Do the Benefits of Innovations Spill Over from Suppliers to Customers?

Li (Lily) Zheng Brooks[1], Yong Chen[1] & Yan Zhao[1]

[1] A.R. Sanchez, Jr. School of Business, Texas A&M International University, Laredo, TX, USA

Correspondence: Yan Zhao, A.R. Sanchez, Jr. School of Business, Texas A&M International University, Laredo, TX, USA. Tel: 1-956-326-2516. E-mail: yan.zhao@tamiu.edu

Received: July 2, 2025 Accepted: August 15, 2025 Online Published: August 23, 2025

doi:10.5430/afr.v14n3p1 URL: https://doi.org/10.5430/afr.v14n3p1

Abstract

Prior research has extensively examined customer-supplier relationships and documented the dominant roles that customers play in firms' financial and investment decisions. Although the nature of the relationship between customers and suppliers is bilateral, the literature has predominantly examined the relationship through the lens of customers, overlooking the impact that suppliers have on customers. Do the benefits of innovation spillover from suppliers affect customers along supply chains? The answer remains unknown. Accordingly, our study explores the benefits of innovation spillovers from suppliers to customers along the supply chain, namely the impact of suppliers' innovation activities on their customers' profitability. We find a positive association between suppliers' innovation activities and customers' profitability, consistent with the innovation spillover from suppliers to customers along supply chains. We also find that this relationship has become more pronounced in recent years, implying the importance of technology and employee mobility in spillover effects along the supply chain. Our additional analysis supports the robustness of this result. Our paper sheds light on the studies and practices of supply chain management by offering a holistic view of suppliers' roles in corporate innovation along supply chains.

Keywords: Supplier-customer relationship, innovation, supply chain, spillover effect

1. Introduction

In supply chains, principal customer firms and suppliers establish relationships via various arrangements, such as long-term contracts, strategic alliances, and relationship-specific investments (Ellis, Henke Jr, & Kull, 2012). Collaboration between suppliers and customers can create efficiency gains during production (Krolikowski & Yuan, 2017). The Statement of Financial Accounting Standards (SFAS) No. 131 requires U.S. firms to disclose the names of their principal customers, which account for at least 10% of total sales in quarterly reports or are otherwise considered important for business (Cohen & Frazzini, 2008). Because the principal customer firms account for a significant part of their suppliers' sales, the suppliers' firm value, financial well-being, and even survival are closely linked to the demand from and the financial condition of the principal customer firms (Banerjee, Dasgupta, & Kim, 2008; Cho, Kim, & Zang, 2020). Suppliers are dependent on their principal customers. Given the power imbalance in the relationship, major customers have more bargaining power than suppliers, whereas suppliers have less control than customers. Accordingly, this customer orientation has dominated the research on customer-supplier relationships in supply chains. Prior studies mainly examine the relationship from the customer's perspective to explore how suppliers are affected by customers. A large number of studies investigate how consumers' financial decisions, including their financing policies and capital structure (Banerjee, Dasgupta, & Kim, 2008; Chu & Wang, 2012), firm value (Cho, Kim, & Zang, 2020), earnings management (Pandit, Wasley, & Zach, 2011; Raman & Shahrur, 2008), stock returns predictability (Cohen & Frazzini, 2008), bankruptcy filings (Hertzel, Li, Officer, & Rodgers, 2008), accounting conservatism (Hui, Liang, & Yeung, 2019), mergers and acquisitions (Ahern, 2012; Ahern & Harford, 2014; Bhattacharyya & Nain, 2011; Fee & Thomas, 2004), information spillover (Hertzel, Li, Officer, & Rodgers, 2008), and cost of capital (Dhaliwal, Judd, Serfling, & Shaikh, 2016) affect suppliers.

Firms' research and development (R&D) strategies and innovations drive their corporate development and economic growth (Krolikowski & Yuan, 2017). Technological innovations are critical for long-term competitive advantages and sustainable growth (Porter, 1992). Therefore, firms' long-term growth and competitiveness rely on their innovations (Jovanovic & MacDonald, 1994). However, innovations carry a significant risk for firms because they involve inherent uncertainties in transitioning from concept to the realization of actual profits. Customers and suppliers must carefully invest in new technologies, products, or services and prioritize their research projects

(Custódio, Ferreira, & Matos, 2019). The strong bargaining power, however, gives customers a considerable influence over suppliers' innovation activities. As such, some existing studies on the relationship between customers and suppliers explore how customers' buyer power affects suppliers' innovation (Chen, 2019) and how technology spills over from customers to suppliers (Chu, Tian, & Wang, 2014).

However, the customer-supplier relationship is bilateral, particularly when suppliers sell their products or services to a few big customers (Banerjee, Dasgupta, & Kim, 2008). Although most existing studies examine how supplier-customer relationships affect financial decisions, corporate investment decisions, and innovations, they predominantly focus on the effects that customers generate on suppliers and largely overlook the effects that suppliers generate on customers in this relationship. Do innovations spill over from suppliers to customers along supply chains? The answer remains unknown. Accordingly, our study explores innovation spillovers from suppliers to customers along the supply chain, namely the impact of suppliers' innovation activities on their customers' profitability. Drawing on and extending the theories of Transaction Cost Economics (TCE) and the Resource Dependence Theory (RDT) in the context of innovation, we posit that suppliers' innovations are closely related to those of customers.

In this study, we use firm-level patent data as an output-based measure of innovation (Kamien & Schwartz, 1975; Hirshleifer, Hsu, & Li, 2013). Using U.S. public firms in five innovative industries from 2003 to 2018 as a sample, we demonstrate that a positive relationship exists between suppliers' innovation activities and customers' profitability, even after controlling for numerous firm-level factors. This finding is consistent with our prediction that the positive effects of innovations spill over from suppliers to customers along supply chains. Our additional analyses show that the relation is robust to different samples and measures.

This study makes the following contributions. First, this study extends existing research on the influence of innovation on firms' financial performance and competitiveness. Specifically, this study provides empirical evidence that a supplier's innovative activities have a strong impact on their customers' profitability. Second, this paper sheds light on relationship-specific investment and supply chain management studies. To the best of our knowledge, studies empirically examining the customer-supplier relationship from the suppliers' perspective and exploring the effect of suppliers' innovative activities on their customers' profitability are scarce. Our study addresses this gap in the literature. Third, this study provides insights into practice and management. Our findings highlight the role of suppliers in the customer-supplier relationship, underscoring the importance of suppliers' innovations and collaboration between customers and suppliers.

The remainder of the paper is organized as follows: Section Literature Background and Hypothesis provides the literature review and hypothesis development. Section Data and Sample Construction presents our research design and sample statistics. Section Empirical Results documents empirical models and analyses. Section Discussions and Conclusions illustrates the contributions of our study and discusses its limitations.

2. Literature Background and Hypothesis

We draw on two streams of literature: the customer-supplier relationship and innovation. Transaction cost economics (TCE) implies that strong coordination and high integration between customers and suppliers can help minimize exchange costs and maximize transaction efficiencies (Williamson, 1979). Collaboration along supply chains particularly encourages customers' and suppliers' R&D investments and innovation. As a result, they both choose to invest more in R&D and remain innovative as a defensive strategy. However, according to the resource dependence theory (RDT), a power imbalance exists among business partners in a resource-dependence relationship (Pfeffer & Salancik, 2015). In supply chains, customer-supplier relationships are often dominated by the principal customers, who possess significant bargaining power. Thus, suppliers tend to actively pursue dependence on their customers and cooperate with them to avoid or reduce switching costs associated with finding new customers (Krolikowski & Yuan, 2017). Suppliers also tend to be actively engaged in research and product development to maintain their competitive position in the market. However, the strong bargaining power of customers can also reduce suppliers' resources allocated to R&D investments and innovations, negatively affecting their innovation intensity, importance, and efficiency (Krolikowski & Yuan, 2017). Friction along the supply chain can impede process innovation and the development of innovative products.

Prior studies on customer-supplier relationships emphasize the customers' dominant roles in corporate finance, leading to a focus on customers' perspectives when exploring factors affecting the relationship, while overlooking the impacts on customers generated by suppliers. For example, Banerjee, Dasgupta, and Kim (2008) find that customer firms prefer their suppliers to have less debt so that the suppliers can remain solvent and deliver the products or services. They also find that customer firms in durable sectors maintain conservative capital structures to encourage their suppliers to commit more relationship-specific investments. Cohen and Frazzini (2008) find that customers' stock returns predict suppliers' stock returns in subsequent months. Cho, Kim, and Zang (2020) document the effect of customer firms' information events on their suppliers' voluntary disclosure. (Note 1) When a customer firm exhibits strong earnings growth, its demand for products or services from its suppliers will likely grow, increasing the suppliers' revenue and earnings (Cho, Kim, & Zang, 2020). When the customer firm experiences earnings decline or financial distress, it may reduce product purchases, delay payments, and default on long-term contracts, negatively affecting its suppliers' performance (Cho, Kim, & Zang, 2020).

Although a few studies on customer-supplier relationships focus on corporate innovation, they are still from the customers' perspective. Customers are traditionally considered the sources of knowledge for innovation (Cohen & Levinthal, 1990; Foss, Laursen, & Pedersen, 2011). The demand and knowledge diffusion channels from customers to suppliers can drive suppliers' innovation activities, and the close customer-supplier relationships and geographic proximity facilitate knowledge spillovers (Chu, Tian, & Wang, 2014). Because supply chain partners are economically linked, their stock returns may correlate due to related fundamentals (Hong, Torous, & Valkanov, 2007; Menzly & Ozbas, 2010). Li (2018) finds that customer firms' positive innovation activities increase their suppliers' profitability. Although individual suppliers' bargaining power may be weak in the customer-supplier relationship, this relationship remains bilateral, and the aggregate impacts on customers from suppliers should not be overlooked.

The production of innovations involves collaboration between team members working together to create new products, services, or processes. A close customer-supplier relationship can facilitate interpersonal interactions among the researchers of suppliers and customers. When suppliers and customers are located close to each other (proximity), knowledge spillovers and idea exchange on both sides are more likely to occur, thereby improving existing products and developing new technologies (Audretsch & Feldman, 2004). (Note 2) Proximity also facilitates the exchange of important factors in the production process, such as intermediate input, talent pools, and natural resources, between suppliers and customers (Orlando, 2004). (Note 3) Such an agglomeration effect is substantial when the customers are innovative themselves and are in closer technological proximity to the suppliers. Dasgupta, Zhang, and Zhu (2015) document that a tight social connection between managers and board members on both sides helps mitigate hold-up problems and improves supplier innovation. Krolikowski and Yuan (2017) find that a concentrated customer base motivates suppliers to invest more in R&D and become more innovative; however, strong customer bargaining power creates hold-up problems and forces suppliers to invest less in R&D and innovation. In recent decades, IT-based networks and real-time data flows have further enabled external innovation collaboration (Thomke, 2006). Information technology enables inter-organizational coordination between the focal firm and its external innovation partners (Kleis, Chwelos, Ramirez, & Cockburn, 2012). Firms can access specialized knowledge and other innovation components that can be incorporated into new products, services, and processes by outsourcing innovation production elements (Chan, Chin, & Lam, 2007). As this close business partnership exists, it is easier for suppliers to understand the specific needs of their customers and receive timely feedback from them (Chu, Tian, & Wang, 2014). Such learning may stimulate suppliers to invest more in research and development, as well as innovative activities, to meet their customers' needs. Consequently, suppliers can deliver higher-quality production components, manufacturing materials, or merchandising units to customers, ultimately enhancing their customers' competitive edge and profitability (Han, Kim, & Srivastava, 1998; Lukas & Ferrell, 2000). Thus, we posit our main hypothesis:

H1: Supplier firms' innovation activities are positively associated with the customer firms' profitability.

3. Data and Sample Construction

3.1 Sample Selection

We conduct our sample selection of U.S.-listed companies through the following procedures. First, we select observations available in Compustat and CRSP to calculate the firm characteristics from 2003 to 2018. We delete the firm with a share price of less than $1 and identify all supplier-customer pairs. According to SFAS 131, firms must disclose the identities of major customers representing more than 10 percent of their sales. We obtain information on customer-supplier relationships from the Compustat segment customer file, which has been used in many studies (e.g., Chu, Tian, & Wang, 2019; Cho, Kim, & Zang, 2020). Following a similar method to Chu, Tian, and Wang (2019), we first exclude all customers reported as governments, regions, or militaries. Because the major customers in the Compustat segment files are only reported with abbreviated names without any other identifiers, we then match customers to their respective Compustat identifiers (i.e., GVKEY) using text matching that requires all the letters in the reported customer name to be sequentially shown in the potential match. When a customer abbreviation matches more than one company in the historical names file of Compustat data files, we manually identify the match by investigating the available public information from firm websites, SEC filings, and Google. Last, when we cannot identify the unique matches, we conservatively eliminate the possible customer-supplier pairs.

Next, we select the supplier-customer pairs where the customer firms are from five innovative (R&D-intensive) industries because these industries rely more heavily on innovations to maintain their competitiveness than most other industries (Mansfield, 1986; Plumlee et al., 2015; Hoffmann et al., 2019). (Note 4) The five innovative industries include chemicals and allied products (Standard Industrial Classification (SIC) 28), industrial and commercial machinery and computer equipment (SIC 35), electronics and communications (SIC 36), transportation equipment (SIC 37), and instruments and related products (SIC 38). Then, we exclude the supplier-customer pairs in which neither customers nor suppliers have ever produced patents. We obtain patent information from the dataset used by Kogan, Papanikolaou, Seru, and Stoffman (2017) (hereafter, KPSS). (Note 5) We use KPSS data because KPSS collects comprehensive U.S. patent information from resources of the USPTO and Google Patents database and is thus used by many recent studies (e.g., Gao, Hsu, Li, & Zhang, 2020; He and Qiu, 2025). The dataset contains detailed patent information, including patent number, citation number, and the date of patent application and grant. We further restrict our sample to firm-year observations with the necessary control variables required in our baseline model.

The final sample includes 3649 firm-year observations that filed patents, and 3277 firm-year observations were granted patents between 2003 and 2018, representing 223 unique customer firms and 487 unique supplier firms. Table 1 provides the temporal distribution of the sample firms across fiscal years. In general, our sample firms are evenly distributed from 2003 to 2018, with fewer observations in 2018. Table 2 presents the industry classification of the customer firms in our sample. Our untabulated results show that the supplier firms are from 20 industries. Among the five innovative industries, the fewest customer firms are from the Instruments and related products (SIC 38) industry.

Table 1. Sample distribution by fiscal years

Fiscal year	# firm years	% of sample
2003	254	6.96
2004	241	6.6
2005	260	7.13
2006	247	6.77
2007	235	6.44
2008	216	5.92
2009	201	5.51
2010	204	5.59
2011	217	5.95
2012	245	6.71
2013	265	7.26
2014	242	6.63
2015	220	6.03
2016	223	6.11
2017	229	6.28
2018	150	4.11
Total	3649	100

Table 2. Sample distribution by industries

Customer firms	# firm years	% of sample
Chemicals and allied products (SIC 28)	826	22.64
Industrial and commercial machinery and computer equipment (SIC 35)	914	25.05
Electronics and communications (SIC 36)	888	24.34
Transportation equipment (SIC 37)	808	22.14
Instruments and related products (SIC 38)	213	5.84
Total	3649	100.0

3.2 Variable Measurement

Innovation tends to occur in highly specialized areas, such as information technology. The number of patents closely captures firms' success in innovation output, unlike input-based measures such as R&D expenditure (Griliches, 1990; Trajtenberg, 1990). Therefore, patenting activity has been widely recognized as a reliable measure of innovation amount (Acs, Anselin, & Varga, 2002; Ahuja, Lampert, & Tandon, 2008; Joshi, 2010; Schilling & Phelps, 2007). Consistent with prior research, we measure innovative activity by the number of patents a firm files in a given year, which are eventually issued using the KPSS dataset. The patent application date is the earliest point at which we can identify new firm capabilities, so using this date allows us to measure the time when patentable work was completed. As there is a typical two- to four-year lag between patent application and approval, some patents applied for in later years may not be included in the database (Gao, Hsu, Li, & Zhang, 2020). To adjust for this truncation bias, we construct a second measure of innovation output using the number of patents a firm issues in a given year (Li, 2018). Due to the positive skewness in patent data, we take the natural logarithm of one plus the count of patents filed (Cpatentfil and Spatentfil) and of one plus the count of patents issued (Cpatentiss and Spatentiss) by customers and suppliers, respectively, as our innovation measures (Chu, Tian and Wang, 2019; Gao, Hsu, Li, & Zhang, 2020). Our dependent variable is customers' return on assets (Cprofit), a commonly used measure of profitability. As we focus on the direct impact of innovation on firms' operational performance, we calculate return on assets as customers' operating income before depreciation (OIBDP) scaled by total assets (AT) (Gallemore & Labro, 2015).

To control for the characteristics of customers and suppliers, we include customer-supplier pair-specific variables following the literature (e.g., Li, 2018; Chiu, Tian, & Wang, 2019). First, we control for customer-level basic characteristics that are most used in the literature, including customers' firm age (Cage), market-to-book ratio (Cmb), sales changes (Cchgsale), firm size (Csize), annual return (Cret), and firm leverage (Clev). We then control for a few additional factors that are more relevant to customers' innovation activities, such as R&D intensity (Cr&d), tangibility (Cppe), CAPEX (Ccapex), and employee size (Cemploy). Next, we control for their suppliers' basic firm characteristics such as firm age (Sage), market-to-book ratio (Smb), firm size (Ssize), annual return (Sret), and firm leverage (Slev). As suppliers' R&D intensity (Sr&d), tangibility (Sppe), CAPEX (Scapex), employee size (Semploy), and ROA (Sprofit) may be associated with their patent activities, we also control for these factors in our estimation. The definitions and detailed measurements of the variables are presented in Table 3.

Table 3. Variable Definitions

Variable	Definition
Cprofit	Customers' return on assets, measured as the operating income before depreciation (OIBDP) scaled by total assets (AT).
Spatentfil	Suppliers' filed patent counts, measured as the natural logarithm of one plus the number of patents filed by the suppliers at the beginning of the year.
Cpatentfil	Customers' filed patent counts, measured as the natural logarithm of one plus the number of patents filed by the customers at the beginning of the year.
Spatentiss	Suppliers' issued patent counts, measured as the natural logarithm of one plus the number of patents issued by the suppliers at the beginning of the year.
Cpatentiss	Customers' issued patent counts, measured as the natural logarithm of one plus the number of patents issued by the customers at the beginning of the year.
Cage	Customers' age, measured as the number of years since the firm first appears in Compustat at the beginning of the year.
Cmb	Customers' market-to-book ratio at the beginning of the year, measured as the market value of equity (PRCC_F × CSHO), scaled by the book value of equity (CEQ).
Cchgsale	Customers' sales change, measured as the log ratio of sales revenue (SALE) in year t to sales revenue in year t-1 [$Log(SALE_t / SALE_{t-1})$].
Csize	Customers' size, measured as natural logarithm of one plus the market value of equity (PRCC_F × CSHO) at the beginning of the year.
Cret	Customers' annual return, measured as the buy and hold stock return in the year prior to the fiscal year end date.
Clev	Customers' leverage, measured as the long-term debt (DLTT) scaled by lagged assets (AT) at the beginning of the year.
Cr&d	Customers' R&D, measured as the R&D expenditure (XRD) scaled by total assets (AT) at the beginning of the year.
Cppe	Customers' tangibility, measured as total property, plant, and equipment assets (PPENT) scaled by total assets (AT) at the beginning of the year.
Ccapex	Customers' capital expenditure, measured by capital expenditure (CAPX) scaled by total assets (AT) at the beginning of the year.
Cemploy	Customers' employee size, measured as the natural logarithm of the number of employees (EMP).
Sprofit	Suppliers' return on assets, measured as the operating income before depreciation (OIBDP) scaled by total assets (AT).
Sage	Suppliers' age, measured as the number of years since the firm first appears in Compustat at the beginning of the year.
Smb	Suppliers' market-to-book ratio at the beginning of the year, measured as the market value of equity (PRCC_F × CSHO), scaled by the book value of equity (CEQ).
Ssize	Suppliers' size, measured as natural logarithm of one plus the market value of equity (PRCC_F × CSHO) at the beginning of the year.
Sret	Suppliers' annual return, measured as the buy and hold stock return in the year prior to the fiscal year end date.
Slev	Suppliers' leverage, measured as the long-term debt (DLTT) scaled by lagged assets (AT) at the beginning of the year.
Sr&d	Suppliers' R&D, measured as the R&D expenditure (XRD) scaled by total assets (AT) at the beginning of the year.
Sppe	Suppliers' tangibility, measured as total property, plant, and equipment assets (PPENT) scaled by total assets (AT) at the beginning of the year.
Scapex	Suppliers' capital expenditure, measured by capital expenditure (CAPX) scaled by total assets (AT) at the beginning of the year.
Semploy	Suppliers' employee size, measured as the natural logarithm of the number of employees (EMP).

3.3 Descriptive Statistics

Table 4 presents the summary statistics for the variables in our main sample (N = 3,649). The sample statistics indicate that sample customer firms are, on average, profitable (the mean and median Cprofit are 0.139 and 0.128, respectively). Regarding the variables related to innovation activities, the means (medians) of Spatentfil and Spatentiss are 2.543 (2.303) and 2.684 (2.485), respectively. The means (medians) of Cpatentfil and Cpatentiss are 5.489 (5.940) and 5.547 (5.866), respectively. The suppliers conduct fewer patent activities than their customers, likely due to the smaller mean size of suppliers (6.763) compared to customers (10.490). The differences in the firm's age, market-to-book ratio, leverage, tangibility, and capital expenditure among customers and suppliers are relatively slight. In contrast, the differences in profitability, firm size, and R&D intensity among customers and suppliers are substantial. It is interesting to note that average supplier firms tend to be smaller in size and have lower profitability, yet they exhibit higher R&D intensity compared to customer firms. These findings imply that 1) supplier firms may have less bargaining power to maintain higher profitability than their major customers, 2) the average supplier invests more resources in technology and innovation than their customers, and the aggregate effects of all suppliers' innovation activities can be crucial for the entire supply chain. (Note 6) Overall, our descriptive statistics are comparable to those reported in prior literature.

Table 5 displays the Pearson correlation coefficients among the measures of innovations and customers' profitability. The correlation between our two innovation measures for customers (suppliers) is 0.91 (0.89). The correlation between customers' and suppliers' innovation output is also positive, which supports the interactions of innovation activities in the supply chain and the importance of controlling for both sides' innovation-related factors in multivariate analyses. More importantly, Table 5 shows a significant and positive correlation between the quantity of suppliers' innovation and customers' profitability.

Table 4. Sample statistics

Main sample with 3,649 firm-year obs.								
Variable	N	Mean	STD	10%	25%	Median	75%	90%
Main variables								
Cprofit	3649	0.139	0.075	0.060	0.089	0.128	0.177	0.245
Spatentfil	3649	2.543	1.510	0.693	1.386	2.303	3.367	4.407
Cpatentfil	3649	5.489	1.683	3.045	4.522	5.940	6.721	7.328
Spatentiss	3277	2.684	1.476	1.099	1.609	2.485	3.434	4.543
Cpatentiss	3277	5.547	1.601	3.178	4.700	5.866	6.713	7.334
Control variables								
Cage	3649	10.967	4.660	5.000	7.000	11.000	15.000	17.000
Cmb	3649	3.528	3.670	1.093	1.653	2.770	4.263	6.844
Cchgsale	3649	0.050	0.156	-0.108	-0.025	0.049	0.127	0.231
Csize	3649	10.490	1.277	8.752	9.743	10.736	11.435	11.893
Cret	3649	0.115	0.383	-0.335	-0.118	0.077	0.305	0.577
Clev	3649	0.178	0.123	0.021	0.087	0.161	0.241	0.378
Cr&d	3649	0.066	0.045	0.020	0.030	0.055	0.098	0.126
Cppe	3649	0.176	0.112	0.060	0.090	0.147	0.248	0.322
Ccapex	3649	0.042	0.036	0.013	0.020	0.029	0.050	0.092
Cemploy	3649	4.183	1.186	2.518	3.597	4.371	5.017	5.638
Sprofit	3649	0.034	0.198	-0.228	-0.026	0.095	0.149	0.196
Sage	3649	9.646	4.719	4.000	6.000	9.000	13.000	17.000
Smb	3649	2.985	6.385	0.898	1.386	2.231	3.700	6.630
Ssize	3649	6.763	1.674	4.758	5.580	6.645	7.880	9.045
Sret	3649	0.172	0.656	-0.465	-0.234	0.069	0.405	0.826
Slev	3649	0.148	0.191	0.000	0.000	0.080	0.229	0.414
Sr&d	3649	0.139	0.145	0.014	0.040	0.094	0.181	0.345
Sppe	3649	0.171	0.137	0.033	0.064	0.133	0.242	0.367
Scapex	3649	0.041	0.035	0.008	0.015	0.031	0.055	0.082
Semploy	3649	1.353	1.326	0.125	0.293	0.820	2.028	3.466

Table 5. Pearson correlation coefficients

Main sample with 3,649 firm-year obs.						
		(1)	(2)	(3)	(4)	(5)
(1)	Cprofit	1				
(2)	Spatentfil	0.06***	1			
(3)	Cpatentfil	0.04***	0.19***	1		
(4)	Spatentiss	0.08***	0.89***	0.20***	1	
(5)	Cpatentiss	-0.01	0.18***	0.91***	0.20***	1

***, **, and * denote significance at the 1%, 5%, and 10% levels, respectively.

4. Empirical Results

4.1 Main Results

To test our main hypothesis, we estimate the following regression model (omitting firm and time subscripts):

$$\text{Cprofit} = \beta_0 + \beta_1 \text{ Suppliers' Innovation} + \sum \beta_i \text{ Customer-level Controls}_i + \sum \beta_j \text{ Supplier-level Controls}_j + I + T + \varepsilon) \quad (1)$$

In equation (1), the dependent variable is our ROA measure, Cprofit. Suppliers' innovation represents our two innovation measures, Spatentfil and Spatentiss. In the context of H1, we expect a positive β_1 coefficient. We include a number of customer-level controls and supplier-level controls as discussed in Section Variable Measurement. In addition, we control for time variation and industry variation in innovation and profitability by incorporating industry fixed effects (I) and year fixed effects (T) in the model. Standard errors are clustered by firm. We employ a lead-lag structure for the dependent variable and the variable of interest because we examine the customers' profitability following the suppliers' patent outcomes, which may take some time to generate customer benefits.

Table 6 demonstrates our regression results using equation (1). Columns (1) & (2) use the basic firm-level controls, and columns (3) & (4) add more innovation-related controls used in the literature. Columns (1) & (3) and columns (2) & (4) utilize the innovation measures Spatentfil and Spatentiss, respectively. Consistent with H1, the coefficients of β_1 in columns (1) & (3) (0.0059 & 0.0046, respectively) and in columns (2) & (4) (0.0064 & 0.0044, respectively) are positive and significant at the 1% level, suggesting a positive relationship between the suppliers' innovation activities and customers' profitability. We also notice that customers' innovation output is not significantly associated with their ROA when using Cpatentfil in columns (1) & (3), and it is negative and significantly associated with their ROA when using Cpatentiss in columns (2) & (4). This result suggests that customers' innovation activities may not yield significant immediate profits for them for two possible reasons. First, the creation and filing process of customers' innovations is associated with many costs that directly impact their short-term net profits; therefore, the potential short-term benefits generated by currently filed patents may be offset by these costs, making the coefficients of Cpatentfil insignificant in columns (1) & (3). Second, when their patents are eventually issued and become public, their competitors can learn from these innovations, which may further impair the customers' own profitability along with the costs of applying these patents into production and result in the negative coefficients of Cpatentiss in columns (2) & (4). However, the confidentiality of supplier information and customized contracts between suppliers and customers can help deter customers' competitors from monitoring and learning from their suppliers' innovations. Despite this evidence, we acknowledge that customers' patents may still improve their future growth and, therefore, will likely lead to a higher firm value in the long run. In sum, consistent with our hypothesis, our main results in Table 6 suggest that supplier firms' innovation output makes an incremental contribution to customers' profitability, after controlling for customers' patent numbers and other relevant factors.

Table 6. Effects of innovation spillovers through the supply chain

	(1)	(2)	(3)	(4)
	Basic controls		More controls	
Spatentfil	0.0059***		0.0046***	
	(3.67)		(3.82)	
Cpatentfil	-0.0037		-0.0038	
	(-1.04)		(-1.23)	
Spatentiss		0.0064***		0.0044***
		(3.67)		(3.46)
Cpatentiss		-0.0080**		-0.0083**
		(-2.06)		(-2.42)
Cage	-0.0009	-0.0010	0.0006	0.0004
	(-0.41)	(-0.47)	(0.31)	(0.22)
Cmb	0.0038***	0.0033***	0.0032***	0.0029***
	(2.81)	(2.71)	(3.35)	(3.41)
Cchgsale	0.0712***	0.0635***	0.0431***	0.0398**
	(3.67)	(3.25)	(2.78)	(2.52)
Csize	0.0189***	0.0223***	0.0339***	0.0355***
	(3.43)	(4.05)	(6.47)	(7.34)
Cret	0.0237***	0.0204***	0.0157***	0.0145**
	(3.48)	(3.05)	(2.71)	(2.50)
Clev	-0.0615*	-0.0541	-0.0415	-0.0365
	(-1.88)	(-1.63)	(-1.41)	(-1.23)
Sprofit	-0.0095	-0.0162	-0.0038	-0.0100
	(-0.93)	(-1.63)	(-0.44)	(-1.09)
Sage	0.0025***	0.0027***	0.0011**	0.0011**
	(3.63)	(3.88)	(2.20)	(2.23)
Smb	0.0000	-0.0000	0.0002	0.0001
	(0.14)	(-0.13)	(1.34)	(0.76)
Ssize	-0.0060***	-0.0055***	-0.0045**	-0.0037**
	(-2.98)	(-3.04)	(-2.34)	(-1.98)
Sret	0.0005	0.0013	-0.0013	-0.0006
	(0.26)	(0.66)	(-0.80)	(-0.36)
Slev	-0.0050	-0.0081	-0.0006	-0.0011
	(-0.60)	(-0.93)	(-0.10)	(-0.17)
Cr&d			-0.0121	0.0529
			(-0.11)	(0.48)
Cppe			0.2570***	0.2570***
			(5.08)	(5.48)
Ccapex			0.0808	0.0908
			(0.53)	(0.62)

Cemploy			-0.0218***	-0.0175***
			(-4.75)	(-3.59)
Sr&d			-0.0141	-0.0126
			(-1.26)	(-1.03)
Sppe			0.0114	0.0112
			(0.79)	(0.64)
Scapex			-0.1033**	-0.1022**
			(-2.38)	(-2.08)
Semploy			0.0005	0.0002
			(0.28)	(0.14)
Intercept	-0.0285	-0.0429	-0.1465***	-0.1657***
	(-0.61)	(-0.91)	(-3.72)	(-4.48)
Year FF	Yes	Yes	Yes	Yes
Industry FF	Yes	Yes	Yes	Yes
# of obs. (N)	3649	3277	3649	3277
Adj_R^2	0.3523	0.3738	0.5306	0.5466

***, **, and * denote significance at the 1%, 5%, and 10% levels, respectively. T-statistics in parentheses are based on the standard errors clustered at the firm level.

4.2 Trend of the Spillover Effect

This section examines whether the innovation externality varies across our sample period. We predict that technological advancements and increased employee mobility in recent years can facilitate communication and collaboration along the supply chain, enabling suppliers to meet customers' demands more effectively through innovation. We repeat our analyses using the subsamples of 2003-2010 and 2011-2018 and report the results of estimating equation (1) in Table 7, columns (1)-(2) and columns (3)-(4), respectively. The coefficients of Spatentfil and Spatentiss in columns (1) and (2) are 0.0034 and 0.0022, respectively; however, they are more statistically significant in columns (3) and (4) at the 1% level (0.0043 and 0.0054, respectively). Consistent with our main result, the significant and positive coefficients of Spatentfil in columns (1) & (3) indicate the existence of the spillover effect of suppliers' innovation activities on their customers' profitability in each subperiod when using Spatentfil as the measure of innovation. More importantly, consistent with our prediction, this spillover effect is more pronounced in recent periods using both innovation measures (Spatentfil and Spatentiss), which is likely due to the increased mobility in both knowledge sharing and employee movement that has occurred in more recent years.

Table 7. Trend of the effects of innovation spillovers through the supply chain

	Period 2003-2010		Period 2011-2018	
	(1)	(2)	(3)	(4)
Spatentfil	0.0034**		0.0043***	
	(2.03)		(3.16)	
Cpatentfil	-0.0020		-0.0062**	
	(-0.43)		(-2.07)	
Spatentiss		0.0022		0.0054***
		(1.26)		(3.42)
Cpatentiss		-0.0103**		-0.0081***
		(-2.11)		(-2.85)
Intercept	-0.1437**	-0.1878***	-0.1577***	-0.1474***
	(-2.49)	(-3.31)	(-4.33)	(-4.21)
Controls	Yes	Yes	Yes	Yes
Year FF	Yes	Yes	Yes	Yes
Industry FF	Yes	Yes	Yes	Yes
# of obs. (N)	1858	1611	1791	1666
Adj_R^2	0.5278	0.5452	0.5694	0.5820

***, **, and * denote significance at the 1%, 5%, and 10% levels, respectively. T-statistics in parentheses are based on the standard errors clustered at the firm level.

4.3 Additional Tests

In this section, we use four different samples and repeat our analyses to check the universality of our main findings. Our first alternative sample (A) eases the restriction of innovative industries on customers. We include all customer-supplier pairs if either the customer or supplier is from an innovative industry in this sample. Assuming a supplier firm operates in an innovative industry, we investigate whether its innovation may also produce spillover effects on its customers, even if these customers are not in an innovative industry. Our second alternative sample (B) lessens the restriction on using non-missing patent data. We include the firm-year observations with missing patents by assuming their patent output as zero in this sample. In this way, we consider the firms that start to generate patents and substantially enlarge the sample size compared to our main sample. Next, we create the third alternative sample (C) by selecting customers from high-tech industries instead of innovative industries. Following Ram and Kim (2023), we define the high-tech industries as biotech (SIC codes 2833-2836; 8731-8734), computer (3570-3577; 7370-7374), and electronics (3600-3674). Lastly, we include all customer-supplier pairs from all industries in our alternative sample (D) to examine whether our main finding about innovative industries can be generalized to all other industries.

We report the results of estimating equation (1) using alternative samples (A) and (B) in Table 8 and alternative samples (C) and (D) in Table 9, respectively. Table 8 and Table 9 show that the coefficients of both *Spatentfil* and *Spatentiss* are all positive and significant across the four samples. These results indicate that our main finding is maintained when using various samples, supporting the external validity of our study.

Table 8. Effects of suppliers' innovations using alternative samples

	(1)	(2)	(3)	(4)
	Sample A: include either innovative customers or suppliers		Sample B: include innovative customers with missing patent data	
Spatentfil	0.0032***		0.0019***	
	(3.16)		(2.63)	
Cpatentfil	-0.0041		-0.0026	
	(-1.57)		(-1.59)	
Spatentiss		0.0030***		0.0022***
		(2.75)		(3.16)
Cpatentiss		-0.0068**		-0.0033*
		(-2.41)		(-1.79)
Intercept	-0.1785***	-0.1922***	-0.2278***	-0.2332***
	(-4.40)	(-4.77)	(-5.09)	(-5.13)
Controls	Yes	Yes	Yes	Yes
Year FF	Yes	Yes	Yes	Yes
Industry FF	Yes	Yes	Yes	Yes
# of obs. (N)	4972	4346	7923	7923
Adj_R^2	0.5477	0.5623	0.4587	0.4606

***, **, and * denote significance at the 1%, 5%, and 10% levels, respectively. T-statistics in parentheses are based on the standard errors clustered at the firm level.

Table 9. Effects of suppliers' innovations using alternative industries

	(1)	(2)	(3)	(4)
	Sample C: include customers in high-tech industries		Sample D: include customers in all industries	
Spatentfil	0.0036***		0.0025***	
	(2.74)		(2.62)	
Cpatentfil	-0.0057		-0.0017	
	(-1.59)		(-0.78)	
Spatentiss		0.0025*		0.0030***
		(1.96)		(2.87)
Cpatentiss		-0.0088**		-0.0039*
		(-2.16)		(-1.66)
Intercept	-0.2829***	-0.3053***	-0.1538***	-0.1766***
	(-6.01)	(-7.33)	(-3.98)	(-4.47)
Controls	Yes	Yes	Yes	Yes
Year FF	Yes	Yes	Yes	Yes
Industry FF	Yes	Yes	Yes	Yes
# of obs. (N)	2636	2383	5937	5068
Adj_R^2	0.5424	0.5494	0.5369	0.5533

***, **, and * denote significance at the 1%, 5%, and 10% levels, respectively. T-statistics in parentheses are based on the standard errors clustered at the firm level.

4.4 Robustness Test

Our primary tests utilize the number of patent applications and patent issuances to measure the quantity of innovation outputs. However, the number of patents is an imperfect proxy of innovation success, as patents vary widely in their technological and economic relevance (Griliches, Hall, & Pakes, 1991). A common way to measure the relevance of a patent is by the number of citations it subsequently receives. In this section, we adopt a second set of measures to capture the importance of innovation output (Li, 2018; Chu, Tian, & Wang, 2019). Specifically, we replace the number of patent applications (Spatentfil and Cpatentfil) and patent issuance (Spatentiss and Cpatentiss) with the total number of future citations a filed patent receives (Scitesfil and Ccitesfil) and the total number of future citations an issued patent receives (Scitesiss and Ccitesiss) in subsequent years, respectively. (Note 7) Table 10, columns (1) & (3) report the results of using Scitesfil and Ccitesfil, and columns (2) & (4) report the results using Scitesiss and Ccitesiss as the measure of innovation activities. Consistent with our main finding, the coefficients on Scitesfil and Scitesiss in columns (1)-(4) are all positive and significant at the 5% level ($p<0.05$). This result implies that both the quantity and quality of suppliers' innovation are positively associated with customers' profitability, consistent with our hypothesis.

In addition to the alternative measures, we also examine whether our results are sensitive to alternative model specifications. First, we repeat our analysis by controlling for both firm-fixed effects and year-fixed effects. As a delay in the spillover effect of supplier firms on customer firms may exist, we then repeat our analysis by running a regression using different lags (Li, 2018). Our untabulated results indicate that our main finding remains robust across various model specifications.

Table 10. Effects of suppliers' innovations using alternative measures

	(1)	(2)	(3)	(4)
Scitesfil	0.0023**		0.0017**	
	(2.23)		(2.06)	
Ccitesfil	0.0017		0.0006	
	(0.57)		(0.25)	
Scitesiss		0.0027**		0.0016*
		(2.31)		(1.84)
Ccitesiss		-0.0024		-0.0022
		(-0.67)		(-0.73)
Intercept	-0.0283	-0.0393	-0.1414***	-0.1550***
	(-0.64)	(-0.85)	(-3.69)	(-4.05)
Controls	Yes	Yes	Yes	Yes
Year FF	Yes	Yes	Yes	Yes
Industry FF	Yes	Yes	Yes	Yes
# of obs. (N)	3649	3277	3649	3277
Adj_R^2	0.3463	0.3572	0.5258	0.5339

***, **, and * denote significance at the 1%, 5%, and 10% levels, respectively. T-statistics in parentheses are based on the standard errors clustered at the firm level.

5. Discussions and Conclusions

Previous research has extensively examined customer-supplier relationships and documented the dominant roles of customers in corporate finance and corporate innovation within the supply chain. The customers' strong bargaining power in relationships makes these studies customer-oriented. They examined the relationship from the lens of customers while overlooking the impacts on customers generated by suppliers. This study examines the benefits of innovation spillovers from suppliers to customers along the supply chain, specifically the impact of suppliers' innovation activities on their customers' productivity. We demonstrate a positive relationship between suppliers' innovation activities and customers' productivity, indicating that innovations do indeed spill over from suppliers to customers along supply chains. We also find that this relationship has become more pronounced in recent years, which underscores the importance of technology and employee mobility in the spillover effect along the supply chain. Our main result also demonstrates certain external validity and holds to a battery of robustness checks.

This paper contributes to two strands of literature. First, it expands the literature that examines the effect of customer-supplier relationships on operations. We examine the effects of innovation on customers from the suppliers' perspective and provide direct empirical evidence that a supplier's innovation activities affect their customers' profitability, meaning that innovations do spill over from suppliers to customers along supply chains. Second, our paper contributes to the emerging literature on the role that supply-chain relationships play in corporate finance and innovation. We try to fill the gap by examining whether suppliers' innovation activities affect customer profitability. Our paper sheds light on the studies and practices of supply chain management by offering a holistic view of suppliers' roles in corporate innovation along supply chains. Third, our study has implications for practice. The findings in this paper help managers understand the role of suppliers in enhancing customers' competitive advantage and operational profitability, particularly as information technology continues to advance. Our results suggest that customers pay attention to suppliers' innovations even if suppliers have limited bargaining power. To further enhance innovation for suppliers and facilitate a spillover effect for customers, both parties should strengthen their collaboration and provide technology communication through channels such as data-sharing platforms and joint R&D programs.

This research has some limitations that open opportunities for future research. First, the CRSP segment database only reports a small fraction of supplier-customer relationship data based on Statement of Financial Accounting Standards (SFAS) No. 131. (Cohen & Frazzini, 2008). We recognize that customer names in the database can sometimes be vague, and we must manually match them to existing stocks in the Compustat database. Although we follow the consistent matching method with prior literature on supply chain (e.g., Chu, Tian, & Wang, 2019; Cho, Kim, & Zang, 2020) and check multiple information sources when manually matching them, this issue might cause data loss or inaccuracy in the customer-supplier pairs identified in our research. Future research can use Bloomberg's data, particularly the SPLC function, to determine supply chain relationships. The SPLC function can alleviate the issue by classifying supply chain partners into suppliers and customers identified with tickers. Moreover, it summarizes the most recent trading amount between focal stocks and each supply chain partner (Agarwal, Leung, Konana, & Kumar, 2017). Second, our study provides direct evidence that supports the spillover effect of suppliers' innovation on customers' profitability. Future studies can explore further the complete mechanisms through which this spillover effect exists and how the innovation activities of customers and suppliers may interact dynamically within the supply chain.

References

Acs, Z. J., Anselin, L., & Varga, A. (2002). Patents and innovation counts as measures of regional production of new knowledge. *Research Policy, 31*(7), 1069-1085. https://doi.org/10.1016/S0048-7333(01)00184-6

Agarwal, A., Leung, A. C. M., Konana, P., & Kumar, A. (2017). Cosearch attention and stock return predictability in supply chains. *Information Systems Research, 28*(2), 265-288. https://doi.org/10.1287/isre.2016.0656

Ahern, K. R. (2012). Bargaining power and industry dependence in mergers. *Journal of Financial Economics, 103*(3), 530-550. https://doi.org/10.1016/j.jfineco.2011.09.003

Ahern, K. R., & Harford, J. (2014). The importance of industry links in merger waves. *The Journal of Finance, 69*(2), 527-576. https://doi.org/10.1111/jofi.12122

Ahuja, G., Lampert, C. M., & Tandon, V. (2008). 1 moving beyond Schumpeter: management research on the determinants of technological innovation. *The Academy of Management Annals, 2*(1), 1-98. https://doi.org/10.5465/19416520802211446

Audretsch, D. B., & Feldman, M. P. (2004). Knowledge spillovers and the geography of innovation. *Handbook of Regional and Urban Economics, 4*, 2713-2739. https://doi.org/10.1016/S1574-0080(04)80018-X

Banerjee, S., Dasgupta, S., & Kim, Y. (2008). Buyer–supplier relationships and the stakeholder theory of capital structure. *Journal of Finance, 63*(5), 2507-2552. https://doi.org/10.1111/j.1540-6261.2008.01403.x

Bhattacharyya, S., & Nain, A. (2011). Horizontal acquisitions and buying power: A product market analysis. *Journal of Financial Economics, 99*(1), 97-115. https://doi.org/10.1016/j.jfineco.2010.08.007

Chan, C. T., Chin, K. S., & Lam, P. K. (2007). Strategic sourcing in the Hong Kong toy industry. *International Journal of Quality & Reliability Management, 24*(8), 776-799. https://doi.org/10.1108/02656710710817081

Chen, Z. (2019). Supplier innovation in the presence of buyer power. *International Economic Review, 60*(1), 329-353. https://doi.org/10.1111/iere.12355

Cho, Y. J., Kim, Y., & Zang, Y. (2020). Information externalities and voluntary disclosure: Evidence from a major customer's earnings announcement. *The Accounting Review, 95*(6), 73-96. https://doi.org/10.2308/tar-2017-0129

Chu, Y., Tian, X., & Wang, W. (2014). *Learning from customers: Corporate innovation along the supply chain*. Working Paper, University of South Carolina. https://doi.org/10.2139/ssrn.2505029

Chu, Y., Tian, X., & Wang, W. (2019). Corporate innovation along the supply chain. *Management Science, 65*(6), 2445-2466. https://doi.org/10.1287/mnsc.2017.2924

Chu, Z., & Wang, Q. (2012). Drivers of relationship quality in logistics outsourcing in China. *Journal of Supply Chain Management, 48*(3), 78-96. https://doi.org/10.1111/j.1745-493X.2011.03259.x

Cohen, L., & Frazzini, A. (2008). Economic links and predictable returns. *The Journal of Finance, 63*(4), 1977-2011. https://doi.org/10.1111/j.1540-6261.2008.01379.x

Cohen, W. M., & Levinthal, D. A. (1990). Absorptive capacity: A new perspective on learning and innovation. *Administrative Science Quarterly, 35*(1), 128-152. https://doi.org/10.2307/2393553

Custódio, C., Ferreira, M. A., & Matos, P. (2019). Do general managerial skills spur innovation? *Management Science, 65*(2), 459-476. https://doi.org/10.1287/mnsc.2017.2828

Dasgupta, S., Zhang, K., & Zhu, C. (2015). *Innovation, social connections, and the boundary of the firm*. Available at SSRN. https://doi.org/10.2139/ssrn.2614706

Dhaliwal, D., Judd, J. S., Serfling, M., & Shaikh, S. (2016). Customer concentration risk and the cost of equity capital. *Journal of Accounting and Economics, 61*(1), 23-48. https://doi.org/10.1016/j.jacceco.2015.03.005

Ellis, S. C., Henke Jr, J. W., & Kull, T. J. (2012). The effect of buyer behaviors on preferred customer status and access to supplier technological innovation: An empirical study of supplier perceptions. *Industrial Marketing Management, 41*(8), 1259-1269. https://doi.org/10.1016/j.indmarman.2012.10.010

Fee, C. E., & Thomas, S. (2004). Sources of gains in horizontal mergers: evidence from customer, supplier, and rival firms. *Journal of Financial Economics, 74*(3), 423-460. https://doi.org/10.1016/j.jfineco.2003.10.002

Foss, N. J., Laursen, K., & Pedersen, T. (2011). Linking customer interaction and innovation: The mediating role of new organizational practices. *Organization Science, 22*(4), 980-999. https://doi.org/10.1287/orsc.1100.0584

Gallemore, J., & Labro, E. (2015). The importance of the internal information environment for tax avoidance. *Journal of Accounting and Economics, 60*(1), 149-167. https://doi.org/10.1016/j.jacceco.2014.09.005

Gao, H., Hsu, P. H., Li, K., & Zhang, J. (2020). The real effect of smoking bans: evidence from corporate innovation. *Journal of Financial and Quantitative Analysis, 55*(2), 387-427. https://doi.org/10.1017/S0022109018001564

Griliches, Z. (1990). Patent statistics as economic indicators: A survey. *Journal of Economic Literature,* (28), 1661-1707. https://doi.org/10.3386/w3301

Griliches, Z., Hall, B. H., & Pakes, A. (1991). R&D, patents, and market value revisited: is there a second (technological opportunity) factor? *Economics of Innovation and New Technology, 1*(3), 183-201. https://doi.org/10.3386/w2624

Han, J. K., Kim, N., & Srivastava, R. K. (1998). Market orientation and organizational performance: is innovation a missing link? *Journal of Marketing, 62*(4), 30-45. https://doi.org/10.2307/1252285

He, Q., & Qiu, B. (2025). Environmental enforcement actions and corporate green innovation. *Journal of Corporate Finance, 91*, 102711. https://doi.org/10.1016/j.jcorpfin.2024.102711

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. https://doi.org/10.1016/j.jfineco.2007.01.005

Hirshleifer, D., Hsu, P. H., & Li, D. (2013). Innovative efficiency and stock returns. *Journal of Financial Economics, 107*(3), 632-654. https://doi.org/10.1016/j.jfineco.2012.09.011

Hoffmann, A. O. I., Kleimeier, S., Mimiroglu, N., & Pennings, J. M. E. (2019). The American Inventors Protection Act: A natural experiment on innovation disclosure and the cost of debt. *International Review of Finance, 19*(4), 641-651. https://doi.org/10.1111/irfi.12174

Hong, H., Torous, W., & Valkanov, R. (2007). Do industries lead stock markets? *Journal of Financial Economics, 83*(2), 367-396. https://doi.org/10.1016/j.jfineco.2005.09.010

Hui, K. W., Liang, C., & Yeung, P. E. (2019). The effect of major customer concentration on firm profitability: competitive or collaborative? *Review of Accounting Studies, 24*, 189-229. https://doi.org/10.1007/s11142-018-9469-8

Joshi, M. (2010). Seizing the opportunity for innovation: a case study from India. *International Journal of Technology Marketing, 5*(1), 90-104. https://doi.org/10.1504/IJTMKT.2010.033299

Jovanovic, B., & MacDonald, G. M. (1994). The life cycle of a competitive industry. *Journal of Political Economy, 102*(2), 322-347. https://doi.org/10.3386/w4441

Kamien, M. I., & Schwartz, N. L. (1975). Market structure and innovation: A survey. *Journal of Economic Literature, 13*(1), 1-37.

Kleis, L., Chwelos, P., Ramirez, R. V., & Cockburn, I. (2012). Information technology and intangible output: The impact of IT investment on innovation productivity. *Information Systems Research, 23*(1), 42-59. https://doi.org/10.1287/isre.1100.0338

Kogan, L., Papanikolaou, D., Seru, A., & Stoffman, N. (2017). Technological innovation, resource allocation, and growth. *The Quarterly Journal of Economics, 132*(2), 665-712. https://doi.org/10.3386/w17769

Krolikowski, M., & Yuan, X. (2017). Friend or foe: Customer-supplier relationships and innovation. *Journal of Business Research, 78*, 53-68. https://doi.org/10.1016/j.jbusres.2017.04.023

Li, K. (2018). Innovation externalities and the customer/supplier link. *Journal of Banking & Finance, 86*, 101-112. https://doi.org/10.1016/j.jbankfin.2017.09.003

Lukas, B. A., & Ferrell, O. C. (2000). The effect of market orientation on product innovation. *Journal of the Academy of Marketing Science, 28*(2), 239-247. https://doi.org/10.1177/0092070300282005

Menzly, L., & Ozbas, O. (2010). Market segmentation and cross-predictability of returns. *The Journal of Finance, 65*(4), 1555-1580. https://doi.org/10.1111/j.1540-6261.2010.01578.x

Orlando, M. J. (2004). Measuring spillovers from industrial R&D: on the importance of geographic and technological proximity. *RAND Journal of Economics,* 777-786. https://doi.org/10.2307/1593773

Pandit, S., Wasley, C. E., & Zach, T. (2011). The effect of research and development (R&D) inputs and outputs on the relation between the uncertainty of future operating performance and R&D expenditures. *Journal of Accounting, Auditing & Finance, 26*(1), 121-144. https://doi.org/10.1177/0148558X11400583

Pfeffer, J., & Salancik, G. (2015). External control of organizations-Resource dependence perspective. *Organizational Behavior, 2*, 355-370.

Plumlee, M., et al. (2015). Bank loan spread and private information: Pending approval patents. *Review of Accounting Studies, 20*(4), 593-638. https://doi.org/10.1007/s11142-014-9304-9

Porter, M. E. (1992). Capital choices: Changing the way America invests in industry. *Journal of Applied Corporate Finance, 5*(2), 4-16. https://doi.org/10.1111/j.1745-6622.1992.tb00485.x

Ra, K., & Kim, G. G. (2023). Does litigation risk matter for managers' asymmetric cost behavior? *Finance Research Letters, 53*, 103619. https://doi.org/10.1016/j.frl.2022.103619

Raman, K., & Shahrur, H. (2008). Relationship-specific investments and earnings management: Evidence on corporate suppliers and customers. *The Accounting Review, 83*(4), 1041-1081. https://doi.org/10.2308/accr.2008.83.4.1041

Schilling, M. A., & Phelps, C. C. (2007). Interfirm collaboration networks: The impact of large-scale network structure on firm innovation. *Management Science, 53*(7), 1113-1126. https://doi.org/10.1287/mnsc.1060.0624

Thomke, S. H. (2006). Capturing the real value of innovation tools. *MIT Sloan Management Review, 47*(2), 24.

Trajtenberg, M. (1990). A penny for your quotes: patent citations and the value of innovations. *The Rand Journal of Economics,* 172-187. https://doi.org/10.2307/2555502

Williamson, O. E. (1979). Transaction-cost economics: the governance of contractual relations. *The Journal of Law and Economics, 22*(2), 233-261. https://doi.org/10.1086/466942

Notes

Note 1. They find that customers' earnings announcement (EA) affects their suppliers' earnings guidance decisions and could increase uncertainties regarding their suppliers' prospects. Therefore, suppliers are more likely to issue earnings guidance after their customers' EA.

Note 2. Chu, Tian, & Wang (2019) document a positive effect of supplier-customer geographic proximity on suppliers' innovation. They find that when suppliers are geographically close to their customers, customers' demands are enhanced by proximity, which further facilitates suppliers' innovation.

Note 3. A short distance between a supplier and its customer can also create a strong social connection (Dasgupta, Zhang, & Zhu, 2015).

Note 4. We identify customer-supplier pairs across all industries before restricting the customer firms to those within innovative industries, as some suppliers of innovative customer firms are from non-innovative industries. Although these suppliers do not heavily rely on innovations, it is still possible that their innovations have external impacts on their major customers.

Note 5. We thank Dr. Noah Stoffman for providing the publicly available data on his website: https://kelley.iu.edu/nstoffma. He also details how the dataset is constructed on this website.

Note 6. The quantity of innovative activities per supplier is smaller than that of customers; however, the total number of supplier firms in our sample exceeds that of customer firms.

Note 7. Using citations suffers from a truncation bias because it takes a longer time for an early patent to receive citations than for a later patent; therefore, we utilize this measure in the robust test instead of the main tests (Li, 2018).