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Research Article

How Does Technology Import and Export Affect the Innovative Performance of Firms? From the Perspective of Emerging Markets Firms

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As economic globalization develops greatly in recent years, emerging market firms (EMFs) increasingly grasp the opportunity of cross-border learning to develop and improve their technology capability through learning by exporting (LBE) and learning by technology importing (LBTI). Although LBE and LBTI have been supported by extensive literature, it still is not clear what and how EMFs learn through LBE and LBTI. In this study, we highlight the role of human agency by examining how perceived competitive threat from informal firms determines EMFs relative preference for product innovation and process innovation. Based on a World Bank dataset on Chinese manufacturing firms during 2009–2011, this study finds firms facing high (vs. low) perceived informal competition which may devote relatively more attention to product innovation than to process innovation after entering into export markets, whereas firms facing high perceived informal competition may pay more attention to process innovation in process of learning by technology import. This study is the first to focus on the effect of informal sector firms on cross-border learning.

1. Introduction

In the past two decades, the emergence of a group of emerging market firms (EMFs) with high international competitiveness has been a hot topic in international business [1], strategic management [2], marketing [3], and innovation [4]. EMFs operate in home country market characterized underdeveloped institutions and weak factor market that constrain the development of technological capability [4]. Given EMFs' achievement that has amazed the world, a great body of studies has devoted to explain how EMFs overcome the constraints of the home environment and catch up with multinational enterprises (MNEs) from advanced economy [1, 5].

Many scholars treat cross-border learning as the critical mechanisms of EMFs' catch-up. International markets constitute a particularly advantageous terrain for EMFs to get in touch with diverse portfolios of knowledge not available in their home markets. Hence, international markets provide a "springboard" for EMFs to catch up with advanced economy MNEs through learning [1]. Some recent literature studies have identified two key cross-border learning mechanisms for EMFs to enhance their technical capabilities, technology import and learning by doing [3]. As such, a great body of the literature has shown that firms can learn through exporting activities and subsequently achieve productivity gains, which has been labeled as "learning-by-exporting effect (LBE)" [6, 7]. In addition, research has also found technology licensing from foreign origins is positively associated with the licensee firm's technological innovation, labeled as "learning-by-technology-importing effect" (LBTI) [3].

Although LBE and LBTI are supported by extensive literature, we still do not know what EMFs learn from exporting and technology importing and what account for the heterogeneity of LBE and LBTI. Prior literature has mainly focused on the relationship between LBE and LBTI, and the quantity of innovations produced. Yet, firms are viewed as passive agents. However, it is intuitive that firms have an active role in absorbing knowledge spillovers available in foreign markets and selecting the knowledge that better fit with their strategic intentions. As such, firms having different innovation strategies may seek different types of innovation output and obtain different ex post-outcomes. Although both LBE and LBTI are key mechanisms for EMF to upgrade their technology capability, it is still unclear whether LBE and LBTI contribute to EMFs' innovation by different mechanisms. Furthermore, previous research has explored LBE and LBTI in isolation and linked them to the same innovation outputs. According to Wang and Tao [3], LBE is an accumulative learning approach that is rooted in acquiring explicit knowledge, whereas LBTI is an assimilative learning approach that pays much more attention to tacit knowledge. The different nature of LBE and LBTI may lead to different mechanisms for contribution to innovation. It is a surprise that rare studies pay attention to it.

To address these important gaps in the extant literature, the current study attempts to explore and compare the relationship between export/technology import and two types of innovation in the context of China. Specially, we focus on firms' innovation strategies by distinguishing process versus product innovations. Departing from prior literature, we follow organizational learning theory and attention-based view to posit that EMFs proactively exploit the opportunity to absorb and use the knowledge available in foreign markets guided by their innovation strategies. Studies on organizational learning theory have traditionally incorporated human agency into the explanations of organizational outcomes [8, 9]. As firms follow different institutional logic and have different innovation strategies, we suggest that LBE and LBTI depend on their innovation strategies. Furthermore, we further predict that firms selectively employ cross-border learning mechanisms to pursue their innovation strategies since different innovation strategies require different nature of knowledge. In this study, we characterize and qualify a firm's innovation strategy by its relative preference with respect to product versus process innovations. More importantly, we argue that what innovation strategies EMFs seek depends on a novel factor that is prevalent in emerging countries but rare in the developed countries: perceived competitive threat from informal firms (abbreviated as "informal competition"). In this paper, informal firms refer to those that are unregistered but derive income from the production of legal goods and services [10]. Instances such as WeChat business and *Shan-Zhai* (Shan-Zhai refers to copycat, counterfeit, or pirate goods, including imitation and trademark infringing brands in China) manufacturers in China, mainly come under the purview of informal firms [11]. Based on the attention-based view [12], which argues that what decision makers do depend on the issues and answers they focus their attention on, we argue that the perceived competitive threat from informal firms in home countries can influence the focal firm's attention to process or product innovation and then affect the effects of LBE and LBTI on process and product innovation outcomes. Specially, we posit that firms facing high level of informal competition will selectively learn more product innovation from export and learn less process innovation from international technology import, compared with those facing low informal competition.

We test our predictions by using a Chinese firm survey conducted by the World Bank in 2012. China is a particularly suitable context for this study. China has catapulted in the world's second-largest economy and third place of outward FDI, Many Chinese firms, such as Huawei, ZTE, and Lenovo, have become world-class leaders in their own industry, including several emerging and high-technology industries. Our results demonstrate that the export status and engagement in LBTI indeed are positively associated with firm innovation outputs, including product innovation and process innovation. Firms facing high (vs. low) perceived informal competition show more product innovation output after the entry into export markets, whereas firms facing high (vs. low) perceived informal competition show more process innovation output after engagement in LBTI. The findings of the study have implications for how managers of internationalizing EMEs can exploit international markets to enhance innovation performance, which we will describe it in detail in the discussion sector.

2. Theory Background

2.1. The International Learning Mechanism for EMFs. Due to the limitations of the institutional environment in their home countries, unlike the firms in the developed markets, EMFs are generally unable to rely on the institutional environment of their home countries to achieve independent innovation so as to upgrade their capabilities and cultivate their international competitive advantages [4]. In order to overcome constrains of home countries undeveloped institution, EMFs generally seek to upgrade their capability by tapping into international market through technology import and exporting [13].

According to Chittoor et al. [14], when deciding their knowledge-seek strategy from foreign markets, EMFs can access and acquire knowledge from international markets through two important learning mechanisms. The first learning mechanism is accumulative learning, which indicates that EMFs can vigorously "buy" technology through technology import. The second mechanism is assimilation learning mechanism, which holds that "learning-by-doing," such as export and foreign direct investment, is the major mechanism for emerging markets to develop innovative capability. These two mechanisms, in turn, are built on the two dimensions of knowledge, respectively, explicit knowledge and tacit knowledge [15]. The critical distinction between the two lies in the transferability and the mechanisms for transfer. Explicit knowledge can be codified and

therefore be relatively easy to transfer through books, technical specifications, designs, and machinery [15, 16]. Tacit knowledge, however, is hard to codify and can only be observed through its application and acquired through practice [15, 16]. Rooted in acquiring explicit knowledge, accumulative learning emphasizes that firms can access the knowledge through investment in physical and human capital [14]. Accumulative learning, however, argues that most of valuable knowledge is tacit in nature and thereby technology import is not a sufficient means to achieve technological learning. Assimilationists argue that competitiveness derives from tacit knowledge, which is characterized as valuable, rare, and inimitable. As such, in order to improve innovation capability through cross-border learning, firms should embed into international markets and "learning-by-doing." The second distinction between the two learning mechanisms lies in the source of experience. Organizational learning generally is defined as a change in the organization's knowledge that occurs as a function of experience [17]. The most fundamental dimension of experience is whether it is acquired directly by the focal organizational unit or indirectly from other units (Levitt and March 1988). Obviously, accumulative learning emphasizes indirect experience, whereas accumulative learning pays more attention to direct experience.

Given the diverse theoretical assumptions of these two cross-border learning mechanisms, it is theoretically and empirically unclear how and under what conditions each learning mechanism facilitates innovation efforts. In this study, in line with the prior literature [3, 14], we focus on technology import as a proxy of accumulative learning and export as a proxy of assimilation learning. Despite the fact that LBE and LBTI have gained empirical credibility, what firms actually learn from these markets and how they do it remain unexplored. The extant literature is generally assumed that both LBT and LBTI enable EMFs to tap into a pool of novel and valuable knowledge and then learning effect spontaneously occurs. Some recent literature has begun to pay attention to the possible variance across firms in this learning process and mainly emphasizes the difference in specific export markets [18]and firms' absorption capability [19]. Still, the learning process is dependent on firms' selective attention and decisions. Scholars in organizational learning theory have long stressed the role of deliberative learning [8]. Capability development relies on learning, especially deliberate learning which is infused with intentionality, conscious deliberation, planning, and expertise [20]. For example, Kale et al. [21] found that prior alliance experience contribute little to the development of alliance capability without deliberative learning effort. Therefore, departing from the extant literature, we stress firms' proactive and deliberate behavior to absorb and exploit the knowledge available in international markets through LBE and LBTI. As such, in this study, we examine whether and how LBE and LBTI affect the two fundamental types of innovation outcomes (product innovation and process innovation) and further explore the role of informal competition in home countries in LBE and LBTI.

2.2. Product Innovation and Process Innovation. A number of definitions of product and process innovation have been offered by previous studies; in this study, we adopt the widely accepted definitions from the *Organization for Economic Co-operation and Development* (OECD). According to OECD, product innovation is "a good or service that is new or significantly improved. This includes significant improvements in technological specifications components and materials, software in the product, user friendliness, or other functional characteristics." Process innovation is defined as "a new or significantly improved production or delivery method. This includes significant changes in techniques, equipment, and/or software" (OECD, 2015).

Product innovation and process innovation differ significantly in their intrinsic features and knowledge base and are predominantly sought by different firms at different timings of their life cycle [7]. It is generally believed that process innovation increases price-cost margin on the output by reducing costs [22] and increasing quality [7], flexibility [23], and responsiveness [24], whereas product innovation increases price-cost margin on the output by increasing the price which the buyers are willing to pay [7]. Furthermore, product innovation and process innovation also differ in their knowledge base. Compared to product innovations, process innovation involves more tacit knowledge or proprietary aspects of the value chain and is less likely to be reverse-engineered [25]. Other studies hold that product innovation and process innovation may be affected by different environmental and organizational factors [25]. For example, Hullova et al. [26] propose that product innovation and process innovation have different requirements for firm skills and emphasize the importance and awareness of the difference between them. All these studies indicate product and process innovations are different in nature and pursued by different firms given their different needs and incentives. However, few research studies examine the different effects exports and technology imports might have on these two types of innovation (exception for Golovko and Valentini [7]). We are among the first ones to explore this question.

3. Hypothesis Development

Before the discussion of our hypothesis, we first classify two main premises that our theoretical derivation hinges upon. First, EMFs proactively exploit the opportunity to absorb and use the knowledge available in foreign markets' guiding by their innovation strategies and managerial intentionality. The behavior of firms is guided by managerial intentionality, a core feature of human agency as "to be an agent is to intentionally make things happen by one's actions" (Bandura, 2001, p.2). Firm strategy decisions embody managerial intentionality. Accordingly, the specific effect of LBE and LBTI will differ and depend on firms' innovation strategy and managerial intentionality [7]. Second, although prior research identifies innovation strategy from a variety of dimensions, such as incremental vs. radical innovation and independent vs. cooperative innovation, in this study, we

characterize and qualify a firm's innovation strategy by relatively preference for process innovation vs. product innovation.

3.1. Baseline Hypothesis. During the past three decades, a great body of the literature has evidenced that firms can learn through exporting activities and technology importing activities. The extant LBE literature has evidenced the positive relationship between LBE and greater innovation outcomes. First, engagement in export can boost innovation motivation. It is well known that firms selling products or services in foreign markets suffer from "the liability of foreignness" defined as "the costs of doing business abroad that result in a competitive disadvantage for an MNE subunit, broadly defined as all additional costs a firm operating in a market overseas incurs that a local firm would not incur" (Zaheer, 1995: 342-343). These costs include additional transportation and administrative costs. To address the liability of foreignness, firms have to enhance productivity through process innovation to bear the additional costs that export entails or improve product premium through product innovation. Second, engagement in exporting can boost innovation opportunity. Through export, firms are believed to acquire two types of knowledge: market knowledge and technological knowledge [18]. Market knowledge refers to knowledge about identifying host countries' customer needs or preferences, while technological knowledge refers to knowledge about operating processes, methods, and techniques. Different customers from different countries have different preferences for product attributes and provide a variety of feedbacks to exporting firms, which can help exporters to break the inertia of thinking to improve process innovation. In addition, firms can also extend their technological knowledge through export. Exporters will face much more competitors who otherwise will not encounter in the domestic market. These foreign competitors, especially those from the developed countries, provide an operational benchmark to imitate and even reverse-engineer their products [19]. Furthermore, export can influence innovation activities through reducing innovation cost. Given the difference in economic development level across countries, business cycles are not perfectly correlated across national markets [27]. Engagement in export can stabilize their cash flows by diffusing market risk. A stable cash flow enables to overcome financing constraints and gain access to larger internal financial resources for innovation [27].

Technology import is always viewed as an important approach for EMFs to catch up firms from the developed countries [3]. Through technology import, firms not only "buy" technology knowledge that they want but also accumulate other knowledge through communications with technical licensors. Both knowledge is beneficial to product and process innovation. For example, using 160 high-tech Chinese firms as a sample, Wang and Li-Ying [28] have found that technology licensing from foreign origins is positively associated with the licensee firm's subsequent technological innovation performance and productivity. In addition, for EMFs, LBTI may be more beneficial to innovation because of EMFs' technical disadvantage over firms from developed countries. For example, using 178 Chinese firms during 2000–2004 as the sample, Li-Ying and Wang [29] documented that in-licensed international technologies have performed better with regard to indigenous innovation than those that are mainly in-licensed domestic technologies.

Therefore, we propose our baseline hypothesis:

> H0: entering export markets and product innovations is positively associated with (a) product innovation and (b) process innovation; international technology import (LBTI) is positively associated with (c) product innovation and (d) process innovation

3.2. Attention-Based View. Our first premise is based on the attention-based view (ABV) that explains how a firm makes its strategic choices [12]. The ABV build upon Simon who argued that organizational members, as human beings, are inherently limited in their attentional capacity. The key idea of ABV lies in that firm behavior which depends upon the areas where the decision makers devote their limited attention [12]. According to Ocasio [12], attention is defined as "the noticing, encoding, interpreting, and focusing of time and effort by organizational decision makers on both (1) issues: the available repertoire of categories for making sense of the environment: problems, opportunities, and threats; and (2) answers: the available repertoire of action alternatives: proposals, routines, projects, programs, and procedures." Our theoretical derivation is centered around two central premises of ABV.

The first fundamental premises of ABV is the "focus of attention" premise which argues that what the decision makers do depends on what issues they face and the answers (action alternatives) they focus on their limited attention [30]. The second core premises of ABV is the "situated attention" premise which describes that what issue and answer decision makers focus on depends upon the specific characteristics of the situation facing the decision maker [12]. Previous studies have applied the ABV to explain how industry characteristics, such as velocity [31] and changes in industry regulation [32], have shaped decision makers' attention of allocation and thereby what strategies firms seek.

Building on these premises, we then identify a novel factor that shape EMFs' relative preference in terms of product and process innovation: perceived threat from informal firms ("informal competition"). We posit that firms facing high perceived informal competition may devote relatively more attention to product innovation than to process innovation after entering into export markets, compared with firms having low perceived informal competition. In contrast, firms facing high perceived informal may pay more attention to process innovation when they engage in LBTI.

3.3. Informal Competition, Learning by Exporting, and Innovation. Firms' innovation process is deeply affected by the competitive environment, as evidenced by the extensive

studies on R&D races [33, 34]. However, the extant literature generally focuses on competition threats from players inside the boundaries of legal jurisdiction, i.e., formal economy, in the context of the developed economies and overlooks the effect of the informal firms in the developing countries context, due to their lack of prevalence in the developed economy contexts [34–38]. Although the informal sector has been defined in various ways by previous studies, we adopt the definition from Nichter and Goldmark [10] who define informal firms as "businesses that are unregistered but derive income from the production of legal goods and services" (p.1455). In fact, informal firms constitute a significant portion in the developing economies [39], with some studies concluding that informal economy accounts for about 50% of economic activities [40] and employs 50 to 72% of the nonagricultural workforce [39]. Therefore, firms in some developing countries typically face a significant competition threat from informal firms (simply as informal competition) that are unregistered but derive income from the production of legal goods and service [40]. Despite of the significant proportion of the informal economy in the emerging economies, research on the consequence of informal competition is scarce, which has begun to be as a new frontier in the field of areas such as innovation [36], entrepreneurship [41], nonmarket strategies [35], and international business [38]. As a result, in addition to competition from formally registered firms, competition by informal firms also constitutes a significant strategic concern for formal firms and may interfere with formal firms' innovation strategy.

The nature of perceived informal competition may have implications for propensity and the firms seek for process innovation or product innovation. It is likely that the preference for product innovation in the export context becomes relatively stronger for firm facing great informal competition compared to firms that do not have perceived competitive threat from informal competition. First, informal competition in the context of emerging economies is an important situational characteristic that draws great attention of formal firms' managers. Competitive pressures have always been a major force responsible for the considerable attention [34]. Although an individual informal firm is generally small, unproductive, and stagnant [42], aggregate activity in the informal sector is considerable, with some estimates indicating that they account for between 30% and 66% of all output in emerging economies [41]. Informal firms, while being inferior in quality and efficiency than formal firms [39], usually avoid high taxes and burdensome regulations, allowing them to possess cost advantages and higher flexibility regarding products, processes [35], and in turn, steal market share from formal firms. As such, informal competitors are also likely to draw attention because their informal status may provide cost and/or speed advantages [35]. Several recent literatures support this argument. For example, McCann and Bahl [36] followed the theoretical logic of ABV and found that informal competition can draw great attention and thereby drive formal firms to engage in innovation to differentiate themselves from informal rivals. Similarly, Rouhin et al. [38] also argue that informal competition can draw great attention of firms and resort to export and to escape informal competition built on the logic of ABV. In sum, informal competition in the context of emerging economies is an important situational characteristic that draws great attention of formal firms' managers.

Second, the attention to the informal competition increases firms' need to differentiate themselves from informal rivals. Legal status is the most significant difference between formal and informal firms. By not registering, informal firms can cut the bureaucratic costs associated with conforming to rules and regulations, avoid the need to bribe corrupt government officials, and do not pay tax or other levies to the government [43]. Thus, informal firms enjoy advantages in operating more quickly and at lower cost, as demonstrated by previous literature [35, 36]. As the inherent cost-based advantage of informal firms over formal ones, an effective competitive response to informal competition is to differentiate themselves from informal rivals by product innovation. Taken together, firms facing great informal competition are likely to devote more attention to product innovation to escape informal competition rather than process innovation aiming at reducing cost, compared with firms facing low informal competition.

If ex ante firms facing high informal competition are more inclined toward product innovation than those with low informal competition perception, firms perceiving high informal competition will experience an even stronger incentive to invest in this innovation type, as entering foreign markets allows them to access to knowledge that are unavailable at home country. As such, firms perceiving high informal competition will selectively absorb more knowledge related to product innovation than process innovation, compared with those facing low informal competition perception. Taken together, our arguments lead to the following two hypotheses.

Hypothesis 1. The greater the competitive threat a focal firm perceives from informal sector firms, the stronger the positive relationship between entering export markets and product innovations will be.

Hypothesis 2. The greater the competitive threat a focal firm perceives from informal sector firms, the weaker the positive relationship between entering export markets and process innovations will be.

3.4. Informal Competition, Learning by Technology Import, and Innovation. Unlike learning by doing, inputs of international technology from foreign sources need to afford the extra sunk costs of technology import. During technology import, we propose firms perceiving high informal competition may devote more attention to process innovation when compared to firms with low informal competition perception. First, given the high investment of technology import, the concern of illegal imitation from informal competition may push firms to pursue innovation that informal rivals find difficult to copy. In spite of general lack of necessary technical resource and knowledge to

engage in original innovation, informal firms are unconstrained by intellectual property protection, allowing them to rapidly produce and sell new copycat products developed from formal firms with inferior quality and low price. According to a survey conducted by China Europe international business school [44], local firms in China market survey said that it only took 4 to 6 months to make similar products or copies after introducing a new product [44]. Given that technology is high cost, the hazard of value appropriation of innovation often is taken into consideration during LBTI, since process innovation involves more tacit knowledge or proprietary aspects of the value chain and is less likely to be reverse-engineered [25], compared to product innovation. Thus, under the conditions of substantial cost of LBTI and the threat of illegal imitation from informal rivals, informal firms perceiving high informal competition will be more likely to pay attention to process innovation rather to product innovation to afford the cost.

Second, although LBTI involves more explicit knowledge as a typical accumulative learning mechanism, exploitation and absorption of foreign technologies requires a threshold technological ability to understand the technology and apply/adapt it internally [14]. Although registration does not enable informal firms to enjoy the advantages with low cost and high flexibility, being informal "violates one of the most basic tenets of organization theory: the need for sociopolitical legitimacy" [45]. As a result, investing in, working for, or transacting with informal firms requires a higher degree of trust in the entrepreneurs and their organizations, which, in turn, constrain the ability of informal firms to access to a variety of resources, including financial capital and human capital, and to attract customers [45]. Informal firms typically lack in technological ability to copy process innovation.

Accordingly, our arguments lead to the following two hypotheses.

Hypothesis 3. The greater the competitive threat a local firm perceives from informal sector firms, the weaker the positive relationship between international technology import (LBTI) and product innovations will be.

Hypothesis 4. The greater the competitive threat a focal firm perceives from informal sector firms, the stronger the positive relationship between international technology import (LBTI) and process innovations will be.

4. Methods

4.1. Sample and Data. The World Bank conducts a series of surveys of firms across major emerging economies such as China and India. In this study, we use the survey that was conducted by the World Bank in China (2009–2011) data to test our hypotheses. The survey is a comprehensive firm-level survey of a representative sample of an economy's private sector across all provinces and most of industries in China. Specially, it covers a broad range of business environment topics, including access to finance, corruption, infrastructure, crime, competition, and performance measures. Compared to indicators based on expert assessments (e.g., Transparency International), this survey is conceptually more rigorous and less prone to measurement biases [46]. It employs standardized survey instruments and a stratified sampling technique (at the level of the two-digit International Standard Industrial Classification code, firm size, and geographic location) to yield data that are both representative and comparable across locations and industries and also uses appropriate survey designs and careful implementation to help to deal with concern about the common method bias or response bias [47]. For example, questions in the survey were phrased in an indirect manner to solicit genuine responses from firms, especially for some sensitive questions, such as the bribery-related questions. In order to encourage firms to sincerely response the survey, researchers first contacted executives, emphasizing that the project was organized by the World Bank and neither the identities of the companies nor the respondents would be revealed. In addition, researchers spent considerable resources and time training interviewers to ensure that the interviewers had sufficient skills. Therefore, although the data in this study was a survey in nature, the common method bias or the response bias was not a severe problem for this survey [48]. The study focuses on manufacturing industries since it is imperative that they continuously invest in innovation compared to other industrial categories (such as services or nonprofits). Previous research has used the same dataset [3, 49], as it is a representative for the Chinese manufacturing sector over this period.

4.2. Measures

4.2.1. Dependent Variables. Our measure of product innovation propensity is evaluated by a survey question that asks respondents whether "new products or services were introduced" over the past three years. We code product innovation as 1 if the firms have developed a new product and 0 otherwise. By the same token, another dependent variable—process innovation—is also a dummy variable that are equal to "1" if a firm reports process innovation occurring in last three year and "0" otherwise. This measure of product innovation and process innovation has been used by previous authors such as McCann and Bahl [36] and Mendi and Costamagna [50]. We also consider alternative measures for product innovation and process innovation in our robustness test. For product innovation performance, we measure it by a question: "what percent of this establishment's total annual sales was accounted for by products or services that were introduced in the last three years." For process innovation performance, we measure it by the answer of "what percent of this establishment's annual production volume was associated with new or improved processes introduced over the last three years."

4.2.2. Independent Variables. In this study, we examine the relationship between product/process innovation and LBE/LBTI. We are specifically interested in assessing whether the perceived informal competition plays a significant role in differentiating the effect of LBE and LBTI on innovation. Our key independent variable is firm export status, which equals to "1" if a firm exported in that year and "0" otherwise. By the same token, we measure technology import by

a dummy variable that takes value 1 if the respondent reports their firm uses technology licensed from a foreign-owned company during last 3 year and "0" otherwise.

To measure the threats from informal sector firms, we use questions from this survey that asked firms to describe competitive threats from informal sector firms, as follows: "are practices of competitors in the informal sector no obstacle (0), a minor obstacle (1), a moderate obstacle (2), major obstacle (3), or a very severe obstacle (4) to the current operations of this establishment?" This measure of competitive threats from informal sector firms has been used by previous authors such as Iriyama et al. [35] and McCann and Bahl [37]. We also consider an alternative measure in our robustness testing that simply ask respondents "does this establishment compete against unregistered or informal firms?"

4.2.3. Control Variables. There is a considerable body of research that has examined the determinants of both firm export/technology import and innovation. Based on the previous literature, we identify a set of variables to control for possible confounds in testing our model. The previous literature has documented that product innovation and process innovation are predominantly sought by different firms at different stages of their life cycle [7]. Therefore, we control firm age (logarithm), firm size (log of the number of employees), top manager experience (the natural log of the number of years of experience the firm's top manager had in the firm's primary industry), and human capital (average number of years of education of typical production worker) [51]. The prior literature reveals that different governance modes affect firms' value, profitability, and innovation strategy [52] and shows significant differences between private, foreign, and state-owned firms [53]. As a result, we control for firms' ownership composition. Control for ownership composition is captured through the composition of ownership percentage in the establishment (foreign and state). To capture the knowledge scope, we include a diversification index based on the Simpson diversity index (diversity) [35], using data from the survey about firms' sales of their primary product or service (including software products) as a percentage of their total annual sales. Next, we also control for general competitive pressure by using a question that asked respondents to report how many competitors it faces in the market for its product or service, and the options are none, one, two to five, and more than five [50]. Finally, industry and country dummies are included to control for location and sector effects. Table 1 presents the definitions of the variables used in the empirical analysis.

5. Results of Empirical Analysis

Table 2 shows the descriptive statistics and correlation coefficient matrix of the main variables in the sample. As shown in Table 3, we can see that both export and technology introduction have a positive and significant correlation with product innovation and process innovation, which means that both may play a significant role in product innovation and process innovation. The collinearity diagnosis shows that VIF values of all study variables are less than 3.2, indicating that multicollinearity is not a serious concern in our analyses.

Since our dependent variables, product/process innovation, are measured as a binary variable, we employ the logit model for evaluating the effect of LBE/LBTI on produce/process innovation models. Table 4 shows the results. In Table 4, Models 1–3 provide results for the effect of independent variables on produce innovation, whereas Models 4–6 provide results for the effect of independent variables on process innovation. Models 1 and 4 are a baseline specification including only control variable. Models 2 and 5 introduce the direct effect of the export status of a firm and engagement in LBTI. Built on Models 2 and 5, Models 3 and 6, respectively, add the moderation of informal competition.

In Models 2, the coefficient for the export status of a firm is positive and weak significant ($b = 0.377$, $p < 0.1$), indicating that the export status of a firm can benefit for product innovation, supporting Hypothesis 0(a). In addition, Model 2 shows that the coefficient for technology import is also positive and significant ($b = 1.367$, $p < 0.01$), supporting the argument of Hypothesis 0(c). Furthermore, the coefficient for interaction between informal competition and the export status is positive and significant ($b = 0.468$, $p < 0.05$), suggesting that the greater the competitive threat a local firm perceives from informal sector firms, the more the export status of a firm contribute to product innovation. Therefore, Hypothesis 1 is supported. However, the coefficient for interaction between informal competition and engagement in technology import is negative but not significant ($b = -0.040$, $p = 0.861$). Hypothesis 2 is not supported.

Model 5 presents the direct effect of the export status of a firm on the likelihood of product innovation and the coefficient for the export status of a firm is positive and significant ($b = 0.661$, $p < 0.05$), indicating that the export status of a firm can also benefit for EMFs' process innovation, which supports Hypothesis 0(b). In addition, the coefficient for engagement in technology import is also positive and significant ($b = 1.652$, $p < 0.01$), supporting Hypothesis 0(d). Model 6 further presents results related to the moderating effect of informal competition on process innovation. The results indicate that the coefficient for interaction between informal competition and the export status of a firm is negative but not significant ($b = -0.301$, $p < 0.317$). As such, Hypothesis 3 is not supported. However, the coefficient for interaction between informal competition and the export status of a firm is positive and weak significant ($b = 0.760$, $p < 0.060$), indicating that the greater the competitive threat a focal firm perceives from informal sector firms, the stronger the positive relationship between LBTI and an increase in process innovations will be. Therefore, Hypothesis 4 is supported.

5.1. Additional Analysis. We proceed by conducting some additional analyses to provide further evidence consistent with our hypotheses. First, the dummy variable nature of our dependent variables limits the explanation for how much LBE and LBTI benefits for EMFs' innovation performance.

Table 1: Variable measure.

Variable	Description	References
Dependent variables		
Product innovation	Dummy that takes value 1 if the firm introduced a new product, 0 otherwise	McCann and Bahl [36]
Process innovation	Dummy that takes value 1 if the firm introduced a new process, 0 otherwise	Mendi and Costamagna [50]
Product performance	Percent of this establishment's total annual sales was accounted for by new products	Mendi and Costamagna [50]
Process performance	Percent of annual production volume was associated with new or improved processes	Mendi and Costamagna [50]
Independent variables		
Exporter	Binary indicator for engagement in export currently	McCann and Bahl [36], Shinkle and McCann [54]
Technology import	Binary indicator for using technology licensed from a foreign-owned company	Wang and Tao [3]
Informal competition	Five-point Likert-type scale indicator for a survey question: "to what extent do the practices of competitors from the informal sector are an obstacle to the firm's operations"	McCann and Bahl [36], Iriyama et al. [35]
Control variables		
Firm age	Log of number of years a firm has been in operation	McCann and Bahl [36], Iriyama et al. [35], Krammer [55]
Firm size Iriyama et al. [35], McCann and Bahl [31]	Log of the number of employees	Krammer [55],
Top managers experience	The number of years the top manager or business owner has worked in that sector	McCann and Bahl [36]
Human capital	Average number of years of education of typical production worker	Wang and Tao [3]
State ownership	Percentage of government ownership	McCann and Bahl [36]
Foreign ownership	Percentage of foreign ownership	McCann and Bahl [36]
Diversification	Simpson diversity index of firm's primary product/service share	Iriyama et al. [35]
Formal competition	The number of competitors it faces in the market for its product or service	Rouhin etal. [38]

Therefore, we take a further step to explore how LBE/LBTI affects innovation performance. We measure performance of product and process innovation by, respectively, using the proportion of new products accounting for total annual sales and the annual production volume associated with new or improved processes. The statistical analysis for product/process innovation performance shows that 49.22% of firms in our sample do not have any new product innovation, while 21.27 % of firms in our sample do not introduce any new process innovation. Given our dependent variables have lower bound of zero, the left-censored data violates the linearity assumption of ordinary least squares (OLS). Therefore, we use Tobit models which correct the dependent variable with limiting values, making it possible to estimate the relationship between LBE/LBTI and innovation performance. Table 5 reports the results of Tobit regressions. Model 2 shows that both the export status ($b = 4.947$, $p < 0.01$) and LBTI ($b = 15.513$, $p < 0.01$) are positively associated with product innovation performance, supporting Hypothesis 0(a) and Hypothesis 0(c). Model 3 shows that, for product innovation performance, the coefficient of the interaction term between the export status and informal competition is positive and significant ($b = 4.756$, $p < 0.05$), supporting Hypothesis 1. However, the coefficient of the interaction term between engagement in technology import and informal competition is also not significant. Hypothesis 2 is not supported again. Model 4 shows that both the export status ($b = 5.552$, $p < 0.01$) and international technology import ($b = 5.628$, $p < 0.01$) are positively associated with process innovation performance, supporting Hypothesis 0(a) and Hypothesis 0(c). Model 5 explores how informal competition moderates the relationship between LBE/LBTI and process innovation. The results show that the coefficient of the interaction term between engagement in the export status and informal competition is negative and significant ($b = -3.193$, $p < 0.05$), indicating that the greater the competitive threat a focal firm perceives from informal sector firms, the weaker the positive relationship between LBTI and an increase in process innovations performance will be. Therefore, Hypothesis 3 is supported. Mode 6 in Table 5 also shows informal competition strengthens the positive relationship between LBTI and process innovation performance, supporting Hypothesis 4.

Second, we further explored whether our results of moderation of informal competition is generalizable for all types of competition pressure. In our paper, we stressed the idiosyncrasy of informal competition in terms of advantages of lower cost, higher flexibility, and illegal imitation. However, one may argue that the role of informal competition in allocating attention between product and process innovation during cross-border learning through LBE or LBTI is just an example of the effect of general competition pressure. In other

Table 2: Description statistics.

Variable	N	Mean	SD	Min	Max
Product innovation	1186	0.51	0.50	0.00	1.00
Process innovation	1186	0.79	0.41	0.00	1.00
Product performance	1186	12.55	18.09	0.00	100.00
Process performance	1186	17.63	17.81	0.00	100.00
Exporter	1186	0.21	0.41	0.00	1.00
Technology import	1186	0.26	0.44	0.00	1.00
Firm age	1186	2.43	0.52	0.00	4.83
Firm size	1186	3.45	1.21	0.69	9.66
TM experience	1186	2.74	0.49	0.00	3.85
State ownership	1186	6.18	22.60	0.00	100.00
Foreign ownership	1186	4.94	19.34	0.00	100.00
Diversity	1186	0.08	0.14	0.00	0.99
Formal competition	1186	4.77	0.66	1.00	5.00
Human capital	1186	10.12	1.89	1.00	18.00
Informal competition	1186	1.86	0.89	1.00	5.00

Table 3: Coefficients matrix $N = 1193$.

Variables		1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
1	Product innovation	1														
2	Process innovation	0.48*	1													
3	Product performance	0.68*	0.33*	1												
4	Process performance	0.30*	0.52*	0.51*	1											
5	Exporter	0.15*	0.15*	0.13*	0.14*	1										
6	Technology import	0.30*	0.21*	0.32*	0.21*	0.18*	1									
7	Firm age	0.03	0.03	0	−0.01	0.02	0	1								
8	Firm size	0.10*	0.12*	0.09*	0.06*	0.29*	0.16*	0.05	1							
9	TM experience	0.08*	0.14*	−0.01	0.03	0.08*	−0.05	0.37*	0.18*	1						
10	State ownership	−0.15*	−0.31*	−0.11*	−0.19*	−0.09*	−0.09*	0.13*	0.12*	−0.06*	1					
11	Foreign ownership	0.05	0.06*	0.06	0.01	0.25*	0.21*	−0.07*	0.10*	−0.05	−0.07*	1				
12	Diversity	0.12*	0.14*	0.02	0.07*	0.13*	0.08*	−0.02	0.09*	0.06*	−0.07*	0.04	1			
13	Formal competition	−0.04	−0.02	−0.10*	−0.08*	0.03	−0.02	0.03	−0.06*	−0.01	0.08*	−0.01	−0.04	1		
14	Human capital	0.07*	0.11*	0.04	0.12*	0.04	0.13*	0.05	0.02	0.03	−0.01	0.02	0.14*	0	1	
15	Informal competition	0.12*	0.13*	0.05	0	0	0.06*	−0.01	−0.06*	0.06*	−0.20*	−0.01	−0.01	0.11*	−0.09*	1

* $p < 0.05$.

words, it is a competition that plays a key role in attention allocation rather than the idiosyncrasy of informal competition. To rule out this question, we have investigated whether our results of moderation of informal competition is generalizable for all types of competition pressure. We have verified that our results of moderation of informal competition are invalid for formal competition pressure.

Third, we use propensity score matching (PSM) method to address inherent defect of cross-sector data in endogeneity problem and causality test. To measure the effect of LBE and LBTI on innovation, the ideal experiment would be to compare the difference of innovation outputs between a firm after it starts LBE and LBTI and the same firm has no LBE and LBTI. Yet, this ideal data is difficult to get because we cannot observe the counterfactual outcomes, "what would have happened if a firm had not exported or imported international technology?" To address endogeneity problem and causality test, we have conducted a PSM method to further test our hypotheses (we wish to thank an anonymous reviewer for this suggestion). The results of PSM are presented in Table 6. Table 6(A) shows the results of the comparison between exporter and nonexporters, as well the

Table 4: Logit regressions results.

	M1 Product	M2 Product	M3 Product	M4 Process	M5 Process	M6 Process
Control variables						
Firm age	−0.028	−0.021	−0.032	0.073	0.048	0.057
	(0.153)	(0.159)	(0.161)	(0.195)	(0.205)	(0.206)
Firm size	0.193***	0.108	0.100	0.343***	0.292***	0.302***
	(0.064)	(0.069)	(0.069)	(0.084)	(0.089)	(0.090)
Top managers' experience	0.319*	0.283	0.304	0.306	0.259	0.269
	(0.181)	(0.187)	(0.186)	(0.206)	(0.211)	(0.214)
State ownership	−0.018***	−0.017***	−0.017***	−0.037***	−0.037***	−0.036***
	(0.005)	(0.005)	(0.005)	(0.006)	(0.006)	(0.006)
Foreign ownership	−0.001	−0.009**	−0.009**	0.002	−0.008	−0.007
	(0.004)	(0.004)	(0.004)	(0.006)	(0.006)	(0.006)
Diversification	2.707***	2.396***	2.406***	3.539***	3.302***	3.272***
	(0.616)	(0.633)	(0.633)	(0.976)	(1.020)	(1.028)
Formal competition	−0.075	−0.133	−0.125	−0.026	−0.191	−0.215
	(0.112)	(0.118)	(0.118)	(0.140)	(0.150)	(0.152)
Human capital	0.201***	0.174***	0.178***	0.166***	0.160**	0.164***
	(0.046)	(0.047)	(0.047)	(0.061)	(0.063)	(0.064)
Informal competition (IC)	0.115	0.086	0.001	0.133	0.084	0.216
	(0.090)	(0.092)	(0.106)	(0.125)	(0.129)	(0.149)
Independent variables						
Exporter (EP)		0.377*	−0.469		0.661**	1.203*
		(0.199)	(0.439)		(0.300)	(0.630)
Technology import (TI)		1.367***	1.445***		1.652***	3.146***
		(0.200)	(0.468)		(0.342)	(0.903)
IC∗EP			**H1: 0.468****			**H2: −0.301**
			(0.218)			**(0.301)**
IC∗TI			**H3: −0.040**			**H4: 0.760***
			(0.228)			**(0.405)**
Constant	−2.622***	−1.931**	−1.844*	0.702	1.920	1.648
	(0.897)	(0.944)	(0.952)	(1.454)	(1.508)	(1.520)
Location effect	Yes	Yes	Yes	Yes	Yes	Yes
Industry effect	Yes	Yes	Yes	Yes	Yes	Yes
Observations	1186	1186	1186	1186	1186	1186
Pseudo R2	0.238	0.273	0.276	0.331	0.372	0.376
Wald chi square	392.151	447.389	452.170	375.871	418.901	423.491
Log likelihood	−627.814	−595.225	−592.834	−379.237	−353.812	−351.517

Standard errors are in parentheses. * $p < 0.1$, ** $p < 0.05$, and *** $p < 0.01$.

comparison between firms engaging in LBTI and firms that do not engage in LBTI. The results support our baseline Hypothesis 0, indicating that firms indeed can learn from LBE and LBTI to increase product and process innovation performance. In Table 6(B), we split our sample into two subgroups: low informal competition group and high informal competition group. Using nearest neighbor matching to conduct PSM, we have found the positive relationship between engagement in export and product innovation is only significant for firms facing a high level of informal competition, but this relationship does not remain significant for firms facing a low level of informal competition. In contrast, we have found the positive relationship between engagement in export and process innovation (dummy) is only significant for firms facing a low level of informal competition, but this relationship remains not significant for firms facing a high level of informal competition. These results indicate that informal competition will push exporters to learn more product innovation while learning less process innovation. Given the difference of product innovation performance between exporters and nonexporters is significant for both low and high informal competition groups, we cannot directly compare the effect of informal competition on learning from exporting. To address it, we conduct a bootstrap method to assess the statistical significance [56]. The results also show the positive relationship between engagement in export and process innovation performance is stronger for low informal competition group than high informal competition group. Using the bootstrap method [56], we also confirm that the positive relationship between engagement in LBTI and process innovation performance is stronger for high informal competition group than low informal competition group, while the positive relationship between engagement in LBTI and product innovation performance is weaker for high informal competition group than low informal competition group. The PSM results suggest that firms facing high level of informal competition will selectively learn more product innovation

Table 5: Tobit regressions results for product/process innovation performance (continuous variable).

	M1 Product performance	M2 Product performance	M3 Product performance	M4 Process performance	M5 Process performance	M6 Process performance
Control variables						
Firm age	−1.616	−1.596	−1.745	−1.144	−1.239	−1.178
	(1.875)	(1.821)	(1.818)	(1.249)	(1.237)	(1.236)
Firm size	1.854**	0.494	0.453	1.272**	0.500	0.562
	(0.780)	(0.798)	(0.796)	(0.517)	(0.534)	(0.534)
Top managers' experience	3.831*	3.355	3.495*	3.334**	2.865**	2.725**
	(2.176)	(2.125)	(2.116)	(1.395)	(1.388)	(1.386)
State ownership	−0.206***	−0.184***	−0.188***	−0.264***	−0.251***	−0.250***
	(0.063)	(0.062)	(0.061)	(0.041)	(0.041)	(0.041)
Foreign ownership	−0.005	−0.087*	−0.085*	−0.010	−0.060*	−0.060*
	(0.045)	(0.045)	(0.045)	(0.030)	(0.031)	(0.031)
Diversification	19.751***	16.543***	16.471***	11.583***	10.608**	10.678**
	(6.520)	(6.359)	(6.342)	(4.454)	(4.435)	(4.423)
Formal competition	−0.361	−1.081	−0.932	0.965	0.502	0.404
	(1.377)	(1.348)	(1.346)	(0.950)	(0.944)	(0.942)
Human capital	1.980***	1.525***	1.566***	1.000***	0.813**	0.768**
	(0.534)	(0.521)	(0.520)	(0.355)	(0.353)	(0.353)
Informal competition	−0.019	−0.250	−1.458	−0.693	−0.782	−0.581
	(1.099)	(1.070)	(1.275)	(0.741)	(0.736)	(0.863)
Independent variables						
Exporter		4.947**	−4.116		5.520***	11.461***
		(2.189)	(4.864)		(1.520)	(3.379)
Technology import		15.513***	14.698***		5.628***	1.615
		(2.119)	(4.723)		(1.483)	(3.338)
IC∗EP			**H1: 4.756****			**H2: −3.193****
			(2.280)			**(1.618)**
IC∗TI			**H3: 0.376**			**H4: 2.303***
			(2.264)			**(1.316)**
Constant	−19.809*	−9.787	−8.302	−1.046	5.540	6.294
	(11.092)	(10.921)	(10.987)	(7.350)	(7.366)	(7.427)
Var(e.product_perfor)	648.564***	605.959***	602.132***			
	(40.826)	(38.011)	(37.761)			
Var(e.process_perfor)				348.511***	339.842***	338.150***
				(16.773)	(16.382)	(16.300)
Location effect	Yes	Yes	Yes	Yes	Yes	Yes
Industry effect	Yes	Yes	Yes	Yes	Yes	Yes
Observations	1186	1186	1186	1186	1186	1186
Pseudo R2	0.057	0.066	0.067	0.042	0.045	0.046
Wald chi square	380.088	440.608	445.307	371.974	403.556	408.387
Log likelihood	−3158.1295	−3118.8029	−3116.4533	−4274.8976	−4235.7602	−4233.3446

Standard errors are in parentheses. * $p < 0.1$, ** $p < 0.05$, and *** $p < 0.01$.

Table 6: The results of PSM (propensity score matching analysis).

(A) Differences in means in innovation outcomes between Exporters (technology importer) and nonexporters (firms that do not engage in LBTI) for full sample

Variables	Exporter (dummy)		Technology import (dummy)	
	ATT	*t*-value	ATT	*t*-value
Product innovation (dummy)	0.103	2.31**	0.287	7.38***
Product innovation performance	0.370	1.78*	12.21	7.62***
Process innovation (dummy)	0.054	1.76*	0.153	5.76***
Process innovation performance	1.985	2.51***	1.519	4.48***

(B) Differences in means in innovation outcomes between exporters (technology importer) and nonexporters (firms that do not engage in foreign technology import) across low and high informal competition group

Variables	Exporter		Technology importer	
	Low informal	High informal	Low informal	High informal
Product innovation (dummy)	0.026	0.248***	0.414***	0.252***
Product innovation performance	3.664	8.200**	14.335***	12.323***
Process innovation (dummy)	0.105**	0.048	0.129**	0.212***
Process innovation performance	7.345***	5.629**	1.798	12.229***

*, **, and *** are significantly different from zero at the 10%, 5%, and 1% level, respectively.

from export and learn less process innovation from LBTI than those facing low informal competition.

6. Conclusion

Despite the ample evidence that both LBE and LBTI leads to significant productivity gains for EMFs, what EMFs learn from LBE and LBTI remains largely unexamined [7, 57]. More important, the important role of firms' agency in LBE and LBTI process receives rare attention. Drawing from organizational learning theory and the attention-based view, we postulate that the learning mechanisms underlying the LBE effect and the LBTI effect are not homogeneous across firms but dependent on firms' propensity of attention allocation for process or product innovation. Specifically, we argue that after entering into foreign markets or importing foreign technology, firms will actually select, absorb, and use the knowledge that better fits the specific needs of their innovation strategy. Our results indicate that the export status and engagement in technology import indeed are positively associated with firm innovation outputs, including product innovation and process innovation. The results confirm what firms learn from LBE and LBTI in terms of product innovation and process innovation depends on perceived competitive threat from informal firms, with some important distinctions. Firms facing high perceived informal competition show more product innovation output after the entry into export markets (Hypothesis 1), whereas show more process innovation output after engagement in technology import (Hypothesis 4). Our results, therefore, suggest firms facing high perceived informal competition may devote relatively more attention to product innovation than to process innovation after entering into export markets, compared with firms having low perceived informal competition. In contrary, firms facing high perceived informal may pay more attention to process innovation in process of learning by technology import.

6.1. Contribution to the Literature. Our study makes several contributions to the literature on LBE and LBTI, as well as cross-border learning mechanisms of EMFs. First, our findings enrich LBE and LBTI by stressing the important role of firms' agency. While the distinction between product and process innovation has been previously stressed in the literature on LBE and LBTI [7, 25, 58], few studies examine whether and how LBE and LBTI have different effect on these two types of innovation outputs. The extant research on LBE and LBTI often has predominantly focused solely on the direct relationship between exporting and one type of innovation, and the mechanisms of "learning" are treated as automatic as the result of knowledge spillover. Our study highlights the important role of firms' agency and argues that LBE and LBTI have different effects on different dimensions of technological performance for different firms. And these different effects are not merely the outcome of knowledge spillovers, but also of purposeful and selective absorption for knowledge guided by their attention allocation.

Second, our study further enriches the literature on learning and capabilities building of EMFs by exploring one important but underexplored factor: competitive threat from informal sector firms. The extant literature on organizational learning has identified two key sources of cross-border learning mechanisms: knowledge accumulation mechanisms, such as deliberate investments in organizational routines and structures [8], and assimilation mechanisms, such as learning-by-doing [59] and experiential learning [60]. Although a great body of the literature has evidenced, the learning, knowledge seeking, and catch-up objectives determine the speed and paths of internationalization of EMFs [1], and few studies explore the specific learning mechanisms and link those to realization of knowledge seeking objectives of internalization. Our study enriches this stream of the literature by linking the two types of learning mechanisms and strategic choices across both resource (inward internationalization) and product market (outward internationalization) domains of internationalization. Hence, our findings contribute to a better understanding of the catch-up path of EMFs through tapping into global market.

Third, our study also makes some contributions to the literature on informal firms. Many developing countries are characterized as a dual-economy system with formally registered firms and an informal sector [36, 50, 61]. Although informal economy is an important constitution of social economy in emerging economies, with some studies concluding that informal economy accounts for about 50% of economic activities [40], it is only recently that informal sector economy has attracted attention in management research, due to their lack of prevalence in developed economy contexts. In the past decade, scholars have investigated various relevant topics and outcomes of informal economic activities, such as the determinants of activity in the informal economy [43, 62, 63] and the benefits/disadvantages of informality [45], However, the strategic consequences of informal economy remain relatively less explored, especially regarding formal firms' reaction to competitive threat from informal firms [36]. Our findings highlight the role of perceived competitive threat from informal firms in determining EMFs' attention allocation for product and process innovation. As such, our study is among the first ones to examine the consequence of informal economy in terms of internalization, learning, and capability building.

6.2. Limitation. Like all research, our study has several limitations. First, the cross-sectional nature of our design limits our assessment of causal relationships. The cross-sectional data cannot reflect the change over time and thus restricts the validity of results to some extent. Although we used a robust set of control variables, including industry and country effects, there may be other unobserved factors that influence our causal relationships. Second, this study is only limited in the Chinese market, and whether the conclusions can be extended to other emerging markets remains to be explored. Third, the measurement of product innovation

performance and process innovation performance is to measure the proportion of new products introduced in the past three years to the total sales and the proportion of products produced through the new process to the total output, which may not well reflect the effect of knowledge acquisition from outside. As we all know, it takes time for an enterprise to transform the acquired knowledge into output and there may be other factors in the process to influence. The output of product/process innovation is the best indicator to reflect and measure the impact of organizational learning on innovative performance.

Data Availability

We assembled our data from the survey data of the World Bank on the operating conditions of 2,848 firms in China (2009–2011), which links the introduction of foreign technologies, export, and state ownership of firms with process innovation performance and product innovation performance, and we test the hypotheses put forward in the theoretical part. The survey data of the World Bank used standard questionnaire methods and the samples were evenly distributed in 25 cities and 26 industries. On the whole, the samples identified in this survey represented firms in China quite well.

Conflicts of Interest

The authors declare that there are no conflicts of interest regarding the publication of this paper.

Authors' Contributions

J.W. performed the conceptualization for the first manuscript. K.W. designed the study and processed the data. S.M. performed data collection. S.X performed the review and editing of the manuscript.

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