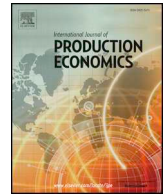




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# The impact of transaction attributes on logistics outsourcing success: A moderated mediation model



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## ABSTRACT

While an increasing number of firms outsource their logistics activities, the failure rate of logistics outsourcing is still high. To address such issue, this study draws upon transaction cost theory (TCT) and extended resource-based view (ERBV) to examine the mechanism through which transaction attributes (i.e., 3 PL providers' asset specificity and logistics technological uncertainty) affect logistics outsourcing success. We argue that top management plays an essential role in mediating transaction attributes to exercise their influences on logistics outsourcing success. However, such a mediating mechanism is effective only when trustworthy alternative 3 PL providers are available in the market. The data from 250 manufacturing subsidiaries in China are used to test our model. Important implications for research and practices are discussed.

## 1. Introduction

With the globalization, more manufacturers outsource their logistics activities to third-party logistics (3 PL) providers, so that improve their logistics performance (Lai et al., 2008). By doing so, 3 PL user firms expect to focus on core competencies, save logistics costs, improve customer services, and thus enhance competitiveness (Chu and Wang, 2012; Lai et al., 2008; Zhu et al., 2017). However, along with such advantages, such outsourcing risks as losing control of logistics activities, information leakage, and additional efforts and costs on outsourcing management also exist (Gadde and Hulthén, 2009; Lau and Zhang, 2006; Yang et al., 2016). Logistics outsourcing does not always succeed; rather, the failure rate of logistics outsourcing is relatively high (Yang et al., 2016). Due to the high risk of failure, some large firms in China (e.g., JD.com and Alibaba) even abandoned logistics outsourcing but internalized logistics activities by building their own logistics systems (Zhu et al., 2017). Therefore, how to achieve logistics outsourcing success is an important issue for both 3 PL users and providers.

Previous studies suggested that building quality logistics outsourcing relationship can mitigate outsourcing dependence and risks, as well as help firms improve operational and financial performance (Chu and Wang, 2012; Huo et al., 2015; Lai et al., 2013a; Qureshi et al., 2017). However, operational and financial performances are not the direct outcome of logistics outsourcing. Those two measures are distant

from logistics outsourcing and thus could not accurately capture the outcome of logistics outsourcing. Rather, as Han et al. (2008) suggested, logistics outsourcing success, referring to the overall advantage attained from logistics outsourcing, should be assessed. Logistics outsourcing success could be assessed from a broader perspective, including strategic, technological, and economic benefits. While most previous studies only focused on a sole and isolated aspect (see Appendix A), further studies are needed to examine logistics outsourcing success from a broader perspective. Therefore, the present study aims to examine how to leverage transaction attributes in logistics outsourcing for overall outsourcing success.

Transaction attributes (e.g., asset specificity and uncertainty), the key elements of transaction cost theory (TCT) (Coase, 1937; Williamson, 1975, 1979), were widely examined in the logistics outsourcing literature as the determinants of outsourcing decisions (i.e., outsourcing or internalizing logistics activities) (e.g., Aas et al., 2008; Gong et al., 2016; Hong et al., 2010; Hsiao et al., 2010; Skjoett-Larsen, 2000) as well as outsourcing risks (Tsai et al., 2008, 2012). However, to best of our knowledge, it still remains unclear how and when such attributes influence logistics outsourcing success. In the present study, we propose that top management and supplier presence in the market play vital roles in such influences.

On the one hand, in line with the resource-based view (RBV) (Barney, 1991), top management can be regarded as a firm's key resource that affects business processes and strategies and their outcomes.

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Top management is responsible for making organizational decisions and responding to changes in the external environment (Liang et al., 2007) and thus influences the decision outcomes (Hambrich and Mason, 1984). As such, top management is critical to the success of logistics outsourcing. Liang et al. (2007) pointed out that the external forces could emit effects on an organization's behaviors through influencing the beliefs and behaviors of human agents. In the same vein, we argue that transaction attributions may affect logistics outsourcing success through influencing top management beliefs (i.e., the mediation role of top management).

On the other hand, the availability of qualified 3 PL providers (i.e., supplier presence) is another important resource that affects logistics outsourcing outcomes because it determines the possibility and the quality of external logistics resources (Chu and Wang, 2012). A large number of qualified 3 PL providers available in the market give top managers more space to play their roles, such as more bargaining power and less risk of dependence on logistics providers. In this regard, we further propose that the mediation effect of top management beliefs is contingent on the availability of trustworthy 3 PL providers (i.e., the moderation role of supplier presence).

In sum, by integrating TCT and RBV the present study empirically investigates how transaction attributes (i.e., technological uncertainty and asset specificity) influence logistics outsourcing success, including the mediating role of top management beliefs and the moderation effect of supplier presence. In doing so, we collected data from 3 PL providers that operated in China. China's 3 PL industry provides an important yet idiosyncratic setting to examine the influences of transaction attributes on logistics outsourcing. First, logistics outsourcing in China has been developed rapidly for years and plays a significant role in China's economic growth (Chu, 2012). According to the statistics, the logistics outsourcing revenue in China has tripled from RMB 416.7 billion in 2009 to RMB 1241.1 billion in 2017 and is expected to reach RMB1,600 billion by 2020 (China Federation of Logistics & Purchasing, 2018a). Besides, the ratio of total logistics cost to GDP has decreased from 16.6% in 2014 to 14.6% in 2017 (China Federation of Logistics & Purchasing, 2018b), indicating the growth of logistics' efficiency. Second, China's 3 PL industry has been experiencing a high level of technological uncertainty, due to the rapid development of logistics technologies (e.g., automated high-rise warehouse, automatic guided vehicle, automatic sorting conveyor system, among others) (Li, 2018). At the same time, most manufacturers are having obsolete logistics equipment and technologies (Wang et al., 2008), thus massive investments in updating logistics-related equipment and technologies are required. Therefore, China's 3 PL is an appropriate setting to examine both technological uncertainty and asset specificity.

## 2. Theoretical background

### 2.1. Logistics outsourcing

Logistics outsourcing has been well examined since the rise of 3 PLs in the 1990s (Chu and Wang, 2012). Previous studies mainly focused on outsourcing decision-making and its determinants (e.g., Ameknassi et al., 2016; Cheng and Lee, 2010; Hsiao et al., 2010; Maltz and Ellram, 1997; Wang et al., 2018), 3 PL provider selection (e.g., Aguezouli, 2014; Anderson et al., 2011; Azadi and Saen, 2011; Falsini et al., 2012; Govindan et al., 2016; Liu and Wang, 2009; Wan et al., 2015), logistics outsourcing relationship management (e.g., Chu and Wang, 2012; Hofer et al., 2012; Huo et al., 2015; Knemeyer et al., 2011; Wallenburg et al., 2011), and outsourcing performance (e.g., Cho et al., 2008; Gotzamani et al., 2010; Wallenburg et al., 2010; Yang et al., 2016; Zailani et al., 2015).

In terms of logistics outsourcing performance, as summarized in Appendix A, most previous studies used operational performance (Chu et al., 2017; Yang et al., 2016) or financial performance (Chu and Wang, 2012; Lai et al., 2013a; Liu et al., 2015; Yeung et al., 2012) to

assess the outcome of logistics outsourcing. For example, Chu and Wang (2012) used financial performance and Yang et al. (2016) employed operational performance to assess the logistics outsourcing outcome. However, the operational and financial performance improvement is just part of the success of logistics outsourcing. As suggested by Goo et al. (2008), cost reduction is not a stand-alone driver of outsourcing, and outsourcing can produce many types of benefits, including business impact, user satisfaction, economic benefits, and technological capabilities. Accordingly, several studies examined the logistics outsourcing outcome from other angles. For example, Cho et al. (2008) stressed the importance of improving customer satisfaction through customized logistics service. Shi et al. (2016) argued that logistics activities are always outsourced to make the firms more focused on core businesses. Hashai (2016) emphasized the value of obtaining new technological knowledge from external partners through outsourcing some operations (including logistics activities). Hence, to comprehensively evaluate the various benefits of outsourcing logistics activities, in the present study we adopt outsourcing success, a more complete description of outsourcing outcome, which consists of economic benefit, strategic benefit, and technological benefit (Goo et al., 2008; Lee et al., 2004).

### 2.2. Transaction cost theory (TCT)

TCT was proposed to explain why the firm exists and what the boundary of the firm is (Coase, 1937). According to TCT, market and hierarchy are two alternative governance structures, and the choice of them depends on their transaction costs (Williamson, 1975, 1979). TCT assumes that decision makers are prone to act with opportunism and they display bounded rationality in their decision making (Williamson, 1975). Opportunism is defined as "self-interest seeking with guile, to include calculated efforts to mislead, deceive, obfuscate, and otherwise confuse" (Williamson, 1985). Bounded rationality refers to intensely rational but limited behavior (Williamson, 1985). Under conditions of bounded rationality, individuals are less able to receive, store, retrieve, and process information without error (Williamson, 1975). In this regard, transactions attributes - asset specificity, uncertainty, and frequency are important factors affecting transaction costs (Rindfleisch and Heide, 1997). Asset specificity refers to the degree to which an asset can be transferred to alternative uses by other users (Williamson, 1989), which is the most important attribute influencing the governance structure (Geyskens et al., 2006). Uncertainty refers to the "computational inability to ascertain the structure of the environment" (Williamson, 1989). Frequency refers to the repetitiveness of a particular type of transaction (Miranda and Kim, 2006).

With the logic of TCT, the transaction attributes influence the choice and effectiveness of governance structures (Geyskens et al., 2006; Rindfleisch and Heide, 1997). Accordingly, TCT has been widely adopted to explain logistics outsourcing (Aas et al., 2008; Chu et al., 2017; Gong et al., 2016; Hong et al., 2010; Hsiao et al., 2009, 2010; Maltz, 1994; Skjoett-Larsen, 2000). However, previous studies focused on outsourcing decision-making from the TCT perspective (Aas et al., 2008; Gong et al., 2016; Hong et al., 2010; Hsiao et al., 2009, 2010; Maltz, 1994; Skjoett-Larsen, 2000). For example, from the TCT perspective, Hong et al. (2010) found the decrease in transaction costs and risks would lead to a higher degree of logistics outsourcing. Hsiao et al. (2010) also employed TCT to investigate the determinants of logistics outsourcing decisions, and found that transaction attribute in terms of asset specificity is one of the crucial determinants. Chu et al. (2017) examined the moderation effects of asset specificity and uncertainty on the effectiveness of relational governance (i.e., *guanxi*) in the logistics outsourcing context. These studies indicated the importance of transaction attributes in outsourcing decision-making. However, little is known about whether transaction attributes subsequently affect logistics outsourcing success, and if so, how and when the effects take place.

Hence, the present study aims to examine the mechanism through

which transaction factors influence logistics outsourcing success (i.e., the mediation effect of top management and the moderation effect of supplier presence). Considering the characteristics of logistics as a technology-intensive industry (Hills and Sarin, 2003; Yang et al., 2016) and the importance of user-specific equipment in logistics outsourcing, the present study focuses on the transaction attributes in terms of 3 PL provider's asset specificity and logistics technological uncertainty. Logistics activities are largely being performed in the manufacturers; the frequency of logistics can be considered as infinite and thus plays no role in the logistics outsourcing context (Aubert et al., 1996). In addition, frequency has received limited attention in the transaction cost literature, and few empirical studies have found the support for its significant role (Geyskens et al., 2006). Hence, the frequency was not included in our study.

### 2.3. Extended resource-based view (ERBV)

The resource-based view (RBV) regards a firm as a set of resources and assumes that the competitive advantage comes from the valuable resources (Barney, 1991). However, it is impossible for a firm to maintain all resources required for developing sustainable competitive advantages. Thus, the extended RBV (ERBV) asserts that strategic resources can also be gained from outside (Lavie, 2005). The ERBV provides a basis for studying outsourcing decision, as firms can outsource their non-core businesses to external providers for resource complementarity when they are deficient in performing these activities in house (McIvor, 2009).

The ERBV underlines resource integration and relationship strategies across organizational boundaries for generating competitiveness. In support of this view, Lai et al. (2012) found that customer integration and supplier integration can facilitate the impact of internal integration on developing mass customization capability. Park et al. (2017) indicated that the alignments between external and internal IT governance could promote operational efficiency, market growth, and innovation performance. These studies implied that top management might play a critical role in logistics outsourcing. As a firm's decision makers, top managers play significant roles in determining the internal governance (i.e., strategies and decisions) and external collaboration. Their beliefs, as responses to the market and technological environment, guide a firm's decisions on resource allocation and direct organization actions (Dai et al., 2014). Hence, the ERBV is an appropriate theoretical basis for examining the mediating role of top management beliefs in promoting outsourcing success.

The ERBV also proposes that a firm can appropriate a different range of benefits generated through resources integration in the cases of different bargaining power (Lavie, 2005). Supplier presence, which refers to the availability of trustworthy 3 PL provider in the market, is closely related to this bargaining power. For example, a larger number of suppliers available in the market can decrease a firm's dependency on its suppliers and increase the firm's bargaining power, thus enhancing top management's confidence on outsourcing success. In this sense, top managers may respond differently to environmental factors and take different actions under different levels of supplier presence, leading to different outcomes. Therefore, we speculate that the role of top management beliefs with regard to carrying the influences of transaction attributes on outsourcing success is contingent on supplier presence.

### 2.4. Integrating TCT and RBV

Although TCT stresses the influence of transaction attributes (i.e., asset specificity and technological uncertainty) on short-term economic benefits (i.e., transaction costs) for effective governance, whereas ERBV emphasizes the importance of gaining access to external strategic resources for long-term competitive advantages, both theories are pertaining to the outsourcing decision and outcome. On the one hand, achieving performance improvement in terms of transaction cost is the

main target of outsourcers. On the other hand, firms also expect to develop competitive advantages when making outsourcing decisions. Hence, TCT and ERBV are complementary in understanding outsourcing decisions and outcomes (McIvor, 2009; Vivek et al., 2008). A growing body of research has applied the integrated framework of TCT and RBV to investigate outsourcing decisions (McIvor, 2009; Neves et al., 2014; Watjatrakul, 2005) as well as relationship performance (Lai et al., 2013b; Leiblein, 2003). In the same vein, we integrate TCT and RBV to examine logistics outsourcing success. Specifically, we argue that top management beliefs can be affected by transaction attributes and the beliefs can influence logistics outsourcing success. In addition, these effects are contingent on the scarcity of external resources (i.e., supplier presence).

## 3. Conceptual model and hypotheses

As discussed above, TCT provides a theoretical foundation for the assertion that transaction attributes influence logistics outsourcing success, while ERBV lays a theoretical basis for the mediating role of top management beliefs and the moderating role of supplier presence. Combining these two theoretical perspectives better explains how transaction attributes affect the success of logistics outsourcing. That is, it is through the mediating mechanism of top management beliefs that transaction attributes affect the success of logistics outsourcing, and such a mediating mechanism is contingent on supplier presence. The conceptual model is shown in Fig. 1. The hypotheses are developed as follows.

### 3.1. Transaction attributes and logistics outsourcing success

As discussed above, considering our research context of logistics outsourcing, the study focuses on two transaction attributes: 3 PL provider's asset specificity and logistics technological uncertainty. A 3 PL provider's asset specificity refers to the investments the 3 PL provider provides, which are specific only to a particular logistics outsourcing relationship and are not transferable to alternatives (Narayanan et al., 2015). Specific investments in logistics outsourcing include human asset and physical asset. Physical assets are tangible assets, mainly includes equipment, facilities, and hardware. Human assets primarily include substantial specific knowledge and specifically trained employees.

In a logistics outsourcing relationship, the 3 PL provider's asset specificity would enhance logistics outsourcing success in the following mechanisms. First, according to TCT, the high level of asset specificity leads the 3 PL provider to make efforts to safeguard the specified assets and to maintain the relationship (Cai and Yang, 2008; Rindfleisch and Heide, 1997). In doing so, the 3 PL provider would like to cooperate with the outsourcer and provide logistics desired by the outsourcer, which will help the outsourcer achieve its expected logistics goals and thus get the logistics outsourcing success. Second, the high level of 3 PL provider's asset specificity also helps the outsourcer to counteract the risk of resource dependence (Narayanan et al., 2015), because the dedicated assets in the logistics outsourcing relationship can hardly be used for other purposes. Third, the long-term orientation of the logistics outsourcing due to a high level of asset specificity may leave more spaces for the logistics outsourcing users to focus on long-term development, which may help them achieve the logistics outsourcing success from a strategic view.

In sum, the desired logistics services, reduced risks, and long-term orientation due to a high level of 3 PL provider's asset specificity facilitate the logistics outsourcing success. Previous studies in logistics outsourcing also reported that asset specificity positively affects logistics outsourcing performance (e.g., Lui et al., 2009; Rokkan et al., 2003; Vita et al., 2010; Wang, 2002). For example, Vita et al. (2010) found that suppliers' asset specificity, both human and physical, has positive effects on outsourcing performance. Therefore, we hypothesize that:

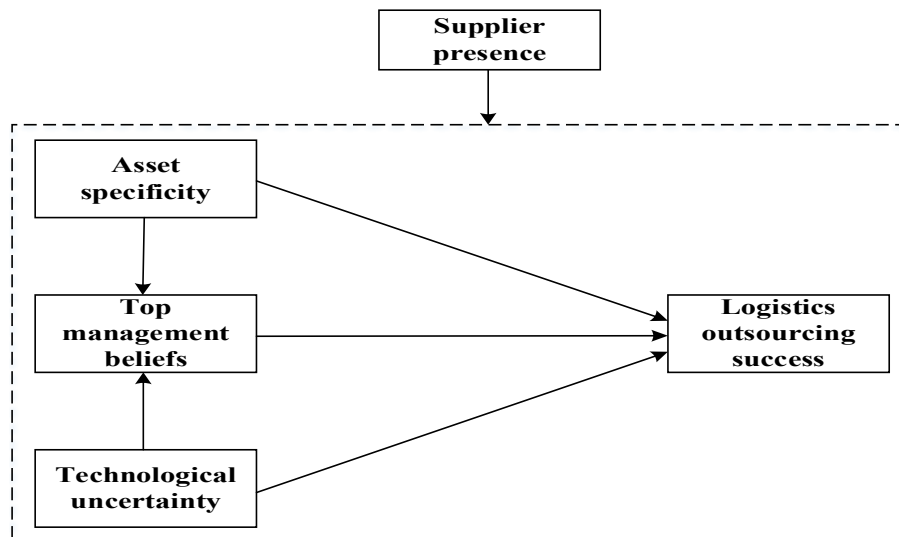


Fig. 1. Conceptual framework.

#### H1. Asset specificity affects outsourcing success positively.

Logistics technological uncertainty refers to the outsourcer's perceived uncertainty in the technologies of logistics services it needs and outsources. It reflects outsourcing users' inability to trace and predict the development of logistics technologies, which brings risks of technological obsolescence to these firms as they use the logistics technologies but do not focus on the development of logistics technologies. Such firms may suffer from relatively low logistics efficiency and quality because they could not keep up and adopt the newest technologies. To avoid exposure to such risks, these firms would outsource logistics activities to understand the logistics technologies and take advantages of 3 PL providers' professional skills. We argue that, in the outsourcing process, logistics technological uncertainty will be helpful for logistic outsourcing success.

First, firms with a high level of technological uncertainty are confronted with the risk of logistics failure owing to logistics technological obsolescence, especially when logistics technologies are developing rapidly nowadays. These firms have ample motivation to overcome the high uncertainty in order to provide high-quality logistics services to customers (Gelderman et al., 2016). Under this circumstance, they tend to place great trust in and depend on their 3 PL providers. The resulting close coordination between two parties promotes the efficiency of logistics outsourcing, thereby increasing logistics service quality and reducing logistics costs. In contrast, firms with low technological uncertainty are more likely to have internal technological capabilities, so their logistics strategies may be inconsistent with the plans of their 3 PL providers. This contradiction hinders the professional 3 PL providers giving full play to their advantages. In this sense, logistics technological uncertainty facilitates outsourcing success by enhancing the collaboration between logistics outsourcing users and 3 PL providers.

Second, high technological uncertainty impels firms to learn actively from professional 3 PL providers in cooperation. As a result, these firms will be acquainted with up-to-date logistics technologies and adapt quickly to the changing technological environment. However, firms with low technological uncertainty may gain limited technological benefits from professional partners because they have developed internal technological skills, in general, low level though, and are less motivated to learn from their 3 PL providers (Jean et al., 2012). Hence, technological uncertainty can contribute to logistics outsourcing success by encouraging logistics outsourcing users to keep up with technological development by learning. The higher opportunity for learning indicates the potential of learning as a source of competitive advantages (Adner and Kapoor, 2010).

Third, firms with high logistics technological uncertainty are often inefficient in logistics activities but competitive in their fields. By leaving the risks of logistics technology to 3 PL providers (Balakrishnan and Wernerfelt, 2010; Parmigiani, 2007), firms can concentrate their resources on core competencies to achieve the strategic goals, which helps them to achieve logistics outsourcing success from a strategic perspective. Therefore, we hypothesize the following:

#### H2. Technological uncertainty affects outsourcing success positively.

#### 3.2. Mediating role of top management beliefs

ERBV posits that a focal firm can use external and internal resources for competitive advantages (Lavie, 2005). Lai et al. (2012) suggested that firms should enhance the efficiency of resource integration by integrating with external service providers. As Hambrich and Mason (1984) suggested that organizational choices are a reflection of the top management's values and cognitive bases, top management beliefs play an important role in shaping and implementing the firm's strategies. In this context, top management beliefs refer to a subjective psychological state regarding the potentials of logistics outsourcing. It is the top managers' mental image of a desired organizational state of logistics outsourcing. Top managers develop their belief structures in analyzing and responding to the environment and use these beliefs to guide their administrative behaviors (Lee et al., 2014; Liang et al., 2007). In other words, the environmental factors affect top management beliefs, which in turn influence the firm's decisions and the outcomes. Such a mediating role of top management beliefs is supported by several previous studies (e.g., Liang et al., 2007; Yigitbasioglu, 2015). For example, Liang et al. (2007) found that top management beliefs mediate the impacts of institutional forces on the outcome of adopting an ERP system. Following such logic, we argue that top management beliefs mediate the effects of transaction attributes on logistics outsourcing success.

More specifically, when a 3 PL provider invests heavily on a particular logistics outsourcing relationship, the outsourcer has reasons to believe that the provider may be unlikely to behave opportunistically and that the provider would make efforts to provide desired and even customized logistics services. Such thoughts will shape the top managers' beliefs in the success of logistics outsourcing. Hence, asset specificity is positively related to top management beliefs.

When a firm is facing with a high level of logistics technological uncertainty, the top management of the firm may believe that logistics outsourcing would help reduce logistics related operating costs and

lower technological obsolescence risks (Ang and Cummings, 1997). In addition, technological uncertainty indicates that the technological resources inside the focal firm are deficient. In this case, the logistics outsourcing users may believe that 3PL providers with professional knowledge and skills may employ the newest technologies to help the logistics outsourcing users improve logistics quality. Therefore, top management may perceive higher benefits of logistics outsourcing in the circumstance of a high level of logistics technological uncertainty. In other words, logistics technological uncertainty is positively related to top management beliefs.

Positive top management beliefs in logistics outsourcing benefits may facilitate the success of logistics outsourcing. In fact, with the positive beliefs in logistics outsourcing, top managers offer guidelines for managers and employees to support logistics outsourcing by sharing positive beliefs. Moreover, they may impel favorable organizational structures and policies and cultivate organizational culture to support the implementation of logistics outsourcing (Liang et al., 2007; Mitchell, 2006). According to ERBV, an effective inter-firm collaboration and resource integration can lead to logistics outsourcing success. Hence, top management beliefs facilitate the success of logistics outsourcing.

In sum, transaction attributes affect logistics outsourcing success through influencing the top management beliefs in the benefits of logistics outsourcing. Therefore, we propose the following hypotheses:

**H3.** Top management beliefs mediate the positive relationship between asset specificity and logistics outsourcing success.

**H4.** Top management beliefs mediate the positive relationship between technological uncertainty and logistics outsourcing success.

### 3.3. Moderating role of supplier presence

Supplier presence reflects the paucity of trustworthy logistics service providers available in the market (Ang and Cummings, 1997), which is relevant with the dependency and bargaining power. Previous research from the RBV perspective has suggested that resource integration across organizational boundaries can generate a different range of benefits in the case of different bargaining powers (e.g., Lavie, 2005). In this process, top management plays significant roles. Top managers are responsible for formulating strategies about resource integration and cooperation for logistics outsourcing, so they have to take supply market (i.e., the level of supplier presence) into consideration. Hence, their beliefs about logistics outsourcing's benefits based on transaction factors may vary with the different level of supplier presence, thus affecting the outcome of logistics outsourcing. Specifically, when only few suppliers in the market can provide logistics services, it indicates that an outsourcer has very limited choices and may have high dependence on suppliers, and thus the outsourcer has less power to bargain with the suppliers. Therefore, 3PL providers may behave opportunistically and have fewer incentives to provide quality services. In this case, although top managers are positive with logistics outsourcing, they may have relatively low confidence in the expected success because of the potential dependence issues (Chu et al., 2017). Such low confidence in logistics outsourcing can induce conservative cooperation strategies, thus ultimately restricting the success of logistics outsourcing.

In contrary, when the supplier presence is high, the user firms have more options and thus stronger bargaining power in making outsourcing decision, thereby facing less risk of over-dependence on 3PL providers (Williamson, 1979), whereas 3PL providers are under great competitive pressure and forced to make more efforts to increase customer stickiness (Matusik, 1998). In this case, top managers have more confidence in logistics outsourcing. In addition, the high level of supplier presence provides a friendly environment for logistics outsourcing users, in which top managers can exert their roles much easier through

offering guidelines for employees and setting up favorable policies. Hence, top management beliefs are more likely to contribute to logistics outsourcing success. In sum, we argue that the mediating effects of top management beliefs on the relationship between transaction attributes and outsourcing success are amplified when the supplier presence is high. That is:

**H5.** Supplier presence enhances the indirect effect of asset specificity on outsourcing success through top management beliefs.

**H6.** Supplier presence enhances the indirect effect of technological uncertainty on outsourcing success through top management beliefs.

## 4. Methodology

### 4.1. Sampling and data collection

This study was based on a questionnaire survey in Mainland China. We sampled the subsidiaries of public-listed manufacturing firms, which should operate their business independently in Mainland China. To determine our sample framework, we took the following two steps to generate the subsidiaries list.

**Step 1:** We identified manufacturing firms that are in Shanghai or Shenzhen stock exchange market and that are public-listed in HK stock exchange market with Headquarter locating in Mainland. In doing so, we deleted companies that are classified into the manufacturing industry by China Securities Regulatory Commission, but whose sales mainly come from other service sectors like the real estate industry. 1134 companies from Mainland stock market exchange and 203 companies from HK stock market exchange were identified.

**Step 2:** We selected subsidiaries completely controlled by the firms from Step 1 by analyzing the Annual Report of all firms from Step 1. In total, 5291 subsidiaries of Mainland public-listed manufacturers and 1008 subsidiaries of HK public-listed manufacturing firms were included in our sample framework.

Then, with the help of HTR consulting company which previously belongs to National Bureau of Statistics of China, a survey was conducted with one key informant approach. In total, 6299 questionnaires were sent out, and 200 useable questionnaires were received with a response rate of about 4%. This is acceptable considering the challenges and difficulties in surveying senior managers of public-listed companies. The unit of analysis is at the organization level. The demographics of responding subsidiaries is shown in Tables 1 and 2.

Table 1 shows the diversity of the location of responding subsidiaries. Our responding subsidiaries were from 34 cities in 17 provinces which are half of the total Chinese provinces, indicating representativeness of the sample in terms of location. From Table 2, we can find that the sample distributes evenly in terms of sub-industries, suggesting the adequate representativeness of the sample. Therefore, our sample is acceptable in terms of representativeness.

### 4.2. Measures

The measures were adapted from established instruments in previous literature. In order to enhance the content validity of measures, the adopted measures were subject to review by several experts in logistics outsourcing, focus group discussion with several managers who were in charge of logistics outsourcing, and pilot test with 30 firms. The measures were then revised to be more understandable and valid. The final version of measures is shown in Appendix B. A brief description is as follows.

The measure of asset specificity was adapted from Ang and Cummings (1997) and Miranda and Kim (2006). The respondents were

**Table 1**  
Geographic distribution of sample.

Provinces	No.	Cities	No.
Shanghai	24	Shanghai	24
Beijing	14	Beijing	14
Tianjin	14	Tianjin	14
Chongqing	6	Chongqing	6
Shandong	31	Jinan	9
		Qingdao	4
		Weifang	4
		Yantai	9
		Taiwan	1
		Linyi	4
Jiangsu	30	Nanjing	11
		Suzhou	7
		Wuxi	10
		Nantong	1
		Changzhou	1
Zhejiang	24	Hangzhou	11
		Ningbo	12
		Shaoxing	1
Fujian	12	Fuzhou	1
		Xiamen	7
		Quanzhou	4
Liaoning	10	Shenyang	8
		Dalian	2
Heilongjiang	3	Ha'erbin	3
Hebei	6	Shijiazhuang	6
Hubei	12	Wuhan	12
Hunan	5	Changsha	5
Henan	3	Zhengzhou	3
Guangdong	30	Shenzhen	20
		Guangzhou	5
		Zhuhai	1
		Dongguan	4
Shanxi	3	Xian	3
Sichuan	23	Chengdu	23

**Table 2**  
Company profile.

Industry	Industry code	Parent companies	Subsidiaries
Food and beverage	C0	15	23
Textile, clothing, and leather	C1	11	13
Forestry and furniture	C2	2	2
Paper and printing	C3	4	6
Oil, chemicals, and plastics	C4	19	26
Electronic and electrical equipment	C5	25	27
Metal and non-metal	C6	25	31
Machinery, equipment, and instrument	C7	60	78
Pharmaceuticals and biotechnology	C8	17	19
Information technology (Hardware)	G	15	15
Miscellaneous	C99	3	5
Others		4	5
Total		200	250

asked to answer four questions on the 3PL provider's specific investments in both physical and human assets. The last item (AS4) was dropped because its loading was lower than 0.60. Two items adapted from [Ang and Cummings \(1997\)](#) were employed to measure logistics technological uncertainty. A three-item scale was adapted from [Chatterjee et al. \(2002\)](#) and [Liang et al. \(2007\)](#) to measure top management beliefs in the benefits of logistics outsourcing. The scale of supplier presence was adapted from [Ang and Cummings \(1997\)](#) and [Miranda and Kim \(2006\)](#). Nine items adapted from [Goo et al. \(2008\)](#), [Lee et al. \(2004\)](#), and [Wang \(2002\)](#) were used to measure logistics outsourcing success in terms of cost-benefit, strategic benefit, and

technological benefit. The last item (OS9) of this construct was dropped because its loading was lower than 0.60. All the items were anchored on a 7-point Likert scale, with “1” representing “completely disagree” and “7” representing “completely agree”.

**5. Data analysis and results**

We used LISREL 8.70 to assess the measurement model and structural model, and a bootstrapping estimation procedure was adopted to investigate the significance of mediation effects. Then, we used the macro PROCESS under SPSS 22 to examine conditional process model ([Hayes, 2013](#)).

**5.1. Measurement model**

Following [Fornell and Larcker \(1981\)](#), we conducted a confirmatory factor analysis (CFA) to assess the constructs in terms of convergent validity, discriminant validity, and reliability. The results of the CFA showed fairly acceptable fit statistics:  $\chi^2(142) = 353.04$ , RMSEA = 0.077, NFI = 0.91, CFI = 0.95, IFI = 0.95, GFI = 0.87, and SRMR = 0.055.

We used composite reliability (CR) and Cronbach's alpha to assess the reliability of all constructs. As shown in [Table 3](#), all values of CR (ranging from 0.822 to 0.907) are higher than 0.7, suggesting adequate reliability ([Fornell and Larcker, 1981](#)). In addition, all constructs have a Cronbach's alpha > 0.70 (ranging from 0.820 to 0.905), indicating acceptable reliability ([Nunnally and Bernstein, 1994](#)). [Table 3](#) shows that all factor loadings were greater than 0.60 and significant at the  $p < 0.01$  level. The average variance extracted (AVE) was employed to assess convergent validity. Except the AVE of LOS (0.472) is less than but close to 0.5, all other values of AVE are higher than 0.5, suggesting adequate convergent validity ([Fornell and Larcker, 1981](#)).

The discriminant validity was assessed by comparing the AVE of each construct with the shared variances between that construct and all of the other constructs. Higher AVE of the individual construct than shared variances suggests discriminant validity ([Fornell and Larcker, 1981](#)). [Table 4](#) shows the inter-construct correlations off the diagonal of the matrix. Comparing all the correlations and square roots of AVEs

**Table 3**  
Measurement model.

Item	Loading	T-value*	AVE	CR	Cronbach's alpha
<b>Asset specificity</b>					
AS1	0.78	13.26	0.611	0.824	0.825
AS2	0.72	12.00			
AS3	0.84	14.40			
<b>Technological uncertainty</b>					
TU1	0.87	8.93	0.698	0.822	0.820
TU2	0.80	8.61			
<b>Top management beliefs</b>					
TMB1	0.78	13.87	0.679	0.864	0.863
TMB2	0.84	15.35			
TMB3	0.85	15.46			
<b>Supplier presence</b>					
SP1	0.82	15.32	0.765	0.907	0.905
SP2	0.93	18.68			
SP3	0.87	16.75			
<b>Outsourcing success</b>					
OS1	0.67	11.46	0.472	0.877	0.874
OS2	0.63	10.57			
OS3	0.66	11.16			
OS4	0.78	14.16			
OS5	0.70	12.20			
OS6	0.64	10.66			
OS7	0.66	11.12			
OS8	0.74	12.92			

Note: AVE – average variance extracted; CR – composite reliability. \*All item loadings are significant at  $p < 0.01$  level.

**Table 4**  
Inter-construct correlations.

	(1)	(2)	(3)	(4)	(5)
(1) Asset specificity	<b>0.78</b>				
(2) Technological uncertainty	0.15**	<b>0.84</b>			
(3) Top management beliefs	0.21***	0.21***	<b>0.82</b>		
(4) Supplier presence	0.03	0.15**	0.13*	<b>0.87</b>	
(5) Outsourcing success	0.23***	0.27***	0.36***	0.41***	<b>0.69</b>

Note: The square root of the average variance extracted (AVE) is shown on the diagonal of the matrix in bold. The inter-construct correlations are shown off the diagonal. \*\*\*p < 0.01; \*\*p < 0.05; \*p < 0.1.

shown on the diagonal, the results indicate adequate discriminant validity.

Following Podsakoff et al. (2003) and Richardson et al. (2009), we employed three approaches to assess common method bias (CMB). First, Harman's single-factor test suggested that no one factor accounted for more than 30% of the covariance. Second, as evident in Table 4, there were no excessively high correlations (> 0.7) (Tabachnick and Fidell, 2013). Third, the CFA marker variable approach was conducted with normative pressure as the marker variable. Normative pressure was assessed using three items (adapted from Lai et al., 2010): (NP1) 3 PL has been wildly used by our competitors currently; (NP2) 3 PL has been wildly used by our suppliers currently; (NP3) 3 PL has been wildly used by our customers currently. Following the procedures suggested by Schwarz et al. (2017), we estimated and compared five models. Table 5 shows the results of model comparisons and Appendix C shows the factor loadings of the method-U model. These results suggest that CMB would not unduly impact the hypothesis testing of this study, though it may be present in our data.

5.2. Structural model

Fig. 2 shows the estimation results of the structural model. The goodness of fit indices were  $\chi^2(98) = 270.46$  with RMSEA = 0.084, NFI = 0.91, CFI = 0.94, IFI = 0.95, GFI = 0.88, and SRMR = 0.054, suggesting an acceptable fit. As indicated by path coefficients and their significance levels, both 3 PL provider's asset specificity ( $\beta = 0.13$ ;  $p < 0.1$ ) and logistics technological uncertainty ( $\beta = 0.19$ ;  $p < 0.05$ ) have significant positive impacts on logistics outsourcing success, supporting H1 and H2.

To test the mediating effects of top management beliefs, we calculated the indirect effects by multiplying the path coefficients from transaction attributes (asset specificity, technological uncertainty) to top management beliefs (a) and from top management beliefs to outsourcing success (b). We tested the significance of the mediation effects using the Sobel test (Sobel, 1982). If the Sobel test leads to the critical z-value of 1.96, the mediator carries the influence of the independent variable on the dependent variable. The results suggest that the indirect

**Table 5**  
Chi-square, goodness-of-fit values, and model comparison tests (CFA marker).

Model	$\chi^2$	df	CFI
CFA	448.63	194	0.95
Baseline	492.89	204	0.94
Method-C	472.05	203	0.95
<b>Method-U</b>	<b>424.94</b>	<b>185</b>	<b>0.95</b>
Method-R	428.03	195	0.95
Chi-square Model Comparison Tests			
$\Delta$ Models	$\Delta\chi^2$	$\Delta$ df	$\chi^2$ critical value at 0.05
Baseline vs. Method-C	20.84**	1	3.84
Method-C vs. Method-U	47.11**	18	28.87
Method-U vs. Method-R	3.09	10	18.31

Note: The comparison results suggest Method-U Model is accepted; \*\*Significant at p < 0.05 level.

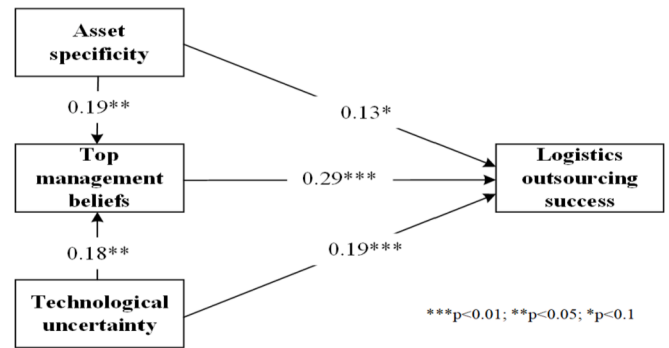


Fig. 2. Structural model with parameter estimates.

effect of asset specificity on logistics outsourcing success through top management beliefs is positive and significant ( $\beta = 0.19 \times 0.29 = 0.055$ ;  $p < 0.05$ ), suggesting support for H3. The indirect path from logistics technological uncertainty to logistics outsourcing success through top management beliefs is  $0.18 \times 0.29 = 0.052$  and significant at 0.05 level, suggesting support for H4. We also estimated the indirect effects using the Bayesian estimation with bias-corrected bootstrapping following the procedure suggested by Preacher and Hayes (2004, 2008). The results further confirm the support for H3 (with a 95% bias-corrected bootstrap confidence interval: [0.0193, 0.1074]) and H4 (with a 95% bias-corrected bootstrap confidence interval: [0.0142, 0.1135]).

When a mediation process is dependent on a moderator variable, there exists a moderated mediation effect (Calantone et al., 2017; Hayes, 2013). To test the moderating role of supplier presence on two mediating effects, we built moderated mediation models using “Model 58” proposed by Hayes (2013), as shown in Fig. 3. Specifically, we selected “Model 58” in PROCESS with a bootstrap analysis on 10,000 resamples, from which bias-corrected 95-percentile confidence intervals (CI) were estimated. PROCESS is a SPSS macro program, which was developed by Hayes (2013) for assessing the complex models including both mediator and moderator variables. It has been widely used in previous studies (e.g., Lin et al., 2016; Ojha et al., 2018; Xie et al., 2018). Moderated mediation exists when any confidence interval excludes 0, which indicates the moderation effect at some level of mediation.

The results in Table 6 show that the conditional indirect effect of asset specificity on logistics outsourcing success through top management beliefs is significant when the level of supplier presence is high (95% bias-corrected CI: [0.0277 to 0.1672]), although it is insignificant when supplier presence is low (95% bias-corrected CI: [-0.0468 to 0.0668]). This confirms that supplier presence enhances the indirect effect of asset specificity on outsourcing success through top management beliefs, providing support for H5.

Similarly, the moderated mediation effect of top management beliefs on the relationship between technological uncertainty and outsourcing success is examined. As shown in Table 7, with 10,000 resamples, the conditional indirect effect is significant when supplier presence is high (95% bias-corrected CI: [0.0188 to 0.1658]) but is insignificant when supplier presence is low (95% bias-corrected CI: [-0.0259 to 0.0882]). This confirms that the mediation effect of top management beliefs on the relationship between technological uncertainty and outsourcing success is stronger when supplier presence is higher, providing support for H6.

6. Discussion and conclusions

6.1. Major findings

Drawing upon transaction cost theory and extended resource-based view, this study examines how transaction attributes affect outsourcing

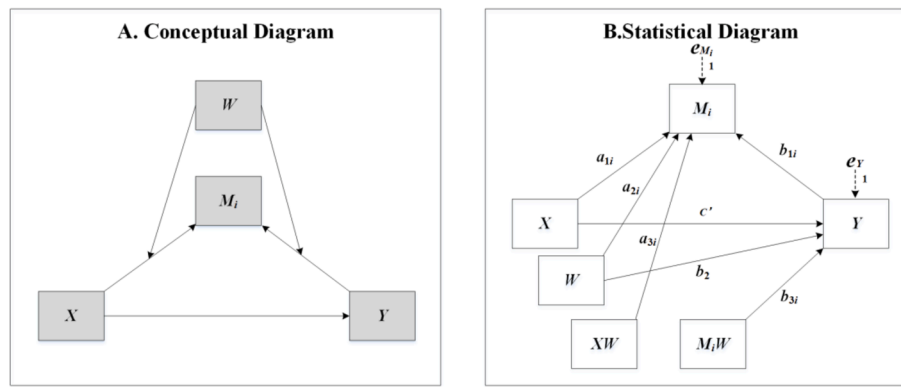


Fig. 3. Moderated mediation.

performance. The results reveal several valuable findings, as elaborated as follows.

First, transaction attributes, both 3 PL providers’ asset specificity and logistics technological uncertainty, have positive impacts on outsourcing success. On the one hand, asset specificity is suggested to play a critical role in safeguarding cooperative relations and reducing opportunistic behaviors. On the other hand, the positive relationship between technological uncertainty and outsourcing success suggests the great importance of technologies in the logistics industry as well as collaborative relationships in the logistics outsourcing process. Although high technological uncertainty is a disadvantage for firms to conduct logistics activities in-house, it can drive coordination in the outsourcing process and thus promotes logistics outsourcing success.

Second, the results show that top management beliefs significantly mediate the influences of transaction attributes on logistics outsourcing success. This finding indicates that top managers, as decision makers, play an essential role in the success of logistics outsourcing. This is consistent with the findings of several previous studies (Dai et al., 2014; Liang et al., 2007) that top management mediates the influences of external factors on firms decisions or strategic outcomes.

Third, the results also suggest that the mediating mechanism of top management is contingent on supplier presence. When the supplier presence is high, top management beliefs significantly carry the effects of transaction attributes on outsourcing success. However, when supplier presence is low, the mediation effects of top management beliefs are insignificant. It may be because the beliefs in the logistics outsourcing benefits are easier to be developed and executed for promoting inter-firm collaboration and outsourcing success when there are a larger number of qualified service providers in the market. In contrast, despite that top management may prefer outsourcing logistics activities for the economic purpose (from the TCT perspective), their positive beliefs in logistics outsourcing may be offset because the low presence of alternative suppliers in the market may result in a low confidence in developing organizational capabilities (from the RBV perspective). In this case, top managers may take a watching stance and are reluctant to devote strategic resources to this outsourcing. In addition, the dependency on 3 PL providers might be developed, and the effects of top

management beliefs might be offset, even canceled by this dependency. Another explanation is that even the top management has strong beliefs in the logistics outsourcing benefits, developed from whatever sources, these beliefs are constrained by the market – no or limited number of 3 PL providers can help the top management to realize their beliefs. This result supports the view that TCT and RBV are complementary in understanding the outsourcing phenomenon (Vivek et al., 2008). When assessing and implementing logistics outsourcing, outsourcers consider not only economic rents but also capability development (Neves et al., 2014). The finding is also consistent with the argument of McIvor (2009) that the potentials for performance improvement in terms of cost, service, and quality should be balanced by the current condition in the supply market.

6.2. Research implications

This study contributes to the literature in several aspects. First, this study enriches the literature on logistics outsourcing by examining logistics outsourcing success. While most previous use operational or financial performance to assess the outcome of logistics outsourcing (Chu and Wang, 2012; Huo et al., 2015; Lai et al., 2013a; Qureshi et al., 2017), this study employs logistics outsourcing success which may better assess the outcome of logistics outsourcing from a broader perspective, including strategic, technological, and economic impacts. Moreover, we examined logistics outsourcing performance in a unified form by integrating cost perspective and resource perspective (i.e., TCT and ERBV). The results confirm the transactional determinants of logistics outsourcing success (i.e., 3 PL providers’ asset specificity and logistics technological uncertainty). Furthermore, the comprehensive framework helps identify the mechanism of how and when transaction attributes affect outsourcing success (i.e., through affecting top management beliefs, when many trustworthy 3 PL providers are available).

Second, this study contributes to the TCT literature by extending TCT from explaining the outsourcing decision to explaining outsourcing outcomes. With the tradition of TCT, transaction attributes affect the decision on the choice of governances because of their incurred transaction costs. Our findings suggest that within a logistics outsourcing

Table 6  
Conditional indirect effect of asset specificity on outsourcing success through top management beliefs moderated by supplier presence.

Mediator	Condition	Conditional indirect effect of supplier presence		
		Effect	SE	95% CI
Top management beliefs	Low (-1 SD)	0.0032	0.0267	[-0.0468 to 0.0668]
	Middle (0)	0.0384	0.0192	[0.0094 to 0.0879]
	High (+1 SD)	0.0764	0.0330	[0.0277 to 0.1672]

Note: Bootstrap resample = 10,000. Conditions for the moderator (supplier presence) are the mean and plus/minus one standard deviation from the mean. SE = standard error; CI = confidence interval. Estimates were calculated using the PROCESS macro.



**Table 7**  
Conditional indirect effect of technological uncertainty on outsourcing success through top management beliefs moderated by supplier presence.

Mediator	Condition	Conditional indirect effect of supplier presence		
		Effect	SE	95% CI
Top management beliefs	Low (−1 SD)	0.0120	0.0267	[−0.0259 to 0.0882]
	Middle (0)	0.0385	0.0222	[0.0060 to 0.0959]
	High (+1 SD)	0.0677	0.0347	[0.0188 to 0.1658]

Note: Bootstrap resample = 10,000. Conditions for the moderator (supplier presence) are the mean and plus/minus one standard deviation from the mean. SE = standard error; CI = confidence interval. Estimates were calculated using the PROCESS macro.

relationship (i.e., the decision has been made to outsource), perceived risks related to transaction attributes (i.e., 3 PL providers’ asset specificity and logistics technological uncertainty) would affect the outcomes of the outsourcing.

Third, this study also enriches the resource-based view by examining the role of top management in evaluating logistics outsourcing and managing resource integration in the outsourcing process. The findings outline the importance of top management in achieving logistics outsourcing success. In addition, extending previous research on top management that stresses the mediating mechanism of top management beliefs (Dai et al., 2014; Liang et al., 2007), this study further reveals that such mediating mechanism is not universally effective. This mechanism is effective only when the logistics outsourcing market is favorable; that is, qualified logistics service providers are available in the market.

6.3. Managerial implications

The findings offer several implications for logistics practitioners. First, the findings suggest that firms are more likely to achieve outsourcing success when the 3 PL providers’ asset specificity is high. Hence, when outsourcing logistics activities, firms should ask 3 PL providers to invest in user-specific assets, such as hardware tailored to their special needs, or specifically trained employees, to lock in the suppliers.

Second, when firms are unable to predict the logistics technological development, it is easier to achieve logistics success if the logistics activities are outsourced to professional logistics service providers. We are indeed in the era of radical technological changes. These technologies become ever sophisticated and complicated, which cannot be easily assimilated and operated in-house.

Third, our findings indicate that top management beliefs are important for logistics outsourcing success. Therefore, with logistics outsourcing, top managers should formulate appropriate beliefs in the benefits of logistics outsourcing and share such beliefs to employees and functional departments. Such beliefs may serve as a signal to all employees and departments that logistics success is inevitable. The

unwavering beliefs, in turn, motivate and guide all employees and departments to realize the beliefs.

Finally, the findings show that the influence of transaction attributes carried by top management beliefs on logistics outsourcing success is stronger when supplier presence is high. Accordingly, when many trustworthy 3 PL providers are available, firms may enjoy the benefits of logistics outsourcing and get success easily. In this circumstance, top management should make more efforts in sharing their beliefs in logistics outsourcing success. In contrast, when trustworthy alternatives are unavailable or limited, top managers should exercise caution on logistics outsourcing with the awareness of the risks of potential over-dependence issues.

6.4. Limitations and future research directions

While this study provides valuable insights for research and practice, it also suffers from several limitations. First, this study only examined the influence of transaction attributes on logistics outsourcing success. Future research may explore other determinants of logistics outsourcing success. Second, this study just investigated the moderation effect of supplier presence; future works may examine the influences of other environmental factors such as environmental dynamics, institutional pressures, among others. Third, our sample was based on subsidiaries of publicly traded Chinese manufacturers. Due to cultural differences and economic development status of the area where the firms operated, it would provide interesting insights if future research examines the effects of transaction attributes on logistics outsourcing success across countries.

Declarations of interest

None.

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Appendix A. Literature review on logistics outsourcing performance

Sources	Antecedent(s)	Outcome variable(s)	Theory
Cho et al. (2008)	<ul style="list-style-type: none"> <li>Logistics capability</li> <li>Logistics outsourcing (mediator)</li> </ul>	<ul style="list-style-type: none"> <li>Financial performance</li> <li>Customer satisfaction</li> </ul>	N/A
Gotzamani et al. (2010)	<ul style="list-style-type: none"> <li>Quality status</li> </ul>	<ul style="list-style-type: none"> <li>Financial performance</li> </ul>	N/A
Chu and Wang (2012)	<ul style="list-style-type: none"> <li>Dependence</li> <li>Relationship characteristics</li> <li>Relationship quality</li> </ul>	<ul style="list-style-type: none"> <li>Financial performance</li> </ul>	<ul style="list-style-type: none"> <li>Transaction cost theory</li> <li>Resource dependency theory</li> </ul>
Yeung et al. (2012)	<ul style="list-style-type: none"> <li>Exporters’ strategic orientation towards 3 PL providers</li> <li>3 PL providers’ basic capability</li> <li>3 PL providers’ augmented capability</li> <li>Exporters’ competitive advantage</li> </ul>	<ul style="list-style-type: none"> <li>Financial performance</li> </ul>	<ul style="list-style-type: none"> <li>Resource-based view</li> </ul>

Lai et al. (2013a, 2013b)	<ul style="list-style-type: none"> <li>● Dependence</li> <li>● Relationship quality</li> <li>● Logistics integration</li> </ul>	<ul style="list-style-type: none"> <li>● Financial performance</li> </ul>	<ul style="list-style-type: none"> <li>● Resource dependency theory</li> </ul>
Liu et al. (2015)	<ul style="list-style-type: none"> <li>● 3 PL integration</li> <li>● Logistics outsourcing</li> </ul>	<ul style="list-style-type: none"> <li>● Operational performance</li> <li>● Financial performance</li> </ul>	<ul style="list-style-type: none"> <li>● Resource-based view</li> </ul>
Zailani et al. (2015)	<ul style="list-style-type: none"> <li>● Human asset specificity</li> <li>● Physical asset specificity</li> <li>● Transaction Uncertainty</li> <li>● Logistics outsourcing practices (mediator)</li> </ul>	<ul style="list-style-type: none"> <li>● Strategic focus</li> <li>● Operative ability</li> <li>● Financial benefits</li> </ul>	<ul style="list-style-type: none"> <li>● Transaction cost theory</li> </ul>
Hashai (2016)	<ul style="list-style-type: none"> <li>● R&amp;D intensity</li> <li>● R&amp;D collaboration</li> <li>● Integration of customer-facing activities</li> </ul>	<ul style="list-style-type: none"> <li>● Technological knowledge exploration</li> </ul>	<ul style="list-style-type: none"> <li>● Transaction cost theory</li> <li>● Knowledge-based view</li> </ul>
Shi et al. (2016)	<ul style="list-style-type: none"> <li>● Asset specificity</li> <li>● Uncertainty</li> <li>● Order frequency</li> <li>● Transaction size</li> <li>● Third-party purchase service (mediator)</li> </ul>	<ul style="list-style-type: none"> <li>● Value-to-client (focus on core competencies, minimize purchasing risks, and maintain a long-term relationship)</li> <li>● Benefit-to-provider</li> </ul>	<ul style="list-style-type: none"> <li>● Transaction cost theory</li> <li>● Resource-based view</li> <li>● Social exchange theory</li> </ul>
Yang et al. (2016)	<ul style="list-style-type: none"> <li>● Transaction uncertainties</li> <li>● Control mechanisms</li> </ul>	<ul style="list-style-type: none"> <li>● Operational performance;</li> <li>● Satisfaction to vendor</li> </ul>	<ul style="list-style-type: none"> <li>● Transaction cost theory</li> </ul>
Chu et al. (2017)	<ul style="list-style-type: none"> <li>● Dependence</li> <li>● Guanxi</li> <li>● Uncertainty (moderator)</li> <li>● Asset specificity (moderator)</li> </ul>	<ul style="list-style-type: none"> <li>● Operational performance</li> </ul>	<ul style="list-style-type: none"> <li>● Transaction cost theory</li> </ul>
Zhu et al. (2017)	<ul style="list-style-type: none"> <li>● Basic logistics outsourcing</li> <li>● Advanced logistics outsourcing</li> <li>● Outsourcing management process (moderator)</li> </ul>	<ul style="list-style-type: none"> <li>● Cost performance;</li> <li>● Delivery performance</li> </ul>	<ul style="list-style-type: none"> <li>● Resource-based views</li> </ul>

Appendix B. Constructs and items

Constructs	Items
Asset specificity	
AS1	If we use 3 PL, they would have to make substantial investments in hardware tailored to our needs.
AS2	Compared to our competitors, our logistics facilities and service are relatively unique.
AS3	If we use 3 PL, they would have to make substantial investments in hardware tailored to our needs.
AS4	Managing our logistics activities requires specifically trained employees.(dropped)
Technological uncertainty	
TU1	We believe that the technological obsolescence of our logistics activities needed by our firm cannot be predicted.
TU2	It is difficult to foresee and keep up with the development change in logistics technology.
Top management beliefs	
TMB1	The senior management of our firm believes that logistics outsourcing has the potential to provide significant business efficiency to the firm.
TMB2	The senior management of our firm believes that logistics outsourcing will create a competitive arena for firms.
TMB3	The senior management of our firm believes that logistics outsourcing has the potential to provide significant business benefits to the firm.
Supplier presence	
SP1	There are a sufficient number of reputable 3 PLs who potentially could provide logistics services to us.
SP2	There are a sufficient number of trustworthy 3 PLs who potentially could provide logistics services to us.
SP3	There are a sufficient number of reliable 3 PLs who potentially could provide logistics services to us.
Outsourcing success	
OS1	We have been able to enhance logistics competence.
OS2	We have been able to gain access to skilled logistics personnel.
OS3	We have enhanced economies of scale in human resource.
OS4	We have enhanced economies of scale in logistics technological resource.
OS5	We have increased control of logistics expenses.
OS6	We have reduced the risk of logistics technological obsolescence.
OS7	We have increased access to key logistics technologies.
OS8	We have increased operational efficiency of using logistics technologies.
OS9	We have been able to refocus on core business. (dropped)

Appendix C. Method-U Model factor loading

Indicator	Asset specificity	Technological uncertainty	Top management beliefs	Supplier presence	Logistics outsourcing success	Method variable
AS1	0.78					0.24**
AS2	0.71					0.22**
AS3	0.84					0.26**
TU1		0.80				0.15**
TU2		0.85				0.11
TMB1			0.74			-0.02
TMB2			0.82			-0.09
TMB3			0.81			-0.09
SP1				0.77		0.28**
SP2				0.89		0.29**
SP3				0.82		0.29**

OS1	0.56	0.39**
OS2	0.61	0.17**
OS3	0.63	0.20**
OS4	0.71	0.32**
OS5	0.61	0.37**
OS6	0.59	0.25**
OS7	0.67	0.14**
OS8	0.71	0.21**
MV1		0.86 <sup>a</sup>
MV2		0.87 <sup>a</sup>
MV3		0.80 <sup>a</sup>

Note: \*\*p < 0.05.

<sup>a</sup> Factor loadings taken from the baseline model are fixed values.

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