8-20-2019

Customer's inventory accruals and supplier's earnings quality

Cheuk Kwong FOK

Terms of Use

CUSTOMER'S INVENTORY ACCRUALS AND SUPPLIER'S EARNINGS QUALITY

FOK CHEUK KWONG

MPHIL

LINGNAN UNIVERSITY

2019

CUSTOMER'S INVENTORY ACCRUALS AND SUPPLIER'S EARNINGS QUALITY

by
FOK Cheuk Kwong
霍芍光

A thesis
submitted in partial fulfillment
of the requirements for the Degree of
Master of Philosophy in Business

Lingnan University

2019
ABSTRACT

CUSTOMER'S INVENTORY ACCRUALS AND SUPPLIER'S EARNINGS QUALITY

by

Fok Cheuk Kwong

Master of Philosophy

We examine the influence of customer's inventory accruals on supplier's accounting quality and earnings management practices. We consider two views of the role of customer's inventory accruals play on their supplier and how they relate to their financial reporting. The first is the customer's inventory accruals reflect supplier's earnings management (i.e., intentional bias) as well as lead to difficulty in supplier's earnings estimation (i.e., unintentional errors). The second view is based on supplier's information advantage theory, which suggests suppliers are capable to interpret the information content of customer's inventory accruals. In contrast to the information advantage view, we find that suppliers with higher level of customer's inventory accruals have lower earnings quality and engage in more earnings management, even after controlling for their own inventory accruals level.

Key words: inventory accruals, financial reporting, earnings quality, earnings management, supply chain

DECLARATION

I declare that this is an original work based primarily on my own research, and I warrant that all citations of previous research, published or unpublished, have been duly acknowledged.

Fok Cheuk Kwong

Date:

CERTIFICATE OF APPROVAL OF THESIS

CUSTOMER'S INVENTORY ACCRUALS AND
SUPPLIER'S EARNINGS QUALITY
by
FOK Cheuk Kwong

Master of Philosophy

Panel of Examiners :

SIGNED
(Prof. WONG Shiu Ho) (Chairman)

SIGNED
(Prof. HUI Kai Wai) (External Member)

SIGNED
(Prof. LIU Liming) (Internal Member)

SIGNED
(Prof. SHANG Weixin) (Internal Member)

Chief Supervisor :

Prof. LIU Liming

Co-supervisor :

Prof. CHAN Koon Hung

Approved for the Senate :

SIGNED

(Prof. MOK Ka Ho Joshua)
Chairman, Postgraduate Studies Committee

20 AUG 2019

Date

Table of Content

ACKNOWLEGMENTS

I thank my supervisors Prof. Liming Liu and Prof. Koon Hung Chan for their excellent supervisions. I appreciate the great research training provided by Prof. Mary E. Barth, Dr. Michael Chau, Prof. Igor Goncharov, Prof. Martin Glaum, Prof. Kai Wai Hui, Prof. Mingyi Hung, Prof. Wayne R. Landsman, Dr. Hsiao-Hui Lee, Prof. Ji-Chai Lin, Prof. Tse-Chun Lin, Prof. Jeffrey Ng, Prof. James Ohlson, Dr. Yaxuan Qi, Dr. Albert Tsang, Prof. Echo Wan, Prof. Junbo Wang, Dr. Xin Wang, Prof. Steven Young, Prof. Guochang Zhang and Prof. Kevin Zhou through the Cross-Institutional Course Enrolment Scheme and the 8th WHU Doctoral Summer Program in Accounting Research. I am very grateful to the insightful comments from Prof. John R. Birge, Prof. Xin Chang, Dr. Weixin Shang, Dr. Jing Wu, Prof. Huai Zhang and seminar participants at the Tenth POMS-HK International Conference and MSOM Conference 2019. I also thank Mr. Wai Ho Chan for his technical support.

CUSTOMER'S INVENTORY ACCRUALS AND SUPPLIER'S EARNINGS QUALITY

1. Introduction

"Thomas and Zhang (2002) … find that inventory accruals exhibit the most robust relation with future stock returns … it is likely due to both the economic magnitude of inventory accruals and the reluctance of managers to write down inventory in the face of slowing demand."

(Dechow et al. 2011)

We investigate the influence of the economic magnitude of customer's inventory accruals on supplier's earnings quality. An instrumental paper of Sloan (1996) show that the quality of the accrual component of earnings is lower than that of cash flow component. Further, Thomas and Zhang (2002) find that change in inventory is the most important component of accrual estimation error. Recently, Allen et al. (2013) indicate that inventory accruals lead to lower earnings quality due to measurement error caused by the write-downs of inventory. Although inventory accrual is an important determinant of earnings quality, it is unclear that whether inventory accruals of one firm exhibit externalities and affect the earnings quality of their economically-related counterparties, i.e. suppliers. Meanwhile, Operations Management literature document that customer's excess inventory news is associated with negative short windows stock returns of their suppliers (Hendricks and Singhal 2009). Accordingly, inventory management and its impacts along the supply chain are focused by the industry participants. For example, Home Depot Inc. draws media attention by adopting lean inventory management (Ziobro, 2016) and Walmart are blamed by attaining better inventory management through passing the costs on to their suppliers (Nuzio, 2019). Recent works in accounting demonstrate the role of customers/suppliers on a firm's accounting practices (Raman and Shahrur 2008, Hui et al.

2012). We extend this stream of studies by testing how, if at all, inventory accruals which reside in the downstream customers influence the supplier's accounting quality and earnings management behavior.

We consider two views of the influence of customer's inventory accruals on the supplier's earnings quality. The first view is based on the notion that inventory buildup at downstream customer reflects both intentional and unintentional estimation errors. An increase in customer's inventory accruals is a signal that supplier is engaged in real earnings management through channel stuffing. To elaborate, suppliers may inflate their earnings/sales by loading excessive inventory to its customers than they are capable of selling. However, customers will return unsold inventory in the future and associated revenues of suppliers will not be realized. The inflated earnings achieved by real earnings management will probably reverse in the future, lead to lower persistence of earnings and poor accounting quality. Second, customer's inventory accruals cause unintentional errors in earnings estimation since it is more difficult for supplier to predict an uncertain future, or just because measurement error related to the inventory write-downs. Prior research in operation management (e.g. Steinker and Hoberg 2013) suggest that inventory level signals either expected higher future demand or sales fall below expectations. Moreover, the demand uncertainty propagates to upstream suppliers in an amplified form by the bullwhip effect (Bray and Mendelson 2012). For example, when supplier (the announcing firm) announces the excess inventory news about its customers, the negative market reaction is more serious than when the excess inventory is about the announcing firm directly (Hendricks and Singhal 2009). The demand uncertainty coupled with the bullwhip effect may raise difficulty for supplier firms to estimate earnings and provide high quality financial statements.

An alternative view suggests that suppliers, especially those who operate in closely related lines of business of their customers, are capable to access to customer's superior information and promote a more accurate estimation in future prospects and earnings. This view is predicated on the supplier extending trade credits to their customers and its information advantage beyond financial intermediaries can reduce information asymmetries between lenders and borrowers (information advantage hypothesis). Petersen and Rajan (1997) document that suppliers extend trade credit to even loss-making customers when suppliers predict these customers have high growth potential in the future. Intuitively, suppliers gather private information from customers during the ordinary course of business and they are able to differentiate different business conditions signaled by customer's inventory accruals. In other words, customer's inventory accruals and supplier's private information pieced together as "mosaic" and provide additional information for suppliers to estimate earnings. Thus, we attempt to answer the empirical question if customer's inventory accruals level affect supplier's earnings quality.

Following prior literature (e.g. Thomas and Zhang 2002, Allen et al. 2013), we employ changes in inventory over average total assets as the measure of inventory accruals. Our final sample includes 7,950 firms in Compustat Segment database. To address potential problems related to omitted variables, we control for supplier's own inventory accruals level.

We examine the impact of customer's inventory accruals using two measures of earnings quality and a measure of financial misstatement. In each case, we control for related determinants of earnings quality identified in the prior literature. Our findings are consistent with customer's inventory accruals exerting a significant negative influence on supplier firms' earnings management and earnings quality, instead of a positive causal

relation. In particular, we find that higher level of customer's inventory accruals leads to poorer supplier's earnings quality measured by the standard deviation of residuals derived from Dechow and Dichev (2002) model and the absolute magnitude of discretionary accruals. Moreover, we show that suppliers with higher level of customer's inventory accruals exhibit a higher tendency of a financial misstatement as measured by "fraud score" (Fscore) (Dechow et al., 2011). Thus, we conclude that customer's inventory accruals level is a significantly negative determinant of supplier's earnings quality.

We employ numerous additional analyses to evaluate the robustness of the main results. First, we use the change specification to examine how the change in customer's inventory accruals affect the change in supplier's earnings quality. Second, we use an instrumental variables analysis to address potential endogeneity concern. Third, we followed Roychowdhury (2006) to add the change in LIFO reserve to inventory accruals as an alternative measure to account for the differences caused by first-in, first-out (FIFO) versus last-in, first-out (LIFO) inventory valuation methods. Taken as a whole, the results continue to cast doubt on the supplier's informational advantage and favor the difficulty in earnings estimation view. In no case do we find higher customer's inventory accruals level cause higher supplier's accounting quality or less likelihood of a financial misstatement.

Our paper adds to the contemporary accounting literature in numerous directions. First, this study highlights that high level of customer's inventory accruals harms supplier firms' financial reporting quality. Although some studies try to investigate the causal relation between the role of inventory accruals and earnings quality, they focus on how inventory accruals affect the earnings quality of their own firms instead of its externalities on suppliers. To our knowledge, we are the first to investigate if the inventory accruals of one

firm affect the earnings quality of their economically-related counterparties. Second, by providing strong and consistent evidences on the causal relatioship between customer's inventory accruals and supplier's financial reporting quality, we shed light on how customer's inventory accruals extend to other aspects to stock market reaction, in this case, financial reporting quality. Third, our findings have important implications to the capital market participants. If customer's inventory accruals level affects supplier firms' earnings quality, our findings are useful to accountants, auditors, investors as well as regulators in distinguishing reliable earnings information from less accurate information. Thus, our findings can help capital market participants better understand how firms' business and reporting behaviors are affected by accounting information of their downstream customers.

The paper proceeds as follows. Section 2 is the literature reviews and hypotheses development. Section 3 outlines the research designs and section 4 describes the sample. In section 5 we discuss the empirical findings. Section 6 demonstrates additional analyses and section 7 offers the conclusion.

2. Hypotheses Development and Related Research

An instrumental paper of Sloan (1996) break down earnings into two components: cash flows and total accruals, and the literature has developed to further test the persistence of the components of cash flows and different accruals. For inventory accruals, Abarbanell and Bushee (1997) document that firms with low inventory accruals quality have more future changes in earnings. In addition, Thomas and Zhang (2002) show that the inventory change is the most important cause of accrual anomaly. Allen et al. (2013) show that inventory accruals are likely to experience subsequent reversals because of

inventory write-downs, which reflect that higher inventory accruals lead to lower persistence of earnings.

Recent literature in operations management indicate that the buildup of excess inventory adversely affects firm outcomes in financial performance and stock market reaction. For instance, Chen et al. (2005, 2007) and Steinker and Hoberg (2013) establish a negative relationship between high inventory level and future stock returns. Likewise, Kesavan and Mani (2013) document abnormal inventory growth is associated with poor one-year ahead earnings.

Researchers have recently taken an interest in exploring the influence of customer's corporate behavior on their suppliers. Hendricks and Singhal (2009) show the negative impacts of customer's excess inventory announcement on supplier firm's stock returns in short time windows of one to five days after the announcement. Their paper underscores the financial implications of customer's inventory information to their economically-related counterparties. Hertzel et al. (2008) document that when customers files for bankruptcy, the stock returns of their suppliers are likely to be negative, and Houston, Lin and Zhu (2016) demonstrate that a customer's bankruptcy increases the bank financing costs of its major suppliers. Hui et al. (2012) show that when the bargaining power of customer is stronger, the supplier meets the demand for accounting conservatism recognizes losses more quickly, and vice versa. Overall, prior empirical evidence suggests that customer's corporate behaviors are important actors on supplier's financial practices, as well as accounting policies.

However, there is no empirical evidence on whether the impacts of customer's inventory accruals exert on their supplier firms' earnings quality and likelihood of earnings misstatement. Prior studies on earnings quality are basically related to accruals

quality (Dechow and Schrand 2004). There are two reasons for poor accruals quality. First, managers can intentionally manipulate accruals through earnings management. Second, managers can unintentionally misestimate accruals because it is hard to predict the future or because there are demand shocks due to customer's inventory write-downs. Both reasons have been well studied in the existing literature. From the perspective of earnings management, prior studies have documented that managers use "inventory accruals" to overstate their earnings (e.g., Thomas and Zhang 2002). For unintentional errors, Dechow and Dichev (2002) show that the accruals quality is not only associated with managerial opportunism but also systematically related to the volatility of operations, such as absolute size of accruals, loss incidence, and the standard deviation of cash flows, accruals, earnings, and sales.

We expect that a high level of customer's inventory accruals leads to poor supplier's earnings quality because errors in accrual estimation are likely to occur and affect the financial reporting quality. These potential errors can be caused by intentional errors, such as earnings management, and unintentional errors such as measurement errors. For intentional errors, inventory buildups at customers could imply that supplier firms may engage in "channel stuffing" or "trade loading," which could lead to earnings management through accelerating revenue recognition and recording receivables sooner than justified. For unintentional errors, a higher level of customer's inventory accruals indicates greater uncertainty, more estimation and result in estimation errors, and thus lower earnings quality. In the face of confounding signals due to customer's inventory growth, suppliers have inherent difficulty to distinguish between expected future demand increases or bloated inventories due to disappointing sales, which increase the uncertainty about the future demand and volatility of operations. In case of bloated inventories,

supplier firms have less control over magnitude and the speed of inventory reductions. The suppliers' future business prospects are likely related to the actions of customers take, such as promotion and sales discount. Such kind of high uncertainty in the operating environment increases the tendency of using approximations and estimation, and result in higher estimation errors and lower accrual quality. In particular, Allen et al. (2013) show that firms with high inventory accruals are more likely to report write-downs of inventory in next years. As customer's inventory write-downs are severe negative shocks to the supplier firm's future sales and cash flows, supplier firms are suffered from less stable predictable future prospects, therefore, more and larger estimation errors. Hence, if customer's inventory accruals levels allow intentional and unintentional errors in earnings estimation to occur, we expect a negative causal relation between customer's inventory accruals level and supplier's earnings quality.

Although higher level of customer's inventory accruals might lead to higher supplier's earnings estimation error, supplier's information advantage could potentially suggest customer's inventory accruals do not affect supplier's earnings quality.

It is generally accepted that the supplier's information advantage is useful to interpret information content about customer's inventory accruals. First, suppliers gather customer private information from the ordinary course of business (Petersen and Rajan, 1997). Suppliers pay close attention to how customers conduct service or deliver goods. The order size and frequency could help suppliers to understand customers' operating conditions. The similarity in the line of business activities further empowers suppliers to better interpret customer's statuses and future prospects. For example, Petersen and Rajan (1997) show that suppliers provide trade credit even to loss-making firm if the customers have good future sales potential. Information advantage theory propose that suppliers are

able to interpret the information content of customer's inventory accruals as well as predict future demand and understand industry trends (Burkart and Ellingsen 2004). Since supplier's information advantage likely curtail both procedural and estimation errors in predicting future cash flows, a high level of customer's inventory accruals might not result in poor supplier's earnings quality. Moreover, Burkart and Ellingsen (2004) argue that information advantage of suppliers is obtained from their input transaction. Distinct from other types of lenders, suppliers automatically notify if the customer is carrying out a productive activity. Moreover, customers' payment activities could be directly observed by suppliers. If customers fail to reach early payment discount option, it means they do not have lower cost alternatives to repay the owing amount and may indicate operating problems (Smith, 1987). To extend, imprecise future information signaled by customer's inventory accruals become a clear picture to the suppliers when combined with that their existing information set. For example, a high level of customer's inventory accruals could be interpreted as higher future demand when the customer firm implements a productive activity and takes advantages of early payment discounts. Thus, a high level of customer's inventory accruals may suggest a more sophisticated management team with good supply chain collaboration processes and information sharing with their suppliers. Based on the arguments above and extant empirical evidence, we hypothesize that supplier may have an information advantage in interpreting the information of customer's inventory accruals and a high customer's inventory level do not lead to lower financial reporting quality. Given the two contrasting views, it remains an empirical question whether customer's inventory accruals affect supplier's earnings quality. Thus, we establish the following hypothesis:

Ceteris paribus, higher level of customer's inventory accruals level does not affect supplier's earnings quality.

3. Research Design

This section discusses the research designs used to test our hypothesis. To examine whether a high level of inventory accruals at downstream customers affects a supplier firm's earnings quality, we consider two commonly used proxies – the standard deviation of Dechow and Dichev (2002) residuals and the absolute magnitude of abnormal accruals (Francis et al. 2005). To capture the propensity of earnings management, we employ the extent of income increasing accruals.

We utilize the following model to empirically evaluate how customer inventory accruals affects earnings quality:

$$Earnings\ Quality = \alpha_0 + \alpha_1 INVACC_c + \sum \alpha_i\ Controls + \xi \quad (1)$$

where *Earnings Quality* is proxied by discretionary accrual and accrual quality. $INVACC_c$ is level of customer's inventory accruals. We control for other determinants of reporting quality and earnings management, described in more detail later.

The first measure of earnings quality is based on the method developed by Dechow and Dichev (2002) and modified by Francis et al. (2005). The rationale of this approach is to map accruals into past, present and future operating cash flows and measurement error weakens such mapping. With this premise, the standard deviation of this measurement error (*AQ*) represents deteriorating earnings quality in which higher *AQ*

indicates poorer earnings quality. According to Dechow and Dichev (2002), we model the measurement error in earnings with the following regression:

$$WA_{it} = \beta_0 + \beta_1 CFO_{it-1} + \beta_2 CFO_{it} + \beta_3 CFO_{it+1} + \beta_4 \Delta REV_{it} + \beta_5 PPE_{it} + \varepsilon_{it} \quad (2)$$

where *WA* represents working capital accruals, *CFO* is the cash flows from operations, *ΔREV* is the change in total revenue, and *PPE* is property, plant and equipment (gross). *AQ* is measured by the standard deviation of residuals, calculated over years *t-4* through *t*.[1] All variables are deflated by average total assets and winsorized at the 1% level to mitigate the effect of extreme values.

Our second proxy of earnings quality is measured by the absolute value of discretionary accruals (*ABS_DA*) which is derived from the modified Jones (1991) model. The measure is based on the rationale that a firm's accruals capture both fundamentals like changes in revenues and *PPE*. Thus, the amount that cannot be explained by fundamentals can be viewed as abnormal, and high level of abnormal accruals implies low earnings quality. To define the level of abnormal accruals, we employ the following model by industry-year with at least 20 firm-years in year *t*.[2]

$$TA_{it} = \lambda_0 + \lambda_1(\Delta REV_{it} - \Delta AR_{it}) + \lambda_2 PPE_{it} + \kappa_{it} \quad (3)$$

[1] Accrual quality is the standard deviation of the residuals (ε) over current and past 4 years with at least 4 observations out of 5 years.
[2] Industries are defined per Fama and French (1997).

Total accruals (*TA*) represents income before extraordinary items less net operating cash flows, *ΔAR* is change in accounts receivable and the remaining variables are defined as equation 2. All variables are deflated by average total assets and winsorized at the 1% level to mitigate the effect of extreme values. The absolute value of the residual (κ_{it}) is our second proxy of earnings quality. To ensure consistency of interpretation for *AQ* and *ABS_DA*, higher *AQ* and *ABS_DA* imply poorer financial reporting quality.

To measure earnings quality, we utilize the error term κ_{it} in equation (3) that indicates deviations from expected accruals explained by fundamental operating activities of the supplier. In short, the error term captures the extent of accrual manipulation. In addition, we consider only positive errors (labeled as *DA*> 0), as we are intended to find out whether managers exploit income-increasing discretionary accruals to attain financial reporting objectives.

In estimating equation (1), we control for several determinants of earnings quality and earnings management following Jiang et al. (2010) and Bergstresser and Philippon (2006). In particular, we control for supplier's firm characteristics like firm size (*Size*), firm leverage (*LEV*), age of the firm (*OldFirm*), growth opportunities proxied by market to book ratio (*MB*), volatility in operations proxied by volatility of sales growth (*StdSaleGrwth*). Hribar and Nichols (2007) find that earnings quality measures are especially sensitive to firm-specific volatility in outcome variables like sales and financial performance. Hence, we control for standard deviation of sales (*StdSale*) and standard deviation of operating cash flows (*StdCF*). We also include the level of supplier's inventory accruals ($INVACC_s$) in our model. The estimated empirical specification is as follows:

$$Earning\ Quality_{it} = \alpha_0 + \alpha_1 INVACC_{c_{it}} + \alpha_2 SIZE_{it} + \alpha_3 LEV_{it} + \alpha_4 MB_{it} + \alpha_5 OldFirm_{it} + \alpha_6 StdSaleGrwth_{it} + \alpha_7 StdSale_{it} + \alpha_8 StdCF_{it} + \alpha_9 INVACC_{s_{it}} + Industry\ Fixed\ Effects + Year\ Fixed\ Effects + \xi \quad (4)$$

Industry and year fixed effects are captured in the model to control for possible differences in industries and economy-wide trends. We predict that the coefficient α_1 from equation (4) will be positive (negative) if having high level of customer's inventory accruals is associated with poorer (better) earnings quality and more (less) earnings management.

4. Sample and Descriptive Statistics

Our dataset includes supply chain pairs listed in Compustat Segment database during the years 1977-2016. Our primary variable of interest is the customer's inventory accruals. Since a supplier can have multiple customers, we employ supply chain sales weighted average to aggregate variables from customers (Patatoukas, 2012). We calculate the weighted customers' inventory accruals (w_INVACC_c) as follow:

$$weight_{ijt} = \frac{csale_{ijt}}{\sum_{j=1}^{n} csale_{ijt}}$$

$$w\_INVACC_{c_{it}} = \sum_{j=1}^{n} weight_{ijt} \times INVACC_{c_{ijt}}$$

where $csale_{ijt}$ is supply chain sales from supplier *i* to customer *j*; *n* is the number of customers in year *t*; and $INVACC_{c_{ijt}}$ is inventory accruals of customer *j* in year *t*.

Following prior studies, we exclude the customer firms from financial industry (i.e. sic code 6000 – 6999).

Table 1 shows the summary statistics of the variables utilized in the empirical specifications (Appendix 1 reports detailed variable definitions). Although our dataset is extracted from Compustat Segment database which is different from prior literature, the mean and median of the earnings quality proxies do not deviate very much from those in prior literature (e.g. Hopkins et al., 2015).

Table 2 reports the correlation matrix which reveals interesting clues about the relation between customer's inventory accruals ($INVACC_c$) and earnings quality proxies. First, w_INVACC_c is positively correlated with both *AQ* and *ABS_DA*, suggesting that suppliers with high level of customers' inventory accruals experience lower earnings quality (i.e., higher *AQ* and *ABS_DA*). Second, w_INVACC_c is positively correlated with *Positive_DA* implying that firms with high level of customers' inventory accruals may have greater tendency to manage earnings upwards to attain earnings targets, an indication of intentional estimation error.

Although these results suggest a higher level of customers' inventory accruals leads to suppliers' lower earnings quality and more earnings management, our dependent variable w_INVACC_c is correlated with fundamental characteristics like size (*SIZE*) and age (*OldFirm*). Thus, we turn next to the multivariate analysis.

5. Empirical Findings

5.1. Main Results

Table 3 demonstrates the empirical results for the relationship between the weighted customers' inventory accruals (w_INVACC_c) and our measures of earnings quality. Column (1) shows the findings of assessing equation (4) utilizing *AQ* as the proxy for earnings quality. The coefficient on w_INVACC_c is positive and significant (α_1 = 0.033, p < 0.01), implying that firms with a higher level of customers' inventory accruals have lower accrual quality. In column (2) we find consistent results in which w_INVACC_c is positively related to higher absolute discretionary accruals (α_1 = 0.053, p < 0.01). The results are appealing to the errors in accrual estimation hypothesis. The evidence does not support that supplier have information advantage to interpret customer's inventory information. In economic terms, these results suggest that when the level of customer's inventory accruals is increased by 1 unit, *AQ* and *ABS_DA* is approximately increased by 52% and 82% respectively, measured at the median of the distribution of these variables.[3] Results presented in column (3) test the association of customer's inventory accruals on their firms' earnings management practices. The coefficient of w_INVACC_c is positive but insignificant. The results are similar to preliminary findings of the univariate correlations in Table 1.

Since supplier may not incorporate the customer inventory information into the financial reporting practice in the same fiscal year, we re-examine model (1) – (3) using

[3] In Table 1, the median of *AQ* is 0.063. The coefficient on the customer inventory accruals (*w_INVACCc*) in Table 3 is 0.033. When *w_abi* is increased by 0.01 unit, there is a 0.52% increase in *AQ* [(0.033/0.063) * 0.01]. For *ABS_DA*, the median is 0.065. The coefficient on the customer inventory accruals in Table 3 is 0.053, representing a 0.82% increase [(0.053/0.065) * 0.01].

one-year lead dependent variables. Results in column (4) – (5) are generally consistent with previous findings. The coefficient of $w\_\ INVACC_c$ in column (6) becomes statistically significant (α_1 = 0.069, p < 0.01). Supplier with a higher level of customers' inventory accruals is associated with higher level of income-increasing discretionary accruals in year *t+1*. As with the tests on earnings quality of supplier, the result is consistent with errors in accruals hypothesis.

5.2 Robustness Tests

In this section, we investigate if the results reported in Table 3 are robust to alternative design choices. Even though we control for related firm characteristics that determine earnings quality, there yet may be characteristics that we have omitted. Further, the customer's inventory accruals could be endogenously determined. We address each of these issues in turn.

5.2.1 Changes in the level customer's inventory accruals

First, we address the issue of omitted variables by conducting an analysis using changes specification. Specifically, we only retain observations in which the level of customers' inventory accruals changes (increasing inventory accruals or decreasing inventory accruals between time t and time t+1) and re-estimate equation (4) using change specification. Thus, the firm acts as its own control, and the coefficient of change in weighted customers' inventory accruals ($ch\_\ w\_\ INVACC_c$) captures the change in supplier's earnings quality due to the change in customer's inventory accruals. Results reported in Table 4 are generally consistent with previous findings. The coefficient of $ch\_w\_\ INVACC_c$ in the *ch_ABS_DA* regression is positively significant (α_1 = 0.069,

p<0.1). The coefficient of $ch\_w\_INVACC_c$ in the ch_AQ regression is also positive and significant.

5.2.2 Instrumental Variables

Since having customer with different level of inventory accruals might be a choice variable, endogeneity is a potential concern. To solve the problem, we conduct an instrumental variables approach (Larcker and Rusticus 2010). We use customer's operational efficiency, measured by industry-adjusted inventory turnover, as the instrumental variable. It has two important features as an instrument. First, Lee and Kesavan (2018) find that it is correlated with our variable of interest ($INVACC_c$), as firms with higher operational efficiency have a lower probability of inventory buildup. Second, it is unlikely that the operations management of the downstream customer affects the accounting practices of the supplier firm. Hence, it exhibits appealing properties of a valid instrument: exogeneity and a strong correlation with the variables of interest.

To implement the instrumental variables approach, we estimate the first-stage OLS regression as follow:

$$w\_INVACC_{c_{it}} = \alpha_0 + \alpha_1 w\_ait_{it} + \alpha_2 SIZE_{it} + \alpha_3 LEV_{it} + \alpha_4 MB_{it} + \alpha_5 OldFirm_{it} + \alpha_6 StdSaleGrwth_{it} + \alpha_7 StdSale_{it} + \alpha_8 StdCF_{it} + \alpha_9 invt\_growth\_s_{it} + Industry\ Fixed\ Effects + Year\ Fixed\ Effects + \eta_{it} \quad (5)$$

where w_ait_{it} is the supply chain sales weighted inventory turnovers.

Inventory needs in different industries can be quite different. Accordingly, we follow Chen et al. (2005,2007) and Hutton et al. (2012) to take the normalized deviation from the industry mean to define whether a firm has superior operational efficiency or fall behind. To illustrate, it is the normalized cost of goods sold to inventory ratio (i.e. [IT – industry mean of IT]/ industry standard deviation of IT). The remaining variables is defined as previous equations.

An advantage of using w_ait_{it} is unit free. The interpretation of $w_ait_{it}$is simple. If w_ait_{it} is positive, customers of firm *i* in year *t* are more efficient than their competitors in the same industry on average, and vice versa.

Using the predicted values from equation (5), we estimate the following specification:

$$Earnings\ Qualtiy_{it} = \alpha_0 + \alpha_1 w\_INVACC_{c_{it[instrument]}} + \alpha_2 SIZE_{it} + \alpha_3 LEV_{it} + \alpha_4 MB_{it} + \alpha_5 OldFirm_{it} + \alpha_6 StdSaleGrwth_{it} + \alpha_7 StdSale_{it} + \alpha_8 StdCF_{it} + \alpha_9 invt\_growth\_s_{it} + Industry\ Fixed\ Effects + Year\ Fixed\ Effects + \eta_{it} \quad (6)$$

The variable of interest ($w\_INVACC_{c_{it[instrument]}}$) is the predicted value from equation (5) and represents the exogenous portion of customers' inventory accruals.

Table 5 tabulates the results of the instrumental variables tests. We expect the exogenous instrument, *w_ait*, loads negatively in the first stage, indicating that the level of customers' inventory accruals is decreasing with their operational efficiency. Results

of the second-stage estimation presented in columns (2) indicate that inferences are consistent with those drawn from Table 3.

5.3 Alternative Proxy for Customer's Inventory Accruals

Since the inventory valuation method can be different across companies, we adjust the inventory number by including the change of last-in-first-out reserve (*lifr*) in our inventory accruals measure.

$$AINVACC_{c_{it}} = \frac{\Delta \text{invt}_{it} + \Delta \text{lifr}_{it}}{average\ total\ asset_{it}}$$

Consistent with previous practices, we aggregate the variables from customers (including *AINVACCc*) using supply chain sales weighted average when suppliers have multiple customers.

Table 6 examine the relation between adjusted inventory accruals ($AINVACC_c$) of customer and proxies of supplier's earnings quality. The results show that suppliers with higher *AINVACC* tend to have lower earnings quality. The coefficients on *AINVACC* are positive and significant (coefficient = 0.027 and 0.048 and p-value <0.05, <0.01 respectively) when explaining future AQ and ABS_DA. The coefficient of w_INVACC_c for *Positive_DA* becomes significant when explaining future Positive_DA at *t+1*. These results are generally consistent with previous findings and support the errors in accrual estimation hypothesis rather than informational advantage hypothesis.

5.4 Summary

Overall, these tests establish a significant negative causal relation between customer's inventory accruals level and supplier's earnings quality. When customers firms accumulate a high level of inventory accruals, suppliers face more difficulty in earnings estimation and tend to engage in upwards earnings management. Our inferences are robust to change specifications and different measures of customer's inventory accruals. Moreover, our robust instrumental variable (IV) analysis proposes a causal interpretation of the impact of customer's inventory accruals on supplier's earnings quality instead of a reverse relation.

6. Additional Analyses

6.1. Does the Customer's Inventory Accruals increase the Likelihood of Misstatements?

The findings thus far suggest there is a negative causal relation between customer's inventory accruals level and supplier's earnings quality. Now, we investigate the impact of customer's inventory accruals level on the likelihood of misstatements of supplier firms. Many accounting researchers use restatements, SEC Accounting and Auditing Enforcement Releases (AAERs) and internal control weakness reported under the Sarbanes Oxley Act (SOX) as the external indicators of earnings misstatements, either for unintentional errors or intentional earnings management. Disadvantages of using AAERs include selection bias and small sample sizes. Meanwhile, there are problems with differentiating between intentional and unintentional errors using restatements and SOX firms sample. Thus, Dechow et al. (2011) demonstrate that financial statement information is useful for detecting earnings management and introduce a composite

measure of the probability of manipulation (F-score) to detect the likelihood of financial misstatements. To elaborate, F-Score (*fscore*) is a scaled logistic probability measure that utilize the characteristics of misstatements firms such as accrual quality, financial performance, off-balance sheet information, nonfinancial measures, and market-based measures to predict future misstatements. If suppliers with high level of customers' inventory accruals have a higher propensity to misstate their financial statements, these firms result in higher *fscore*.

Table 7 column (1) presents the results of relation between the level of customers' inventory accruals (*w_INVACCc*) and suppliers' F-Score. The coefficient on *w_INVACCc* is positively significant (coefficient = 0.97 and $p<0.01$). This indicates a higher level of customers' inventory accruals increases the probability of misstatements of supplier firms. Column (2) is the results of the estimation of the tendency of suppliers reporting internal control weakness (*ICW*) in year t or t+1. The sample period is from 2004 to 2016 for column (2) analysis since the SOX 404 became effective in 2004. Due to the sample period restriction, the number of observations is reduced to 6,153. The coefficient on *w_INVACCc* is positive and statistically significant (coefficient = 3.98, $p<0.05$). It implies that suppliers with higher level of customer's inventory accruals tend to report material weakness in current or next year.

6.2 Does Supplier's Inventory Accruals Influence their Earnings Quality?

Our inference that inventory accruals engender inferior financial reporting quality and greater earnings management is predicated on the potential errors inherent in estimating inventory accruals. Extant research (Thomas and Zhang, 2002; Allen et al., 2013) document that inventory accruals lead to lower persistence of earnings. Therefore,

it is not inconceivable that supplier's own inventory accruals, instead of customer's inventory accruals, affects the incidence and magnitude of earnings estimation errors, thereby resulting in lower earnings quality.

To test this conjecture, we compare and correlate the customer's inventory accruals and supplier's own inventory changes.

Table 2 reports the correlations between general supplier's own (*INVACCs*) and their customer's inventory accruals (*INVACCc*). The correlations indicate that supplier's inventory accruals are highly correlated with those of their customer (corr = 0.17, $p<0.01$). This suggests that (i) the role of inventory accruals for earnings quality documented is likely to propagate along the supply chain, (ii) the impact of customer's inventory accruals on their supplier's earnings quality could be explained by the supplier's own inventory accrual level.

Table 8 tabulates results from regression results of the relationship between the firm's own inventory accruals and reporting outcomes. In estimating the regressions, we estimate equation (4) by adding the control variable for the firm's inventory accruals (*INVACCs*), customer concentration (*rank_cc*), average supply chain relationship duration (*avg_duration*) and operating cycle (*operating_cycle*). Results are broadly consistent with both the firm's and their customer's inventory accruals affect earnings quality. Our findings indicate that the effects of customer's inventory accruals are incrementally significant on supplier's earnings quality after controlling for the supplier's own inventory accruals. We also find that the firm's own inventory accruals level is positively associated with its absolute value of discretionary accruals (coefficient = 0.0056) and accruals quality (coefficient = 0.029) and the coefficient in the earnings quality regression does not reach conventional significance levels. With respect to

likelihood of accounting misstatements, we document that the firm's own inventory level is positively related to the F-Score and the relationship is statistically strong. Together, the evidence suggests that customer's inventory accruals is an external determinant of the supplier's earnings quality which is incremental to the firm's own inventory accruals documented.

6. Conclusions

This paper examines how the level of customer's inventory accruals affects supplier's financial reporting, specifically the role they play in firms' accounting quality and earnings management. We consider two contrasting hypotheses towards the effects of customer's inventory accruals on supplier's earnings quality. First, we consider a high level of customer's inventory accruals allows international and unintentional errors in earnings estimation to occur and there is a neagtive relation between customer's inventory accruals level and supplier's earnings quality. Second, we consider supplier may have inherent informational advantages when processing the customer inventory information. Based on informational advantage hypothesis, customer's inventory accruals level is unrelated to supplier's earnings quality. Our findings indicate that customer's inventory accruals level is negatively associated with supplier's earnings quality. In additional tests, we employ alternative measures to capture the differences in inventory recording methods and the results are consistent to the main analysis.

Taken as a whole, the results are not favor with supplier's information advantage hypothesis, at least with respect to accounting quality and earnings management decisions. Rather, high level of customer's inventory accruals adversely affects supplier's financial

reporting quality. Our results are robust to change base analysis using the observations with changing inventory holding practices and adding change specifications to the model. Moreover, we also use different indicators of earnings quality including F-Score (Dechow et al., 2011) and internal control weakness. Furthermore, our results are robust when additional control variables such as supplier's own inventory accruals, customer concentration, average supply chain relationship duration and operating cycle are included. All the findings are broadly consistent with our main results which support the errors in accrual estimation hypothesis.

Our paper contributes to the literature about inventory accruals externality along the supply chain and the determinates of earnings quality. To our knowledge, we are among the first to address the adverse effect of customer's inventory accruals level on their supplier's earnings quality and likelihood of financial misstatements. Second, we shed light on how customer's inventory accruals level extends to other aspects to stock market reaction, in this case, accounting practices. Third, our evidence has important implications to the investing community. If customer's inventory accruals level affects supplier firms' earnings quality, our evidences are useful to capital market participants in distinguishing between reliable earnings information and inaccurate earnings information. Specifically, this study extends and develops the understanding on the influence of inventory accruals on earnings quality along the supply chain.

References

Abarbanell J.S. and Bushee B.J. (1997). Fundamental Analysis, Future Earnings, and Stock Prices. *Journal of Accounting Research, 35*(1), 1-24.

Allen E.J., Larson C.R., and Sloan R.G. (2013). Accrual reversals, earnings and stock returns. *Journal of Accounting and Economics, 56*(1), 113-129.

Bergstressera D., and Philippon T. (2006). CEO incentives and earnings management. *Journal of Financial Economics, 80*(3), 511-529.

Bray R.L., Mendelson H. (2012). Information Transmission and the Bullwhip Effect: An Empirical Investigation. *Management Science, 58*(5), 860-875.

Burkart M., and Ellingsen T. (2004). In-Kind Finance: A Theory of Trade Credit. *American Economic Review, 94*(3), 569-590.

Chen H., Frank M.Z., and Wu O.Q. (2005). What actually happened to the inventories of American companies between 1981 and 2000? *Management Science, 51*(7), 1015-1031.

Chen H., Frank M.Z., and Wu O.Q. (2007). U.S. retail and wholesale inventory performance from 1981 to 2004. *Manufacturing & Service Operations Management, 9*(4), 430-456.

Dechow P. M., Khimich N. & Sloan R. G. (2011). The Accrual Anomaly. In L. Zacks, *The Handbook of Equity Market Anomalies: Translating market inefficiencies into effective investment strategies* (p. Chapter 2). Wiley Finance.

Dechow P.M. and Schrand C. (2004). *Earnings Quality.* The Research Foundation of CFA Institute.

Dechow P.M., Ge W., Larson C.R., and Sloan R.G. (2011). Predicting material accounting misstatements. *Contemporary Accounting Research, 28*, 17-82.

Dechow R.M., and Dichev I.D. (2002). The quality of accruals and earnings: The role of accrual estimation errors. *The Accounting Review, 77*(1), 35-59.

Francisa J., LaFond R., Olsson P., and Schipper K. (2005). The market pricing of accruals quality. *Journal of Accounting and Economics, 39*(2), 295-327.

Hendricks K.B. and Singhal V.R. (2009). Demand-Supply Mismatches and Stock Market Reaction: Evidence from Excess Inventory Announcements. *Manufacturing & Service Operations Management, 11*(3), 509-524.

Hertzel M.G., Li Z., Officer M.S., Rodgers K.J. (2008). Inter-firm linkages and the wealth effects of financial distress along the supply chain. *Journal of Financial Economics, 87*(2), 374-387.

Hopkins J., Maydew E. and Venkatachalam M. (2014). Corporate General Counsel and Financial Reporting Quality. *Management Science, 61*(1), 129–145.

Houston J.F., Lin C. and Zhu Z. (2016). The financial implications of supply chain changes. *Management Science, 62*(9), 2520-2542.

Hribar P., and Nichols D.C. (2007). The Use of Unsigned Earnings Quality Measures in Tests of Earnings Management. *Journal of Accounting Research, 45*(5), 1017-1053.

Hui K.W., Klasa S., and Yeung P.E. (2012). Corporate suppliers and customers and accounting conservatism. *Journal of Accounting and Economics, 53*(1-2), 115-135.

Hutton A.P., Lee L.F., and Shu S.Z. (2012). Do Managers Always Know Better? The Relative Accuracy of Management and Analyst Forecasts. *Journal of Accounting Research, 50*(5), 1217-1244.

Jiang J., Petroni K.R., and Wang I. (2010). CFOs and CEOs: Who have the most influence on earnings management? *Journal of Financial Economics, 96*(3), 513-526.

Jones J.J. (1991). Earnings Management During Import Relief Investigations. *Journal of Accounting Research, 29*(2), 193-228.

Larcker D.F., and Rusticus T.O. (2010). On the use of instrumental variables in accounting research. *Journal of Accounting and Economics, 49*(3), 186-205.

Lee H.L., Padmanabhan V., and Whang S. (1997). Information distortion in a supply chain: The bullwhip effect. *Management Science, 43*(4), 546-558.

Lee H.S., and Kesavan S. (2018). Do productive retailers have fewer excess inventory announcements? *working paper*.

Nuzio, T. (2019, April 24). *The High Cost of Carrying Inventory and What Wal-Mart is Doing About It*. Retrieved from ICC Logistics: https://icclogistics.com/the-high-cost-of-carrying-inventory-and-what-wal-mart-is-doing-about-it/

Patatoukas P.N. (2011). Customer-base concentration: implications for firm performance and capital markets. *The Accounting Review, 87*(2), 363-392.

Petersen M.A. and Rajan R.G. (1997). Trade Credit: Theories and Evidence. *Review of Financial Studies, 10*(3), 661-691.

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

Roychowdhury S. (2006). Earnings management through real activities manipulation. *Journal of Accounting and Economics, 42*(3), 335-370.

Sloan R.G. (1996). Do Stock Prices Fully Reflect Information in Accruals and Cash Flows about Future Earnings? *The Accounting Review, 71*(3), 289-315.

Smith J.K. (1987). Trade credit and informational asymmetry. *Journal of Finance, 42*(4), 863-872.

Steinker S. and Hoberg K. (2013). The impact of inventory dynamics on long-term stock returns – An empirical investigation of U.S. manufacturing. *Journal of Operations Management, 31*(5), 250-261.

Thomas J.K., and Zhang H. (2002). Inventory changes and future returns. *Review of Accounting Studies, 7*(2-3), 163-187.

Ziobro, P. (2016, June 27). Retailers Rethink Inventory Strategies . *The Wall Street Journal*.

Appendix 1
Variable Definitions

Variable	Variable Definition
w_INVACCc	customer's supply chain sales weighted inventory accruals; inventory accruals is defined as change in inventory for year t-1 to year t deflated by average total assets;
AQ	accruals quality estimated as the standard deviation of the residuals of a modified Dechow-Dichev (2002) over the current and previous 4 years;
ABS_DA	absolute value of discretionary accruals from a modified Jones (1991) model;
Positive_DA	positive discretionary accruals from a modified Jones (1991) model, 0 or negative discretionary are considered as missing value
SIZE	log of market value of equity;
LEV	total long-term debt (dltt) divided by total assets (at);
MB	market to book equity ratio;
StdSaleGrwth	standard deviation of sales growth over the current and previous 4 years;
StdSale	standard deviation of sales over the current and previous 4 years;
StdCF	standard deviation of cash flows from operations (oancf) scaled by total assets (at) over the current and previous 4 years;
OldFirm	Indicator variable that equals to 1 if the firm is listed on Compustat for more than 20 years, equals to 0 otherwise;
fscore	F-Score developed by Dechow et al. (2011)
ICW	= 1 when the firm reports internal control weakness at year t or year t+1
avg_duration	average duration of supplier-customer relationship in Compustat Segment database;
rank_cc	decile rank of customer concentration (cc), $cc_{it} = \sum_{j=1}^{j}(\frac{csale_{ijt}}{sale_{it}})^2$, where $csale_{ijt}$ is the supply chain sales from customer *j* to supplier *i* at time *t*;
ABIs	inventory accruals of supplier which is calculated as change of inventory from year t-1 to year t deflated by average total assets
w_ait	customer's supply chain sales weighted abnormal inventory turnover; abnormal inventory turnover is defined as [(IT – industry mean of IT)/ industry standard deviation of IT] where IT is inventory turnover (cost of goods sold to inventory ratio)
AINVACCc	customer's supply chain sales weighted adjusted inventory accruals; adjusted inventory accruals is defined as [(Δinvt +Δlifr) / average total asset], where Δinvt is change of inventory and Δlifr is change in last-in-first-out reserve of inventory from year t-1 to year t

Table 1 Descriptive Statistics

This table provides descriptive statistics and correlations for 9,768 firm-years. All variables are defined in Appendix 1

	count	mean	p50	sd	p25	p75
w_INVACCc	9768	.0115957	.0047459	.0319648	-.0020232	.0196538
ABS_DA	9768	.0645361	.0422383	.071992	.0177203	.0836792
Positive_DA	9768	.0643658	.0422383	.0710306	.0177203	.0836792
AQ	9768	.0627237	.0462406	.0542824	.0276799	.077507
fscore	9768	1.087922	.9250701	.7821753	.5207914	1.416282
SIZE	9768	4.856391	4.793318	2.304314	3.139072	6.496804
LEV	9768	.172336	.1225799	.1827923	.0026362	.286606
MB	9768	2.943373	1.697309	4.47993	1.016719	3.057346
sd of sales growth	9768	.2285443	.1604383	.2344034	.0842229	.2822674
sd of sales	9768	158.6124	22.51129	435.6631	6.006624	91.65877
sd of cash flow	9768	.0921718	.0622938	.1036413	.0364486	.1066742
ABIs	9768	.0263468	.0085103	.0582517	0	.043592
OldFirm	9768	.3516585	0	.4775124	0	1
rank_cc	9768	.5321663	.5	.2824285	.3	.8
avg_duration	9768	4.820265	4	4.098264	2	6

Table 2 Correlation Matrix

	w_INVACCc	ABS_DA	Positiv~A	AQ	fscore	SIZE	LEV	MB	sd of s~h	sd of s~s	sd of c~w	ABIs	OldFirm
w_INVACCc	1												
ABS_DA	0.0557***	1											
Positive_DA	0.0556***	0.999***	1										
AQ	0.00928	0.480***	0.478***	1									
fscore	0.128***	0.412***	0.412***	0.233***	1								
SIZE	-0.0450***	-0.285***	-0.287***	-0.286***	-0.0625***	1							
LEV	-0.00556	-0.0834***	-0.0838***	-0.165***	0.000452	0.170***	1						
MB	0.00442	0.154***	0.151***	0.248***	0.0845***	0.156***	0.0519***	1					
sd of sales gr~h	0.0187*	0.319***	0.319***	0.478***	0.231***	-0.320***	-0.150***	0.0920***	1				
sd of sales	-0.0444***	-0.122***	-0.123***	-0.131***	-0.0185*	0.518***	0.120***	0.0142	-0.0210**	1			
sd of cash flow	-0.0103	0.357***	0.355***	0.563***	0.0950***	-0.297***	-0.184***	0.301***	0.395***	-0.152***	1		
ABIs	0.170***	0.357***	0.361***	0.101***	0.491***	-0.0858***	0.0332***	0.0129	0.0948***	-0.0518***	0.0603***	1	
OldFirm	-0.0201**	-0.122***	-0.123***	-0.170***	-0.0669***	0.202***	0.0306***	-0.0925***	-0.126***	0.121***	-0.192***	-0.0783***	1

* p<0.10, ** p<0.05, *** p<0.01

Table 3 Relation between Customer's Weighted Invetory Accruals and Proxies of Earnings Quality

This table reports OLS estimation of the association between customer's supply chain weighted average abnormal inventory (*w_ABIc*) and proxies of earnings quality and reporting quality over the period 1977–2016. Models (1) – (3) are estimated using variables at fiscal year t, whereas we use one year ahead dependent variable in models (4) – (6). All variables are defined in the appendix. Standard errors are presented in parentheses.[4]

	AQ	ABS_DA	Positive_DA	AQ[t+1]	ABS_DA[t+1]	Positive_~1]
	b/se	b/se	b/se	b/se	b/se	b/se
w_INVACCc	.0331967***	.0527304***	.0106511	.0447887***	.0419721*	.0691075***
	(.0104288)	(.0165276)	(.0213329)	(.0120411)	(.0213075)	(.0211716)
SIZE	-.0034588***	-.0052867***	-.0055986***	-.003636***	-.0065591***	-.0061873***
	(.0003267)	(.0003587)	(.0004168)	(.000366)	(.0004492)	(.000527)
LEV	-.0015067	-.0090499***	-.0017796	-.0054222*	-.015824***	-.0250398***
	(.0026469)	(.0026988)	(.0034985)	(.0027043)	(.0039928)	(.0050192)
MB	.0010957***	.0013533***	.0013933***	.0012666***	.0016011***	.0021369***
	(.0001352)	(.0001903)	(.0002376)	(.0001538)	(.0002476)	(.0003532)
sd of sales growth	.0579882***	.0496265***	.0402068***	.056988***	.0430866***	.0391995***
	(.0046354)	(.0042697)	(.0053324)	(.0047239)	(.004867)	(.0058625)
sd of sales	5.10e-07	3.73e-06***	2.78e-06**	1.15e-06	4.40e-06***	2.29e-06
	(7.18e-07)	(8.93e-07)	(1.28e-06)	(8.40e-07)	(1.11e-06)	(1.61e-06)
sd of cash flow	.1907574***	.1344606***	.1329247***	.1804318***	.083985***	.0783931***
	(.0097546)	(.0133687)	(.0134771)	(.010282)	(.0135021)	(.0133229)
OldFirm	-.0018451*	-.0020208	.0012746	-.0017426	-.0028687*	-.0004299
	(.0009795)	(.0012473)	(.0011897)	(.0010537)	(.0016105)	(.0014782)
ABIs	.003387	.0217182	.410311***	-.0093522	.0445234***	.0631731***
	(.006531)	(.0189)	(.0209245)	(.0060591)	(.0151683)	(.0232707)
N	22706	22921	11303	17274	17335	8459
r2_a	.4555527	.193784	.3106762	.4389906	.1684687	.1904804
Cluster	Firm, year	Firm, year	Firm, year	Firm, year	Firm, year	Firm, year
Segment_dummies	Yes	Yes	Yes	Yes	Yes	Yes
Year_dummies	Yes	Yes	Yes	Yes	Yes	Yes

* p<0.10, ** p<0.05, *** p<0.01

[4] For the models in column (4) – (6), we only keep the observations in which the firm maintain supply chain relationship in both fiscal year t and year t+1.

Table 4 Relation between Changes of Customer's Weighted Abnormal Inventory and Proxies of Earnings Quality

This table reports estimation of the relation between changes of customer weighted abnormal inventory and changes of proxies of earnings quality over the period 1977-2016. All variables are defined in Appendix 1. Standard errors are presented in parentheses.

	ch_ABS_DA b/se	ch_AQ b/se
ch_w_INVACCc	.0609049*	.0195961*
	(.034136)	(.0114731)
ch_SIZE	-.0058758**	-.0005391
	(.0026951)	(.0010066)
ch_LEV	.0040789	.0040368
	(.0086586)	(.0032756)
ch_MB	.0028949***	.0007152**
	(.0007372)	(.000265)
ch_StdSaleGrwth	.0116868	.0362875***
	(.0163553)	(.0051779)
ch_StdSale	3.33e-06	-1.53e-06
	(4.59e-06)	(1.08e-06)
ch_StdCF	.1442697***	.1617302***
	(.0379599)	(.0137945)
ch_OldFirm	.0057442	.002471
	(.003993)	(.0019605)
ch_ABIs	-.0529526*	-.0295873***
	(.0296862)	(.0081595)
N	4811	4798
r2_a	.0205285	.1449969
Cluster	Firm, year	Firm, year
Segment_dummies	Yes	Yes
Year_dummies	Yes	Yes

* p<0.10, ** p<0.05, *** p<0.01

Table 5 IV

We use operational efficiency of customer (i.e. supply chain sales weighted industry adjusted inventory turnover) as an instrumental variable for customer abnormal inventory.

	first stag~)	IV(ABS_DA)
	b/se	b/se
w_ait	-.0124946***	
	(.0011877)	
w_INVACCc		.2682826**
		(.1288431)
SIZE	.0003057	-.0053058***
	(.0002025)	(.0003662)
LEV	-.0030821*	-.0081626***
	(.0016482)	(.002816)
MB	.0001696**	.001312***
	(.0000673)	(.0001969)
sd of sales growth	.0028646*	.0495995***
	(.0016616)	(.0043939)
sd of sales	-8.04e-07	3.86e-06***
	(5.55e-07)	(9.68e-07)
sd of cash flow	-.0112016***	.1362975***
	(.0033088)	(.0133251)
OldFirm	.0003331	-.0019125
	(.000644)	(.0012419)
ABIs	.0409787***	.0147623
	(.0077786)	(.0204462)
constant	.0093501***	
	(.0012584)	
N	22842	22395
r2_a	.0991496	.1849137
Cluster	Firm, year	Firm, year
Segment_dummies	Yes	Yes
Year_dummies	Yes	Yes

* p<0.10, ** p<0.05, *** p<0.01

Table 6 Relation between Abnormal inventory and Proxies of Earnings Quality (Using an Alternate Proxy for Abnormal inventory

Results of OLS estimation of the relation between alternative metrics and proxies of earnings quality. All variables are defined in Appendix 1. Standard errors are presented in parentheses.

Adjusted Inventory Accrual (*AABIc*)

	AQ	ABS_DA	Positive_DA	fscore	ICW
	b/se	b/se	b/se	b/se	b/se
main					
w_ABIc	.0269868**	.0475483***	.0084236	.8173253***	2.26027
	(.0105367)	(.016808)	(.0221461)	(.2197477)	(1.700942)
SIZE	-.0035346***	-.0053568***	-.0055545***	.0137032***	-.279462***
	(.0003493)	(.0003912)	(.0004454)	(.0046316)	(.0646841)
LEV	-.0011587	-.0091044***	-.0028273	.2871451***	.9781354***
	(.0027873)	(.0030694)	(.0041233)	(.0512286)	(.3593054)
MB	.0011396***	.0013778***	.0013765***	.0024908	-.0040328
	(.0001384)	(.0002007)	(.0002545)	(.0020154)	(.0094092)
sd of sales growth	.0597333***	.0518248***	.0413537***	.3902175***	.6578839*
	(.0048062)	(.0045877)	(.0056815)	(.0432547)	(.3581138)
sd of sales	7.37e-07	4.17e-06***	2.74e-06*	6.37e-06	4.73e-06
	(8.15e-07)	(1.05e-06)	(1.44e-06)	(.0000186)	(.000152)
sd of cash flow	.1934512***	.1364635***	.1346958***	-.0298734	.53729
	(.0102295)	(.014886)	(.0156691)	(.0882245)	(.5711907)
OldFirm	-.0018825*	-.0021446	.0010984	.0353714**	-.0464677
	(.0010515)	(.0013386)	(.0013106)	(.0163508)	(.1939758)
ABIs	.0072133	.0187566	.4117754***	4.696057***	.2551008
	(.0070705)	(.0202662)	(.0227148)	(.1864922)	(1.44165)
N	19977	20151	9893	17806	5253
r2_a	.4457374	.1920991	.3064132	.2648558	.
Cluster	Firm, year	Firm, year	Firm, year	Firm, year	Firm, year
Segment_dummies	Yes	Yes	Yes	Yes	No
Year_dummies	Yes	Yes	Yes	Yes	No

* p<0.10, ** p<0.05, *** p<0.01

Table 7 Relation between Abnormal inventory and Earnings Quality (F-score and ICW)

All variables are defined in Appendix 1. Standard errors are presented in parentheses.

	fscore b/se	ICW b/se
main		
w_INVACCc	.9714677***	3.980367**
	(.2036407)	(1.865841)
SIZE	.0170669***	-.2955507***
	(.0046464)	(.0593769)
LEV	.3082972***	.7854664**
	(.0479931)	(.3783774)
MB	.0025857	-.0022784
	(.0020518)	(.0089555)
sd of sales growth	.4183584***	.5834658*
	(.0430695)	(.3530876)
sd of sales	3.03e-06	.0000594
	(.000017)	(.0001385)
sd of cash flow	-.0638847	.5659792
	(.0790948)	(.5448921)
OldFirm	.035513**	-.0685489
	(.0150913)	(.1702283)
ABIs	4.70076***	.4167528
	(.1716032)	(1.228417)
N	20206	6153
r2_a	.2642451	.
Cluster	Firm, year	Firm, year
Segment_dummies	Yes	No
Year_dummies	Yes	No

* p<0.10, ** p<0.05, *** p<0.01

Table 8 Additional Control Variables

	AQ b/se	ABS_DA b/se	fscore b/se	ICW b/se
main				
w_INVACCc	.0230095**	.0418633**	.7305971***	3.58018*
	(.0109645)	(.0163672)	(.2070916)	(1.898461)
SIZE	-.0031589***	-.0044687***	.0132725***	-.2914286***
	(.0003174)	(.0003799)	(.0048722)	(.0587439)
LEV	-.0004935	-.0081933***	.3503609***	.8480452*
	(.0028647)	(.0028486)	(.0513038)	(.4330578)
MB	.001016***	.0012215***	.0012183	-.0108666
	(.0001448)	(.0001834)	(.0024674)	(.0116494)
sd of sales growth	.061683***	.0544287***	.4151371***	.3617812
	(.0045119)	(.0041269)	(.0409972)	(.3970299)
sd of sales	9.11e-07	4.12e-06***	4.91e-06	.0000804
	(7.63e-07)	(9.23e-07)	(.000017)	(.0001371)
sd of cash flow	.2000213***	.1482494***	-.0241019	1.551529***
	(.0100436)	(.0151601)	(.0913979)	(.5932976)
OldFirm	-.001317	-.0017098	-.0028208	-.2028876
	(.0009886)	(.001252)	(.0145964)	(.1756445)
ABIs	.0047915	.0237332	4.706869***	.249356
	(.006064)	(.0182515)	(.1608205)	(1.110245)
rank_cc	.0028441	.0064288***	-.0814632***	.1865255
	(.0017553)	(.0023051)	(.0264479)	(.211775)
avg_duration	-.0003196**	-.0001247	.0067691***	.0193833
	(.0001212)	(.0001317)	(.0020641)	(.0152725)
operating_cycle	.0096686***	.0163768***	.2006007***	.1613136
	(.0010692)	(.0014514)	(.0154239)	(.1000582)
N	19977	20188	17727	5247
r2_a	.4681747	.211842	.2952408	.
Cluster	Firm, year	Firm, year	Firm, year	Firm, year
Segment_dummies	Yes	Yes	Yes	No
Year_dummies	Yes	Yes	Yes	No

* p<0.10, ** p<0.05, *** p<0.01