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The Effects of B2B Service Innovations on Firm Value and Firm Risk: How Do They Differ from Those of B2C Service Innovations?

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Report Summary

Developed economies today are dominated by services, and in developing economies, services are growing by leaps and bounds. Business-to-business (B2B) firms, which account for the majority of the market transactions, are increasingly using new services or service innovations (B2B-SIs) to grow and garner competitive advantage. Such service innovations are associated with a certain degree of risk. For example, new services are often hard to scale since they may have to be "produced" at the customers' locations and cannot be manufactured and inventoried at a central location ahead of time.

To better assess the return and risk outcomes of B2B-SIs, it is useful to compare them to business-to-consumer service innovations (B2C-SIs). In this study, Thomas Dotzel and Venkatesh Shankar analyze a unique panel data set of 1,668 service innovations (B2B-SIs as well as B2C-SIs) across 14 industries. They empirically examine the effects of B2B-SIs on firm value and firm risk and compare these effects to those of B2C-SIs.

They find that B2B-SIs have a positive effect on firm value and an insignificant effect on idiosyncratic and systematic risk. B2C-SIs increase firm value but are surrounded by greater uncertainty, resulting in higher idiosyncratic and systematic risk.

At the industry level, the authors uncover important asymmetries in the effects of B2B-SIs and B2C-SIs on firm value. Interestingly, for firms that compete in industries with both B2B and B2C customers, B2B-Sis have a slightly more positive effect on firm value than B2C-SIs. In B2B (B2C)-dominant industries, B2B (B2C)-SIs have a greater effect on firm value.

The findings have implications for managers of goods and services companies in B2B and B2C industries. B2B executives should consider introducing more B2B-SIs. They should also consider introducing B2C-SIs. In B2C industries, executives need to evaluate if the greater effect of B2C-SIs on firm value outweighs the increased risk associated with these innovations. Furthermore, executives in industries that deal with both business customers and end consumers should slightly favor introducing B2B-SIs: in these industries, B2B-SIs increase firm value to a larger degree than B2C-SIs, without raising firm risk.

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"*Successful services is almost like being married to the customer. It represents a huge barrier to entry for competitors*." Senior Manager, SKF.

"*Through the expansion beyond pure product supply and the move into services, we become an integral part of the customer's operations, being not anymore interchangeable*." Senior Manager, Adhesives Business, Henkel.

These quotes from Business-to-Business (B2B) managers capture the growing prominence of services for firms, in particular, B2B companies. Services are becoming increasingly important in economic development. In 2014, service industries accounted for approximately 78% of the United States (U.S.) gross domestic product (World Bank 2016).

B2B markets constitute a lion's share of all markets (Rindfleisch and Antia 2012). B2B commerce accounts for the majority of commerce in the U.S. (Oliva 2012). A growing number of B2B firms are becoming service-dominant (e.g., IBM, Xerox) driven by the need to build long lasting relationships with both their customers and customers' customers (Fang, Palmatier, and Steenkamp 2008; Wiersema 2013).

B2B companies increasingly depend on new services or service innovations for growth (Sawhney, Balasubramanian, and Krishnan 2004). Formally, a service innovation is *the exploitation of an idea for a service that is new to the firm and intended to provide its customers new benefits* (adapted from Berry et al. 2006). This conceptualization is also consistent with Bettencourt (2010) who defines a service innovation as a new or improved service concept that satisfies the customer's unmet needs. Firms constantly seek to introduce service innovations to create value and stay competitive (e.g., Bitner, Ostrom, and Morgan 2008). One of the biggest challenges facing business marketers is identifying new opportunities for organic business growth through innovations (Wiersema 2013), in particular, service innovations.

B2B firms strive to realize value from the service innovations they introduce. The value that a firm generates from its B2B service innovations (B2B-SIs) for its shareholders is becoming a

critical issue. The Institute for the Study of Business Markets (ISBM) points out that "as firms continue to seriously "mix" service offerings […] with hard product offerings, the issue of computing value, demonstrating value, and documenting value is becoming ever more important" (ISBM 2008, p. 30). However, because innovations are risky, the value created from B2B-SIs may be associated with some firm risk. Managers need to better understand the return and risk arising from B2B-SIs to determine whether the returns are commensurate with the risks.

To better assess the return and risk outcomes of B2B-SIs, it is useful to compare them against business-to-consumer service innovations (B2C-SIs). How do the value and risk generated by B2B-SIs for firms differ from those derived from B2C-SIs? Given the differences between business and consumer markets along several dimensions, including number of buyers, scalabilty and heterogeneity, it is important to better understand the differences between B2B-SIs and B2C-SIs. On the one hand, the markets for B2B-SIs are less heterogeneous, offering a steady (contractual) cash flow potential than those for B2C-SIs. On the other hand, B2C-SIs can be scaled to a wider market to generate bigger cash flows. These differences will likely have different implications for firm value and firm risk across B2B-SIs and B2C-SIs.

The literature on service innovation is sparse (e.g., Biemans, Griffin, and Moenaert 2015; Dotzel, Shankar, and Berry 2013; Menor, Tatikonda, and Sampson 2002; Meyer and DeTore 2001). Service innovations significantly differ from goods innovations along dimensions such as scalability and co-production (Nijssen et al. 2006). Among B2C service innovations, electronic-(e-) service innovations differ substantially from people-(p-) service innovations (Dotzel, Shankar, and Berry 2013). However, not much is known about any systematic differences between B2B-SIs and B2C-SIs and their effects on firm value and risk.

The purpose of this paper is to fill the void in the B2B services and innovation literatures by addressing the following research questions: (1) What are the effects of B2B service innovations on firm value? (2) What are the effects of B2B service innovations on firm risk? (3) How do these effects compare to those of B2C service innovations?

We empirically address these questions by developing a modeling system that relates B2B and B2C service innovations to firm value and firm risk, while controlling for other firm and market factors. We estimate our model using a unique panel dataset of 1,668 service innovations assembled from multiple data sources across 14 industries for five years. The results show that B2B-SIs have a positive effect on firm value but an insignificant influence on firm risk. In contrast, B2C-SIs are associated with higher firm risk. B2B-SIs (B2C-SIs) have a higher effect on firm value in B2B (B2C)-dominant industries. In industries with a mix of business customers and consumers, B2B-SIs have slightly higher impact on firm value than B2C-SIs. These results have significant implications for strategic decisions on innovations.

Our results make important contributions to both the theory and practice of marketing. From a theoretical viewpoint, our research offers a detailed explanation of how and why B2B-SIs affect firm value and firm risk and why these effects differ from those of B2C-SIs. From a practitioner viewpoint, our research helps managers better understand both the returns and risks arising from B2B service innovations and make more informed decisions about B2B-SI and B2C-SI. This research offers business marketers a better understanding of the role of service innovations in firm value creation. Furthermore, it is particularly helpful for managers of firms that offer both B2B-SIs and B2C-SIs. Based on the findings, companies such as Dell and FedEx, which introduce service innovations in both business and consumer markets, can better manage their portfolio of B2B-SIs and B2C-SIs.

CONCEPTUAL DEVELOPMENT

Research on goods innovations shows that such innovations may have mixed financial consequences. Eddy and Saunders (1980) report no significant effects on financial value for goods innovation. In contrast, Fang, Palmatier, and Grewal (2011), Sood and Tellis (2009), Sorescu, Chandy, and Prabhu (2003), Sorescu and Spanjol (2008), Srinivasan et al. (2009), and Pauwels et al. (2004) find positive effects of goods innovation on firm value. However, such value derived from goods innovation may also be positively associated with systematic risk (David, Hitt, and Gimeno 2001).

Services differ from goods in many ways, but there is limited research on service innovations (e.g., Biemans, Griffin, and Moenaert 2015; Dotzel, Shankar, and Berry 2013; Menor, Tatikonda, and Sampson 2002; Meyer and DeTore 2001; Nijssen et al. 2006). Much less is known about service innovations than about goods innovations (Nijssen et al. 2006). Dotzel, Shankar, and Berry (2013) compare e-service innovations and p-service innovations and find that while e-service innovativeness has a positive and significant direct effect on firm value, p-service innovativeness has an overall significantly positive effect on firm value only in human-dominated industries; and both e- and p-service innovativeness are positively associated with idiosyncratic risk.

Among service innovations, B2C-SIs has been the focus of research attention (e.g., Dotzel, Shankar, and Berry 2013). Given the importance of B2B markets and B2B-SIs, it is surprising that we do not know much about financial consequences of B2B-SIs and how they compare with those of B2C-SIs.

We propose a conceptual model delineating the relationships among B2B-SIs, B2C-SIs, firm value and firm risk. Figure 1 presents the proposed model. The conceptual model is based on the

marginal benefits (returns) and marginal costs (risk) aspects of economic theory but also draws from the resource-based view (RBV) of the firm (Barney 1991; Wernerfelt 1984) and the role of industry or product markets in creating competitive advantage (Rumelt 1991). (Figures appear following References.)

The Effect of B2B Service Innovations on Firm Value

Innovativeness, and in particular goods innovation, may have a direct effect on firm value (Bayus, Erickson, and Jacobson 2003; Fang, Palmatier, and Grewal 2011; Moorman and Slotegraaf 1999).

B2C-SIs have a positive direct effect on firm value (Dotzel, Shankar, and Berry 2013). Service innovations likely confer multiple advantages for a firm. First, service innovations can offer new customer value, which will likely grow demand from new customers (Shankar, Berry, and Dotzel 2009). The growing demand will result in increased revenue streams and cash flows. Second, service innovations will likely enhance existing customer value and customer loyalty. Customer value derived from a service is the outcome of a co-production process between the customer and the firm (e.g., Meuter et al. 2005; Vargo and Lusch 2004). To minimize the cost of co-production over time, customers are likely to avoid switching from the service provider, enhancing their loyalty to the service provider. Enhanced loyalty will likely lead to higher future cash flows, resulting in a positive effect of service innovations on firm value.

Innovations are critical to the growth of B2B firms (Chakravarty, Kumar, and Grewal 2014; Noordhoff et al. 2011), so B2B-SIs may have a key effect on firm value. B2B firms often work closely with their customers in creating new services that create marginal benefits for the firms. The B2B or industrial buying process is often highly complex, involving multiple stakeholders such as financial analysts, engineers, and purchasing agents (Grewal and Lilien 2012). B2B firms

invest in direct sales force and channel intermediaries, allowing them to build unique resources for privileged access and strong ties with customers (Ulaga and Reinartz 2011). In the services context, close ties with the customers enable a firm fine-tune its B2B-SIs to add customized value to its business customers. SIs that offer greater customized value have a greater potential for generating price premiums. Strong relationships with business customers allow firms to gain greater margins by applying value-based pricing approaches (Anderson, Kumar, and Narus 2007). Such premium margin services create substantial marginal benefits for the firm by significantly adding to its future cash flows.

B2B-SIs also allow customers to co-produce, enhancing value and boosting cash flows to the innovating firms. When customers co-produce a service innovation, customer value is enhanced (Vargo et al. 2010). For example, if a small and medium enterprise (SME) wants to maximize the value it gains from a new network installation service offered by Dell, it can actively participate in the value creation process. This active co-production of value includes the customer providing detailed information about the network needs, giving access to facilities and ensuring that staff members are available and well-trained to operate the network. If a firm does not do its part in the co-production process, customer value may significantly decrease or even diminish (Gustafsson, Kristensson, and Witell 2012). Enhanced customer value can lead to greater cash flows, resulting in greater firm value. Based on these theoretical arguments, *we predict that B2B-SIs will have a positive effect on firm value.*

We now compare the positive effect of B2B-SIs on firm value with that of B2C-SIs. B2B-SIs differ from B2C-SIs based on market characteristics, service characteristics, and the bases of resource-based advantage. We summarize these theoretical differences between B2B-SIs and B2C-SIs in Table 1. (Tables follow References.)

There are fundamental differences in the characteristics of B2B and B2C markets. B2B markets have fewer customers who are often geographically concentrated (e.g., Morris, Pitt, and Honeycutt, Jr. 2001). In B2B markets, the buying sequence is complex and the seller's contact with the buyer is typically direct. Unlike B2C markets, B2B markets are driven by formal vendor evaluation and buyer-seller contracts (Bowman 2012). B2B buyers make fewer purchases, each of which is expected to create more value than an average B2C purchase, making value pricing possible for B2B-SIs. B2B services are often tailored to the business buyer's needs, while B2C services are standardized as much as possible. In B2B markets, the seller comes to the buyer to promote and has short and direct distribution channels; in contrast, in B2C markets exhibit the opposite characteristics (e.g., Morris, Pitt, and Honeycutt, Jr. 2001). B2B markets enjoy deeper relationships with customers with vendors exhibiting a greater loyalty toward their buyers (e.g., Perreault and McCarthy 2004).

The service characteristics of B2B-SIs are dissimilar to those of B2C-SIs. Scale-based cost reductions are not as important in B2B markets as in B2C markets (e.g., Lilien and Rangaswamy 2006). B2B services are more intangible because of embeddedness of ties between the seller and the buyer (Noordhoff et al. 2011). B2B-SIs also serve less diverse needs and face less heterogeneity than B2B-SIs.

Across B2B-SIs and B2C-SIs, some bases of resource-based advantages may be similar, but the degree of advantage and other bases may be different. Both B2B-SIs and B2C-SIs have high value-creating ability, high rarity, and low substitutability. However, because of larger markets and greater scalability, some B2C-SIs can create greater firm value than B2B-SIs. In contrast, B2B-SIs are harder to imitate because B2B-SIs are often customized due to direct relationships.

These differences between B2B-SIs and B2C-SIs suggest different sources of marginal benefits for B2B-SIs compared to B2C-SIs. On the one hand, B2B-SIs can produce positive returns from a smaller number of high value customers with formal contracts (Grewal and Lilien 2012). On the other hand, B2C-SIs can create high or very high returns from scale advantages (low costs at high volumes) of more tangible service offerings to consumers who are pulled to the firm. The extent of marginal benefits stemming from these sources could be higher or lower for B2B-SIs compared to B2C-SIs, leading to different levels of cash flows for these innovations. Thus, although the bases of the resource-based view differ for B2B-SIs and B2C-SIs, the magnitude of difference in returns between B2B-SIs and B2C-SIs could be positive or negative or even negligible. Therefore, we treat this difference as an empirical issue.

The Effect of B2B Service Innovations on Firm Risk

B2B-SIs will likely have marginal costs to the firm that impact firm risk, marked by stock price volatility. Innovation is inherently associated with firm risk (Fang, Palmatier, and Grewal 2011; Sorescu and Spanjol 2008). Variability in stock prices reflects two types of underlying firm risk, systematic risk and idiosyncratic risk. Systematic risk or market risk is the extent to which the firm's stock return corresponds with the average return of all the stocks in the market (Sharpe 1964). Idiosyncratic risk is the residual risk associated with the firm's abnormal returns after controlling for systematic risk and is important to multiple stakeholders, including debt holders, employees, suppliers, and customers (Gaspar and Massa 2006). Service innovativeness is associated with both systematic and idiosyncratic firm risk (Dotzel, Shankar, and Berry 2013).

Systematic Risk

Introducing new products or investing in R&D will lower systematic risk (Chaney, Devinney, and Winer 1991; Srinivasan, Haunschild, and Grewal 2007) because it creates

strategic differentiation that can protect innovative firms from market downturns (Srinivasan, Haunschild, and Grewal 2007). However, service innovations may reduce systematic risk only in people-intensive industries but will either increase or have no significant effect on systematic risk in other industries (Dotzel, Shankar, and Berry 2013). Given that services are difficult to scale, hard to protect through patents, and co-produced to create value, it may be difficult for a firm to change systematic risk through service innovations in industries that are not dominated by people.

B2B-SIs may or may not have any relationship with systematic risk. Because systematic risk is a market-level risk, for any set of a firm's B2B-SIs to have an impact on its systematic risk, they would have to influence investors' perceptions that the firm's stock will respond differently to the market return. Such B2B-SIs typically have to be disruptive or market creating innovations (Berry et al. 2006). They could also be introduced during economic cycles that could have a significant effect on the market. In a typical year, a firm is less likely to have such a set of innovations. To the extent that a firm does not have such innovations in a year, B2B-SIs are unlikely to affect systematic risk. Furthermore, B2B firms generally have embedded ties with their business customers that help counter any market-level risk associated with B2B-SIs, consistent with Noordhoff et al. (2011). However, there could be periods in which such B2B-SIs may have a significant influence on systematic risk, especially if they are market-altering innovations. Therefore, it is an empirical issue for our analysis to investigate.

We expect the effect of B2B-SIs on systematic risk to significantly differ from that of B2C-SIs. As illustrated in Table 1, the differences between business markets and consumer markets will affect service characteristics and the bases of the resource-based view to different degrees for B2B-SIs and B2C-SIs. For example, formal, high value contracts with fewer well known

customers for B2B-SIs will likely mitigate some of the marginal costs or uncertainties compared to B2C-SIs. They will reduce the scalability disadvantage of B2B-SIs compared to B2C-SIs while increasing inimitability, rarity, and the value creating ability of the firm.

Compared to B2B-SIs, B2C-SIs appeal to a wider and more heterogeneous customer base and could potentially affect the market as a whole. These B2C characteristics imply that B2C-SIs could lead to a high uncertainty in overall market demand and hence unsteady cash flows that cannot be easily anticipated by the investors. Because B2C services have to scale to a much larger customer base, the market uncertainty about whether the additional sales revenue volume will offset the vagaries of satisfying more diverse customers may be greater for B2C-SIs than B2B-SIs. As a result, investors will perceive the returns from B2C-SIs as less stable, making firms that introduce B2C-SIs more sensitive to market downturns. Thus, compared to B2B-SIs, B2C-SIs will more likely have a positive influence on systematic risk. Thus, we *predict that the effect of B2B-SIs on systematic risk is significantly less positive than the effect of B2C-SIs.*

Idiosyncratic Risk

We expect B2B-SIs to be negatively related to idiosyncratic risk. B2B markets have fewer customers with close relationships and any new service is often thoroughly vetted with customers and potential clients before it is launched. In fact, customers participate in activities such as opportunity recognition, funding, and feedback provision, absorbing the vulnerability of the innovation (Coviello and Joseph 2012). Many B2B-SIs are solutions to expressed problems experienced by customers, increasing the inimitability and rarity of the innovation from a resource-based view perspective (Barney 1991). Moreover, many B2B services are contractual in nature, providing not only stability but also visibility to a firm's cash flows (Wuyts and Geyskens 2005). Furthermore, many B2B firms build execution risk assessment and mitigation

capability critical to successfully introduce new services (Ulaga and Reinartz 2011). Therefore, they may not carry any firm-specific risk. Rather, because the SIs may replace or augment previously unsatisfactory solutions of the firms with contractual revenue streams, they may lead to a greater certainty in cash flows. Thus, this reduced uncertainty in customer demand and cash flows may result in B2B-SIs even helping lower idiosyncratic risk.

Because of the differences between business and consumer markets illustrated in Table 1, we anticipate B2C-SIs to be positively related to idiosyncratic risk. B2C-SIs usually target larger customer segments than new business services (Grewal and Lilien 2012). Although many of these new services may be pilot tested with a small sample of consumers, the acceptance of a much broader and diverse set of consumers is often uncertain. B2C-SIs also need to be scaled to a larger audience than B2B-SIs, involving greater investments, often with longer return horizons. In addition, unlike B2B-SIs, many B2C-SIs involve fewer and shallower direct contacts with customers, leading to inefficiencies in the co-production process of the new service and heightening the uncertainty in the firm's cash flows. Finally, contracts in consumer markets are predominantly informal and switching between providers is easier compared to business markets. This characteristic will make it difficult for investors to evaluate the size and stability of the cash flows and will expose the firm to increased residual risk. In summary, *we predict that B2B-SIs will have a negative effect on idiosyncratic risk, while B2C-SIs will have a positive effect.*

Control Variables

Consistent with prior research (e.g., Dotzel, Shankar, and Berry 2013; Sorescu and Spanjol 2008), we control for firm and market factors that might directly affect firm value and firm risk.

Firm Factors

Firm size. Firm size may be related to firm value (Dotzel, Shankar, and Berry 2013). On the one hand, larger firms may leverage their advantages in the market place and be more valuable than smaller firms. On the other hand, larger firms may suffer more from inertia and are less likely to be nimble and be associated with greater firm value than smaller firms. This logic may apply to firm risk as well.

Firm age. A firm's age is an organizational demographic that can affect its firm value (Carroll and Hannan 2000). Younger firms may be more agile and be able to enjoy a higher firm value than older firms (Huergo and Jaumandreu 2004). By the same logic, younger firms are more likely to be entrepreneurial and be associated with greater firm risk.

Acquisition. Acquisitions can increase or decrease the innovative output of a firm (Sorescu and Spanjol 2008). While firms often gain new product lines through acquisitions (which would result in an increase of innovative output), acquisitions can also reduce the amount of resources available for innovation (which would result in a decrease of innovative output).

Alliance. Prior research shows that alliances have a direct positive effect on firm value (e.g., Kalaignanam, Shankar, and Varadarajan 2007) and through their positive effect on innovation output (e.g., Srinivasan, Haunschild, and Grewal 2007).

Operating margin. Previous research shows that operating margin has a significant effect on firm value and firm risk (Dotzel, Shankar, and Berry 2013; Rao, Agarwal, and Dahlhoff 2004) because it represents a firm's ability to charge a premium for delivering greater customer value and to manage the variance in the premium.

Market Factors

Competitor innovation activity. Following Dotzel, Shankar, and Berry (2013), we include competitors' innovation activity (the ratio of 12-month cumulative competitors' sales increase to market size) as it may influence firm value and firm risk.

Market size. Katila and Shane (2005) suggest that market size to a significant determinant of firm value. We define market size as the natural logarithm of industry sales.

Market growth. Previous research shows that markets with high growth also tend to have high investments to keep pace with growth (Szymanski, Bharadwaj, and Varadarajan 1993). These investments will likely be positively related to firm value. However, they could be positively or negatively related to firm risk depending upon the type of new services introduced. We define market growth as the 12-month percentage growth in industry sales.

In addition, we control for industry fixed effects (Rumelt 1991) through industry dummies. We also control for temporal effects through year dummies.

DATA AND VARIABLE OPERATIONALIZATION

To empirically test our predictions, we require panel data on firm value, firm risk, firm and market factors driving service innovations, and the number and type of service innovations introduced by a firm. Because these data are not readily available from a single data source, we manually assembled a unique panel data set using different sources. The advantage of this approach is that we avoid common method bias by using separate sources for key independent and dependent variables (Mithas, Krishnan, and Fornell 2005).

To obtain a mix of B2B and B2C innovations across a broad cross-section of companies, we constructed our sample from three broad lists, the American Customer Satisfaction Index (ACSI) database, the Institute for the Study of Business Markets (ISBM) member company list, and the

Forbes' list of most innovative companies.[1] We collected data from a cross-section of 14 industries, namely, computers, automobiles, chemicals, metals, electrical goods, wholesale, business services, consumer goods, utilities, retailing, insurance/telecommunications, hospitality/courier services, airlines, and Internet portals/online travel services. We chose the years 2001 to 2005 as it represents the period after the Internet bubble and well before the economic recession of 2008-2009 to avoid any confound with macroeconomic factors. We chose all the companies from the ISBM and Forbes databases and a random sample of ACSI firms, totaling 119, for which the necessary financial data were available from COMPUSTAT and CRSP. The ACSI firms reflect the U.S. economy, so a random sample represents the cross-section of U.S. firms. Sixty six firms introduced both B2B-SIs and B2C-SIs, while 23 (33) firms launched only B2B-SIs (B2C-SIs). We obtained firm age data from Hoover's company profiles.

We collected information on 1,668 service innovations introduced by these 119 firm by applying an archival method. Using all news sources available in LexisNexis (including new wires), we collected the number of service innovations introduced between 2000 and 2005 for each firm in our sample. Based on a content analysis, we manually categorized the innovations into B2B-SIs and B2C-SIs and assessed the reliability of this analysis by having two judges independently analyze the content of the news releases. Our sample is based on more than 120,000 different news releases. Our sample compares favorably to that used in other innovation studies (e.g., Bayus, Erickson, and Jacobson 2003; Dotzel, Shankar, and Berry 2013).

Table 2 provides a detailed list of variables, operationalization, and data sources. Some examples for each type of service innovation appear in Table 3.

[1] We considered banks but could not include them in our sample because banks have different regulations with regard to financial reporting. We also had to exclude conglomerates because the data for all service innovations across all subsidiaries of the conglomerates were unavailable.

A distribution of B2B-SIs, B2C-SIs, and total SIs appear in Figures 2A to 2C, respectively. Because innovations are expensive, not every firm can introduce a service innovation every year. The distributions reflect a skew toward zero annual innovations. B2B-SIs have a higher proportion of zeros than B2C-SIs as B2B-SIs may be focused on fewer customers and may take longer to implement than B2C-SIs due to the more complex buying sequence.

We use Tobin's Q as a measure of firm value, following prior research (e.g., Bharadwaj, Bharadwaj, and Konsynski 1999; Krasnikov and Jayachandran 2008; Lee and Grewal 2004; Rao, Agarwal, and Dahlhoff 2004; Sorescu and Spanjol 2008). Using the COMPUSTAT/Center for Research on Security Prices (CRSP) database, we compute Tobin's Q as *(market value of the firm's common stock shares + book value of the firm's preferred stocks + book value of the firm's long-term debt + book value of the firm's inventories + book value of the firm's current liabilities – book value of the firm's current assets)/(book value of the firm's total assets),* consistent with prior research (e.g., Chung and Pruitt 1994). Tobin's Q has various advantages over alternative outcome measures. First, as Lee and Grewal (2004) point out, Tobin's Q is a forward looking measure as it is derived from stock market prices. Second, it captures the long-term performance of a firm because it compares its replacement value to the market value. Third, it is not sensitive to different accounting standards, which makes it very suitable for application across multiple industries (Chakravarthy 1986).

Following Lee and Grewal (2004) and Luo and Bhattacharya (2006), we adopt a more conservative approach to calculate Tobin's Q. Rather than use year-end stock price and common shares outstanding, we use the average stock price and common shares outstanding at the end of the four quarters to calculate Tobin's Q. This approach is more conservative as it overcomes the volatility problem that may be present when the year-end measure of stock price and common

shares outstanding approach is used. Figure 3 shows the smoothed distribution of Tobin's Q in our sample. The distribution is unimodal and exhibits some symmetry around the mode, allowing us to use a normal approximation for modeling purposes.

The smoothed distributions of systematic risk and idiosyncratic risk appear in Figures 4 and 5, respectively. Both are unimodal, but idiosyncratic risk exhibits a sharper peak and is less symmetric than systematic risk.

The summary statistics of the key variables appear in Table 4. The average number of B2B-SIs (1.13) is smaller than the average number of B2C-SIs (1.69). The average Tobin's Q in the sample is 1.51. Finally, the average systematic risk and idiosyncratic risk are 1.05 and .02, respectively, consistent with those reflected by the smoothed distributions in Figures 4 and 5.

Table 5 shows the correlation matrix for the key variables. No correlation is high and the variance inflation factors (VIFs) are below three, so multicollinearity is not an issue in the data.

MODEL DEVELOPMENT AND ESTIMATION

Model Development

We develop a system of three equations with firm value, systematic risk and idiosyncratic risk as the dependent variables. In each equation, subscript *i* represents the firm and subscript *t* represents the calendar year. These equations follow:

$$
\begin{aligned}
TOBINQ_{it} = {} & \alpha_0 + \alpha_1 B2BSI_{it} + \alpha_2 B2CSI_{it} \\
& + \alpha_3 LFSIZE_{i(t-1)} + \alpha_4 LFAGE_{i(t-1)} + \alpha_5 ACQUIS_{i(t-1)} + \alpha_6 ALLIANCE_{i(t-1)} \\
& + \alpha_7 OPMGIN_{i(t-1)} + \alpha_8 COMPINA_{i(t-1)} + \alpha_9 LMSIZE_{i(t-1)} + \alpha_{10} MGROWTH_{i(t-1)} \\
& + \sum_{k=1}^{D} \phi_k IND_k + \sum_{m=1}^{4} \varphi_m YEAR_m + \varepsilon_{it}
\end{aligned} \tag{1}
$$

where TOBINQ is the firm value, B2BSI is the number of B2B service innovations, B2CSI is the number of B2C service innovations, LFSIZE is the natural logarithm of the size of a firm, LFAGE is the natural logarithm of the age of the firm, ACQUIS is the number of acquisitions,

ALLIANCE is the number of alliances, OPMGIN is the operating margin, COMPINA is the competitor innovation activity, LMSIZE is the natural log of the market size, MGROWTH is the market growth rate, and IND are dummy variables representing industries other than the base industry (consumer products firms). YEARs are dummy variables that denote calendar years in the sample, with 2001 as the base year. ε is an error term. The industry and year dummy variables allow us to control for heterogeneity, using the fixed effects approach, consistent with prior research (e.g., Dotzel, Shankar, and Berry 2013; Shane, Shankar, and Aravindakshan 2006). **α**, φ, and ϕ represent parameters.

$$
\begin{aligned}
SRISK_{it} = {} & \beta_0 + \beta_1 B2BSI_{it} + \beta_2 B2CSI_{it} \\
& + \beta_3 LFSIZE_{i(t-1)} + \beta_4 LFAGE_{i(t-1)} + \beta_5 ACQUIS_{i(t-1)} + \beta_6 ALLIANCE_{i(t-1)} \\
& + \beta_7 OPMGIN_{i(t-1)} + \beta_8 COMPINA_{i(t-1)} + \beta_9 LMSIZE_{i(t-1)} + \beta_{10} MGROWTH_{i(t-1)} \\
& + \sum_{k=1}^{D} \gamma_k IND_k + \sum_{m=1}^{4} \pi_m YEAR_m + \eta_{it}
\end{aligned} \tag{2}
$$

where SRISK is the systematic risk, η is an error term, **β**, γ, and π represent parameters, and the other terms are as defined earlier.

$$
\begin{aligned}
IRISK_{it} = {} & \delta_0 + \delta_1 B2BSI_{it} + \delta_2 B2CSI_{it} \\
& + \delta_3 LFSIZE_{i(t-1)} + \delta_4 LFAGE_{i(t-1)} + \delta_5 ACQUIS_{i(t-1)} + \delta_6 ALLIANCE_{i(t-1)} \\
& + \delta_7 OPMGIN_{i(t-1)} + \delta_8 COMPINA_{i(t-1)} + \delta_9 LMSIZE_{i(t-1)} + \delta_{10} MGROWTH_{i(t-1)} \\
& + \sum_{k=1}^{D} \lambda_k IND_k + \sum_{m=1}^{4} \theta_m YEAR_m + \nu_{it}
\end{aligned} \tag{3}
$$

where IRISK is the idiosyncratic risk, ν is an error term, **δ**, λ, and θ represent parameters, and the other terms are as defined earlier.

Following Tuli and Bharadwaj (2009), we compute IRISK as follows:

$$
IRISK_{it} = \left[\frac{1}{252} \sum_{\tau=1}^{252} (\varepsilon_{i\tau} - \bar{\varepsilon}_{i\tau})^2 \right]^{1/2}, \tag{4}
$$

where τ is trading day in year t and ε_{it} is the residual from the following four-factor model (Carhart 1997).

$$(5)\quad R_{i\tau} - R_{f\tau} = \alpha_{FFM} + \beta_{FFMmi}(R_{m\tau} - R_{f\tau}) + \beta_{Si}SMB_{\tau} + \beta_{Hi}HML_{\tau} + \beta_{Ui}UMD_{\tau} + \varepsilon_{i\tau} \ ,$$

where $R_{i\tau}$ is the return of firm *i*'s stock, $R_{f\tau}$ is the return of a risk-free treasury bond *f*, $R_{m\tau}$ is the return of market index *m*, SMB_{τ} is the difference in returns between small and big stocks, HML_{τ} is the difference in returns between high and low book-to-market stocks, and UMD_{τ} is the momentum factor, all on trading day τ. The term β_{FFM} is the systematic risk parameter (Carhart 1997), and α_{FFM}, β_S, β_H, and β_U are the other parameters. The error term is as defined previously. Thus, SRISK is β_{FFM}.

Model Estimation and Endogeneity Control

The errors across the three equations are likely to be correlated. Therefore, we estimate the three equations by the seemingly unrelated regression (SUR) estimation approach (Zellner 1962). We control for unobserved heterogeneity through the industry and the year fixed effects. Because we estimate both systematic risk and idiosyncratic risk from the same four-factor model in Equation 5, they may be heteroscedastic. Therefore, following Dotzel, Shankar, and Berry (2013), we estimate our model by weighted least squares SUR. We weight the risk observations by the inverse of the square root of the sum of one and the estimated systematic risk variance from Equation 5.

To control for the endogeneity of B2B-SIs and B2C-SIs, we use competitor B2B-SIs and B2C-SIs as the primary instruments. Competitor B2B-SIs and B2C-SIs may influence a focal firm's decisions on the number of service innovations but may not directly affect the value of the focal firm, making them good exclusion variables. The remaining instruments include all the exogenous variables in the system. We estimate the models using the control function (CF)

approach, consistent with Petrin and Train (2010). Because B2B-SIs and B2C-SIs are count variables, we use a Zero Inflated Negative Binomial (ZINB) regression model for the B2B-SIs and B2C-SIs equations, consistent with Long and Freese (2003). To control for the endogeneity of a few other independent variables in Equations 1, 2, and 3, following prior research (e.g., Dotzel, Shankar, and Berry 2013; Luo and Bhattacharya 2006; Morgan and Rego 2006; Rao, Agarwal, and Dahlhoff 2004; Sorescu and Spanjol 2008), we lag these independent variables by one time period. Using lagged variables not only helps eliminate potential reverse causality but also overcomes potential correlations of the independent variables with the error term.

RESULTS

Main Model Results

Table 6 presents the estimation results of Equations 1, 2, and 3. Our expectations about the relationship between service innovations and firm value are partially confirmed. B2B-SIs have a positive effect on firm value ($p < .01$). B2C-SIs also have a significant influence on firm value ($p < .01$). Consistent with our arguments, B2B-SIs create new revenue streams with clients with whom the firm may have already established relationships, leading to incremental cash flows. These enhanced cash flows are associated with greater firm value.

There are differences in the effects of B2B-SIs and B2C-SIs on firm risk. B2B-SIs do not significantly raise or lower either systematic risk or idiosyncratic risk ($p > .10$). These results suggest that volatility in cash flows is not affected by B2B-SIs. These findings are consistent with our expectations and underscore the benefits of pursuing B2B-SIs.

Interestingly, B2C-SIs are positively associated with both systematic risk ($p < .10$) and idiosyncratic risk ($p < .01$). Based on our theoretical arguments, there is greater uncertainty surrounding acceptance by a wider market and increased vagaries in cost scalability for B2C-SIs.

Thus, they carry greater cash flow variability. The enhanced cash flow variability is associated with greater firm risk. Therefore, there is a strong asymmetry between B2B-SIs and B2C-SIs.

The effects of most of the control variables on firm value are in the expected directions. Among firm factors, the coefficients of firm size ($p < .05$) and firm age ($p < .01$) are negative, implying that smaller and younger firms tend to have a higher firm value. Furthermore, firms growing through acquisitions and alliances tend to be more valuable ($p < .05$). Firms with greater operating margins have higher value ($p < .01$). Turning to market factors, competitor innovation activity and market growth have negative ($p < .05$) and positive ($p < .01$) effects, respectively. Competitor innovations dampen firm value, while growing markets enhance firm value.

The effects of the control variables on firm risk are mixed. While operating margin, competitor innovation activity and market size help lower systematic risk, firm size, firm age and market growth are negatively associated with idiosyncratic risk ($p < .05$ or better).

Table 7 provides a summary of our key findings. The number of B2B-SIs introduced by a firm has a positive effect on firm value. They also do not exacerbate either systematic risk or idiosyncratic risk. In contrast, although the number of B2C-SIs is positively associated with firm value, it is also positively associated with both the risks. These results underscore the attractiveness of B2B-SIs in a firm's innovation portfolio.

Robustness Checks

We ensured the robustness of our results by performing several additional analyses. First, we included firm-level dummy variables instead of industry-level dummy variables to check if the industry dummies parsimoniously capture the firm-specific effects. Although the number of firms is much higher than that of industries and the coefficients differ, the effects of the main variables of interest were consistent with those from the proposed model. Second, we estimated

our model using a random effects panel model. Again, because the random effects model is much more parsimonious than the fixed effects model, we expect the results to change. However, the effects of the main variables were substantively consistent, indicating that our model results are fairly robust to different specifications of unobserved heterogeneity.

Third, our sample includes three groups of firms; firms which introduced only B2B-SIs, firms which introduced only B2C-SIs, and firm which introduced both B2B- and B2C-SIs. To ensure that our results are not skewed by the mix of these three types of firms, we estimated our model on a sub-sample of 330 observations from 66 firms which introduced both B2B- and B2C-SIs. The results appear in Table 8. We had to drop market growth for this sample because it was highly correlated with competitor innovation activity. The signs and directions of the effects of the focal variables of this sub-sample analysis are consistent with those in the overall sample. Thus, our results are robust to the sample mix.

Fourth, to test if the coefficients of B2B-SIs and B2C-SIs in Equations (1), (2), and (3) changed with industries, we first estimated a model with interactions of a dummy variable representing whether the industry was primarily B2B or B2C with each of these coefficients. The results remained substantively the same.

Fifth, to check if B2B-SIs and B2C-SIs have an interaction effect on firm value and firm risk, we attempted to estimate a model by including their interaction in all the three equations. However, the correlations between this interaction variable and each of B2B-SI and B2C-SI were high, precluding a thorough investigation of the interaction effect.

IMPLICATIONS

Implications for Theory

Our results indicate important implications for theory. The findings that B2B-SIs create firm value and enhance neither systematic risk nor idiosyncratic risk suggests the following possible underlying theoretical mechanism. B2B service innovations are targeted at fewer, geographically concentrated customers. Successful firms introducing B2B-SIs have a high degree of customer contact to understand customers' complex buying sequence. These firms also compete strongly to emerge as favorites in the buyers' formal vendor evaluations. When introducing B2B-SIs, they also likely customize the innovation, practice value pricing and promote it to their customers through direct channels (Ulaga and Reinartz 2011). As a result, they are able to forge formal contracts with their buyers for the new service offerings (Wuyts and Geyskens 2005). By remaining loyal vendors, they deepen their relationships and embed ties with their business customers (Noordhoff et al. 2011). All these activities improve cash flows arising from the introduction of B2B-SIs. The enhanced cash flows result in increased firm value.

B2B-SIs are typically created based on a clear understanding of customer needs and are sold to customers through formal contracts and deep relationships. As a result, these innovations mitigate volatility in cash flows at both the market level and the firm level. The lukewarm volatility does not significantly alter either systematic risk or idiosyncratic risk.

The results on the differences between the effects of B2B-SIs and B2C-SIs on firm risk suggest possible differences in theoretical mechanisms. Unlike B2B-SIs, B2C-SIs are more scalable, tangible, and heterogeneous in value to their consumers. Although these characteristics enable B2C-SIs create value for the firm, they also make B2C-SIs more susceptible to market downturns and create uncertainty in the levels of price premiums different consumers may pay

for the innovations. Such uncertainty in prices leads to fluctuations in future cash flows of firms introducing B2C-SIs. In contrast, the revenues and margins from B2B-SIs are more predictable because of the smaller and stable customer base entering into formal contracts for the B2B-SIs.

The results on the differences in the effects of B2B-SIs on firm value and firm risk across industries also raise new questions for theoretical exploration. Why is the net firm value from B2B-SIs highest or lowest in some industries? Why are the net effects of B2B-SIs on firm risk also different across the industries? Why are the effects systematically different from those of B2C-SIs in certain industries? A deeper exploration of industry differences with in-depth industry data may be able to shed light on these questions.

Implications for Practice

Our findings have critical implications for managerial practice. Table 9 summarizes the managerial implications of the key findings. The finding that B2B-SIs have a positive effect on firm value combined with the finding that B2B-SIs do not have a significant effect on firm risk suggest that B2B firms should consider introducing B2B-SIs whenever possible. B2B-SIs may take a long time to develop and co-produce with the customers. However, they can serve as effective entry barriers against competitors as well as increase the switching costs for customers, which will mitigate the risks associated with growth strategies.

The result that B2C-SIs have a positive effect on systematic risk suggests that B2C-SIs negatively impact market volatility. That is, by increasing systematic risk, B2C-SIs will increase the sensitivity of a firm's stock as a result of market changes. Firms will have to carefully evaluate the benefits and costs of introducing B2C-SIs. Unlike B2B-SIs, firms should be particularly vigilant in comparing the returns of B2C-SIs against the risks and should only launch

B2C-SIs after they have determined that the risk-adjusted returns are acceptable or exceed their hurdle rate.

The finding that B2C-SIs also have a positive effect on idiosyncratic risk further suggests a cautionary approach toward B2C-SIs. Their effect on firm risk is significantly more than B2B-SIs indicating that the differences between business and consumer markets will lead to higher uncertainty in cash-flow as a result of introducing B2C-SIs. Therefore, if managers of companies that operate in both business and consumer markets expect similar returns from B2B-SIs and B2C-SIs, they may be better off focusing on B2B-SIs because these returns can be achieved with lower risk. However, in some cases, greater returns from B2C-SIs may outweigh the disadvantage of higher firm risk. Managers should perform a thorough risk-return analysis for B2C-SIs based on the effects of prior innovations and then determine which type of innovation is the better investment.

The returns-risk balance differs across industries. A summary of the average number of B2B-SIs and B2C-SIs and their net incremental effects on firm value and risk for the 14 industries in our sample appears in Table 10. The average number of B2B-SIs per year is highest in the business services industry (4.36), while the average annual number of B2C-SIs is highest for Internet portal/online travel services (9.70). The net effect on firm value of B2B-SIs also is highest for business services at .210 change in Tobin's Q. The net effect of B2C-SIs is highest for Internet portals/online travel services at .388 change in Tobin's Q. In general, for industrial goods and services, B2B-SIs generate higher firm value, whereas in consumer industries, B2C-SIs create higher firm value. The one exception is hospitality/courier services for which the net effect of B2B-SIs on Tobin's Q (.1478) is greater than that of B2C-SIs (.1011), albeit not by a

large amount. For hospitality and courier services, which have a balanced set of business customers and consumers, B2B-SIs have a slightly higher impact on firm value than B2C-SIs.

The effects of B2B-SIs and B2C-SIs on firm risk vary across the industries. B2B-SIs in the business services industry lower systematic risk by the largest amount, while those in the consumer products industry reduce it by the least extent. In contrast, B2C-SIs increase both systematic and idiosyncratic risk most in the Internet portals/Online travel services industry and least in the chemical industry. B2B-SIs have negligible impact on idiosyncratic risk in all the industries.

Taken together, the results from Table 10 offer concrete managerial recommendations. Executives in the business services industry should anticipate the best returns to B2B-SIs at the lowest risk across the gamut of 14 industries. Similarly, managers of Internet portals/Online travel services should expect to earn the highest returns for B2C-SIs but must also be prepared for the highest risk (both systematic and idiosyncratic risk). Therefore, firms should have a stronger focus on B2B-SIs in such industries. Hospitality/Courier services executives, who typically have a portfolio of B2B-SIs and B2C-SIs, may want to lean more toward B2B-SIs because compared to B2C-SIs, B2B-SIs in this industry raise firm value more without significantly enhancing systematic or idiosyncratic risks.

LIMITATIONS, FUTURE RESEARCH, AND CONCLUSION

The limitations of this study provide opportunities for future research. First, our study is limited to the variables for which we were able to obtain data. While we control for unobserved heterogeneity using fixed effects, new potentially influential variables could be added to the model if data on them are available. Second, we do not have information about failed B2B-SIs. Incorporating this information may give us deeper insights. Third, future research could analyze

B2B-SIs deeper by further classifying them as e-innovations vs. p-innovations, “new to the firm” vs. “new to the market service innovations,” and radical vs. incremental service innovations if such data become available. Fourth, with suitable data, it would be worthwhile to compare the effects of revenue generating B2B-SIs with those of non-revenue generating B2B-SIs.

In conclusion, we have taken an important first step in studying the effects of B2B-SIs on firm value and firm risk. The results show that B2B-SIs have a positive and significant effect on firm value but an insignificant influence on firm risk. In contrast, B2C-SIs are associated with higher firm risk. B2B-SIs (B2C-SIs) have a higher effect on firm value in B2B (B2C)-dominant industries. In industries with a mix of business customers and consumers, B2B-SIs have slightly higher impact on firm value than B2C-SIs. Our findings offer executives important insights about the relative value of B2B service innovations that assist in their innovation investments.

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Table 1

DIFFERENCES BETWEEN B2B-SIs AND B2C-SIs

	B2B-SIs	*B2C-SIs*
	Characteristics of	
	Business Markets	*Consumer Markets*
No. of customers	Low	High
Geographic location of customers	Concentrated	Dispersed
Customer contact	Direct	Indirect
Buying sequence	Complex	Simple
Vendor evaluation	Formal	Informal
Value pricing	Possible	Difficult
Service design and delivery	Customized	Standardized
Promotion	Seller comes to buyer	Buyer comes to seller
Distribution channels	Short and direct	Long and indirect
Contracts	Formal	Informal
Depth of relationship	Deep	Shallow
Vendor loyalty	High	Low
	Services Characteristics	
Scalability	Low	High
Intangibility	High	Low
Heterogeneity	Low	High
	Bases of Resource-Based Advantage	
Value-creating ability	High	High
Rarity	High	High
Inimitability	High	Low
Substitutability	Low	Low

Table 2
VARIABLES, MEASURES, AND DATA SOURCES

Variable	*Notation*	*Operational Measure*	*Data Source*
		Focal Variables	
B2B- Service Innovations	B2B-SI	Annual firm-level count of B2B-service innovations	LexisNexis
B2C- Service Innovations	B2C-SI	Annual firm-level count of B2C-service innovations	LexisNexis
Firm value	TOBINQ	Tobin's q	CRSP, COMPUSTAT
Systematic risk	SRISK	Value of beta obtained from the Carhart four-factor model	CRSP
Idiosyncratic risk	IRISK	Standard deviation of residuals of the Carhart four-factor model	CRSP
		Control Variables	
Firm size	LFSIZE	Natural logarithm of firm's sales revenues	COMPUSTAT
Firm age	LFAGE	Natural logarithm of firm age in years	Hoover's Company Profiles
Acquisition	ACQUIS	Annual firm-level count of acquisitions	SDC Platinum
Alliance	ALLIANCE	Annual firm-level count of strategic alliances	SDC Platinum
Operating margin	OPMARGIN	Ratio of net income before depreciation to sales revenues	COMPUSTAT
Competitor innovation activity	COMPINA	Ratio of annual incremental cumulative competitors' sales revenues to market size	COMPUSTAT
Market size	LMSIZE	Natural logarithm of industry sales revenues	COMPUSTAT
Market growth	MGROWTH	Annual percentage growth in industry sales revenues	COMPUSTAT

Table 3
EXAMPLES OF B2B AND B2C SERVICE INNOVATIONS

Firm	*Year Introduced*	*Type*	*Service Innovation*
Yahoo!	2000	B2B-SI	"Yahoo!, the top Web-navigation company, is launching a business-information portal called Corporate Yahoo!; the new service will enable companies to display an internal corporate Web page integrated company information and programs with Yahoo content such as weather, stock quotes and news" (6/26/2000)
Dell	2002	B2B-SI	"Dell plans Monday to formally announce a new line of services for small and medium-sized businesses that typically do not have large technical staffs or budgets. […] Services include network design, network installation and staff training." (12/8/2002)
FedEx	2002	B2B-SI	"On June 10 FedEx Freight East will launch a pioneering service, FedEx Freight Next Day Plus, to assist companies in reducing inventory cycle times. With the new money-back guaranteed service, FedEx Freight East will deliver shipments via truck in selected lanes up to 900-miles by the next business day, well over the regional LTL industry standard of up to 500 miles by the next day." (6/10/2002)
US Airways	2002	B2C-SI	"US Airways announces a new convenience at usairways.com that enables customers to check-in for domestic flights and obtain boarding passes online. (12/20/2002)
Wal-Mart	2003	B2C-SI	"Wal-Mart is introducing basic financial services for US customers, using the same low-margin strategy that has turned it into the world's biggest retailer. The entry of the discount superstore giant into financial services has always been feared by financial competitors worried that it could undercut their margins while facing a lighter regulatory burden." (1/8/2003)
Starbucks	2004	B2C-SI	"Coffee shop giant Starbucks said Thursday it was launching the first of its "music bars" where customers can listen to digital recordings and burn their own CDs." (10/14/2004)

Table 4
SUMMARY STATISTICS

	M	*Mdn*	*SD*	*Min*	*Max*
		Focal Variables			
B2B Service Innovations	1.13	.00	2.51	.00	20.00
B2C Service Innovations	1.69	1.00	3.00	.00	28.00
Firm value	1.51	1.08	1.22	-.11	8.70
Systematic risk	1.05	1.00	.42	.14	3.08
Idiosyncratic risk	.02	.02	.01	.01	.09
		Control Variables			
Firm size	8.96	8.98	1.28	4.38	12.56
Firm age	4.01	4.32	.89	1.10	5.34
Acquisitions	1.14	.00	1.9	.00	17.00
Alliances	.39	.00	1.02	.00	8.00
Operating margin (%)	.03	.05	.14	-2.50	.41
Competitor innovation Activity	.09	.05	.15	.00	.96
Market size	11.73	11.67	1.53	6.21	14.71
Market growth (%)	6.72	6.76	19.24	-47.61	115.13

Notes: The number of observations = 591. An observation refers to the combination of firm and year for which data are available.

Table 5
CORRELATION MATRIX MODEL VARIABLES (n = 591)

	1	*2*	*3*	*4*	*5*	*6*	*7*	*8*	*9*	*10*	*11*	*12*	*13*
1. B2B Service Innovations	1.00												
2. B2C Service Innovations	.12**	1.00											
3. Firm value	.08*	.14**	1.00										
4. Systematic risk	.00	.24**	-.04	1.00									
5. Idiosyncratic risk	.04	.29**	.07*	.47**	1.00								
6. Firm size	.07*	.03	-.23**	-.06	-.24**	1.00							
7. Firm age	-.06	-.18**	-.41**	-.14**	-.36**	.30**	1.00						
8. Acquisitions	.10**	.03	.14**	-.01	.06	.17**	-.04	1.00					
9. Alliances	.07	.23**	.17**	.22**	.23**	-.01	-.19**	.17**	1.00				
10. Operating margin	.08**	-.11**	.14**	-.24**	-.36**	.07	.22**	.04	-.07*	1.00			
11. Competitor innovation activity	-.04	.02	-.02	-.09**	.08*	.07*	.04	.04	-.07*	.04	1.00		
12. Market size	.11**	-.10**	-.34**	-.16**	-.12**	.56**	.24**	.03	-.03	.01	.16**	1.00	
13. Market growth	.06	.07	.09**	-.01	.07*	.09**	-.07*	.14**	-.01	.08**	.51**	.18**	1.00

Note: *$p < .10$. **$p < .05$.

Table 6
WLS-SUR ESTIMATION RESULTS OF FIRM VALUE, AND FIRM RISK EQUATIONS

Parameter/ Independent Variables	*Firm Value Coefficient (SE)*	*Systematic Risk Coefficient (SE)*	*Idiosyncratic Risk Coefficient (SE)*
	Focal Variables		
Intercept	5.46 (.42)***	1.1918 (.0599)***	.0430 (.0010)***
B2B-Service Innovations	.05 (.02)***	-.0014 (.0058)	.0000 (.0001)
B2C-Service Innovations	.04 (.01)***	.0091 (.0051)*	.0002 (.0001)***
	Additional Variables and Interactions		
Firm size	-.11 (.04)**	.0678 (.0342)**	-.0017 (.0006)***
Firm age	-.48 (.05)***	.0281 (.0397)	-.0014 (.0007)**
Acquisitions	.09 (.02)***	-.0138 (.0179)	.0001 (.0003)
Alliances	.11 (.04)**	.0011 (.0408)	-.0008 (.0007)
Operating margin	1.36 (.27)***	-.7272 (.3153)**	-.0027 (.0055)
Competitor innovation activity	-.59 (.28)**	-.4435 (.2260)*	.0020 (.0039)
Market size	-.06 (.04)	-.1347 (.0272)***	-.0030 (.0005)***
Market growth	.01 (.00)***	.0022 (.0020)	-.0000 (.0000)
	Fixed Effects/ Dummy Variables[a]		
Utilities	-1.18 (.15)***	.2199 (.0505)***	.0047 (.0009)***
Retailing	-.10 (.14)	.2216 (.0484)***	-.0000 (.0008)
Insurance/telecommunications	-1.46 (.19)***	.2216 (.0629)***	.0037 (.0011)***
Hospitality/Courier services	-1.07 (.20)***	.2425 (.0675)***	-.0012 (.0012)
Airlines	-1.59 (.22)***	.9722 (.0759)***	.0076 (.0013)***
Internet portals/Online travel services	-1.20 (.35)***	.3989 (.1159)***	.0041 (.0020)**
Computers	-.91 (.18)***	.2332 (.0611)***	.0015 (.0011)
Automobiles	-1.44 (.28)***	.2216 (.0899)**	.0040 (.0016)**
Chemicals	-1.09 (.16)***	.3504 (.0549)***	.0010 (.0010)
Metals	-1.62 (.20)***	.3935 (.0699)***	-.0025 (.0012)**
Electrical goods	-.88 (.29)***	.5231 (.1015)***	.0001 (.0018)
Wholesale	-1.01 (.29)***	.1110 (.1014)	-.0005 (.0018)
Business services	-.70 (.22)***	.0792 (.0750)	-.0042 (.0013)***
R-Square	.50	.48	.78

Notes: *$p < .10$. ** $p < .05$. *** $p < .01$. Notes: [a] Base industry is consumer products. Sample size = 591.

Table 7
SUMMARY OF KEY FINDINGS

	Dependent Variable		
Independent Variable	*Firm Value*	*Idiosyncratic Risk*	*Systematic Risk*
B2B-Service Innovations	+[a]	NS	NS
B2C-Service Innovations	+[a]	+	+

Note: [a] The difference between the effects of B2B-SI and B2C-SI on firm value is not significant ($p > .10$).

Table 8
SUB-SAMPLE ANALYSIS RESULTS OF FIRM VALUE, AND FIRM RISK EQUATIONS FOR SAMPLE FIRMS THAT INTRODUCED BOTH B2B-SIs AND B2C-SIs

Parameter/ Independent Variables	*Firm Value Coefficient (SE)*	*Systematic Risk Coefficient (SE)*	*Idiosyncratic Risk Coefficient (SE)*
	Focal Variables		
Intercept	9.43 (.71)****	1.1217 (.0802)****	.0442 (.0015)****
B2B-Service Innovations	.04 (.02)***	-.0051 (.006)	-.0000 (.0001)
B2C-Service Innovations	.04 (.02)***	.0086 (.0060)*	.0001 (.0001)
	Additional Variables and Interactions		
Firm size	-.14 (.07)***	.0148 (.0500)	-.0015 (.0009)*
Firm age	-.93 (.07)****	.1029 (.0606)**	-.0021 (.0011)**
Acquisitions	.05 (.03)**	-.0079 (.0230)	.0000 (.0004)
Alliances	.01 (.06)	-.0444 (.0530)	-.0011 (.0010)
Operating margin	1.17 (.30)****	-1.0100 (.3319)****	.0013 (.0062)
Competitor innovation activity	1.02 (.62)**	-.5251 (.5213)	-.0200 (.0098)***
Market size	-.21 (.07)****	-.1150 (.0391)****	-.0032 (.0007)****
	Fixed Effects/ Dummy Variables[a]		
Utilities	-.65 (.23)****	.2687 (.0683)****	.0074 (.0013)****
Retailing	-.20 (.21)	.3895 (.0733)****	.0009 (.0014)
Insurance/telecommunications	-1.24 (.26)****	.3220 (.0814)****	.0056 (.0015)****
Hospitality/Courier services	-1.15 (.23)****	.4038 (.0818)****	.0010 (.0015)
Airlines	-1.48 (.27)****	.9487 (.0909)****	.0093 (.0017)****
Internet portals/Online travel services	-1.98 (.52)****	.4985 (.1686)****	-.0006 (.0032)
Computers	-.81 (.23)***	.3932 (.0771)****	.0025 (.0014)**
Automobiles	-.79 (.33)***	.3432 (.0991)****	.0054 (.0019)****
Chemicals	-.73 (.31)***	.5494 (.1090)****	.0027 (.0020)
Electrical goods	-.92 (.41)***	.3429 (.1422)***	.0035 (.0027)
Wholesale	-1.67 (.42)****	.0706 (.1417)	.0015 (.0027)
Business services	-.79 (.30)****	.2031 (.1018)***	-.0017 (.0019)
R-Square	.65	.52	.78

Notes: *$p \leq .15$. ** $p \leq .10$. *** $p \leq .05$. **** $p \leq .01$ Notes: [a] Base industry is consumer products. Sample size = 330. Compared to the full model in Table 6, the market growth variable was dropped due to multicollinearity. The metals dummy was dropped from this sub-sample because no sample firm in this industry introduced both B2B-SIs and B2C-SIs.

Table 9
SUMMARY OF KEY MANAGERIAL IMPLICATIONS

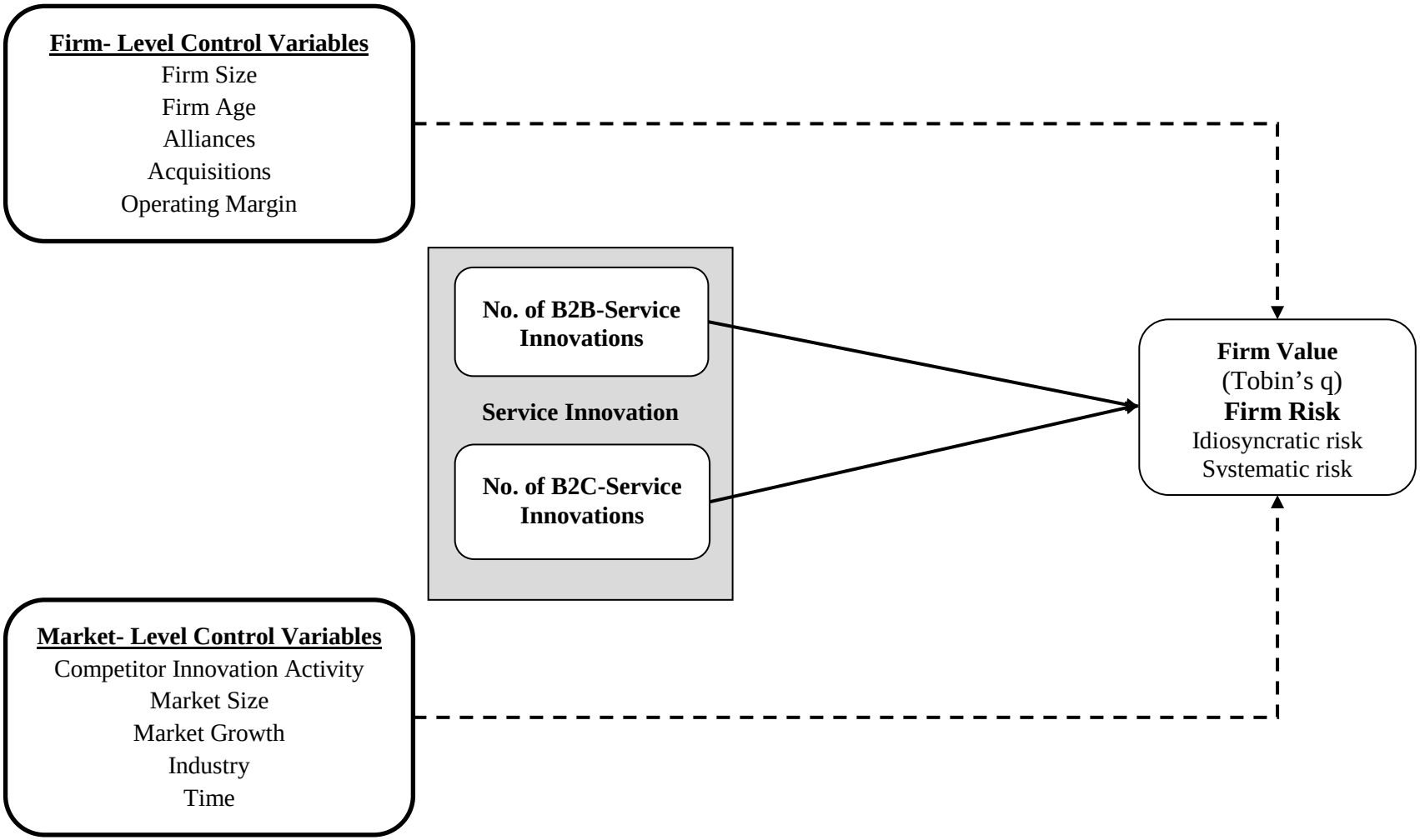
Key Finding	*Managerial Implication*
B2B-SIs have a positive effect on firm value.	B2B firms should consider introducing more B2B-SIs.
B2C-SIs have a positive effect on firm value.	Although B2B firms predominantly focus on B2B innovations, they should also consider introducing B2C-SIs.
The difference between the effects of B2B-SIs and B2C-SIs on firm value is statistically insignificant. B2C-SIs increase firm risk significantly more than B2B-SIs.	Beyond a basic mix of B2B-SIs and B2C-SIs, if managers have to make a choice or need to allocate resources between B2B-SIs and B2C-SIs, B2B-SIs are a better option from firm risk reduction standpoint.

Table 10
SUMMARY OF THE AVERAGE NUMBER OF B2BSI AND B2CSI AND THEIR EFFECTS ON FIRM VALUE AND FIRM RISK

Industry	*Avge. Annual No. of B2B-SIs per Firm*[a]	*Avge. Annual No. of B2C-SIs per Firm*[a]	*Net Effect of B2B-SIs on Firm Value*	*Net Effect of B2C-SIs on Firm Value*[b]	*Net Effect of B2B-SIs on Systematic Risk*	*Net Effect of B2C-SIs on Systematic Risk*	*Net Effect of B2B-SIs on Idiosyncratic Risk*	*Net Effect of B2C-SIs on Idiosyncratic Risk*
Consumer Products	.15	.80	.0072	.0320	-.0002	.0073	.00000	.00019
Utilities	.53	.83	.0255	.0332	-.0007	.0075	-.00001	.00020
Retailing	.38	2.50	.0183	.0999	-.0005	.0227	.00000	.00060
Insurance/ Telecommunications	2.64	4.20	.1271	.1679	-.0036	.0381	-.00002	.00101
Hospitality/Courier services	3.07	2.53	.1478	.1011	-.0042	.0230	-.00003	.00061
Airlines	.80	4.20	.0385	.1679	-.0011	.0381	-.00001	.00101
Internet portals/ Online travel service	1.60	9.70	.0771	.3877	-.0022	.0880	-.00002	.00233
Computers	1.35	.93	.0650	.0372	-.0019	.0084	-.00001	.00022
Automobiles	3.13	.53	.1507	.0212	-.0043	.0048	-.00003	.00013
Chemicals	1.12	.06	.0539	.0024	-.0015	.0005	-.00001	.00001
Metals	.60	0	.0289	n/a	-.0008	n/a	-.00001	n/a
Electrical goods	.60	.10	.0289	.0040	-.0008	.0009	-.00001	.00002
Wholesale	1.10	.60	.0530	.0240	-.0015	.0054	-.00001	.00014
Business services	4.36	2.20	.2100	.0879	-.0060	.0199	-.00004	.00053

Notes: [a] The average is across all the firms, many of which do not introduce any service innovation in a given year.
n/a –not applicable.

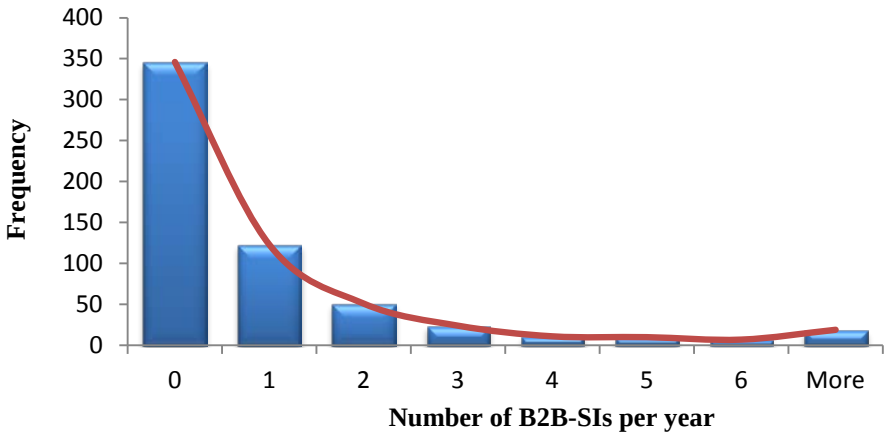
Figure 1
CONCEPTUAL MODEL LINKING SERVICE INNOVATION, FIRM VALUE, AND RISK



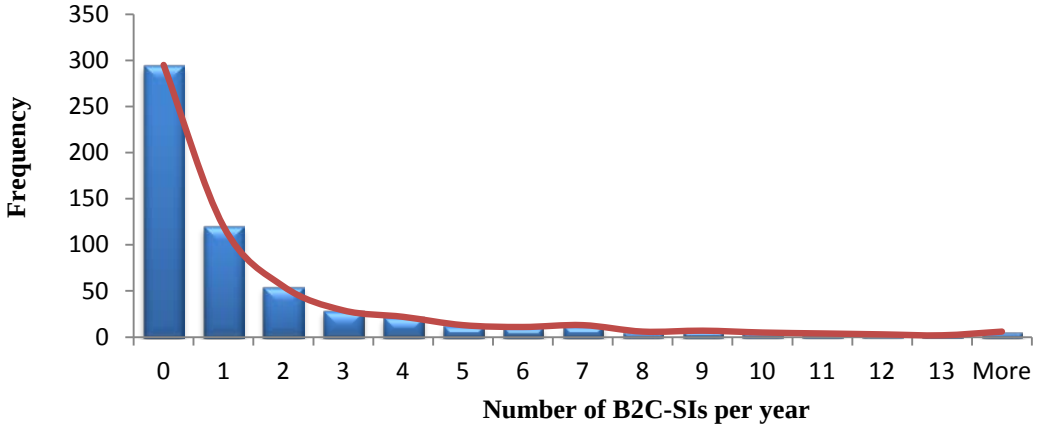
Notes: Continuous lines indicate focal relationships, while dashed lines represent relationships involving control variables.

Figure 2
DISTRIBUTION OF NUMBER OF SERVICE INNOVATIONS

A: DISTRIBUTION OF NUMBER OF
B2B SERVICE INNOVATIONS (B2B-SIs)



B: DISTRIBUTION OF NUMBER OF
B2C SERVICE INNOVATIONS (B2C-SIs)



C: DISTRIBUTION OF TOTAL NUMBER OF
SERVICE INNOVATIONS (SIs)

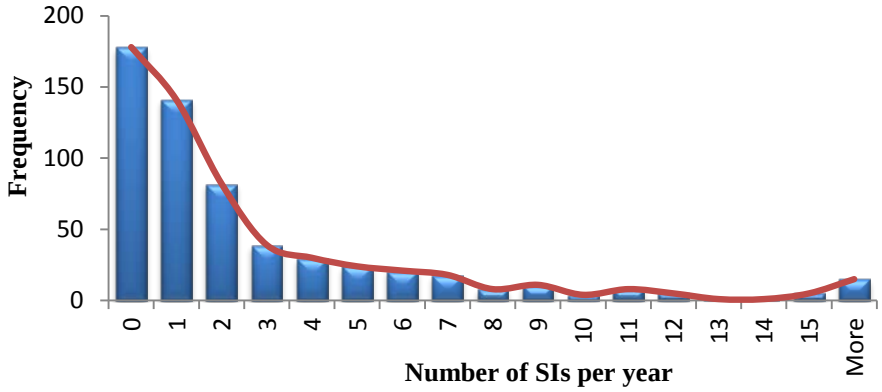


Figure 3
DISTRIBUTION OF FIRM VALUE (TOBIN'S Q)

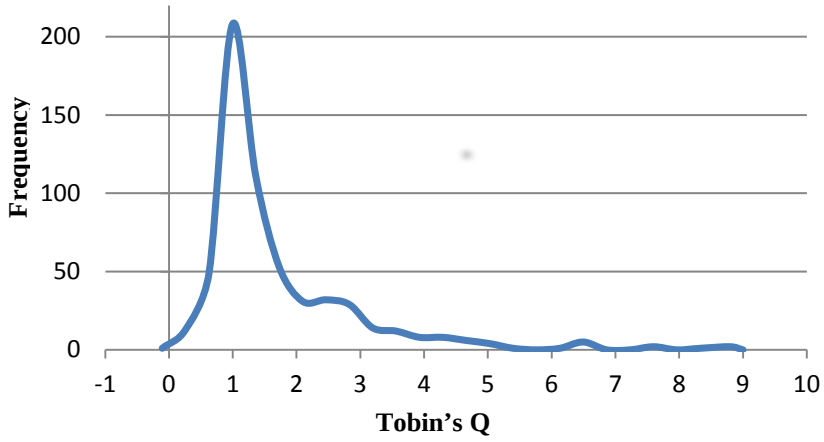


Figure 4
DISTRIBUTION OF SYSTEMATIC RISK

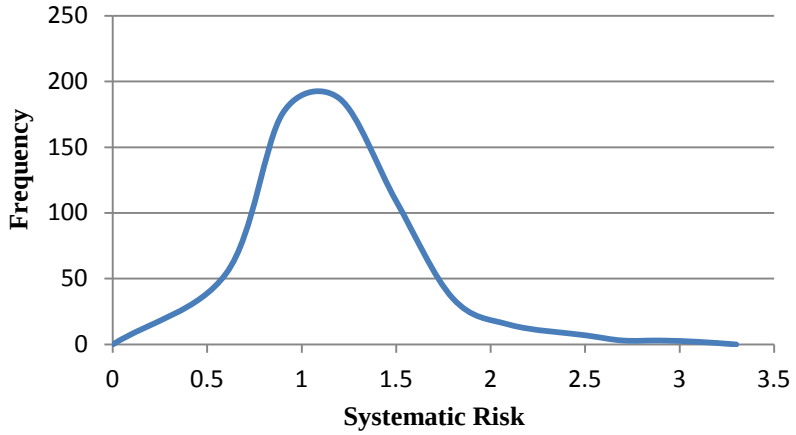


Figure 5
DISTRIBUTION OF IDIOSYNCRATIC RISK