



**International Journal of Technology Management**

ISSN online: 1741-5276 - ISSN print: 0267-5730

<https://www.inderscience.com/ijtm>

---

**The reverse innovation strategies of the latecomer firms - a multiple-case study from China**

Jia Ma, Yusen Xu

**DOI:** [10.1504/IJTM.2023.10052648](https://doi.org/10.1504/IJTM.2023.10052648)

**Article History:**

Received:	23 January 2019
Last revised:	04 December 2020
Accepted:	21 January 2022
Published online:	20 December 2022

---

## The reverse innovation strategies of the latecomer firms – a multiple-case study from China

---

Jia Ma

School of Management,  
Chengdu University of Information Technology,  
No. 24 Block 1, Xuefu Road, 610225, Chengdu, China  
Email: majiadlut@163.com

Yusen Xu\*

Business School (School of Quality Management and Standardisation),  
Foshan University,  
No. 18, Jiangwan Road, Chan Cheng, 528225, Foshan, China  
Email: ipmp@dlut.edu.cn

\*Corresponding author

**Abstract:** The reverse innovation strategies for latecomer firms are situation dependent. Based on the multiple-case study, how the latecomer firms adopt the reverse innovation strategy in different situations has been investigated. The market demand difference and technology gap between the developing country and developed country are proposed as the situational determinant of reverse innovation. Four reverse innovation strategies of the latecomer firms are illustrated coupling four different situations, including rapid-penetration strategy, differentiation-driven strategy, development-centred strategy and full-range strategy. A strategy selection framework of reverse innovation for latecomer firms is build up supported by the contingency theory. Two strategy evolution paths about how the latecomers achieve the overall reverse innovation have been identified. This paper contributes to theory on how latecomer firms accomplish the reverse innovation in resource constraints and enrich the understanding of reverse innovation strategy based on contingency approach.

**Keywords:** reverse innovation; latecomer firm; reverse innovation opportunity; emerging market; innovation strategy; China.

**Reference** to this paper should be made as follows: Ma, J. and Xu, Y. (2023) 'The reverse innovation strategies of the latecomer firms – a multiple-case study from China', *Int. J. Technology Management*, Vol. 91, Nos. 1/2, pp.107–132.

**Biographical notes:** Jia Ma is a Lecturer in the Chengdu University of Information Technology. She concentrates on the research of technical innovation, especially the ones in emerging industries.

Yusen Xu is a Professor and Doctoral Supervisor in Foshan University. His research is related to innovation management and technical innovation, especially in technology development pathway in China.

## 1 Introduction

It has long been well accepted that the innovation normally trickle down from the developed countries to the developing countries (Vernon, 1966). This assumption has been challenged since Immelt et al. (2009) brought forward the concept of reverse innovation. The adjective 'reverse' refers to the bottom-up of the innovation flow (Von Zedtwitz et al., 2015). More and more phenomenon of the reverse innovation has been noticed, raising many theoretical questions in at least four areas, including innovation, internationalisation, multinational enterprise management and FDI spillovers (Govindarajan and Ramamurti, 2011).

However, the current studies about the reverse innovation mainly concentrate on the developed-country multinational enterprises (DMNEs). Although Govindarajan and Ramamurti (2011) and Von Zedtwitz et al. (2015) stressed that latecomers may engage more in strong reverse innovation than the DMNEs, there is still a lack of study focusing on the latecomer firms. Since the innovation process between latecomers and DMNEs are fundamentally different (Kim, 1980), some theoretical gap still remains as following:

- 1 The differences between the reverse innovations led by latecomer firms and DMNEs are still not clear, especially from the strategic management perspective.
- 2 The reverse innovation seems to be a new phenomenon.

However, the differences between the reverse innovations led by latecomer firms and the traditional catching-up led by the newly industrialised countries (NICs) firms remain unclear.

In reality, the reverse innovation is a very difficult task for latecomer firms, since they have advantage neither in technology nor in marketing (Wang et al., 2012). In this concern, Corsi (2012) mentioned that only the innovation, of which the most of steps in whole process are completed by the latecomer firms, can be called the real reverse innovation. From our investigation in China, some latecomer firms have been found accomplishing the reverse innovation in recent years, providing empirical evidence. The research question is raised to explore how the latecomer firms adopt the reverse innovation strategies corresponding to the different situation. The multiple-case study is applied as the research method with eight typical reverse innovation cases selected and analysed.

For the theoretical significance, this study focuses on the reverse innovation strategies adopted by latecomer firms, which supplement and enrich the theory of reverse innovation. Moreover, this study profiles the evolution path of reverse innovation strategy, which can extend the theory of innovation strategy. For the practical significance, the research could bring guidance for latecomers on reverse innovation strategy decision making. The evidence from China may also provide revelations for the latecomer firms in the other developing countries.

In Section 1 of this paper, the research question of this study and theoretical gap about reverse innovation are put forward. The theoretical basis is illustrated in Section 2. The research design is profiled in Section 3 and the multi-case analysis is shown in Section 4. The research findings in Section 5 reveal that there are four basic reverse innovation strategies corresponding to different situation, and evolution paths of reverse innovation strategy for latecomers have been identified. In Section 6, the conclusion has been made, and the theoretical gaps this study may fill have been discussed.

## **2 Theoretical basis**

### *2.1 Reverse innovation*

The concept of reverse innovation was initially set up by Immelt et al. (2009), referring to the innovation process ‘trickling-up’ from the emerging markets in developing economies to the developed countries. Since then, the word reverse innovation has frequently been mentioned in ‘Harvard Business Review’, ‘Business Week’, and ‘Fast Company’. The notion was further expounded by Govindarajan and Trimble (2012) identifying the west as the centre of activity, with any innovation coming from developing economies as the reversing flow. Von Zedtwitz et al. (2015) suggest that multinationals need to manage and monitor the portfolio of global reverse innovation flows and upgrade the dynamic capabilities needed to appropriate value from complex relationships and networks.

Govindarajan and Ramamurti (2011) pointed out that the reverse innovation is on where an innovation is first adopted, not where it is developed. This viewpoint distinguishes the reverse innovation from the phenomenon of which DMNEs set R&D affiliates in developing countries but adopt the innovations first in developed countries (Cantwell and Mudambi, 2005). Moreover, the concept of reverse innovation needs to be set against an older version of the term ‘reverse innovation’ existing in the new product development literatures.

The current studies about reverse innovation mainly focus on DMNEs. As Caves (2007) figured out, the innovation is often regarded as technological innovation, especially in the mainstream of international business literatures. Since it is assumed that the advanced technology originates from the developed countries, therefore, the DMNEs with significant technical advantages have been taken as the research objects (Ramamurti and Singh, 2009; Guillen and Garcia-Canal, 2009). Current literatures explore how the DMNEs take advantage of the reverse innovation from different perspectives. Corsi and Von Zedtwitz (2016) stressed that DMNEs must recognise that the knowledge and technology transferring to the developed countries has resulted in highly talented and skilled innovators in former fringe markets. Hadengue et al. (2015) suggested that DMNEs should engage in alliances and partnerships with local firms in developing countries and call for greater collaboration in reverse innovation. Agarwal et al. (2020) stressed that DMNEs are increasingly harnessing the potential of emerging markets by setting up local subsidiaries. Hadengue et al. (2017) discussed how the DMNEs anticipate and overcome the fears of product cannibalisation and not-invented-here syndrome in reverse innovation. Giannetti and Rubera (2020) mentioned that international new product launch speed is an important strategic choice in reverse innovation.

### *2.2 The latecomer firm triggering the reverse innovation*

A latecomer firm is defined as a manufacturing company (existing or potential) located in a developing country, which faces technological difficulties and marketing barriers (Hobday, 1995; Choi, 1996). The latecomer firm is a fast learner (Mathews and Cho, 1999), often shifting the basis of its competitive posture towards more sophisticated levels of activity through institutional supports. The latecomer firm is initially resource poor, but has some initial competitive advantages, such as low costs, which it can utilise to leverage a position in the industry of choice (Mathews, 2002). For the international

competitiveness, some observers have argued that the local latecomer firms rely too much on home country advantages (Rugman, 2009), and lack intangible ownership advantages (Madhok, 2010), such as brands and cutting-edge technology. Others disagree, points out that some local latecomer firms can sustain long run performance possessing a variety of ownership advantages (Guillen and Garcia-Canal, 2009; Lessard and Lucea, 2009; Williamson and Zeng, 2009). Occasionally, latecomer firms may even be at the forefront of an emerging industry, acting as ‘global first movers’ (Ramamurti and Singh, 2009). They are usually quicker to make strategic decisions and nimbler than the local subsidiaries of DMNEs that require approvals from remote headquarters (Amsden, 2009).

Govindarajan and Ramamurti (2011) mentioned that reverse innovation entails at least three stages. The latecomer firms possess different advantages and disadvantages in the different stage. The first stage is adoption of an innovation in one emerging market. The relative advantages include customer intimacy flair for low-cost solutions, clean slate approach, strong commitment to local market, access to local resources and capabilities and patient capital (Ramamurti and Singh, 2009). The second stage is the transferring the innovation to other emerging markets. The latecomer firms often have product pricing and features better suited to emerging markets (Cuervo-Cazurra and Genc, 2008). The third stage is transferring the innovation selectively to the developed-country markets. The latecomer firms are unconstrained by prior investments or risk of cannibalisation, and have prospect of rising margins in moving upscale and no internal resistance to expansion. However, the latecomer firms may take a risk of losing anchor customers when moving to overseas markets, since building external linkages might limit the internal resource developments in resources constraints (Mohan, 2012). Comparatively, latecomer firms seem to have the edge over DMNEs in the first stage of reverse innovation, but the advantage seems to shift progressively toward DMNEs in the later stages (Govindarajan and Ramamurti, 2011).

Concerning about factors influencing the reverse innovation for latecomer firms, the learning, especially the technology learning, is often considered as the most important influencing factor in capability accumulation (Bell and Pavitt, 1995; Hobday, 1995; Figueiredo, 2003). Han and Liu (2020) figured out that latecomer follows the path of imitation innovation, independent innovation and leading technology development in reverse innovation process. Maeda and Mori (2011) pointed out that the reverse innovation process is of great complexity. The influencing factors include the determination of the senior managers and the entire organisation, foresight of technology and market, optimisation capabilities of the firm’s resources and so on. Moreover, the business model innovation also allows the latecomer to overcome disadvantages from the late entry and gain competitive advantages (Park, 2011). Although above influence factor of reverse innovation have been investigated, the situational factors influencing the reverse innovation strategy decision making have been ignored.

### *2.3 The situational determinant of reverse innovation for the latecomer firms*

The reverse innovation of the latecomer is usually not an occasional accident, but a strategic activity (Immelt et al., 2009; Govindarajan and Trimble, 2012). The strategies to pursue often depend on the suitability among the company mission, internal environmental factors and external environmental factors. According to the contingency theory, the strategies are situation-dependent, signifying different innovation strategies

are selected and adopted in the different situations (Quinn et al., 1988). Therefore, the analysis of context factors (situation) is important. The situational determinant in this study is proposed in terms of barriers and opportunities that the latecomer firms encounter in the reverse innovation.

Concerning about the main barriers, the latecomer firms face the technological difficulties and marketing barriers (Hobday, 1995). About the reverse innovation opportunities, the first one is the emerging market's demand differences, claiming that the new product or services launched in emerging market need to be differentiated to well meet the different demands. DMNEs often adapt the Triad-based products for the mass market of developing country (Rugman and Verbeke, 2004). The Triad-based products cannot meet the local demands perfectly, creating the opportunities for the latecomer firms. The second opportunity is about the technology advance in emerging market, especially the ones leveraging the disruptive innovation or leapfrogging for the latecomer firm. Therefore, the marketing demand factor and technology factor influence the reverse innovation from both sides of threat and opportunity. These two factors are also consistent with the innovation driving force theory, which stresses that the innovation is technology pushed and demand pulled (Nelson, 1959; Langrish et al., 1972; Scherer, 1984; Rosenberg, 1994). It implies that the driving forces of reverse innovation are of no difference with the general innovation. Moreover, supported by the theory of distance (Ghemawat, 2001), the market demand difference and technology gap between developing and developed country are diverse, according to the characteristics of specific industry or the specific products. The latecomer firms then face diverse market demand differences and different size of technology gaps in the reverse innovation. Based on above analysis, a hypothesis is raised as follow.

**Hypothesis** The market demand difference and technology gap between the developing country and developed country are the proper situational determinants of reverse innovation strategy.

The proper situation determinants can help the latecomer firms launch the right strategy in the right situations at the right time. Based on the hypothesis, the situational matrix of reverse innovation for latecomer firms are set up, shown in Figure 1. The 'difference of market demand' between the developing country and developed country, shown in the vertical axis of the matrix, depends on the consumer buying power, culture, preference, buying desire and so on. The size of technology gaps, shown in the lateral axis of the matrix, represents the differences in technological advancement between developing country and developed country in a given industry. The large or small in two-two cross connection of these two situational determinants makes the matrix, displaying four situation in which the latecomer firms launch reverse innovation strategy. The situation 1 refers to the small size of technology gap and small difference of market demand. The situation 2 refers to the small size of technology gap and large difference of market demand. The situation 3 refers to the large size of technology gap and small difference of market demand. The situation 4 refers to the large size of technology gap and large difference of market demand.

**Figure 1** The situational matrix of reverse innovation for latecomer firms

Difference of Market Demand	Large	<b>Situation 2</b>	<b>Situation 4</b>
	Small	<b>Situation 1</b>	<b>Situation 3</b>
		Small	Large
		Size of Technology Gap	

### 3 Research design

#### 3.1 Research method

The multiple-case study is applied in this study as the research method. The case study method is suited to answer ‘how’ questions and the multiple-case studies provide a stronger base for theory building (Eisenhardt, 1989; Yin, 2003). The theory is developed by recognising patterns of relationships among constructs within and across cases and their underlying logical arguments (Eisenhardt and Graebner, 2007). Case analysis in this multiple-case study includes the inner-case analysis, dual-case analysis, and cross-case analysis. The inner-case analysis can help develop deeper understanding of each case. The dual-case analysis based on the contrast logic or verified logic, and the cross-case analysis based on the comparative logic can help recognise the relationships among factors relate to the research questions. Cross-case analysis is like conducting several experiments for the replication of same logic across cases (Eisenhardt, 1989; Yip, 1989). Since one latecomer firm may launch several reverse innovation projects to develop several different products, this study takes the product developed in reverse innovation as the research unit, but not the latecomer firm as the unit of analysis. The product, developed in reverse innovation, often in terms of a project, is regarded as a case in this study. Case group is sorted by the cases in similar situation for dual-case analysis in this study.

#### 3.2 Sample selection

The sample selection follows the rules of purposive sampling and theoretical sampling (Eisenhardt, 1989). According to the situational matrix, two typical cases are selected for each situation. There are eight cases in total are selected as samples. In these eight cases, there are three cases chosen from Haier in three different situations and two cases chosen from Mindray in two different situations. Selecting more than one case from the same latecomer firm, can better explore how the latecomer firm chooses different strategies in different situations, and better observe the strategy evolution path. These samples are also selected considering the availability and the typicality. Eight reverse innovation cases (marked from C1 to C8) from five latecomer firms in China are listed in Table 1.

**Table 1** The enterprises for case study and the products (samples) of reverse innovation

<i>Name of latecomer</i>	<i>Products of reverse innovation (case)</i>	<i>Developed country entered in reverse innovation</i>
Haier Group	Double-door refrigerator (case 1, C1) Mini washer (case 2, C2) Hybrid (double-Driver) washing machine (case 3, C3)	America, Euro, Japan, et al.
BYD Co.Ltd	Mobile phone battery (case4, C4)	America, Euro, Japan, et al.
Mindray Medical Inte	Ultrasound product series, like the digital black and white ultrasound products (case 5, C5) Portable ultrasound device (case 6, C6)	Euro, America
Goldwind Co. Ltd.	Direct-drive permanent magnet wind turbine generator (case 7, C7)	Australia, America
Sunward Intelligent Machiner Co. Ltd.	Small-scaled hydraulic excavator (case 8, C8)	Euro

### 3.3 Data collection

The research group includes one professor, two PhD candidates and four master degree candidates, with research experiences in technological innovation and innovation management. The data about above five latecomer firms and eight cases (products) are collected from more than three sources, to meet the requirements of the triangulation method put forward by Patton (1987). Three approaches, shown in Table 2, were adopted in the data collection, including semi-structured interviews, archives, and internal data access. The data collection guide focuses on the how the latecomer firm makes decisions about the reverse innovation strategies, and what factors influence these decisions.

The semi-structured interviews were carried out with engineers, technical directors, marketing executives from above five firms as internal interviewees. The external interviewees mainly include engineers and people from management level in peer companies, and the researchers in academic institutions. The interview outlines are listed in Table 3. There are seven internal interviewees and eight external interviewees have been interviewed. These interviews were conducted in early 2017. The internal data were collected together with some interviews. The archive includes enterprise official website information, listed company's prospectus and periodical announcements, relevant news reports, case-related academic literatures in journals. Since the reverse innovation strategy is often made by the top management level in the company. The research group paid special attentions to the speeches, interview report from top management level, published in a formal journal, magazines or newspapers. The authenticity about these data collected from archives is also checked in the interviews, to meet the requirements of the triangulation principle.

**Table 2** Data collection approaches

<i>Name of enterprise</i>		<i>Enterprise internal data</i>		<i>Archives</i>	<i>The interviews of industrial experts</i>
Haier Group	1	Collect internal data from the engineer and the participant of development of mini washer and 'hybrid' washing machine through two hour phone interview.	1	Collect public information from Corporate official website and the other reliable websites.	Individual face to face interview with the engineer from the Midea Group for four hours, and the engineer from the Little SwanWashing Machine Co., Ltd, for three hours.
(C1, C2, C3)	2	Collect the internal information about the marketing through 2 hour direct telephone interview with a marketing executive.	2	Search the related information from academic network data, like Chinese Core Journal Database, the academic literature database, and the China Core Newspaper Databases.	
	3	Observe the demonstration and the function introduction from sales people in stores.			
BYD CO. LTD. (C4)		Collect the internal data through face to face two hours interview with an engineer, who is currently working in BYD.		The same as above.	One hour interview with an engineer, who is working in Motorola.
Mindray Medical Inte (C5, C6)		Two hour phone interview with an engineer who has worked in Mindray. P two hour phone interview with a marketing executive in international marketing department.		The same as above.	Interview with an engineer, for one hour, who is working at GE Medical Business Department.
Goldwind CO. LTD. (C7)		The board chairman appointed the secretary to attend telephone interviews for several times, for about 3 hours in total.		The same as above.	Interview with two professors of Mechanical and Electrical Engineering in Dalian University of Technology, each for two hours.
Sunward Intelligent Machinery CO. LTD. (C8)		Two hours telephone interview with the engineer, who is working in International Marketing Department in Sunward.		The same as above.	Interview with middle-class manager in regional agent of Atlas Copco, for two hours, an engineer in regional agent of Atlas Copco, for two hours.

**Table 3** Interview outlines in data collection

<i>Questions for internal interviewees</i>	<i>Questions for external interviewees</i>
What are your job responsibilities in the company?	Please introduce the industry you work in. What are your job responsibilities?
Please describe the product portfolio and developing process of the company.	What is the development level of this industry in China?
How did you launch your international business?	In what degree are the Chinese companies internationalised in this industry?
Do you have any comparative advantages in global market?	
What are the opportunities and threats you encounter in global market?	Are the products made in China in this industry being accepted in global market? Are these accepted by the market in developed country?
Do you think the Chinese local firms have some special opportunities in developed country market?	Do you think the Chinese companies have some special opportunities in developed country market?
What are the market demand differences between the international market and market in China?	What are the market demand differences in this industry between the international market and market in China?
How did you make the decision about the direction of R&D?	Are the Chinese companies highly involved in R&D activities in this industry?
Do you have a large technology gap with the leading firms in related industry?	Is there a large technology gap with the leading firms in this industry?
How do you organise your R&D projects?	How do the Chinese companies acquire technology knowledge and market knowledge? Are the Chinese companies often linked closely to the leading multinationals?
Why do you think your customer in developed country choose your product?	
The first country that the firm chose to enter, is with the market demand similar as the ones in China, or different from the ones in China. Why and how did you make this decision?	Are there any differences, especially in value propositions, between the products provided by the Chinese companies and the leading multinationals?
How does the management level make the decision about product development plan in global market? What is the process?	Why do you think the customer in developed country would prefer the products made in China?

### 3.4 Data processing and data analysis

To process the qualitative data analysis, six members are divided into two groups to explore how the latecomer firms adopt the reverse innovation. First, the collected original qualitative data are checked and fully comprehended by each group. Second, the factors related to the reverse innovation strategy are identified and induced by each group independently. Then, two round of discussions about these factors are made to modify and reach an agreement. Afterwards, Delphi method has been used to evaluate the degree of large or small, weak or strong of above factors. Three rounds of questionnaires covering these factors are sent out to the experts, including six research group members and other two consultants. The group response has been made through consensus about

the degree of these factors. The performance of reverse innovation has also been evaluated in this process. At last, all the data analysis results were handed to other three industry experts and two academic researchers to examine and verify as consultants for the theoretical saturation test.

## 4 Multi-case analysis

### 4.1 Inner-case analysis

Inner-case analysis has been carried out for each case. The factors related to the reverse innovation strategy have been induced. The relationships among these factors are inner-case analysed. Two factors (the market demand differences between developing country and developed country, the technology gap between developing country and developed country) are the context factors. Two factors (being involved in idea/concept generation, being involved in technology development) are the strategic activities. Two factors (the innovation capabilities of latecomer firms, the innovation capabilities and competitive strategy of leading firms and other competitors) are the conditional factors.

**Table 4** The case description of the samples

<i>Case</i>	<i>The case description</i>
Case 1 Haier double-door refrigerator	The first double-door refrigerator in the world was made by Haier. Haier imported the production technology and manufacturing equipment from Liebherr in Germany in 1985. The technicians and marketing staffs in Haier found that, due to different habits, the needs for cold storage function is more prominent than freezing function for families in China. In response, the double-door refrigerator was developed, laying the cold storage chamber with highly frequent use on the top of the freezing chamber. The double-door refrigerator quickly achieved high market share in China because of its advantages in convenience and energy efficiency. When Haier analysed the European market, they found the increasing demands for frozen foods. Thus, the freezing chamber are developed to be laid below and enlarged. In 1990s, Hair quickly modified the products appropriately, trickling up the products into Germany, where the refrigerator technology came from.
Case 2 Haier mini washer washing machine	The experiences from the double-door refrigerators reminded Haier to pay attention to idea generation in innovation. Haier established a market feedback access, named 'Daily Information Network'. Through this access, they found that the existing washing machines were normally oversized in washing capacity for the consumers in China. It caused problems of water wasting, time consuming, high power consumption and too much space occupying. In 1997, Haier started to develop the super-small machine with market position in small volume, instant washing, easy to move, to meet the demands of families with fewer members and those who have to wash clothes by hand in summer. Haier found that family size in the developed countries was also becoming smaller, and the number of singles was increasing, providing market opportunities. After occupying the domestic market, the series of 'mini washer' products were introduced in Japan, European and US markets.

**Table 4** The case description of the samples (continued)

<i>Case</i>	<i>The case description</i>
Case 3 The 'hybrid' washing machine of Haier	In 2001, there were three different kinds of washing machine, including roller washing machine, stirring washing machine and pulsator washing machine. These three kinds of washing machine have different shortcomings. The Haier marketing department noticed that what customers really need is a green and full-featured washing machine with superior clearance ability, water-saving and tangle-free. Haier finally overcame the technology difficulties of 'one power input, and two powers output'. The improvement made it possible to reduce the cost and achieve the effective switch from washing to drying. After one year R&D efforts, 'Hybrid' washing machine, called as 'the forth washing machine' was launched in both domestic market and foreign market simultaneously.
Case 4 Mobile phone battery of BYD	In 1995 BYD took advantage of the mature technology of nickel-cadmium batteries, concentrating on the production process innovation. BYD learned the production line process from foreign manufactures, broke the automated process into manual or semi-automated steps. It took BYD only about 1 million RMB to build up the own production line, which could produce 4000 cadmium batteries per day. Such production line might cost tens of millions RMB formed by the automated process from the foreign manufactures. Meanwhile, BYD established an innovation assemblage made up by a series of micro-innovation. For example, reforming the chemical composition of the liquid in battery, developing corrosion-resistant and nickel-plated piece to replace original nickel piece, searching for alternative raw materials to cut cost and so on. In 1996, BYD became the world largest nickel-cadmium mobile phone battery supplier. It trickled the products up to Japan, the country where the technology originated from.
Case 5 The Mindray digital black and white ultrasound products	Medical ultrasound equipment technology was mastered by GE and other DMNEs. Mindray focused on the innovation of follow-up digital ultrasonic equipment, and put efforts in development of digital black and white ultrasound products. Acquired venture capital in 1997, Mandray carried out high-intensity product development, launched the first digital black and white ultrasound desktop products (DP-9900) in 2001. With great cost performance, the products were introduced to European markets.
Case 6 The portable ultrasound device of Mindray	Mindray identified the demands for portable ultrasound products in maternal child health care system at domestic market. Meanwhile, the feedback information from overseas agencies showed that the private clinics and small private hospitals in Europe also had the similar demands. Mindray started developing the portable ultrasound products and focused on special features, including high portability, easy operability and low price. In 2004, Mindray brought forward the portable ultrasound device, and also mastered the colour signal processing technology. In 2006, Mindray launched the first digital colour ultrasound device DC-6 in China, with own intellectual property rights. Furthermore, the price of DC-6 is about 40% lower than similar products from GE, Siemens, Toshiba and other DMNEs. In 2013, the Mindray's overseas market sales accounted for 55% of the total sales.

**Table 4** The case description of the samples (continued)

<i>Case</i>	<i>The case description</i>
<p>Case 7 The Goldwind permanent magnet direct drive wind turbine</p>	<p>Supported by the government, Goldwind improved a lot in the R&amp;D capability, and successively developed the own doubly-fed wind turbine sets. By 2008, Glodwind was able to manufacture key parts of wind turbine independently, such as wind wheel, hydraulic system, control system and so on. It acquired VENSYS from Germany, which had PMDD (Permanent-Magnet Direct-Drive) technology patents. Through the combination after the acquisition, Glodwind developed the 2.5MW and the 3MW PMDD wind turbine. The technical principles of PMDD wind turbine has been already fulfilled by leading multinational enterprises. What Goldwind more concentrated is in product design and product development. In 2011, Goldwind launched the first US project with 71 turbines based in Shady Oaks. In November 2012, Goldwind won a contract for supplying Gullen Range project in New South Wales of Australia with 73 PMDD wind turbine.</p>
<p>Case 8 Sunward mini intelligent hydraulic excavator</p>	<p>In 1990s, the excavator market share occupied by the DMNEs in China was than 90%. From the market analysis, Sunward found that the global enterprises had R&amp;D advantages in the field of large and medium-sized construction machines. However, for small-sized excavator, the mechanical, electrical and hydraulic systems were not well integrated. The technology development process was not very difficult and investment requirements were relatively low. Moreover, domestic demand for small-sized excavator was high. Market analysis in Europe and USA showed that the large global multinational engineering machine enterprises preferred the large and medium-sized construction machinery products with high-profit. They ignored small-sized excavator segments with potential application in the municipal construction, gardens, and farms. With accumulated experiences in product idea generation and conceptualisation, Sunward pre-empted the niche markets by improving the product’s convenience for use, flexible operation and multifunction. After occupying the domestic market, Sunward exported the products to the European market.</p>

Generally, the steps of innovation chain include ideas/concepts generation, research and development, commercialisation (or industrialisation). Latecomer firms have been found only focusing on specific step of innovation chain in inner case analysis. Because the latecomer firm has relatively weak innovation capability and encounters resource constraints, it cannot involve in all the steps of innovation chain independently. The case description is shown in Table 4.

*4.2 Dual-case comparative analysis*

Based on the inner-case analysis, the cases in the same situation have been sorted into case group. Case 1 and case 4 in situation1 are classified as case group 1. Case 2 and case 8 in situation 2 are classified as case group 2. Case 5 and case7 in situation 3 are classified as case group 3. Case 3 and case 6 in situation 4 are classified as case group 4. The dual case comparative analysis has been carried out in each case group with context factors (situational determinants) controlled. The dual case comparative analysis shows that in all four case groups, the two cases have the similar strategic activities and similar latecomer innovation capabilities supporting the strategic activities. The two cases in each case group reflect mutually confirmed relationship.

### 4.3 Cross-case comparative analysis

The cross-case comparative analyses are carried out among the four case groups. Each case group shows different strategic activities and different latecomer innovation capabilities with other three. These four case groups reflect complementary relationships with each other. The result of dual-case comparative analysis and cross-case comparative analysis is shown in Table 5.

**Table 5** Dual-case comparative analysis and cross-case comparative analysis

		<i>Dual-case analysis</i>			<i>Cross-case analysis</i>	
	<i>Context factor</i>	<i>Strategic activities</i>	<i>Relationship with other case in group</i>	<i>Relationship with other groups</i>	<i>Innovation performance</i>	
G1	C1	S1: small size of technology gap.	Low involved in idea/concept generation;	C1/C4	Complementary with G2, G3, G4	***
	C4	Small market demand differences	Low involved in technology development (high in commercialisation)	Mutually confirmed		**
G2	C2	S2: small size of technology gap;	High involved in idea/concept generation	C2/C8	Complementary with G1, G3, G4	*****
	C8	Large market demand differences	Low involved in Technology development	Mutually confirmed		****
G3	C5	S3: large size of technology gap;	Low involved in idea/concept generation;	C5/C7	Complementary with G1, G2, G4	***
	C7	Small market demand differences	High involved in technology development	Mutually confirmed		***
G4	C3	S4: large size of technology gap;	High involved in idea/concept generation;	C3/C6	Complementary with G1, G2, G3	*****
	C6	Large market demand differences	High involved in technology development	Mutually confirmed		****

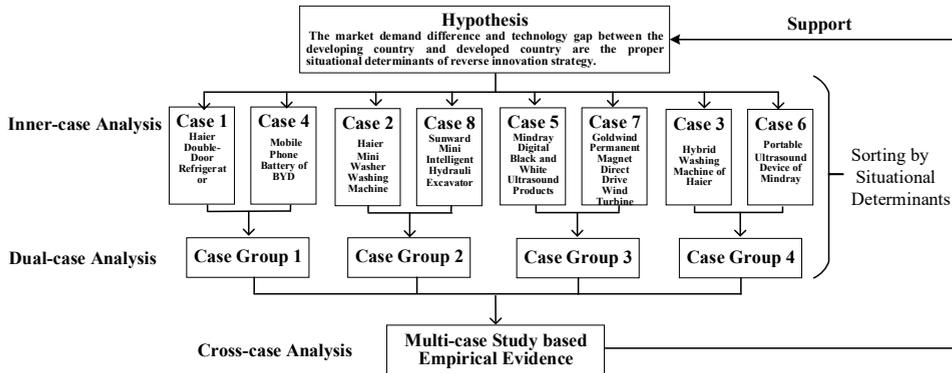
Notes: The number of (\*) in the table means the good or not of reverse innovation performance. The indicators used in the evaluation consist of the market share, sales growth, and the total service capability in developed countries.

The cross-case analysis indicates that the strategic activities have relevance with the reverse innovation performance. It shows the trend that the more involved in technology development or the more involved in conception/idea generation can better improve the reverse innovation performance. However, since the reverse innovation is highly situation-dependent, the strategy of being high involved in idea/concept generation or high involved in technology development, may not adapt to the real situation, especially in recourse constraints.

## 5 Research findings

The mutually confirmed relationship in dual-case comparative analysis and the complementary relationships in 4 case groups have supported the hypothesis put forward in Section 2.3, shown in Figure 2. The result confirms that the market demand difference and technology gap are the proper situational determinant of reverse innovation strategy.

**Figure 2** The empirical evidence-based multi-case study findings



### 5.1 The four basic reverse innovation strategies for the latecomers

According to the research findings, the reverse innovation strategies for latecomer firms are proposed as below.

#### 5.1.1 The rapid-penetration strategy for the situation 1

The reverse innovation strategy suited in situation 1 is named as the ‘rapid-penetration strategy’. The strategic purpose is to occupy the market in a fast speed, often with heavy promotion and low price strategic activities. The innovation of double-door refrigerator of Haier was the case of ‘rapid-penetration strategy’. It was the leading multinational enterprises who first made the conceptualisation of the double doors refrigerators. However, Haier took advantage of leading enterprises’ hesitation in action, and occupied the market rapidly. Meanwhile, adding a door and a thermostat to the product did not ask for high technology development capabilities, which ensured Haier accomplishing the rapid-penetration strategy. BYD, in the same way, was weak in both capabilities of conceptualisation and technology development. However, BYD finally opened the global market by adopting process innovation, quick action and low-price strategy.

The ‘rapid penetration strategy’ is adopted in the situation that there is no big demand differences between the target segments in emerging market and the ones in developed country. Moreover, the technology about the products is often available or not complex for the latecomer firms. The necessary condition of applying the ‘rapid penetration strategy’ is that the latecomer firm owns the readymade ‘good enough’ technology. Products can be redesigned to get ultralow cost with the experience curve effect. The emerging market requires products with significantly improved price-performance features, creating opportunities for ‘affordability innovation’. The consumers in

developed country are also value conscious, happy with 'good enough' product quality. Usually, rapid penetration strategy is the most appropriate strategy of reverse innovation for the latecomer firm in the start-up stage in certain industry. The quick market response and market development capabilities are the key to the rapid-penetration strategy. To provide 'faster' and 'cheaper' product value proposition is the key point for latecomer firms, especially for the products with high price demand flexibility. In this situation, DMENs often prefer the skimming strategy, concentrating on the high profit segments and ignoring the low-end segments. This provides an opportunity for latecomer firms applying the 'rapid penetration strategy'.

### *5.1.2 The differentiation-driven strategy for situation 2*

For the situation 2, the 'differentiation-driven strategy' is adopted as the reverse innovation strategy with high concentration on idea/concept generation of product. The latecomer firms add new functions to optimise the products for emerging markets, such as portability or ease of use. The strategy is to better meet the different demands in emerging markets, which may also create new applications in developed countries. As mentioned above, the leading multinational enterprises paid most attention to the large-volume washing machine with high-profit. Haier concentrated on idea generation and developed the small-volume washing machines, demanded in both developing and developed country. As the same, Sunward targeted at the small-sized excavators, which was ignored by the leading multinational enterprises, and occupied the global market.

This strategy is often adopted when the market demands between the emerging market and developed country market are different, and the technology is relatively mature in emerging market with small technology gap with developed country. In the emerging market, the demands are often differentiated and dynamic, leaving some segments ignored by DMENs. Moreover, based on the glocalisation strategy, the DMENs often adapt the Triad-based products for the mass market of developing country, which cannot match the local demands very well. Redesigning the existing products from the ground up for ignored segments may generate a second round of growth of those products in developed markets. Moreover, choosing the profitable niche market as a target can avoid confrontation with strong competitors for latecomer firms. Compared with the rapid-penetration strategy, the requirements to implement the differentiation-driven strategy are higher in some degree. More than idea generation, it requires the product development, market development and manufacturing capabilities. From above cases, although the two latecomer firms were both weak in R&D capability, they at least had the technical capabilities to redesign and develop the adaptable products.

### *5.1.3 The development-centred strategy for situation 3*

The reverse innovation strategy suited in situation 3 is named as the 'development-centred strategy' for the latecomer firms. From the case analysis, although leading multinational enterprises had exploited direct-drive permanent magnet technique principle before Goldwind, they had not invested enough in further development due to the 'path-dependence'. Goldwind undertook the technological development by heavy investments in a rapid speed. The case of the digital black and white ultrasound products of Mindray worked in the same way.

The development-centred strategy is adopted in the situation that the latecomer firms encounter technological barriers. In this situation, the technology gap between the emerging market and developed country is large, and the market demand differences are relatively small. The situation often exists in the emerging industry. The related technology is unavailable in the emerging market, but might be acquired from developed country in some extent. There are some reasons why we call the strategy ‘development-centred’, but not the ‘R&D-driven’. From the cases of Godwind and Mindray, we noticed that the research activities, like the basic technical principles, have been mainly accomplished by the leading companies in developed country. Goldwind and Mindray only concentrated on the technological development activities such as production process design, aiming at the commercialisation and industrialisation of the products. The technology searching activity often works instead of the research activity. By focusing the limited resource on single activity, the investments in development activities and production activities are less risky for the latecomer firms.

The adoption of the development-centred strategy asks for comprehensive capabilities, including the technology searching capability, financing capability and so on. For example, before the PMDD technology has been industrialised on large-scale by DMNEs, Goldwind must fully evaluate the pros and cons of the technology, and the difficulties in technological development. Goldwind put high-intensive investments in technological development and accomplished the industrialisation more quickly than the DMNEs did. It also required strong financing capability. The development-centred strategy for latecomer firms often brings disruptive technology (as Mindray digital black and white ultrasound products). It may even cause technological leapfrogging if the window of opportunity emerges and has been grabbed (as Godwind’s PMDD wind turbines).

#### *5.1.4 The full-range strategy for situation 4*

In situation 4, the latecomer firms adopt the ‘full-range reverse innovation strategy’, concentrating on both idea/concept generation and technology development. It is the most demanding and challenging strategy, compared with other three. The cases of hybrid washing machine and portable ultrasound equipment showed that the reverse innovation in situation 4 depends on strong capability of developing advanced technology, which Haier and Mindray had accumulated in early stage.

The full-range strategy is adopted in the situation that market demand differences between emerging market and developed country are large, providing market opportunities for latecomer firms. The technology gap is also large, bringing technology barriers for local latecomer firms. The situation usually exists in emerging industry with strong market competition and strict technology blockade. The latecomer firms usually chose to target the niche segment in emerging market, especially at the bottom of the pyramid (BOP). This can help avoid the direct competition with DMNEs, which mainly serve only the top of the pyramid in emerging markets.

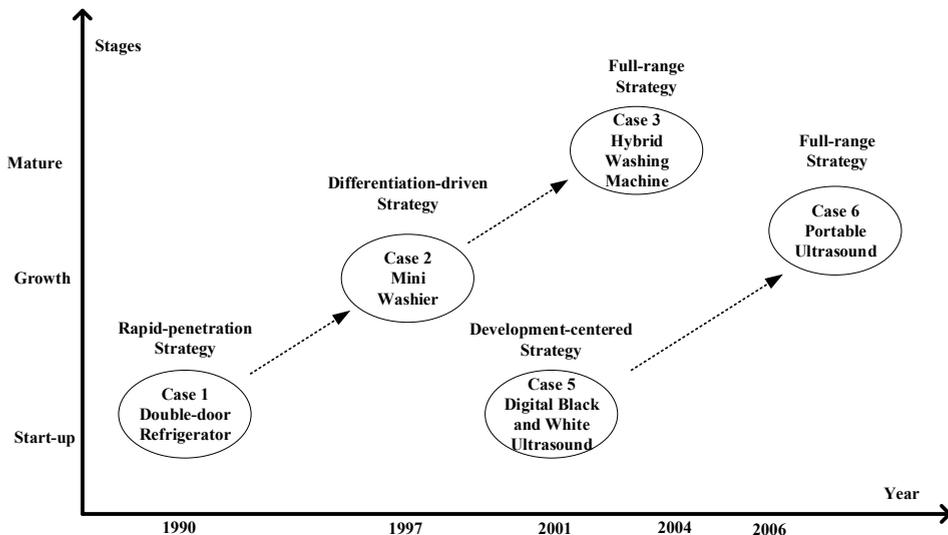
The latecomer firms provide the perfectly matched value propositions for the niche segment in emerging markets, and try to create new applications to develop potential markets in developed countries. ‘Up-to-date technology’ or advanced technology is preferred in both emerging market and developed countries. The ‘good enough’ technology may not work, because the large technology gap is too large. It is clear that endogenous capability of R&D is the key to adopt the full-range strategy for latecomer

enterprises. Meanwhile, to overcome the difficulties in R&D, strong external resource integration capability is a must. For example, in the development of the hybrid washing machine, the main technical difficulty was to develop the motor producing dual-power. It was a problem that could hardly be solved in China at that moment. Through patent search, Haier found a company in South Korean owing such technology. Haier then requested this company to develop the motor, and timely acquired the patents of the motor developed by the South Korean company.

## 5.2 The evolution path of reverse innovation strategy

The cases of Haier and Mindray are depicted in the dimension of time, showed in Figure 3. Two evolution paths of reverse innovation have been identified. These two paths also reflect the growth process of the latecomers with the innovation capability accumulation step by step.

**Figure 3** The evolution path of reverse innovation strategy of Haier and Mindray



### 5.2.1 Evolution path 1: Haier group as example

The evolution path 1 follows the way from rapid-penetration strategy, differentiation-driven strategy to full-range strategy. It focuses on marketing in the early stage, and concentrates more on technology in latter stage. The first double-door refrigerator in the world was made by Haier, which showed its quick response to the market by adopting the rapid-penetration strategy. The double-door refrigerator quickly achieved high market share in China because of its advantages in convenience and energy efficiency. The case of mini washer also shows a very quick response to meet the ignored demands by adopting the differentiation-driven strategy. Although Haier's technology development capability was weak at that time, adding a door to a refrigerator and the miniaturisation technology of a washing machine were not so complex. Actually, the R&D team took only four months to develop the mini washer. Therefore, in the early

stage, Haier concentrates more on marketing in the situation that the technology barrier is low. In the latter stage, to maintain and strengthen the market status, Haier put heavy investment in the ‘up-to-date technology’. The chief engineer in the washing machine department came up with the new idea that to integrate the advantages of different kinds of washing machine together. The product concepts of hybrid washing machine had been brought forward, conceiving both the impeller and the drum rotating at the same time. In order to realise the idea, hundreds of proposals had been designed by the Haier R&D team and also with the help of professional design company. With the concentration shifting from marketing to technological development, the up-to-date technology pushed Haier go deeper into the market by adopting the full-range strategy.

### *5.2.2 Evolution path 2: Mindray medical as example*

The evolution path 2 follows the way from development-centred strategy to full-range strategy. It focuses on technology development in the early stage and concentrates more on marketing in latter stage. Medical ultrasound equipment technology was quite mature, with core technology mastered by GE and other large multinational companies. The Mindray faced large technology barriers in the early stage. Although GE had noticed the possibility of cost reduction by the combination of digital technology and ultrasonic technology, it still adopted traditional analogue technology. While GE shifted its concentration to the more profitable colour ultrasound equipment, Mindray still focused on the innovation of follow-up digital ultrasonic equipment. Adopting development-centred strategy, Mindray brought forward a ‘cheaper’ product based on the technology DP-9900 with high-intensity product development. The products were well accepted in European markets due to the great cost performance. After launching the digital black and white ultrasound products mentioned above, Mindray shifted its concentration more on marketing, and decided to develop an exclusive portable ultrasound product. Meanwhile, it also mastered the colour signal processing technology by adopting full-range strategy. The potable ultrasound was launched and accepted by the niche markets creating new applications in both domestic and developed country.

There are two evolution paths identified form this multiple-case study. Since the scale of the sample is limited, these two evolution paths may not cover all the circumstances. More samples and quantitative research may be used to further explore the evolution path of reverse innovation strategy.

## **6 Synthesis and discussion**

### *6.1 Synthesis*

This study illustrates that the reverse innovation strategies adopted by latecomer firms are highly situation-dependent. The market demand difference and technology gap between the developing country and developed country are the proper situational determinants of reverse innovation strategy. Comparatively, the DMNEs with less technology difficulties and marketing barriers are less situation-dependent than the latecomer firms, and they even adopt the reverse innovation strategy as part of the global strategy. However, for the latecomers with resource constraints, adopting the right reverse innovation strategy in the right situation at right time are extremely essential.

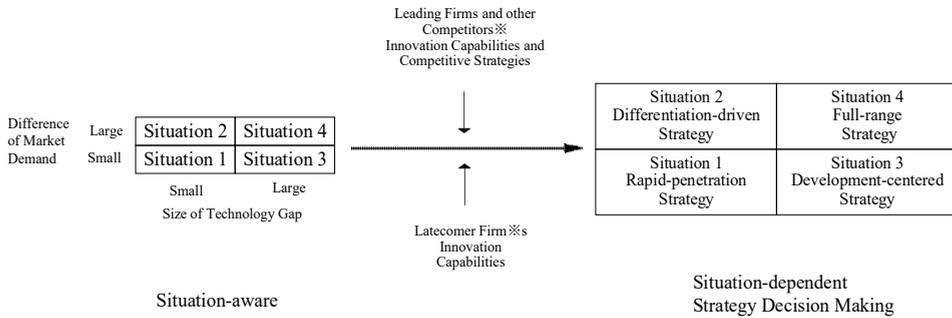
**Table 6** Four basic reverse innovation strategies in different situation for latecomer firms

<i>Reverse innovation strategy for latecomer</i>	<i>Situations</i>	<i>Key point of the strategy</i>	<i>Latecomer's innovation capability requirements</i>	<i>DMNEs' limitations in such situation</i>
Rapid-penetration strategy	<i>Situation 1:</i> there is no big demand difference between the target segments in emerging market and the ones in developed country, and the technology of the products is often available in emerging market and not complex for the latecomer firms. It often exists in the mature industry.	Provide 'faster' and 'cheaper' product value proposition (often with heavy promotion and low price strategic activities) in local and developed country market, offer price-performance features.	Quick market response capability; market development capability; usually own the ready-made 'good enough' technology.	Often concentrate on the high profit segments and ignore the low-end segments; prefer skimming strategy and miss the best market occupying chance.
Differentiation-driven strategy	<i>Situation 2:</i> the demands between the emerging market and developed country market are different, and industrial technology is relatively mature in emerging market with small technology gap with developed country.	Provide 'better' product value proposition to better meet the different demands in emerging market than the DMNEs do, and create new applications in developed countries.	Market cognition ability; conceptualisation capability; adaptive technology improvement capability.	Adapt triad-based products for the mass market of developing country, which cannot meet the local demands well.
Development-centred strategy	<i>Situation 3:</i> the latecomer firms confront technological barriers, when the technology gap between the emerging market and developed country is large, and the market demand differences are relatively small. This situation usually exists in the emerging industry.	Concentrate the high-intensive investment to technology development and accomplish industrialisation rapidly, may cause technological leapfrogging or bring disruptive technology.	Technology cognition and search capability; financing capability; industrialisation capability.	Subject to path-dependence and competency trap.
Full-range strategy	<i>Situation 4:</i> the market demand differences between emerging market and developed country are significant, providing market opportunities for latecomer firms. The technology gap is also large, bringing technology barriers for latecomer firms. The situation usually exists in the emerging industry with strong market competition and strict technology blockade from DMNEs.	Target the niches in emerging market, especially the ones at the BOP, provide the perfectly matched value propositions, create new applications to develop potential markets in developed countries. 'Up-to-date technology' technology is preferred.	Market cognition ability; idea generation and conceptualisation capability; endogenous R&D capability; resource integration capability.	Often serve only the top of the pyramid in emerging markets; have tension between global capability and national standardisation and national responsiveness.

Besides the external situations, the multiple-case study also shows that, which reverse innovation strategies for latecomer firm to pursue also depends on latecomer’s internal capabilities and leading company’s competitive strategies. As the latecomers develop the capabilities to meet strategic fit in reverse innovation, they also take advantages DMNEs’ limitations in such situation. From the multi-case analysis, it can conclude that there are four basic reverse innovation strategies for latecomer firms coupling four different situations, shown in Table 6.

According to four different situations, four reverse innovation strategies, including rapid-penetration strategy, differentiation-driven strategy, development-centred strategy and full-range strategy, can be selected and adopted. The reversion innovation strategies may be developed and adapted dynamically, matching the changes in external and internal environments. As Grant (1996) has mentioned, a firm’s strategy must be based on its resources and capabilities, and must be determined in relation to its external opportunities. The reverse innovation strategy selection framework for latecomer firm is shown in Figure 4.

**Figure 4** Reverse innovation strategy selection framework for latecomer firm



## 6.2 Discussion

From a theoretical perspective, the contribution of this study is in line with the literature on the innovation internationalisation (Dahlman et al., 1987; Bartlett and Ghoshal, 1989; Kim, 1997; Rugman, 2009), its developments in multinational enterprise management (Doz and Prahalad, 1991; Caves, 2007; Guillen and Garcia-Canal, 2009), and the more recent study about reverse innovation (Govindarajan and Ramamurti, 2011; Govindarajan and Trimble, 2012; Von Zedtwitz et al., 2015). It is noticeable that the previous studies of reverse innovation mainly focus on the DMNEs. This study contributes to the theory on how latecomer firms adopt the reverse innovation strategy in resource constraints, and enrich the understanding of innovation strategy based on contingency approach. The theoretical gaps this study may fill are discussed as follows.

### 6.2.1 The differences between the reverse innovation led by latecomer firms and DMNEs

Firstly, in the view of strategic thinking, the reverse innovation led by latecomer firms is characterised by ‘concentration’. Although the four reverse innovation strategies led by latecomer firms are quite different, they all concentrate on only one or two steps of the

innovation chain. This can be explained by the resource constraints (Mathews and Cho, 1999) that the latecomer firms confront. The thinking of 'concentration' in latecomer firms' reverse strategy can also be deployed in the market targeting. In the reverse innovation, latecomer firms often apply the concentrated marketing as the market-coverage strategy (Varadarajan and Clark, 1994). It only targets a few submarkets, especially the low-end or niche market. On the other hand, without the resource limitations, the DMNEs often engage in more steps in innovation chain, from the R&D to commercialisation to capture more values from each (Doz and Prahalad, 1991). About the market-coverage, DMNEs apply the differentiated strategy by targeting several market segments and designing separate offers for each.

Secondly, in the view of competition strategy, the latecomer firms adopt the reverse innovation as market-challenger strategy. As the market leader, DMNEs mainly use the reverse innovation as defence strategy. As Govindarajan and Ramamurti (2011) mentioned that DMNEs have long got access to the technology and skills needed to create something like the Tata Nano. However, in practice, there was little incentive for them to do so. The main reason why DMNEs take the reverse innovation as a defence strategy is because they have to contend with strong internal resistance to transferring reverse innovations from emerging markets (Govindarajan and Ramamurti, 2011). Such innovations have the potential to cannibalise existing sales and profits in traditional markets and might adversely affect the DMNEs 'brands and image, causing 'self-disruption'. However, once latecomer firms developed such products, DMNEs were drawn into the game (Ramamurti and Singh, 2009).

The position of reverse innovation strategy is also different for latecomer firms and DMNEs. Catching-up is the strategic goal of latecomer firms as a fast follower (Mathews et al., 2011). The reverse innovation, as the main path of latecomer's global expansion, is the coincident with the latecomer's strategic goal of catching-up. The organisation structure of latecomer firms is often based on the catching-up strategic goal, which is less centralised, more flexible, more quickly to respond than the DMNEs (Wu et al., 2010). However, the DMNEs take the glocalisation as the main strategy and the organisation structure is centralised and product-focused based on the glocalisation (Roth, 1988; Robertson, 1995). The potential self-disruption of reverse innovation forces the DMNEs to make organisational change. For example, GE sets up local growth team (LGT) to execute a zero-based effort in emerging market. The position of reverse innovation strategy can be regarded as a remedy or supplement of the glocalisation for the DMNEs, as a result of the tension between the global standardisation and national responsiveness.

Above three differences give revelations to latecomer firms to further improve the reverse innovation strategy. First of all, reverse innovation need to be supported by 'rapid action' and 'pre-emptive market occupy' for latecomer firms. In this process, the latecomer firms can make use of the limitations of DMNEs in different situations, shown in Table 3. For example, the path-dependence, tension between global standardisation and national responsiveness, the familiarity trap, competency trap, complacency trap and so on. Secondly, the latecomer firms ought to forecast the response pattern of DMNEs before they launch the reverse innovation, in order to break the counteroffensive from DMNEs in advance.

### *6.2.2 The differences between the reverse innovations led by the latecomers and the traditional catching-up activity led by the NICs firms*

While Govindarajan and Ramamurti (2011) brought forward the question about why now and not earlier the reverse innovation occur. There have been some doubts remaining that, is the reverse innovation the familiar story with the firms in industrially backward countries playing catch-up, e.g., Japanese or Korean firms in the postwar period (Tsurumi, 1976; Amsden, 1992). From the research findings of this study, the nature of innovation spawned from emerging market is further discussed as follows.

Firstly, as analysed in Section 3.1, the market demand differences provide opportunities of reverse innovation in emerging market. However, the demand difference between the NICs and the USA were not as significant as that in nowadays (Balassa and Noland, 1988). The size of local market in Japan and Korea is much smaller than the ones in China and India. With the small local market, the firms of Japan and Korea are often exported-oriented, encountering competitions directly from the DMNEs in developed country (Wilson and Purushothaman, 2003). The advanced technology is more required as competitive strategy. Therefore, the technological catching-up, especially the technological leapfrogging plays an important role in traditional catching-up story, as Kim (1980, 1997), Lall (1992) and Dahlman et al. (1987) has stated. On the other hand, the huge and highly differentiated local market of China and India provides different opportunities for the latecomer firms to survive and develop, although they suffer the resource constraints (Kothari et al., 2013). In such context, the 'good enough' technology can even be disruptive, leveraging the reverse innovation.

Secondly, the world itself has changed profoundly in the last 30 to 40 years, becoming much flatter than before (Friedman, 2005). It shapes gateways to internationalisation that had not existed earlier (Williamson and Zeng, 2009). Western multinationals were unable to enter and compete in postwar Japan and Korea, but this has been less true of post liberalisation China or India. As a result, DMNEs can participate in the innovation process in emerging economies; in the ways that they could not did in postwar Japan or Korea.

From above two aspects, this study reveals that the situations in which the reverse innovation occur in current China, is quite different from the ones the traditional catching-up stories are in. The opportunities and threats in emerging market nowadays are different from the NICs traditional latecomers experience ever before. Therefore, the reverse innovation is definitely different from the traditional catching-up activities. For example, the reverse innovation often provides the 'cheaper, faster, better' value propositions, these value propositions may creates new applications or create a new market in developed country (Lee and Ki, 2017; Ahmed et al., 2017). While in traditional catching-up, most of the patterns are based on the technological innovation (Kim, 1980; Lall, 1992; Dahlman et al., 1987).

For a long time, the scholars and practitioners in China have attached great attention to the catching-up of Japan and Korea, and try to learn and imitate the catching-up strategy of NICs. Since the traditional catching-up of NICs concentrated on technological innovation, the innovation has been often regarded as 'technological innovation' in China. This may lead to losing sight of the market and business model innovation in emerging market. On the other hand, the scholars in West often view the reverse innovation from emerging market as marketing innovation or business model innovation. The technology efforts made by latecomer firms might be neglected. However, these

efforts may trigger the disruptive technology or even technological leapfrogging. Therefore, to develop a comprehensive understanding about reverse innovation strategy of latecomer firms, this study builds up integrative framework in a contingency theory.

## Acknowledgements

The authors would like to thank The National Social Science Foundation of China (Grant Numbers: 21BGL265) for supporting this research. The authors are grateful to the reviewers for valuable comments.

## References

- Agarwal, N., Brem, A. and Dwivedi, S. (2020) 'Frugal and reverse innovation for harnessing the business potential of emerging markets – the case of a Danish MNC', *International Journal of Innovation Management*, Vol. 24, No. 1, pp.1–15.
- Ahmed, F., Ahmed, N., Briggs, T.W.R. et al. (2017) 'Can reverse innovation catalyse better value health care?', *The Lancet Global Health*, Vol. 10, No. 5, pp.967–968.
- Amsden, A. (2009) 'Does firm ownership matter? POEs vs. FOEs in the developing world', in *Emerging Multinationals in Emerging Markets*, Cambridge University Press, Cambridge.
- Amsden, A.H. (1992) *Asia's Next Giant: South Korea and Late Industrialization*, Oxford University Press, Oxford.
- Balassa, B. and Noland, M. (1988) *Japan in the World Economy*, Institute for International Economics, Washington, D.C.
- Bartlett, C.A and Ghoshal, S. (1989) *Managing Across Borders: The Transnational Solution*, Harvard Business School Press, Boston.
- Bell, M. and Pavitt, K. (1995) *Trade, Technology and International Competitiveness*, World Bank Publications, New York.
- Cantwell, J. and Mudambi, R. (2005) 'MNE competence-creating subsidiary mandates', *Strategic Management Journal*, Vol. 26, No. 12, pp.1109–1128.
- Caves, R. (2007) *Economic Analysis and Multinational Enterprise*, 3rd ed., Cambridge University Press, Cambridge.
- Chen, J. and Huang, H. (2011) 'Reverse innovation: a new class of innovation', *Science & Technology Progress and Policy*, in Chinese, Vol. 28, No. 8, pp.1–5.
- Choi, Y. (1996) *Dynamic Techno-Management Capability: The Case of Samsung Semiconductor Sector in Korea*, Avebury, Aldershot, UK.
- Corsi, S. (2012) *Reversing the International Flow of Innovation: How Does Chinese Market Trigger Reverse Innovation?*, The Sant'Anna School of Advanced Studies of Pisa.
- Corsi, S. and Von Zedtwitz, M. (2016) 'Reverse innovation: a new world order for global innovation?', *European Business Review*, Vol. 11, No. 4, pp.72–77.
- Cuervo-Cazurra, A. and Genc, M. (2008) 'Transforming disadvantages into advantages: developing-country MNEs in the least developed countries', *Journal of International Business Studies*, Vol. 6, No. 39, pp.957–979.
- Dahlman, C.J., Ross-Larson, B. and Westphal, L.E. (1987) 'Managing technological development: lessons from the newly industrializing countries', *World Development*, Vol. 6, No. 15, pp.759–775.
- Doz, Y.L. and Prahalad, C.K. (1991) 'Managing DMNCs: a search for a new paradigm', *Strategic Management Journal*, Vol. S1, No. 12, pp.145–164.

- Eisenhardt, K.M. (1989) 'Building theories from case study research', *Academy of Management Review*, No. 14, pp.532–550.
- Eisenhardt, K.M. and Graebner M.E. (2007) 'Theory building from cases: opportunities and challenges', *Academy of Management Journal*, Vol. 50, No. 1, pp.25–32.
- Figueiredo, P.N. (2003) 'Learning, capability accumulation and firms differences: evidence from latecomer steel', *Industrial and Corporate Change*, Vol. 3, No. 12, pp.607–643.
- Friedman, T. (2005) *The World Is Flat: A Brief History of the Twenty-first Century*, Farrar, Straus and Giroux, New York.
- Ghemawat, P. (2001) 'Distance still matters', *Harvard Business Review*, Vol. 79, No. 8, pp.137–147.
- Giannetti, V. and Rubera, G. (2020) 'Innovation for and from emerging countries: a closer look at the antecedents of trickle-down and reverse innovation', *Journal of the Academy of Marketing Science*, Vol. 48, No. 5, pp.987–1008.
- Govindarajan, V. and Ramamurti, R. (2011) 'Reverse innovation, emerging markets and global strategy', *Global Strategy Journal*, Vols. 3–4, No. 1, pp.191–205.
- Govindarajan, V. and Trimble, C. (2012) *Reverse Innovation: Create Far from Home, Win Everywhere*, Harvard Business School Press, Boston.
- Grant, R. (1996) 'Prospering in dynamically competitive environments: organizational capability as knowledge integration', *Organization Science*, Vol. 7, No. 4, pp.375–387.
- Guillen, M.F. and Garcia-Canal, E. (2009) 'The American model of the multinational firm and the 'new multinationals' from emerging markets', *Academy of Management Perspectives*, Vol. 23, No. 2, pp.23–35.
- Hadengue, M., de Marcellis-Warin, N. and Warin, T. (2015) 'Reverse innovation and reverse technology transfer: from made in China to discovered in China in the pharmaceutical sector', *Management international/International Management/Gestión Internacional*, Vol. 19, No. 4, pp.49–69.
- Hadengue, M., de Marcellis-Warin, N., von Zedtwitz, M. and Warin, T. (2017) 'Avoiding the pitfalls of reverse innovation: lessons learned from Essilor one company's experiences suggest how the specific challenges of reverse innovation may be anticipated and overcome', *Research-Technology Management*, Vol. 60, No. 3, pp.40–47.
- Han, X. and Liu, S. (2020) 'Research on the path of reverse innovation: a case study of high-tech industry latecomer firms in China', *International Journal of Economics, Finance and Management Sciences*, Vol. 8, No. 4, pp.138–145.
- Hobday, M. (1995) 'East Asian latecomer firms: learning the technology of electronics', *World Development*, Vol. 23, No. 7, pp.1171–1193.
- Immelt, J.R., Govindarajan, V. and Trimble, C. (2009) 'How GE is disrupting itself', *Harvard Business Review*, Vol. 87, No. 10, pp.56–65.
- Kim, L. (1980) 'Stages of development of industrial technology in a developing country: a model', *Research Policy*, Vol. 3, No. 9, pp.254–277.
- Kim, L. (1997) *Imitation to Innovation: The Dynamics of Korea's Technological Learning*, Harvard Business Press, Boston.
- Kothari, T., Kotabe, M. and Murphy, P. (2013) 'Rules of the game for emerging market multinational companies from China and India', *Journal of International Management*, Vol. 19, No. 3, pp.276–299.
- Lall, S. (1992) 'Technological capabilities and industrialization', *World Development*, Vol. 20, No. 2, pp.165–186.
- Langrish, J., Gibbons M. and Evans, P. (1972) *Wealth from Knowledge*, Macmillan, London.
- Lee, K. and Ki, J-H. (2017) 'Rise of latecomers and catch-up cycles in the world steel industry', *Research Policy*, Vol. 46, No. 2, pp.365–375.
- Madhok, A. (2010) 'Acquisitions as entrepreneurship: internationalization and emerging-market multinationals'. Paper presented at *Global Strategy Journal launch Conference*, Oak Brook.

- Maeda, M. and Mori, J. (2011) 'An inverse innovation for photovoltaic (PV) industry', *IEEE International Technology Management Conference*, 27–30 June, San Jose, CA. 1034–41, DOI: 10.1109/ITMC.2011.5995999.
- Mathews, J.A. (2002) 'Competitive advantages of the latecomer firm: a resource-based account of industrial catch-up strategies', *Asia Pacific Journal of Management*, Vol. 9, No. 4, pp.467–488.
- Mathews, J.A. and Cho, D.S. (1999) 'Combinative capabilities and organizational learning in latecomer firms: the case of the Korean semiconductor industry', *Journal of World Business*, Vol. 34, No. 2, pp.139–156.
- Mathews, J.A., Hu, M.C. and Wu, C.Y. (2011) 'Fast-follower industrial dynamics: the case of Taiwan's emergent solar photovoltaic industry', *Industry and Innovation*, Vol. 18, No. 2, pp.177–202.
- Mohan, A.V. (2012) 'Internal and external resources for enhancing innovation capabilities – an exploratory study based on cases from the Malaysian automobile sector', *Asian Journal of Technology Innovation*, Vol. 20, No. 1, pp.29–47.
- Nelson, R.R. (1959) 'The economics of invention: a survey of the literature', *The Journal of Business*, Vol. 32, No. 2, pp.101–127.
- Park, S. (2011) 'The effects of entry timing and business model innovation on performance: the case of the global MP3 player market', *Asian Journal of Technology Innovation*, Vol. 19, No. 1, pp.133–147.
- Patton, M.Q. (1987) *How to Use Qualitative Methods in Evaluation*, Sage, London.
- Quinn, J.B., Mintzberg, H. and James, R.M. (1988) *The Strategy Process: Concepts, Contexts and Cases*, Prentice-Hall, Englewood Cliffs.
- Ramamurti, R. and Singh, J.V. (2009) 'What have we learned about emerging-market MNEs?', in *Emerging Multinationals in Emerging Markets*, (Eds.), Cambridge University Press, Cambridge.
- Robertson, R. (1995) 'Glocalization: time-space and homogeneity-heterogeneity', *Global Modernities*, Vol. 1, No. 2, pp.25–44.
- Rosenberg, N. (1994) *Exploring the Black Box: Technology, Economics and History*, Cambridge University Press, Cambridge.
- Roth, K. (1988) 'The multinational mission: balancing local demands and global vision', *Journal of International Business Studies*, Vol. 19, No. 2, pp.304–306.
- Rugman, A. (2009) 'Theoretical aspects of MNEs from emerging markets', in Ramamurti, R. and Singh, J.V. (Eds.): *Emerging Multinationals in Emerging Markets*, Cambridge University Press, Cambridge.
- Rugman, A.M. and Verbeke, A. (2004) 'A perspective on regional and global strategies of multinational enterprises', *Journal of International Business Studies*, Vol. 35, No. 1, pp.3–18.
- Scherer, F.M. (1984) *Innovation and Growth: Schumpeterian Perspective*, MIT Press, Cambridge.
- Tsurumi, Y. (1976) *The Japanese are Coming: A Multinational Interaction of Firms and Politics*, Ballinger Publishing, Cambridge.
- Varadarajan, P.R. and Clark, T. (1994) 'Delineating the scope of corporate, business and marketing strategy', *Journal of Business Research*, Vol. 31, Nos. 2–3, pp.93–105.
- Vernon, R. (1966) 'International investment and international trade in the product cycle', *Quarterly Journal of Economics*, Vol. 80, No. 2, pp.190–207.
- Von Zedtwitz, M., Corsi, S., Søberg, P.V. et al. (2015) 'A typology of reverse innovation', *Journal of Product Innovation Management*, Vol. 1, No. 32, pp.12–28.
- Wang, J., Lan, X. and Zheng, L. (2012) 'Multinational R&D in China: from home-country-based to host-country-based Innovation', *Management, Policy & Practice*, (In Chinese), Vol. 14, No. 2, pp.192–202.
- Williamson, P. and Zeng, M. (2009) 'Chinese multinationals: emerging through new gateways', in *Emerging Multinationals in Emerging Markets*, Cambridge University Press, Cambridge.

- Wilson, D. and Purushothaman, R. (2003) *Dreaming with the BRICs: A Path to 2050*, Global Economics Paper. No. 99, Goldman Sachs, New York.
- Wu, X., Ma, R. and Shi, Y. (2010) 'How do latecomer firms capture value from disruptive technologies? A secondary business-model innovation perspective', *IEEE Transactions on Engineering Management*, Vol. 57, No. 1, pp.51–62.
- Yin, R.K. (2003) *Case Study Research: Design and Method*, 3rd ed., Sage, London.
- Yip, G. (1989) 'Global strategy in a world of nations?', *Sloan Management Review*, Vol. 31, No. 1, pp.29–41.