Customer Tax Uncertainty and Supplier Investment

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Abstract

This paper examines the effect of customer firms' tax uncertainty on their supplier firms' investment decisions. We find that customers' tax uncertainty, proxied by additions to unrecognized tax benefits (UTBs) from current-year positions, is associated with an increased likelihood of underinvestment and a decreased likelihood of overinvestment by suppliers. This finding implies that customers' UTB reserves appear to increase suppliers' uncertainty about investment payoffs, thereby increasing (decreasing) their tendency to underinvest (overinvest). We further document that the relation between customers' tax uncertainty and suppliers' likelihood of under- or overinvestment is more pronounced for durable goods suppliers, customers with large trade credit, and customers with high financial constraints. These results suggest that when supplier firms are more exposed to risks from customers' businesses, they are likely more cautious about risks associated with their customers' tax uncertainty, leading to more conservative investment behavior. Overall, our paper provides evidence on the relevance of UTB information to one of the important stakeholders of the firm, i.e., suppliers.

Keywords: investment; supply chain; tax uncertainty; uncertain tax positions; unrecognized tax benefits

1. Introduction

We investigate the effect of tax uncertainty of downstream firms (i.e., customers) on the investment decisions of upstream firms (i.e., suppliers). The supply chain literature highlights the benefits of using customer information to calibrate the level of investment made by suppliers (Kouvelis, Chambers, and Wang 2006). In particular, information about risks associated with customers' businesses helps mitigate two key information frictions for suppliers. First, supplier chain investments are usually relationship-specific and thus are significantly less valuable outside of a specific customer-supplier relationship (e.g., Williamson 1979; Joskow 1987). This bond enables customers to extract rents from their suppliers after the investment is made and results in a "hold-up" problem that causes suppliers to underinvest. Second, suppliers, rather than customers, bear the costs of holding extra inventory or capacity. Therefore, customers have the tendency to inflate demand to ensure that they will always have product in stock, resulting in the "bullwhip" effect (Lee, Padmanabhan, and Whang 1997).

Due to these information frictions, suppliers benefit from gathering relevant information about their customers from all available sources to gauge investment payoffs when making supply chain investments. Consistent with this argument, existing research documents that supplier firms incorporate information contained in their customer firms' disclosures, such as risk factor disclosures and forward-looking disclosures, into their investment decisions (Chen, Kim, Wei, and Zhang 2019; Chiu, Kim, and Wang 2019). Our study focuses on customer firms' tax uncertainty (i.e., uncertainty related to tax positions that may or may not be upheld upon IRS audit), as reflected in reserves for unrecognized tax benefits (UTBs), and examines whether and how customer tax uncertainty is associated with supplier investment.

Tax uncertainty poses a significant business risk to firms, which may adversely influence

stakeholders' expectations about firms' future cash flows because of potential substantial cash outflows from settling tax disputes with the Internal Revenue Service (IRS). Anecdotal evidence points to incidents of credit downgrades that are related to IRS settlements and their associated large cash outflows. For example, Fitch Ratings downgraded Merck & Co.'s credit rating to AA- after the firm settled a $2.3 billion tax dispute with the IRS in 2007, with the reason being that the cash outflow for the IRS settlement dampens the firm's free cash flow generation.[1] Consequently, tax uncertainty can be viewed as increasing firms' liquidity risk and potentially affect suppliers' investment decisions. In another example, the Wall Street Journal reported in September 2022 that Caterpillar settled a dispute about the tax treatment of profits from a Swiss subsidiary with the IRS for (coincidentally, also) $2.3 billion (Jacob and Tita 2022). Caterpillar reported the settlement within the UTB reserve disclosure in its 2021 10-K and highlighted it as a critical accounting estimate and critical audit matter. Information about firms' uncertain tax positions is publicly available and can be easily accessed by stakeholders (as in the Caterpillar example). As a result, tax uncertainty evident in UTB reserves can be viewed as negatively affecting firms' ability to meet contractual obligations and thus influence their suppliers' investment behavior.

While most settlements are of lower magnitude than that in the above examples, even in less extreme cases, tax uncertainty is still a substantial concern. In a survey of corporate tax executives, uncertainty about the validity of claimed tax positions and detection risk by the IRS are noted as significant concerns of top management (Graham, Hanlon, Shevlin, and Shroff 2014). Risks associated with tax uncertainty, as part of a customer firm's business risks, could affect its supplier firms' assessments about its future financial position and cash flow generation. Customers' tax uncertainty could increase suppliers' uncertainty about the customers' ability to

[1] https://www.fitchratings.com/research/corporate-finance/fitch-downgrades-merck-co-ratings-to-aa-outlook-stable-16-02-2007

fulfill contracts and hence the payoffs from their supply chain investments. If customers' tax uncertainty leads to an increase in suppliers' uncertainty when making investment decisions, we conjecture that suppliers are more likely to underinvest and are less likely to overinvest (i.e., a more conservative investment behavior). However, it is possible that risks associated with tax uncertainty might not be material enough to endanger customers' ability to fulfill contracts or change suppliers' expectations about investment payoffs in general. Therefore, whether customers' UTB information is related to suppliers' investment behavior is an empirical question.

Our sample consists of publicly listed U.S. supplier firms from 2008–2021 that disclose the identities of their major customers (i.e., customers that account for more than 10% of a supplier's sales). Following prior studies (e.g., Dyreng, Hanlon, and Maydew 2019; Guenther, Wilson, and Wu 2019), we measure customer tax uncertainty using UTB increases arising from uncertain tax positions taken in the current year disclosed in firms' financial statements.[2] We use the investment model from Biddle, Hilary, and Verdi (2009) and estimate a multinomial logistic regression to predict the likelihood of under- and overinvestment by supplier firms. Although increases in customer tax uncertainty measured by UTB increases are more likely to prompt underinvestment than overinvestment, they could also decrease the likelihood of overinvestment, so we examine both outcomes. Controlling for customer tax avoidance and other factors that may affect the average level of supplier investment, we find that customer firms' UTB additions from current-year tax positions are associated with an increased likelihood of underinvestment and a decreased likelihood of overinvestment by their supplier firms. These results are consistent with suppliers being concerned about their major customers' tax uncertainty, which makes their investment payoffs more uncertain and thereby increases (decreases) their likelihood to

[2] UTB increases in current positions capture the tax avoided from the tax liability a firm potentially bears under the U.S. statutory tax rate through uncertain tax avoidance strategies (Guenther et al. 2019).

underinvest (overinvest).

We further perform cross-sectional analyses to corroborate our findings. We motivate our cross-sectional tests based on the extent to which supplier firms are exposed to the risks from customers' businesses, which would affect how careful suppliers evaluate the risks associated with their customers' uncertain tax positions when making investment decisions. First, relative to nondurable goods suppliers, durable goods suppliers invest largely in relationship-specific assets and thus are more exposed to their customers' business risks. Second, suppliers bear a higher risk when they provide customers with a larger amount of trade credit. Third, due to financial linkages between customers and suppliers, suppliers face a higher risk when their customers are more financially constrained. Lastly, adjustment costs related to overinvesting in inventory are higher for suppliers with low inventory turnover, as any extra inventory is slow to sell on the market. In these scenarios, we expect the effect of customers' tax uncertainty on suppliers' likelihood of underinvestment to be more pronounced. Consistent with our expectation, we find that our results are mostly concentrated in durable goods suppliers, customers with large trade credit, customers with high financial constraints, and suppliers with low inventory turnover.

We conduct several additional tests to check the robustness of our results. First, we estimate the effect of customer tax uncertainty on the changes of different types of supplier investments. We find that customer tax uncertainty is negatively related to supplier changes in inventory and capital expenditures, and is insignificantly related to supplier changes in R&D and acquisition expenditures. These results suggest that customer tax uncertainty has a greater negative effect on suppliers in the types of investments that more strongly reflect the supplier-customer relationship (i.e., in inventory and capital expenditures rather than in R&D and acquisition expenditures). This finding, as well as the finding from quantile regressions, address concerns about the generated

regressor bias (Chen, Hribar, and Melessa 2023). To mitigate the concerns of potential confounding factors, we additionally control for the supplier's own tax uncertainty, customers' overall firm risk, future cash flow uncertainty, incoming smoothing, and accounting conservatism, and obtain similar results. Next, to make sure that our results are not sensitive to measurement choices, we use alternative measurements for customer tax uncertainty and supplier investment tendency, and results are unchanged. We separate total investment into capital and non-capital investment, and our results hold for both types of investment. Lastly, instead of using the aggregated data at the supplier-firm-year level, we rerun all analyses using the unaggregated data at the customer-supplier-firm-year level, and results remain similar.

Collectively, our results suggest that customers' tax uncertainty appears to increase their suppliers' uncertainty about investment payoffs and in turn affect their investment behavior, and that this effect is more pronounced when suppliers' investments are more exposed to their customers' business risks. This inference is consistent with the existing research showing that UTBs strongly predict future cash tax payments (e.g., Ciconte, Donohoe, Lisowsky, and Mayberry 2023; Gleason, Markle, and Song 2023). Our findings also complement results in Small and Song (2021) that UTBs increase short-term investor uncertainty about future firm value.

Our study contributes to the literature in the following ways. First, we contribute to the literature on the use of accounting information along the supply chain (e.g., Raman and Shahrur 2008; Dou, Hope, and Thomas 2013; Radhakrishnan, Wang, and Zhang 2014). We extend this literature by showing that customers' UTB reserves are relevant inputs to suppliers' investment decisions. The literature has been inconclusive on the relevance of UTB information. For example, there is mixed evidence on whether UTB information, as required by the Financial Accounting Standards Board (FASB) Interpretation No. 48 (FIN 48), improves relevance of tax expense

(Robinson, Stomberg, and Towery 2016; Gleason et al. 2023). In addition, Hasan, Hoi, Wu, and Zhang (2014) find that banks use UTB information in assessing the riskiness of the borrowing firms. Our study sheds light on the relevance of UTB information from the perspective of an important stakeholder of the firm, i.e., suppliers.

Second, our paper contributes to the literature on the effect of tax uncertainty on corporate investment. Recent studies document a negative effect of a firm's tax uncertainty on *its own* innovative and non-innovative investments (Williams and Williams 2021; Jacob, Wentland, and Wentland 2022; Goldman 2023; Goldman, Lampenius, Radhakrishnan, Stenzel, and Feres de Almeida 2023). We complement this stream of literature by documenting a spillover effect of tax uncertainty on investment *along the supply chain*. Moreover, by documenting the impact of customers' UTBs on suppliers' investment, our study responds to the call for further research on real effects of UTB disclosures by Blouin and Robinson (2014).

Third, our paper adds to the literature on the effect of cash flow uncertainty on corporate investment. Alnahedh, Bhagat, and Obreja (2019) highlight the role of cash flow uncertainty on corporate employment and investment. As prior studies document that UTBs are closely related to future cash taxes paid (e.g., Ciconte et al. 2023), tax uncertainty associated with UTB reserves can be viewed as a novel measure of cash flow uncertainty, which is different from the volatility measures (e.g., cash flow volatility) commonly used in prior research.

The remainder of this paper is organized as follows. Section 2 reviews the related literature and develops our hypothesis. Section 3 describes our research design. Section 4 presents empirical results, and Section 5 discusses the results of robustness tests. Section 6 concludes.

2. Related literature and hypothesis development

2.1. Suppliers' use of information about customers

Prior literature investigates investment behavior along the supply chain and finds that these investments are typically relationship-specific (e.g., Joskow 1987). This bond results in at least two frictions that can cause suppliers to deviate from an optimal level of supply chain investment and to either under- or overinvest. First, the "hold-up" problem occurs when suppliers underinvest in relationship-specific investments because they anticipate rent extraction from customers. Rent extraction occurs because the value of relationship-specific investments is lower outside the specific customer-supplier relationship when a supplier invests in specialized equipment (Williamson 1979). Second, the "bullwhip" effect can lead suppliers to overinvest. Customers would prefer suppliers to have extra capacity since the customers do not bear capacity costs. As a result, customers inflate their demand to suppliers (e.g., Lee et al. 1997). Raman and Shahrur (2008) provide supporting evidence that firms manage their earnings opportunistically to induce suppliers to make larger relationship-specific investments.

Due to these frictions, it is critical that supplier firms are informed about their customer firms' ability to fulfill contractual obligations when making decisions on relationship-specific investments. Prior literature has documented evidence that suppliers gather and use customer information to guide their investment decisions. Raman and Shahrur (2008) and Dou et al. (2013) highlight the role of discretionary accruals in relationship-specific investments in the supply chain. Chen et al. (2019) document that the readability of management earnings forecast reports provided by customer firms is related to the quality of their supplier firms' investments. Chiu et al. (2019) find that more informative customer risk factor disclosures are associated with less under- and overinvestment by suppliers. Chen, Gong, and Luo (2022) show that suppliers' investments decrease following higher short interest in their customers' equity. Taken together, these studies

suggest that suppliers take into account customer information from all possible sources (e.g., firms' own disclosures or capital market news) that is relevant to customers' ability to fulfill contracts for their decision making.

2.2. Tax uncertainty and investment

Another stream of literature examines the effect of tax uncertainty on corporate investment, where most papers use UTBs disclosed under FIN 48 as a proxy for tax uncertainty.[3] In general, results indicate that UTBs have a negative association with investment *within firm*. Several studies find that UTB disclosures required by FIN 48 alter firms' incentives for innovation and lead to a reduced sensitivity of innovative investment to tax incentives and a decrease in patent applications by publicly listed firms (Williams and Williams 2021; Goldman et al. 2023). Further, Goldman (2023) documents that UTB disclosures lead to not only lower innovative investment but also lower non-innovative investment. In addition, Jacob et al. (2022) exploit the staggered adoption of Schedule UTP, a private UTB disclosure to the IRS phased in over 2010–2014, and find that firms respond to tax uncertainty by delaying their own large capital investments. Notably, existing studies focus on *firm-level* effects of tax uncertainty on corporate investment. Whether a firm's tax uncertainty affects its stakeholders' investment (i.e., *spillover* effects) remains unanswered.

Tax uncertainty also has consequences in capital markets and contracting. While there is little evidence of an association between UTB disclosures and contemporaneous abnormal returns, Small and Song (2021) find that UTB additions are associated with reduced trading activity around the 10-K release and wider bid-ask spread subsequent to the 10-K release.[4] This result suggests that UTB disclosures increase short-term investor uncertainty about future firm value.

[3] FIN 48 (codified as ASC 740-10) standardizes the recognition, measurement, and disclosure of tax reserves in financial statements and became effective for fiscal years beginning after December 15, 2006.
[4] See also Frischmann, Shevlin, and Wilson (2008) for the stock market reaction to important FASB pronouncements associated with the development and implementation of FIN 48.

Nevertheless, Brown, Drake, and Martin (2016) find that boards of directors still use ex-ante information on tax uncertainty from UTBs to adjust managerial compensation. Finally, UTBs are also associated with firm cash balances, suggesting that firms hold more cash to pay for potential tax liabilities, consistent with a precautionary savings motive (Hanlon, Maydew, and Saavedra 2017). This is in line with Ciconte et al. (2023) and Gleason et al. (2023), who find evidence that UTBs are closely related to future cash taxes paid.

2.3. Taxes and the supply chain

Tax strategies along the supply chain have been examined in recent studies. For example, Cen, Maydew, Zhang, and Zuo (2017) find that both principal customers and their suppliers avoid more taxes than peer firms by shifting their profits to tax haven subsidiaries. In a subsequent paper, Cen, Maydew, Zhang, and Zuo (2022) provide evidence on the diffusion of tax planning along the supply chain, and in particular, from major customers to their dependent suppliers, which generates economic benefits for both customers and suppliers in the product market. It appears that the IRS is aware of the possibility of tax coordination among supply chain partners. Brown, Paparcuri, Ruiz, and Stice (2023) find that past IRS attention on one supply chain partner is associated with future IRS attention on other supply chain partners and with UTB settlements with the IRS. Therefore, it is likely that tax strategies of customers are observable by suppliers and hence may influence suppliers' decision making.

2.4. Hypothesis development

Managers face uncertainty when making investment decisions because payoffs from investments are uncertain and depend on macro-, industry-, and firm-level factors. Disclosures about peer firms (from either peers' own disclosures or other sources) can affect information sets available to managers and consequently influence their investment choices (Roychowhury, Shroff,

and Verdi 2019). If these disclosures alter the level of uncertainty about investment payoffs, managers can acquire pertinent information from such disclosures to inform their investment decisions.

Prior research shows that firms use UTB information to adjust their operating decisions. For example, boards use UTB information in compensation contracting, and managers consider UTB reserves in cash holdings decisions (Brown et al. 2016; Hanlon et al. 2017). Besides the within-firm use of UTB information, it is possible that UTB reserves could contain information that is useful to other stakeholders of the firm as well. In our study, we focus on a firm's supplier chain partners and investigate whether supplier firms use their customer firms' UTB information when making investment decisions.

Tax uncertainty related to UTB reserves involves adverse information that could negatively impact stakeholders' expectations about a firm's future cash flow. Lisowsky, Robinson, and Schmidt (2013) indicate that UTB reserves reflect the level of aggressiveness of a firm's tax strategies. Hasan et al. (2014) argue that tax avoidance engenders significant risks, including information risk, agency risk, and IRS audit risk. They find that banks use UTB reserves to gauge a firm's tax aggressiveness with regard to uncertain tax positions (i.e., tax positions that may or may not be upheld in the event of an IRS audit). Firms incur significant direct and indirect costs when the IRS challenges their tax positions. Direct costs include litigation costs for resolving tax disputes, back taxes, and potential substantial penalties. Indirect costs include political and reputational risks that firms might face in the wake of tax disputes. Additionally, firms may receive increased attention from the IRS over an extended period. As shown in the anecdote of Caterpillar earlier, the costs related to uncertain tax positions can be significant.

Uncertain tax benefits are linked to future cash flow uncertainty (Hasan et al. 2014). As an

illustration, on February 16, 2007, a few days after Merck & Co. resolved their $2.3 billion tax dispute with the IRS, Fitch Ratings downgraded the firm's credit rating to AA-. The main reason behind this decision was that the cash outflow resulting from the IRS settlement was expected to weaken the firm's ability to generate free cash flow. There are other instances of credit downgrades caused by tax disputes. On June 30, 2009, Moody's downgraded Edison International's senior notes to Ba3, pointing to a significant deterioration in credit quality and an increased likelihood of a financial covenant breach due to the firm's recent settlement with the IRS. Collectively, IRS settlements and their associated substantial cash outflows are one of the common reasons resulting in credit downgrades. In other words, tax uncertainty entails some material cash flow risk, which might influence a firm's ability to meet its contractual obligations. Therefore, to make informed investment decisions, supplier firms are likely to consider their customer firms' tax uncertainty.

Recent research suggests that UTBs represent expected and actual future cash outlays (Dyreng et al. 2019; Ciconte et al. 2023). As a result, suppliers may view UTBs as a liquidity or cash flow risk to their customers, which increases the uncertainty about their investment payoffs. This argument is consistent with the finding of Small and Song (2021) that UTBs increase short-term investor uncertainty about future firm value. If suppliers consider customers' UTBs as part of liquidity or cash flow risk that makes the payoffs from relationship-specific investments more uncertain, we expect that suppliers are more likely to underinvest and are less likely to overinvest. Although increases in customer tax uncertainty are more likely to prompt underinvestment than overinvestment, we examine both outcomes because it could affect the likelihood of both.

On the other hand, it is possible that there is no relation between customer tax uncertainty and supplier investment. Risks associated with tax uncertainty might not be material enough to change suppliers' expectations about investment payoffs or influence customers' ability to fulfill

contracts in general. Furthermore, many attributes about uncertain tax positions are not publicly disclosed, such as their causes or jurisdictions. Accordingly, it is unclear whether customers' UTB information is material or informative enough for suppliers' investment decisions. In this case, we would expect no relation between customer firms' tax uncertainty and supplier firms' likelihood to under- or overinvest.

Based on this discussion, we posit the following hypothesis (stated in alternative form):

Hypothesis. *Customer firms' tax uncertainty is associated with their supplier firms' investment.*

3. Research design

Following previous research (e.g., Dyreng et al. 2019; Guenther et al. 2019), we use additions to UTBs related to current-year tax positions scaled by the beginning UTB balance to measure tax uncertainty of major customer firms to a supplier firm. This measure is then weighted by the ratio of a supplier's sales to a major customer over its total sales to all disclosed major customers and yields our main test variable *C_UTBINC*. Note that we use a sales-based weighting scheme to aggregate data from the customer-supplier-firm-year level to the supplier-firm-year level and hence our analyses are performed at the supplier-firm-year level. The reason why we use UTB reserves to measure tax uncertainty is that this information is publicly available from 10-K filings—a credible source that is audited. Thus, the UTB information allows suppliers to generate informed assessments of risks associated with their customers' uncertain tax positions.

To measure a supplier firm's likelihood of under- and overinvestment, we use the model in Biddle et al. (2009) to capture a firm's deviation from the expected level of investment.[5] First, we estimate the following regression model by industry and year and obtain the residuals:

$$INVEST_{t+1} = \alpha_0 + \alpha_1 SGrowth_t + \varepsilon_{t+1} \qquad (1)$$

[5] We alternatively use the investment model in Richardson (2006) and obtain qualitatively similar inferences.

where $INVEST_{t+1}$ is total investment at year t+1, measured as the sum of R&D expense, capital expenditures, and acquisition expenditures, less cash receipts from the sale of property, plant, and equipment (PP&E) and depreciation and amortization, scaled by lagged total assets.[6] $Sgrowth_t$ is the percentage change in sales from year t-1 to t. Following Biddle et al. (2009), we estimate Eq. (1) by industry and year for all Standard Industrial Classification (SIC) 2-digit industries with at least 20 observations in a given year.

We divide observations into three groups based on the quartiles of the residuals from Eq. (1). We designate the bottom quartile as the underinvestment group and the top quartile as the overinvestment group, while the middle two quartiles represent the "normal" investment group. We construct the dependent variable *R_INVEST* as a categorical variable equal to one for firm-years with residuals in the bottom quartile (i.e., the underinvestment group), two for firm-years with residuals in the second and third quartiles (i.e., the "normal," baseline reference investment group), and three for firm-years with residuals in the top quartile (i.e., the overinvestment group).

We estimate the following multinomial logistic model to predict the likelihood of a firm being in the underinvestment *or* overinvestment group (i.e., in categories one or three, respectively), as compared to the "normal" investment group (i.e., the benchmark group in category two):

$$R\_INVEST_{t+1} = \beta_0 + \beta_1 C\_UTBINC_t + \Sigma\beta_l Control_{l,t} + \varepsilon_{t+1} \qquad (2)$$

β_1 is our coefficient of interest, which represents the probability of being in the under- or overinvestment group against the benchmark group. A positive (negative) coefficient for under- versus normal investment indicates that a firm is more (less) likely to underinvest. Similarly, a positive (negative) coefficient for over- versus normal investment indicates that a firm is more

[6] We follow the suggestion from Koh and Reeb (2015) and set missing R&D expense to the yearly industry average, with the industry membership defined according to the 4-digit SIC code.

(less) likely to overinvest.[7]

We include control variables that could be correlated with customer tax uncertainty or may affect supplier investment and influence the likelihood of under- and overinvestment by a supplier. First, we control for the level of tax avoidance of customer firms. Dyreng et al. (2019) document a positive relation between tax uncertainty and tax avoidance. Following Dyreng et al. (2008, 2019), we measure customer firms' tax avoidance by the five-year average cash effective tax rate, and then apply a weight based on supplier sales to each major customer relative to total sales to all disclosed major customers (*C_TAXAVOID*). Importantly, by controlling for the level of customer tax avoidance, our test variable *C_UTBINC* captures the effect of customer tax uncertainty on supplier investment that is *incremental* to the effect of customer tax avoidance.

Next, we include a group of supplier-firm-level control variables that may affect supplier investment. Following Biddle et al. (2009), we control for institutional ownership (*INST*), analyst following (*NUMEST*), the degree of antitakeover protection (*GINDEX*), firm size (*SIZE*), the book-to-market ratio (*BM*), cash flow volatility (*STDCFO*), sales volatility (*STDSALE*), investment volatility (*STDINVEST*), Altman's Z-score (*ZSCORE*), asset tangibility (*TAN*), leverage (*LEV*), industry leverage (*LEV_IND*), operating cash flow relative to sales (*CFOSALE*), cash slack relative to PP&E (*SLACK*), dividend payout (*DIV*), firm age (*AGE*), operating cycle (*OPCYCLE*), and accounting losses (*LOSS*). Definitions of all variables are detailed in Appendix A. We winsorize all continuous variables at 1st and 99th percentiles in our empirical analyses and use robust standard errors clustered by firm.

[7] Although our groups are defined categorically as equal to one for the underinvestment group, two for the base "normal" investment group, or three for the overinvestment group, the multinomial logistic regression effectively transforms the comparisons into two separate logistic models, categorizing (a) *one* for the underinvestment group and *zero* for the "normal" investment group (e.g., Column (1) in Table 3); and (b) *one* for the overinvestment group and *zero* for the "normal" investment group (e.g., Column (2) in Table 3). Therefore, our interpretations are based on the relative effect compared to the "normal" investment group, given that it is in fact the baseline reference group for our regressions.

4. Empirical analyses

4.1. Sample and descriptive statistics

Our initial sample consists of publicly listed supplier firms in the U.S. that disclose major customer firms that account for more than 10 percent of their sales from 2008–2021. The Statement of Financial Accounting Standards (SFAS) Nos. 14 and 131 require firms to disclose the names of major customers that account for more than 10 percent of their sales individually. We rely on the information from this disclosure to link suppliers to their customers. To ensure the availability and comparability of UTB data, we require disclosed major customer firms to be non-financial and non-utility U.S. firms. We link supplier firms with major customer firms using Compustat company identifiers (i.e., GVKEYs) in the linking table called "Supply Chain with IDs (Compustat Segment)" on WRDS.[8] We begin our sample period in 2008 because information on UTBs becomes available in 2007 pursuant to FIN 48, and we require one-year lagged information for our research design. We also require that firms in our sample have information available for constructing regression variables in Eq. (2). We obtain data for these variables from Compustat, the Center for Research in Security Prices (CRSP), the Institutional Brokers' Estimate System (I/B/E/S), the Thomson-Reuters Institutional Holdings (13F), and the Institutional Shareholder Services (ISS) databases. After dropping observations without necessary data for constructing main regression variables and those in financial and utility industries, our final sample used in the main tests consists of 5,804 supplier-firm-year observations of 1,175 supplier firms. Table 1 describes our sample selection procedure.[9]

Table 2, Panel A reports descriptive statistics on main regression variables. Panel A shows

[8] This linking table is created based on the data in "Customer Segments" under "Historical Segments" in Compustat.
[9] We expect our average sample firm to be larger and with greater analyst coverage than the average firm in Compustat due to our sample selection criteria.

that the mean of *R_INVEST*, the measure for the likelihood of under- and overinvestment, is 1.876 and the median is 2, similar to the values reported in prior research that uses this variable (e.g., Chiu et al. 2019). Given that *R_INVEST* is a categorial variable that equals one for the underinvestment group, two for the "normal" investment group, and three for the overinvestment group, the mean value of 1.876 suggests that there are more observations belonging to the underinvestment group than to the overinvestment group in our sample. The mean (median) sales-weighted average of customer UTB increases from current-year positions is 15.3% (10%) of the beginning UTB balance in our sample. Panel B presents Pearson correlations among main regression variables. Since our dependent variable *R_INVEST* is categorical and captures under- and overinvestment that are at both ends of its distribution, it is difficult to interpret the correlations between *R_INVEST* and other variables. Similar to the correlations reported in Dyreng et al. (2019), we find a significant and negative correlation between the customer tax uncertainty measure (*C_UTBINC*) and the customer tax avoidance measure (*C_TAXAVOID*).

4.2. Main results

Table 3 reports our main results of the effect of customer firms' tax uncertainty on supplier firms' investment. Column (1) reports results on underinvestment, and Column (2) reports results on overinvestment; each is interpreted as relative to the "normal" investment group, which serves as the baseline reference group (see Footnote 7). We find that customer firms' UTB additions from current-year tax positions are associated with an increased likelihood of underinvestment and a decreased likelihood of overinvestment by their supplier firms. This result indicates a relation between customers' tax uncertainty and suppliers' tendencies to under- or overinvest. Previous studies document evidence that UTB reserves represent the risk of future cash outflow (Hasan et al. 2014; Ciconte et al. 2023; Gleason et al. 2023). Consistent with this evidence, our findings

suggest that customer firms' tax uncertainty increases their supplier firms' uncertainty about investment payoffs, thereby increasing (decreasing) their tendency to underinvest (overinvest).

To gauge the economic significance of our findings, we estimate the change in the probability of an average firm falling in the under- or overinvestment group as their customers' tax uncertainty increases. For example, the estimated probability of under- or overinvestment for a supplier firm with an average value of *C_UTBINC* is 26 percent and 14 percent, respectively. If *C_UTBINC* increases by 25 percent, the probability of underinvestment increases by 0.5 percent, and the probability of overinvestment decreases by 0.4 percent. This economic significance is comparable to other factors that affect a supplier firm's likelihood of under- or overinvestment, such as a firm's own cash flow volatility (*STDCFO*).[10]

4.3. Cross-sectional analyses

4.3.1. Durable and nondurable goods suppliers

Relative to nondurable goods suppliers, durable goods suppliers invest largely in relationship-specific assets, the success and payoffs of which are closely tied to how well their customers' businesses are. Therefore, information pertinent to customer firms' business risk and financial condition is likely more useful for investment decisions of supplier firms in durable goods industries than those in nondurable goods industries (Kale and Shahrur 2007).

In this test, we partition our sample into two subsamples based on supplier firms' industry membership. We classify supplier firms with SIC codes 245, 250-259, 283, 301, and 324-399 as durable goods suppliers and the rest as nondurable goods suppliers. We estimate Eq. (2) using each

[10] It is difficult to interpret the marginal effect of a continuous variable, such as *C_UTBINC*, in a multinomial logistic regression. Thus, to measure the economic magnitude of the documented effect, we first calculate the probability of an average firm falling into the under- or overinvestment category as $\pi_{ij} = \frac{e^{x_i' \beta j}}{\sum_\gamma e^{x_i' \beta \gamma}}$ at the mean values of all independent variables, where *j* represents the three investment categories as denoted by *R_INVEST*. To estimate the change in the probability, we then calculate the probability of under- or overinvestment when *C_UTBINC* increases by 25 percent.

subsample and report the results using the subsample of durable goods suppliers in Panel A and the results using the subsample of nondurable goods suppliers in Panel B of Table 4.

We find that the relation between customer tax uncertainty and supplier underinvestment is more pronounced in the subsample of durable goods suppliers. We document a significant difference in the likelihood of underinvestment between durable and nondurable goods suppliers (p = 0.000) while the difference in the likelihood of overinvestment between durable and nondurable goods suppliers is insignificant (p = 0.688). These results suggest that compared to supplier firms in nondurable goods industries, supplier firms in durable goods industries are more likely to underinvest when their customer firms' tax uncertainty is higher.

4.3.2. Amount of trade credit extended to customers

Trade credit serves as an important economic channel through which corporate failures and liquidity shocks spread along the supply chain (Boissay and Gropp 2013; Jacobson and von Schedvin 2015). Financial connections among supply chain partners, such as the provision of trade credit and large sales exposure, magnify the spread of shocks along the supply chain (Agca, Babich, Birge, and Wu 2022). Supplier firms bear extra risks from customer firms when they give trade credit to their customers as customers can possibly delay or default on payments. This risk is higher when suppliers provide customers with a larger amount of trade credit. Therefore, we expect that when suppliers have offered their customers greater amounts of trade credit, they would be more careful with assessments of risks associated with their customers' businesses when making investment decisions.

To test this prediction, we divide our sample into two subsamples based on the median value of trade credit given to customers. We follow Li, Ng, and Saffar (2021) and calculate trade credit as the ratio of account payables to the cost of goods sold. We estimate Eq. (2) using each

subsample. Table 5, Panel A presents the results for the subsample above the median value (i.e., customers with high trade credit), and Panel B presents the results for the subsample that is equal to or below the median value (i.e., customers with low trade credit).

Consistent with our expectation, the relation between customer tax uncertainty and supplier investment is significant in the subsample of customers with high trade credit, but is insignificant in the subsample of customers with low trade credit. The difference in the coefficient on *C_UTBINC* between two subsamples is significant regarding underinvestment by suppliers (p = 0.011), while the difference is statistically insignificant regarding overinvestment by suppliers (p = 0.948). These findings imply that the amount of trade credit extended to customers plays a role in the relation between customers' tax uncertainty and suppliers' likelihood of underinvestment.

4.3.3. Level of financial constraints faced by customers

Supply chain partners are economically and financially interrelated. As suppliers have significant sales from their major customers, customer firms' financial distress likely leads to their supplier firms' financial distress (Lian 2017). Supplier firms experience significant and negative stock price reactions when their customer firms file for bankruptcy (Hertzel, Li, Officer, and Rodgers 2008). Hence, supplier firms are more likely to underinvest and are less likely to overinvest in relationship-specific investments when tax uncertainty is high for their customer firms that are more financially constrained.[11]

We measure the level of customer financial constraints by the number of negative words scaled by the number of total words in customer firms' annual reports, following Law and Mills (2015). We then split our sample into two subsamples based on the median value of the measure

[11] Prior research (e.g., Law and Mills 2015; Edwards, Schwab, and Shevlin 2016) documents that firms facing greater financial constraints tend to pursue more aggressive tax strategies to avoid taxes, as evidenced by lower cash tax effective rates and higher UTB reserves.

for customer financial constraints. We estimate Eq. (2) using each subsample and report results for the subsample above the median value (i.e., customers with high financial constraints) and for the subsample that is equal to or below the median value (i.e., customers with low financial constraints) in Panels A and B of Table 6, respectively.

We find that when customers are more financially constrained, their tax uncertainty is associated with their suppliers' tendencies to under- and overinvest. However, when customers are less financially constrained, we observe that the relation between customer tax uncertainty and supplier investment holds only in the case of overinvestment (i.e., suppliers are less likely to overinvest) but not in the case of underinvestment (i.e., suppliers are not necessarily more likely to underinvest). Similar to Tables 4 and 5, the difference in the coefficient on *C_UTBINC* between two subsamples is significant regarding underinvestment by suppliers (p = 0.004), but is statistically insignificant regarding overinvestment by suppliers (p = 0.795). These results suggest that customers' financial constraints influence the extent to which suppliers consider customer tax uncertainty in their investment decisions.

4.3.4. Supplier inventory turnover

Suppliers face adjustment costs if they misestimate the amount of investment to make in inventory (e.g., Caglayan, Maioli, and Mateut 2012; Hwang, Jung, Lee, and Yang 2020). Chang, Kwok, and Wong (2024) find that cost structure rigidity and inventory are substitutes in managing customer demand uncertainty and document that firms prefer lower inventory levels when inventory carrying costs increase. Adjustment costs related to overinvesting in inventory are higher for firms with low inventory turnover, as any extra inventory is slow to sell on the market. As such, we expect that supplier firms with lower inventory turnover will have a stronger underinvestment response to customer tax uncertainty.

To test this expectation, we measure supplier inventory turnover as the firm's cost of goods sold scaled by its average inventory in year *t*. We split our sample into two based on the median value of supplier inventory turnover and estimate Eq. (2) using each subsample. We report results in Panels A and B of Table 7, respectively. We find that the positive relation between customer tax uncertainty and supplier underinvestment is concentrated in suppliers with lower inventory turnover (see Panel B), consistent with suppliers' tendency to underinvest to avoid high adjustment costs related to overinvestment in inventory. The difference between the two subsamples is significant for underinvestment by suppliers ($p = 0.000$), but is insignificant for overinvestment ($p = 0.609$), similar to our other cross-sectional results.

5. Robustness tests

We conduct several additional tests to ensure the robustness of our results. First, we test if the effect we document is present in different subcategories of investments. We expect our results to manifest in capital expenditures and inventory rather than R&D or acquisition expenditures because the former types of investments are more tailored to the specific customer-supplier relationship than the latter types. To examine this expectation, we replace our dependent variable with the change of capital expenditures, inventory, R&D expenditures, and acquisition expenditures, and regress these measures on customer tax uncertainty and other control variables from Eq. (2) with year and industry fixed effects in an ordinary least squares (OLS) model. We report the results in Table 8. We find that customer tax uncertainty is negatively related to changes in suppliers' capital expenditures and inventory, but is insignificantly related to their R&D or acquisition expenditures. These results are consistent with customer tax uncertainty having a greater effect on the types of supplier investments that are more specific to the customer-supplier relationship. The findings also indicate that our results hold for both short- and long-term supplier

investments.

Second, we consider the critique on the absolute residual measures used to proxy for investment efficiency. Chen et al. (2023) explain that the primary problem for using generated variables in two-step procedures is that estimating the relation in two steps does not fully account for the covariance among the independent variables included in the two regressions. As a solution, Chen et al. (2023) propose a one-step quantile regression that regresses the level of investment on all the fixed effects from the original first-stage regression, the independent variables in the second step, and their interactions. However, due to a large number of control variables in our model, we were unable to estimate full quantile regressions with all control variables and interacted fixed effects. The specifications we were able to estimate (i.e., with fixed effects only or a limited number of control variables) show a significantly negative relation between customer tax uncertainty and the level of supplier investment, with a stronger relation at lower quantiles (untabulated), consistent with our main results. Coupled with the results in Table 8 using an OLS model with changes in investment as the dependent variable, and the fact that our dependent variable in Eq. (2) is based on ranked residuals rather than the absolute residuals, the results of our robustness tests should further mitigate concerns about the bias from generated regressors.

Third, we re-estimate our tests with additional control variables at the supplier- and customer-firm level. We first add a control variable for the supplier's own tax uncertainty (*UTBINC*) as a firm's own tax uncertainty may affect its own investment (e.g., Williams and Williams 2021; Goldman 2023). We then include control variables for customer-firm-level characteristics that could correlate with our customer tax uncertainty measure, such as overall firm risk (*C_RETVOL*) and future cash flow uncertainty (*C_FUTURE_CFOVOL*). We also control for other customer-firm-level features that have been shown to affect suppliers' investment behavior,

such as income smoothing (*C_INCSMOOTH*) in Raman and Shahrur (2008) and Dou et al. (2013), as well as accounting conservatism (*C_CSCORE*) in Hui, Klasa, and Yeung (2012). Panels A and B of Table 9 show that our results are similar after including additional supplier- and customer-firm-level control variables.

In addition, we test alternative variable measurements for customer tax uncertainty and supplier investment.[12] In Table 10, Panel A, we measure customer tax uncertainty using the percentage change in the balance of customer UTBs in the current year.[13] In Panel B, we use terciles instead of quartiles for classifying the under, normal, and over investment groups. In Panel C (Panel D), we use capital investment (non-capital investment) only in our supplier investment measure. Overall, our results are robust to these alternative measurements, except that the coefficient on *C_UTBINC* becomes insignificant (but remains the same sign) in Column (2) of Panel C.

Lastly, our reported analyses use data at the supplier-firm-year level, where we aggregate customer-firm-level data using a weighted average based on a supplier's sales to a major customer relative to its total sales to all disclosed major customers. To ensure that our results are not sensitive to the weighting scheme that we use for aggregating data from the customer-supplier-firm-year level to the supplier-firm-year level, in unreported analyses, we alternatively perform all analyses using unaggregated data at the customer-supplier-firm-year level and obtain similar results. Further, to ensure that our results are not affected by the COVID-19 period in 2020 and 2021, we re-run our tests after dropping these two years. The results remain similar.

[12] In an unreported analysis, we use different denominators, such as sales, for our customer tax uncertainty measure (*C_UTBINC*). Results are insensitive to different denominators.

[13] Note that the change in the balance of UTBs in the current year would capture both uncertainty from current-year tax positions and the resolution of uncertainty from prior-year tax positions (Dyreng et al. 2019). This is why we choose to use UTB additions from current-year tax positions as our main tax uncertainty measure.

6. Conclusion

This paper examines the relation between customer tax uncertainty and supplier investment and documents that customer firms' tax uncertainty has a significant effect on the investment decisions of supplier firms. Specifically, we find that customer firms' UTB additions from current tax positions are associated with an increased (decreased) likelihood of underinvestment (overinvestment) by supplier firms. Our cross-sectional analyses reveal that this association is mostly concentrated in durable goods suppliers, customers with large trade credit, and customers with high financial constraints. Our results suggest that suppliers take their customers' tax uncertainty into account when assessing risks associated with their customers' ability to meet contractual obligations and their payoffs from relationship-specific investments. When suppliers are exposed to greater customer risks, they are more cautious about customers' tax uncertainty.

Overall, our paper extends the literature on the effect of tax uncertainty on corporate investment (e.g., Williams and Williams 2021; Goldman 2023; Goldman et al. 2023) and the use of information about customer firms in supplier firms' decision making (e.g., Chen et al. 2019; Chiu et al. 2019; Chen et al. 2022). We highlight the role of customer tax uncertainty in supplier investment and document a spillover effect of firms' UTB information on their supplier firms' investment. Our findings suggest that UTB information is relevant not only to capital providers (e.g., Hasan et al. 2014) but also to other stakeholders, such as supply chain partners.

Our study is subject to some caveats. First, while we make research design choices to alleviate endogeneity, we cannot draw a causal inference on the effect of customers' UTB reserves on suppliers' tendencies to under- or overinvest. It is possible that our UTB measure of tax uncertainty captures other firm characteristics that might not be observable and thus are not controlled for. Second, we cannot entirely rule out the possibility that supplier firms might obtain

information from other public or private sources to form estimates for the level of tax uncertainty of their customer firms, which could correlate with our tax uncertainty measure based on UTB reserves in customer firms' financial statements. Third, we rely on UTB information required by FIN 48 to construct a proxy for tax uncertainty. It is empirically challenging to disentangle the effects of risks associated with UTB reserves from the informativeness of UTB disclosures independent of the risks they disclose.

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Appendix A
Variable definitions

Variable	**Definition** (Source: Compustat, unless otherwise specified)
Supplier under- and overinvestment variable	
R_INVEST_{it+1}	A categorical variable based on the quartiles of the residuals from a firm-specific investment model: $INVEST_{it+1} = \alpha_0 + \alpha_1 SGrowth_{it} + \varepsilon_{it+1}$. $INVEST_{it+1}$ is total investment at year t+1, measured as the sum of capital investment (CAPX), R&D expenditure (XRD), and acquisition expenditure (AQC), less cash receipts from the sale of property, plant, and equipment (SPPE), less depreciation and amortization (DP), scaled by lagged total assets (AT). Missing R&D expenditure is set to the yearly industry average, with industry membership defined according to the 4-digit SIC code. $SGrowth_{it}$ is the percentage change in sales from year t-1 to year t. The model is estimated by year and industry for all industries with at least 20 observations in a given year. Firms are sorted into quartiles based on the residuals from the investment model. The variable is set equal to one for firm-years with residuals in the bottom quartile, two for firm-years with residuals in the second and third quartiles, and three for firm-years with residuals in the top quartile. Note that the regressions are interpreted as underinvestment firms (bottom quartile) or overinvestment firms (top quartile), relative to "normal" investment firms (middle two quartiles).
Customer tax uncertainty variable	
C_UTBINC_{it}	The weighted average of UTB increases for current-year tax positions (TXTUBPOSINC) scaled by the beginning UTB balance (TXTUBBEGIN), where the weight is computed as a supplier firm's sales to a major customer firm scaled by the supplier firm's total sales to all disclosed major customer firms
Customer-firm-level control variable	
$C\_TAXAVOID_{it}$	The weighted average of *TAXAVOID,* where the weight is computed as a supplier firm's sales to a major customer firm scaled by the supplier firm's total sales to all disclosed major customer firms. *TAXAVOID* is the five-year sum of taxes paid (TXPD) scaled by the five-year sum of pretax income (PI) less special items (SPI), from t-4 to t. The variable is winsorized at zero and one and then multiplied by -1
Supplier-firm-level control variables	
$INST_{it}$	The percentage of shares held by institutional investors. *INST* is set to zero if missing (Source: Thomson Reuters)
$NUMEST_{it}$	The number of analysists following the firm. *NUMEST* is set to zero if no analyst following is reported (Source: I/B/E/S)
$GINDEX_{it}$	The index of antitakeover protection created by Gompers, Ishii, and Metrick (2003) multiplied by -1. *GINDEX* is set to zero if missing (Source: ISS)
$SIZE_{it}$	The natural logarithm of total assets (AT)
BM_{it}	Total assets (AT) scaled by the sum of the book value of debt and the market value of equity (PRCC_F × CSHO), where the book value of debt is computed as total assets (AT) less the book value of equity (CEQ)

$STDSALE_{it}$	The standard deviation of sales (SALE) scaled by lagged total assets (AT) over the past five years
$STDINVEST_{it}$	The standard deviation of investment scaled by lagged total assets (i.e., *INVEST*) over the past five years
$ZSCORE_{it}$	Altman's Z-score computed as 1.2 × (working capital / total assets) + 1.4 × (retained earnings / total assets) + 3.3 × (earnings before interests and taxes / total assets) + 0.6 × (market value of equity / total liabilities) + 1.0 × (sales / total assets)
TAN_{it}	Net property, plant, and equipment (PPENT) scaled by total assets (AT)
LEV_{it}	Long-term debt (DLTT) scaled by the sum of long-term debt (DLTT) and the market value of equity (PRCC_F × CSHO)
LEV_IND_{it}	Average leverage (i.e., *LEV*) for firms in the same SIC 4-digit industry
$CFOSALE_{it}$	Cash flow from operations (OANCF) scaled by sales (SALE)
$SLACK_{it}$	Cash (CH) scaled by net property, plant, and equipment (PPENT)
DIV_{it}	An indicator variable that is equal to one if the firm paid dividends (DV), and zero otherwise
AGE_{it}	The natural logarithm of the difference between the first year the firm appeared in the CRSP database and the current year (Source: CRSP)
$OPCYCLE_{it}$	The natural logarithm of receivables (RECT) scaled by sales (SALE) plus inventory (INVT) scaled by the cost of goods sold (COGS), multiplied by 360
$LOSS_{it}$	An indicator variable that is equal to one if income before extraordinary items (IB) is negative, and zero otherwise

Table 1
Sample selection

Criteria	Firm-years	Firms
Observations with non-missing major customer data between 2008 and 2021	17,611	3,219
Less: Observations with missing data for measuring customer tax uncertainty	(9,576)	(1,617)
Less: Observations in financial and utility industries	(962)	(151)
Less: Observations without necessary data to construct other main regression variables	(1,269)	(276)
Final sample	5,804	1,175

Table 2
Descriptive statistics and correlations

Panel A presents descriptive statistics of our main variables. Panel B presents the Pearson correlation table (coefficients in bold are statistically significant at 10% or less). All other variables are as defined in Appendix A.

Panel A. Descriptive statistics

	N	Mean	S.D.	Q1	Median	Q3
R_INVEST_{it+1}	5,804	1.876	0.645	1.000	2.000	2.000
C_UTBINC_{it}	5,804	0.153	0.205	0.047	0.100	0.184
$C\_TAXAVOID_{it}$	5,804	-0.201	0.118	-0.296	-0.197	-0.108
$INST_{it}$	5,804	0.574	0.367	0.217	0.695	0.890
$NUMEST_{it}$	5,804	7.898	8.228	1.000	5.000	13.000
$GINDEX_{it}$	5,804	-2.356	3.027	-5.000	0.000	0.000
$SIZE_{it}$	5,804	6.552	1.993	5.140	6.561	7.982
BM_{it}	5,804	0.663	0.317	0.430	0.628	0.853
$STDCFO_{it}$	5,804	0.092	0.136	0.030	0.053	0.096
$STDSALE_{it}$	5,804	0.245	0.269	0.084	0.160	0.294
$STDINVEST_{it}$	5,804	0.167	0.323	0.032	0.069	0.157
$ZSCORE_{it}$	5,804	3.670	5.540	1.612	3.090	5.108
TAN_{it}	5,804	0.204	0.209	0.060	0.134	0.265
LEV_{it}	5,804	0.163	0.196	0.000	0.095	0.252
LEV_IND_{it}	5,804	0.152	0.095	0.084	0.127	0.201
$CFOSALE_{it}$	5,804	-0.050	0.863	0.022	0.088	0.172
$SLACK_{it}$	5,804	3.800	9.413	0.233	0.880	2.965
DIV_{it}	5,804	0.366	0.482	0.000	0.000	1.000
AGE_{it}	5,804	2.635	1.002	2.079	2.833	3.296
$OPCYCLE_{it}$	5,804	4.735	0.640	4.369	4.757	5.140
$LOSS_{it}$	5,804	0.356	0.479	0.000	0.000	1.000

Panel B. Correlations

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)	(14)	(15)	(16)	(17)	(18)	(19)	(20)	(21)
(1) R_INVEST_{it+1}	1.00																				
(2) C_UTBINC_{it}	**-0.09**	1.00																			
(3) $C\_TAXAVOID_{it}$	**-0.06**	**-0.11**	1.00																		
(4) $INST_{it}$	0.01	**0.03**	0.01	1.00																	
(5) $NUMEST_{it}$	**-0.08**	**0.04**	**-0.04**	**0.56**	1.00																
(6) $GINDEX_{it}$	**-0.02**	**-0.06**	**0.14**	**-0.51**	**-0.42**	1.00															
(7) $SIZE_{it}$	0.02	**0.04**	**-0.04**	**0.45**	**0.65**	**-0.42**	1.00														
(8) BM_{it}	**0.15**	**-0.05**	-0.01	**-0.20**	**-0.29**	**0.15**	**-0.09**	1.00													
(9) $STDCFO_{it}$	**-0.17**	**0.02**	**0.09**	**-0.16**	**-0.12**	**0.20**	**-0.29**	**-0.19**	1.00												
(10) $STDSALE_{it}$	0.01	0.01	-0.01	**-0.17**	**-0.16**	**0.16**	**-0.26**	**0.04**	**0.38**	1.00											
(11) $STDINVEST_{it}$	**-0.04**	0.02	-0.01	**-0.15**	**-0.12**	**0.13**	**-0.17**	0.01	**0.33**	**0.31**	1.00										
(12) $ZSCORE_{it}$	0.00	0.01	**-0.04**	**0.19**	**0.13**	**-0.16**	**0.09**	**-0.29**	**-0.05**	0.00	**-0.05**	1.00									
(13) TAN_{it}	**0.09**	**-0.06**	**0.02**	-0.02	**0.03**	0.02	**0.15**	**0.26**	**-0.15**	**-0.11**	**0.06**	**-0.10**	1.00								
(14) LEV_{it}	**0.09**	0.00	0.01	**0.03**	-0.01	0.00	**0.29**	**0.37**	**-0.17**	**-0.04**	**0.07**	**-0.32**	**0.37**	1.00							
(15) LEV_IND_{it}	**0.24**	**-0.08**	-0.01	**0.07**	0.02	**-0.04**	**0.23**	**0.32**	**-0.24**	**-0.04**	**-0.03**	**-0.11**	**0.51**	**0.48**	1.00						
(16) $CFOSALE_{it}$	**0.12**	**-0.04**	**-0.06**	**0.09**	**0.11**	**-0.12**	**0.21**	**0.15**	**-0.37**	-0.02	**-0.12**	**0.09**	**0.17**	**0.10**	**0.19**	1.00					
(17) $SLACK_{it}$	**-0.16**	0.02	**0.04**	**-0.12**	**-0.10**	**0.12**	**-0.22**	**-0.11**	**0.36**	**0.11**	**0.08**	**0.04**	**-0.31**	**-0.18**	**-0.25**	**-0.23**	1.00				
(18) DIV_{it}	**0.14**	0.00	**-0.13**	**0.12**	**0.19**	**-0.28**	**0.40**	-0.02	**-0.24**	**-0.14**	**-0.11**	**0.08**	**0.12**	**0.08**	**0.23**	**0.16**	**-0.16**	1.00			
(19) AGE_{it}	**0.10**	0.02	**-0.12**	**0.04**	**0.07**	**-0.26**	**0.16**	**0.05**	**-0.25**	**-0.20**	**-0.15**	**0.03**	**-0.03**	**-0.02**	**0.06**	**0.14**	**-0.12**	**0.30**	1.00		
(20) $OPCYCLE_{it}$	0.02	**0.07**	**-0.04**	**0.06**	**0.04**	**-0.08**	**0.04**	-0.02	**-0.11**	**-0.14**	**-0.09**	**0.09**	**-0.18**	**-0.04**	**-0.10**	**0.05**	**-0.09**	**-0.02**	**0.17**	1.00	
(21) $LOSS_{it}$	**-0.12**	**0.02**	**0.09**	**-0.22**	**-0.22**	**0.27**	**-0.34**	**0.12**	**0.25**	**0.11**	**0.13**	**-0.29**	**-0.04**	**0.07**	**-0.12**	**-0.31**	**0.14**	**-0.33**	**-0.20**	**-0.03**	1.00

Table 3
Effect of customer tax uncertainty on supplier investment

This table presents the multinomial logistic regression results of the effect of customer tax uncertainty on supplier investment. The baseline group in each column is the "normal" investment group. Variables are defined in Appendix A. *Z*-statistics, calculated using robust standard errors clustered by firm, are reported in parentheses. ***, ** and * indicate statistical significance at the 1%, 5%, and 10% levels, respectively.

	Underinvestment vs. normal investment	Overinvestment vs. normal investment
	(1)	(2)
	R_INVEST_{it+1}	R_INVEST_{it+1}
C_UTBINC$_{it}$	**0.583*** **	**-0.672*** **
	(3.819)	**(-2.590)**
$C\_TAXAVOID_{it}$	0.001	-1.137**
	(0.002)	(-1.986)
$INST_{it}$	-0.439**	0.003
	(-2.102)	(0.014)
$NUMEST_{it}$	0.027***	-0.010
	(2.719)	(-0.765)
$GINDEX_{it}$	0.001	0.024
	(0.026)	(0.805)
$SIZE_{it}$	-0.010	-0.125**
	(-0.185)	(-2.400)
BM_{it}	-0.358*	0.359*
	(-1.789)	(1.726)
$STDCFO_{it}$	1.045**	-1.172
	(2.576)	(-1.600)
$STDSALE_{it}$	-0.578**	0.130
	(-2.287)	(0.519)
$STDINVEST_{it}$	0.222	0.184
	(1.514)	(0.831)
$ZSCORE_{it}$	-0.001	0.007
	(-0.093)	(0.527)
TAN_{it}	0.106	-0.772*
	(0.316)	(-1.799)
LEV_{it}	0.450	0.300
	(1.108)	(0.780)
LEV_IND_{it}	-3.230***	3.921***
	(-3.059)	(5.274)
$CFOSALE_{it}$	-0.021	0.051
	(-0.499)	(0.614)
$SLACK_{it}$	0.027***	0.010
	(4.361)	(1.190)
DIV_{it}	-0.147	0.402***
	(-1.030)	(2.600)
AGE_{it}	-0.070	0.061
	(-1.151)	(0.793)
$OPCYCLE_{it}$	-0.138	-0.089
	(-1.547)	(-0.708)
$LOSS_{it}$	0.186*	-0.327***
	(1.859)	(-2.860)
Intercept	0.570	-1.176
	(1.001)	(-1.390)
N	5,804	5,804
Pseudo R^2	0.071	0.071

Table 4
Cross-sectional analysis based on suppliers' durable goods industry membership

This table presents the multinomial logistic regression results of the effect of customer tax uncertainty on supplier investment conditional on suppliers' durable goods industry membership. Suppliers with SIC codes 245, 250-259, 283, 301, and 324-399 are classified as those belonging to the durable goods industries (Panel A) and the rest as those belonging to the non-durable goods industries (Panel B). The baseline group in each column is the "normal" investment group. All other variables are as defined in Appendix A. *Z*-statistics, calculated using robust standard errors clustered by firm, are reported in parentheses. ***, ** and * indicate statistical significance at the 1%, 5%, and 10% levels, respectively.

Panel A. Durable goods

	Underinvestment vs. normal investment	Overinvestment vs. normal investment
	(1)	(2)
	R_INVEST_{it+1}	R_INVEST_{it+1}
C_UTBINC$_{it}$	**1.024*** **	**-0.682** **
	(5.303)	**(-2.019)**
Intercept	-1.732**	-0.304
	(-2.304)	(-0.305)
Control variables	Included	Included
N	3,407	3,407
Pseudo R^2	0.101	0.101

Panel B. Nondurable goods

	Underinvestment vs. normal investment	Overinvestment vs. normal investment
	(1)	(2)
	R_INVEST_{it+1}	R_INVEST_{it+1}
C_UTBINC$_{it}$	**-0.699** **	**-0.895** **
	(-2.215)	**(-2.191)**
Intercept	-0.132	-2.449
	(-0.144)	(-1.632)
Control variables	Included	Included
N	2,397	2,397
Pseudo R^2	0.101	0.101
p-value for the coef. diff. between Panel A and Panel B	0.000	0.688

Table 5
Cross-sectional analysis based on the amount of trade credit extended to customers

This table presents the multinomial logistic regression results of the effect of customer tax uncertainty on supplier investment conditional on the amount of trade credit that supplier firms have given to their customer firms. The conditional variable *C_TRADCRED* is the sales-weighted customer trade credit, where trade credit is calculated as account payables (AP) scaled by the cost of goods sold (COGS), as per Li, Ng, and Saffar (2021). The sample is divided into: the subsample with above-the-median customer trade credit (i.e., high customer trade credit) (Panel A) and the subsample with equal- or below-the-median customer trade credit (i.e., low customer trade credit) (Panel B). The baseline group in each column is the "normal" investment group. All other variables are as defined in Appendix A. *Z*-statistics, calculated using robust standard errors clustered by firm, are reported in parentheses. ***, ** and * indicate statistical significance at the 1%, 5%, and 10% levels, respectively.

Panel A. High customer trade credit

	Underinvestment vs. normal investment	Overinvestment vs. normal investment
	(1)	(2)
	R_INVEST_{it+1}	R_INVEST_{it+1}
C_UTBINC$_{it}$	**0.856*** **	**-0.687***
	(4.879)	**(-1.824)**
Intercept	0.822	-1.522*
	(1.171)	(-1.691)
Control variables	Included	Included
N	2,902	2,902
Pseudo R^2	0.076	0.076

Panel B. Low customer trade credit

	Underinvestment vs. normal investment	Overinvestment vs. normal investment
	(1)	(2)
	R_INVEST_{it+1}	R_INVEST_{it+1}
C_UTBINC$_{it}$	**-0.099**	**-0.651***
	(-0.288)	**(-1.704)**
Intercept	0.283	-1.090
	(0.376)	(-0.849)
Control variables	Included	Included
N	2,902	2,902
Pseudo R^2	0.079	0.079
p-value for the coef. diff. between Panel A and Panel B	0.011	0.948

Table 6
Cross-sectional analysis based on customer financial constraints

This table presents the multinomial logistic regression results of the effect of customer tax uncertainty on supplier investment conditional on the level of financial constraints faced by customer firms. The conditional variable *C_FINCON* is the sales-weighted ratio of the number of negative words to the number of total words in customer firms' 10-K filings, as per Law and Mills (2015). The sample is divided into: the subsample with above-the-median customer financial constraints (i.e., high customer financial constraints) (Panel A) and the subsample with equal- or below-the-median customer financial constraints (i.e., low customer financial constraints) (Panel B). The baseline group in each column is the "normal" investment group. All other variables are as defined in Appendix A. *Z*-statistics, calculated using robust standard errors clustered by firm, are reported in parentheses. ***, ** and * indicate statistical significance at the 1%, 5%, and 10% levels, respectively.

Panel A. High customer financial constraints

	Underinvestment vs. normal investment	Overinvestment vs. normal investment
	(1)	(2)
	R_INVEST_{it+1}	R_INVEST_{it+1}
***C_UTBINC**$_{it}$*	**0.776*** **	**-0.623***
	(4.510)	**(-1.827)**
Intercept	-0.629	-1.474
	(-0.930)	(-1.510)
Control variables	Included	Included
N	2,902	2,902
Pseudo R^2	0.100	0.100

Panel B. Low customer financial constraints

	Underinvestment vs. normal investment	Overinvestment vs. normal investment
	(1)	(2)
	R_INVEST_{it+1}	R_INVEST_{it+1}
***C_UTBINC**$_{it}$*	**-0.160**	**-0.757***
	(-0.552)	**(-1.883)**
Intercept	2.680***	-0.742
	(3.648)	(-0.648)
Control variables	Included	Included
N	2,902	2,902
Pseudo R^2	0.078	0.078
p-value for the coef. diff. between Panel A and Panel B	0.004	0.795

Table 7
Cross-sectional analysis based on supplier inventory turnover

This table presents the multinomial logistic regression results of the effect of customer tax uncertainty on supplier investment conditional on the inventory turnover of the supplier firm. Supplier inventory turnover is calculated as the cost of goods sold scaled by the average inventory in year *t.* The sample is divided into: the subsample with above-the-median supplier inventory turnover (i.e., high supplier inventory turnover) (Panel A) and the subsample with equal- or below-the-median supplier inventory turnover (i.e., low supplier inventory turnover) (Panel B). The baseline group in each column is the "normal" investment group. All other variables are as defined in Appendix A. *Z*-statistics, calculated using robust standard errors clustered by firm, are reported in parentheses. ***, ** and * indicate statistical significance at the 1%, 5%, and 10% levels, respectively.

Panel A. High supplier inventory turnover

	Underinvestment vs. normal investment	Overinvestment vs. normal investment
	(1)	(2)
	R_INVEST_{it+1}	R_INVEST_{it+1}
C_UTBINC_{it}	**-0.364**	**-0.595****
	(-1.240)	**(-2.046)**
Intercept	-0.294	0.743
	(-0.291)	(0.536)
Controls	Included	Included
N	2,902	2,902
Pseudo R^2	0.080	0.080

Panel B. Low supplier inventory turnover

	Underinvestment vs. normal investment	Overinvestment vs. normal investment
	(1)	(2)
	R_INVEST_{it+1}	R_INVEST_{it+1}
C_UTBINC_{it}	**0.994*****	**-0.902***
	(4.952)	**(-1.739)**
Intercept	1.676**	-2.752**
	(2.489)	(-2.219)
Controls	Included	Included
N	2,902	2,902
Pseudo R^2	0.087	0.087
p-value for the coef. diff. between Panel A and Panel B	0.000	0.609

Table 8
Effect of customer tax uncertainty on changes in different types of supplier investments

This table presents the ordinary least squares regression results of the effect of customer tax uncertainty on changes in different types of supplier investments. Dependent variables are the changes in capital expenditures (Column (1)), inventory (Column (2)), R&D expenditures (Column (3)), and acquisition expenditures (Column (4)), scaled by lagged total assets. Variables are defined in Appendix A. *t*-statistics, calculated using robust standard errors clustered by firm, are reported in parentheses. ***, ** and * indicate statistical significance at the 1%, 5%, and 10% levels, respectively.

	(1) $\Delta CAPEX_{it+1}$	(2) $\Delta INVT_{it+1}$	(3) $\Delta R\&D_{it+1}$	(4) ΔACQ_{it+1}
C_UTBINC$_{it}$	**-0.006****	**-0.010*****	**0.004**	**-0.012**
	(-2.393)	**(-3.791)**	**(0.703)**	**(-1.187)**
$\Delta C\_TAXAVOID_{it}$	-0.025**	0.001	0.010	0.021
	(-2.050)	(0.074)	(0.466)	(0.586)
$\Delta INST_{it}$	0.002	0.000	0.015	-0.008
	(0.575)	(0.030)	(1.202)	(-0.380)
$\Delta NUMEST_{it}$	0.001**	0.000	0.001*	0.000
	(2.062)	(0.571)	(1.860)	(0.072)
$\Delta GINDEX_{it}$	-0.000	-0.001	-0.000	-0.006***
	(-0.155)	(-1.274)	(-0.018)	(-3.658)
$\Delta SIZE_{it}$	-0.027***	-0.063***	-0.154***	-0.144***
	(-11.049)	(-15.615)	(-12.092)	(-11.119)
ΔBM_{it}	-0.014***	-0.013***	-0.043***	0.020*
	(-3.949)	(-2.639)	(-3.482)	(1.657)
$\Delta STDCFO_{it}$	-0.016	0.032	-0.164***	0.055
	(-1.109)	(1.491)	(-3.077)	(0.804)
$\Delta STDSALE_{it}$	0.001	-0.006	-0.012	0.025
	(0.153)	(-0.926)	(-0.670)	(1.146)
$\Delta STDINVEST_{it}$	-0.006	-0.006	0.017	-0.246***
	(-0.913)	(-0.796)	(0.483)	(-6.541)
$\Delta ZSCORE_{it}$	0.001***	0.001***	-0.002***	0.007***
	(2.659)	(4.797)	(-2.734)	(6.448)
ΔTAN_{it}	-0.146***	0.043**	-0.013	0.011
	(-6.084)	(2.176)	(-0.197)	(0.172)
ΔLEV_{it}	-0.036***	-0.034***	0.030	-0.243***
	(-4.332)	(-4.080)	(1.373)	(-7.980)
ΔLEV_IND_{it}	-0.002	-0.010	-0.012	0.010
	(-0.171)	(-0.555)	(-0.296)	(0.166)
$\Delta CFOSALE_{it}$	0.001	0.003**	-0.009**	0.001
	(0.416)	(2.273)	(-2.052)	(0.179)
$\Delta SLACK_{it}$	-0.000**	-0.000	-0.000	0.003***
	(-2.014)	(-0.020)	(-0.983)	(3.928)
DIV_{it}	-0.001	0.001	-0.001	-0.001
	(-1.050)	(0.615)	(-0.471)	(-0.413)
AGE_{it}	0.000	-0.001	-0.001	-0.000
	(0.306)	(-1.601)	(-0.792)	(-0.209)
$\Delta OPCYCLE_{it}$	0.001	-0.001	-0.005	-0.013*
	(0.618)	(-0.425)	(-0.853)	(-1.768)
$LOSS_{it}$	-0.002	-0.001	-0.004	-0.023***
	(-1.520)	(-0.515)	(-0.870)	(-5.420)
Intercept	-0.000	0.125***	-0.020*	-0.012
	(-0.073)	(27.039)	(-1.773)	(-0.868)
Industry and year fixed effects	Included	Included	Included	Included
N	4,629	4,629	4,629	4,629
Adjusted R^2	0.126	0.180	0.168	0.156

Table 9
Controlling for additional supplier and customer firm characteristics

This table presents the multinomial logistic regression results of the effect of customer tax uncertainty on supplier investment after including additional supplier- and customer-firm-level control variables. Panel A includes a supplier-firm-level control variable *UTBINC* for the supplier's own tax uncertainty. Panel B includes the following customer-firm-level control variables. *C_RETVOL* is the customers' sales-weighted standard deviation of monthly stock returns (RET) in a given year, as per Guenther, Matsunaga, and Williams (2017). *C_FUTURE_CFOVOL* is the customers' sales-weighted future cash flow volatility, where future cash flow volatility is the standard deviation of operating cash flow (OANCF) scaled by lagged total assets (AT) from year *t* to year *t*+2. *C_INCSMOOTH* is the decile rank of customers' sales-weighted income smoothing, calculated as the ratio of the standard deviation of income before extraordinary items (IB) scaled by lagged total assets (AT) to the standard deviation of operating cash flow (OANCF) scaled by lagged total assets (AT), multiplied by -1. *C_CSCORE* is the decile rank of customers' sales-weighted accounting conservatism, calculated following Khan and Watts (2009). The baseline group in each column is the "normal" investment group. All other variables are as defined in Appendix A. *Z*-statistics, calculated using robust standard errors clustered by firm, are reported in parentheses. ***, ** and * indicate statistical significance at the 1%, 5%, and 10% levels, respectively.

Panel A. Supplier own tax uncertainty

	Underinvestment vs. normal investment	Overinvestment vs. normal investment
	(1)	(2)
	R_INVEST_{it+1}	R_INVEST_{it+1}
C_UTBINC$_{it}$	**0.803*** **	**-0.867*** **
	(4.475)	**(-2.601)**
$UTBINC_{it}$	-0.226*	-0.210
	(-1.658)	(-1.253)
Intercept	0.052	-1.530
	(0.074)	(-1.401)
Other control variables	Included	Included
N	3,943	3,943
Pseudo R^2	0.073	0.073

Panel B. Customer-level control variables

	Underinvestment vs. normal investment	Overinvestment vs. normal investment
	(1)	(2)
	R_INVEST_{it+1}	R_INVEST_{it+1}
C_UTBINC$_{it}$	**0.639*** **	**-0.636** **
	(4.066)	**(-2.376)**
C_RETVOL_{it}	0.382	-0.507
	(0.294)	(-0.295)
$C\_FUTURE\_CFOVOL_{it}$	2.251	2.281
	(1.077)	(0.779)
$C\_INCSMOOTH_{it}$	0.047	0.015
	(1.405)	(0.434)
C_CSCORE_{it}	-0.331**	-0.018
	(-2.425)	(-0.110)
Intercept	0.633	-1.239
	(1.084)	(-1.419)
Other control variables	Included	Included
N	5,593	5,593
Pseudo R^2	0.071	0.071

Table 10
Alternative measurements

This table presents the multinomial logistic regression results of the effect of customer tax uncertainty on supplier investment using different variable measurements. Panel A uses the change in UTB balance as an alternative measure for customer tax uncertainty. *C_UTBBAL_CHG* is the sales-weighted average of the percentage change in the UTB balance in year *t*. Panel B uses a dependent variable *R_INVEST_TER*, calculated based on the terciles of the residuals from the firm-specific investment model. Panel C uses a dependent variable *R_INVEST_CAPEX*, calculated using capital expenditures. Panel D uses a dependent variable *R_INVEST_NCAPEX*, calculated using non-capital expenditures (i.e., R&D expenditures and acquisitions). The baseline group in each column is the "normal" investment group. All other variables are as defined in Appendix A. *Z*-statistics, calculated using robust standard errors clustered by firm, are reported in parentheses. ***, **, and * indicate statistical significance at the 1%, 5%, and 10% levels, respectively.

Panel A. Change in UTB balance

	Underinvestment vs. normal investment	Overinvestment vs. normal investment
	(1)	(2)
	R_INVEST_{it+1}	R_INVEST_{it+1}
C_UTBBAL_CHG$_{it}$	**0.257*** **	**-0.234***
	(2.913)	**(-1.940)**
Intercept	0.563	-1.204
	(0.986)	(-1.422)
Control variables	Included	Included
N	5,804	5,804
Pseudo R^2	0.070	0.070

Panel B. Tercile split

	Underinvestment vs. normal investment	Overinvestment vs. normal investment
	(1)	(2)
	$R\_INVEST\_TER_{it+1}$	$R\_INVEST\_TER_{it+1}$
C_UTBINC$_{it}$	**0.556*** **	**-0.536***
	(3.358)	**(-2.344)**
Intercept	1.159*	-0.950
	(1.759)	(-1.423)
Control variables	Included	Included
N	5,804	5,804
Pseudo R^2	0.084	0.084

Panel C. Capital investment

	Underinvestment vs. normal investment	Overinvestment vs. normal investment
	(1)	(2)
	$R\_INVEST\_CAPEX_{it+1}$	$R\_INVEST\_CAPEX_{it+1}$
C_UTBINC$_{it}$	**0.582*** **	**-0.031**
	(3.461)	**(-0.173)**
Intercept	-2.419***	-0.256
	(-3.886)	(-0.592)
Control variables	Included	Included
N	5,804	5,804
Pseudo R^2	0.111	0.111

Panel D. Non-capital investment

	Underinvestment vs. normal investment	Overinvestment vs. normal investment
	(1)	(2)
	$R\_INVEST\_NCAPEX_{it+1}$	$R\_INVEST\_NCAPEX_{it+1}$
C_UTBINC$_{it}$	**0.559*** **	**-0.557** **
	(3.715)	**(-2.222)**
Intercept	0.682	-1.106
	(1.238)	(-1.240)
Control variables	Included	Included
N	5,804	5,804
Pseudo R^2	0.070	0.070