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## R&D Strategies in Multinational Enterprises from 2010 to 2020: A Literature Review

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### **Abstract:**

*Studies on Multinational enterprises (MNEs) have experienced rapid growth over the last decade years. The significance attached to MNEs were attached by foreign direct investment (FDI). There is no comprehensive review to examine current research on Research and Development (R&D) strategies in this field. The article aims to increase the understanding of the R&D strategies effect on Multinational enterprises with relevant indicators in the last decade. The data extraction took place at the end of August 2020 in the Spring link and Science Direct. This study analyzed relevant academic, peer- reviewed journal articles published in English for 2010-2020 in the business discipline indexed in the Spring link and Science Direct. The findings conclude there are three mainstreams R&D strategies on MNEs dominant: 1) R&D international; 2) The approaches to investment destinations; 3) Technology creation and absorption. 4) R&D expenditures and investment. These results can help managers, researchers, and policymakers better understand R&D expenditures, R&D internationalization on MNEs.*

**Keywords:** Multinational Enterprises (MNEs), Research and Development (R&D) strategies, literature review

### **1. Introduction**

Multinational Enterprises (MNEs) or Multinational corporations (MNCs) have been at the forefront of changes in the global economy over the last few decades, as trade and investment barriers have been removed, and transportation and communication costs have declined. MNEs largely adopt a regional strategy as opposed to a global one (Rugman et al., 2011; Verbeke & Kano, 2016). MNEs' research and development (R&D) activities are the functions to be located upstream of the company activity (Narula & Dunning, 2010). Therefore, MNEs need to optimize their location choices, especially for R&D activities (Colovic & Mayrhofer, 2011).

Sageder and Feldbauer-Durstmüller (2018) provided an overview of the state of research on management control at MNCs over the past 25 years. However, control of specific business functions like marketing or R&D was not a focus of their review.

Athukorala and Kohpaiboonb (2010) used a new panel dataset over the period 1990–2004. They examined the R&D intensity of operations of U.S.-based MNE affiliates is determined mainly by domestic market size, overall R&D capability, and the cost of hiring R&D personnel. Similarly, Zhou (2016) used a panel dataset of overseas R&D investment by U.S.-based MNEs during 1999–2008, pointed to the need for policies that strengthen domestic R&D stock, enhance human capital endowment and support a domestic market that is open to the world in order to attract overseas R&D investment by multinational enterprises.

The role of MNEs in the era of globalization and the trends of FDI, particularly in Research and Development (R&D) via opening up of MNEs' R&D centers in developing and emerging economies, are of significant research concern today. There are many different actors in the globalization of the innovation process. R&D internationalization appears with significant contributions to MNEs.

Although the phenomenon is widely used in both research and practice, there is no comprehensive review of the examined relationship between the R&D strategy and MNEs. This research gap is the motivation for the present study. The new developments in R&D strategies of Multinational enterprises in the past ten years (2010–2020) are analyzed in this study.

### **2. Methodology**

In order to ensure the arrangement, this review used following keywords to locate relevant articles by open access: ("R&D strategy" AND "Multinational enterprises") OR ("R&D" AND "MNEs") OR ("R&D strategy" AND "Multinational corporations") OR ("R&D strategy" AND "Multinational companies") OR ("R&D strategy" AND "Multinational firms"). Searches were conducted in the Spring link and Science Direct. The data extraction took place at the end of August 2020. This study analyzed relevant academic, peer- reviewed journal articles published in English for the period of 2010–2020 in the business discipline. Then double entries of articles were removed. After careful reading abstracts and the main bodies of the articles, the irrelevant articles were removed. Consequently, altogether 75 articles (see Figure 1.) were found for this study purpose.

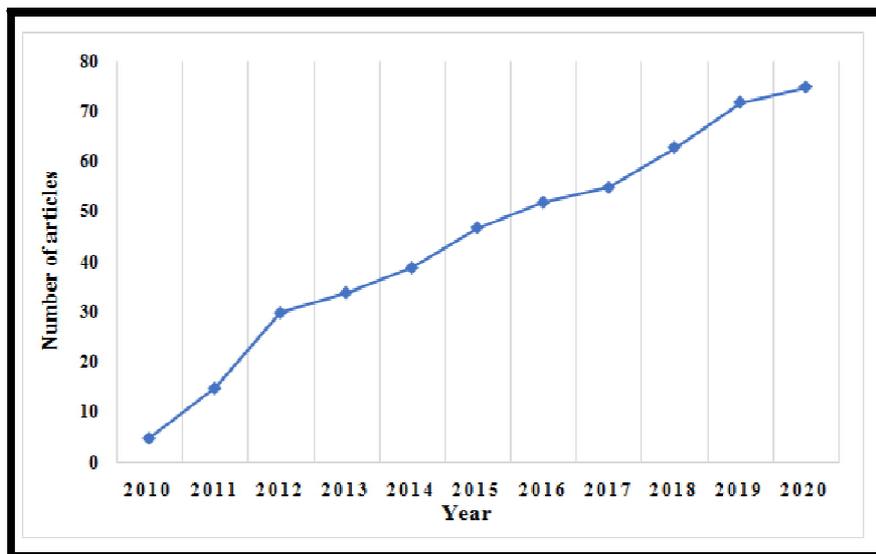


Figure 1: Numbers of Publication of Articles on Multinational Enterprises from 2010 to 2020

### 3. Findings and Discussion

Vrontis and Christofi (2019) provided a systematic review of 42 articles on R&D internationalization appearing in publication outlets for more than two decades and examined R&D internationalization's impact on innovation within the firm's boundaries. The growing internationalization of R&D activities creates managerial challenges for globally competing MNEs (Manolopoulos et al., 2011). Moreover, Yamashita and Yamauchi (2019) found that an increase in overseas R&D is the primary driver of innovation creation for multinational firms.

#### 3.1. R&D Internationalization

Ghoshal and Bartlett (1990) discussed four types of international R&D projects as following.

- Local-for-local: developing products and processes for local markets independently in each foreign R&D center.
- Locally for global: developing products for global markets in foreign R&D centers.
- Center-for-global: developing new products and processes in the home country for global markets.
- Globally linked: developing products with multiple R&D centers in various markets networked together.

The internationalization of R&D was thus a consequence of the globalization of production activities and sales. Since the 1990s, MNEs have been investing in R&D abroad to gain access to superior knowledge (Cantwell, 1995; Dunning & Narula, 1995). Demirbag and Glaister (2010) showed that MNEs' experience of overseas R&D projects abroad is also critical. Significantly, MNEs are increasingly expanding their R&D centers in foreign countries due to the various benefits that this strategy offers (Khasawneh & Dasouqi, 2017). Adding to this, US MNEs have been steadily increasing their R&D facilities (Berry 2014).

Recently, some researcher further classified overseas R&D by multinational firms as belonging to four categories (Egan 2017; Jha et al. 2018):

- Carrying out R&D in a location where other firms in the same industry are doing R&D, to learn from the innovation environment.
- Carrying out R&D that could be applied in the home country and elsewhere because the cost conditions in the host country are favorable compared to those of the home country.
- Adapting products originally made elsewhere to local market conditions in the foreign country, that is, product development in the United States National Science Foundation (NSF).
- Participating in a global network of R&D activity of the firm based on of costs, market features, and the availability of knowledge and/or skills.

Moreover, Motohashi, K. (2015) classified the HBA (Home Base Augmenting) and HBE (Home Base Exploiting), described the activities of foreign R&D in the following figure 2.

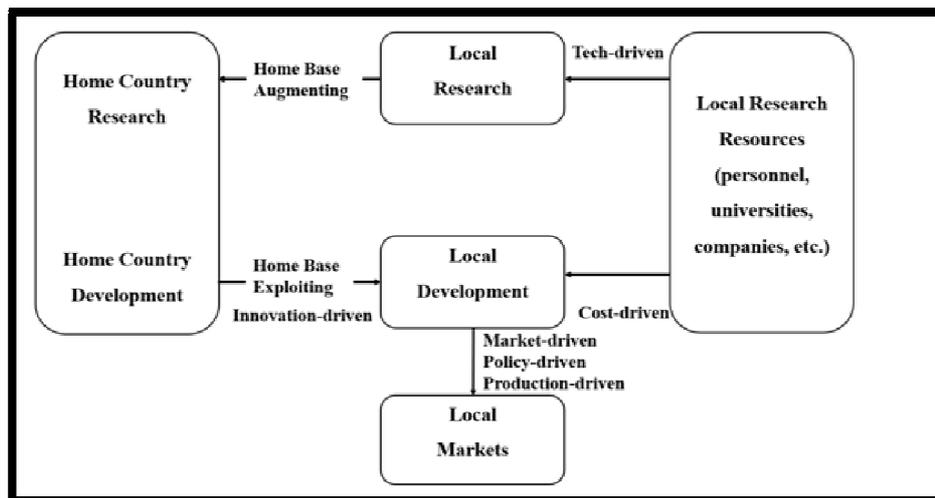


Figure 2: Activities of foreign R&D in Home Base Augmenting and Home Base Exploiting

### 3.1.1. Reverse Innovation

Govindarajan and Ramamurti (2011) defined reverse innovation as MNEs use R&D in relatively low-cost emerging market locations to develop or create products and processes applied in the home country and the rest of the world. Additionally, Suresh et al. (2020) provided a comprehensive conceptualization of reverse innovation and defined it as a multidimensional construct, indicated that it is critical for MNEs to pay attention and comprehend the emerging markets holistically in a reverse innovation context.

### 3.1.2. Open Innovation

As open innovation approaches open up a whole range of new opportunities for innovative companies, their attention can be diverted if they engage in too many partnerships or receive too many new technology proposals (Birkinshaw et al., 2011). For advanced market (AMNEs) scholars (Duet et al., 2014) pointed out collaborative research. For example, open innovation advances scientific and market knowledge as well as speed up the innovation process. Meanwhile, previous studies have documented the mechanisms AMNEs, such as FIAT, Philips, GM, employ to implement open innovation (Chesbrough & Brunswicker, 2014; Salter, Criscuolo & TerWal, 2014).

### 3.2. Technology Creation and Absorption Effect on Multinational Enterprises (MNE)

Alvarez and Marin (2013) analyzed with panel data, studied how the integration of firms from developing countries in sophisticated high-tech markets can be defined by the combined action of MNEs and the ability for technology absorption and creation.

According to Crespo et al. (2014), subsidiaries serve as key knowledge nodes capable of acquiring, converting, and transferring knowledge throughout the MNC. In contrast, Michailova and Mustaffa (2012) assert that subsidiaries are increasingly acknowledged as sources of knowledge for the headquarters and the peer subsidiaries. Fang et al. (2013) analyzed 572 Japanese MNEs across 47 countries to examine the relationships between multiple knowledge resources (technological and marketing knowledge), the relatedness between parents and foreign subsidiaries, and subsidiary performance.

### 3.2.1. Knowledge Exploration and Transfer

Multinational breadth may entail organizational costs that hamper productivity (Baier et al., 2015) and force MNEs to maintain narrow communication channels that do not enable them to exploit the knowledge exploration potential fully. MNEs need to have wide knowledge exchange pathways, both with external parties and within the MNE (Narula, 2014).

Similarly, Castellani et al. (2016) used data from the top R&D investors in the world. They investigated the potentially differential effects of the breadth and depth of multinationals on business productivity, as well as the mediating role of R&D. Their results show that multinational depth has a direct positive effect on productivity, while an increase in multinational breadth is associated with lower productivity. In contrast, multinational breadth and depth are positively correlated with R&D investments, although the relationship is stronger for multinational breadth. Buckley and Tian (2017) have argued that the debate on EMNEs has focused on knowledge-based advantages and locational advantage and has failed to focus adequately on internalization.

### 3.3. The Approaches to Investment Destination

Recent evidence suggested that foreign R&D can positively impact MNE productivity (Nieto & Rodriguez, 2011; Griffith et al., 2008; Lahiri, 2010; Harhoff et al., 2014).

Lin et al. (2018) took Huawei's R&D globalization as an example of international cooperation and innovation. In 2010 and 2011, Huawei improved its R&D ability through substantial R&D expenditures, and it gradually increased its proportion of transnational R&D cooperation patents.

R&D activities are functions that MNEs ultimately transfer to a host country during the final development stages, when globalization has reached its high point (Motohashi, 2015). India has a number of world-class educational institutes to whom foreign firms prefer collaborative partners. There are many examples of MNEs R&D units situated on Indian university campuses (Krishna, 2012).

Belderbos et al. (2014) found a positive influence of academic research strength on foreign firms' R&D investment location decisions for a sample of R&D investments in European regions. Xiong (2018), based on the panel data of seven economically developed regions in China from 2006 to 2015, showed that, from its direct impact, the active establishment of multinational companies R&D centers and their agglomeration would positively influence regional technological innovation ability. From the indirect effect, the aggregation of the R&D center of MNCs improves regional innovation ability through the flow and agglomeration of talents, research and development funds.

Guimón and Filippov (2012) pointed out that developing countries tend to have weaker IP regimes and judicial systems, which may be a barrier to the attraction of R&D by MNEs. MNCs have to adjust to respective host-country political, economic and other conditions when establishing foreign subsidiaries (Sageder & Feldbauer-Durstmüller, 2018).

### 3.3.1. Emerging Markets

MNEs are extending R&D activities to host locations in emerging markets as part of their global innovation networks. MNEs from developed countries establish their R&D units in emerging markets, particularly in China and India (World Investment Report, 2005; Moncada et al., 2011; Krishna et al., 2012; Jha et al. 2018.). Jeoung Yul Lee et al. (2020) drew on a sample of 1468 MNEs from 24 regions in China, founded that a synergetic combination of explorative and exploitative virtual knowledge is positively associated with MNE performance. Besides, MNEs assign more responsibility for R&D and innovation to affiliates in emerging markets that have broader markets, lower human resource costs, more significant overall R&D activity, and, to some extent, more excellent activity of the company (Grosse, 2019).

On the other hand, Munari et al. (2010) find a greater pressure towards the reduction of R&D in market-based governance systems such as in Britain and the United States. Haakonsson & Ujjual (2015) drew on Novozymes's in-depth case study, a leading European MNE from a highly globalized sector with eight R&D sites spanning eight countries. By explicitly focusing on the R&D activities in the emerging markets of China, India and Brazil, the article delves into Novozymes's current reorganization of innovation.

While advanced market MNEs already possess innovation capabilities at the moment. Previous studies (Kumaraswamy et al., 2012; Rui et al., 2016) suggested that EMNEs use different mechanisms to upgrade their innovation capabilities such as alliances with local and foreign companies, learning by doing actively. In EMNEs, innovation efforts involve strengthening: (1) an output capability (manufacturing a product or technology), and (2) building an innovation capability (developing or enhancing a technology) (Awate et al., 2012).

Furthermore, the generic internationalization strategies of Chinese EMNEs include being the local optimizer, the low-cost supplier, the advanced-market seeker, and the global consolidator, respectively, depending on its strategic direction, such as target countries with multinational preference, the movement value chain, brand, and entry mode (Tan, 2017).

### 3.3.2. R&D in the EMNEs (Multinational Enterprises from Emerging Economies)

Juasrikul et al. (2018), based on an event study of 1096 cross-border alliances from 1994 to 2013, indicated that the higher the EMNE's ex-ante risk level (e.g., R&D, corporate, and strategic risks), the greater the value creation will be for them.

Kedia et al. (2012) argued that EMNE knowledge-seeking outward FDI is not based on the traditional asset-exploitation model of FDI, but rather tends to be focused on asset-augmentation through the exploitation of EMNE unique circumstances. Also, Piperopoulos et al. (2018) suggested that EMNEs can use outward foreign direct investment as a strategy to globalize R&D and enhance their innovation performance and demonstrate that certain established assumptions regarding organizational learning are not valid for EMNEs.

### *3.4. R&D Expenditures and Investment*

For MNEs, there has been intense competition among developing countries to attract R&D-intensive foreign direct investment (FDI) through investment promotion campaigns and by offering generous R&D related tax concessions and high quality infrastructure at subsidized prices (Athukorala & Kohpaiboon, 2010). The R&D expenditures of the leading ten multinational companies exceeded that of the United States' whole higher education sector (National Science Foundation 2012; EU Economics of Industrial Research & Innovation 2012).

R&D internationalization provides companies with a sustainable competitive advantage in the race for the most substantial R&D investments and R&D global leadership and the entailed economic and financial benefits (Montresor & Vezzani, 2015).

### 3.4.1. Foreign Direct Investment (FDI) by Multinational Enterprises (MNEs)

FDI by MNEs represents one of the most researched international business (Blonigen, 2005; Werner, 2002; Paul & Singh, 2017). Worasinchai and Bechina (2010) discussed the effects that Multinational corporations could have on technology diffusion and the development of potential R&D within Thailand. However, the Thai government has implemented the policy to foster and attract R&D based Foreign Direct Investment (FDI). Their study highlighted that barriers impede the fluidity of knowledge sharing between multinational corporations and Thai universities.

Rugman (2010), Verbeke and Kano (2016) explained FDI in the context of regionalization and global value chain disaggregation. FDI is researched by (Qian et al., 2013; Yang et al., 2013) and firms continue to diversify geographically in upstream and downstream operations (Verbeke & Asmussen, 2016).

Santos-Arteaga et al. (2017) used a sample of Spanish manufacturing firms to analyze the effect that a firm's MNEs status has on its ex-post innovative performance and productivity. They revealed dynamic, positive effects of FDI on firm's technological performance, with increments in patents and product innovation taking place before subsequent increments in productivity occur. Ziyi and Quyen (2020) found that both Chinese MNEs' relational assets and the market-seeking oriented FDI are positively related to subsidiaries' local responsiveness strategy in accommodating local customer needs, government policies, market conditions, and competitive intensity. In particular, Justin and Feliciano-Cestero (2020) reviewed more than 500 journal articles, which as a whole, can be considered representative of the present body of knowledge on MNE-FDI. They found that, despite the long history of FDI research, there has been a considerable rise in academic interest and publications since 2000.

#### 4. Conclusion

With the growing and expanding pace of globalization, MNEs' R&D strategies are also expanding as never before. MNEs usually restrict their R&D activity close to headquarter (Mansfield et al. 1979). However, in the late 1980s, there was a rapid increase in foreign-funded and foreign performed R&D in most industrialized countries. Further, developing countries and the MNEs themselves focusing on their core competencies, MNEs doing R&D activities outside developed countries moving to the emerging market. The studies on R&D strategies in MNEs have appeared in a wide range of journals. This research focuses on the content analysis of previous reviews of the R&D literature on MNEs during the last decade. This study has also revealed several key issues based on the current research perspective regarding R&D in MNEs and summarized last decade's research in the context of developed and developing countries.

First, most literature on open innovation shows multinational knowledge-intensive firms with well-established R&D processes, mainly in developed countries. Since the competitiveness derived from low labor costs has been eroded over the past decade. The motivations behind the globalization of different types of innovation in emerging markets are manifold, ranging from efficiency-seeking and demand-seeking investments, aiming to reduce costs or adapt products to foreign markets. Meanwhile, to capture resources and capabilities of different countries to integrate and leverage them into competitive advantages.

Second, overseas innovative R&D activities aimed at the exploitation of advanced foreign knowledge. Consequently, knowledge exploration and FDI have a direct effect on encouraging MNEs to commit to R&D investment. However, international R&D management literature is too much focused on the early stages. Future studies may give more emphasis on MNEs for this literature stream in the later stages. For innovation, scholars need to develop nexus between R&D strategies to advise policymakers. MNEs limitedly and unsystematically practice absorptive capacities in the past ten years. However, open innovation requires MNEs to adjust their strategy for absorptive capacities. There is an urgent need to incorporate these barriers into the reverse innovation, open innovation, and MNEs literature.

Furthermore, this research has listed different variables used in R&D research to show their impacts on MNEs. Much of the literature has focused on externalities and R&D spillovers, implicitly assuming that MNEs are almost always beneficial for development. The review organized studies across six dimensions of R&D, including antecedents, characteristics, and outcomes undertaken by MNEs.

This paper contributes to the understanding R&D strategies by offering some insights into terms associated with MNEs. Both academics and practitioners can use these R&D strategies as a guide and repository of MNEs' management.

#### 5. Limitations

Nevertheless, the search may not have captured all articles that address the subject of this review. This review's focus is on scientific journals and excludes monographs, conference papers, and journals for practitioners. Articles in languages other than English were ignored. The papers have been analyzed according to replicable criteria using standardized review protocols. Nevertheless, the interpretation of results in this review is contingent on the authors, with the limitation that other researchers might have clustered factors differently.

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