



## **Impact of reverse innovation and FDI intention on research and development from emerging economies**

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### **Abstract**

This study examines the relationship between investment in R&D and Reverse Innovation and how Reverse Innovation affects FDI intentions. Based on the limited literature review and findings from the interview, it is apparent that firms are investing a huge sum of money in R&D for the innovation. It also shows that reverse innovation can be explorative and exploitative based on the nature of the business and the level of technology. It also suggests that firm explore and exploit the market based their customer attraction of technology. The analysis also shows that the company interviewed in this study leverage the human resources across the globe.

**Keywords:** investment, R&D, reverse innovation, FDI intentions

### **1. Introduction**

Foreign direct investment or FDI has been significantly paid attention by multinational corporations (MNCs) either from developed or developing countries in recent years. MNCs are using FDI as a firm's strategy to gain market access in foreign countries. MNCs are firms that engage in international production, own or control productive activities, which are generally located in more than two countries (Tang, Selvanathan, and Selvanathan 2012) [26]. In addition, when MNCs from emerging economies initiate innovation or technology, called as reverse innovation and consecutively expand it into foreign markets through FDI implementation (Zeschky 2014) [27]. The concept of reverse innovation is relatively new and interesting; however, many emerging economies are effectively utilising reverse innovation especially those from BRIC economies (Alvarez and Marin 2013) [1]. Furthermore, when reverse innovation is invested by MNCs through FDI implementation across the globe, research and development (R&D) has become a particular activity that assists firms to acquire competitive advantages (Lin and Yeh 2005) [13]. According to Lin and Yeh (2005) [13], FDI and R&D are interdependent upon each other. Noteworthy, FDI has been implemented through the different purposes from MNCs, divided into explorative and exploitative intention. However, no research has been done and affirmed that reverse innovation from emerging countries are explorative or exploitative, this paper will be focusing on the conceptual framework through the impact of R&D on Reverse Innovation could be exploitative or explorative. Thus, the first hypothesis will be examined the relationship between R&D and reverse innovation as they are dependent and rely on each other, followed by the second hypothesis addressed on reverse innovation and FDI intention perspective.

### **2. Literature review**

#### **FDI from developing countries**

In last two decades, the emerging economies of BRIC countries, Brazil, Russia, India and China, along with

VISTA countries including Vietnam Indonesia, South Africa, Turkey and Argentina as well as Mexico and Thailand, have been interested into investing abroad and started to establish multinational enterprises (MNEs) in many more developed-economic countries (Hennart 2012) [8]. There have been increasing in size of outward FDI from emerging economies and expanded into developed countries or developing countries rather than being targeted (Masron, Abdullah and Amran 2012) [15]. For example, India has its splendid technology, and Brazilian banks are expanding largely (Punnett 2013) [18]. These types of MNEs are known as emerging market multinationals (EMNEs) and they certainly have various potentials in both being sources of global competition and consumer markets (Gaffney, Kedia and Clampit 2013) [4]. Furthermore, outward FDI from China is attracted to countries that have such large GDP, high inflation, high exports and imports as well as countries that have similar culture or characteristics to China (Kolstad, and Wiig 2012) [12]. This shows that FDI from emerging countries has been significantly played its role to explore more competitiveness in foreign countries.

#### **2a. FDI intention**

Several articles show that FDI is a principal economic driver as it transfers technology, which is essential to economic growth (Pilgrim 2013) [17]. In particular, Dunning determined three advantages of FDI, including Ownership advantages-O, Location Advantages-L, and Internationalisation advantages-I, known as OLI that help implementing FDI efficiently (Tast 2014) [25]. Additionally, FDI intention has been analysed as explorative and exploitative (Kim, Mahoney, and Tan 2010) [1]. Dunning pointed out that there are four basic motives of FDI, which are Resource-seeking, Market Seeking (Roelfsemab, 2013) [20], Efficiency-Seeking and Asset-Seeking (Tast 2014; Nor 2013) [25]. These perspectives are considered as an explorative FDI that involved with seeking local technology, enlarging home-country advantages, and searching for new knowledge that is not implemented within

the home country (Cantwell, 2009 as cited in Kim, Mahoney and Tan, 2010) <sup>[11]</sup>. On the other hand, when firms expand into foreign markets and intend to exploit those countries to seek for host countries' specific advantages, it is considered as exploitative (Schildt, Maula and Keil 2005) <sup>[24]</sup>. Thus, the intention of FDI could be different depending on the purpose of MNCs.

## 2b. Reverse Innovation

Reverse innovation is a recent phenomenon where new technology is developed in an emerging country and products are being sold at low cost in the home market and explore the market in developed countries at a similar cost. Govindarajan and Ramamurti (2011) have defined reverse innovation as innovations that are first adopted in emerging markets before being adopted in rich countries.

Further explanation, reverse innovation refers to products with extremely high-cost advantages compared to existing solutions. They typically do not have sophisticated technological features, but meet the basic needs at a low-cost level by comparably high value for the customer (Zeschky 2011; Agarwal and Brem 2012 as cited in Ivens and Björn, 2013) <sup>[27, 10, 10]</sup>. According to Govindarajan and Trimble (2013) <sup>[6]</sup>, addressed that reverse innovation is crucial for people in developing countries, which has a result from a lack of infrastructure, less developed and fewer delayed regulatory, an instability within countries, and change of environment.

Some evidence shows some countries from emerging economies have been developing their technologies and spread them across countries, for example, Brazil develops in the aircraft industry, electronics and computers, and India develops in IT industry such as computer and software (Alvarez and Marin 2013) <sup>[1]</sup>. Additionally, India as a larger economy, has been adapting technologies for local demand and consumption to build local industries, which have made greater opportunity in terms of computer skill (Goswami, and Saikia 2012) <sup>[5]</sup>. From those examples, this could be a result of a states combination, institutions, foreign capital and domestic enterprises (Alvarez and Marin 2013) <sup>[1]</sup>. It is implied that these innovations have been one of the methods that MNCs utilise, through FDI implementation. Consequently, innovation and technology from emerging economies, which are initiated by emerging economies and spread over many countries, are indicated as reverse innovation.

## 2c. Research and development (R&D)

Throughout recent decades, R&D has been paid attention and intensively involved with high cost. Researchers investigated that R&D had a high relationship between R&D expenditure and innovative output (Hambrick and Macmillan 1985) <sup>[7]</sup>. Specifically, "countries with higher income are more likely to invest larger amounts in R&D" (Qu, Huang, Zhang and Zhao 2013) <sup>[19]</sup>. There are three main reasons why MNCs adopt R&D activity when they decide to go abroad. In developed countries, R&D has a strong role in transferring technology from developed countries to host country, especially in developing countries. Developing countries are likely to attract developed countries to invest in R&D, and economic has been dramatically grown. R&D has been distinguished as "centre for excellence" for any product development (Zeschky, Widenmayer, and Gassmann 2014) <sup>[27]</sup>. The authors have

done case studies on R&D of western MNCs in foreign subsidiaries and it shows that when local expertise and knowledge is used in subsidiaries, the innovation comes up due to specific budget allocation for R&D. Thus, more investment on R&D creates more platforms for the innovation and new product (Zeschky, Widenmayer, and Gassmann 2014) <sup>[27]</sup>. This study shows that managers in the company invest heavily in R&D to build local expertise in the market. Therefore, the local know-how and engineering skills is vital for R&D. When more of such investment in R&D is given, the best things come out of the emerging market.

## 3. Conceptual Framework and Hypotheses development

There has been no research done on reverse innovation from emerging countries that indicated whether (or not) they are explorative or exploitative. Some evidences explained that MNCs played crucial roles in emerging countries on reverse innovation through subsidiaries from developed countries. It only investigated that reverse innovation relies on different factors such as R&D, communication, entrepreneurship, entry mode and subsidiaries' existing time, but nothing focused on its function as being explorative or exploitative. However, some literature implied that MNCs in emerging economies tend to be explorative than exploitative to acquire new technology and competitiveness but still not relevant to the field of this study. Based on the literature and past research, there has been no research done about the relationship between reverse innovation and R&D whether there are explorative or exploitative. Therefore, the conceptual framework has been addressed.

### Proposition1: The investment on R&D impacts Reverse Innovation.



### 3a. R&D and reverse innovation

R&D is crucial for innovation, according to the study; R&D is a vital force for the development of any new products (Zeschky, Widenmayer and Gassmann 2014) <sup>[27]</sup>. As the company invests more on R&D, the new ideas are generated; new products are developed and give more competition to the developed markets, evaluating the consequences of the reverse innovation in developed market is difficult and data are limited. However, El-Ghazaly (2010) <sup>[3]</sup> mentioned that reverse innovation in advanced economies is the introduction of greater competition in input and product markets. Reverse innovation comes from the concept of disruptive innovation theory, which was introduced by Christensen and Bower (1996) gave a new dimension to disruptive innovations (cited in Sinha 2013) <sup>[23]</sup>. This helps many organisations to find new opportunities from disruptive technology or reverse innovation that may be inferior in the beginning, but it would be valued by the low-end market or niche market. Therefore, this technology would improve continuously to overcome strong competitions.

According to Huang and Yu (2011) <sup>[9]</sup>, facing fast technological changes and global competition, inter-organization collaborations have become increasingly important for firms to enhance their competitiveness. Some researchers have been done about the studies in R&D which

is according to Huang and Yu (2011) <sup>[9]</sup>, prior studies conclude that R&D collaborations with research organizations, including technology research institutions and universities, have a direct and positive impact on firm innovation. However, there is no research done on the impact of R&D on reverse innovation. Thus, the first hypothesis has been addressed.

### 3b. Reverse innovation and FDI intention

There is research done on reverse innovations, which focuses on cost constraining and market seeking. A research carried out by Zeschky, Widenmayer and Gassmann (2014) <sup>[27]</sup> state innovations, which are analyzed and ultimately transferred to developed markets, becoming reverse innovation. The author also cites several examples of companies from China and India for developing new products and is competitively selling at low cost in developed markets. Thus, cost innovation is a solution for similar functionalities to western products at a lower cost for resource-constrained consumers.

For instance, GE portable ultrasound from China has substantially marketed in developed markets. Likewise, ZPMC is another largest player in the world market for harbour cranes. Another Chinese firm, Huawei, can sell top-notch smartphones, which gives immense competition to western market (Sinha 2013) <sup>[23]</sup>.

Additionally, Borini, Oliveira, Silveira and Concer (2012) <sup>[2]</sup> pointed out that reverse innovation is a crucial factor in terms of competition for MNCs from emerging countries when decide to expand into foreign markets. Consecutively, MNCs are searching for new opportunities, new advantages and capabilities, which implied as being explorative. On the one hand, there is no research or statistical data on whether such reverse innovation can be purely exploitative or explorative in terms of FDI intention. On the other hand, by analysing the literature review on reverse innovation, it is apparent that reverse innovation is more likely to be explorative in nature at the beginning in such a way of market seeking, and is specially designed for resource-constrained consumers. Therefore, the second hypothesis has been addressed as following

**Proposition 2: When reverse innovation is strong or high, the likelihood for explorative FDI is high.**

### 4. Research Methodology

Qualitative research method was deployed to collect the views about the reverse innovation. The structured questionnaires were employed instead of the quantitative method. There is lack of information on the topic that this study is focusing on. There are limited researches done on this particular topic. Nonetheless, there are some articles which describes the reverse innovation. Questionnaires were sent to a few selected companies and countries through their web page contact address. However, there was no response from these particular companies. I have been looking for building a relationship with the companies and its focal person before the questionnaires were framed. Despite doing that, I was not able to establish a relationship with any companies to send my questionnaires. The reason for not being able to establish the contact and relationship was might be due to ignorance of the front desk people working in the company who check the mail. I also tried to contact the focal person of the company through the contact number

of the company provided in their home page. Having been failed to establish any contact with the focal person, I looked for the social media page for the focal person. Finally, I was able to connect to the focal person to LinkedIn through one of the search engines. It took quite some time to connect to the focal person and finally the contact was established. I wrote him an application to his private message about my desperate need for the information. To gather as much as information, I persuaded him that his company is known in our University in several business units. The focal person was reluctant to carry out my task, as he had to attend several business meetings. However, he finally agreed to answer my questions and cautioned me that much information will not be revealed.

### 4a. Variables

Three variables have been used to determine the extent of our research questions. In the proposition 1 or H1, the independent variable is 'investment on R & D', and Reverse Innovation as dependent variables. In the proposition 2 or H2, Reverse innovation is the dependent variable and FDI intention as an independent variable. No moderator or modulator has been used for this study. R & D has been placed as important tools for several companies and the investment needed is substantial. Therefore, the variable w chosen is significant as the driver of the company's growth and it has a huge impact on the reverse innovation. "R&D expenditure measures the systematic efforts undertaken by firms to increase the stock of knowledge, and the use of this stock of knowledge to devise new applications" (Sasidharan 2010) <sup>[22]</sup>.

Reverse Innovation is a result of extensive investment in R&D and thereby which we linked to different components of FDI intentions.

FDI motive is considered as important for the reverse innovation. Foreign subsidiaries can be established for efficiency- and market-related motives, as well as to source local knowledge (Dunning 1977) as cited in (Santangelo 2013).

Therefore, to examine the congruency of the variables, the questionnaires have been structured. Key concept and properties of data transcript were referred for the data analysis. The important key points were picked up from the transcript, which is related to the propositions. However, the interviewee has not responded to some of the questions due to the secrecy policy of the company.

### 5. Analysis and Results

Important themes were chosen to determine the result. Key points such as Investment in R&D, Reverse Innovation and FDI intentions, which are termed as Explorative or Exploitative, have been identified and the interviewee has indicated some of the key points lightly. Dunning pointed out that there are four basic motives of FDIs, which are Resource-seeking, Market Seeking (Roelfsemab 2013) <sup>[20]</sup>, Efficiency-Seeking and Asset-Seeking (Tast 2014; Nor 2013) <sup>[25]</sup>.

**Proposition 1: The investment on R&D impact on reverse innovation**

As it has been argued in the proposition 1 that higher the investment in R&D has a huge impact on the innovation and better technology. This study wanted to see how much the investment in R&D has an impact on the development of

new technology. It has been argued that for the innovation to be surfaced, investment should be made by the firms or companies. As the R&D comes to full swing, the innovation becomes the essential elements of the team. Thus, reverse innovation comes into effect with new products and services that are competitively penetrating the market.

To validate the above points, the interviewee had expressed that investment in R&D is essential for the innovation and said "we have been investing in research for over three decades now. As for financial investments, we invested over Rs7 billion last year on innovation. We have been consistently investing about 1.5 per cent of our total turnover on research and innovation."

Therefore, it is apparent that firms are investing huge amount of money in the R&D and it suggests that a fair amount of total turnover of the company is reserved aside for research and innovation.

Besides, to determine a firm's innovation as reverse innovation, the separate questions were structured. How the firm's innovation does is considered as reverse innovation? I believed that reverse innovation happens at home country and being used at developed markets. Reverse innovation comes from the concept of disruptive innovation theory, which was introduced by Christensen and Bower (1996) gave a new dimension to disruptive innovations (cited in Sinha 2013) [23]. Reverse innovation has some components such as frugal innovation and disruptive innovation. The interviewee had suggested that their innovation is reverse innovation:

"Derivative innovations help us constantly improve in current services and markets. We do this through our business units, centres of excellence and tools from the company Tools group".

"Platform innovations (Frugal) look at helping businesses adapt to changes in the next two to three years. Company sensor cloud platform, frugal but versatile devices, and our social platforms are just some examples of this kind of innovation".

"Disruptive innovations are long-term research explorations that can be game-changers. We are investing in areas with high potential such as genomics, metagenomics, integrated computational materials engineering (ICME), robotics and automation, and human-centric systems".

In addition, the interviewee also states some of the examples how their innovation is reverse innovation: "There are many live examples of how we help customers: We helped a leader in wind energy with an analytics solution for their big data; a Silicon Valley technology leader has used our capabilities and co-innovation network for mobility and user experience solutions; we are enabling a global retail chain to manage its carbon footprint. Therefore, innovation our company creates has a huge impact at a global scale and it is a reverse innovation".

On being asked whether the innovation is to create new knowledge or product, the interviewee agreed that sole purpose of innovation is to create new knowledge with a competitive advantage in the market and lead the market in terms of technologies.

**Proposition 2: When reverse innovation is strong or high, the likelihood for explorative FDI is high.**

The next contextual framework framed was to see how reverse innovation could impact the FDI intentions. The study shows that innovation from emerging market has

some level of influence in the global market, especially in the developed countries.

Reverse Innovation can be FDI intentions could be considered as an explorative based on what level of activity that the firms carry out; it involves with seeking local technology, enlarging home-country advantages, and searching for new knowledge that is not implemented within the home country (Cantwell 2009 as cited in Kim, Mahoney and Tan 2010) [11]; can be exploitative otherwise if a new set of innovation comes in a package without having to use the existing knowledge of the foreign countries.

Nonetheless, the studies by Borini, Oliveira, Silveira and Concer (2012) [2] shows that reverse innovation is critical for MNCs coming from emerging economies; thus MNCs are searching for new opportunities or capabilities which can be explorative initially.

Cost-effective innovation is a solution for similar functionalities to western products at a lower cost for resource-constrained consumers. The primary focus of the frugal innovation is to cater the needs of the domestic consumer, however, due to the similar income bracket in the developed countries, the need for the frugal innovation product has been on the rise, which the firm may try to exploit at the later stage. The interviewee responded to the question of how successful their innovation in expanding the market: "We are at a global footprint. We have been successful because of our cost-effective technologies". "We have a good team of researcher and engineers working constantly for innovation, as I explained earlier, we have 4E models that work perfectly and we were able to break the competition and our business is successful worldwide".

Besides, the interview data also unearthed some of the strategies in innovation used in the company: "We have a 4E model for innovation management. The core research in the labs comes under the 'Explore' phase. Once we have tested research concepts and we feel they are technologically sound and have market traction, we 'Enable' these ideas by engineering applications. Those that are most attractive to our customers and business are then scaled up by an 'Exploit' team. There is a fourth team, the 'Evangelise' team, that works as a glue between the other three Es, taking research to business and providing market information to research".

This suggests that the reverse innovation involves some models and strategies for innovation management. Also, in house innovation activities are linked to the market information, which it has 'explore phase' as well as 'exploit phase'. Therefore, it appears that Reverse innovation leverages certain section of the markets and enters into exploitative phase.

The interviewee also emphasised on the importance of Human resources that the company have across the continents. Different expertise work on the development of technology and collaboration among employees across different time zone is done through the use of its technology. The interviewee said the following concerning the management of employees:

"Our employees are located globally across different time zones, and technology is critical for collaboration. Our intranet, Source, allows teams to keep in touch with what's going on in the business. We leverage technology extensively across functions to build business efficiency. We can integrate human resources and resources globally and provided access to accurate and timely information for

decision-making”.

It is also interesting to learn that this particular company has about 2,500 people in innovation, asset creation, research and development, across the organisation. This suggests that human capital has been utilised efficiently across different time zones.

## 6. Discussions and Conclusion

FDI from emerging economies in the area of this study is still new. It is apparent that firms invest more in R&D. The company in this research gives evidences that they invest more and it is one of the oldest companies, which focuses in the development of technologies and explores the market initially. As the taste of the consumer widens, they jump into the exploitative phase in which the technology is cost innovative and effective. It also gives evidences that competition is the principal barriers and devising a competitive technology gives them a lead in the global arena.

Reverse innovation is sometimes known as frugal innovation, which originates from disruptive innovation. It is found that disruptive innovation is the essence of reverse innovation in this particular company interviewed. Findings from the interview transcript suggest that the company have a model in the development of innovation like 4 E models that are divided into the explore phase, enable phase, exploit phase and evangelise phase. Therefore, the variables and the framework devised for this study is interconnected. Moreover, the interviewee also responded that his company has FDI or international business in innovation and technology in North America, Europe and Asia. Thus, it suggests that the company competitively produce technology that cater to its prestigious customer. Interpretation from the interview data shows that their innovation is reverse innovation and seeks both market and exploit the market if the innovation is attractive to its customers. It also suggests that expansion of business abroad is to establish efficiency and competencies from a large pool of talents across different time zones. Therefore, reverse innovation from emerging economies could be explorative as well as exploitative based on the level of innovation and technology development.

## 7. Limitations and Future Research Directions

The purpose of this study was to see how investment in R&D has impact on Reverse innovation and the intention of expanding abroad. However, the academic research on this field is underdeveloped and needs further studies with in-depth frameworks and methodologies. This study is characterized by several limitations. Firstly, the methodologies used are not extensive; only qualitative data were collected due to the nature of the topic. Secondly, the respondent to the questionnaire was only one person or one company. Thirdly, the limitation of the study lies on the non-availability of previous related research on the topic. Finally, the limitation of the study was due to the lack of empirical data on reverse innovation and FDI.

From the analysis, it is believed that reverse innovation is new phenomena and provides an academic an interesting topic to explore. Future researcher can develop a similar framework with more modulators, moderator and variables.

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