MICRO-FOUNDATIONAL DIMENSIONS OF FIRM INTERNATIONALISATION AS DETERMINANTS OF KNOWLEDGE MANAGEMENT STRATEGY: A CASE FOR GLOBAL STRATEGIC PARTNERSHIPS

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Abstract

Innovation is a critical source of competitive advantage in an increasingly changing and globalising environment and, thus, knowledge management lies at the core of a firm's global business strategy. This paper investigates the relationship between micro-foundational dimensions of firm internationalisation and its knowledge management strategy in the emerging economies, which have been found more efficient in converting technology into socio-economic impact. We specifically look at the technology acquisition modes which are operationalised into three categories: internal development, global strategic partnership, and outsourcing. Results from the analysis of World Bank data collected from manufacturing firms operating in emerging economies show that specific micro-foundational dimensions such as the share of foreign employees, level of foreign input and foreign sales have a significant impact on the choice of technology acquisition mode by a firm; whereas the level of foreign ownership does not have such an effect.

Key words: *micro-foundations, global strategic partnership, internationalisation, knowledge management strategy, technology acquisition, emerging markets, socio-economic impact*

1. Introduction

Internationalisation presents interesting theoretical and practical questions for exploration, especially related to the degree and nature of its outcomes at the level of a firm. It is widely acknowledged that internationalisation inevitably exposes a firm's capabilities and resources to the international markets for customers, capital, and suppliers which, in turn, brings about considerable transformation in the scope and nature of its strategic choices. Internationalisation has also been found to spur organisational learning (Ruigrok, and Wagner, 2003; Zhu, Sarkis and Lai, 2012). Extant literature on internationalisation has explored a plethora of firm level consequences of internationalisation. An important firm level outcome of internationalisation explored in the extant literature is the nature of its innovation strategy (Tsao and Chen, 2012; Frey, Iraldo and Testa, 2013; Ren, Eisingerich and Tsai, 2015; Genc, Dayan and Genc, 2019). Since innovation strategy is, itself, a multi-dimensional construct, empirical studies in this domain have considered issues like the impact of firm internationalisation on firm R&D investment levels (Fors and Svensson, 2002; Kumar and Aggarwal, 2005), new product development propensity (Tsinopoulos, Lages and Sousa, 2014) and new product development performance (Jeong, 2003; Wu, Ma and Liu, 2019), etc.

However, despite its critical importance, there is a paucity of research on the impact of a firm's level of internationalisation on its technology acquisition mode. This is an important gap in the literature considering the critical role played by a firm's technology acquisition mode in determining its performance across key indicators (Jones, Lanctot and Teegen, 2001 Cassiman and Veugelers, 2006; Arora and Gamberdella, 2010; Thakur-Wernz, Bruyakab and Contractor, 2020). Further, as explained above, there is overwhelming evidence pointing to the significant influence of internationalisation on the strategic choices of a firm.

Exploring the antecedents of a firm's technology acquisition strategy is also important from the perspective of social change as the technology acquisition strategies followed by firms have larger implications in skill development and entrepreneurial capability creation at the macro-level, especially in emerging economies (Del Giudice et al., 2019). Building these capabilities, in turn, impacts a society's capacity to generate and assimilate technological shifts especially in the form of developing university-industry collaboration, entrepreneurial networks, start-up ecosystems (Turriago-Hoyos et al., 2015) and product quality levels in the economy (Fisher-Vanden and Terry, 2009).

Considering the significance of this phenomenon, we attempt to explore the impact of firm level internationalisation on modes of technology acquisition. Primarily based on the knowledge-based view of the firm and organisational learning theory, the study considers internationalisation as a platform for organisational actors to develop knowledge and gain international experience that is then utilised in selecting the best technology possible. Based on this perspective, this study thus assumes that the impact of a firm's level of internationalisation on strategic choice is better visualised through the micro-foundational perspective. Following the arguments developed by Park and Harris, (2014), we propose that internationalisation impacts an organisation at several levels and to study its true impact it is important to consider the individual, process and structural micro-foundations as the antecedents to the outcomes of internationalisation. This view also finds support in Nuruzzaman, Gaur and Sambharya (2017) and Paruchuri and Eisenman (2012) who found linkages between individual level factors like managerial experience and a firm's innovation strategy.

The study therefore attempts to contribute to the extant literature in multiple ways. By exploring the impact of internationalisation on choice of technology acquisition mode, the study attempts

to widen the knowledge base pertaining to the antecedents on technology acquisition strategy of emerging market firms.

Considering the larger, socio-economic implications of technology choice mode, especially in emerging economies, knowledge about the antecedents of technology acquisition mode can be extremely valuable in triggering social transformation. Connectedly, the study also addresses calls for research on the 'market for technology' made by authors like Arora and Gambardella, (2010) and Ford and Probert, (2010) who call for deeper research on technology acquisition modes.

We also attempt to contribute to the literature on the micro-foundations of technology choice. While several studies have shown that individual or process level issues in an organisation could impact its innovation strategy (eg., Jiang, Branzei and Xia, 2016; Deligianni, Voudouris and Lioukas, 2015; Mazzucchelli et al., 2019; Contractor et al., 2019; Thakur-Wernz, Bruyakab and Contractor, 2020), except for a few studies (eg. Nuruzzaman, Gaur and Sambharya, 2017; Paruchuri and Eiseman, 2012, etc.) there is a lack of deeper understanding of firm level antecedents of technology acquisition mode from a micro-foundational perspective. This study, by exploring the micro-foundational perspectives on firm level technological choice mode, is therefore expected to increase the breadth of this emerging field of research.

The study also aims to contribute to the literature on the impact of internationalisation concerning the strategic choices of firms. Though this literature is quite well established, there are still several gaps especially in understanding the varied impact of different dimensions of internationalisation. While, in general firms internationalise to seek new markets, new resources, or create efficiency, recent trends, however, indicate an increasing propensity among firms

towards internationalisation with the main aim of searching for knowledge and thereafter gaining access to new knowledge (Nachum and Zaheer, 2005: Demirbag and Glaister, 2010; Ayden et al., 2020). Therefore, our focus on technology acquisition modes is both timely and significant, especially in the context of emerging markets. The study thus addresses calls by several authors (e.g., Demirbag and Yaprak, 2016; Genc, Dayan and Genc, 2019) who highlight the need to conduct further studies on the impact of internationalisation on firm level innovation. Further, recent empirical evidence suggests that the impact of internationalisation impacts several dimensions of a technology strategy. Therefore, in this study, we embark on exploration of a relationship between internationalisation and the firm's choice of technology acquisition mode.

Our aim is also to contribute to a growing domain of studies that look at the mode of technology acquisition, with a special focus on global strategic partnerships (GSP). As Ghouri et al. (2019) argue, global strategic partnerships strengthen relationships among business partners, and lead to the creation of better products and services across multiple territories through inter-firm collaboration. The rise of such partnerships points to the existence of a multitude of benefits that can accrue from such collaborations. For instance, through activities that involve sharing research and development platforms, some of these partnerships have specifically demonstrated mutual growth pathways in innovation and R&D development.

Although, social change has been discussed widely in organisational studies, its relationship to GSPs remains underexplored (Ghouri et al. 2019). We hope that our study would contribute to this growing field, especially in the context of emerging markets.

In the ensuing sections, we review the literature related to the theoretical underpinnings of our study, followed by literature that integrates internationalisation and the innovation strategy of firms; we then develop our hypotheses. This is followed by the research method and data section. We then examine the research findings. We conclude the paper with a discussion of practical implications, limitations and suggest avenues for future research.

2. Literature Review and Conceptual Development

Our study is theoretically grounded in organisational learning and the knowledge-based view (KBV) of the firm, while using a micro-foundational approach to deconstruct the dimensions of internationalisation, which is typically used as a unidimensional construct. We therefore review literature connecting the research domain of our study with the micro-foundational perspective and then review the literature on our central constructs from the KBV.

2.1 Micro-foundational Perspective

Although the micro-foundational approach dates back to the middle of the last century (Foss, 2011), it started being proactively employed by the strategic management scholars just over a decade ago as an explanatory heuristic of the firm level effects within the resource-based/knowledge based view (Foss, 2011). In essence, the micro-foundational approach is a form of reductionism whereby a certain complex phenomenon is explained in terms of more fundamental, lower level phenomena (Kincaid, 1997). Although micro-foundational theorising of strategic management scholars was initially concerned with an individual level of analysis, recent conceptualisations propose to consider individuals, processes and structures as three primary categories of micro-foundations (Felin et al., 2012; Coviello et al., 2017). According to Foss & Pedersen (2016: p.5), micro-foundations are about locating the proximate causes of a phenomenon at levels of analysis lower than that of the phenomenon itself.

The micro-foundational perspective has also been employed to explain firm level innovation strategy. For instance, studies in the domains of knowledge processes (Reinholt, Pedersen and Foss, 20110), top management competencies (Akhtar et al., 2018), absorptive capacity (Volberda, Foss & Lyles, 2010), cross-border mergers and acquisitions (Haapanen et al., 2019), open innovation partnerships (Scuotto et al., 2020) and firm R&D (Paruchuri and Eisenman, 2012; Nuruzzaman, Gaur and Sambharya, 2019) have all adopted a micro-foundations perspective. The micro-foundations perspective has also been used by previous studies in the domain of internationalisation (e.g., Elg et al., 2017; Nuruzzaman, Gaur and Sambharya, 2019; Vahlne and Johanson 2020, etc.).

While some of the recent micro-foundations-related studies focus specifically on leadership and managerial characteristics, this individual level of analysis may not always be practical or even possible within the boundary of a specific data set (Vromen, 2010). Foss (2011) suggests that the level of the micro-foundational lens should depend on the problem that a scholar is trying to solve. Therefore, micro-foundations may represent sufficiently heterogeneous groups at the lower level of analysis than the main dependent variable.

We explore the relationship between different micro-foundational dimensions of internationalisation (such as foreign labour, sales, ownership, inputs, experience) and a firm's choice of a technology acquisition mode, whereby the key heterogeneity in these variables represents the *home-foreign* spectrum.

2.2 Technology Acquisition and Knowledge Management Strategies

In the following sections we first discuss the extant literature on the key variable considered in this study, *the technology acquisition mode*, and the position of this variable as a key element of a firm's *KM strategy*. Then, we explain the link between internationalisation and KM strategy and specify the *microfoundational dimensions of internationalisation*, linking them to a particular choice of technology acquisition mode through a series of hypotheses grounded in organisational learning theory, and the KBV of the firm.

Choice of a mode of technology acquisition is an important component of a firm's KM strategy (Jiang, Branzeib and Xia, 2016; Darroch and McNaughton, 2002). Several studies have looked into the main determinants of a firm's technology acquisition mode (for a comprehensive review, see Cho and Yu, 2000). Most of these studies look at technology choice as a decision by a firm to either: (a) Develop their own technology [we call it *'internal technology development'* (ITD) hereafter], (b) jointly develop with some other entity [*'global strategic partnership'* (GSP)] or (c) buy it outright from some external source [*'technology outsourcing'* (TO)]. Past studies have traced a firm's decision to choose between the three modes to a variety of factors. According to Cho and Yu (2000), these factors can be broadly grouped into three major groups: (a) Firm-related aspects like R&D capabilities and R&D experience; (b) technology-related capabilities like developmental cost; and, (c) environment-related aspects like the appropriability regime.

Robertson and Gatignon (1998) consider technology choice to fall between two poles: Internal development, and market contracting. Later, based on Hennart (1993), a further 'middle path' joint development was adopted as a third option that represents an intermediate governance mechanism between these two poles. Thus, the original make-buy dichotomy was transformed into a choice between make, buy, or ally strategies. The firm's technology acquisition mode is, therefore, hypothesised to be determined by the governance cost of choosing each of these modes

(Robertson and Gatignon, 1998). According to this framework, firms will shift to in-house development when the cost of governance related to external sourcing outpaces the cost of internal development. In the present study we adopt a different perspective and base our hypotheses on the knowledge about alternatives as a determinant of technology choice.

According to Schneckenberg, Truong and Mazloomi (2015), organisational learning practices lead to better innovation performance. That is, firms which have better knowledge about innovation alternatives through organisational learning processes will be able to better select and utilise technology. This perspective is aligned to the micro-foundational perspective of strategy (Felin, Foss and Polyhart, 2015). Firms, essentially, differ in their knowledge about different suppliers of technology and costs and benefits of contracting (or internally developing) different technologies. Since internal development is always very resource-intensive and limited by a firm's present technological capabilities, firms with a greater breadth of knowledge about technology markets and experience in dealing with a larger base of suppliers may prefer to externally source their technology either through external purchase or joint development with suppliers or customers. According to Cesaroni (2004), in the chemical industry, there is evidence that firms with knowledge of and access to different suppliers of technology (or a 'market for technology') exhibit a preference for external sourcing of technology over in-house development. The study argues that the incentive for in-house development of technology diminishes once firms become aware of or gain access to a market for technology. Van Rooij (2005) also broadly supports this view. In the ensuing sections we argue that internationalisation provides firms with greater knowledge and learning about 'markets for technology' and, hence, would stimulate firms towards external sourcing and global strategic partnerships for technology.

2.3 Internationalisation and KM strategies

As a firm increases its level of international activities, it is forced to make several changes to its strategies. The KM strategy of a firm is one area where the impact of internationalisation will be very significant because facing the challenges and exploiting the opportunities presented by internationalisation would require success in innovation. Kogut, (1991) and Kogut and Zander (1993) state that internationally diversified firms may require new technology/innovation to gain a competitive advantage and to compete effectively with local firms. Internationalisation also provides the means to nurture R&D and innovation. International diversification is expected to provide firms with potential for achieving greater returns on innovation and, hence, lowers the risk of investment in technology (Hitt, Hoskisson and Ireland, 1994; Wu, Chen, and Jiao, 2016; Zúñiga-Vicente et al., 2019). Kotabe (1990) argues that firms operating in a single country may find it difficult to invest heavily in R&D as it may take longer to recoup this investment. Hence, the greater the level of internationalisation, the greater the need and potential to innovate. This proposition is largely supported by the extant literature. Several studies have found empirical evidence to support the relationship between internationalisation of a firm or variables related to internationalisation like export orientation, geographical diversity, etc., and investment in R&D (Fors and Svensson, 2002; Kumar and Aggarwal, 2005).

Many of these studies are, however, narrowly focused and usually relate to only one dimension of internationalisation and to one dimension of technology strategy. For instance, a large number of studies have explored the relationship between internationalisation and R&D intensity (e.g., Braga and Willmore, 1991; Kumar and Saquib, 1996; Hitt, Hoskisson and Kim, 1997; Kumar and Aggarwal, 2005; Kathuria, 2008; Sasidhrana and Kathuria, 2011; Tsao and Chen, 2010, etc.). While R&D intensity is a very important factor, it still represents only one of the dimensions of a firm's technology strategy. According to Granstrand et al. (1992), technology strategy consists of the policies, plans and procedures for acquiring technology, managing

technology within the firm and exploiting it for profit. Within this expanded scope of technology strategy, some studies have looked at linkages between internationalisation and the different dimensions of technology strategy like technology diversification (Kuemmerle, 1997; Ito and Wakasugi, 2007) and indigenisation of technology (Xie and Li, 2013; Jiang, Branzei and Xia, 2016).

2.4 Internationalisation and Technology Acquisition Mode

Choice of a technology acquisition mode is an important component of a firm's knowledge management strategy. As greater internationalisation increases a firm's exposure to new markets and challenges, the firm may be presented with more options to source its technology. Also, from a micro-foundational perspective, in firms with lesser levels of internationalisation, decision makers and managers may typically have relatively less exposure to the markets for technology, less participation in networks that boost technology sourcing efficiency and may not be aware of global developments in technology which, thus, forecloses several options for technology acquisition (Pittiglio, Sica and Villa, 2009; Ardito et al., 2019). Despite these possible links, few empirical studies have explored the potential link between internationalisation and the choice of a technology acquisition mode. In this study we adopt the conventional technology acquisition mode categories, viz., *"technology purchase or contracting*" or outsourcing (TO), *"global strategic partnership"* (GSP) and *"internal or in-house development of technology*" (IDT). Technology outsourcing implies outright purchase of disembodied technology or licenses. GSP would involve partnering with another organisation/entity to develop technology jointly. This would involve alliances or joint ventures to develop technology. As Hung and Tang (2008) explain, such a mode of technology acquisition requires heavy commitment from both parties to the venture and is resource-intensive. In-house/internal development would mean a completely

internal technology acquisition strategy with zero involvement from another outside organisation/entity.

The impact of internationalisation on the technology acquisition mode is proposed based on the knowledge-based view of the firm and organisational learning theory. The three acquisition modes, TO, GSP, and IDT vary in terms of the level of external market knowledge required for the acquiring firm to successfully acquire technology (Van Rooij, 2005; Tsai, Chang and Hung, 2018). For TO and GSP, the firm needs to have good knowledge about possible suppliers of technology or possible alliance partners as well as the typical terms and conditions under which technologies or licenses can be bought or joint development undertaken. However, compared to TO and GSP, the level of external market knowledge required for IDT is relatively low. Given the need to acquire technology in the fastest and most cost-efficient manner, firms with better market knowledge would, therefore, seek to exploit this knowledge by opting for either TO or GSP over IDT.

However, to successfully negotiate and enter into GSP contracts with other organisations a firm would require even greater knowledge about the external market for technology (Hung and Tang, 2008). This is because, due to greater levels of commitment in a GSP, searching for, locating, and then negotiating with a potential partner would need greater knowledge about the market, potential suppliers, nature of technology alliances, and the typical nature and scope of cooperative agreements in the industry, etc. (Kogut, 1988; Saraiva, 2017). Further, greater depth of knowledge and experience of international cultural and contractual differences, familiarity with differences in the mode of operations, trust building mechanisms are all very important for a successful GSP (Demirbag and Mirza, 2000). As Ghouri et al. (2019, p.322) explain, in GSP, partner organisations “typically have to embed and implement transformed measures, processes

and systems in daily routine operations due to inter-firm involvement and engagement". On the other hand, according to Kogut (1988), alliance or GSP is more preferable than a market-based TO since, in GSP, the uncertainty over the outcome of the transaction is reduced due to the mutual commitment of resources by both parties. Further, GSPs allow firms to augment the capabilities of the incumbent organisations as well as allow greater exploration of the evolving environmental opportunities (Kaur et al., 2019). Thus, due to the inherent advantage of GSP, firms with greater external market knowledge would try to exploit that knowledge by opting for GSP rather than TO.

Penrose (1959) contends that the knowledge acquired by an organisation through a learning process opens up new productive opportunities and enables a firm to exploit these opportunities. As firms internationalise, they are more acquainted with different suppliers, product technologies, technology markets, etc. Eriksson et al. (1997) term this type of knowledge, i.e., knowledge of products, markets, and technology as '*external business knowledge'*. Due to greater exposure to foreign markets, and the subsequent knowledge of technology suppliers and the different types of partnerships possible in the markets, an internationalised firm will be more aware of and would have had experience with various possible technology acquisition modes than a firm with a lesser level of internationalisation and, hence, lesser knowledge of different technology suppliers and acquisition modes (Jeong, 2003; Buckley et al. 2016).

This is consistent with Tsang's (2002) view that internationalisation, itself, is a learning experience. An important aspect of this learning experience is 'vicarious learning' (Tsang, 2002) through which the firm learns about the strategies, management practices and, especially, technologies possessed by other organisations. The opportunities for vicarious learning offered

through internationalisation present firms with greater and broader insights into different modes of technology acquisition.

In this paper, we complement this line of thinking by adopting the micro-foundational perspective of knowledge acquisition and application developed by Argote (1999) who emphasises the role of the individual in the knowledge base of the firm. According to this perspective knowledge is primarily acquired and applied by individual actors who represent the firm. Hence, a highly internationalised firm is expected to have in their ranks several employees who have high levels of exposure to the international market than firms who are less exposed to international markets. These employees are expected to possess the experience and capability to scan, identify, negotiate and conclude technology acquisition contracts with providers.

Organisational learning has been presented as an outcome of internationalisation in several studies. For instance, Zahra, Ireland and Hitt, (2000) show that international expansion directly increases a firm's breadth and depth of technological learning and Hitt et al. (1997) point out that internationalisation not only allows a firm to enrich its sources of knowledge, but also provides the opportunity to capture ideas from a greater number of new and different markets, thereby presenting international firms with greater opportunities to learn. A similar idea has also been developed by Ruigrok and Wagner (2003). An important factor behind this learning is the participation of the internationalised firm in several networks of organisations comprising international customers and suppliers. As Zahra, Ireland and Hitt (2000, p.928) contend, "international diversity fosters involvement in established networks of manufacturers and other technology providers, which in turn increases technological learning." Further, Santos et al. (2004) argue that internationalisation helps firms in making contacts and establishing alliances with local suppliers, universities, research centres and competitors.

The external business knowledge acquired by a firm through greater internationalisation could, in turn, be put to use in the choice of a technology acquisition mode (Cavusgil et al., 2003; Cantwell and Mudambi, 2005; Kafouros, et al., 2008; Zahra et al., 2009). The link between greater knowledge and technology acquisition mode has been presented by several studies in the past. Desyllas and Hughes (2008), for instance, found that, in the context of high-technology firms, a large knowledge stock predisposes firms towards acquisition of smaller firms as a technology sourcing strategy because they perceive they are capable of selecting and absorbing targets.

2.5 Dimensions of Internationalisation

Most previous studies have considered internationalisation as a unidimensional concept. Though a unidimensional measure is simplistic and easy to operationalise, it fails to capture the multidimensional nature of the construct. According to Sullivan (1994), internationalisation is basically a 'multidimensional construct' and, hence, operationalising internationalisation using a single measure may lead to a situation where the influence of all the factors associated with internationalisation are not captured. Sullivan (1994) proposes a measure that treats a firm's level of internationalisation in terms of its financial, structural and psychological perspectives. However, this method has received severe criticism since the outcome measure lumps together several different dimensions to eventually produce a combined degree of internationalisation. Ramaswamy and Kroeck (1996) criticise this method for adding up entirely different dimensions to create a single measure. Later, UNCTAD (1995) and Ietto–Gillies (1998), too, developed aggregated measures of internationalisation. However, all the aggregated measures are afflicted with a fundamental flaw since they attempt to summate measures of different dimensions. A micro-foundational approach enables us to disentangle this conundrum. Adoption of the micro-foundations perspective in explaining a macro level phenomenon has emerged in the

management literature, recently. Authors such as Foss and Pedersen (2016) and Strauss, Lepoutre and Wood (2017) advocate such an approach. It is argued that micro-foundations-based theories may provide alternative explanations or may supplement macro level explanations (Felin & Foss, 2005; Foss, 2010). Further, it has been suggested that, for multilevel theorising, the microfoundations perspectives could be incorporated into international business research (Felin, Foss, Heimeriks, & Madsen, 2012; Cano-Kollman, Cantwell, Hannigan, Mudambi & Song, 2016).

Therefore, in order to avoid the problem of aggregated measures mentioned above, Hassel et al. (2003), consider these dimensions separately as individual dimensions of internationalisation. According to Hassel et al. (2003), the degree of internationalisation of a firm has two fundamental dimensions: (i) The production dimension; and, (ii) the corporate governance dimension. The first dimension - reflected in the turnover abroad and international production sites - is the traditional measure of internationalisation while the second dimension measure – in terms of the internationalisation of ownership – is a new dimension. From a survey of German multinational firms, they show that these two dimensions do not co-vary and, hence, cannot be treated together. However, in this study they do combine several distinct dimensions in developing the 'real' or production dimension of internationalisation viz. foreign sales, foreign labour, and foreign presence. Here, we operationalise internationalisation as a multidimensional construct and look at how the different dimensions of internationalisation affect the technology strategy of a firm. Further, we consider firms from a multitude of countries, thereby avoiding the limitations of a single country study.

The different dimensions of internationalisation define a firm's dependence and commitment to the international market. However, individual dimensions provide specific insights into a firm's path towards internationalisation. Here, we consider four aspects of a firm's internationalisation:

1. The extent to which the ownership of the firm is internationalised *('foreign ownership')*;
2. the extent to which the firm generates sales from foreign countries ('*foreign sales'*);
3. the extent to which the work force is internationalised *('foreign labour'*);
4. the extent to which the raw-material inputs for production are from international markets *('foreign inputs'*); and,
5. the extent to which the firm has international experience ('*foreign experience'*).

While these dimensions, together, explain a firm's level of internationalisation, each of these dimensions captures the different paths through which a firm is progressing in relation to internationalisation. In this study we attempt to explore how each of these dimensions affects a firm's preference for different modes of technology acquisition. The conceptual model developed and tested in this study is presented in Figure 1.

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3. Hypotheses Development

3.1 Foreign Ownership as a Determinant of Technology Acquisition Mode

In terms of foreign ownership, firms could range from a wholly owned subsidiary of a foreign company to an enterprise without any foreign shareholding. Empirical studies have found positive relationships between foreign ownership and R&D investments in several countries. For

instance, Howe and McFetridge (1976) in Canada, Bertschek (1995) in West Germany, Love et al., (1996) in Scotland, and Kwon and Park (2018) in Japan. Apart from determining the intensity of R&D, international owners are also expected to bring a broader knowledge base in terms of possible international technology partners and modes of technology acquisitions. Further, foreign ownership contributes financial, technical, and managerial resources to domestic firms to which they would otherwise not have any access (Lofts and Loundes, 2000). According to Kim (1997), deep stakeholder involvement exposes a firm to unique knowledge bases and experiences. Hence, firms with higher foreign ownership levels may have a greater capability and tendency to search for and enter alliances and strategic partnerships than firms who are totally devoid of any foreign shareholding. Therefore, since foreign ownership increases the technological options for a firm, it is possible that such firms may not consider internal development of R&D as the most preferred technology acquisition strategy. Studies by Kennedy et al. (2008) and Jiang, Branzei and Xia (2016) also support this view. Through a panel study of Chinese firms, Jiang, Branzei and Xia (2016) show that foreign investment has a significant negative influence on indigenous innovation efforts. Thus:

The greater the foreign ownership of a firm, the greater will be its preference for:

H1a: GSP compared to IDT;

H1b: TO compared to IDT; and,

H1c: GSP compared to TO.

3.2 Foreign Sales as a Determinant of Technology Acquisition Mode

Foreign sales, sometimes called ‘export orientation’ and measured as the percentage of foreign sales to total sales (FSTS), is often used as a proxy to internationalisation (e.g., Calabro et al., 2013). This is also an indicator of the extent to which a firm is dependent on a global customer

base and competing with a global competitor group. Firms with higher levels of export orientation are, therefore, more susceptible to the pressures of global competition and are also more accountable to the demands of a global customer group. Hence, firms are naturally inclined to procure and absorb technologies that adequately equip them to deliver the products and services demanded by a larger, global customer base as well as that can compete with a global competitor group. This will inevitably lead to greater levels of learning about the markets and possible providers of technology as opposed to a firm that has less exposure to foreign customers and competitors. Nassimbeni (2001) found that the propensity of small units to export is strictly linked to their ability to innovate the product and develop valid inter-organisational relations. Thus, greater export orientation compels firms to search for a varied portfolio of technologies as well as consider a more diversified collection of technology sources. The empirical link between export orientation and R&D collaboration has already been supported in a few studies. For instance, Kleinknecht and Reijnen (1992) found a positive link between the extent of foreign sales and propensity to enter foreign collaboration for R&D among a large sample of firms in the Netherlands. Freel (2003) concluded, from a survey of small and medium scale manufacturing enterprises, that export propensity is greatly associated with external linkages and, further, Tomiura (2007) found that, among Japanese firms, collaborations with other firms on joint projects is significantly linked to exports of large-sized firms, while affiliations with business associations and R&D intensity are critically associated with the export propensity of small-sized firms. Hence, based on our earlier arguments about TO, GSP and IDT:

The greater the ratio of foreign sales to domestic sales, the greater would be its preference for:

H2a: GSP compared to IDT;

H2b: TO compared to IDT; and,

H2c: GSP compared to TO.

3.3 Foreign Labour as a Determinant of Technology Acquisition Mode

The share of foreign employees to total employees has been considered as a key indicator of internationalisation by Hassel et al. (2003), Ietto-Gillies (1998) and UNCTAD (1997). The share of foreign employees increases the diversity of the firm as well as its combined knowledge. The presence of foreign employees could also expand the outlook of the whole organisation and lead to broader thinking about strategic decisions such as technology sourcing. Studies on the role-played by foreign employees on firm innovativeness are rare. Some of the extant studies show a positive impact of the presence of foreign employees in improving the technology-related innovativeness of firms. For instance, Santacreu-Vasut, and Teshima, (2016) show that foreign employees are actually agents of technology transfer in MNEs while Narula and Hagedoorn (1999) have found a strong correlation between the percentage of foreign employees in a firm and the extent to which it has entered into strategic technology alliances with overseas partners. Several studies have, however, explored the connection between employee movements from foreign firms to domestic firms and organisational learning. For instance, Görg and Storbl (2005); Liu et al. (2010a; 2010b); Balsvik (2011) and Poole (2013) highlight strong connections between worker movements from foreign to domestic firms and productivity spillover effects. Liu et al. (2010a), in fact, clearly show that employees who have returned from foreign countries act as knowledge spillover agents when they return and work in domestic enterprises. The presence of foreign employees is, in fact, nothing more than a manifestation of employee mobility. Past studies have also clearly shown how employee mobility is a strong antecedent for knowledge acquisition in organisations (for an exhaustive review see Mawdsley and Somaya, 2016). These studies, thus, indirectly endorse the view that the presence of foreign workers could

increase the organisation's knowledge base concerning technology choices and transfer modes. Hence, based on our earlier arguments about TO, GSP and IDT:

The greater the ratio of foreign labour, the greater would be its preference for:

H3a: GSP compared to IDT;

H3b: TO compared to IDT; and,

H3c: GSP compared to TO.

3.4 Foreign Inputs as a Determinant of Technology Acquisition Mode

The impact of the level of foreign inputs on the technology acquisition mode is predicated on the increased learning that results from importing and adopting foreign inputs in the production process of firms. Past studies have found a direct linkage between the innovation activities of firms and the level of import of foreign products in the economy (Bertschek, 1995; Teshima, 2009). However, these studies focus on innovation induced by competition from imports rather than due to the learning induced through imports. Few studies have looked at the learning impact of imports as well as the access to markets for technology that imports indirectly provide. For instance, Fernandes and Paunov (2010) found significant impact on organisational learning from foreign trade though a study of Chilean firms. With a higher proportion of foreign supplies and inputs, firms have opportunities to enter several inter-organisational relationships, which lead to opportunities for knowledge acquisition and subsequent exploitation. Most firms which have a higher proportion of foreign supplies are part of international supply chains. Ernst (2002) and Ernst and Kim (2002), and Ayden et al., (2020) highlight how firms from emerging economies linked in global production networks (GPNs) to enhance their knowledge through exposure to a diversity of network participants. Participation in such GPNs entails significant exposure to foreign supplies. Yli- Renko et al. (2001) found evidence to relate the social capital generated

from inter-organisational linkage with technology performance in a survey among technology-based firms. Bellamy, Ghosh and Hora (2013), found that greater integration of firms into the supply networks based on two constructs – supply network accessibility and supply network interconnectedness – leads to greater accumulation of knowledge for the network participants and, hence, to greater innovativeness. The knowledge thus acquired by being part of a network can, therefore, be exploited in choosing technology acquisition modes. Hence, based on our earlier arguments about TO, GSP and IDT:

The greater the ratio of foreign inputs, the greater would be its preference for:

H4a: GSP compared to IDT;

H4b: TO compared to IDT; and,

H4c: GSP compared to TO

3.5 Foreign Experience as a Determinant of Technology Acquisition Mode

According to the organisational learning theory, a firm's external market knowledge increases with the international experience it gains (Zahra, Ireland and Hitt, 2000). As Wu, Ma and Liu (2019) assert, operating in a diverse environment exposes a firm to a variety of knowledge and ideas which adds to its technology repertoire. Hernandez and Nieto (2016) further extend the idea of 'technology knowledge' as a component of the international experiential knowledge that influences a firm's choice of technology. Therefore, in order to acquire technology in the fastest and most cost-efficient manner, firms with better market knowledge would take advantage of this knowledge by opting for either TO or GSP over IDT (Van Rooij, 2005). Furthermore, GSP is more preferable than a market-based TO since, in GSP, the uncertainty is reduced due to the mutual commitment of resources by both parties (Kogut, 1988; Demirbag and Weir, 2006). However, to successfully negotiate and enter GSP contracts with other organisations requires

even greater knowledge about the external market for technology, about the market, potential suppliers, nature of technology alliances, and typical nature and scope of cooperative agreements in the industry, etc. (Kogut, 1988; Hung and Tang, 2008). Thus, due to the inherent advantage of GSP, firms with greater external market knowledge would try to exploit that knowledge by opting for GSP rather than TO. Therefore, based on these arguments about TO, GSP and IDT:

The greater the foreign experience, the greater would be its preference for:

H5a: GSP compared to IDT;

H5b: TO compared to IDT; and,

H5c: GSP compared to TO.

4. Data and Methods

Emerging markets represent an important context for inquiry not only because of their stellar growth but, also, because they became a prominent base of internationalising firms. Whereas until 1980 the home country of a multi-national enterprise (MNE) was in North America, Western Europe or Japan, recently we witnessed a rise of internationalisation coming from South Korea, followed by China and other BRIC countries and, now, approximately one third of MNEs are from emerging markets (UNCTAD, 2013; Demirbag and Yaprak, 2016; Yaprak et al., 2018). Moreover, emerging markets were found to be the most efficient ground to convert technology into socio-economic impact (Apaydin, Bayraktar, and Hossary, 2018; Tatoglu et al., 2020). Therefore, we explored the empirical support for our propositions through the analysis of data pertaining to firms operating in the emerging economies of Asia, Latin America, Eastern Europe and Africa. The data were collected by the World Bank through its Enterprise Survey project between the years 2003 to 2005. The enterprise survey data collection instrument has changed in

later years; therefore, to capture all the relevant dimensions ***in our conceptual framework*** and a balanced level of countries between developing and emerging market countries, we decided to use 2005 data (collected from 2003 to 2005). The Enterprise Survey project is a large-scale data-gathering exercise funded and coordinated by the World Bank to collect firm-level data across several dimensions like innovativeness, capacity utilisation, human resource management, internationalisation, corporate governance, business-government relations, etc. The data were collected by well-trained researchers using a standard questionnaire through face-to-face interviews with members of the management team. The characteristics of the sample firms based on the key dimensions of the data source are summarised in Table 1.

INSERT TABLE 1 ABOUT HERE

4.1 Dependent Variable

To measure the dependent variable – technology acquisition mode – the response given to one particular question was used. This question asked the respondent to select the leading ways through which the establishment had acquired technological innovations over the past two years. We categorised firms into three groups based on the answers given. The categories identified were: (a) Firms which prefer to outsource technology; (b) firms that prefer to develop technology in-house; and, (c) firms that prefer to develop technology jointly with either clients or suppliers.

Technology acquisition mode and categorisation scheme:

(a) Firms which were included as technology outsourcers [TO] preferred the following innovation mode:

- Bought technology embodied in new machinery or equipment
- Licensing or turnkey operations from international sources

(b) Firms which were included as preferring the joint-development of technology mode favoured the following innovation method [GSP]:

- Developed in cooperation with client firms
- Developed with equipment or machinery suppliers

(c) Firms which were included as preferring in-house development of technology used the following innovation method [IDT]:

- Developed or adopted from within the establishment locally.

The correlation matrix of the independent variables in the study is shown in Table 2. The pairwise correlations do not seem to present serious multicollinearity problems for the multivariate analysis, as none of the variables have correlation coefficients above 0.60 (Hair et al. 2006, p. 227).

4.2 *Independent variables*

The five independent variables were measured either directly from the survey or through minor modifications. Foreign ownership was measured as the ratio of foreign ownership in the firm that was directly measured in the World Bank Enterprise Survey. Percentage of foreign sales was measured by subtracting the percentage of domestic sales (which was measured in the survey) from 100. The percentage of foreign employees was directly measured in the study. The percentage of foreign inputs was calculated by reducing the percentage of inputs and supplies from domestic sources (measured directly in the survey) from 100. Internationalisation experience was measured by calculating the time in years since the firms started first exporting – which was directly measured in the enterprise survey questionnaire.

INSERT TABLE 2 ABOUT HERE

4.3 Control Variables

4.3.1 Firm- and Industry-level Control Variables

In this study we also consider two context-specific control variables: (a) The size of the firm; and, (b) the sector in which the firm operates. Firm size has been considered as a determinant of innovative activities of firms. For instance, Cohen and Klepper (1996) found that firm size influences a firm's choice between process innovation and product innovation. As the size of the firm increases, it has more ability to collaborate and partner with other organisations to develop technology (Hagedoorm and Schakenraad, 1994). According to Beneito (2003), larger firms may show both greater capabilities to face the relatively higher cost of innovation and higher possibilities to exploit the results of the innovation process but, conversely, other factors such as the inherent bureaucracy of large firms may limit the organisational autonomy, thus lessening the incentive to generate their own innovations. The size of the firm was measured as the logarithm of the number of full-time employees working in the firm.

The industry sector in which the firm operates has been included as past studies have shown that the firm's sector of operation heavily influences its R&D investment (Demirbag and Glaister, 2010). We classified the industrial sector of firms in our database in accordance with the UK Department of Trade and Industry R&D score board. We categorised the firms into four sectors: Group 1 - Chemicals and Pharmaceuticals; Group 2 - Electrical and Electronics; Group 3 - Auto and Non-metallic industries; and, Group 4 - Food and Beverages.

4.3.2 Country-level Control Variables

Since the technology choice of a firm is influenced by several factors associated with the firm's country of operation, we included several country-level control variables. These variables comprise: (a) The research infrastructure in the country of operation; (b) educational

infrastructure in the country of operation; (c) intellectual property protection available in the country of operation; and, (d) status of the country of operation of the firm as an emerging country or a developing country.

Several studies have considered intellectual property protection in the context of technology acquisition mode. According to Jones et al. (2001), in environments where technology is not well protected, the supply of accessible external technology is curtailed and, hence, firms operating in such environments may not have access to the appropriate technology. Further, firms operating in an environment with a very low level of intellectual property protection may not find technology partners easily since technology partners may be afraid of future opportunism by their partners.

The knowledge infrastructure available to a firm could also have an important impact on the technology choice. The knowledge infrastructure considered, here, includes research and education infrastructure of a country (Demirbag and Glaister, 2010). If the firm operates in an environment with a poor knowledge infrastructure, generating the resources required for in-house development of technology would be quite difficult and the firm will be forced to undertake external sourcing of technology. The research infrastructure index and educational infrastructure index were created for the countries participating in the survey from a principal component analysis conducted from the World Economic Forum (WEF) global competitive index for countries (2005 survey published in 2006). Five variables were used in the principal component analysis: Maths education quality of a country; general education quality of a country; university business collaboration levels; research institute quality; and, quality of research training. University business collaboration, research institute quality, and quality of

research training in a country were loaded into the research quality index of a country while maths education quality and general education quality of a country, together, were loaded into the education quality of a country.

The intellectual property protection index, the research infrastructure index and education infrastructure index of a country were drawn from the WEF global competitiveness report (2006) which is a 2005 survey published in 2006. The reason behind choosing 2005 WEF data is to align both World Bank Enterprise Survey and WEF global competitiveness report data.

The country cluster was operationalised as a dummy variable, coded 1 if the country is an emerging economy and 0 otherwise. In classifying emerging economies, we used the World Bank's upper middle income and lower middle-income countries which are classified as emerging economies in the MSCI index (https://www.msci.com/emerging-markets). Amongst these countries, those with high foreign direct investment performance were classified as emerging and the rest as developing. Therefore, we classified Brazil, South Africa, Lithuania, Thailand, Philippines, Egypt and Vietnam as emerging and the remaining countries in the sample as developing.

4.4 Model Specification

The empirical analyses were conducted in two stages. In the first stage, the technology acquisition mode of in-house and alternatives was modelled as a qualitative choice problem. Three alternative technology acquisition modes were considered: TO, GSP, and IDT. The nature of the dependent variables allowed us to use the multinomial logit approach to estimate the effect of explanatory variables on the probability that each of the three technology acquisition alternatives would be chosen. The multinomial logit analysis allows the explanatory variables to

affect different odds of choosing one alternative technology acquisition mode relative to another. The probability that the ith firm will choose the jth acquisition strategy (Pij) is given in the following model.

Pij = Pr (Rij > Rik), for k≠j, j= 0,1,2,3 where Rij is the maximum utility for firm i if the firm chooses the acquisition mode j

Pij = exp (xijβj) / ∑exp (xijβj),

where Pij is the probability of choosing alternative j and βj is the vector of coefficients to the independent variables (x). The parameters (βs) are estimated by maximising a log likelihood function. Multinomial logistic models are a linked set of binary logistics models simultaneously estimated for all possible comparisons among decision categories that allow data to be analysed more efficiently than multiple independent binary logistics models (Long 1997; Long and Freese, 2006).

In the second stage, we conduct marginal effect analysis to examine the change in probability of selecting a technology acquisition mode as one-unit change in the independent variable occurs (Long and Freese, 2006; Demirbag et.al., 2010).

5. Analysis and Results

Since the World Bank Enterprise Survey project is carried out across more than 100 countries worldwide, there are problems of missing data. Hence, we restricted our sample to only those firms for which data were available for all the variables. Further, we deleted data from firms with an employee size of less than 10 and included only firms operating in the manufacturing sector. The final sample comprised 3,622 firms from 20 countries. The details of the sample are

provided in Table 1. As seen from Table 1, the data are entirely comprised of firms from developing and emerging economies.

We analysed the data using multinomial logistic regression, with technology acquisition mode as the dependent variable. The independent variables consisted of the five internationalisation variables. Log of firm size, country's index of intellectual property protection, the country factor score measuring its knowledge infrastructure (education and research infrastructures), the status of the country as emerging or developing, and industry sector of the firm (as a dummy variables) were used as control variables. The regression model provided a statistically adequate explanation to the variation in the dependent variable as indicated by the pseudo R^2 values. Tables 3 and 4 show the pseudo-R^2 values as well as the beta coefficients of the independent and control variables.

INSERT TABLE 3&4 ABOUT HERE

As there are three technology acquisition modes for the dependent variable (IDT, GSP and TO) for conducting the logistic regression, we considered internal technology development [IDT] as the reference choice. The significance and the sign of the regression coefficients indicate how a variable influences a firm's technology acquisition mode. To explore the real impact of the independent variables on technology acquisition modes, four regression models were estimated. In model 1 we included only the country cluster, industry- and firm-level control variables. In model 2 we included the independent variables as well as country cluster, firm- and industry-level control variables. In model 3 we included only the firm-, industry- and country-level control variables without the independent variables. In the final model, we included all the independent and control variables. The pseudo R^2 value was the highest for the final model with a significant improvement from model 3 composed of only the control variables. Thus, it can be

concluded that the five internationalisation variables contribute significantly to the technology acquisition of firms over and above the impact of the control variables. Table 4 provides the results from the marginal analysis. To interpret the findings, therefore, we need to look at the results from both table 3 and table 4.

In terms of foreign ownership, it is seen that the regression coefficients for the three technology acquisition variables are not significant in model 4 in table 3. Hence, foreign ownership does not seem to have any impact on technology acquisition mode. No support is found for Hypotheses H1a to H1c.

In terms of the level of foreign sales, we can see that the regression coefficient of GSP is positive ($b = 0.017$, $p < 0.01$) and higher than that for TO ($b = 0.0034$, $p < 0.01$). Hence, it can be concluded that firms with higher foreign sales prefer GSP over TO. Results from table 4, in fact, show that internal development IDT has a negative coefficient. Thus, it can be inferred that firms with a higher proportion of foreign sales prefer GSP followed by TO and then IDT. Hypotheses H2a to H2c are fully supported.

Concerning proportion of foreign labour employed, TO has a positive, significant value ($b = 0.0237$, $p<0.001$) while, interestingly, GSP has a negative significant value ($b = -0.0330$, $p<0.001$). Considering the results from table 4, where IDT also has a significant negative value, we can conclude that firms with a higher proportion of foreign labour prefer TO over IDT, which means H3b is supported, though both H3a and H3c are actually found to be supported in the opposite direction. As far as the marginal effects of FEMPLOY (foreign nationals as percentage of permanent skilled workers) are concerned table 4 results also show that the magnitude of the

negative coefficient of GSP is higher than that of IDT; that TO is supported over GSP; and, IDT is supported over GSP therefore providing no support for H3a and H3c.

In terms of the higher percentage of foreign supplies as part of the inputs, results from table 3 show that TO has a positive significant value ($b = .0071$, $p < 0.01$) as well as GSP ($b = 0.0055$, $p < 0.01$). Hence, both TO and GSP are preferred over IDT by firms with higher foreign supplies. Looking at table 4, IDT has a negative, significant coefficient, though the positive coefficient of GSP is not significant. Hence, while we can say firms with a higher proportion of foreign supplies prefer GSP over IDT and TO over IDT, it is not possible to conclude that firms prefer GSP over TO. Therefore, the results support H4a and H4b, but not H4c.

As far as international experience is concerned, both GSP ($b = -0.0155$, $p < 0.01$) and TO ($b = -0.0151$, $p < 0.01$) have negative significant coefficients. This implies that firms with greater international export experience have a greater preference for IDT than either GSP or TO. The marginal analysis in table 4 shows that the negative coefficient for GSP is not significant, though for TO it is significant. This means that an increase in international experience does not increase the likelihood of GSP over IDT, but it decreases the likelihood of both TO and GSP compared to IDT. Therefore, no support is found for Hypotheses 5a, 5b and 5c.

We also examined the effects of firm-, industry- and country-level control variables on technology acquisition modes. The size of the firm has a positive significant coefficient in table 3, implying a preference towards TO over IDT. Further, in table 4, the marginal effect analysis indicates that an increase in the firm size increases the likelihood of TO over GSP and IDT.

There are some noticeable differences in industry groups' impact on technology acquisition modes. While firms in the chemicals and pharmaceuticals industries (Group1) and electrical equipment and electronics (Group2) show a preference for IDT, firms in automotive, non-metallic and plastic materials (Group 3), show a preference for TO. There are no noticeable differences in the effect of firms in food and beverage industries (Group 4) on technology acquisition modes of firms.

Of the country-specific control variables, in table 3, the intellectual property protection (IPP) index has a significant negative coefficient for TO and positive significant coefficient for GSP showing a preference for GSP compared to IDT. In table 4, IPP's coefficient for GSP is positive and significant and greater than that of both TO and IDT thus showing a preference for GSP over IDT and TO in countries with a high IPP index. Our country cluster variable also emerges as an important control variable indicating emerging market firms' preference for GSP. Concerning the education and research infrastructures of countries involved, while an increase in the education infrastructure increases firms' preference for GSP (compared to both TO and IDT), an increase in the research infrastructure, however, increases the probability of technology acquisition through IDT compared to both TO and GSP.

INSERT TABLE 5 ABOUT HERE

6. Discussion

The study argues that the micro-foundations of a firm's strategy such as the level of involvement in international activities influence a firm's technology acquisition mode, with an increasing preference for the global strategic partnerships for technology acquisition. We argue that, in general, the greater the involvement level of a firm's international activities, the lesser will be the

preference for internal development of technology and the greater will be the preference for outsourcing or global strategic partnership (GSP) for technology and, further, between outsourcing and GSP, there will be a greater preference for (GSP) with increasing levels of internationalisation. The larger argument is based on the knowledge-based view of the firm. However, we consider the knowledge-based view from a more micro-foundational perspective, by considering how international exposure could enhance managerial learning and, thus, enable them to better search for technology suppliers and negotiate with technology vendors, thus expanding the scope of technology acquisition modes. We argue that organisations with greater exposure to international markets through their micro-foundational internationalisation activities will, thus, opt for more advanced technology acquisition strategies like global strategic partnerships or technology outsourcing rather than internal development. Since internationalisation is typically a multidimensional construct, we consider five different micro-foundational dimensions concerning the international involvement of a firm: The level of foreign investment in the firm; the level of foreign sales; the percentage of foreign employees; the percentage of foreign supplies as inputs; and, the internationalisation experience of the firm. We also use many firm, industry and country-level control variables, as the technology choice of a firm is influenced by a plethora of contextual factors.

The results are based on the data drawn from a large international sample of firms which enhances the generalisability of our results as well as contributes to the validity of our study. The results from the multinomial regression, however, do not completely support our hypotheses.

First, our analyses show that foreign ownership does not have any significant influence over the technology acquisition mode of companies. This could be explained by the micro-foundations perspective. Foreign ownership, by itself, might not be adequate to equip the managers and

decision-makers in firms to search, evaluate and acquire technology in a way that influences the technology acquisition mode. This result is, in a way, reflected in a recent study by Xie and Li (2013) who found no significant relationship between foreign investment and R&D intensity in a sample of Chinese automobile component manufacturers. Often, foreign ownership is confined to investment in the firm's capital stock with very little human interaction with the foreign owner allowed.

The results show that the proportion of foreign sales has a significant role to play in the context of technology acquisition. In general, the percentage of foreign sales of a firm tends to favour GSP. This endorses our argument about external business knowledge being an important influence in a firm's technology choice and also about the preference for GSP over TO with greater levels of internationalisation. This is an interesting result as it indirectly supports the results obtained by Jiang, Branzei and Xia (2016) who did not find any influence for the percentage of foreign sales on indigenous innovation activities. Further, studies by Kathuria (2008) and Sasidharan and Kathuria (2011) found no significant impact for the export intensity of firms on the firms' choice of conducting R&D activities through a study of Indian firms. Our findings endorse the results from these previous studies as we find that foreign sales do not lead to the choice of IDT as a technology acquisition mode. However, our results in some ways contradict the results obtained by Xie and Li (2013) who found a positive relationship between the export intensity of firms and their indigenous R&D investment as well as Nuruzzaman, Singh and Pattnaik (2019) who found a positive relationship between export intensity and imitative innovation by emerging country firms.

The proportion of foreign employees tends to influence firms in favour of TO over both GSP as well as IDT. This is a significant result. However, contrary to our hypotheses, firms with a higher

proportion of foreign employees tend to prefer TO over GSP. This result could be due to industry- or country-level effects. Often, foreign employees are inducted when the firm is unable to fill the skills gap from domestic sources. This probably signals a general lack of internally available skills in the industry. In such a situation, firms are unable to attract potential technology collaborators since technology collaborators need to be convinced about the partner's ability to contribute to the partnership (Demirbag and Weir, 2006). TO is the easiest option as the firm can acquire technology despite the lack of skills. Such firms may also try to develop in-house technology since it does not require a foreign partner. A recent study by Fassio, Montobbio, and Venturini (2019), using industry-level data from three European countries, found that while migrant labour generally improved the innovativeness of industries, its impact varies across industries. Hence, the divergence in our results could be explained by the differences in the industry sectors or the country-level effects. Further studies in this area are recommended.

The proportion of foreign inputs and supplies tend to influence a company's preference away from IDT. The regression coefficients favour TO and GSP over IDT, but are not significant in the case of the choice between TO and GSP. This is generally in favour of our propositions. With greater knowledge acquired through the purchase of supplies from foreign countries, firms may prefer to look at outsourcing or joint development of technology (GSP) rather than in-house development.

However, the results related to international experience are diametrically opposed to our hypotheses. The results show that if a firm has had higher experience in exporting its products worldwide, i.e., the firm had been in the export business for a long period of time, they tend to prefer internal development of technologies over both global strategic partnerships and technology outsourcing. This is counterintuitive and needs further research to explain.

The study contributes in various ways to extant theory in response to recent calls to examine the micro-foundations approach to knowledge transfer mechanisms (Andersson et al., 2016; Cano-Kollman et al., 2016). First, this is one of the first studies that attempts to link micro-foundational dimensions of internationalisation with the technology acquisition mode of a firm. It is well acknowledged that internationalisation provides rich learning experiences for firms and firms have tried to utilise the learning gained through this experience (Love et al., 2016). Though both constructs have been studied independently, and there is anecdotal evidence to link the two constructs, previous studies have not considered this relationship. The significant relationships traced by this study, therefore, establish the grounds to conduct further research into this area.

Our study also contributes to the theme of internationalisation as a learning experience for firms and the various ways in which this experience can be exploited. By considering the five different micro-foundational dimensions of firm internationalisation and understanding their relative impact on the technology acquisition mode, we show how internationalisation is a multi-dimensional construct and how the different dimension can impact firm strategy in different ways. The results from this study, therefore, indirectly contribute to the discourse on exploration versus exploitation. The study also contributes to the micro-foundational perspective of the firm as the results endorse the view that managerial learning and the cognition they receive through their internationalisation experience is applied in choosing the mode of technology acquisition.

6.1 Technology Acquisition Mode and Social Change

The issue of social change has been an important topic in both academia and management practice in the new millennium (Bies, Bartunek, Fort & Zald, 2007). Corporations have been increasingly playing the role of social change agents, be it through their leaders making social change a strategic imperative or as a result of multilayered and complex relationships with

external stakeholders who influence the firm's social orientation (Barnett, 2007). This role can be assumed by the firms proactively, or reactively, in response to a particular crisis (Aguilera, Rupp, Williams, & Ganapathi, 2007). Building from the microfoundational level of the employee domain of individual needs, the authors argue, however, that industry self-regulation and preventive actions may be more effective than government exhortation and post-hoc damage management. A recent study by Christofi et al. (2019) has proposed, based on a systematic literature review, an integrative framework of the development of technological innovation through cross-border mergers and acquisitions (M&As). Among other aspects, this framework suggests that greater social integration is associated with improved capability transfer between the acquiring and acquired organisation, and that greater operational integration reduces the negative impact of culture-related differences on potential absorptive capacity.

Based on a recent review of social change literature, Stephan, Patterson, Kelly & Mair (2016) propose a comprehensive corporate social change model which includes change mechanisms and enables organisational practices. Two of this model's levers, capability and opportunity, can be directly related to the technology acquisition modes in our paper, as capabilities enable meaningful engagement in GSP when an appropriate opportunity for such GSP presents itself.

Further, beyond the differences in the proximal benefits of technology acquisition mode to individual firms, the technology acquisition strategy followed by groups of firms also has strong implications for social change. For instance, Archibugi and Pietrobelli (2003) and Goedhuys (2007) have shown how excessive adoption of a technology import strategy does not lead to any social benefit for the local economy of developing countries as organisational learning is minimal. Further, as Googins and Rochlin (2000) assert, inter-organisational relationships, on the other hand, can bring about social change in one form or another.

Our study is based on a large sample of emerging economy firms and, according to recent research by Apaydin et al. (2018), emerging markets were found to be more efficient in converting technology into economic and social outcomes such as equality, health and education. It is also widely acknowledged that technological change is a key element in industrialisation and catch-up in emerging economies (Fu, Pietrobelli and Soete, 2011). Firm-level technology acquisition is an important dimension in tracing the technology change trajectory of emerging economies. Further, it can also be argued that economies derive immense productivity benefits, in general, if firms are able to exploit their international experiences to procure the most appropriate technologies in the most appropriate forms. Hence, an exploration of the firm-level dynamics of technology acquisition provides a preview to the underlying mechanisms that accelerate technology-enabled social change and industrialisation in emerging economies. The present study looks at the impact of several key variables on firm-level technology acquisition that could also contribute to social change in emerging economies. Specifically, through exploring factors like foreign workers and the nature of their impact in the technology acquisition process, the study revisits important social debates linked to the economic impact of foreign workers, especially in strengthening the technological base of industries in emerging economies. The present study thus contributes to the arguments put forward in studies like Fassio et al. (2019) that explore the contribution of foreign workers in building the innovation capabilities of countries. Unlike Fassio et al. (2019), the present study looks at the issue from firm-level data and, hence, attempts to look at this issue from a different angle. Results from the study could be used by policy makers in emerging economies to forecast the outcomes of employing foreign workers in firms. The impact of other firm-level variables, such as international experience and foreign sales, also helps in developing a complete picture of

technology acquisition of emerging economy firms. Thus, the paper helps in tracing the different dimensions of the socio economic systems that contribute to technological change pathways.

6.2 Limitations

This study has relied on quantitative data from the World Bank enterprise survey. While the World Bank enterprise survey is a very useful source, it has some limitations which potentially might affect the generalisability of our results. Firstly, the enterprise survey provides a limited number of variables on internationalisation. Secondly, some of the information being sought is sensitive and responses are not complete for each case. Therefore, the data set contains missing values for several respondents across several variables.

While our study combines data from 20 emerging and developing countries, there is a need for a more refined consideration of the differences between countries covered in this study but it was not possible to capture the inter-country variation in the analysis as the sample for some of these countries was small for such comparisons.

6.3 Managerial Implications

This study offers several implications for managers. Firstly, suppliers of technology may use this model to forecast the preferred technology acquisition mode of their customers by extrapolating the customer firm's dimensions of internationalisation. Secondly, results from this study provide firms with directions about the future benefits of rapid internationalisation. The results differentiate the predictive power of the different dimensions of internationalisation which can help in predicting the type of internationalisation dimensions that contribute more to the knowledge-base of the firm. This is significant as not all firms that internationalise may be

following the same process. Further implications include the prospect of predicting competitors' actions and plotting competitors' behaviour regarding technology acquisition mode.

6.4 Further Research

Further research could increase the breadth and scope of internationalisation dimensions to understand its impact on technology acquisition modes. For instance, the presence of foreigners on the board, the presence of international competitors, international subsidiaries, etc., may be included in the list of independent variables. The dependent variable – technology acquisition mode – could also be measured in different ways in order to achieve greater precision in future. It would also be worth considering the moderating effects of several independent variables as well as that of some macro-level variables to enhance the predictive power of the equation. Further research should differentiate between the technology acquisition modes of western MNEs, emerging country MNEs, and domestic firms, and should consider the corporate strategy of these groups and how these shape technology acquisition decisions.

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Figure 1. Conceptual Framework of Determinants of Technology Development Mode

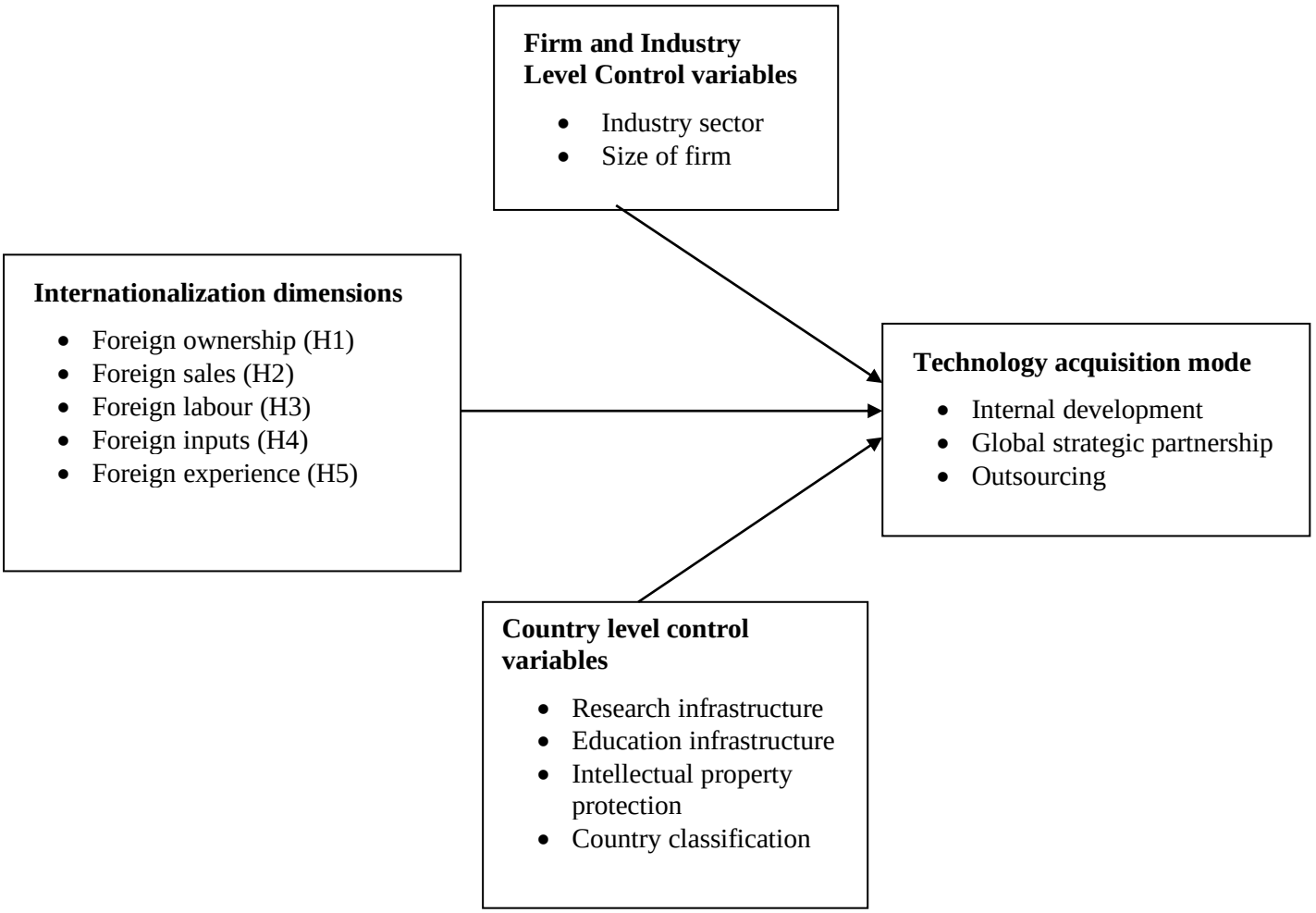

Table 1. Characteristics of the Sample

	No	Percent
Ownership		
Foreign	403	11.1
Local	3219	88.9
R&D intensity of industry		
Group 1 (Pharmaceuticals and chemicals)	273	7.5
Group 2 (Electronics and electrical)	181	5.0
Group 3 (Engineering, automotive)	371	10.2
Group 4 (Food and beverages)	987	27.3
Group 5 (Other)	1810	50.0
Technology acquisition mode		
Outsource (TO)	1961	54.1
In-house (ITD)	818	22.6
Global strategic partnership (GSP)	843	23.3
Country		
Brazil	1150	32.0
Cambodia	33	1.0
Costa Rica	50	1.4
Ecuador	93	2.6
Egypt	45	1.3
El Salvador	203	5.6
Guatemala	211	5.9
Lithuania	61	1.7
Mali	26	0.7
Nicaragua	141	3.9
Oman	31	0.9
Pakistan	422	12.5
Philippines	330	9.3
South Africa	132	3.6
Syria	34	0.9
Tanzania	70	2.0
Thailand	388	10.7
Uganda	50	1.4
Vietnam	44	1.3
Zambia	42	1.2
Country cluster		
Emerging	2108	58.2
Developing	1514	41.8
Total	***3622***	***100***

Table 2. Correlation Matrix

Variable name	**Variable *description***	**Mean**	**SD**	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**13**	**14**	**15**
1. FEMPLOY	Foreign nationals as percentage of permanent skilled workers	51.46	81.8	1.00														
2.FSALE	Percentage of foreign sales	242.3	133.1	0.14*****	1.00													
3.FSUPPLIES	Percentage inputs from foreign suppliers	0.18	0.17	0.41*****	0.23*****	1.00												
4.EXPER	Internationalisation experience	1.36	0.92	0.02	-0.02	-0.05	1.00											
5.RESINFRA	Research infrastructure	2.06	0.54	0.02	-0.04	-0.07	-0.43*****	1.00										
6.EDUINFRA	Education infrastructure	12.70	2.35	0.06	0.08	0.04	0.12	0.12	1.00									
7.INTELPRO	Intellectual property protection	0.77	0.41	0.07	0.08	0.13*****	0.00	0.00	0.01	1.00								
8.GROUP 1	Chemicals and pharmaceuticals	-0.02	0.18	-0.01	-0.07	-0.02	-0.04	-0.03	-0.32*****	0.01	1.00							
9.GROUP 2	Electrical and electronics	14.80	12.31	0.05	0.05	-0.10	0.43*****	-0.54*****	0.20*****	-0.02	0.51*	1.00						
10GROUP 3	Auto, non-metallic and plastic material	0.08	0.27	-0.13*****	-0.27*****	-0.12	0.05	0.06	0.02	0.09	0.07	0.08	1.00					
11.GROUP 4	Food, beverages	0.06	0.23	0.10	0.38*****	-0.05	0.03	0.08	0.02	0.17*****	0.09	0.09	-0.07	1.00				
12.COUNTRY	Country cluster	0.42	0.49	-0.07	0.41*****	0.23*****	-0.17*****	-0.19*****	0.03	-0.19*****	-0.25*****	-0.29*****	-0.25*****	-0.21*****	1.00			
13.OWNERSHIP	Ownership of firm	0.03	0.17	0.57*****	-0.00	0.49*****	0.04	0.03	0.06	0.03	0.05	0.07	-0.05	-0.04	-0.14*****	1.00		
14.LOG SIZE	Number of employees (log)	0.18	0..38	-0.20*****	0.17*****	0.11	0.00	-0.01	-0.03	-0.07	-0.02	-0.01	-0.14*****	-0.11	0.02	-0.08	1.00	

Notes:
SD = Standard deviation
*****$p < 0.001$ (two-tailed test)
N=3,622

Table 3. Results of Multinomial Logistic Regression: Outsourcing and Joint Development compared to In-house Development

		Model 1		Model 2		Model 3		Model 4	
Variable name	**Variable description**	**Outsource**	**GSP**	**Outsource**	**GSP**	**Outsource**	**GSP**	**Outsource**	**GSP**
Constant		0.3593**	-1.5648***	0.3865**	-1.3678***	4.3793***	-6.4581 ***	4.4508***	-6.9125***
Independent variables Firm Level									
OWNERSHIP	Ownership of firm			0.0053**	0.0008			0.0023	0.0020
FSALE	Percentage of foreign sales			0.0051**	0.0169***			0.0034*	0.0170***
FEMPLOY	Foreign nationals as percentage of permanent skilled workers			-0.0008	-0.0068			0.0237***	-0.0330***
FSUPPLIES	Percentage inputs from foreign suppliers			0.0108**	0.0018			0.0071***	0.0055***
EXPER	Internationalisation experience			-0.0125***	-0.0148**			-0.0153***	-0.0154***
Country Level control variables									
RESINFRA	Research infrastructure					-0.2996***	-0.3438***	-0.2644**	-0.1986*
EDUINFRA	Education infrastructure					-.1761***	0.286551***	-0.2197***	0.1517**
INTELPRO	Intellectual property protection					-1.2940***	1.4591***	-1.3360***	1.7243***
COUNTRY	Country cluster	-0.1523	0.5787***	0.0843	0.6998***	0.2304*	0 .8163 ***	0.2990**	0.5985***
Industry level Control variables									
GROUP 1	Chemicals and pharmaceuticals	-0.2286	0.1234	-0.4298**	0.2966	-0.2737 *	0.0580	-0.4104*	0.1646
GROUP 2	Electrical and electronics	-1.0456***	0.1696	-1.2725***	0.1115	-0.9492***	0.05287	-1.0811***	-0.0472
GROUP 3	Auto, non-metallic and plastic material	-0.1168	0.2410	-0.1440	0.3649**	0.2004	-0.4692 **	0.1532	-0.2347
GROUP 4	Food, Beverages	0.0000	0.2377*	0.0499	0.3611***	0.0666	-0.1349	0.0894	0.0540
Firm Level Control Variable									
LOG SIZE	Number of employees (log)	0.1698***	0.2719***	0.0635	0.1469***	0.1659 ***	0.1881 ***	0.1358**	0.0135
LR (Chi Sq)		185.09***		369.37***		1192.22***		1383.30***	
Log likelihood		-3556.72		-3464.58		-3053.15		-2957.61	
Pseudo R^2		0.0254		0.0506		0.1634		0.1895	

Notes:
***p*< 0.05; ****p*<0.01; *****p*<0.001.
N = 3,622

Table 4. Marginal Effects of Explanatory Variables on Technology Development Mode – Estimated from a Multinomial Logistic Regression Model

Variable name	Variable description	Outsource	GSP	In-house
Independent variables Firm Level				
OWNERSHIP	Ownership of firm	0.0004	0.0000	-0.0004
FSALE	Percentage of foreign sales	-0.0009**	0.0022***	-0.0013***
FEMPLOY	Foreign nationals as percentage of permanent skilled workers	0.0093***	-0.0076***	-0.0017**
FSUPPLIES	Percentage inputs from foreign suppliers	0.0011***	0.0001	-0.0012***
EXPER	Internationalisation experience	-0.0022**	-0.0007	0.0029***
Country Level control variables				
RESINFRA	Research infrastructure	-0.0445	-0.0030	0.0475***
EDUINFRA	Education infrastructure	-0.0704***	0.0469***	0.0235***
INTELPRO	Intellectual property protection	-0.5142***	0.4107***	0.1035***
# COUNTRY	Country cluster	0.0117	0.0606***	-0.0724***
Industry level Control variables				
# GROUP 1	Chemicals and pharmaceuticals	-0.1203***	0.0463**	0.0739
# GROUP 2	Electrical and electronics	-0.2542***	0.1007***	0.1535***
# GROUP 3	Auto, non-metallic and plastic materials	0.0607*	-0.0488**	-0.0119
# GROUP 4	Food, beverages	0.0163	-0.0010	-0.0153
Firm Level Control Variable				
LOG SIZE	Number of employees (log)	0.0322***	-0.0122*	-0.0110**

Number of observations: 3,622

Marginal effects are evaluated at the mean values of the explanatory variables.

#dy/dx is for discrete change of dummy variable from 0 to 1

*****p< 0.05; ******p<0.01; *******p<0.001

Table 5. Summary of the Empirical Support for Study Hypotheses

	Empirical Results
Higher the level of foreign ownership of a firm, greater the propensity to choose:	
H1a: GSP over IDT	No support
H1b: TO over IDT	No support
H1c: GSP over TO	No support
Higher the level of foreign sales of a firm, greater the propensity to choose:	
H2a: GSP over IDT	Support
H2b: TO over IDT	Support
H2c: GSP over TO	Support
Higher the proportion of foreign labour employed in a firm, greater the propensity to choose:	
H3a: GSP over IDT	No support
H3b: TO over IDT	Support
H3c: GSP over TO	No support
Higher the proportion of foreign inputs as raw materials in a firm, greater the propensity to choose:	
H4a: GSP over IDT	Support
H4b: TO over IDT	Support
H4c: GSP over TO	No support
Longer the international experience of a firm, greater the propensity to choose	
H5a: GSP over IDT	No support
H5b: TO over IDT	No support
H5c: GSP over TO	No support