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## Impact of supply chain risk and organizational risk propensity on supply chain integration and firm performance: some propositions

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### ABSTRACT

Some propositions about the impact of supply chain risk and organizational risk propensity on supply chain integration and firm performance are proposed. Organizational risk propensity moderates the negative relationship between supply chain risk (supply delivery risk, internal process risk, Demand variability risk) and supply chain integration (supplier integration, internal integration, customer integration). The integrative model is theoretically valuable in further exploring the internal path and mechanism of the impact of supply chain risk on firm performance, and is also practically provide suggestions and references for supply chain risk management and supply chain integration.

### KEYWORDS

Supply chain risk; Organizational risk propensity; Supply chain integration; Firm performance.



## INTRODUCTION

With reference to existing research<sup>[1-2]</sup> and considering the controllability of the risk, from the three-dimensional perspective of “supplier-focal firm-customer”, this study focused on the operational risk of supply chain and divided it into supply risk, demands risk and internal risk, which are defined as follows: 1) Supply risk refers to the possible threats to the lives and safety of customers or their demands caused by the failure of single supplier or the whole supply market<sup>[3]</sup>. To insure normal production, sales and other functions, more and more firms hope their suppliers to deliver goods on time and consider the risk of delivery. Supply delivery risk is one focal point of this study. 2) Demand risk emphasizes the risk incurred by the dynamic of environment and the instability of demand<sup>[4]</sup>. The instability of demand is a common characteristic of the global market and the greatest challenge to firms. It can bring higher cost inventory, lower service level and unreliable delivery. Therefore, demand variability risk is a focal point of this study. 3) Internal risk is possible loss resulted from improper firm operation, human errors, imperfection of technology and inappropriate management. The operation risk has a domino effect and bullwhip effect. Its rationality and efficiency determine firms’ quick response and timely adjustment to market changes, as the factors related to the survival and development of firms. Therefore, internal process risk is another focal point of this study.

There has been no consensus on the definition and dimension of supply chain integration<sup>[5]</sup>. Some studies regarded it as one-dimensional concept<sup>[6-10]</sup> while more studies viewed it as multi-dimensioned concept<sup>[5,11-17]</sup>. Adopted by the mainstream, supply chain integration refers to the strategic cooperation between firms and their partners along the supply chain, in order to achieve the maximum value with low cost and high efficiency for customers by managing firms’ flow of products, service, information and capital<sup>[5,17,18]</sup>. It includes three dimensions-supplier integration, internal integration and customer integration. Internal integration is about the coordination among strategy, practice and process by inner organization, which emphasizes the internal coordination ability of firms. External integration refers to the coordination among strategy, practice and process between firms and their partners, including supplier integration and customer integration, and emphasizes the internal ability of coordinating suppliers and customers<sup>[17]</sup>.

It is widely known that obtaining outstanding performance is the main motive for most firms to participate in the integration of supply chain<sup>[5,19]</sup>. Therefore, it is important to understand the meaning of performance. According to the analysis on existing research, firm performance includes the performance of operation, innovation, customer service, market and finance<sup>[17]</sup>. The dichotomous classification of operation performance and financial performance is adopted by most scholars and, also, in this study. Operational performance refers to the performance on cost, quality, flexibility and delivery<sup>[11,19]</sup>. While financial performance refers to performance on profit-earning ability, operating ability and debt-paying ability, including indexes like return on capital, return on sales, return on investment, profit and growth of market shares<sup>[9,17,19]</sup>.

### RELATIONSHIP BETWEEN SUPPLY CHAIN RISK ON SUPPLY CHAIN INTEGRATION

Supply delivery risk appears as failed delivery, insufficient and uncertain supply<sup>[3]</sup>. When the risk of supply delivery is high because of the long period of delivery and unstable delivery of suppliers, the manufacturers will be unwilling to share accurate inventory information and timely order information with them. In addition, due to the unstable and unreliable delivery, the manufacturers are unwilling to co-invest new product and process improvement with suppliers. At the same time, failed delivery impedes the formation of strategic alliance between manufacturers and suppliers<sup>[2]</sup>. Therefore, supply delivery risk will hinder supply chain integration.

Moreover, the high risk of supply delivery can hinder the coordination among the internal departments and functions of firms. In case of delay, uncertainty and mistakes in delivery, the incoordination and clashes will arise among internal purchasing and production of firms. Meanwhile, the uncertain and unreliable delivery makes it harder for firms to coordinate their product design and process improvement, because both of them need the participation of suppliers. In addition, due to the failed delivery of suppliers, manufacturers will not change their internal operation for the cooperation<sup>[20]</sup>. In general, supply delivery risk can result in the failure of the internal integration of firms<sup>[2]</sup>.

What’s worse, the risk of supply delivery can spread to downstream supply chain, bringing interrupted supply, delayed and uncertain delivery to customers. It will have a negative impact on the reliance and cooperation between customers and manufacturers. If suppliers can not provide raw materials to the manufactures in time, then manufactures can not deliver products to their customers timely. The long period of delivery will lead to the delay of products and finally influence the satisfaction and loyalty of customers. Therefore, when supply delivery risk is high, customers tend not to integrate with manufacturers<sup>[2,3,20]</sup>. Thus,

#### Proposition 1

*Supply delivery risk is negatively related to supply chain integration: (a) supplier integration, (b) internal integration, and (c) customer integration.*

Internal process risk refers to the possibility of departure from the expected goals because of the uncertainty of operating environment, the complexity of customers’ demand and the limit of firms’ competence or their staff’s abilities. Because of the uncertain external environment and improper internal process, firms may not produce qualified products. And lack of firm strength and staff ability, like machine breakdown and key personnel loss can also cause regular production

process interrupted, thus impeding the output. Other factors such as inaccurate market prediction, imperfection of production design and improper use of technology can lead to failure of meeting customers' personalized and diversified demands. All these factors will influence the establishment of a good partnership between firms and their customers. In addition, the change of operating process goes against the forming of teamwork among different departments and sharing of information about production, logistics, quantity and demand, thus hindering the cooperation and management of firms<sup>[1]</sup>. Moreover, when risk exists in operating process of manufacturers, the demand information of materials and products will become uncertain, thus making demand prediction and production decision of upstream manufacturer difficult, further causing suppliers reluctant to build strategically alliance with manufacturers. Thus,

### Proposition 2

*Internal process risk is negatively related to supply chain integration: (a) supplier integration, (b) internal integration, and (c) customer integration.*

Demand variability risk derives from the instability of market and the complexity of demand<sup>[21]</sup>. When the risk of demand variability is high, the demand of customers is unstable and hard to predict. Therefore, manufacturers often have to revise their products to respond to the market change, which also increases the difficulty to accurately predict the demands<sup>[22]</sup>.

With the changing demands, the raw materials demands will vary correspondingly. Therefore, suppliers have to change their products or service to satisfy the demands of manufacturers, which can bring some problems on the quality and quantity of raw materials. Meanwhile, there will be investment risk when the demand is uncertain. So, suppliers will not cooperate with manufacturers to improve quality and develop new technology<sup>[2]</sup>. Besides, inaccurate demand information can also lead to improper operation of internal departments of firms. Due to the changing market, the demand information collected by sales department can vary from time to time, which complexes the exchanges between sales department and other departments. As a result, it is hard to coordinate the internal departments and functions of firms<sup>[2]</sup>. Meanwhile, manufacturers find it difficult to investigate the demand of customers and get their feedbacks due to the changing demand of customers. Therefore, the integration with customers will be more difficult under such a circumstance<sup>[23]</sup>. Thus,

### Proposition 3

*Demand variability risk is negatively related to supply chain integration: (a) supplier integration, (b) internal integration, and (c) customer integration.*

## IMPACT OF SUPPLY CHAIN INTEGRATION ON FIRM PERFORMANCE

By constructing strategic and cooperative partnership, manufacturers and their suppliers can share information about demand prediction, production plans and inventory. Through all these efforts, it can facilitate interactions and mutual trust. Then, suppliers will better understand the operation of manufacturers to help them predict and respond to the demand changes<sup>[17]</sup>. Meanwhile, the interaction between manufacturers and suppliers, including information exchanges and coordination, help manufacturers make better production plan to deliver products on time<sup>[17]</sup>. In addition, the suppliers' participation in the design of new products and technology innovation can help manufacturers optimize their production process, R&D cost and time, and improve the efficiency of new product development. In conclusion, integration with suppliers can help to improve operational performance of firms.

Empirical studies showed that supplier integration was related to the performance of product development<sup>[7,10]</sup> and supplier communication<sup>[8]</sup>. However, some studies pointed out that supplier integration had nothing to do with<sup>[13]</sup> or had negative influence on operational performance<sup>[12,16,24]</sup>. In addition, empirical studies also showed that the larger the scope of integration, the more market share and profits earned by firms<sup>[11]</sup>. Rosenzweig et al. (2003) believed that the strength of supply chain integration had significantly influence on financial performance. Both Narasimhan and Kim (2002) and Das et al. (2006) found that supplier integration would improve financial performance of firms. In conclusion, we believe that supplier integration is positively related to firm performance. Thus,

### Proposition 4

*Supplier integration is positively related to firm performance: (a) operational performance and (b) financial performance.*

Different departments of a firm have different information and knowledge. So the integration of them can break the functional barrier caused by traditional specialization and enhance operating efficiency<sup>[17]</sup>. It is necessary to coordinate different departments in researching, purchasing, manufacturing and marketing. The trans-department information sharing, regular meetings, joint plan and cooperative development can facilitate the integration of operating process. Likewise, the trans-department cooperation is beneficial to enhance the efficiency of new product development. From this point of view, internal integration will positively impact firm operational performance<sup>[26]</sup>.

Although some scholars proposed that internal integration had no direct relationship with operational performance<sup>[16]</sup>, most scholars argued that internal integration had positive influence on operational performance, including process efficiency<sup>[27]</sup>, logistics service performance<sup>[12,13]</sup>, and so on. Flynn et al. (2010) also believed that internal integration had significantly positive influence on operational performance. According to study Stank et al. (2001b), internal integration was the most important factor causing differences on the whole performance of firms. Other studies also elaborated the

relationship between internal integration and financial performance<sup>[14,17,24]</sup>. For example, Droge et al. (2004) found that both the internal and the external integration were related to financial performance, and Swink et al. (2007) believed the integration of strategy, product and process influenced financial performance. In conclusion, we believe that internal integration is the basis of supply chain integration, and has positive impact on firm performance. Thus,

### **Proposition 5**

*Internal integration is positively related to firm performance: (a) operational performance and (b) financial performance.*

Firms can get more accurate demand information through close cooperative relationship with customers. Then, firms can reduce time on product design and production plan. They will have low product inventories and will timely offer better products and superior service to their customers<sup>[17]</sup>. Moreover, customers' participation can effectively enhance communication with firms, which is beneficial to the improvement of product development. Firms should take the customers' demand into consideration in the early stage of product design by offering chances to participate in the development of new products. Then, they can largely shorten development cycle and reduce manufacturing cost while enhancing the satisfaction of customers. From this, customer integration can help firms improve operational performance.

Empirical studies showed that customer integration had positive influence on logistics performance<sup>[12,13]</sup>, innovation and quality performance<sup>[16]</sup> and operational performance<sup>[17]</sup>. External integration positively affected production process efficiency<sup>[27]</sup> and logistics performance<sup>[28]</sup>. Meanwhile, some scholars believed customer integration related to customer satisfaction. For example, Homburg and Stock (2004) pointed out that customer integration was directly related to customer satisfaction. However, Koufteros et al. (2005) and Song and Di Benedetto (2008) argued that customer integration had indirect relationship with customer satisfaction. The existing studies did not reach an agreement on the influence of customer integration on financial performance. Flynn et al. (2010) did not find customer integration significantly related to financial performance while Koufteros et al. (2005) and Narasimhan and Kim (2002) believed customer integration had positive influence on financial performance. Droge et al. (2004) also found that both of customer integration and supplier integration could improve market share and financial performance. In conclusion, customer integration is positively related to firm performance. Thus,

### **Proposition 6**

*Customer integration is positively related to firm performance: (a) operational performance and (b) financial performance.*

## **MODERATING EFFECT OF ORGANIZATIONAL RISK PROPENSITY**

Kocabasoglu et al. (2007) proposed the concept of Organization Risk Propensity and defined it as the likelihood of a firm's acceptance of less or more risky behavior over time. Organizational risk propensity refers to the attitude of an organization towards risk. When the risk propensity is high, the organization is likely to take a risk. However, the existing research seldom touched on risk propensity at organizational level. Most of them involved the influence of risk propensity in innovation and new product development. It was generally recognized that risk propensity positively related to new product development<sup>[23]</sup>, process improvement and service technology innovation<sup>[32]</sup>, and process innovation<sup>[33]</sup>. Das and Joshi (2007) found that risk propensity had positive influence on the relationship between differential strategy and process innovation. Kocabasoglu et al. (2007) believed risk propensity played a mediating role between uncertain environment and supply chain investment. By this token, the organizational risk propensity had an important influence on decision-making of organizational behavior.

As is known to all, it is human nature to avoid risk and so are the organizations. Generally, individuals or organizations prefer affirmatory results and will try to avoid uncertainties. As mentioned above, supply chain risk has negative influence on supply chain integration, which means the higher the degree of supply chain risk, the smaller the possibility of supply chain integration. Because the uncertainty of risk can bring uncertain results of supply chain integration, firms will avoid the risk brought by supply chain integration. However, through the lens of decision-making studies and behavior economics, the existence of the organizational risk propensity will affect the risk decision of firms. When the firm of supply chain is risk-favor, it is likely to take a risk to integrate supply chain. On the other hand, a single firm participating in supply chain integration can help the firm deal with risk better. Therefore, the motivation of supply chain integration will be stronger under such a circumstance. Therefore,

### **Proposition 7**

*Organizational risk propensity moderates the relationship between supply chain risk (supply delivery risk, internal process risk and demand variability risk) and supply chain integration (supplier integration, internal integration and customer integration), such that the negative relationship is weaker when organizational risk propensity is high rather than low.*

In the above discussion, we suppose: (1) supply chain integration mediates the relationship between supply chain risk and firm performance; (2) organizational risk propensity weaken the negative impact of supply chain risk on supply chain integration but don't moderate the impact of supply chain integration on firm performance. According to these

assumption, we can further reasoning, the negative or indirect effect of supply chain risk on firm performance through supply chain integration is weaker when the organizational risk propensity is stronger. That is, the stronger the organizational risk propensity, the stronger the mediating effect of supply chain integration between supply chain risk and firm performance. Consequently,

### Proposition 8

*The integrative model is moderated-mediation. The mediating effect of supply chain integration on the relationship between supply chain risk and firm performance is stronger when organizational risk propensity is stronger than weaker.*

## CONCLUSIONS

In the future, based on which follow-up study can focus on the following aspects. Firstly, empirically test how supply chain risk influences supply chain integration, and explore the internal mechanism of supply chain risk on supply chain integration. Secondly, empirically test the relationship among different dimensions of supply chain integration and firm performance clarify how supply chain integration affects firm performance. Thirdly, examine the moderating effect of organizational risk propensity on the relationship between supply chain risk and supply chain integration, and further clarify the relationship mechanism between supply chain risk and supply chain integration. At Last, verify the mediating role of supply chain integration and whether the integrative model is moderated mediation.

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## REFERENCES

- [1] J.Chen, A.S.Sohal, D.I.Prajogo; Supply chain operational risk mitigation: a collaborative approach, *International Journal of Production Research*, **57(1)**, 2186-2199 (2013).
- [2] L.Zhao, B.Huo, L.Sun, X.Zhao; The impact of supply chain risk on supply chain integration and company performance: a global investigation, *Supply Chain Management: An International Journal*, **18(2)**, 115-131 (2013).
- [3] G.A.Zsidisin; Managerial perceptions of supply risk, *Journal of Supply Chain Management*, **39(1)**, 14-26 (2003).
- [4] I.J.Chen, A.Paulraj; Towards a theory of supply chain management: the constructs and measurements, *Journal of Operations Management*, **22(4)**, 119-150 (2004).
- [5] X.Zhao, B.Huo, W.Selen, J.H.Y.Yeung.; The impact of relationship commitment and internal integration on external integration, *Journal of Operations Management*, **29(1-2)**, 17-32 (2011).
- [6] M.Pagell; Understanding the factors that enable and inhibit the integration of operations purchasing and logistics, *Journal of Operations Management*, **22(5)**, 459-487 (2004).
- [7] K.J.Petersen, R.B.Handfield, G.L.Ragatz; Supplier integration into new product development: coordinating product, process, and supply chain design, *Journal of Operations Management*, **23(3/4)**, 371-388 (2005).
- [8] P.D.Cousins, B.Menguc; The implications of socialization and integration in supply chain management, *Journal of Operations Management*, **24(5)**, 604-620 (2006).
- [9] A.Das, R.Narasimhan, S.Talluri; Supplier integration-finding an optimal configuration, *Journal of Operations Management*, **24(5)**, 563-582 (2006).
- [10] X.A.Koufteros, T.C.E.Cheng, K.H.Lai; Black-box and gray box supplier integration in product development: antecedents, consequences and the moderating role of firm size, *Journal of Operations Management*, **25(4)**, 847-870 (2007).
- [11] M.T.Frohlich, R.Westbrook; Arcs of integration: an international study of supply chain strategies, *Journal of Operations Management*, **19(2)**, 185-200 (2001).
- [12] T.P.Stank, S.B.Keller, D.J.Closs; Performance benefits of supply chain integration. *Transportation Journal*, **41(2)**, 31-46 (2001a).
- [13] T.P.Stank, S.B.Keller, P.J.Daugherty; Supply chain collaboration and logistical service performance, *Journal of Business Logistics*, **22(1)**, 29-48 (2001b).
- [14] R.Narasimhan, S.W.Kim; Effect of supply chain integration on the relationship between diversification and performance: evidence from Japanese and Korean firms, *Journal of Operations Management*, **20(3)**, 303-323 (2002).
- [15] C.Droge, J.Jayaram, S.K.Vickery; The effects of internal versus external integration practices on time-based performance and overall firm performance, *Journal of Operations Management*, **22(6)**, 557-573 (2004).
- [16] X.Koufteros, M.Vonderembse, J.Jayaram; Internal and external integration for product development: the contingency effects of uncertainty, equivocality, and platform strategy, *Decision Sciences*, **36(1)**, 97-133 (2005).
- [17] B.B.Flynn, B.Huo, X.Zhao; The impact of supply chain integration on performance: a contingency and configuration approach, *Journal of Operations Management*, **28(1)**, 58-71 (2010).
- [18] X.Zhao, B.Huo, B.B.Flynn, Y.J.H.Yeung; The impact of power and relationship commitment on the integration

- between manufacturers and customers in a supply chain, *Journal of Operations Management*, **26(3)**, 368-388 (2008).
- [19] S.K.Vickery, J.Jayaram, C.Droge, R.Calantone; The effects of an integrative supply chain strategy on customer service and financial performance: an analysis of direct versus indirect relationships, *Journal of Operations Management*, **21(5)**, 523-539 (2003).
- [20] M.T.Frohlich; E-integration in the supply chain barriers and performance, *Decision Sciences*, **33(4)**, 537-556 (2002).
- [21] E.Boyle, P.Humphreys, R.Mclvor; Reducing supply chain environmental uncertainty through e-intermediation: an organization theory perspective, *International Journal of Production Economics*, **114(1)**, 347-362 (2008).
- [22] P.Trkman, K.McCormack; Supply chain risk in turbulent environments: a conceptual model for managing supply chain network risk, *International Journal of Production Economics*, **119(2)**, 247-258 (2009).
- [23] R.Calantone, R.Garcia, C.Droge; The effects of environmental turbulence on new product development strategy planning, *Journal of Product Innovation Management*, **20(2)**, 90-103 (2003).
- [24] M.Swink, R.Narasimhan, C.Wang; Managing beyond the factory walls: effects of four types of strategic integration on manufacturing plant performance, *Journal of Operations Management*, **25(1)**, 148-164 (2007).
- [25] E.D.Rosenzweig, A.V.Roth, J.W.Dean Jr; The influence of an integration strategy on competitive capabilities and business performance: an exploratory study of consumer products manufacturers, *Journal of Operations Management*, **21(3)**, 437-456 (2003).
- [26] C.L.Tan, M.Tracey; Collaborative new product development environments: implications for supply chain management, *Journal of Supply Chain Management*, **43(3)**, 2-15 (2007).
- [27] K.A.Saeed, M.K.Malhotra, V.Grover; Examining the impact of inter-organizational systems on process efficiency and sourcing leverage in buyer-supplier dyads, *Decision Sciences*, **36(3)**, 365-396 (2005).
- [28] C.Gimenez, E.Ventura; Logistics-production, logistics-marketing and external integration: their impact on performance, *International Journal of Operations & Production Management*, **25(1)**, 20-38 (2005).
- [29] C.Homburg, R.M.Stock; The link between sales people's job satisfaction and customer satisfaction in a business-to-business context: a dyadic analysis, *Journal of the Academy of Marketing Science*, **32(2)**, 144-158 (2004).
- [30] M.Song, A.Di Benedetto; Supplier's involvement and success of radical new product development in new ventures, *Journal of Operations Management*, **26(1)**, 1-22 (2008).
- [31] C.Kocabasoglu, C.Prahinski, R.D.Klassen; Linking forward and reverse supply chain investments: the role of business uncertainty, *Journal of Operations Management*, **25(6)**, 1141-1160 (2007).
- [32] K.M.Gilley, B.A.Walters, B.J.Olsen; Top management team risk taking propensities and firm performance: direct and moderating effects, *Journal of Business Strategies*, **19(2)**, 95-114 (2002).
- [33] S.R.Das, M.P.Joshi; Process innovativeness in technology services organizations: roles of differentiation strategy, operational autonomy and risk-taking propensity, *Journal of Operations Management*, **25(4)**, 643-660 (2007).