

The Impact of Different Innovation Modes on Export Performance of Chinese Firms

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A growing number of Chinese firms have chosen to enter the export market to benefit from the global market. The analysis of determinants of export performance has become significantly crucial within the context of emerging markets. This study looks at two aspects of innovation strategy, namely internal and external innovation and their effects on exports, which is the first step of internationalization. Drawing on the resource-based view (RBV) and institutional-based view (IBV), the study investigates the role of different innovation modes in shaping the export performance of Chinese firms in the presence of institutional obstacles. The findings show external innovation strategy enables Chinese firms to perform better in the export market. However, the export performance will be negatively affected if firms adopt both innovation strategies. In Tsinghua University's addition, the impact of the external innovation model is amplified for firms that encounter more institutional obstacles.

Keywords: export behavior, innovation strategy, internationalization, institutional environment

INTRODUCTION

In the current economic context of increasing globalization, firms can no longer ignore the influence of international competition. The increasing engagement of firms in export activities has indicated that firms are reluctant to rely solely on their local market. Exporting, as the quickest and easiest way for firms to enter foreign markets and engage in internationalization, plays a vital role in organizational strategies and long-term success. More specifically, exporting enables firms to enter the global market, providing them with new technologies, economies of scale and improved productivity (Child and Rodrigues, 2005; Julian et al., 2012; Stoian et al., 2018). As a result, the research interest in which factors are critical to a firm's export success has remained strong over the past two decades (Zou and Stan, 1998; Gao et al., 2010; Agosin et al., 2012; Chen et al., 2016). Many factors, including government policies, domestic market characteristics and strong competencies, have been discussed at both micro and macro-level (Sousa et al., 2008). Following this line of research, many recent studies on export performance have associated the innovation capability of the firms with their export performance (Singh, 2009, Filipescu et al., 2013, Yi et al., 2013). As an essential source of competitive advantages, innovation enables firms to eventually

eliminate the performance gap derived from uncertainties in the external environment and succeed in the global market.

More specifically, the rapidly changing global market environment requires firms to operate more effectively and efficiently. Therefore, firms adopt innovation to respond quickly to external changes and uncertainties before the increasing competition in the export market erodes their existing competitive advantages. Firms have different ways to conduct innovation activities. On the one hand, firms can use continuous internal investments to generate sufficient critical resources for innovation development. On the other hand, firms can acquire external technology through outsourcing, licensing, and company acquisition or by hiring qualified researchers with relevant knowledge (Cassiman and Veugelers, 2006). Besides, many firms will adopt both innovation strategies to maximize global market returns. Compared with in-house R&D activities, external technology sourcing may alleviate the challenges derived from faster product renewal and increasing R&D costs (Berchicci, 2013). However, searching for external sources of knowledge could also be time-consuming and expensive. Although the advantages and downsides of both innovation strategies are well documented in the context of the innovation enhancement effect, little is known about their impact on firms' exporting performance. It is reasonable to argue that different results will be obtained due to the unique characteristics of internal and external R&D.

Therefore, although the relationship between innovation capability and export performance has been well-explored, the role of different innovation modes in explaining organization export strategies and export performance has been largely unexplored by scholars, especially in the context of the emerging economy. This will lead to significant shortcomings since firms have different strategies to conduct innovation activities which may influence their export performance profoundly. The role of varying innovation modes is more salient in the emerging economy because firms used to rely heavily on external innovation strategies due to the lack of an internal knowledge base. However, with emerging countries' development, more firms tend to consider depending on internal investments to achieve sustainable development in the global markets (Chiaroni et al., 2011). As a result, since firms from emerging economies begin to engage in both innovation modes, omitting the difference between different innovation strategies will also limit our understanding of exporting.

On the other hand, the institutional environments of the emerging economy are also worth investigating when examining the relationship between innovation and export since the business and political environments have changed significantly. This study focuses on Chinese privately-owned firms belonging to the manufacturing segment. China is an exciting context for studying factors associated with export and innovation performance due to the sophistication of its exports, the diversification of its product mix, and growing trade liberalization and innovation capabilities. Thus, the choice of Chinese firms is justified by these facts.

This study advances the literature on innovation and internationalization in an emerging economy in two ways. First, recent theorizing on innovation and exporting focuses on the nexus between innovation capabilities and internationalization but overlooks how different innovation strategies affect the firms' export performance. A new economic landscape in the context of emerging economies requires a combination of internationalization and innovation to achieve competitiveness. This study addresses this gap by considering how two different innovation modes, namely internal or in-house innovation and external innovation, may enhance or constrain the export performance of firms that originated from emerging economies. Second, the role of institutions is more salient in emerging economies because the rules are fundamentally different from those adopted by developed countries. Previous studies in this area have ignored how institutional obstacles of emerging economies may influence the relationship between innovation and exporting activities. In particular, most studies focus on national-level institutions, which implicitly assume that the firms experience similar institutional pressures when undertaking exporting activities. However, Chinese firms exhibit significant variations in dealing with institutional obstacles, which lead to different competitive advantages. Therefore, examining the impact of the institutional context using general indicators at the national level will limit our understanding of the relationship between export activities and heterogeneity in the institutional environment from individual firms' perspectives. Thus, this study also extends previous literature on innovation modes by investigating the influence of potential

institutional obstacles that firms might encounter during global expansion. Also, while prior studies have focused on the direct effect of institutions on firms' export performance in emerging economies (Gao et al., 2010), it remains unclear how institutional obstacles affect export performance by moderating the effect of innovation capabilities of the firm. By integrating the RBV and institutional-based view (IBV), this study provides a practical, theoretical framework for analyzing this hitherto ignored relationship. This study argues that institutional obstacles mediate the relationship between innovation modes and exporting activities by viewing it as a firm-level innovation supporting institution (Wu et al., 2016; Yi et al., 2013). This framework explains how innovation strategy and firm-specific institutional idiosyncrasies jointly shape Chinese firms' exporting activities.

The empirical analyses are conducted based on the most comprehensive data on Chinese enterprises regarding export performance and innovation activities, World Bank China Enterprise Survey (2012). This study uses critical variables of the dataset to study the relationship between innovation modes and export performance.

The study is structured as follows. The following section presents the theory development and hypotheses, followed by a description of the empirical research and a discussion of the results. The final section discusses the contribution and limitations of the study.

THEORETICAL BACKGROUND AND LITERATURE REVIEW

Innovation Modes and Export Performance

Innovative investments enable firms to develop more outstanding capabilities to meet global demands. Firms willing to invest in innovation will likely produce good products to boost their sales in the export markets (Golovko and Valentini, 2011). Exporting may put firms at a disadvantage in the markets due to sunk costs, including additional transportation or administrative fees. However, investments in innovation could help the firm diminish these costs as engaging in innovation may improve the firm's productivity (Cassiman and Golovko, 2011). Consequently, innovation capability may contribute to firms' export performance. Although there is rich empirical literature that identifies the positive link between innovation and exporting performance (Filipescu et al., 2013; Yi et al., 2013; Chiva et al., 2014; Rialp-Criado and Komochkova, 2017), the effect of different innovation modes, classified into internal and external innovation strategy, has been mostly neglected in previous studies. Consistent with the existing literature, this study focuses on how firms develop competitive competence from different innovation strategies to help them succeed in the global market.

There are many ways that firms could carry out innovation. On the one hand, firms could generate sufficient critical mass through continuous internal investments. Internal innovation strategy may be developed by learning-by-doing or learning-by-using and is generally embodied in organizations (Teece, 1986). On the other hand, firms may adopt external knowledge sources through licensing, R&D outsourcing or company acquisition. From the RBV perspective, the internal strategy has advantages over external acquisitions. Primarily, it encourages firms to innovate by using existing technology and make the firm independent of other competitors. However, external R&D may provide firms with resources that are not available internally. Therefore, several potential benefits may be acquired by a firm through R&D outsourcing. First, an external innovation strategy enables firms to control their budget better and reduce the fixed costs of innovation (Grimpe and Kaiser, 2010). By using this strategy, firms could benefit from the cost advantages and perform better in the export market. Second, R&D outsourcing provides firms with quality advantages since the contractors can employ specialized know-how, equipment, and infrastructure.

On the contrary, internal R&D strategy may be less efficient since low-skilled workers cannot easily replace skilled R&D employees if firms lack R&D personnel. Also, the product development for overseas markets could be delayed due to the limited innovation capabilities. As a result, firms become less competitive in their exporting activities. External technology may help companies overcome the drawbacks of internal innovation through in-house R&D by simulating firms' innovation ability by absorbing advanced external knowledge, which will enable firms to secure and enhance their competitive advantages to compete in the international markets. As a result, firms who adopt an external innovation strategy can gain

competitive competencies, which are considered an essential determinant of export performance. Such an innovation strategy enables firms to overcome innovation constraints due to limited internal resources and technological development abroad. The preceding reasoning leads us to propose the following hypothesis about the relationship between export performance and innovation modes:

Hypothesis 1: Adopting the external innovation model positively impacts the export performance of Chinese firms.

In search of competitive advantages, firms can not solely depend on internal R&D. Although internal R&D plays an essential role in determining the firm's innovation performance, firms also need to look for external knowledge resources as a necessary complement to in-house R&D (Cassiman and Veugelers, 2006). According to the RBV, imitable and rare resources are the key to realizing technological capabilities. However, these resources are not always available to the firm, given the technical complexity of the business environment. In other words, firms must acquire external knowledge outside the scope of the firm's in-house R&D capabilities and combine external knowledge with internal knowledge to achieve potential competitive advantages. The rationale behind this notion is that innovation nowadays involves various complex knowledge and technologies.

Only relying on in-house R&D would lead to low efficiency in innovation performance due to missing out on critical technology opportunities (Kafouros and Buckley, 2008). Due to the fast-changing technology environment, firms should upgrade their technological capabilities, which are rare and imitable, by exploring and integrating external know-how to broaden their innovation knowledge base. Given the nature of fast product cycles, firms have less than enough time to cultivate the technology independently. Hence, seeking the opportunities to gain access to external knowledge through licensing, outsourcing or acquisitions would enable the firm to enlarge its knowledge base while strengthening its capabilities, leading to increased competitive advantages. This strategy would provide firms with sustainable technological advantages which are difficult to imitate. In line with this argument, empirical studies show that using ready-to-use external technologies enables firms to reduce technical uncertainties and shorten the new product development life cycle (Kafouros and Forsant, 2012).

Adopting both modes helps firms develop their innovation capabilities better and differentiate themselves from rivals. The RBV perspective, which views firms as entities that enable knowledge creation, also indicates that using both innovation strategies is a way to equip firms with the knowledge they need in the export market. In particular, the global market is technological diversity where the technological changes are fast and unpredictable. Adopting both innovation strategies becomes necessary to prevent risks that dramatically threaten market stability. Also, firms tend to adopt external innovation strategies to gain flexibility and speed when expanding globally. However, the competitiveness of export markets is relatively high. Internal innovation strategy is also valuable since it gives firms the first-mover advantage and generates barriers to imitation. Therefore, firms will gain competitive advantages in international markets and boost export performance. In other words, firms adopting both innovation modes can achieve a better position in the export market due to their enlarged knowledge base and more vital innovation capabilities, thus increasing their export performance. This discussion leads to the following hypothesis:

Hypothesis 2: Adopting both external and internal innovation modes positively impacts the export performance of Chinese firms.

The Moderating Role of Institutional Obstacles

Many obstacles need to be overcome before making reasonable business decisions. Many factors, including government policies, education and research institutions and regulations, are viewed as the determinants of firms' innovation-enhancing effects of internationalization (Yamakawa et al., 2008; Gaur et al., 2014). Compared with domestic markets, export markets are more distant and diverse due to the existence of different institutional environments (Kostova and Zaheer, 1999). Firms may encounter severe institutional difficulties because of the imperfection of the market mechanism or political instability (Hiatt

and Sine, 2014). On the other hand, public institutions will influence the outcome of economic activities by providing public goods and services (Bianchini et al., 2019).

For firms that rely on the internal innovation mode, a well-developed institutional environment reduces uncertainty and possible transaction costs (North, 1991). As a result, fewer institutional barriers will also enhance firms' export performance by reinforcing the role of innovation capabilities. More specifically, institutional barriers are associated with the potential costs generated from internal innovation activities. For instance, a well-functioning institutional environment will provide firms with vigorous enforcement of contracts, security, safety and legal protection. The learning costs of "how to deal with the domestic and foreign institutions" is relatively low, which is easy to understand. Less institutional obstacles will reduce the costs associated with technological innovation and enhance its export performance. By contrast, institutional barriers will increase the transaction costs or uncertainties, making it harder for firms to access necessary resources to support their innovation activities (Zhu et al., 2012).

Also, weak institutional environments, including weak enforcement of laws and government efficiency, will lead to the lack of enough reliable information and service associated with innovation opportunities (Young et al. 2018). These factors will increase innovation activities' uncertainties and limit the internal innovation mode's positive benefits on firms' export performance. Therefore, firms that adopt the internal innovation mode will have different export performances when they enter other countries associated with varying levels of institutional obstacles.

On the other hand, firms that prefer an external innovation strategy are less vulnerable to such external institutional obstacles. In particular, the transition costs of dealing with external R&D partners would be higher if the contracts are incomplete. It is difficult for Chinese firms to formulate a complete agreement if they operate in complex institutional environments where regulatory scrutiny will be imposed. Due to institutional misalignment, they will face a significant liability of foreignness when operating in countries with more developed institutions (Wang et al., 2012). Since the knowledge is highly tangible, the inherent risks of R&D collaborations in a transparent institutional environment with strong regulatory quality could be very costly. The coordination effort will increase the management burden, including transaction costs and monitoring.

Also, firms are reluctant to take risks before fully understanding the institutional environment. However, windows of opportunity also play a vital role in innovation and export performance. Firms must formulate the collaboration contract as soon as possible to gain a first-mover advantage. This could not be achieved if each party's responsibility was not specified. Also, Chinese firms are more used to an institutional void environment given the domestic institutional characteristics. They have gained experience operating in environments lacking the most developed institutions and governance conditions (Cuervo-Cazurra and Genc, 2008). When adopting an external innovation strategy, those experiences would alleviate the risks and uncertainty generated from the unfamiliar institutional environment. As a result, it could enhance the technological capabilities of firms which, in turn, will boost their expansion overseas. Given the above arguments, this study proposes the following:

Hypothesis 3a. *The effects of internal innovation strategy on export performance will be stronger for firms that encounter fewer institutional obstacles.*

Hypothesis 3b. *The effects of external innovation strategy on export performance will be stronger for firms that encounter more institutional obstacles.*

METHODS AND DATA

This study has employed the two-step Heckman selection model (Heckman, 1979) to overcome the selection bias in firms' decisions to enter the global markets. In the first-stage selection model, a probit model has been estimated to capture the export propensity where the dependent variable equals one if firms decide to export and 0 otherwise. The model calculates the Inverse Mills Ratio (IMR) for all firms based on various industry, firm and regional characteristics. In addition, an innovation variable satisfies the

exclusion restriction to address the identification problem (Sartori, 2003). To control for the potential heteroskedasticity problem, the second stage model uses generalized least squares (GLS) to model the export intensity of the firms that export. When examining the direction of causality between innovation modes and export performance, the endogeneity problem could be a concern, given that the outcomes may modify the explanatory variables. To overcome this issue, the independent variable has been lagged to make sure of the direction of causality.

Date and Sample

The dataset used in this empirical analysis comes from a set of People's Republic of China Enterprise Surveys carried out by the World Bank, which covers 2,700 privately-owned and 148 state-owned firms in 2012. It consists of manufacturing and services sectors, and this empirical analysis only focuses on firms in the manufacturing industry. The dataset has rich information about the features of Chinese firms, especially privately-owned firms, including exporting, innovation activities, degree of competition, and business-governance relations. This dataset has its advantages by directly capturing the innovation actions, exports and institutional environment.

Although the survey was carried out in 2012, which may affect the data's effectiveness, this dataset is the latest panel of Chinese enterprise data available to track changes in business environment and activities. Also, it captures the unique features of private firms, which play an increasingly important role in China's "Going out" policy. Therefore, it is a perfect choice to support the study on the relationship between innovation modes and the export performance of Chinese firms. On the other hand, 148 state-owned enterprises (SOEs) have been excluded since the internationalization of Chinese SOEs differs from that of private firms in terms of motivation, entry strategy and managerial capabilities (Buckley et al., 2010; Lin, 2010; Luo et al., 2010; Voss et al., 2010; Xiong et al., 2020). More specifically, the export decisions of Chinese SOEs are shaped mainly by the Chinese government, which could not be fully explained by the factor associated with the business prospect. In addition, given that the survey sampling focused on privately-owned firms, only a tiny proportion of sample firms are SOEs. Thus, keeping only the privately-owned firms in this research is better. After eliminating missing values, this sample was left with 1448 observations from 25 industries for 2010.

Measurements

Export performance. Following previous research (Calof, 1994; Greenaway et al., 2004), two dependent variables have been adopted to measure the export performance of the Chinese firm. Exp is a dichotomous variable that takes the value of 1 if firms decide to export and 0 otherwise. Exp intensity is the percentage of a direct export percentage of the firm's sales in the fiscal year 2010. Various firms, regions and industry characteristic variables have been included in the two-step estimation to determine the firm's export performance.

Innovation modes. There are two significant forms of firms' innovation modes. One is internal innovation which means the innovation was developed within the examined firms (Make). This study captures how much a sample firm spent on R&D activities within the establishment in the last three years. The other mode is external innovation which indicates that innovating firms are mainly based on the innovation developed outside the firm (Buy). This is measured by how much a sample firm spent on research and development activities contracted with other companies in the last three years. Natural logarithms of the R&D expenditure are used in the estimations. Following previous literature (Barbosa and Eiriz, 2009), this study uses lagged measures of Make and Buy, which are predetermined for firms' export performance, to address the possible endogeneity bias. This approach can allow the research to avoid the reverse causality problem. As shown in figure 2, 129 firms use to make innovation mode while 607 firms use the buying strategy.

This study uses the innovation stage (Stage) to measure how much the firm has invested in innovation activities. More specifically, the factor analytic method is adopted in this study to capture how various aspects of innovation interact with one another and to develop correspondent scales. According to previous research, factor analysis is used to identify the underlying patterns for many potential variables, which could

be summarized or condensed into a smaller and manageable set of variables. Principle component analysis (PCA) produces one variable to indicate how much the firms have invested in innovation during the past three years. In addition, the Heckman selection model requires the presence of at least one theory-driven variable that affects the first-stage model but not the second-stage model. Therefore, this model uses Stage, which only appears in the first stage, to control for selection bias.

Institutional obstacles. The institutional environment also influences the effects of different innovation modes on export activities to a large extent. Based on the questionnaire survey, which asked the respondents to what degree the environment is an institutional obstacle to the current operations of the establishment, this study generates a variable to indicate the level of institutional barriers. More specifically, the respondents were required to identify their perception of institutional obstacles affecting their day-to-day business operations, from no to very severe. As shown in figure 2, there are five most severe problems faced by Chinese firms: tax rates, tax administration, business licensing and permits, political instability, corruption and courts. Based on their average subjective assessments of the impact of these variables, this study uses PCA to create a variable (INO) to measure the potential institutional obstacles.

Control variables. A set of control variables captures a category of firm, industry and regional characteristic variables to account for firm heterogeneity. The natural logarithm of the firm's total annual sales for all products and services is used as the indicator of the firm size (Size). The link between the firm's scale and export intensity has been among the most widely analyzed relationships in international business literature. Dunning (2006) suggests that the larger the organization, the greater the capability to sell abroad. Large companies possess more financial and human resources and higher economy of scale levels. The workers' productivity may be another factor affecting the firm's export performance. With more skilled production workers, the firm's productivity more easily meets the demand of the overseas markets. As a result, a positive relationship between productivity growth rate and export performances has been identified in previous research (Guan and Ma, 2003; Monreal-Pérez et al., 2012).

The firm's productivity is measured by the number of skilled production workers (Skill). This study also accounts for the firms' age (Age), as the natural logarithm of firm age, given that the older firms tend to gain more business experience, which is an essential determinant of export success since the experienced firms are more likely to adapt to the different business environments when exporting (Majocchi et al., 2005). Another control variable is the industry dummy to indicate whether the firm is from the high-tech industries or not (Hightec). Based on the classification of manufacturing industries provided by The Organization for Economic Co-operation and Development (OECD) Directorate for science, this research classifies the firm according to the technology intensity of their primary industry. Finally, the location of the firm has been controlled (Loc). In line with previous studies, Loc is coded one if the firm is located in a coastal city of China and 0 otherwise. The Chinese coastal areas are far more advanced than inland cities regarding modern infrastructure and economic output (Zhao and Zou, 2002; Chen and Zheng, 2008). These advantages enable them to expand overseas more easily. In addition, firms from coastal areas have more experience doing business abroad thanks to the 'going out' policy.

EMPIRICAL RESULTS

Common Method Variance

One of the most significant problems related to surveying data is standard method variance (CMV). The correlations become a significant issue given data construction when the dependent and independent variables are from the same sources. This study could avoid such issues for the following reasons. First, the World Bank Enterprise Survey does not ask for any personal information from the respondents, which enables the respondents to answer without concern the social acceptance. This will reduce the risks of CMV associated with respondents' anonymity problems (Siemsen et al., 2010). Second, the dependent variables of two-stage models are not perceptual measures. The export propensity and intensity are objective measurements calculated by firms' financial data. In this case, the CMV problem is less likely to occur.

Hypotheses Tests and Results

Table 1 shows the sample's descriptive results and VIF of all variables. None of the values is above the conventional threshold of 10, suggesting no multicollinearity problem in the model. Heckman's sample selection model over the pooled firm-level data is estimated using a maximum likelihood estimator with the robust standard errors clustered by firm. Table 3 reports the results of the Wald test, which confirms that the correlation between export propensity and export intensity equations is significantly different from zero. In other words, the choice of the Heckman selection model is appropriate due to the existence of sample selection bias. Table 2 also reports estimates for the Heckman selection model with Probit estimates for the export propensity of the model of export performance. The dependent variable is the export propensity, and the independent variables include the innovation modes and institutional-related variables. Model 1 has only the control variables, while the other variables are included in Models 2,3,4,5 and 6.

Table 3 shows the estimates of the second stage of export performance. The dependent variable is export intensity, while the independent variables include the hypothesized variables related to the innovation modes, institutional environment and other firm-specific variables. Model 1 serves as the baseline model since it only consists of the control variables, and subsequent models add main variables and interaction terms (Models 2, 3, 4, 5 and 6). The variables of Loc, Size and Skills have statistically significant impacts on the export intensity, which shows that firms from the coastal area, being larger and having more skilled workers are more likely to engage in export markets. This result aligns with the literature (Chen et al., 2016). Whether the firm is from the high-tech industry has a negative but insignificant effect, partially because the domestic competition level of the high-tech industry is very fierce, which reduces the incentive to engage in exporting. In addition, Age has a negative and significant impact on export performance ($\beta=-0.078$, $p<0.05$), indicating that younger firms are more eager to expand overseas.

According to growing evidence, young firms initiate international business and exemplify early and rapid internationalization (Cavusgil and Knight, 2015). In addition, given their unique intangible resources and capabilities, these young firms choose to export as their first step toward internationalization. Institutional obstacles (INO) appear negative and significant in all models. This indicates that firms encountering fewer obstacles in business will perform better in export markets. Model 2 suggests that using the buying strategy positively relates to the export intensity ($\beta=0.015$, $p<0.01$), providing strong support for Hypothesis 1. In line with Hypothesis 2, Model 3 explores the interactions between two different innovation modes. The interaction term is significant but negative ($\beta=-0.001$, $p<0.1$), contrary to Hypothesis 2. One potential reason is that using both innovation strategies requires an extensive knowledge base and learning ability to assimilate the external knowledge. This process may need additional resources from firms which could impede them from performing well in export markets.

Despite previous studies' suggestion of a positive relationship between external R&D and export performances, there are still some downsides to R&D outsourcing which could have detrimental effects on export behavior. More specifically, it casts doubt on the linkage between internal and external R&D and their impact on the export performances in the context of Chinese firms. According to Cassiman and Veugelers (2006), besides internal sourcing, most firms today will require knowledge from beyond their boundaries. It is argued that make or in-house R&D and external know-how are complimentary, which allows firms to use more efficient resources by combining internal and external information sourcing. However, firms might fail to assimilate and leverage the knowledge when integrating external knowledge, which is negative for realizing export performances.

First, R&D outsourcing may hurt firms' internal innovation in the meantime since many resources are needed, such as management after acquiring the outside knowledge, which diverts resources from internal innovation. Therefore, over-outsourcing may mitigate the benefit of R&D but leads to a tipping point at which the combination of internal and external R&D becomes negatively associated with export performances. Models 4 and 5 examine the moderating impact of institution obstacles on export intensity. The interaction term coefficient in Model 4 is positive and significant ($\beta=0.001$, $p<0.05$), indicating that the potential institutional barriers strengthen the relationship between internal innovation strategy and export intensity. The results do not provide support for H3a.

Similarly, the interaction term in Model 5 is positive and significant ($\beta=0.001, p<0.01$), which indicates the institutional obstacles strengthen the impact of the buy innovation strategy. Thus, H3b is supported. These innovation mode factors can also inform the magnitude of estimated coefficients on export performance. Both make and buy innovation modes positively impact subsequent innovation performance. The coefficient of the buying strategy is the largest of all, which indicates that it is the most critical factor for export performance.

Robustness Checks

Although using lag variables will reduce the endogeneity problems, there might still be unobserved effects that influence the relationship between innovation modes and export performance. One way to address the potential endogeneity problem is to use a generalized method of moments (GMM) which consider the potential econometric issues associated with heteroskedasticity, endogenous variables and autocorrelation (Caldera, 2010). Following Sun (2009), this study uses the Tobit model with GMM estimation. Table 4 represents the results, and the model includes all independent variables and interaction terms. The coefficient of the independent variables, institutional obstacles, and interaction terms remain qualitatively unchanged. Overall, the results are robust to different estimation methods.

DISCUSSION

This study develops an integrative framework that theoretically articulates and empirically tests the impact of different innovation modes on the export performance of the internationalization of Chinese firms. The hypotheses have been underpinned by the RBV and the IBV of firms. Specifically, this paper finds a positive link between external innovation strategy and export intensity. In addition, firms with weak internal innovation capability tend to use external innovation strategies to compensate for weak in-house technological capabilities.

In search of competitive advantages, external innovation strategy enables firms to become more efficient in terms of saving time and costs related to upgrading technological capabilities. Also, noting the combined effect of internal and external innovation modes, this study reveals that adopting both innovation strategies may impede firms' performance better in export performance compared with those who focus solely on external innovation mode. This finding contradicts the previous literature, which argues that firms could benefit from adopting both innovation strategies due to the complementation effect. However, the innovation-enhancing impact on export performance could be limited for the following reasons.

First, assimilating external knowledge involves a significant amount of time and resources. However, Chinese firms lag in global markets regarding necessary experience and related resources (Zhu et al., 2012). Thus, they may shift managerial resources from internal innovation to external innovation since the latter involves less time and uncertainty. Resource reconfiguration may distract firms from going abroad, given their limited resources and experience. The findings support the argument that coping with the uncertainties of exporting markets and achieving superior performance requires balancing internal and external innovation strategies (Doloreux et al., 2018). From the RBV perspective, limited resources could discourage firms from going abroad. Therefore, combining internal and external innovation strategies may mitigate the innovation-enhancing effects to a tipping point at which it becomes negatively associated with export performance. This study confirms that such trade-off effects between different innovation strategies will impact the firms' subsequent performance in Chinese export activities.

In addition, this study also examines to what extent institutional obstacles influence the role of innovation modes in shaping export performance. The findings reveal that the positive effect of different innovation modes becomes amplified for firms that encounter more institution obstacles. In the context of emerging economies, multiple factors will shape the outcomes of export performance. This study finds that the role of both internal and external innovation modes in promoting export performance is more significant for firms that encounter more institutional obstacles. In other words, institutional barriers may drive Chinese firms to expand when they rely on either internal or external innovation strategies globally. Given the imperfect institutional features of emerging economies, firms seek to go into the overseas market to mitigate

the risks and uncertainties they could encounter in the domestic market. Although efficient regulatory or strong institutions are essential to the success of innovation activities, Chinese firms that focus on in-house innovation strategy would choose to go abroad given that the competition level of domestic markets is relatively high. In addition, domestic policies on accessing intangible collateral are still early. The complexity of implementing relevant laws is one of the bottlenecks hindering knowledge-intensive sectors' development. As a result, exporting provides a potential escape route for firms that try to develop their technological capabilities to avoid those risks and uncertainties generated by institutional barriers (Witt and Lewin, 2007).

The rationale behind this notion is that external innovation strategy involves significant transaction costs of dealing with external R&D partners. The incomplete contracts result from poor bargaining, directly associated with limited time and unfamiliarity generated from an institutional distance. It is difficult for a Chinese firm to formulate complete contracts if they operate in an environment where multiple regulations from different ministries or regional governments will be imposed (Wei et al., 2018). Alternatively, firms that prefer external innovation mode become less vulnerable to such institutional obstacles.

The inherent risks of R&D collaborations could be very costly, costing firms the window of opportunity. In addition, Chinese firms are concerned about the effectiveness of external knowledge sourcing, which is essential to the enhancement effect of export performance. Given the imperfect institutions of emerging economies, Chinese firms are more familiar with the potential environment of institutional voids when collaborating with external knowledge sources. As they have more experience dealing with the institutional obstacles, the effects of external innovation strategy on export performance become stronger.

CONCLUSION

Combining RBV and IBV, this study investigates the role of different innovation modes in influencing export performance at the firm level in the existence of institutional obstacles. Based on survey data, the evidence obtained in this study suggests that the external innovation model helps firms to become more engaged in the export markets. However, firms that adopt both innovation strategies might perform poorer in the exporting markets. On the other hand, the influence of the external innovation model has been amplified for firms that encounter more institutional obstacles. This study sheds new light on different innovation modes affecting Chinese firms' export performance.

This study contributes to the growing research on innovation strategies and internationalization. First, by introducing RBV and IBV, this study develops a theoretical mechanism to conceptualize different innovation modes and builds the connection between different modes and export performance in emerging economies. Previous literature focuses mainly on the impact of varying innovation strategies on innovation outcomes which fail to identify and document export performance variations that result from the different innovation modes. This study advances innovation strategy and exporting literature by discussing the unique characteristics of varying innovation modes and how these features would boost or limit firms' internationalization performance.

Second, this study also complements prior studies that represent the relationship between different innovation modes as a dichotomy. More specifically, the relationship is described as either complementary or substitute. However, this study suggests a tipping point at which external innovation strategy would mitigate the complementarities between internal and external innovation modes in the context of export performance. Thus, the effectiveness of innovation in promoting export performance would be compromised if the firms fail to balance internal and external innovation strategies. The benefits of tapping into external innovation strategy would be mitigated by the additional costs of the searching, coordinating and learning process (Berchicci, 2013). Thus, investing in internal and external innovation strategies could expose firms to the risks and uncertainty that fail to generate competitive advantages in the global markets. The empirical results provide a better understanding of the advantages and limitations of two innovation strategies in exporting activities. In addition, the empirical analysis confirms the role of institutional obstacles in shaping the impact of different innovation modes on export performance.

By integrating the IBV perspective, this study conceptualizes the role of institutional obstacles firms may encounter, which the RBV perspective fails to consider. Rather than exploring the direct nexus between institutional factors and export performance, this study complements export literature by focusing on the moderating role of institutional obstacles. The analysis indicates that institutional obstacles may drive firms to expand globally when relying on either internal or external innovation modes. Given the specific institutional features of the emerging economy, the findings challenge the conventional wisdom that institutional obstacles could be a liability for firms in terms of boosting the enhancement effect of innovation. This is particularly true for Chinese firms as exporting alleviates the pressures derived from domestic competition. Therefore, this study adds to the literature on the value of innovation for exporters in the presence of institutional obstacles.

This study has a few limitations, which can serve as suggestions for future research directions. First, the data are cross-sectional, which were drawn from the survey of a single year. This prevents the study from controlling for time-variant variables associated with export performance. Future research may consider employing panel data to control for this unobserved heterogeneity. In addition, this study focuses on institutional obstacles as aspects of the institutional environment. However, other institutional features, including bureaucratic reforms, financial development and regulation quality, may impact export performance. Future studies may want to explore those factors as the base for the theoretical development of innovation and export literature.

FIGURE 1
DIFFERENT INNOVATION MODES ADOPTED BY CHINESE FIRMS
(TOTAL NUMBER OF FIRMS)

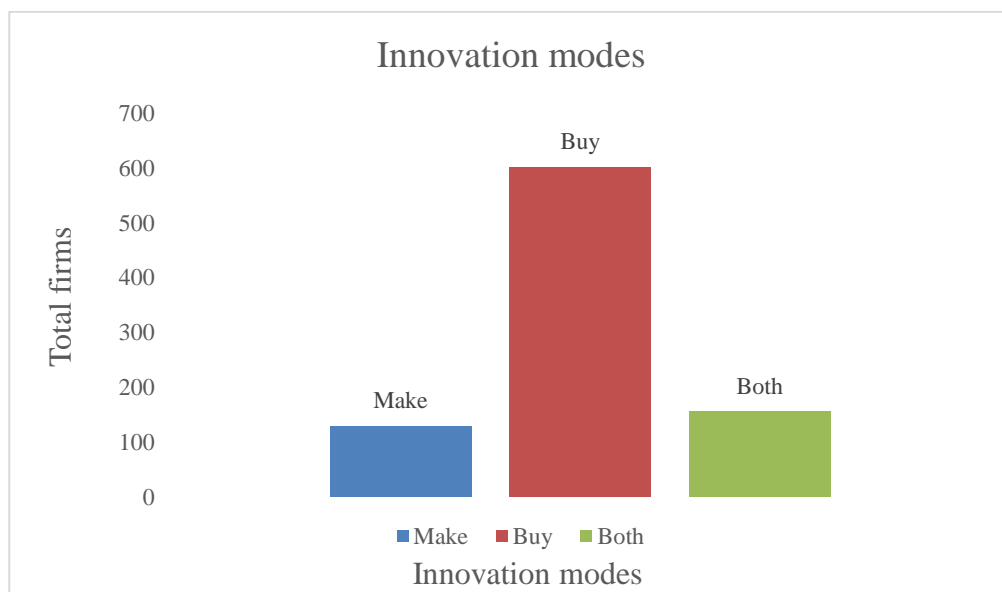


FIGURE 2
THE INSTITUTIONAL OBSTACLES AS PERCEIVED BY CHINESE FIRMS
(IN PERCENT OF THE TOTAL NUMBER OF FIRMS)

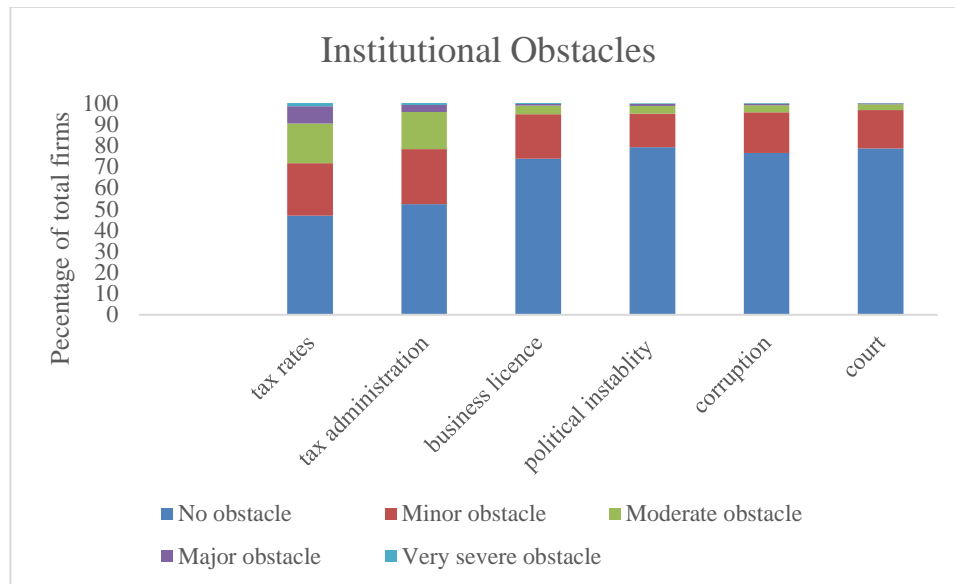


TABLE 1
SUMMARY STATISTIC

Variable	Observation	Mean	S.D.	Min	Max	Vif
Propensity	1,691	0.33	0.47	0.00	1.00	
Intensity	1,691	0.14	0.27	0.00	1.00	
Make	1,691	4.83	6.59	0.00	20.21	1.23
Buy	1,691	1.25	3.93	0.00	17.73	1.19
Loc	1,691	0.36	0.48	0.00	1.00	1.10
Size	1,669	0.00	1.00	-2.95	4.45	1.09
Skill	1,669	0.00	1.00	-2.27	4.36	1.07
Hightec	1,691	0.35	0.48	0.00	1.00	1.05
Age	1,650	2.69	0.40	1.10	4.85	1.04
Stage	1,691	0.00	2.44	-28.74	1.85	1.02
Ino	1,657	0.00	1.88	-1.48	11.00	1.02

TABLE 2
INNOVATION MODES AND EXPORT PROPENSITY

	Export propensity					
	Model1	Model2	Model3	Model4	Model5	Model6
Loc	0.296*** (0.025)	0.401*** (0.066)	0.399*** (0.066)	0.395*** (0.066)	0.201*** (0.038)	0.202*** (0.038)
Size	0.188*** (0.034)	0.118*** (0.033)	0.117** (0.032)	0.113** (0.032)	0.114** (0.035)	0.115** (0.033)
Skill	0.188*** (0.043)	0.196*** (0.031)	0.196*** (0.035)	0.199*** (0.034)	0.197*** (0.033)	0.198*** (0.032)
Hightec	-0.074 (0.702)	-0.077 (0.064)	-0.077 (0.061)	-0.073 (0.063)	-0.074 (0.066)	-0.076 (0.064)
Age	-0.072** (0.043)	-0.076* (0.043)	-0.073* (0.042)	-0.074* (0.041)	-0.075* (0.043)	-0.076* (0.045)
INO	-0.041*** (0.017)	-0.040** (0.016)	-0.044** (0.015)	-0.043** (0.015)	-0.044** (0.018)	-0.043** (0.011)
Stage	-0.006* (0.013)	-0.006 (0.007)	-0.006 (0.007)	-0.006 (0.007)	-0.006 (0.007)	-0.006 (0.007)
Make		0.012** (0.005)	0.011** (0.006)	0.012** (0.005)	0.012** (0.006)	0.011** (0.005)
Buy		0.026 (0.016)	0.023 (0.014)	0.024 (0.014)	0.022 (0.014)	0.025 (0.015)
Make*Buy			0.002 (0.001)			0.002 (0.002)
Make* INO				0.001** (0.001)		0.001* (0.000)
Buy* INO					0.011** (0.001)	0.002 (0.000)
Rho	0.990*** (0.001)	0.996*** (0.002)	0.999*** (0.002)	0.566*** (0.182)	0.566*** (0.182)	0.566*** (0.182)
Sigma	0.526*** (0.022)	0.566*** (0.182)	0.566*** (0.182)	0.566*** (0.182)	0.566*** (0.182)	0.566*** (0.182)
Lambda	0.185*** (0.228)	0.576** (0.182)	0.576** (0.18)	0.576** (0.183)	0.576** (0.183)	0.576** (0.183)

TABLE 3
INNOVATION MODES AND EXPORT INTENSITY

	Export intensity					
	Model1	Model2	Model3	Model4	Model5	Model6
Loc	0.181*** (0.037)	0.200*** (0.038)	0.201*** (0.038)	0.200*** (0.038)	0.201*** (0.038)	0.202*** (0.038)
Size	0.048*** (0.015)	0.036** (0.015)	0.036** (0.015)	0.036** (0.015)	0.036** (0.015)	0.036* (0.015)
Skill	0.052*** (0.018)	0.049*** (0.018)	0.049*** (0.018)	0.049*** (0.018)	0.049*** (0.015)	0.049*** (0.018)
Hightec	-0.028 (0.036)	-0.043 (0.037)	-0.043 (0.038)	-0.044 (0.037)	-0.043 (0.037)	-0.044 (0.038)
Age	-0.078** (0.043)	-0.080* (0.043)	-0.041* (0.043)	-0.082* (0.043)	-0.081 (0.043)	-0.086** (0.044)
INO	-0.027*** (0.009)	-0.019** (0.009)	-0.019** (0.009)	-0.018* (0.009)	-0.017** (0.009)	-0.015 (0.009)
Make		0.006** (0.003)	0.006** (0.003)	0.006* (0.003)	0.006* (0.003)	0.006** (0.003)
Buy		0.015*** (0.004)	0.016*** (0.004)	0.014*** (0.004)	0.014*** (0.004)	0.015*** (0.004)
Make*Buy			-0.001* (0.003)			0.001 (0.002)
Make* INO				0.001** (0.001)		0.001* (0.000)
Buy* INO					0.001*** (0.001)	0.003 (0.000)
Uncensored obs	524	524	524	524	524	524
Wald χ^2	223.87	244.72	223.90	208.47	205.82	122.41
Constant	-1.042*** (0.235)	-0.881*** (0.235)	-0.885*** (0.238)	-0.873*** (0.238)	-0.879 (0.237)***	-0.859*** (0.241)

*p<0.10, **p<0.05 and ***p<0.01 (standard errors in parenthesis).

TABLE 4
TOBIT MODEL

	Export propensity Model1	Export intensity Model2
Loc	0.112** (0.022)	0.113** (0.028)
Size	0.115*** (0.043)	0.036*** (0.043)
Skill	0.104*** (0.012)	0.059** (0.056)
Hightec	-0.055 (0.045)	-0.034 (0.033)
Age	-0.0706* (0.035)	-0.076** (0.034)
INO	-0.045** (0.021)	-0.023 (0.029)
Make	-0.001 (0.007)	0.002* (0.003)
Buy	0.011*** (0.004)	0.011** (0.002)
Make*Buy	0.035 (0.019)	0.011 (0.004)
Make* INO	0.004 (0.001)	0.004* (0.001)
Buy* INO	0.003* (0.001)	0.004 (0.001)
Uncensored obs	524	524
Wald χ^2	120.56	120.56
Constant	-0.851*** (0.121)	-0.851*** (0.121)

*p<0.10, **p<0.05 and ***p<0.01 (standard errors in parenthesis).

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