interaction term between the mutual fund flow shocks and High PC/COGS is significantly negative - indicating that firms with high purchase contract intensity more quickly decrease their market leverage after the leverage-increasing shocks. We find the interaction term becomes insignificant for the sixth through eighth quarters, although we do not report the results after the sixth quarter to conserve space.

Lastly, in Column 8, we show that firms with high purchase contract intensity decrease their market leverage through additional sales of common and preferred equity. Column 8 shows the firm-year level regression results from a linear probability model of sales of equity. We find that firms with high purchase contract intensity are more likely to issue equity following the negative leverage-increasing mutual fund flow shock. Overall, these results are consistent with our conclusion that the managers of firms using outside purchase contracts have incentives to use less financial leverage, as firms with material amounts of purchase contracts quickly and effectively decrease their financial leverage levels through equity sales after leverage-increasing exogenous shocks.

8 Conclusions

We examine firm and industry characteristics associated with firm outsourcing using a unique database of outsourcing purchase contracts over the years from 2004 to 2017. We first document informative stylized facts that outside purchase contracting is significantly associated with firm growth, firm value-added per worker, and the location feasibility of receiving products or services from counter-parties, at the firm level, and higher competition, high import penetration, and high technology at the industry level. Firms with fewer fixed assets prior

to China's entry into the WTO in 2001 and that operate in industries that have high import penetration outsource significantly more using purchase agreements.

We find that firms' extensive use of outside purchase contracts is related to a reduction in cash flow volatility relative to matched firms that use no or low purchase contracts. In particular, during the recent financial crisis, firms with significant purchase contracts were able to better match costs with sales fluctuations, as such firms incurred fewer fixed costs, thereby reducing their operating leverage. Despite this reduction in cash flow volatility, we find strong evidence that firms with external purchase contracts use less financial leverage.

We show that characteristics of suppliers, including supplier competition and distance, along with own labor force characteristics of the firms that use purchase contracts, can help understand the negative relation between the use of purchase contracts and leverage. Examining the outside purchase contract and leverage decisions simultaneously, we find that similar factors influence both but mainly in the opposite directions. Especially, firms with higher value-added workers, that have suppliers farther away with higher competition and are close to a port of entry to the U.S. are more likely to use outside purchase contracts but avoid using higher leverage. The overall results are consistent with the same underlying factors accounting for firms' tendency to simultaneously use more outside purchase contracts and less leverage.

Lastly, we find the evidence that firms using purchase contracts decrease their financial leverage by issuing additional equity after leverage-increasing exogenous shocks. These results support our conclusion that outsourcing firms have strong incentives to maintain lower leverage.

Overall, our results are consistent with firms that choose to use purchase contracts using less leverage to mitigate the potential loss of the relation-specific investments that can occur when firms experience financial distress or bankruptcy. Our results are consistent with

the hypothesis that the costs arising from incomplete contracts between firms and their contracting parties and related financial distress costs affect how firms that use outside purchase contracts finance their operations. We thus extend the extensive incomplete contracting literature that begins with Grossman and Hart (1986) and Hart and Moore (1990) by showing that incomplete contracting and the potential loss of value through financial distress influence not only who should own assets, but also how firms finance.

Appendix A Collection of purchase contracts data

This appendix describes how we collect the outside purchase contracts data. We first electronically gather all “10-K”s and “10-K405”s by PERL web crawling²³ of the SEC EDGAR database, searching for the filings from 2004 to 2010. We do not include “10KSB”s and “10KSB40”s, because small business issuers (or smaller reporting companies) are not required to disclose purchase obligations by the SEC’s final rules. Then, using PERL programming we specifically extract purchase obligations data in the MD&A section and other identifying information including the CIK number in each 10-K.

There are two types of reporting practices. First, firms use HTML documents. In this case, purchase obligations are disclosed in tabular formats. Second, firms use TEXT documents. In this case, it is highly likely that the firms disclose purchase obligations also in textual formats. For the HTML groups, we extract all tables first and then sort out the certain tables including search keywords. The search keywords are the combinations of “*purchase*” and one of the following terms: “*obligation*” “*commitment*”, “*agreement*”, “*order*” or “*contract*”. From the tables including the search terms, we extract the proper rows that contain the amount of purchase obligations. For the TEXT document group, we use page breaks instead of tables. From the pages including the above search terms, we extract the proper sentences that contain information on the amount of purchase obligations.

In the event that the extraction process cannot sort out a table or a page containing search terms, we reexamine the whole document and search for other terms including either “*contract obligation*” or “*contract commitment*”. When the extracted information does not contain “*purchase*” or there still exists no match for the search terms, we conclude that the firm has no purchase obligations. The reporting units vary with reporting firms. Therefore, we normalize the units of disclosed purchase obligations in million dollars, by matching other information in the extracted tables or pages with the corresponding Compustat data item.

²³We acknowledge that Andy Leone’s Perl resource page at http://sbaleone.bus.miami.edu/PERLCOURSE/Perl_Resources.html provides a useful help to get started EDGAR web crawling algorithms using PERL.

Appendix B Variable definitions

<i>PC exists</i>	is the firm-level variable that equals one, if a given firm has disclosed a non-zero amount of purchase obligations in the given year.
<i>PC/COGS</i>	is a firm's estimated payment amount within the closest fiscal year under all of purchase contracts, normalized by cost of goods sold.
<i>Market leverage</i>	is the ratio of total debt to market value of assets.
<i>Book leverage</i>	is the ratio of total debt to book value of assets.
<i>Short-term leverage</i>	is the ratio of debt in current liabilities to the market value of total assets.
<i>Long-term leverage</i>	is the ratio of long-term debt to the market value of total assets.
<i>Net leverage</i>	is the market leverage net of cash.
<i>Leverage with AP</i>	is market leverage that additionally includes accounts payable as part of total debt.
<i>Log(mv assets)</i>	is the log of market value of the firm's assets. Market value of assets is market value of common equity plus book value of preferred stock plus debt (long-term debt + debt in current liabilities) plus book value of minority interest.
<i>Log(1+age)</i>	is the log of one plus firm age, defined as a given year minus the year when the firm first appeared in Compustat.
<i>Fixed asset ratio</i>	is gross property, plant and equipment divided by total assets in the prior year.
<i>Fixed asset ratio in 2000</i>	is gross property, plant and equipment divided by total assets in the fiscal year 2000.
<i>Profit margin</i>	is earnings after interest, taxes, depreciation, and amortization scaled, scaled by sales.
<i>Cash flow volatility</i>	is the standard deviation of <i>profit margin</i> during the fiscal year 2004-2010 for a given firm or the previous 12 quarters for a given firm quarter.
<i>M/B</i>	is market value of assets divided by book value of assets.
<i>Sales growth</i>	is the percentage growth in sales in a given year.
<i>Foreign tax ratio</i>	is the fraction of foreign income tax paid in total income tax paid in each fiscal year.
<i>CAPX/sales</i>	is capital expenditures divided by sales in the prior year.
<i>R&D/sales</i>	is R&D expenditures divided by sales in the prior year.
<i>Close to port of entry</i>	is one if the minimum distance from the firm's main business location to any port of entry including seaports, hub airports with cargo services, and border crossings is in the lowest tercile of the sample. The information on the U.S. seaports is provided by the Port Import Export Reporting Service from the Maritime Administration's website at http://www.marad.dot.gov/ . We identify 40 seaports within the U.S. 50 states that carry imports with a value of 500 TEUs or greater. The information of the U.S. airports is available on the Passenger Boarding and All-Cargo Data for U.S. Airports from the Federal Aviation Administration website at https://www.faa.gov/airports/ . We identify 105 hub airports with cargo services using the information. In addition, we identify 21 Mexican border crossings and 79 Canadian border crossings with truck traffic. The border crossing data are available at http://transborder.bts.gov/ .
<i>Value-added per employee</i>	is operating income before depreciation divided by the number of employees in the prior year. Negative values are set to zero.
<i>Competition</i>	is one minus the TNIC Herfindahl index. The TNIC Herfindahl index is a measure of product market competitiveness based on the Text-Based Network Industries by Hoberg and Phillips (2015).
<i>High-tech industry</i>	is a dummy variable indicating the 31 4-digit SIC code industries defined as high technology manufacturing industries by TechAmerica organization. By high-technology, we refer to micro-electronics rather than other technologies. We do not include bio-technology firms in the high-technology industries, as biotechnology is not established yet with its own set of SIC codes and rather widely spreads over the drug sectors. Our high-technology industry classification is compatible with Loughran and Ritter (2004) classification.
<i>High PC/COGS industry</i>	is an industry-year level dummy variable that equals one if a given industry's mean PC/COGS level is greater than the median of all industries in the sample at the given year.
<i>High import penetration</i>	is a dummy variable indicating the eight 2-digit SIC code industries (31, 39, 36, 25, 35, 23, 33, and 30) that have the industry import penetration intensity greater than 10 in Table 1 of Hombert and Matray (2018). The industry import penetration intensity in Hombert and Matray (2018) is the change in imports (in 2007 k\$) from China in a given industry from 1991 to 2007 divided by industry employment in 1990.
<i>Supplier distance</i>	is the industry median of firm-specific distances to suppliers. The firm-specific distance to suppliers is the log of one plus the average distance from a given customer firm in U.S. to each domestic or foreign supplier, computed using the latitude and longitude information of each supplier country or state's capital city.
<i>Supplier competition</i>	is the industry median of firm-specific supplier competitions based on the TNIC Herfindahl index by Hoberg and Phillips (2015). The CapitalIQ database identifies the SIC code of a supplier. We link the TNIC competition index to each SIC code and take the average of the TNIC supplier competitions for a measure of firm-specific supplier competitions.

Demand shock

is the detrended annual percentage change in the downstream industry demands, following Maksimovic and Phillips (2001). We obtain each industry's demand condition using the chain-type quantity indexes for gross output by industry from the BEA at http://www.bea.gov/industry/xls/GDPbyInd.GO_NAICS_1998-2011.xls. For the consumer and government demands, we use personal consumption indexes and government spending and investment indexes. We then link these data to each supplier industry by a downstream matrix using the input-output benchmark table from the BEA at http://www.bea.gov/industry/io_benchmark.htm. We use the 2002 standard use tables at the detailed IO-code level, and match this data into NAICS codes by correspondence tables between IO and NAICS codes. To detrend, we regress the raw downstream industry demand on industry and year fixed effects indicator variables and then take the residuals from the regression.

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	Total	Payments Due in Less Than 1 year	Payments Due in 1-3 years	Payments Due in 4-5 years	Payments Due in More Than 5 years
Operating Leases	\$ 865	\$ 108	\$ 211	\$ 192	\$ 354
Purchase Obligations	1,994	1,994	—	—	—
Asset Retirement Obligations	14	—	2	2	10
Other Obligations	4	4	—	—	—
Total	\$ 2,877	\$ 2,106	\$ 213	\$ 194	\$ 364

(a) Source: Apple Inc.'s 10-K for the fiscal year 2005

	Total	Payments Due in Less Than 1 Year	Payments Due in 1-3 Years	Payments Due in 4-5 Years	Payments Due in More Than 5 Years
Operating leases	\$ 2,089	\$ 266	\$ 527	\$ 470	\$ 826
Purchase obligations	8,700	8,700	0	0	0
Other obligations	1,096	912	176	6	2
Total	\$ 11,885	\$ 9,878	\$ 703	\$ 476	\$ 828

(b) Source: Apple Inc.'s 10-K for the fiscal year 2010

	Payments Due in Less Than 1 Year	Payments Due in 1-3 Years	Payments Due in 4-5 Years	Payments Due in More Than 5 Years	Total
Term debt	\$ 2,500	\$ 9,500	\$ 9,356	\$ 34,345	\$ 55,701
Operating leases	772	1,518	1,389	2,592	6,271
Purchase commitments	29,464	0	0	0	29,464
Other obligations	4,553	1,898	53	757	7,261
Total	\$ 37,289	\$ 12,916	\$ 10,798	\$ 37,694	\$ 98,697

(c) Source: Apple Inc.'s 10-K for the fiscal year 2015

Figure 1: Examples of purchase obligations disclosures

Description of purchase obligations excerpted from Apple Inc.'s 2005 10-K: "The Company utilizes several contract manufacturers to manufacture sub-assemblies for the Company's products and to perform final assembly and test of finished products. These contract manufacturers acquire components and build product based on demand information supplied by the Company, which typically covers periods ranging from 30 to 150 days. The Company also obtains individual components for its products from a wide variety of individual suppliers. Consistent with industry practice, the Company acquires components through a combination of purchase orders, supplier contracts, and open orders based on projected demand information. Such purchase commitments typically cover the Company's forecasted component and manufacturing requirements for periods ranging from 30 to 150 days. As of September 24, 2005, the Company had outstanding third-party manufacturing commitments and component purchase commitments of approximately \$2.0 billion. Subsequent to September 24, 2005, the Company entered into long-term supply agreements with Hynix Semiconductor, Inc., Intel Corporation, Micron Technology, Inc., Samsung Electronics Co., Ltd., and Toshiba Corporation to secure supply of NAND flash memory through calendar year 2010. As part of these agreements, the Company intends to prepay a total of \$1.25 billion for flash memory components by the end of the second quarter of 2006."

Table 1: Summary statistics

The table presents summary statistics for firms with high purchase contract intensity and with no or low amounts of purchase contracts. A firm with high purchase contract intensity is one that disclosed a purchase contract amount in the highest tercile for a given fiscal year. All variables are winsorized at the top and bottom 1% of the distribution. Variable definitions are available in Appendix B. The sample consists of 2,568 manufacturing firms during the 10-K report (calendar) years from 2004 to 2017. ***, **, and * indicate statistical significance at the 1%, 5%, and 10% level, respectively.

	High PC/COGS		No or low PC/COGS		Mean difference
	Mean	Median	Mean	Median	
<i>Firm characteristics</i>					
PC/COGS	0.265	0.230	0.037	0.000	0.228***
Market leverage	0.103	0.064	0.122	0.079	-0.019***
Book leverage	0.180	0.130	0.188	0.140	-0.008**
Net leverage	-0.074	-0.046	-0.061	-0.012	-0.013**
Leverage with AP	0.146	0.105	0.174	0.130	-0.029***
Log(mv assets)	7.380	7.198	6.382	6.289	0.998***
Log(1+age)	2.649	2.833	2.499	2.708	0.150***
Profit margin	-0.432	0.049	-1.271	0.029	0.839***
M/B	2.380	1.849	2.262	1.657	0.118***
Sales growth	0.136	0.077	0.134	0.064	0.002
Foreign tax ratio	0.319	0.058	0.274	0.000	0.045***
Fixed asset ratio	0.369	0.285	0.442	0.365	-0.073***
Fixed asset ratio in 2000	0.368	0.315	0.466	0.420	-0.099***
Cash flow volatility	0.580	0.081	1.186	0.079	-0.605***
Close to port of entry	0.378	0.000	0.296	0.000	0.082***
Value-added per employee	0.077	0.042	0.044	0.021	0.033***
R&D/sales	0.318	0.076	0.627	0.029	-0.308***
<i>Industry characteristics</i>					
Competition	0.031	0.027	0.030	0.023	0.000
Industry leverage	0.065	0.038	0.076	0.061	-0.011***
High-tech industry	0.336	0.000	0.241	0.000	0.096***
High PC/COGS industry	0.531	1.000	0.396	0.000	0.135***
Supplier competition	0.830	0.845	0.818	0.845	0.012***
Supplier distance	7.629	7.796	7.503	7.796	0.126***
Observations	4231		16073		

Table 2: Supplier statistics of purchase contracting activities

The table presents summary statistics of suppliers identified in the Capital IQ's business relationship database. The sample consists of 6,917 suppliers for 884 customer firms in our primary sample. The information on suppliers' revenue, assets, total number of employees, SIC code, and headquarters location is available from the Capital IQ database. Each variable is collapsed into its time-series average for each supplier. We use U.S. public firms' industry median R&D intensity within the same 4-digit SIC code to proxy foreign or U.S. private suppliers' R&D intensity.

Supplier Characteristics	Mean	Min	P25	P50	P75	Max	Obs.
Domestic supplier	0.481	0	0	0	1	1	6917
Domestic public supplier	0.321	0	0	0	1	1	6917
Region: America	0.536	0	0	1	1	1	6917
Region: Asia	0.255	0	0	0	1	1	6917
Region: Europe	0.172	0	0	0	0	1	6917
Region: Africa	0.003	0	0	0	0	1	6917
Region: Oceania	0.019	0	0	0	0	1	6917
Region: Unknown	0.016	0	0	0	0	1	6917
Supplier Revenue (\$million)	4595.580	0	50.386	244.643	1730.357	2384814.250	5281
Supplier assets (\$million)	7794.225	0	63.025	305.264	2344.114	2421008.500	5282
Supplier capital intensity (sales/assets)	0.944	0.061	0.577	0.845	1.189	3.008	5277
Supplier labor intensity (employees/revenue)	8.059	0.094	2.992	4.972	8.754	58.148	4903
Supplier R&D intensity (R&D/sales)	0.102	0	0.004	0.087	0.125	0.763	5107
Supplier competition	0.812	0.038	0.739	0.845	0.924	0.978	5107
Supplier in manufacturing	0.475	0	0	0	1	1	6917

Table 3: Industry statistics of purchase contracting activities

The table shows purchase contracting activities by 2-digit SIC code in the manufacturing sector for our sample period. The firm-level purchase contracts data are from purchase obligations information in 10-K filings for a given year. Purchase contract intensity is PC/COGS, which is a firm's estimated payment amount within the closest fiscal year under all of purchase contracts, normalized by cost of goods sold.

Industry description	SIC code	Total firms(#)	Firms with purchase contracts(#)	Firms with purchase contracts(%)	Purchase contract intensity	Purchase contract intensity (within firms with purchase contracts)
Food and kindred products	20	107	75	0.701	0.109	0.151
Tobacco manufactures	21	7	6	0.857	0.184	0.215
Textile mill products	22	12	8	0.667	0.022	0.033
Apparel and other textile products	23	41	25	0.610	0.113	0.185
Lumber and wood products	24	20	9	0.450	0.025	0.057
Furniture and fixtures	25	26	14	0.538	0.031	0.057
Paper and allied products	26	42	33	0.786	0.069	0.088
Printing and publishing	27	49	27	0.551	0.049	0.089
Chemicals and allied products	28	770	380	0.494	0.127	0.231
Petroleum and coal products	29	32	26	0.812	0.097	0.121
Rubber and miscellaneous plastics products	30	42	23	0.548	0.049	0.086
Leather and leather products	31	18	15	0.833	0.175	0.210
Stone, clay, glass, and concrete products	32	26	19	0.731	0.046	0.062
Primary metal industries	33	63	47	0.746	0.121	0.162
Fabricated metal products	34	64	42	0.656	0.068	0.103
Industrial machinery and equipment	35	280	204	0.729	0.093	0.127
Electrical and electronic equipment	36	444	291	0.655	0.102	0.152
Transportation equipment	37	114	71	0.623	0.078	0.123
Instruments and related products	38	376	220	0.585	0.097	0.159
Miscellaneous manufacturing industries	39	35	20	0.571	0.083	0.146
Total		2568	1555	0.606	0.101	0.160

Table 4: Semiconductor firms and purchase contracting strategies

The table presents examples of three firms operating in the semiconductor industry that employ considerably different external contracting strategies. Marvell Technology is known as a leading fabless semiconductor company, Fairchild as a firm that almost exclusively manufactures its own semiconductors. Xilinx, having substantially changed its volume of purchase contracts over time, provides greater time-series variation in external contracting intensity. The table shows the three firms' purchase contracts intensity, financial leverage, and other firm characteristics over the sample period from fiscal year 2004 to 2016. Fairchild data exist until the fiscal year 2015, as the company was acquired by ON Semiconductor on September 2016. Purchase contract intensity is PC/COGS, which is a firm's estimated payment amount within the closest fiscal year under all of purchase contracts, normalized by cost of goods sold.

Year	Revenues (\$MM)	PC (\$MM)	PC/COGS	Fixed asset ratio	CAPX/sales	R&D/sales	M/B	Market leverage
<i>Marvell Technology Group Ltd.</i>								
2004-2016	2778.0	237.5	0.201	0.159	0.037	0.325	2.141	0.007
2004	1224.6	104.0	0.193	0.100	0.056	0.324	3.434	0.003
2005	1670.3	224.5	0.312	0.117	0.080	0.259	5.808	0.002
2006	2237.6	457.0	0.403	0.151	0.108	0.392	2.660	0.036
2007	2894.7	279.0	0.180	0.151	0.051	0.434	1.815	0.049
2008	2950.6	62.6	0.046	0.169	0.025	0.321	1.151	0.001
2009	2807.7	213.3	0.187	0.148	0.013	0.281	2.297	0.000
2010	3611.9	271.5	0.198	0.131	0.032	0.320	2.106	0.000
2011	3393.0	245.6	0.179	0.156	0.025	0.281	1.703	0.000
2012	3168.6	244.5	0.175	0.183	0.020	0.312	1.041	0.000
2013	3404.4	307.2	0.197	0.181	0.021	0.365	1.518	0.000
2014	3707.0	291.2	0.167	0.176	0.019	0.343	1.481	0.000
2015	2725.8	166.8	0.128	0.185	0.013	0.284	1.065	0.000
2016	2317.7	219.7	0.241	0.217	0.016	0.305	1.752	0.000
<i>Fairchild Semiconductor International Inc.</i>								
2004-2015	1492.0	67.8	0.072	1.101	0.083	0.086	1.304	0.179
2004	1601.0	77.9	0.077	0.722	0.138	0.059	1.301	0.274
2005	1425.1	125.9	0.128	0.911	0.062	0.048	1.534	0.219
2006	1651.1	123.8	0.117	0.878	0.080	0.075	1.456	0.199
2007	1670.2	79.9	0.074	0.881	0.086	0.069	1.270	0.218
2008	1574.2	28.5	0.028	1.086	0.104	0.068	0.756	0.383
2009	1187.5	52.2	0.069	1.145	0.039	0.063	1.122	0.239
2010	1599.7	100.9	0.112	1.166	0.133	0.101	1.416	0.122
2011	1588.8	52.9	0.059	1.182	0.117	0.096	1.101	0.141
2012	1397.4	39.4	0.047	1.241	0.096	0.099	1.246	0.107
2013	1405.4	39.6	0.046	1.319	0.054	0.123	1.183	0.094
2014	1433.4	47.5	0.057	1.402	0.039	0.118	1.471	0.080
2015	1370.2	44.5	0.055	1.275	0.048	0.113	1.795	0.070
<i>Xilinx Inc.</i>								
2004	1573.2	97.2	0.185	0.207	0.044	0.225	3.488	0.000
2005	1726.3	76.8	0.127	0.210	0.043	0.210	2.889	0.000
2006	1842.7	59.1	0.089	0.239	0.064	0.225	2.837	0.111
2007	1841.4	74.3	0.117	0.252	0.025	0.194	2.591	0.123
2008	1825.2	46.5	0.076	0.275	0.021	0.193	2.253	0.108
2009	1833.6	129.5	0.208	0.225	0.015	0.202	2.524	0.044
2010	2369.4	141.3	0.184	0.181	0.035	0.214	2.513	0.086
2011	2240.7	102.4	0.140	0.177	0.030	0.184	2.548	0.080
2012	2168.7	96.2	0.141	0.166	0.014	0.212	2.501	0.078
2013	2382.5	143.8	0.209	0.161	0.021	0.227	3.348	0.092
2014	2377.3	106.3	0.163	0.164	0.012	0.221	2.698	0.119
2015	2213.9	108.9	0.175	0.168	0.014	0.225	2.958	0.111
2016	2349.3	112.6	0.170	0.177	0.033	0.272	3.500	0.087

Table 5: Purchase contracting propensity

The table presents the results of the propensity estimation regressions. The dependent variable, High PC/COGS, is one if a given firm is in the highest tercile of PC/COGS in a given year and zero otherwise. The first column is from a firm-level between regression, and others are from firm-year level panel regressions. We estimate both logit (columns 1 and 2) and linear probability models (columns 3 and 4). Variable definitions are available in Appendix B. Industry fixed effects are at the FIC-25 code groups by Hoberg and Phillips (2015). *t*-statistics (in parenthesis) are robust, and adjusted for industry clustering for the firm-level regression and industry-year clustering for the firm-year panel regressions. ***, **, and * indicate statistical significance at 1%, 5%, and 10% level, respectively.

	High PC/COGS			
	(1)	(2)	(3)	(4)
Log(mv assets)	0.208*** (5.11)	0.230*** (16.88)	0.0365*** (14.54)	0.0358*** (13.95)
Log(1+age)	-0.00233 (-0.02)	0.0188 (0.41)	0.00381 (0.51)	0.000423 (0.06)
Profit margin	0.0501*** (5.32)	0.0524*** (5.61)	0.00643*** (7.43)	0.00526*** (7.24)
M/B	0.0998*** (2.95)	0.0275* (1.81)	0.00369 (1.45)	0.00570** (2.19)
Sales growth	0.116 (0.48)	-0.135** (-2.17)	-0.0216** (-2.41)	-0.0182** (-2.05)
Foreign tax ratio	-0.0989 (-0.45)	-0.168*** (-3.58)	-0.0268*** (-3.85)	-0.0227*** (-3.36)
Close to port of entry	0.340*** (2.93)	0.275*** (6.63)	0.0469*** (6.69)	0.0402*** (5.72)
Value-added per employee	1.215 (1.49)	0.440*** (2.78)	0.131*** (3.62)	0.160*** (4.43)
High import penetration	0.516*** (2.94)	0.814*** (8.18)	0.151*** (8.73)	0.119*** (6.73)
Fixed asset ratio in 2000	-0.554* (-1.66)	-0.759*** (-5.73)	-0.0987*** (-5.85)	-0.116*** (-6.81)
Fixed asset ratio in 2000 X High import penetration	-0.830** (-2.35)	-0.908*** (-4.38)	-0.177*** (-5.73)	-0.133*** (-4.23)
Competition	-0.299 (-0.09)	0.801 (0.69)	0.168 (0.94)	0.182 (0.96)
Industry leverage	1.930 (0.81)	0.560 (0.75)	0.0957 (0.85)	
High-tech industry	0.143 (0.95)	-0.0891 (-1.40)	-0.00624 (-0.59)	
High PC/COGS industry	0.722*** (4.28)	0.468*** (5.41)	0.0795*** (5.85)	
Supplier competition	4.956* (1.75)	5.092*** (5.07)	0.805*** (5.28)	
Supplier distance	0.105* (1.96)	0.0654*** (3.96)	0.00523*** (3.72)	
Observations	1473	13826	13826	13826
Pseudo or Adjusted R^2	0.105	0.096	0.098	0.108
Year Fixed Effects	No	Yes	Yes	Yes
Industry Fixed Effects	No	No	No	Yes
Estimation Method	Firm	Between logit	Panel logit	Panel OLS

Table 6: Cost adjustment in firms with and without outside purchase contracts

The table compares changes in input costs following demand fluctuations between firms with high purchase contract intensity and with no or low amounts of purchase contracts. We include a firm in Panel A if the firm disclosed a purchase contract amount in the highest tercile for a given fiscal year, and in Panel B, otherwise. We further split the whole sample between firms in industries with low and high industry median leverage and separately examine them in Panel A. Each column shows the estimated coefficient of Demand shock from an OLS regression with firm-fixed effects. The dependent variables are COGS (cost of goods sold) combined with SG&A (selling, general & administrative expenses), COGS, and SG&A, scaled by average firm sales during the sample period. We additionally exclude firms with $(\text{COGS}+\text{SG\&A})/\text{avrg sales}$ greater than two to avoid outlier effects. A demand shock is the detrended annual percentage change in downstream industry demands. Downstream industry demand is each industry's downstream demand condition measured by the chain-type quantity indexes for gross output from the Bureau of Economic Analysis (BEA) for its upstream industries that are identified by the 2002 Benchmark Input-Output Use Table from the BEA. To detrend, we regress the raw downstream industry demand on industry and year fixed effects indicator variables and then take the residuals from the regression. All specifications have firm fixed effects. *t*-statistics (in parenthesis) are robust and adjusted for firm clustering. ***, **, and * indicate statistical significance at 1%, 5%, and 10% level, respectively.

Panel A: High PC/COGS			
	(COGS+SG&A)/avrg sales	COGS/avrg sales	SG&A/avrg sales
Demand shock	0.00709*** (2.81)	0.00487*** (2.82)	0.00219* (1.77)
Number of firms	822	822	822
Observations	3795	3795	3795
Adjusted R^2	0.276	0.603	0.719
<i>i) Firms with low industry leverage</i>			
Demand shock	0.00949** (2.51)	0.00669*** (2.94)	0.00265 (1.24)
Number of firms	583	583	583
Observations	2276	2276	2276
Adjusted R^2	0.298	0.602	0.633
<i>ii) Firms with high industry leverage</i>			
Demand shock	0.00337 (0.95)	0.00249 (0.87)	0.00100 (0.97)
Number of firms	394	394	394
Observations	1519	1519	1519
Adjusted R^2	0.276	0.523	0.831
Firm Fixed Effects	Yes	Yes	Yes
Panel B: No or low PC/COGS			
	(COGS+SG&A)/avrg sales	COGS/avrg sales	SG&A/avrg sales
Demand shock	0.000430 (0.33)	0.00131 (1.21)	-0.000916* (-1.67)
Number of firms	2000	2000	2000
Observations	13199	13199	13199
Adjusted R^2	0.254	0.513	0.738
Firm Fixed Effects	Yes	Yes	Yes

Table 7: Purchase contracts, quarterly cash flow volatility, and quarterly leverage

The table compares cash flow volatilities and market leverage between firms with high purchase contract intensity and matched firms with no or low amounts of purchase contracts. We estimate a matching model using $\text{Log}(\text{mv assets})$, $\text{Log}(1+\text{age})$, Fixed asset ratio, Profit margin, M/B, Sales growth, Foreign tax ratio, and Competition as matching variables. For each quarter, a firm with high purchase contract intensity is one that disclosed a purchase contract amount in the highest tercile for a given fiscal year. The control observations for a firm with high purchase contract intensity are the four nearest neighbors across the matching variables within the same FIC-25 code that have no or low amounts of purchase contracts. The variable in (a) is the standard deviation of the subsequent 12 quarters' earnings after interest, taxes, depreciation, and amortization scaled by sales. The variable in (b) is quarterly market leverage of the firm. Market leverage is the ratio of total debt to market value of assets. Market value of assets is market value of common equity plus book value of preferred stock plus debt (long-term debt + debt in current liabilities) plus book value of minority interest. Other variable definitions are available in the Appendix B. ***, **, and * indicate statistical significance at 1%, 5%, and 10% level, respectively.

Quarter	(a) Std. dev of cash flows	Std. err.	(b) Quarterly market leverage	Std. err.	Obs.
All quarters	-0.174**	0.074	-0.024***	0.008	1673
2004q1	-0.326**	0.127	-0.012	0.012	1398
2004q2	-0.298**	0.128	-0.018	0.012	1380
2004q3	-0.296**	0.130	-0.015	0.011	1394
2004q4	-0.258*	0.134	-0.015	0.012	1352
2005q1	-0.175	0.136	-0.023**	0.012	1352
2005q2	-0.193	0.137	-0.019*	0.012	1334
2005q3	-0.261*	0.138	-0.019	0.012	1330
2005q4	-0.300**	0.143	-0.01	0.012	1294
2006q1	-0.233	0.149	-0.024**	0.011	1318
2006q2	-0.224	0.148	-0.028**	0.011	1296
2006q3	-0.291**	0.147	-0.019*	0.011	1287
2006q4	-0.480***	0.129	-0.016	0.011	1259
2007q1	-0.435***	0.126	-0.01	0.011	1283
2007q2	-0.470***	0.134	-0.013	0.012	1263
2007q3	-0.463***	0.132	-0.027**	0.013	1261
2007q4	-0.479***	0.129	-0.027**	0.013	1224
2008q1	-0.415***	0.123	-0.023	0.014	1257
2008q2	-0.436***	0.132	-0.026*	0.015	1242
2008q3	-0.414***	0.140	-0.031*	0.017	1251
2008q4	-0.438***	0.144	-0.012	0.019	1217
2009q1	-0.496***	0.147	-0.012	0.018	1227
2009q2	-0.481***	0.146	-0.023	0.016	1207
2009q3	-0.460***	0.146	-0.015	0.015	1196
2009q4	-0.448***	0.150	-0.015	0.014	1174
2010q1	-0.516***	0.145	-0.017	0.014	1173
2010q2	-0.533***	0.148	-0.013	0.013	1158
2010q3	-0.546***	0.150	-0.006	0.013	1160
2010q4	-0.520***	0.147	-0.004	0.012	1140
2011q1	-0.308**	0.132	-0.005	0.013	1119
2011q2	-0.278**	0.128	-0.001	0.015	1108
2011q3	-0.259*	0.135	-0.022	0.014	1098
2011q4	-0.285**	0.143	-0.023*	0.014	1072
2012q1	-0.310**	0.133	-0.026**	0.013	1061
2012q2	-0.295**	0.132	-0.027**	0.013	1041
2012q3	-0.271**	0.132	-0.022*	0.013	1036
2012q4	-0.245*	0.132	-0.027**	0.013	1008
2013q1	-0.01	0.133	-0.029**	0.012	999
2013q2	0.038	0.134	-0.026**	0.012	991
2013q3	0.021	0.134	-0.018	0.011	996
2013q4	0.001	0.133	-0.014	0.011	967
2014q1	-0.117	0.132	-0.026**	0.011	951
2014q2	-0.108	0.134	-0.027**	0.012	937
2014q3	-0.121	0.133	-0.023*	0.012	938
2014q4	-0.178	0.140	-0.019	0.012	901
2015q1	-0.364**	0.149	-0.02	0.013	884

Table 8: Purchase contracts and leverage - OLS regressions

The table examines the effect of outside purchase contracts on leverage. The dependent variable is market or book leverage. Market (book) leverage is the ratio of total debt to market (book) value of assets. Market value of assets is market value of common equity plus book value of preferred stock plus debt (long-term debt + debt in current liabilities) plus book value of minority interest. Other variable definitions are available in Appendix B. PC/COGS and all control variables are lagged one year. Industry fixed effects are at the FIC-25 code groups by Hoberg and Phillips (2015). *t*-statistics (in parenthesis) are robust and adjusted for industry-year clustering. ***, **, and * indicate statistical significance at 1%, 5%, and 10% level, respectively.

	Market Leverage			Book Leverage		
	(1)	(2)	(3)	(4)	(5)	(6)
PC/COGS	-0.0708*** (-7.52)	-0.0566*** (-7.19)	-0.0488*** (-6.40)	-0.0233 (-1.41)	-0.0639*** (-4.25)	-0.0528*** (-3.90)
Log(mv assets)		0.0169*** (24.41)	0.0160*** (25.86)		0.0313*** (25.95)	0.0302*** (32.50)
Log(1+age)		-0.0233*** (-6.98)	-0.0267*** (-13.69)		-0.0273*** (-6.88)	-0.0312*** (-11.75)
Fixed asset ratio		0.0541*** (10.03)	0.0492*** (11.58)		0.0646*** (9.01)	0.0639*** (11.20)
Profit margin		-0.00178*** (-3.41)	-0.00200*** (-4.52)		-0.00367*** (-2.71)	-0.00364*** (-4.06)
M/B		-0.0287*** (-13.81)	-0.0292*** (-30.74)		-0.0119*** (-6.28)	-0.0146*** (-7.81)
Sales growth		0.0121*** (3.13)	0.0123*** (3.58)		0.00917 (1.50)	0.00868 (1.41)
Foreign tax ratio		0.00101 (0.46)	0.00621*** (2.86)		0.00282 (1.00)	0.00914*** (3.11)
Close to port of entry		-0.0112*** (-5.02)	-0.00947*** (-4.08)		-0.0153*** (-4.66)	-0.0122*** (-3.54)
Value-added per employee		-0.0446** (-2.11)	-0.0210 (-1.43)		-0.0500 (-1.49)	-0.0217 (-0.73)
Competition		-0.00511 (-0.06)	0.0681 (1.01)		0.119 (0.90)	0.212** (2.31)
High-tech industry		-0.0354*** (-11.26)			-0.0506*** (-13.16)	
High PC/COGS industry		-0.0127*** (-3.51)			-0.00820* (-1.69)	
Observations	13628	13219	13219	13628	13219	13219
Adjusted R^2	0.019	0.188	0.222	0.011	0.141	0.181
Year Fixed Effects	Yes	Yes	Yes	Yes	Yes	Yes
Industry Fixed Effects	No	No	Yes	No	No	Yes

Table 9: Purchase contracts and related-party incentives

The table presents the results of leverage regressions for firms with and without outside purchase contracts. We include a firm in the group of firms with purchase contracts if the firm discloses a non-zero amount of purchase contracts at least once during the sample period from fiscal year 2004 to 2016, and in the group of firms without purchase contracts, otherwise. The dependent variable is market or book leverage. Market (book) leverage is the ratio of total debt to market (book) value of assets. Market value of assets is market value of common equity plus book value of preferred stock plus debt (long-term debt + debt in current liabilities) plus book value of minority interest. Other variable definitions are available in Appendix B. All control variables are lagged one year. *t*-statistics (in parenthesis) are robust and adjusted for industry-year clustering. ***, **, and * indicate statistical significance at 1%, 5%, and 10% level, respectively.

	Market leverage		Book leverage	
	PC exists (1)	PC doesn't exist (2)	PC exists (3)	PC doesn't exist (4)
Log(mv assets)	0.0170*** (23.74)	0.0146*** (14.86)	0.0312*** (27.90)	0.0288*** (19.76)
Log(1+age)	-0.0249*** (-8.26)	-0.0135*** (-2.89)	-0.0289*** (-8.00)	-0.0147*** (-2.62)
Fixed asset ratio	0.0478*** (9.46)	0.0773*** (9.59)	0.0595*** (8.57)	0.0975*** (9.70)
Profit margin	-0.00138*** (-3.21)	-0.000953*** (-3.15)	-0.00368*** (-3.72)	-0.00152** (-2.12)
M/B	-0.0279*** (-15.33)	-0.0207*** (-11.20)	-0.0139*** (-8.70)	-0.00573*** (-2.77)
Sales growth	0.0157*** (4.52)	0.00687 (1.60)	0.0198*** (3.59)	0.00422 (0.52)
Foreign tax ratio	0.00265 (1.16)	0.0113** (2.18)	0.00576* (1.89)	0.00822 (1.32)
Close to port of entry	-0.0128*** (-5.66)	0.00124 (0.28)	-0.0158*** (-4.81)	-0.00810 (-1.16)
Value-added per employee	-0.0759*** (-4.31)	0.0194 (0.82)	-0.112*** (-4.55)	0.0891* (1.75)
Competition	0.133* (1.79)	-0.0375 (-0.23)	0.384*** (2.71)	-0.122 (-0.70)
High-tech industry	-0.0258*** (-7.57)	-0.0278*** (-5.99)	-0.0429*** (-9.64)	-0.0345*** (-5.36)
High PC/COGS industry	-0.00317 (-0.81)	-0.00406 (-0.68)	0.00621 (1.09)	0.0107 (1.46)
Supplier competition	-0.283*** (-6.10)	-0.112 (-1.63)	-0.358*** (-5.43)	-0.102 (-1.23)
Supplier distance	-0.00379*** (-2.94)	0.00146 (1.06)	-0.00594*** (-4.36)	-0.00000177 (-0.00)
Observations	11629	4486	11629	4486
Adjusted R^2	0.219	0.163	0.162	0.113
Year Fixed Effects	Yes	Yes	Yes	Yes
Industry Fixed Effects	No	No	No	No

Table 10: Differences in leverage with propensity-score based matching

The table examines the relation between purchase contracting and leverage with a propensity-score matched sample. The variable of interest is one of the following leverage measures: Market leverage, Book Leverage, Short-term leverage, Long-term leverage, Net leverage, Leverage with AP, Market leverage (industry adjusted), and Book leverage (industry adjusted). Market (book) leverage is the ratio of total debt to market (book) value of assets. Short-term leverage (long-term leverage) is the ratio of debt in current liabilities (long-term debt) to market value of total assets. Net leverage is the market leverage net of cash. Leverage with AP, which is computed by additionally including accounts payable as part of total debt. For the industry-adjusted leverage, we subtract the industry median leverage in a given fiscal year from firm leverage. Market value of assets is market value of common equity plus book value of preferred stock plus debt (long-term debt + debt in current liabilities) plus book value of minority interest. High PC/COGS is one if a given firm is in the highest tercile of PC/COGS in a given year and zero otherwise. The sample consists of all firm-years for firms with high PC/COGS and their matched observations with no or low PC/COGS. Other variable definitions are available in Appendix B. ***, **, and * indicate statistical significance at 1%, 5%, and 10% level, respectively.

Panel A: Summary statistics for matching variables

Matching variables	High PC/COGS	No or low PC/COGS	Mean difference	t-statistics
	Mean	Mean		
Log(mv assets)	7.409	7.397	0.013	0.27
Log(1+age)	2.817	2.803	0.014	0.80
Profit margin	-0.342	-0.337	-0.005	-0.09
M/B	2.321	2.326	-0.005	-0.13
Sales growth	0.137	0.137	-0.000	-0.00
Foreign tax ratio	0.323	0.332	-0.009	-0.77
Value-added per employee	0.073	0.071	0.002	0.69
Close to port of entry	0.381	0.368	0.013	1.19
High import penetration	0.486	0.491	-0.005	-0.41
Competition	0.030	0.030	0.000	0.09
Industry leverage	0.066	0.066	0.000	0.29
High-tech industry	0.339	0.350	-0.011	-1.05
High PC/COGS industry	0.550	0.545	0.006	0.50
Supplier competition	0.829	0.829	0.000	0.01
Supplier distance	7.611	7.601	0.010	0.44
Observations	3894	3894		

Panel B: Differences in leverage

<i>High PC/COGS firms – Matched no or low PC/COGS firms</i>				
Variable	Mean difference	Std. err.	z	P>z
(1) Market leverage	-0.021***	0.003	-7.276	0.000
(2) Book leverage	-0.024***	0.005	-5.366	0.000
(3) Short-term leverage	-0.010***	0.002	-5.935	0.000
(4) Long-term leverage	-0.018***	0.003	-6.683	0.000
(5) Net leverage	-0.037***	0.007	-5.281	0.000
(6) Leverage with AP	-0.028***	0.003	-8.207	0.000
(7) Market leverage (industry adjusted)	-0.022***	0.003	-7.641	0.000
(8) Book leverage (industry adjusted)	-0.025***	0.004	-5.663	0.000

Table 11: Simultaneous estimation of purchase contracts and leverage

The table examines the simultaneous relation between purchase contracts and leverage using seemingly unrelated regressions (SUR). The two dependent variables are High PC/COGS and Market leverage or Book leverage. High PC/COGS is one if a given firm is in the highest tercile of PC/COGS in a given year and zero otherwise. PC/COGS is a firm's estimated payment amount within the closest fiscal year under all of purchase contracts, normalized by cost of goods sold. Market (book) leverage is the ratio of total debt to market (book) value of assets. Market value of assets is market value of common equity plus book value of preferred stock plus debt (long-term debt + debt in current liabilities) plus book value of minority interest. Other variable definitions are available in Appendix B. Rho is the correlation of the residuals of the two regressions for each system. All control variables are lagged one year. t -statistics (in parenthesis) are robust and adjusted for industry-year clustering. ***, **, and * indicate statistical significance at 1%, 5%, and 10% level, respectively.

	High PC/COGS	Market leverage	High PC/COGS	Book leverage
	(1)	(2)	(3)	(4)
Log(mv assets)	0.0366*** (14.72)	0.0150*** (24.75)	0.0367*** (14.73)	0.0288*** (29.07)
Log(1+age)	0.00615 (0.87)	-0.0210*** (-6.94)	0.00567 (0.80)	-0.0222*** (-6.28)
Profit margin	0.00635*** (7.39)	-0.00123*** (-3.87)	0.00634*** (7.36)	-0.00250*** (-3.41)
M/B	0.00338 (1.34)	-0.0250*** (-14.21)	0.00352 (1.40)	-0.00981*** (-6.74)
Sales growth	-0.0254*** (-2.80)	0.0129*** (4.09)	-0.0256*** (-2.81)	0.0123** (2.54)
Foreign tax ratio	-0.0268*** (-3.86)	0.00449** (2.05)	-0.0268*** (-3.86)	0.00666** (2.44)
Close to port of entry	0.0482*** (6.84)	-0.00997*** (-4.53)	0.0479*** (6.78)	-0.0148*** (-4.58)
Value-added per employee	0.127*** (3.47)	-0.0520*** (-2.78)	0.126*** (3.45)	-0.0597* (-1.96)
Competition	0.182 (1.02)	0.0443 (0.58)	0.175 (0.98)	0.194* (1.70)
High-tech industry	-0.00702 (-0.66)	-0.0268*** (-7.69)	-0.00718 (-0.67)	-0.0412*** (-9.86)
High PC/COGS industry	0.0690*** (5.13)	0.000459 (0.11)	0.0688*** (5.11)	0.00733 (1.25)
Supplier competition	0.793*** (6.70)	-0.277*** (-6.12)	0.790*** (6.69)	-0.314*** (-5.30)
Supplier distance	0.00512*** (3.61)	-0.00221* (-1.72)	0.00529*** (3.72)	-0.00421*** (-3.74)
Fixed asset ratio		0.0541*** (10.75)		0.0680*** (10.62)
High import penetration	0.144*** (8.24)		0.144*** (8.17)	
Fixed asset ratio in 2000	-0.101*** (-6.18)		-0.102*** (-6.19)	
Fixed asset ratio in 2000 X High import penetration	-0.172*** (-5.63)		-0.171*** (-5.59)	
Rho		-0.0625*** (-8.27)		-0.0470*** (-5.60)
Observations		16175		16175
Year Fixed Effects		Yes		Yes

Table 12: Mutual fund flow and market leverage adjustment

The table examines the relation between exogenous equity valuation shocks from mutual fund outflows and leverage adjustment. The dependent variable in columns 1 through 7 is market leverage in the contemporaneous or subsequent quarters. Market leverage is the ratio of total debt to market value of assets. Market value of assets is market value of common equity plus book value of preferred stock plus debt (long-term debt + debt in current liabilities) plus book value of minority interest. The dependent variable in column 8 is an indicator variable for sales of equity in the subsequent years (Compustat item sstk). The regressions in columns 1 through 7 are at the firm-quarter level, and the regression in column 8 is at the firm-year level. High PC/COGS is one if a given firm is in the highest tercile of PC/COGS in a given year and zero otherwise. PC/COGS is a firm's estimated payment amount within the closest fiscal year under all of purchase contracts, normalized by cost of goods sold. Negative mflow shock is one if mflow for a given firm in a given quarter is in the lowest tercile. Mflow is the unexpected mutual funds flow variable following Edmans, Goldstein, and Jiang (2012). Firm control variables used in the previous leverage regressions are included but not reported to conserve space. *t-statistics* (in parenthesis) are robust and adjusted for firm clustering. ***, **, and * indicate statistical significance at 1%, 5%, and 10% level, respectively.

	Quarterly market leverage							
	Contemporaneous	1st subsequent	2nd subsequent	3rd subsequent	4th subsequent	5th subsequent	6th subsequent	Sales of equity
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Negative Mflow shock	0.00295* (1.82)	0.00271* (1.67)	0.000430 (0.26)	0.000881 (0.52)	0.00357** (2.13)	0.00149 (0.88)	0.000314 (0.19)	-0.00746 (-0.95)
High PC/COGS	-0.00560 (-1.52)	-0.00420 (-1.12)	-0.00287 (-0.74)	-0.00106 (-0.26)	0.00103 (0.25)	0.00226 (0.56)	0.00331 (0.82)	0.00583 (0.62)
Negative Mflow shock X High PC/COGS	-0.00442 (-1.54)	-0.00537* (-1.88)	-0.00587** (-2.04)	-0.00671** (-2.16)	-0.00738** (-2.29)	-0.00632* (-1.92)	-0.00445 (-1.31)	0.0248* (1.72)
Observations	54088	53958	53638	53137	52397	51701	50712	15582
Adjusted R^2	0.732	0.732	0.735	0.734	0.732	0.734	0.738	0.471
Firm controls	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Firm fixed effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Year fixed effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes