

Spillover Effects of Earnings Restatements along the Supply Chain*

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Abstract

Using firm-level product market relationship data, we examine how customer firms' earnings restatements affect their dependent suppliers. We find that dependent suppliers experience strong negative market reactions around their customers' restatement announcements, particularly when suppliers are more dependent on the restating customer firms, when the stock market perceives these restatement announcements to be bad news, and when other firms in the restating firm's industry suffer from greater adverse contagion effect. Furthermore, the adverse spillover effect of a customer's earnings restatement on dependent suppliers is greater for suppliers that face higher switching costs, suppliers with larger information asymmetry, or more financially constrained suppliers. We also find that the likelihood of post-restatement relationship termination is higher for less dependent and smaller suppliers. Last, we find worse post-restatement operating performance for more dependent suppliers and terminated suppliers, particularly when they have high switching costs, large information asymmetry or strong financial constraints. Our findings show that earnings restatements have broader value implications that extend beyond the firm to its supply chain members.

1. Introduction

“The big rumor now in Washington is that President Bush is ready to invade Iraq. What we should do is take the CEO's of Enron, WorldCom, and Adelphia, drop them into Iraq and let them have at the infrastructure. Within a few days the country will be ruined.” —Jay Leno

The impact of financial misreporting has always been a subject of interest to academic researchers and policy makers. The public policy interest in this topic has intensified after the high-profile corporate scandals in the early 2000s such as Enron, Worldcom, Tyco and Parmalat.¹ For example, USA Today reported that shareholder wealth is almost wiped out in the case of Worldcom.² A number of academic studies also document that earnings restatements cause massive shareholder losses for restating firms (Dechow et al. 1996; Palmrose et al. 2004).³ However, shareholder losses are unlikely to be the only consequence of financial misreporting.

As a nexus of contracts, restating firms may interact with various stakeholders (Jensen and Meckling 1976). For example, when Worldcom committed financial fraud and subsequently announced expected cuts in capital spending, its major suppliers Lucent and Nortel saw their share prices fall 20% and 9%, respectively. Despite the important economic linkages that stakeholders can establish with the restating firms and anecdotes of the impact of financial misreporting on stakeholder value, research work on how earnings restatements affect the wealth of stakeholders is limited. In this paper, we aim to extend

¹ Enron's assets and profits were inflated or fraudulent and non-existent. Worldcom's earnings were overstated in order to mask declining profitability. Tyco's and Parmalat's former chief executive officers were both convicted of theft of large amounts of cash from their respective companies.

² See article titled “Worldcom in ‘Death Spiral’” on 26 June 2006 by USA Today.

<http://www.usatoday.com/money/covers/2002-06-27-can-worldcom-survive.htm#more>

³ Previous studies also show that earnings restatements often convey adverse information about restating firms' future prospects (Hribar and Jenkins 2004), increase their costs of accessing debt and equity markets (Graham et al. 2008; Shi and Zhang 2008; Wang et al. 2010), and make them more financially constrained (Chen et al. 2009).

the previous literature by examining the effect of a firm's earnings restatements on the value of its dependent suppliers and how this vertical spillover effect along the supply chain varies depending on the characteristics of the major customer relationship that suppliers maintain, such as asset specificity, product uniqueness and guaranty, information asymmetry, and financial health.

We focus on corporate suppliers, as recent research suggests that durable and economically strong trading relationships between customer and supplier firms are prevalent in the U.S. economy. For example, Fee et al. (2006) document that approximately 16 percent of Compustat firms sell to major customers during the time period from 1981 to 2001.⁴ Furthermore, previous research shows that durable trading relationships between suppliers and customers create significant corporate policy interdependence between them (Titman 1984; Maksimovic and Titman 1991; Banerjee et al. 2008; Cremers et al. 2008). When a supplier firm sells to only a few major customers and produces a large quantity of intermediate products for these customers, its business prospects become strongly tied to the performance of major customer firms. For example, an underperforming customer is likely to delay payments, bargain for lower prices, reduce future orders, or even terminate the trading relationship with its suppliers, which can force suppliers into financial distress. This adverse effect can be particularly severe when suppliers depends on the customer firm for a significant proportion of their revenues and produce relationship-specific products that cannot easily be redeployed to other customers or other uses.

Such strong economic links along the supply chain therefore can provide important information for the value of major supply chain members and contracting. For instance, Cohen and Frazzini (2008) show that the stock returns of a firm's major customers predict its future stock returns. Hertz et al.

⁴ A major customer is identified as one that contributes at least 10 percent of the supplier's total sales revenues.

(2008) find that suppliers to bankruptcy filing firms experience negative and significant stock price reactions around bankruptcy filing dates. Johnson et al. (2012) find that supplier issuance decisions have important negative spillover effects for large customers. These studies suggest that customer-supplier relationships can create important spillover effects along the supply chain, which then predict suppliers to be adversely affected by their customer firms' earnings restatements.

Furthermore, certain supplier- and relationship-specific characteristics such as switching costs, information asymmetry, and financial stability are predicted to further exacerbate the adverse spillover effects of restatements along the supply chain.⁵ For example, due to the difficulty in redeploying relationship-specific products to other uses, major customer-supplier relationship is often characterized by high levels of asset specificity, which makes it costly for suppliers and customers to switch trading partners (Williamson 1985; Williamson 1991). Even if the products are generic, the urgency to sell a large quantity to other customers is likely to depress prices. Similarly, suppliers in durable goods industries tend to face high switching costs due to the uniqueness of their products and services and these suppliers are more likely to be negatively affected by their customers' earnings restatements. Therefore, we predict that dependent suppliers experience greater adverse spillover effects when they face higher switching costs.

In addition, suppliers' high information asymmetry can exacerbate adverse spillover effects of customer firms' earnings restatements. The negative spillover effect of customer firms' earnings restatements on supplier value is likely to be more severe for suppliers with greater information

⁵ The adverse spillover effect of restatement refers to the negative relationship between supplier dependency and supplier announcement return/supplier continuation of relationship with the restating firm/supplier operating performance.

asymmetry since the continuity of their relationship with the customers is more uncertain for these suppliers. Furthermore, when major customers restate earnings, their ability to certify suppliers will be weakened and thus the certification benefits that suppliers can enjoy from these customers are likely to be reduced. To the extent that the certification role of large customers is particularly important for opaque suppliers (Johnson et al. 2010), we predict that the adverse spillover effects are more severe for dependent suppliers that suffer from larger information asymmetry.

Another factor that can exacerbate adverse spillover effects is the extent of suppliers' financial constraints. Since restating firms are less likely to make prompt payments or continue the trading relationship, their suppliers are more likely to run into liquidity problems, particularly if they are more financially constrained. Thus, we expect dependent suppliers that are more financially constrained to be more adversely affected by the spillover effects of their customer firms' earnings restatements.

The arguments above also suggest that customers' earnings restatements signal changes in the long-term viability of the post-restatement customer-supplier relationship and supplier post-restatement operating performance. Since customer-supplier relationships are governed by non-enforceable implicit contracts (Shleifer and Summers 1988), the incentives of trading partners to continue their relationships are dependent on the perceived viability of the post-restatement relationship, which can also affect supplier operating performance. As earnings restatements by customers will have negative effect on this perceived viability and this negative effect is likely to be more severe for more dependent suppliers, we expect more dependent suppliers of restating customers to experience worse operating performance than less dependent suppliers after their customers' restatements. Moreover, such effects are expected to be

more severe when suppliers face higher switching costs, larger information asymmetry and stronger financial constraints.

For a sample of earnings restatements announced between 1997 and 2006, we find that suppliers⁶ suffer strong negative market reaction around their customers' earnings restatement announcements, particularly when the market perceives restatement announcements as bad news. The announcement returns of suppliers worsen with the supplier's revenue dependency on restating firms, or when the restating firm's industry experiences more negative market reaction (greater contagion effects). Using relationship-specific investments, product uniqueness, and the importance of product guarantee as measures of switching costs (Titman 1984; Maksimovic and Titman 1991; Kale and Shahrur 2007; Banerjee et al. 2008), we find that the adverse spillover effect of customers' earnings restatements on supplier value is more pronounced for dependent suppliers who face higher switching costs. In addition, using idiosyncratic volatility of stock returns and the availability of analyst coverage as measures of supplier information asymmetry, we find that dependent suppliers who face larger information asymmetry are more negatively affected by the spillover effects of their customers' earnings restatements. We also find that the adverse spillover effect of earnings restatement on dependent suppliers is stronger for more financially constrained suppliers.

In addition, we find that suppliers are more likely to lose their product market relationships when they are smaller, and have weaker economic linkages to the restating firms. Consistent with our evidence on announcement returns, we also find that more dependent suppliers have worse operating performance

⁶ We identify restating firms' dependent suppliers from the business segment files of Compustat, which provide information on the identity of the customer that accounts for greater than 10% of a firm's sales.

in the three years following their customers' restatements. Supplier switching costs further exacerbate the deterioration in operating performance of dependent suppliers. In addition, suppliers that are terminated⁷ post-restatement and who face high switching costs tend to have worse post-restatement operating performance. Overall, these results indicate that earnings restatements by customer firms have important spillover effects along the supplier chain through the transmission of negative information about the viability and value of their trading relationships.

Our study is closely related to Chen and Lai (2007) who also study the effects of earnings restatement along the supply chain. However, our study differs from theirs in at least three ways. First and importantly, while we examine the spillover effect at the firm level, Chen and Lai (2007) examine this issue at the industry level. This industry-level analysis makes it difficult to gauge the true impact of customers' restatements on actual suppliers. For example, while it is possible that their results are due to firms in the supplier industries that sell to the restating firm, they may also be due to other firms that do not sell to the restating firm. As shown in previous studies, other firms in the same industry as the restating firm may also be affected by its earnings restatement announcement (Gleason et al. 2008; Durnev and Mangen 2009). Potential suppliers are also likely to be affected as prospects of future relationships with restating firms are diminished. By focusing on actual customer-supplier pairs, we are able to identify the exact channel through which customers' restatements affect their suppliers and also

⁷ By termination, we mean that the supplier no longer generates at least 10% of their revenues from the particular customer. The supplier could still generate less than 10% of their revenues from the customer but the trading relationship will no longer be classified as a major customer relationship. Our definition follows that of Fee and Thomas (2004). See section 4.3.

provide more accurate estimates of the true economic magnitude of customers' restatements on supplier valuation.

Second, we examine how supplier- and relationship-specific characteristics affect the extent of the adverse spillover effects of restatements along the supply chain, which cannot be done at the customer and supplier industry levels. In our analyses, we control for supplier industry characteristics and uncover new evidence on the cross-sectional variations in the spillover effects of customer restatements across different supplier- and relationship-specific characteristics.

Third, we examine the effect of customers' restatements on the viability and continued economic importance of trading relationship to suppliers by tracing the post-restatement relationship termination and the post-restatement operating performance of suppliers, which again cannot be done at the industry level. Our analyses thus provide first evidence on the duration of product market relationship following earnings restatements.

Our study contributes to the literature on earnings restatements by showing that the effects of earnings restatements extend beyond the firm to its major stakeholders, namely, corporate suppliers. Unlike previous studies that use industry level data to investigate the spillover effects of restatements along the supply chain (Chen and Lai 2007; Gleason et al. 2008; Durnev and Mangen 2009; Files and Gurun 2011), we use firm-level product market relationship data and provide clear evidence that suppliers are adversely affected by the earnings restatements of their customer firms and this adverse effect is more pronounced when the suppliers face higher switching costs, when they have greater information asymmetry, or when they are more financially constrained.

Our study also contributes to the literature that examines the influence of major customer-supplier relationships on various corporate policies. For example, previous studies show that customer firms use low leverage as a commitment device to induce relationship-specific investments from its suppliers (Titman 1984; Maksimovic and Titman 1991; Kale and Shahrur 2007; Banerjee et al. 2008). Fee et al. (2006) find that equity ownership is used to mitigate contractual incompleteness between the customer and the supplier. Johnson et al. (2012) find that supplier SEOs have negative spillover effects on customers, which are more pronounced as information asymmetry of suppliers and customers rises, relationship-specific investment increases, or more valuable product guarantees are offered. Other studies also show that major customer-supplier relationships affect earnings announcements (Pandit et al. 2011), accounting conservatism (Hui et al. 2011), earnings management (Raman and Shahrur 2008), cash policy (Bae and Wang 2011), use of trade credit (Ma and Martin 2012), and debt contracting (Koh et al. 2011). In addition, Fee and Thomas (2004) study the effects of horizontal mergers on supplier performance and Hertz et al. (2008) examine the effects of customer bankruptcy filings on supplier valuation. We add to the literature by showing that earnings restatements by customer firms adversely affect their dependent suppliers.

The remainder of this paper is organized as follows. Section 2 reviews the literature and develops testable hypotheses. In Section 3, we describe the data and sample characteristics. In Section 4, we present the empirical results and discuss the implications. We present summary and concluding remarks in Section 5.

2. Literature review and hypothesis development

2.1. Spillover effects of customers' earnings restatements

Earnings restatements often reveal internal control weaknesses of restating firms and weaken investor confidence. Previous studies such as Palmrose et al. (2004) document that stock market reacts negatively to earnings restatements. Earnings restatements may also convey negative information about the future prospects of restating firms' industries and adversely affect other firms in the same industries as the restating firms (Gleason et al. 2008; Durnev and Mangen 2009) and also firms that are in related industries (Chen and Lai 2007; Files and Gurun 2011). To the extent that a supplier as a firm's stakeholder has closer economic link to the restating firm than an outside firm, we would expect suppliers of the restating firm to experience adverse stock market reactions. Moreover, we would expect these adverse effects to be more pronounced when suppliers have greater economic dependency on the restating firm.⁸ As suppliers often make large investments in relationship-specific assets and their sales to large customers account for a substantial portion of their revenues, any events that signal negative information about a customer's weakening financial condition can adversely affect the value of the trading relationship to suppliers, thus reducing the market values of suppliers, particularly those of more dependent suppliers.⁹ We use the fraction of the supplier's total sales that is generated from the restating

⁸ We use economic dependency, revenue dependency and sales dependency interchangeably.

⁹ A possible counter argument is that the market is inattentive to economic linkages along the supply chain (Cohen and Frazzini 2008) or that suppliers completely hedge the risks arising from their economic dependency on major customer firms. However, these arguments are inconsistent with the evidence documented by previous studies, which show that durable relationships between customers and suppliers have important spillover effects along the supply chain.

customer as a proxy for the supplier's economic dependency on the customer and hypothesize the following:

H1: Suppliers experience adverse market reactions when their customers announce earnings restatements. This negative announcement effect is stronger when suppliers are more economically dependent on restating customers.

Gleason et al. (2008) and Durnev and Mangen (2009) find that earnings restatements signal negative information about the restating firm's industry and affect other firms in the same industry. Since a supplier may sell or redeploy its products to other firms in the industry that restating customers operate, the supplier will be more negatively affected if the customer industry is adversely affected. We average the cumulative abnormal returns of all firms in the customer industry as a measure of contagion within the customer industry. We form our second hypothesis as follows:

H2: The negative supplier stock market reaction to customers' earnings restatements is more pronounced if the customer industry is adversely affected.

2.2. Cross-sectional variation in spillover effects

The arguments above suggest several supplier- and relationship-specific characteristics that can affect the prediction of *H1* (i.e., negative supplier dependency-CAR relationship) such as supplier switching cost, supplier information asymmetry, and supplier financial constraints. We discuss each of these characteristics below.

2.2.1. Switching costs

A supplier's ability to withstand negative spillover effects can depend on its ability to switch to new customers or to redeploy intermediate products to new uses. Customer-supplier relationships often involve high levels of asset specificity, which makes the supplier vulnerable to adverse shocks stemming from its customers. The industrial organization literature suggests that switching costs for the supplier are higher when there are greater asset specificity and product customization (Williamson 1985; Williamson 1991). Following Titman (1984) and Titman and Wessels (1988), we use supplier R&D expenditures and selling, general, and administrative expenses, both normalized by total sales, as measures of the switching costs borne by suppliers. Supplier industry characteristics may also affect how suppliers are affected by their customers' earnings restatements. Suppliers in durable goods industries tend to face higher switching costs than those in other industries due to the uniqueness of their products and the importance of product guarantee (Titman 1984) and thus they are expected to experience more negative spillover effects from customers' earnings restatements. These arguments lead to the following hypothesis:

H2.2.1: The adverse spillover effect of earnings restatements by customer firms is more pronounced for dependent suppliers with higher switching costs.

2.2.2. Information asymmetry

The negative news conveyed by customers' earnings restatements is likely to be more severe for suppliers with greater information asymmetry since the continuity of trading relationships is more uncertain for these suppliers. Pandit et al. (2011) suggest that information asymmetry affects how

investors of supplier firms interpret earnings announcements by customer firms. Suppliers suffering from higher information asymmetry are expected to enjoy greater benefits on their firm value from their customers' certification role.¹⁰ When major customers restate earnings, their certifying ability will be weakened, reducing certification benefits for their suppliers. To the extent that the certification role of large customers is particularly important to suppliers that need more certification, we would expect that suppliers with higher information asymmetry are more adversely affected by their customers' earnings restatements due to the greater uncertainty on their future prospects. Thus, we hypothesize that:

H2.2.2: The adverse effect of earnings restatements by customer firms is more pronounced for dependent suppliers with higher information asymmetry.

2.2.3. Financial constraint

Restating customers are less likely to make prompt payments and/or continue the trading relationship with suppliers, thereby imposing severe liquidity problems on their suppliers. As financially constrained suppliers are less able to withstand liquidity problems resulted from their restating customers' internal control and financial weaknesses, we therefore hypothesize that these suppliers are more adversely affected by their customers' earnings restatements than non-financially constrained suppliers. Thus, our next hypothesis is stated as follows.

H2.2.3: The adverse effect of earnings restatements by customer firms is more pronounced for dependent suppliers with stronger financial constraints.

¹⁰ Johnson et al. (2010) examine the certification role of major customers in their suppliers' IPOs and find that IPO firms with a major customer experience higher valuation at the time of the IPO than those without a major customer. To the extent that IPO suppliers operate in a highly uncertain business environment and have severe information asymmetry problems, this result suggests that the certification role of major customers is stronger when suppliers have greater information asymmetry.

2.3. Post-restatement continuity of product market relationship

Fee and Thomas (2004) find that suppliers with high sales (revenue) dependency on the customers are more likely to be retained after horizontal mergers of their customers. When a customer has multiple suppliers, the high sales dependency of suppliers can certify a high product quality and hence, signify that these suppliers have more important relations with the customer than suppliers with low sales dependency. When the customer is forced to cut back on investments after earnings restatement (Kedia and Philippon 2009), it has to reduce or terminate input purchases from some suppliers. Rationally, the customer is expected to preserve more important suppliers in the relationship and sever the less important ones.¹¹ This leads to the following hypothesis:

H3: Product market relationships with low sales dependency are more likely to be terminated following a customer's earnings restatement.

2.4. Post-restatement supplier operating performance

Since earnings restatements reveal negative information about a customer's financial health, this negative information should manifest itself in a post-restatement supplier operating performance decline. Furthermore, customers' weakened incentives and abilities to invest in and maintain the post-restatement trading relationships can impose significant costs on suppliers, particularly on those with high sales dependency on customers. For example, restating customer firms may reduce or terminate input purchases from their suppliers, and provide less timely payments to their suppliers. Therefore, suppliers who are more dependent on the restating firms or those whose relationships with restating firms are

¹¹ It is also possible that suppliers can voluntarily choose to terminate their product market relationships with restating customers.

terminated are expected to experience poorer operating performance subsequent to their customers' earnings restatements than less dependent suppliers or retained suppliers. We also predict this effect to be more severe for suppliers with higher switching costs, larger asymmetric information, or stronger financial constraints since these suppliers can have more difficulty in switching to new trading partners and are more likely to suffer from liquidity problems. This leads to the following hypothesis:

H4: Supplier firms that are more dependent on restating firms or those that experience relationship termination have poorer post-restatement operating performance than other supplier firms. This negative effect is more severe for suppliers with higher switching costs, larger information asymmetry, or stronger financial constraints.

3. Sample and summary statistics

3.1. Sample

We identify major supplier-customer relationships from Compustat Business Segment Files. SFAS 14 requires that public firms disclose the names of their principal customers that account for at least 10 percent of their total sales or whose purchase has a material impact on their businesses. The amount of sales to each principal customer must also be disclosed.¹²

¹² SFAS 131 issued in June 1997 requires firms to disclose the sales to each principal customer, but not the name of the customer. However, S.E.C. Regulation S-K supersedes this requirement for firms with publicly traded equity (Ellis et al. (2009)). Under Regulation S-K (17 C.F.R. § 229.101) (Item 101), “the name of any customer and its relationship, if any, with the registrant or its subsidiaries shall be disclosed if sales to the customer by one or more segments are made in an aggregate amount equal to 10 percent or more of the registrant's consolidated revenues and the loss of such customer would have a material adverse effect on the registrant and its subsidiaries taken as a whole.” However, if for some reasons, firms do not comply with Regulation S-K and do not disclose their important customers with strong economic dependency; this would bias us against finding significant results that are consistent with our predictions.

To identify the major customers, we manually match the names of the principal customers to their GVKEY in Compustat by closely following the approach in Fee et al. (2006). For customer names that are abbreviated, visual inspection and industry affiliation are used to determine whether the customer is listed in Compustat. For the remaining unmatched customers, we search their corporate websites or the Directory of Corporate Affiliation database to determine whether the customer is a subsidiary of a listed firm and if so, assign it to its parent's GVKEY. To ensure accuracy of customer matching, any customer name that cannot be unambiguously matched to a GVKEY is classified as "unidentified" and discarded.

We obtain data on the list of firms engaging in earnings restatements over the period 1997 to 2006 from the 2003 and 2007 U.S. General Accounting Office (GAO) reports. During this period, there are 2,705 firms that restated their financial statements (inclusive of both intentional and unintentional financial misstatements). We then merge Compustat Business Segment Files with GAO database using GVKEY to identify restating customer firms. The restating firm must be a major customer to at least one supplier in order to be included in our sample. We further require both restating customers and their suppliers to have stock price and financial data available in CRSP and Compustat, respectively, in one year prior to earnings restatements. Duplicate restatements are excluded.

[Insert Table 1]

Panel A of Table 1 summarizes our sample selection criteria. Our final sample consists of 2,141 earnings restatement announcements, of which 1,852 are made by firms without suppliers and 289 by firms with suppliers. A total of 981 suppliers (with available financial data and stock prices) are affected by these customers' earnings restatements from 1997 to 2006.

Panel B of Table 1 shows the distribution of sample suppliers by fiscal year. The number of sample suppliers increases steadily over time except in 2006, consistent with the increasing incidence of earnings restatements over time in the GAO sample.¹³

3.2. Summary statistics

[Insert Table 2]

Table 2 presents the summary statistics for restating firms and their affected suppliers. Detailed definitions for the variables used in Table 2 are provided in Appendix. We winsorize all financial variables at the 1st and 99th percentiles of their distributions to minimize the influence of outliers. Several observations are noteworthy for restating firms. First, we find that restating firms with suppliers are larger and have higher leverage (ratio of the sum of short-term and long-term debt to total assets) than those without suppliers. Second, although restating firms with suppliers and those without suppliers have similar future growth opportunity as measured by Tobin's q (book value of assets minus book value of equity plus market value of equity divided by book value of assets), the former firms have higher operating performance (operating income divided by total sales) than the latter firms. Third, stock price run-up prior to the restatement announcement computed as the one year buy-and-hold abnormal returns preceding the restatement announcement (*Run-Up*) is -1.1% for restating firms with suppliers and -2.6% for restating firms without suppliers. The difference in price run-up between the two groups is not significant.

Next, restating firms with suppliers have lower R&D intensity (R&D expenditures divided by total sales) and lower selling, general, and administrative expense ratio (*UNIQUENESS*: selling, general

¹³ The number of observations decreases markedly in 2006 because the GAO database ended in June 2006.

and administrative expenses divided by total sales) than restating firms without suppliers.¹⁴ Fifth, although the average operating performance over the three years after the restatement announcement year is negative for both restating firms with and without suppliers, the former firms have significantly less negative post-restatement operating performance than the latter firms. Finally, firms with suppliers are more likely to engage in earnings restatements due to irregularities (i.e., intentional manipulations) than those without suppliers.¹⁵

Table 2 also shows the summary statistics for suppliers of restating firms. The average supplier in our sample has a total assets value of \$1.34 billion with a leverage ratio of 21 percent and Tobin's q of 2.09. Given that the average total assets value for restating customers is \$16.1 billion, the average customer in our sample is about 12 times larger than the average supplier.¹⁶ The restating customer accounts on average for 22.3 percent of its supplier sales (*Dependency*), suggesting that the supplier will lose 22 percent of its revenue in the event that its relationship with a restating firm is terminated and that it could not replace the existing customer with the new one. The magnitude of such revenue losses will undoubtedly create immediate financial difficulties for the supplier unless the supplier has perfectly hedged its trades or can immediately redeploy its products to other customers or uses. To the extent that perfect hedging is difficult when future contingencies are hard to predict, especially when relationship-

¹⁴ Missing values of R&D and selling, general, and administrative expenses are set to zero.

¹⁵ We obtain the irregularity-error classification for our sample of restatements from Andrew Leone's website and we thank Karen Hennes, Andrew Leone, and Brian Miller for making their data available.

¹⁶ The large customer size relative to its supplier is not surprising given the mechanical feature of the reporting requirements for our sample that the customer should account for at least 10 percent of a supplier's total sales. This feature allows us to use economically dependent trading partners (i.e., suppliers) in our analysis. It is also a key reason why we focus on the spillover effect of customer earnings restatement announcements on supplier value instead of the other way around.

specific investments are involved, and that the search costs of new customers are high, particularly when suppliers produce products and services that are unique to a certain customer, the suppliers in our sample are likely to have strong economic linkages to the restating firms simply due to the intensity of their trades with the restating firms.

We also find that the average supplier in our sample experiences poor past performance prior to its customer's earnings restatement, with operating performance of -49.9 percent. However, the median operating performance is 0.5 percent, suggesting that supplier past performance is highly skewed. In the one year running up to the restatement announcements, the average supplier experiences a positive buy-and-hold return of 7.4 percent while the median supplier experiences a negative buy-and-hold return of -11.9 percent. The mean R&D intensity and selling, general, and administrative expense ratio are 23.9 percent and 51.3 percent, respectively, suggesting that our sample suppliers face high switching costs when their major customer relationships are terminated. In addition, we find that the mean post-restatement operating performance is -36.5 percent.

Finally, to capture the continuity of the product market relationship after the restatement, we create a *Severance* indicator that takes the value of one if the customer-supplier relationship is terminated within a year of the restatement and zero otherwise. We find that 57 percent of our sample suppliers experience relationship termination in the year after the restatement announcement. Overall, these results provide preliminary evidence that suppliers have characteristics that can exacerbate the negative spillover effects of customers' earnings restatements on their values.

4. Empirical results

4.1. Analyses of announcement effects

In this subsection, we examine the valuation effect of earnings restatements on announcing firms and their suppliers. To estimate the abnormal returns, we employ the standard event study approach. We compute the daily abnormal return by subtracting the daily value-weighted CRSP index return from the restating firm's (supplier's) daily stock return. We sum the daily abnormal returns to compute the cumulative abnormal return (*CAR*) from t_1 days before the restatement announcement date to t_2 days after the announcement restatement date.

[Insert Table 3]

Panel A of Table 3 reports the *CARs* for the restating firms. The mean *CAR* $(-1, 1)$, *CAR* $(-2, 2)$, and *CAR* $(-5, 5)$ for restating firms with at least one supplier are -3.7 percent, -4.1 percent, and -3.9 percent, respectively. These *CARs* are all statistically significant at the 1% level. Similarly, the mean *CAR* $(-1, 1)$, *CAR* $(-2, 2)$, and *CAR* $(-5, 5)$ for restating firms without a supplier are -4.3 percent, -4.8 percent, and -5.1 percent, respectively, all of which are also significant at the 1% level. The difference in the mean *CARs* between the two groups is not significant. The median *CARs* for restating firms with and without suppliers show a similar pattern except that the median *CAR* $(-5, 5)$ for restating firms with a supplier is marginally less negative than the median *CAR* $(-5, 5)$ for restating firms without a supplier.

Panel B of Table 3 shows the *CARs* for suppliers of the restating firms. The mean *CAR* $(-1, 1)$, *CAR* $(-2, 2)$, and *CAR* $(-5, 5)$ for the suppliers of restating firms are small and insignificant at -0.5 percent,

-0.4 percent, and -0.2 percent, respectively. However, the median *CAR* (-1, 1) and *CAR* (-2, 2) are negative and significant at -0.7 percent and -0.4 percent, respectively.

The relatively small magnitude of the *CARs* for the suppliers of restating firms and their lack of statistical significance in Panel B of Table 3 are expected because the announcement effects of customers' earnings restatements can vary substantially with the severity of restatements (Hennes et al. 2008). To unambiguously investigate the spillover effects of customers' earnings restatements, as set out in Panel C of Table 3, we divide our sample suppliers into two subgroups based on whether or not the customer *CAR* (-2, 2) is positive or negative. When customer abnormal returns are positive (negative), we assume that the market perceives customers' earnings restatement announcements as good (bad) news. We find that the mean supplier *CAR* (-1, 1), *CAR* (-2, 2), *CAR* (-5, 5) are -1.4 percent, -1.2 percent, and -1.7 percent, respectively, for earnings restatements associated with negative customer *CARs*, all of which are significant at the 5 percent level or lower. In contrast, the corresponding supplier *CARs* for earnings restatements associated with positive customer *CARs* are positive and sometimes marginally significant. The differences in *CARs* between these two groups are significant. Thus, the negative effect of customers' earnings restatements on supplier value is particularly pronounced when the market perceives the restatement announcements to be bad news. The median shows a similar pattern.

In unreported tests, we also experiment with the market-model approach. Using daily stock returns beginning 211 trading days prior to and ending 11 trading days prior to the restatement announcement date, we estimate a one-factor market model in which the CRSP value-weighted index is used as the market portfolio. Our results are robust to using abnormal returns estimated from the market model.

However, we prefer a market-adjusted approach over a market model approach because the pre-announcement return pattern could bias coefficient estimates from the market model (Palmrose et al. 2004).

To better understand the cross-sectional variation in supplier *CARs*, we present estimates from ordinary least squares (OLS) regressions using supplier *CARs* (-2, 2) as the dependent variable. We use the following baseline regression specification:

$$\begin{aligned} \text{Supplier CAR} = & \beta_0 + \beta_1 \times \text{Dependency} + \beta_2 \times \text{Size} + \beta_3 \times \text{Leverage} + \\ & \beta_4 \times \text{Operating Performance} + \beta_5 \times \text{Run-up} + \beta_6 \times \text{Customer CAR} + \varepsilon \end{aligned} \quad (1)$$

[Insert Table 4]

Our key variable of interest is the supplier's sales dependency on the restating customer firm, *Dependency*, which is computed as the ratio of a supplier's sales to the customer to its total sales. The regressions also control for several variables that may affect supplier *CARs*. We control for supplier size (logarithm of total assets) since larger suppliers are likely to be less vulnerable to negative externalities stemming from their customers. We also control for the supplier's leverage since prior studies show that product market relationships influence a firm's capital structure (Titman 1984; Maksimovic and Titman 1991; Kale and Shahrur 2007; Banerjee et al. 2008). Moreover, highly leveraged firms would face greater financial distress risks when their customers suffer from financial problems. Next, we control for supplier past operating performance. A well-performing supplier is more likely to survive negative externalities stemming from their trade partners than a poorly performing firm and they should therefore suffer fewer difficulties. Another control variable we include in the regression is the supplier's stock

price run-up prior to the restatement announcement. If news of the restatements has leaked out prior to the actual announcements, the stock prices of suppliers could have partially or even fully incorporated the adverse effect of their customer's restatements. This variable also measures the supplier's past stock performance prior to its customer's earnings restatement.

It is possible that our measure of a supplier's sales dependency on the restating firm (*Dependency*) simply captures the normal correlation between supplier and customer stock returns (Pandit, et al. 2011). Thus, we add the correlation between supplier and customer daily stock returns in the year prior to restatement announcements (*Return Correlation*) as an additional control variable. Yet, another possibility is that *Dependency* simply measures the supplier's earnings quality if the supplier with high *Dependency* tends to have similar earnings quality as its restating customer. In this case, suppliers of restating firms can be negatively affected not because of their economic links to the restating firms, but because these restatements convey negative information about the financial reporting quality of supplier firms themselves. To control for this effect, we include a supplier's earnings quality in the regression. To measure a supplier's earnings quality, we use the absolute value of discretionary accruals estimated using the modified Jones Model (Dechow et al. 1995). More specifically, we first estimate the following cross-sectional regression by year for each two-digit SIC industry.

$$\frac{TA_{i,t}}{Assets_{i,t-1}} = \beta_0 \times \frac{1}{Assets_{i,t-1}} + \beta_1 \times \frac{\Delta Sale_{i,t}}{Assets_{i,t-1}} + \beta_2 \times \frac{PPE_{i,t}}{Assets_{i,t-1}} + \varepsilon_{i,t} \quad (2)$$

where $Assets_{i,t-1}$ is total assets for firm i at the beginning of fiscal year t , $TA_{i,t}$ is total accruals for firm i in year t , which is calculated as income before extraordinary items minus cash flows from operating

activities adjusted for extraordinary items and discontinued operations, $\Delta Sale_{i,t}$ is change in sales, and $PPE_{i,t}$ is gross value of property, plant, and equipment.

The estimated coefficients from the above regression are then used to estimate discretionary accruals. We include change in accounts receivable, $\Delta AR_{i,t}$, to capture the extent to which a change in sales is due to aggressive recognition of questionable credit sales. Discretionary accruals, $DA_{i,t}$, is computed as:

$$DA_{i,t} = \frac{TA_{i,t}}{Assets_{i,t-1}} - \hat{\beta}_0 \times \frac{1}{Assets_{i,t-1}} - \hat{\beta}_1 \times \frac{(\Delta Sale_{i,t} - \Delta AR_{i,t})}{Assets_{i,t-1}} - \hat{\beta}_2 \times \frac{PPE_{i,t}}{Assets_{i,t-1}} \quad (3)$$

Finally, we control for customer CAR (-2, 2) as well as calendar year and two-digit SIC industry fixed effects using calendar year and two-digit SIC code indicators, respectively. All financial control variables are measured as of the fiscal year-end that immediately precedes the restatement announcement unless otherwise noted. Standard errors are robust and clustered at the restating customer firm level. Sample size varies across regression specifications because not all variables are available for estimation.

The regression results are reported in Table 4. Column (1) of Table 4 shows that supplier CAR (-2, 2) worsens as the supplier's sales dependency on the restating firm increases. The coefficient estimate on *Dependency* is -0.081, which is significant at the 1 percent level, suggesting that all else being equal, a 10 percent increase in revenue dependency reduces supplier CAR by 0.8 percent over the five-day window. Given that the mean supplier CAR for the full sample is only -0.4 percent, a 0.8 percent decrease is economically large and significant. We also find that suppliers with higher previous stock performance (*Run-up*) and those whose customers' earnings restatement announcements are greeted more positively by the market experience less negative $CARs$.

In column (2) of Table 4, we add *Return Correlation* as an additional control variable. We find that the coefficient estimate on this variable is not significant while the significance of our sales dependency measure remains unchanged.

In column (3) of Table 4, we add *Earnings Quality* in the regression. We find no significant relation between the supplier *CAR* and its earnings quality. The negative relation between the supplier *CAR* and its economic dependency on the restating firm remains statistically significant even after controlling for supplier earnings quality. Thus, *Dependency* is unlikely to spuriously capture supplier earnings quality. Overall, these results support *H1*.

It might be argued that including customer *CAR* is not sufficient to control for the value relevant information conveyed in each restatement. As a robustness check, we include restatement event fixed effects in our regression to control for restatement-specific characteristics and present the regression coefficient estimates in column (4) of Table 4. We find that the negative relation between supplier *CAR* and its economic dependency on the restating firm remains statistically significant. Moreover, the economic magnitude of the dependency variable is quantitatively similar to that in column (1).

[Insert Table 5]

In Table 5, we examine whether the negative spillover effect of customers' earnings restatement announcements on supplier *CARs* shown in Table 4 differs depending on the severity of news about their restatements. Although earnings restatements generally tend to increase uncertainty about the restating firm's future prospects, earnings restatements that contain more negative news are likely to result in more severe consequences than earnings restatements that contain less negative news.

First, we use the market reaction to restating announcements by customer firms as a measure of the severity of their restatements. If the restatement constitutes non-negative (negative) news, we would expect customer *CAR* to be non-negative (negative) and thus the adverse spillover effect on supplier value to be more pronounced when customer *CARs* are negative than when customer *CARs* are positive. Consistent with this view, when we split the sample by the sign of customer *CARs* (-2, 2), we find that the negative relation between the supplier *CAR* and *Dependency* is evident only for the subsample of suppliers whose customers make restatement announcements that contain negative news (column (2)). Specifically, we find that for the subsample of suppliers whose customers experience negative *CARs*, a 10 percent increase in their revenue dependency on the restating customers reduces their *CARs* (-2, 2) by almost 1 percent. In comparison, for the subsample of suppliers whose customers' restatements constitute non-negative news, the coefficient estimate on *Dependency* is an insignificant -0.055 (column (1)).

However, although we find a significant negative relation between supplier announcement returns and supplier dependency in restatement announcements that constitute negative news, we cannot ignore that the same relation is also negative in restatement announcements that constitute positive news. Particularly, we note that the number of restatements with negative market reactions is almost twice the number of restatements with positive market reactions. Thus, the lack of statistical significance in the latter case could be due to a lack of statistical power from the smaller sample size. To err on the side of conservatism, we report results using the full sample of restatement announcements (both positive news and negative news) in our subsequent analyses. Thus, our coefficient estimates are likely to be conservative estimates of the true impact of earnings restatements on the restating firms' suppliers.

Next, we use whether customers' earnings restatements are due to irregularities or errors as a measure of the severity of earnings restatements. The GAO sample includes earnings restatements due to both financial reporting frauds or irregularities (i.e., intentional misreporting) and accounting errors (i.e., unintentional misstatements). Hennes et al. (2008) classify a restatement as an irregularity if it satisfies at least one of the three criteria: (i) variants of the words "irregularity" or "fraud" were explicitly used in restatement announcements or relevant filings in the four years around the restatement; (ii) the misstatements came under Securities and Exchange Commission (SEC) or Department of Justice (DOJ) investigations; and (iii) independent investigations were launched by boards of directors of restatement firms. In a sample of restatements between 2002 and 2005, Hennes et al. (2008) show that relative to error restatements, irregularity restatements have significantly more negative announcement returns, are followed by a significantly higher rate of shareholder class action lawsuits, and lead to significantly more CEO/CFO turnovers. Thus, to the extent that earnings restatements due to accounting irregularities contain more negative information than those due to accounting errors, we expect the severity of earnings restatements to be greater in the former type of earnings restatements than in the latter type of earnings restatements.

When we partition the sample into irregularity and error subsamples and re-estimate equation (1) separately for these subsamples (columns (3) and (4)), we find that the negative relation between the supplier *CAR* and *Dependency* exists in both subsamples. Although the negative relation is more pronounced in the irregularity subsample than in the error subsample, the difference between the two coefficient estimates is not statistically significant at the conventional level. Thus, the negative spillover

effect of customers' earnings restatement announcements on the market value of dependent suppliers is not limited to intentional misreporting, but also to unintentional misstatements.¹⁷

We also examine whether contagion within the customer industry affects the supplier *CARs*. If the entire customer industry is adversely affected by the news conveyed in customers' earnings restatements, it becomes difficult for suppliers to redeploy their products to firms in the same industry as the restating customer firms. Thus, industry contagion can impose high switching costs to suppliers. To capture the extent of intra-industry contagion stemming from a customer firm's earnings restatement, we construct an average customer industry market reaction variable (*INDUSTRY CAR(-2,+2)*). *INDUSTRY CAR(-2,+2)* is the average five-day cumulative abnormal returns of all firms in the same industry as the restating firm where industry is defined according to 2-digit SIC codes.¹⁸ Table 6 presents the results.

[Insert Table 6]

We find that the coefficient estimate on *INDUSTRY CAR (-2,+2)* is positive and significant at the 1 percent level, indicating that supplier *CARs* worsen when the customer industry responds more negatively to its customer's earnings restatement. This result is consistent with a higher switching cost for suppliers when there are stronger intra-industry contagion effects in the restating customer's industry, possibly due a lower chance of redeploying suppliers' intermediate products to other firms in the customer's industry. This result supports *H2*. Including *INDUSTRY CAR(-2,+2)* in the regression does not change the significance of *Dependency*.

¹⁷ We obtain similar results when we use supplier *CARs* (-1, 1) and *CARs* (-5, 5) as the dependent variables, use CRSP equally weighted index as the market index to compute *CARs*, or use the market model to estimate *CARs*.

¹⁸ In untabulated tests, we find that the mean and median *INDUSTRY CAR (-2,+2)* are close to zero and insignificant.

4.2. Cross-sectional variation in supplier CARs

In this subsection, we examine whether supplier- and relationship-specific variables discussed in Section 2 have an effect on the negative supplier *Dependency-CAR* relationship. As mentioned in the previous section, we use the full sample of earnings restatements and not just earnings restatements that are perceived negatively by the market in order to obtain more conservative estimates.

First, we examine whether the supplier's switching costs as measured by the level of their asset specificity and the importance of their product guarantee affects the spillover effects of customers' earnings restatements on supplier value. We use supplier R&D intensity, product uniqueness (selling, general, and administrative expense ratio), and product guarantee and servicing commitment to measure the switching costs. The regression results are presented in Table 7.

[Insert Table 7]

Panel A shows the results using the level of suppliers' asset specificity as the measure of switching costs. Columns (1) and (2) present the regression results for the subsamples of suppliers with above-median R&D intensity and suppliers with below-median R&D intensity, respectively. We find that the negative relation between supplier *CAR* and *Dependency* is evident only for the subsample of suppliers with high switching costs (i.e., suppliers with above-median R&D intensity). The coefficient estimate of -0.152 in column (1) suggests that for a 10 percent increase in revenue dependency, supplier *CAR* is reduced by almost 1.52 percent over a five-day window for suppliers with high R&D intensity. In contrast, the corresponding coefficient estimate for supplier with low R&D intensity is positive and insignificant.

Columns (3) and (4) present the regression results for the subsamples of suppliers with above-median product uniqueness and suppliers with below-median product uniqueness. Consistent with the results in previous columns, we find that the negative relation between supplier *CAR* and *Dependency* exists only for the subsample of suppliers with high switching costs (i.e., suppliers with above-median product uniqueness). We find that for suppliers with high product uniqueness, for a 10 percent increase in revenue dependency, supplier *CAR* is reduced by about 0.99 percent over a five-day window (column (3)). In contrast, there is an insignificant negative relation between supplier *CAR* and *Dependency* for supplier with low product uniqueness (column (4)).

As a further test of the importance of the supplier's switching costs in explaining the spillover effects of customers' earnings restatements on supplier *CARs*, we examine whether the adverse spillover effects are pronounced when suppliers provide highly valued servicing and product guarantees to their customers. To this end, we divide our sample suppliers into suppliers in durable goods manufacturing industries (4-digit SIC codes between 3400 and 4000), suppliers in non-durable goods manufacturing industries (4-digit SIC codes between 2000 and 3400, and suppliers in non-manufacturing industries (all other industries), and re-estimate equation (1) separately for these subsamples. The results are reported in Panel B of Table 7. Consistent with the results in Panel A of Table 7, we find that the negative spillover effect is particularly pronounced for dependent suppliers in durable goods manufacturing industries where switching costs are expected to be the highest (column (1)). These results are consistent with the prediction of *H2.2.1*.

Second, we examine whether the supplier's information asymmetry exacerbate the spillover effects of customers' earnings restatement announcements on its value. We use idiosyncratic volatility of the supplier's past stock returns and the existence of analyst coverage to measure the level of its information asymmetry. Table 8 reports the regression results.

[Insert Table 8]

Columns (1) and (2) of Table 8 present the regression results for the subsamples of suppliers with above-median idiosyncratic volatility and suppliers with below-median idiosyncratic volatility, respectively. We find that the coefficient estimate on *Dependency* is negative and significant for the subsamples of suppliers with above-median idiosyncratic volatility (column (1)) but positive and insignificant for the subsamples of suppliers with below-median idiosyncratic volatility (column (2)).

Columns (3) and (4) of Table 8 show the regression results for the subsamples of suppliers with analyst coverage and suppliers without analyst coverage, respectively. We find that the negative relation between the supplier *CAR* and *Dependency* is stronger for the subsample of suppliers without analyst coverage than for the subsample of suppliers with analyst coverage (-0.093 compared to -0.053), although the difference in coefficient estimates between the two subsamples is not statistically significant.

Overall, these results suggest that greater information asymmetry exacerbates the negative spillover effect for supplier firms with restating customers and support *H2.2.2*.

Third, we examine whether financial constraints faced by suppliers affects the extent of negative spillover effects for suppliers firms with restating customers. We use two different measures of financial constraints, namely, the new Kaplan-Zingales index (*NKZ* index) as described in Hadlock and Pierce

(2010) and the Whited and Wu (2006)'s financial constraint index (*WW* index). *NKZ* index is measured as follows:

$$NKZ_{i,t} = -0.009 \times \frac{CF_{i,t}}{K_{i,t-1}} + 0.031 \times Q_{i,t} + 2.643 \times Leverage_{i,t} + 0.224 \times \frac{Dividend_{i,t}}{K_{i,t-1}} + 0.017 \times \frac{C_{i,t}}{K_{i,t-1}} \quad (4)$$

where *CF* is income before extraordinary items plus depreciation and *K* is property, plant, and equipment. Tobin's *Q* is measured as book value of total assets, plus market value of equity, minus book value of equity, minus deferred taxes, and scaled by total assets. *Leverage* is calculated as total debt (long term debt + short term debt) divided by total capital (long term debt + short term debt + stockholder's equity). It is set to one if stockholder's equity is negative. *Dividend* is common dividends plus preferred dividends and *C* is total cash.

WW index is calculated as follows:

$$WW_{i,t} = -0.091 \times \frac{CF_{i,t}}{AT_{i,t-1}} - 0.062 \times DividendDummy_{i,t} + 0.021 \times Leverage_{i,t} - 0.044 \times LOG(AT_{i,t}) + 0.102 \times IndustrySalesGrowth_{i,t} - 0.035 \times SalesGrowth_{i,t} \quad (5)$$

where *CF* is operating cash flow and *AT* is total assets. The indicator for dividend payment, *DividendDummy*, takes the value of one if the firm pays cash dividends in the year and zero otherwise. Book leverage ratio, *Leverage*, is measured as total debt (long term debt + short term debt) divided by total assets. *SalesGrowth* is percentage change in sales. *IndustrySalesGrowth* is the average sales growth of all firms in the three-digit SIC industry to which the firm in question belongs.

[Insert Table 9]

Columns (1) and (2) of Table 9 present the regression results for the subsamples of suppliers with above-median *NKZ* index (more constrained suppliers) and suppliers with below-median *NKZ* index (less constrained suppliers), respectively. We find that the negative relation between the supplier *CAR* and *Dependency* is more pronounced for the subsample of more financially constrained suppliers than the subsample of less financially constrained suppliers (-0.120 compared to -0.059). The difference in coefficient estimates on *Dependency* between the two subsamples, however, is not statistically significant at the conventional level.

Columns (3) and (4) of Table 9 show the regression results for the subsamples of suppliers with above-median *WW* index (more constrained suppliers) and suppliers with below-median *WW* index (less constrained suppliers), respectively. The coefficient estimate on *Dependency* is negative and significant only for suppliers with high *WW* index (column (3)). These results suggest that dependent suppliers with higher financial constraints experience more negative spillover effects from their customers' earnings restatements, supporting *H2.2.3*. In unreported tests, we use the subsample of earnings restatements that are perceived negatively by the market. Our results remain robust

4.3. Duration of post-restatement product market relationship

In this subsection, we examine whether the probability of a post-restatement termination of the supplier's relationship with the restating firm is significantly different for suppliers with high *Dependency* and suppliers with low *Dependency*. We use the following regression specification and employ the full restatement sample:

$$\begin{aligned}
\text{Prob}(\textit{Severance}) = & F(\beta_0 + \beta_1 \times \textit{Dependency} + \beta_2 \times \textit{Size} + \beta_3 \times \textit{Leverage} + \\
& \beta_4 \times \textit{Operating Performance} + \beta_5 \times \textit{Run - up} + \beta_6 \times \textit{Customer CAR} + \varepsilon) \quad (6)
\end{aligned}$$

We use as the dependent variable a *Severance* indicator that takes the value of one if the customer-supplier relationship is terminated within a year of the restatement and zero otherwise. We follow Fee and Thomas (2004) in our definition of termination. The trading relationship is terminated when the supplier no longer generates at least 10% of its revenues from the restating firm although it could continue selling to the customer. Termination therefore captures the change of a trading relationship from major to non-major or to naught. Unfortunately, we cannot distinguish between the two outcomes as firms are only required to report major customers. We use the same control variables as those used in supplier announcement return regressions and measure these variables in the fiscal year prior to the restatement date. We also include calendar year and two-digit SIC industry fixed effects.

[Insert Table 10]

Table 10 presents the results from the logistic regression. Column (1) shows that more dependent suppliers are more likely to be retained after their customers' earnings restatements. In terms of marginal effects, a 10 percent increase in *Dependency* is associated with a 4.4 percent reduction in the likelihood of relationship termination, keeping all other variables constant at their means. In perspective, the result indicates that the supplier's trading relationship has a 4.4 percent lower chance to change from major to non-major or naught when its dependency increases by 10%. This finding is consistent with *H3*. We also find that large suppliers and suppliers that are less negatively affected by their customers' restatements, as measured by *CAR* (-2, 2), are more likely to be retained after their customers' earnings restatements.

In column (2) of Table 10, we re-estimate the likelihood of relationship termination using the conditional logistic model.¹⁹ This method, which uses only restating firms with multiple suppliers in the estimation, allows us to control for time-invariant customer firm characteristics that may affect the likelihood of product market relationship severance. We find that the results remain the same. In unreported tests, we use the subsample of earnings restatements that are perceived negatively by the market. Our results remain robust.

4.4. Post-restatement changes in operating performance of suppliers

The results from the event study in previous subsections are consistent with an ex ante market expectation of a significant deterioration in major customer-supplier relationships following customers' earnings restatements. In this subsection, we present supporting evidence that customers' restatements affect post-restatement operating performance of suppliers. We follow Fee and Thomas (2004) and use operating income divided by total sales as the measure of firm operating performance. The regression specification is as follows:

$$\begin{aligned}
 \text{Supplier Post} - \text{Restatement Operating Performance} = & \beta_0 + \beta_1 \times \text{Dependency} + \beta_2 \times \\
 & \text{Severance} + \beta_3 \times \text{Size} + \beta_4 \times \text{Leverage} + \beta_5 \times \text{Operating Performance} + \beta_6 \times \text{Run} - \text{up} + \\
 & \beta_7 \text{Customer CAR} + \varepsilon
 \end{aligned}
 \tag{7}$$

The dependent variable is the average operating performance in the three years following customers' earning restatements. The control variables are the same as those we used in supplier announcement return regression and are measured in the fiscal year prior to the restatement date. In

¹⁹ Conditional (fixed effect) logistic model is estimated using only restating firms with at least two suppliers and utilizes within restating firm variation.

addition, we include the *Severance* dummy in the performance regression. We also include calendar year and two-digit SIC industry fixed effects.

[Insert Table 11]

The results are presented in Table 11. In column (1), we find that a 10 percent increase in *Dependency* reduces the supplier's post-restatement raw operating performance by 11.27 percent. This result supports *H4*. Moreover, the supplier raw operating performance falls sharply by about 38.6 percent when its relationship with the restating customer is terminated within a year of the restatement. Using industry median-adjusted operating performance as the dependent variable leads to qualitatively similar results (column (2)). The industry median-adjusted operating performance is estimated by subtracting the median two-digit SIC industry operating performance from each firm's raw operating performance.

Next, we examine how supplier characteristics such as switching costs, information asymmetry and financial constraint affect post-restatement operating performance of suppliers. We divide the sample into subgroups according to these supplier characteristics and re-estimate equation (7) separately for these subgroups. The results are reported in Table 12.

[Insert Table 12]

In Panel A of Table 12, we use the industry median-adjusted post-restatement operating performance of suppliers as the dependent variable and partition the sample according to above-median (high) supplier switching costs and below-median (low) supplier switching costs, as measured by R&D intensity and product uniqueness. We find that the coefficient estimates on *Dependency* are negative and significant only for the subsamples of suppliers with high R&D intensity and high product uniqueness.

Tests of equal coefficients support significantly more negative coefficients for the high switching costs subsamples than the low switching costs subsamples, by both measures of switching costs. In addition, tests of equal coefficients indicate significantly more negative coefficients on the *Severance* dummy for the high switching costs subsamples than the low switching costs subsamples, again by both measures of switching costs. These results indicate that the negative dependency/severance and post-restatement operating performance relationship is more pronounced for suppliers that face high switching costs.

In Panel B, we partition the sample according to above- median (high) supplier information asymmetry and below-median (low) supplier information asymmetry, as measured by idiosyncratic stock returns volatility and the availability of analyst coverage. We find that the negative severance and post-restatement operating performance relationship is more pronounced for suppliers that face high information asymmetry where information asymmetry is measured by idiosyncratic volatility.

In Panel C, we partition the sample according to above-median (high) supplier financial constraints and below-median (low) supplier financial constraints, as measured by the new Kaplan-Zingales financial constraint index (*NKZ* index) and Whited and Wu (2006)'s financial constraint index (*WW* index). We find that the negative dependency/severance and post-restatement operating performance relationship is more pronounced for suppliers that are financially constrained as measured by the *WW* index and the difference in coefficients estimates across subsamples is statistically significant for the *Dependency* variable.

In sum, we find that more dependent suppliers and terminated suppliers suffer worse operating performance subsequent to earnings restatements by their customers, particularly when these suppliers

have high switching costs and strong financial constraints. We also find some evidence that the negative severance and post-restatement operating performance relationship is more pronounced for suppliers with large information asymmetry. Our results largely support *H4*. In unreported tests, we use the subsample of earnings restatements that are perceived negatively by the market. Our results remain robust.

5. Summary and conclusion

Using firm-level product market relationship data, we examine how firms' earnings restatements affect their suppliers. We find that the suppliers experience strong negative abnormal returns around their customers' earnings restatement announcements, particularly when their sales dependency on restating customers is large or when the customer industry experiences more adverse contagion effect. This negative spillover effect (i.e., negative supplier dependency-CAR relationship) of customers' earnings restatement announcements on supplier value is particularly pronounced when the customer announcement returns convey more negative information, when suppliers face higher switching costs, when suppliers have larger information asymmetry, or are more financially constrained.

We also find that the product market relationship between a restating firm and its supplier is more likely to be terminated when the suppliers are less dependent on its customer. Moreover, suppliers that are more dependent on the restating firms or suppliers who lost their relationships with restating customers experience worse operating performance post-restatement.

Overall, these findings suggest that the adverse impact of customers' earnings restatements is not limited to restating firms but also extend to major trading partners along the supply chain. Our results provide new insights into how negative information about the uncertainty over the stability in major

trading relationships affects economic links between member firms in the supply chain and shed new light on the impact of earnings restatements on stakeholder wealth.

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Table 1
Sample construction

The sample consists of 2,141 earnings restatement announcements from 1997 to 2006, of which 1,852 are made by firms without suppliers and 289 by firms with suppliers. A total of 981 suppliers are affected by these customers' earnings restatements. We require restating firms and their suppliers to have available stock price and financial data. Panel A summarizes sample selection criteria and Panel B presents sample distribution by calendar year.

Panel A: Sample selection			
Number of GAO restatements from 1997 to 2006			2,705
Less: duplicate customer restatements or restatements without stock price and financial information			(564)
Number of GAO restatements			2,141
Number of restatement events without suppliers			1,852
Number of restatement events with suppliers			289
Number of suppliers affected by customers' restatements			1,219
Less: suppliers without stock price and financial information			(238)
Sample number of suppliers affected by customers' restatement			981
Number of unique restating firms			193
Number of unique suppliers			636
Number of unique restatement announcements			240

Panel B: Supplier sample distribution by year			
Year	Frequency of restatements	Percent	Cumulative percent
1997	6	0.61	0.61
1998	32	3.26	3.87
1999	69	7.03	10.91
2000	94	9.58	20.49
2001	132	13.46	33.94
2002	114	11.62	45.57
2003	113	11.52	57.08
2004	92	9.38	66.46
2005	268	27.32	93.78
2006	61	6.22	100
Total	981	100	-

Tables 2
Summary statistics

The sample consists of 2,141 earnings restatement announcements from 1997 to 2006, of which 1,852 are made by firms without suppliers and 289 by firms with suppliers. A total of 981 suppliers are affected by these customers' earnings restatements. We require restating firms and their suppliers to have available stock price and financial data. Variables are described in the appendix. ***, **, and * represent statistical significance based on two-sided tests at the 1 percent, 5 percent, and 10 percent levels, respectively.

Variables	Restating firms			Test of difference (<i>p</i> -value) <i>t</i> -test [Wilcoxon <i>z</i> -test]	Suppliers (N=981) Mean [Median]
	Full sample (N=2,141) Mean [Median]	Restating firms without suppliers (N=1,852) Mean [Median]	Restating firms with suppliers (N=289) Mean [Median]		
	Total Assets (in \$millions)	4,444.363 [428.859]	2,624.906 [315.467]		
Leverage	0.259 [0.211]	0.250 [0.195]	0.312 [0.257]	0.01 *** [0.01]***	0.208 [0.150]
Tobin's <i>q</i>	1.941 [1.337]	1.957 [1.333]	1.836 [1.360]	0.29 [0.34]	2.093 [1.493]
Operating Performance	-0.325 [0.015]	-0.362 [0.014]	-0.085 [0.018]	0.01 *** [0.11]	-0.499 [0.005]
Run-Up	-0.024 [-0.101]	-0.026 [-0.101]	-0.011 [-0.010]	0.70 [0.64]	0.074 [-0.119]
R&D	0.123 [0.000]	0.134 [0.000]	0.056 [0.000]	0.02 ** [0.92]	0.239 [0.027]
Uniqueness	0.426 [0.273]	0.448 [0.282]	0.285 [0.225]	0.01 *** [0.01]***	0.513 [0.279]
Post restatement Operating Performance	-0.416 [0.013]	-0.481 [0.010]	-0.022 [0.026]	0.01 *** [0.01]***	-0.365 [-0.010]
Irregularity (indicator)	0.241 [0.000]	0.231 [0.000]	0.305 [0.000]	0.01 *** [0.01]***	0.415 [0.000]
Dependency	-	-	-	-	0.223 [0.165]
Severance (indicator)	-	-	-	-	0.570 [1.000]

Table 3

Cumulative abnormal returns (CARs) for restating firms and their suppliers around the restatement announcements

The sample consists of 2,141 earnings restatement announcements from 1997 to 2006, of which 1,852 are made by firms without suppliers and 289 by firms with suppliers. A total of 981 suppliers are affected by these customers' earnings restatements. We require restating firms and their suppliers to have available stock price and financial data. To estimate the abnormal returns, we employ a market-adjusted event study methodology. We compute the daily abnormal return by subtracting the daily value-weighted CRSP index return from the restating firm's (supplier's) daily stock return. We sum the daily abnormal returns to compute the cumulative abnormal return (CAR) from $t1$ day before the restatement announcement date to $t2$ days after the announcement restatement date. ***, **, and * represent statistical significance based on two-sided tests at the 1 percent, 5 percent, and 10 percent levels, respectively

Panel A: CARs for restating firms with and without suppliers										
	A: With suppliers (N=289)				B: Without suppliers (N=1,852)				Test of difference (B-A)	
	Mean	<i>t</i> -test (<i>p</i> -value)	Median	Signed-rank Statistics (<i>p</i> -value)	Mean	<i>t</i> -test (<i>p</i> -value)	Median	Signed-rank statistics (<i>p</i> -value)	<i>t</i> -test (<i>p</i> -value)	Wilcoxon z-test (<i>p</i> -value)
CAR (-1, 1)	-0.037	0.01***	-0.011	001***	-0.043	0.01***	-0.017	0.01***	0.47	0.17
CAR (-2, 2)	-0.041	0.01***	-0.012	001***	-0.048	0.01***	-0.019	0.01***	0.48	0.22
CAR (-5, 5)	-0.039	0.01***	-0.011	0.01***	-0.051	0.01***	-0.022	0.01***	0.28	0.09*

Panel B: CARs for restating customers' suppliers (N=981)				
	Mean	<i>t</i> -test (<i>p</i> -value)	Median	Signed-rank statistics (<i>p</i> -value)
CAR (-1, 1)	-0.005	0.38	-0.007	0.01***
CAR (-2, 2)	-0.004	0.49	-0.004	0.02**
CAR (-5, 5)	-0.002	0.81	-0.007	0.14

Panel C: CARs for suppliers according to the sign of the restating firm's CAR (-2, 2)										
	A: Positive customer CARs (N=355)				B: Negative customer CARs (N=626)				Test of difference (B-A)	
	Mean	<i>t</i> -test (<i>p</i> -value)	Median	Signed-rank statistics (<i>p</i> -value)	Mean	<i>t</i> -test (<i>p</i> -value)	Median	Signed-rank statistics (<i>p</i> -value)	<i>t</i> -test (<i>p</i> -value)	Wilcoxon z-test (<i>p</i> -value)
CAR (-1, 1)	0.012	0.35	0.000	0.90	-0.014	0.01***	-0.010	0.01***	0.02**	0.01***
CAR (-2, 2)	0.009	0.47	0.000	0.96	-0.012	0.02**	-0.007	0.01***	0.08*	0.08*
CAR (-5, 5)	0.025	0.04*	0.005	0.08	-0.017	0.03**	-0.013	0.01***	0.01***	0.01***

Table 4
OLS regressions of supplier cumulative abnormal returns on explanatory variables:
Baseline results

The sample consists of 981 suppliers of 240 earnings restatements from 1997 to 2006. We require suppliers to have available stock price and financial data. To estimate the abnormal returns, we employ a market-adjusted event study methodology. We compute the daily abnormal return by subtracting the daily value-weighted CRSP index return from the supplier's daily stock return. We sum the daily abnormal returns to compute the cumulative abnormal return (CAR) from t_1 day before the restatement announcement date to t_2 days after the announcement restatement date. Dependent variable is the CAR (-2, +2). All variables are defined in Appendix. The t -statistics in parentheses are based on standard errors that are robust and clustered at the restating firm level. ***, **, and * represent statistical significance based on two-sided tests at the 1 percent, 5 percent, and 10 percent levels, respectively.

Variables	(1)	(2)	(3)	(4)
Dependency	-0.081*** (-3.050)	-0.082*** (-3.037)	-0.082*** (-3.008)	-0.085** (-2.127)
Size	-0.006 (-1.146)	-0.006 (-1.127)	-0.007 (-1.129)	-0.008 (-1.120)
Leverage	-0.036 (-1.155)	-0.036 (-1.165)	-0.037 (-1.168)	-0.067 (-1.056)
Operating Performance	0.002 (1.105)	0.002 (1.108)	0.001 (0.832)	0.001 (0.250)
Run-Up	0.021*** (3.327)	0.021*** (3.414)	0.021*** (3.407)	0.025*** (2.971)
Customer CAR (-2,+2)	0.055* (1.699)	0.056* (1.693)	0.058* (1.726)	
Return Correlation		0.023 (0.364)	0.026 (0.390)	
Earnings Quality			-0.029 (-0.966)	
Constant	-0.023 (-0.674)	-0.022 (-0.623)	0.006 (0.088)	0.069 (1.302)
Industry fixed effects	Yes	Yes	Yes	Yes
Year fixed effects	Yes	Yes	Yes	Yes
Restatement fixed effects	No	No	No	Yes
Observations	981	981	965	981
R-squared	0.041	0.041	0.042	0.167

Table 5
OLS regressions of supplier cumulative abnormal returns on explanatory variables:
Subsample results by customer cumulative abnormal returns

The sample consists of 981 suppliers of 240 earnings restatements from 1997 to 2006. We require suppliers to have available stock price and financial data. To estimate the abnormal returns, we employ a market-adjusted event study methodology. We compute the daily abnormal return by subtracting the daily value-weighted CRSP index return from the supplier's daily stock return. We sum the daily abnormal returns to compute the cumulative abnormal return (CAR) from t_1 day before the restatement announcement date to t_2 days after the announcement restatement date. Dependent variable is the CAR (-2, +2). All variables are defined in Appendix. The t -statistics in parentheses are based on standard errors that are robust and clustered at the restating firm level. ***, **, and * represent statistical significance based on two-sided tests at the 1 percent, 5 percent, and 10 percent levels, respectively.

Variables	(1) Customer CAR(-2,+2) \geq 0	(2) Customer CAR(-2,+2) $<$ 0	(3) Irregularity	(4) Error
Dependency	-0.055 (-0.732)	-0.093*** (-3.725)	-0.080* (-1.700)	-0.062* (-1.898)
Size	-0.003 (-0.285)	-0.008* (-1.882)	-0.008 (-1.018)	-0.003 (-0.512)
Leverage	-0.173 (-1.494)	0.013 (0.770)	0.023 (1.235)	-0.112 (-1.548)
Operating Performance	0.003 (1.015)	0.001 (0.631)	0.001 (0.637)	0.003 (0.699)
Run-Up	-0.001 (-0.094)	0.032*** (4.763)	0.027** (2.608)	0.017** (2.402)
Customer CAR (-2,+2)	-0.012 (-0.204)	0.055 (1.164)	-0.014 (-0.411)	0.292*** (3.046)
Constant	-0.057 (-0.520)	0.136** (2.365)	-0.054 (-0.964)	-0.128** (-2.206)
Industry fixed effects	Yes	Yes	Yes	Yes
Year fixed effects	Yes	Yes	Yes	Yes
Observations	355	626	407	574
R-squared	0.049	0.125	0.102	0.055
Test of equal coefficients (p -value)				
between (1) and (2)		0.638		
between (3) and (4)				0.763

Table 6:
OLS regressions of supplier cumulative abnormal returns on explanatory variables:
Customer industry contagion

The sample consists of 981 suppliers of 240 earnings restatements from 1997 to 2006. We require suppliers to have available stock price and financial data. To estimate the abnormal returns, we employ a market-adjusted event study methodology. We compute the daily abnormal return by subtracting the daily value-weighted CRSP index return from the supplier's daily stock return. We sum the daily abnormal returns to compute the cumulative abnormal return (CAR) from t_1 day before the restatement announcement date to t_2 days after the announcement restatement date. Dependent variable is the CAR (-2, +2). Customer industry contagion (*Industry CAR*(-2,+2)) is calculated by averaging the CAR of all other firms in the same 2-digit SIC industry as the customer. All variables are defined in Appendix. The t -statistics in parentheses are based on standard errors that are robust and clustered at the restating firm level. ***, **, and * represent statistical significance based on two-sided tests at the 1 percent, 5 percent, and 10 percent levels, respectively.

Variables	(1)
Dependency	-0.076*** (-2.834)
Industry CAR (-2,+2)	0.849*** (3.443)
Size	-0.005 (-0.987)
Leverage	-0.042 (-1.358)
Operating Performance	0.002 (1.007)
Run-Up	0.022*** (3.500)
Constant	-0.119* (-1.726)
Industry fixed effects	Yes
Year fixed effects	Yes
Observations	981
R-squared	0.049

Table 7
OLS regressions of supplier cumulative abnormal returns on explanatory variables:
Supplier switching costs

The sample consists of 981 suppliers of 240 earnings restatements from 1997 to 2006. We require suppliers to have available stock price and financial data. To estimate the abnormal returns, we employ a market-adjusted event study methodology. We compute the daily abnormal return by subtracting the daily value-weighted CRSP index return from the supplier's daily stock return. We sum the daily abnormal returns to compute the cumulative abnormal return (CAR) from t_1 day before the restatement announcement date to t_2 days after the announcement restatement date. Dependent variable is the CAR (-2, +2). In Panel A, the sample is partitioned into high or low R&D intensity subsamples and high and low product uniqueness subsamples. In Panel B, the sample is partitioned based on supplier industries – durable goods manufacturing (SIC: 3400-3999), non-durable goods manufacturing (2000-3399), and non-manufacturing (all other SIC codes) industries. All variables are defined in Appendix. The t -statistics in parentheses are based on standard errors that are robust and clustered at the restating firm level. ***, **, and * represent statistical significance based on two-sided tests at the 1 percent, 5 percent, and 10 percent levels, respectively.

Panel A: Asset specificity and product uniqueness				
Variables	(1) High R&D	(2) Low R&D	(3) High Uniqueness	(4) Low Uniqueness
Dependency	-0.152*** (-2.998)	0.008 (0.381)	-0.099*** (-2.776)	-0.072 (-1.469)
Size	-0.017 (-1.521)	0.004* (1.697)	-0.007 (-0.920)	-0.005 (-0.762)
Leverage	-0.037 (-0.804)	-0.048* (-1.873)	-0.052 (-0.615)	-0.024 (-0.767)
Operating Performance	0.005 (1.503)	-0.007 (-0.593)	0.005 (1.437)	-0.001 (-0.393)
Run-Up	0.020* (1.733)	0.020** (2.188)	0.016* (1.813)	0.026** (2.255)
Customer CAR (-2,+2)	0.205* (1.863)	-0.014 (-0.331)	0.106 (1.207)	0.055 (1.296)
Constant	0.089 (0.961)	0.078*** (4.863)	-0.015 (-0.171)	0.059 (0.860)
Industry fixed effects	Yes	Yes	Yes	Yes
Year fixed effects	Yes	Yes	Yes	Yes
Observations	491	490	491	490
R-squared	0.087	0.090	0.044	0.085
Test of equal coefficients (p -value)				
between (1) and (2)		0.010***		
between (3) and (4)			0.660	

Panel B: Importance of product guarantee and servicing commitment			
Variables	(1) Durable	(2) Non-durable	(3) Non-manufacturing
Dependency	-0.118***	-0.084	-0.052*
	(-2.664)	(-0.963)	(-1.852)
Size	-0.007	-0.015	0.002
	(-0.813)	(-0.935)	(0.724)
Leverage	-0.059	-0.120	0.008
	(-1.469)	(-1.243)	(0.256)
Operating Performance	0.002	0.001	0.002
	(0.462)	(0.541)	(0.391)
Run-Up	0.019	0.045	0.032***
	(1.509)	(1.078)	(4.107)
Customer CAR (-2,+2)	0.164**	0.173	-0.054
	(2.475)	(1.386)	(-1.650)
Constant	0.010	0.101	0.033
	(0.211)	(0.965)	(1.547)
Industry fixed effects	Yes	Yes	Yes
Year fixed effects	Yes	Yes	Yes
Observations	414	227	340
R-squared	0.107	0.068	0.121
Test of equal coefficients			
(p-value)			
between (1) and (2)		0.729	
between (1) and (3)			0.184

Table 8
OLS regressions of supplier cumulative abnormal returns on explanatory variables:
Supplier information asymmetry

The sample consists of 981 suppliers of 240 earnings restatements from 1997 to 2006. We require suppliers to have available stock price and financial data. To estimate the abnormal returns, we employ a market-adjusted event study methodology. We compute the daily abnormal return by subtracting the daily value-weighted CRSP index return from the supplier's daily stock return. We sum the daily abnormal returns to compute the cumulative abnormal return (CAR) from t_1 day before the restatement announcement date to t_2 days after the announcement restatement date. Dependent variable is the CAR (-2, +2). The sample is partitioned into high and low idiosyncratic stock return volatility subsamples and analyst coverage and no analyst coverage subsamples. All variables are defined in Appendix. The t -statistics in parentheses are based on standard errors that are robust and clustered at the restating firm level. ***, **, and * represent statistical significance based on two-sided tests at the 1 percent, 5 percent, and 10 percent levels, respectively.

Variables	(1) High IdioVol	(2) Low IdioVol	(3) Analyst Coverage	(4) No Analyst Coverage
Dependency	-0.162*** (-3.306)	0.020 (1.180)	-0.053* (-1.766)	-0.093** (-2.323)
Size	-0.016 (-1.163)	-0.001 (-0.612)	-0.003 (-0.505)	-0.006 (-0.954)
Leverage	-0.045 (-0.789)	-0.007 (-0.522)	0.011 (0.348)	-0.061 (-1.306)
Operating Performance	0.002 (0.815)	-0.000 (-0.060)	0.006** (2.222)	0.001 (0.456)
Run-Up	0.023*** (2.924)	0.009 (1.410)	0.009 (1.057)	0.025*** (3.197)
Customer CAR (-2,+2)	0.036 (0.625)	0.076* (1.719)	0.138*** (2.629)	0.024 (0.639)
Constant	0.192*** (2.776)	-0.058 (-1.337)	-0.057 (-1.332)	-0.082 (-0.756)
Industry fixed effects	Yes	Yes	Yes	Yes
Year fixed effects	Yes	Yes	Yes	Yes
Observations	490	491	315	666
R-squared	0.068	0.069	0.162	0.054
Test of equal coefficients				
(p-value)				
between (1) and (2)	0.000***			
between (3) and (4)	0.472			

Table 9
OLS regressions of supplier cumulative abnormal returns on explanatory variables:
Supplier financial constraints

The sample consists of 981 suppliers of 240 earnings restatements from 1997 to 2006. We require suppliers to have available stock price and financial data. To estimate the abnormal returns, we employ a market-adjusted event study methodology. We compute the daily abnormal return by subtracting the daily value-weighted CRSP index return from the supplier's daily stock return. We sum the daily abnormal returns to compute the cumulative abnormal return (CAR) from t_1 day before the restatement announcement date to t_2 days after the announcement restatement date. Dependent variable is the CAR (-2, +2). The sample is partitioned into high or low financial constraint subsamples according to new Kaplan-Zingales financial constraint index (NKZ index) described in Hadlock and Pierce (2008) and Whited and Wu's (2006) financial constraint index (WW index), respectively. All variables are defined in the appendix. The t -statistics in parentheses are based on standard errors that are robust and clustered at the restating firm level. ***, **, and * represent statistical significance based on two-sided tests at the 1 percent, 5 percent, and 10 percent levels, respectively.

Variables	(1) High NKZ	(2) Low NKZ	(3) High WW	(4) Low WW
Dependency	-0.120** (-2.176)	-0.059* (-1.940)	-0.099*** (-3.189)	-0.064 (-1.396)
Size	-0.006 (-0.935)	-0.005 (-0.613)	-0.019 (-1.170)	-0.006 (-0.751)
Leverage	-0.051 (-1.429)	-0.226 (-1.221)	-0.081 (-1.240)	-0.008 (-0.293)
Operating Performance	0.000 (0.032)	0.007** (2.061)	0.001 (0.317)	0.006* (1.763)
Run-Up	0.033*** (2.758)	0.013 (1.333)	0.018*** (2.655)	0.033* (1.892)
Customer CAR (-2,+2)	-0.014 (-0.359)	0.194** (2.308)	-0.006 (-0.119)	0.109** (2.270)
Constant	0.033 (0.434)	0.226 (1.383)	0.003 (0.054)	-0.019 (-0.266)
Industry fixed effects	Yes	Yes	Yes	Yes
Year fixed effects	Yes	Yes	Yes	Yes
Observations	478	481	486	486
R-squared	0.103	0.043	0.043	0.087
Test of equal coefficients				
(p-value)				
between (1) and (2)	0.361			
between (3) and (4)	0.516			

Table 10**Logistic regressions of severance of product market relationship**

The sample consists of 981 suppliers of 240 earnings restatements from 1997 to 2006. We require suppliers to have available stock price and financial data. Dependent variable is a *Severance* indicator that takes the value of one if the product market relationship between the supplier and the restating firm is terminated in the year after restatement and zero otherwise. All variables are defined in the appendix. The *t*-statistics in parentheses are based on standard errors that are robust and clustered at the restating firm level. ***, **, and * represent statistical significance based on two-sided tests at the 1 percent, 5 percent, and 10 percent levels, respectively.

Variables	(1) Logistic	(2) Conditional Logistic
Dependency	-2.109*** (-4.356)	-2.908*** (-4.900)
Size	-0.204*** (-4.750)	-0.266*** (-6.086)
Leverage	0.146 (0.464)	0.212 (0.492)
Operating Performance	-0.047 (-1.050)	0.019 (0.420)
Run-Up	-0.103 (-1.215)	-0.066 (-0.655)
CAR (-2, +2)	-0.643* (-1.959)	-0.505* (-1.650)
Constant	3.317** (2.075)	
Industry fixed effects	Yes	Yes
Year fixed effects	Yes	Yes
Restatement fixed effects	No	Yes
Observations	980	783
Pseudo R-squared	0.118	0.155

Table 11**OLS regressions of supplier post-restatement operating performance on explanatory variables:
Baseline results**

The sample consists of 981 suppliers of 240 earnings restatements from 1997 to 2006. We require suppliers to have available stock price and financial data. Dependent variable in column (1) is the average operating performance (operating income divided by total sales) of the supplier in the three years after earnings restatements by their customers. Dependent variable in column (2) is the industry median-adjusted average performance, which is estimated by subtracting the median two-digit SIC industry operating performance from each supplier firm's raw operating performance. All variables are defined in the appendix. The *t*-statistics in parentheses are based on standard errors that are robust and clustered at the restating firm level. ***, **, and * represent statistical significance based on two-sided tests at the 1 percent, 5 percent, and 10 percent levels, respectively.

Variables	(1) Raw Operating Performance	(2) Industry median-adjusted Operating Performance
Dependency	-1.127** (-2.367)	-1.178** (-2.574)
Severance (indicator)	-0.386*** (-4.174)	-0.407*** (-4.124)
Size	0.073*** (2.767)	0.088*** (3.331)
Leverage	0.488* (1.891)	0.431* (1.798)
Operating Performance	0.221*** (3.090)	0.212*** (2.849)
Run-Up	0.075 (1.411)	0.065 (1.329)
CAR (-2, +2)	0.052 (0.222)	0.091 (0.385)
Constant	-0.361** (-2.014)	-0.729 (-1.109)
Industry fixed effects	Yes	No
Year fixed effects	Yes	Yes
Observations	860	860
R-squared	0.178	0.163

Table 12**OLS regressions of industry median-adjusted post-restatement operating performance of suppliers on explanatory variables partitioned by supplier characteristics**

The sample consists of 981 suppliers of 240 earnings restatements from 1997 to 2006. We require suppliers to have available stock price and financial data. Dependent variable is the industry median-adjusted supplier operating performance, which is estimated by subtracting the median two-digit SIC industry operating performance from each supplier firm's raw operating performance. In Panel A, the sample is partitioned into subsamples by supplier R&D intensity and supplier product uniqueness. In Panel B, the sample is partitioned into subsamples by supplier idiosyncratic stock return volatility and availability of analyst coverage on the supplier firm. In Panel C, the sample is partitioned into subsamples by supplier financial constraint according to the new Kaplan-Zingales financial constraint index (*NKZ* index) described in Hadlock and Pierce (2008) and Whited and Wu's (2006) financial constraint index (*WW* index), respectively. All variables are defined in the appendix. The *t*-statistics in parentheses are based on standard errors that are robust and clustered at the restating firm level. ***, **, and * represent statistical significance based on two-sided tests at the 1 percent, 5 percent, and 10 percent levels, respectively. The same control variables in column (2) of Table 11 are used and their coefficients are suppressed for brevity.

Panel A: Switching costs

Variables	(1)	(2)	(3)	(4)	Test of equal coefficients (<i>p</i> -value)	
	High R&D	Low R&D	High Uniqueness	Low Uniqueness	between (1) and (2)	between (3) and (4)
Dependency	-1.929*** (-2.863)	-0.407 (-0.963)	-1.782*** (-2.832)	-0.547 (-1.125)	0.045**	0.089*
Severance (indicator)	-0.784*** (-3.858)	-0.079 (-1.456)	-0.671*** (-3.476)	-0.248** (-2.329)	0.001***	0.058*
Controls	Yes	Yes	Yes	Yes		
Industry fixed effects	No	No	No	No		
Year fixed effects	Yes	Yes	Yes	Yes		
Observations	441	419	429	431		
R-squared	0.195	0.125	0.164	0.269		

Panel B: Information asymmetry

Variables	(1)	(2)	(3)	(4)	Test of equal coefficients (<i>p</i> -value)	
	High IdioVol	Low IdioVol	Analyst Coverage	No analyst Coverage	between (1) and (2)	between (3) and (4)
Dependency	-1.338* (-1.967)	-0.837** (-2.148)	-1.586 (-1.596)	-1.064** (-2.326)	0.501	0.525
Severance (indicator)	-0.708*** (-4.750)	-0.125 (-0.943)	-0.470** (-2.580)	-0.390*** (-2.869)	0.005***	0.708
Controls	Yes	Yes	Yes	Yes		
Industry fixed effects	No	No	No	No		
Year fixed effects	Yes	Yes	Yes	Yes		
Observations	413	447	282	578		
R-squared	0.189	0.090	0.253	0.148		

Panel C: Financial constraints

Variables	(1)	(2)	(3)	(4)	Test of equal coefficients (<i>p</i> -value)	
	High NKZ	Low NKZ	High WW	Low WW	between (1) and (2)	between (3) and (4)
Dependency	-0.836 (-1.436)	-1.509*** (-3.051)	-2.025*** (-2.777)	-0.252 (-1.104)	0.403	0.029**
Severance (indicator)	-0.278*** (-2.842)	-0.508*** (-2.950)	-0.611*** (-3.464)	-0.257 (-1.621)	0.243	0.186

Controls	Yes	Yes	Yes	Yes
Industry fixed effects	No	No	No	No
Year fixed effects	Yes	Yes	Yes	Yes
Observations	419	422	410	442
R-squared	0.268	0.208	0.200	0.177

Appendix Variable definition

This appendix provides a detailed description of the construction of all the variables used in the tables.

Variable	Definition
Analyst Coverage	An indicator variable that is equal to one if a supplier is covered by at least one analyst in the month prior to customer's restatement announcement and zero otherwise.
CAR (-2, +2)	Supplier five-day cumulative abnormal return surrounding its customer's restatement announcement (starting from two days before announcement to two days after announcement) calculated by subtracting the CRSP value-weighted returns from the firm's daily returns, and cumulating the difference over the five-day window.
Customer CAR (-2,+2)	Customer five-day cumulative abnormal return surrounding its restatement announcement (starting from two days before announcement to two days after announcement) calculated by subtracting the CRSP value-weighted returns from the firm's daily returns, and cumulating the difference over the five-day window.
Dependency	Supplier's sales to a customer divided by total sales of the supplier. Computed in the year preceding restatement announcement. Also called sales dependency, economic dependency or revenue dependency.
Industry CAR (-2,+2)	Customer industry contagion measure. Computed by averaging the five-day cumulative abnormal return of all other firms in the same 2-digit SIC industry as the customer firm.
Idiosyncratic Volatility	Annualized excess stock return volatility, which is the standard deviation of daily excess stock return within a fiscal year multiplied by the square root of 252, where excess stock return is calculated from the Fama-French three factor model,
Leverage	Supplier's long term debt plus short term debt divided by total assets. Computed in the year preceding the restatement announcement.
Operating Performance	Supplier's operating income divided by total sales. Computed in the year preceding the restatement announcement.
R&D	Supplier R&D expenditure scaled by total sales. Set to 0 if missing. Computed in the year preceding the restatement announcement
Return Correlation	Pearson correlation of supplier and customer daily stock returns in the year preceding the customer's restatement date.
Run-Up	Supplier's one year buy-and-hold abnormal return prior to customer's restatement announcement.
Severance	An indicator variable that is equal to one if the product market relationship is severed within a year of restatement and zero otherwise.
Tobin's q	Supplier's Tobin's q. Computed as book value of assets minus book value of equity plus market value of equity divided by book value of assets
Uniqueness	Supplier product uniqueness, which is measured by dividing selling, general, and administrative expenses by total sales. Set to 0 if missing. Computed in the year preceding the restatement announcement.