The changing geography of innovation

Affordable innovation by Western MNCs in and for emerging economies in Asia

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For Nero

Abstract

The Asian century is at our doorstep. Emerging economies like China and India present a major source of not only supply-, but also demand for Western MNCs. Recent evidence suggests that subsidiaries located in emerging economies in Asia increasingly engage in the development of affordable innovation for the large, diverse and highly competitive lower income segments in these countries.

To expand to these new market segments, it is argued that Western MNCs should localise R&D, and innovate not only on the product side, but create new business models. Yet, why, when and how changes in the external environment influence the development of affordable innovations by Western MNCs in and for emerging economies, and how MNCs reconfigure their entire corporate value chain to design a low-cost offering for the mass-market in the middle, remains little understood. Therefore, this thesis combines ideas from evolutionary economic geography and international business to explain why and how MNCs adapt their value chains in response to dynamic changes in the external environment

The results highlight the role of large domestic demand as a core factor shaping the changing geography of innovation. Western MNCs respond by operating multiple value chain configurations that target different market segments within emerging economies, leading to more localisation and demand-side diversification. The results suggest that subsidiaries of Western MNCs take on a new role in the MNC's innovation network in which they serve as a 'strategic leader for the domestic market'. This thesis builds on in-depth interviews conducted in China, India and Vietnam with managers of three Western MNCs, and presents a compilation of three empirical studies and one systematic literature review. The overarching framework, methods, and findings are discussed in the introductory chapter, the so-called 'Kappa'.

Keywords: affordable innovation, emerging economy, MNC, evolutionary economic geography, subsidiary evolution, case study

Definitions of key concepts

Business models are defined here as 'activity systems' specifying the value creation, delivery and capture mechanisms adopted by the firm, including the value chain configuration adopted to innovate, produce, market and service a product, and the choice of markets to be addressed (Teece 2010; Zott & Amit 2010).

Emerging economies are defined here as a heterogenous group of middle-income countries (IMF 2021) that are characterised by a lower state of industrial development than advanced economies. They generally have lower income levels in terms of GDP per capita (purchasing power parity) and industry portfolios geared towards labour-intensive activities. For the purpose of this thesis, emerging economies in Asia include India and China, and ASEAN countries like Indonesia, Malaysia, Thailand and Vietnam. It is important to note that the state of development differs substantially not only among these countries but also within individual countries and among industries (Alvstam, Ström & Wentrup 2016).

Innovation is defined here as an interactive learning process involving a variety of internal and external actors (multi-actor) from different geographical locations (multi-place) (Asheim & Gertler 2005), and involving all departments along the value chain (Lundvall & Johnsson 1994).

The **mid-market** is commonly described as a market segment between the high- and low-income segments that requests functionality at a low cost (Eriksson 2016; Gadiesh & Leung 2007; Gebauer, Fischer & Fleisch 2013; Jullens 2013).

The **corporate value chain** is defined here as "the full range of activities that firms and workers perform to bring a product from its conception to end use and beyond" (Fernandez-Stark & Gereffi 2011, p.4) referring to the location and organisation of those activities.

For the purpose of this thesis, **Western MNCs** include firms from Europe, the US and Japan. While geographically Japan is in the East, this thesis follows common conventions also used by the G7 and UNCTAD that include Japan as a developed economy (Zhao et al. 2021).

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This PhD project was an exceptional journey spanning over four and a half years, where I met people from all over the world, in an academic, firm-related and private context. I haven't counted the number of planes, trains and boat journeys I made, but, over the course of this thesis I attended conferences, courses and conducted research visits in Finland, Norway, Denmark, Holland, Germany, Switzerland, Austria, the UK, South Korea, China and Vietnam. The time-space trajectory of my PhD would look (at least before the Covid-19 pandemic) like a zigzag between Europe and Asia. Starting off with big and broad ambitions, as every PhD student, sooner or later I was faced with the sobering reality: writing a PhD thesis presents an overwhelmingly complex task, which day and night lingers in your brain.

Initial ideas change over time and new ideas constantly emerge. The more knowledge one gains, the more the colour of the theoretical lens changes, ideally each time allowing us to understand more. In retrospective, the decision to write a compilation thesis and already engage in the publishing process submitting my first article to Asian Business & Management already in July 2018, did not make this PhD journey easier. However, at the same time this duality provided indispensable first hand publishing experience, and for me, it was always an extremely rewarding and fun process, which fortunately, I didn't get tired of. Writing a PhD dissertation is often a rather lonesome road as many people around you don't actually know what you are doing (at stages including yourself), and there is the inevitable risk to of self 'lock-in' not allowing your brain to take a rest. Luckily, there were many wonderful human beings who supported me along the way.

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On a more personal level, this thesis is dedicated to my dog Nero, a keen sailor and my faithful companion, who was always by my side for over 11 years. His emotional support throughout this thesis was indispensable until the end. On behalf of Nero and myself I especially would like to thank my cousin Mara, as well as the Åsblom family, who took care of Nero when I went travelling to Asia for some weeks every year. You were the ocean carrying this PhD ship.

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Sarah Franz

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List of acronyms

ASEAN	The Association of Southeast Asian Nations
DUI	Doing, using and interacting
EMNE	Emerging market multinational enterprise
FDI	Foreign direct investment
GVC	Global value chain
ICT	Information and communication technology
MNC	Multinational corporation
R&D	Research and development
STI	Science, technology and innovation
VCE	Volvo Construction Equipment

List of papers

This dissertation is based on the following papers:

Paper I Franz, S. (2021). The evolution of innovative activity in Asian emerging market subsidiaries of Western MNC's: the case of Bühler India. *Asian Business & Management, 20(1),* 105-130

Paper II Franz, S. Exploring proximity dynamics in the context of frugal innovation: Evidence from a Western MNC in India and Vietnam. *Submitted to a journal*

Paper III Franz, S., Giroud, A., Ivarsson, I. Functional Disaggregation in Swedish Multinationals' Value Chains in the Chinese Market. *Submitted to a journal*

Paper IV Franz, S. Reconciling the bright and the dark side of frugal innovation: A systematic literature review. *Submitted to a journal*

Overview of tables and figures

CHAPTER 1: Introduction

1.1. Setting the scene

The geography of innovation is changing (Audretsch & Feldman 2004; Crescenzi et al. 2020; Crescenzi, Rodríguez-Pose & Storper 2012; Mudambi 2008; Papanastassiou, Pearce & Zanfei 2019). Until the beginning of this century, innovation capabilities were concentrated in the EU, the US and Japan (Dicken 2011; Storper & Walker 1989). However, over the past 20 years, emerging economies, especially in Asia, have become important players in the world economy (Buckley & Ghauri, 2004; De Marchi et al., 2020; Dicken, 2011). Driven by advances in information and communications technology (ICT) and lower-labour costs, Western multinational corporations (MNCs) began to offshore innovation and research and development (R&D) activities to subsidiaries located in emerging economies in Asia (Zhao et al. 2020, 2021).

Recent studies suggest that subsidiaries of Western MNCs located in emerging economies in Asia often engage in the development of affordable innovations to capture larger shares of the 'mid-market' (D'Agostino & Santangelo 2012; Govindarajan & Ramamurti 2011; Ivarsson & Alvstam 2017; Zeschky et al. 2011). The mid-market is commonly described as a market segment between the high- and low-income segments that requests functionality at a low cost (Eriksson 2016; Gadiesh & Leung 2007; Gebauer, Fischer & Fleisch 2013; Jullens 2013). 'Affordable innovations' are defined as simple, easy-to-use, robust, often smaller solutions that make a technology affordable and accessible to a larger portion of the market (Ernst et al. 2015; Zeschky et al. 2011).

Over the past ten years, a plethora of terminologies has emerged describing frugal (Altmann & Engberg 2016; Hossain 2018; The Economist 2010; Zeschky et al. 2011), affordable-value (Ernst et al. 2015), 'good enough', low-cost (Dowling et al. 2011; Pels & Sheth 2017; Williamson 2010) and jugaad (Prahalad & Mashelkar 2010; Radjou et al. 2012) innovation. Some authors have developed typologies and outlined the differences among these different forms of affordable innovation (Von Zedtwitz et al. 2015; Zeschky et al. 2014). However, as this is still a relatively nascent field, the term 'affordable innovation' is adopted for the purposes of this thesis.

While the trend of engaging in affordable innovation for emerging economies has arguably been quite pervasive in the business-to-consumer industries (Arnold and Quelch 1998; Khanna, Palep & Sinha 2005; London & Hart 2004), MNCs operating in a business-to-business environment have recently confronted with the challenge of engaging in affordable innovation

(Winterhalter et al. 2017; Zeschky et al. 2011). Empirical examples of such innovations include a weighing scale for the Chinese mid-price segment developed by Mettler Toledo (Zeschky et al., 2011); innovative activities carried out by German automotive firms in India (Landau et al. 2016); the value truck by Volvo AB; mid-market construction equipment from Sandvik; 'middle-price', high-speed generators from Alfa Laval (Ivarsson & Alvstam 2017); the affordable innovation efforts of pharmaceutical firms in India (Winterhalter et al. 2017); and Volvo's value bus (Schweizer et al. 2019). The argument is that while Western firms have been successful in serving the small share of affluent customers who can afford and are willing to buy technologically sophisticated, state-of-the art solutions at a price premium, the development of affordable solutions for the middle- or lower-price segments in emerging economies has proven to be a much bigger challenge for Western MNCs. In order to compete in the mid-market segments, which tend to be dominated by domestic companies, MNCs must localise R&D and not only innovate on the product side but also adapt their entire business models to respond to fast-paced, dynamic changes in the Asian business environment (Zeschky et al. 2011). How to compete in large, industrialising economies like China and India, and adapt existing routines and structures remain core strategic questions for modern MNCs (Brandt & Thun 2016; Gereffi et al. 2021).

The resulting relocation and reorganisation of firms' value chains is a relevant and timely topic (Gereffi et al. 2021; Hernández & Pedersen 2017; Kano et al. 2020; Lee & Gereffi 2021). After all, by shifting the locus of innovative activity, MNCs produce changes in the overall geographical distribution of innovation at the global level (Crescenzi et al. 2014). Consequently, traditional life-cycle theory (Vernon 1966) is increasingly turned on its head. Developing (emerging) economies are 'not only recipients' but increasingly serve as major sources of innovation (Corsi & Di Minin 2014; Govindarajan & Ramamurti 2011; Ramamurti 2012; Ramamurti & Williamson 2019), and Western MNCs no longer solely innovate close to their home markets in the West. Increasingly, more high-value adding activities or slices thereof are located in emerging economies (Buckley & Strange 2018; Hernández & Pedersen 2017). As the abovementioned examples suggest, emerging economy subsidiaries have moved beyond simply adapting existing products – they are engaging in the development of novel products and solutions (Ivarsson & Alvstam 2017; Zhao et al. 2021), and are moving towards more headquarters-augmenting, and competence-creating roles (Cantwell & Mudambi 2005; Ha & Giroud 2015; Jha et al. 2018; Ryan et al. 2020). In particular, they are engaging in affordable innovation for and in emerging economies. Hence, this thesis seeks to answer the following

overarching question: *Why, when and how do changes in an emerging-economy environment in Asia influence the organisation and location of affordable innovation by Western MNCs?*

Rather than presenting a story of market entry, this thesis focuses on expansion within an existing market, and examines how firms adapt their organisational routines and structures over time in response to changing host-country environments (Meyer et al. 2020; Surdu et al. 2021). A recent study finds that the development of the innovation environment in the Asian region in relation to MNE R&D internationalisation remains a grey zone (Zhao et al. 2021). Connecting affordable innovation to the broader context of economic upgrading and technological change is important, as the mid-market tends to be portrayed as a battleground on which Western firms face fierce domestic competition, and as it is the segment in which the impact of industrialisation in emerging economies manifests (Brandt & Thun 2010, 2016; Gadiesh & Leung 2007; Thun 2018).

To do so, this thesis adopts an evolutionary perspective (Nelson & Winter 1982), and analyses how dynamic changes in institutions, markets and technologies influence the organisation of innovation at the firm level (Boschma & Frenken 2011, 2018). By focusing on how changes in the external environment over time influence the entire value chain configuration for a specific product line, this thesis contributes to a more nuanced understanding of the motivations and factors that influence the organisation and geography of innovation from an MNC perspective (Crescenzi et al. 2020; Kano et al. 2020). More specifically, this thesis enriches our understanding of the phenomenon of affordable innovation from the perspective of Western MNCs in engineering-based industries (Zeschky et al. 2011).

For the purpose of this thesis, the individual firm, in this case the MNC, serves as the main unit of analysis. MNCs are defined as firms that coordinate and control business activities across national borders (Bartlett & Ghoshal 1989). The role of modern MNCs is to coordinate and lead their geographically dispersed and organisationally fragmented networks of subsidiaries, partners, suppliers and customers, which are organised in complex global value chains (GVCs) or global production networks (Kano et al. 2020). MNCs are embedded in multiple, diverse geographical contexts through their subsidiaries (Meyer et al. 2011). Subsidiaries are conceptualised as nodes in space, where the behaviour of an MNC touches ground. From an MNC perspective, the subsidiary's role is to create value for the MNC by combining firm-specific knowledge with location-specific advantages.

The empirical focus of this thesis is subsidiaries of advanced-economy MNCs located in emerging economies in Asia and their endeavours to expand

to the mid-market segment in those economies by engaging in affordable innovation. Specifically, this thesis focuses on two Swedish and one Swiss manufacturing MNCs operating who engage in the development of complex products and systems in engineering-based industries (Hobday 1998). These products represent a capital investment for buyers (Gertler 2003; Pisano 1996). Moreover, their innovation processes are based on doing, using and interacting (DUI) (Lundvall 1994), meaning that the co-location of manufacturing and R&D is key in these industries due to the functional interdependencies between design and production (Ivarsson et al. 2017; Pisano 1996; Pisano & Shih 2012). Thus, innovation in these industries is highly dependent on tacit knowledge and, thereby, highly context-specific (Asheim & Gertler 2005). Not only do institutional contexts, routines, working practices, habits and tastes differ, but they also influence the adoption and diffusion of complex processing technologies (Gertler 2003, 2004). Therefore, for firms active in engineering-based industries, the importance of developing machinery that is especially suited to the contextual conditions found in the respective geographical space is even more pronounced than in more 'footloose' industries (e.g. microchips, textiles).

1.2. Problematisation

This thesis departs from the observation that, in recent years, Western MNCs have increasingly engaged in the development of affordable innovations in emerging economies, especially in Asia (Jha et al. 2018; Neumann et al. 2020; Winterhalter et al. 2017; Zeschky et al. 2011a). A review of the literature on affordable innovation highlights several shortcomings, including a lack of focus on: (a) contextual conditions found in the host-country environment, (b) time and (c) all value chain activities and not only R&D.

First, academics seem to agree that MNCs not only innovate on the product side but also reconfigure their business models and their respective value chains to design a solution that fits mid-market customers in emerging economies (London & Hart 2004; Winterhalter et al. 2017; Zeschky et al. 2011). To make this possible, recent empirical studies highlight the need to focus on all value chain activities (Landau et al. 2016; Winterhalter et al. 2017). Yet, thus far "studies on more sophisticated technical products that require a whole new value chain (incl. new product development) are almost absent" (Winterhalter et al. 2017).

Second, studies suggest that mid-market products complement the firm's existing portfolio and, thereby, create multiplicity in the firm's value chain through the introduction of additional value chain configurations for mid-market product lines (Howell, van Beer & Doorn 2018; Winterhalter et al.

2016). However, running both strategies simultaneously is a major challenge, and firms have to decide to what extent the new 'low-cost' business model should be managerially integrated or separated from the existing premium business model and to what extent the value chain configurations may overlap (Neumann et al. 2020; Winterhalter et al. 2016a). However, most of the literature on the internationalisation and strategy of the MNC has focused on market entry rather than the evolution of entry modes (Asmussen et al. 2009; Benito et al. 2009; Benito et al. 2011; Hennart 2009). In particular, the expansion to new market segments in a country in which the MNC is already active and the resultant managerial challenges stemming from the multiplicity of the firm's value chain configurations have received limited attention. Hence, how these mid-market strategies evolve over time and how they co-exist with existing value propositions remain open questions. Therefore, this thesis offers a dynamic, time-geographic (Hägerstrand 1970) view on affordable innovation at the subsidiary level, and analyses how changes in the subsidiary's external environment influence the organisation of affordable innovation within the MNC.

Third, most studies analysing affordable innovation in the MNC context have focused on internal dynamics and paid little attention to drivers stemming from the external environment. While previous studies point to differences in customer characteristics, lower cost levels and strong domestic competition as the main conditions driving affordable innovation (Brandt & Thun 2010, 2016; Dowling et al. 2011; Eriksson 2016; Gebauer et al. 2013; Jullens 2013), studies of the broader context of affordable innovation are scarce. Recent contributions point to a need to analyse the institutional environment as a driving force behind the organisation of affordable innovation at the firm level (Landau et al., 2016; Neumann et al., 2020; Winterhalter et al., 2017), and to place the phenomenon of affordable innovation into a broader context of technological development and upgrading (Brandt & Thun 2010, 2016). To advance our understanding of affordable innovation, we must understand the factors and conditions that shape the process of affordable innovation at the firm level (Neumann et al. 2020). Due to the focus on firm-internal processes, the field lacks a comprehensive theoretical frame for analysing these complex interdependencies (Agarwal et al. 2017).

Given these shortcomings, this dissertation aims to begin rectifying knowledge gaps related to how Western MNCs develop affordable innovations for and in Asian emerging economies, and the factors and conditions of the emerging-economy environment that influence these affordable innovation efforts at the firm level.

The problem is that existing theories are ill-equipped to fully explain these shifts. On the one hand, economic geography as a discipline has traditionally focused on the economic development and upgrading of regions, while firm-level effects of the changing geography of innovation remain poorly understood. Despite some notable expectations (Crescenzi et al. 2014; Haakonsson et al. 2013; Ivarsson et al. 2017), the core unit of analysis remains the firm as a whole as well as the interactions among firms, universities and governments. Furthermore, while research has recognised that the region also depends on extra-regional knowledge linkages, such as global knowledge pipelines (Bathelt et al. 2004), less attention has been paid to the role of the MNC in regional development (Crescenzi et al. 2014). This is surprising given that around 80% of global business activities are controlled by MNCs (UNCTAD 2013), and that every major MNC now operates R&D units in China and India (Branstetter et al. 2015), mostly complementary to R&D activities in advanced economies (Cano-Kollmann et al. 2016; Zhao et al. 2021). Yet, in order to analyse the link between changes in the environment and firm behaviour, an understanding of the motivations behind the firm-level organisation of innovation is indispensable (Boschma & Frenken 2018). An exploration of these dynamics at the micro level is important for understanding their impact on regional development and the transformation of GVCs (Fuller & Phelps 2017). This is supported by recent studies arguing that knowledge flows within firms are as important as knowledge flows between firms in a specific region or territory (Asheim et al. 2012; Aslesen et al. 2019; Binz et al. 2014; Crescenzi et al. 2020).

On the other hand, studies analysing the changing location of the firm's value chain tend to either focus on single functions or study subsidiary roles in the MNC's innovation network at an aggregate level. For instance, studies on the geography of innovation have focused on the R&D function, while the literature on global production chains or networks has centred on the organisation and geographical dispersion of production. In this regard, customers in developing countries are still portrayed as passive recipients of technologies developed by Western brands (Vernon 1966). The development of novel solutions for new market segments, as in the case of affordable innovation, is not well conceptualised in this stream of literature (Barthlett & Goshal 1989; Kuemmerle 1999; Cantwell & Mudambi 2005). In order to develop an understanding of how innovation is organised at the firm level, we need more studies analysing the entire value chain, including R&D, manufacturing, sales, sourcing and marketing activities for a specific product line or service. Therefore, more studies that analyse the location and organisation of the entire corporate value chain are needed (Baldwin 2006; Hernández & Pedersen 2017; Mudambi & Puck 2016). This is important, as

subsidiaries adopt different roles depending on the type of value chain activity under consideration (Rugman & Verbeke 2011) and as each value chain activity has different locational needs (Alcácer & Delgado 2016). However, empirical studies aiming to map the entire input-output structure of a single product or service remain scarce. This is problematic, as we lack insights into complex configurations that bring a product from innovation to commercialisation (Hernández & Pedersen 2017), and as it limits our ability to capture the motivations behind managerial choices regarding the location and organisation of individual value chain activities and their interdependencies (Benito et al. 2011, 2019; Strange & Humphrey 2019).

1.3. Purpose and research questions

In order to address these shortcomings, this thesis builds on evolutionary economic geography to explain how the external environment shapes firm behaviour over time (Boschma & Frenken 2006; Boschma & Frenken 2011; Martin & Sunley 2007). The 'environment' is conceptualised here as the interplay among markets, technologies and institutions (Esseltzbichler 2009; Lee & Malerba 2017; Nelson 1995; Storper 1997), which is in constant flux (Massey 2005).

In essence, the adoption of an evolutionary perspective means four things. First, evolutionary theory pays significant attention to changes in the external environment and their influence on firm behaviour. Second, time and history are important from an evolutionary perspective, as they highlight the role of path dependency and experience. In this respect, the evolutionary perspective on firms and context is combined with time-geographical thinking, which suggests that all individual activity is shaped by different types of time-space constraints (Henning 2019). Third, organisational routines are viewed as serving as the 'genes' or carriers of these experience, and firms are assumed to compete on the basis of their organisational routines (Nelson & Winter 1982). Fourth, innovation is conceptualised as an interactive learning process (Asheim & Gertler 2005). Therefore, during the time it took to produce this thesis, the author came to the conclusion that an evolutionary approach would be well-suited for developing explanations about a new phenomenon like affordable innovation, and for linking the economic development and growth of regions to the changing geography of innovation at the firm level.

By combining the economic geography and international business literature, this thesis seeks to contribute to research on the geography of innovation by offering a more nuanced understanding of how dynamic changes in the external environment influence innovation at the firm level. Thereby, this thesis responds to calls for more detailed analyses of the spatial patterns of

innovation from an MNC perspective (Boschma & Frenken 2018; Crescenzi et al. 2020), and seeks to contribute to a more evolutionary understanding of how changes in technologies, institutions and markets shape innovation at the firm level (Boschma & Frenken 2018). Specifically, this thesis contributes to the literature on affordable innovation by offering contextualisation and theoretical grounding for this contemporary phenomenon (Brandt & Thun 2016; Neumann et al. 2020).

As mentioned above, **the purpose of this thesis** is to explain *why, when and how changes in an emerging economy environment in Asia influence the organisation and location of affordable innovation by Western MNCs*. Accordingly, two operational research questions guide this study:

RQ 1: *Why, when and how do changes in the external environment influence the development of affordable innovation by Western MNCs in emerging economies?*

RQ 2: *How do Western MNCs reconfigure their value chains to expand to the mid-market segments in emerging economies in Asia?*

To address these questions, this thesis presents three qualitative, in-depth case studies based on personal interviews conducted by the author with managers from one Swiss and two Swedish MNCs active in the manufacturing industry. Volvo Construction Equipment (VCE) AB (henceforth: VCE) is a leading manufacturer of haulers, wheel loaders and excavators for the construction and extraction industry. Epiroc AB (henceforth: Epiroc) produces surface-level and underground equipment for the construction and mining industries. Bühler AG (henceforth: Bühler) is a Swiss, family-owned MNC engaged in the innovation of food-processing technologies (e.g. grains, chocolate, coffee) and advanced materials for the automotive industry.

The three firms share several characteristics. First, they are all European MNCs with small domestic home markets (i.e. Switzerland and Sweden). Second, all three firms produce complex products and systems that represent a capital investment for customers. The traditional business models of Western MNCs focus on the innovation of state-of-the-art technologies in Europe, which are sold at a premium price to a global market. In other words, they focus on customised solutions sold in small volumes with high margins. Third, the food-processing, construction and mining industries are highly regulated by the government, and competition often favours domestic firms. Fourth, for all three firms, the share of sales stemming from Asia has increased significantly over the past 15 years, while the share of European sales has declined, as shown in Table 1. Over this period, sales stemming from Asian

markets tripled in absolute terms. For Bühler, the share of total sales stemming from Asia increased from 19% in 2005 to 35% in 2020. In the case of VCE, the share of Asian sales rose from 16% in 2005 to 38% in 2019, and Asia was the only market showing growth in 2020 (+15%), contributing 48% of total sales. For Epiroc, the share of total sales stemming from Asian markets grew more moderately, rising from 20% in 2005 to 28% in 2020. This indicates that Western MNCs increasingly rely on Asian markets as sources of demand.

Unique data gathered through interviews conducted at the subsidiaries of VCE and Epiroc in China, and Bühler in China, India and Vietnam as well as their respective headquarters serve to elucidate the role of emerging demand

Table 1. Company data.

	Year	Total sales (mil CHF)	Sales Asia (mil CHF)	Sales Europe (mil CHF)	Employees total
Bühler AG	2005	1 502	285	616	6 266
			19%	*41%*	
	2019	3 250	1 105	975	
			34%	*30%*	
	2020	2 700	945	810	12 457
			35%	*30%*	

	Year	Total sales (bil SEK)	Sales Asia (bil SEK)	Sales Europe (bil SEK)	Employees total
Epiroc	2005	15 154	3 031	4 698	7 363
			20%	*31%*	
	2019	40 859	10 665	9 431	
			26%	*23%*	
	2020	36 122	10 057	8 676	14 012
			28%	*24%*	
VCE	2005	34 816	5 717	15 524	10 290
			16%	*45%*	
	2019	88 606	33 932	30 300	
			38%	*34%*	
	2020	81 453	39 095	23 191	13 404
			48%	*28%*	

Source: Compiled by the author based on data from annual reports (2005-2020)

segments and the phenomenon of affordable innovation. Offering a compilation of three empirical studies and one systematic literature review, this thesis explores how advanced-economy MNCs develop affordable innovations for the mid-market in emerging economies in Asia, and how the specific contextual conditions of the host-country environment influence this process.

The results suggest that expansion to the mid-market segments in emerging economies in Asia is a key strategic issue for Western MNCs. In all of the cases presented here, innovation was conducted locally, while the firms adapted their entire value chain configurations, including production, sales and delivery channels, over time in order to develop an affordable solution that suited local

market requirements. However, despite these efforts, the success and benefits of these initiatives remain questionable. In essence, there is a fine line between digging deep into a market and forming a joint venture for the transfer of valuable technological knowledge to emerging-market firms in order to gain a stronger foothold in the respective country or industry, and the risk of strengthening fast-upgrading competitors from emerging economies through knowledge spillovers. These competitors may, in the end, transform themselves into global MNCs.

This thesis contends that competing in emerging economies in Asia helps Western MNCs learn about the organisational routines, institutionalised behaviours and logics that form the roots of the international competition emerging from countries like China and India. It is up to future studies to explore the extent to which the mid-market may serve as a springboard for expanding to similar emerging-market segments in other countries.

1.4. Thesis Structure

This thesis is designed as a compilation. It consists of the introductory chapters (i.e. the 'kappa') and four standalone articles. Chapter 1 introduces the phenomenon, and defines the problem, scope, purpose and main research questions. Chapter 2 introduces the theoretical concepts used in this study and develops a conceptual framework that combines insights from economic geography and international business. Chapter 3 provides the ontological and epistemological background for this thesis, and explains how these are operationalised through the methods used in the different articles. Chapter 4 provides a summary of each article and discusses the main findings in relation to the two main research questions. Chapter 5 summarises the key conclusions and main areas for future research.

The four articles comprised in this thesis are basically presented in the order in which they were written. Each article followed a different trajectory and is in a different stage of publication.

Paper I, titled 'The evolution of innovative activity in Asian emerging market subsidiaries of Western MNC's: the case of Bühler India', is single-authored and was published in *Asian Business and Management* (Franz, 2021).

Paper II, currently titled 'Exploring proximity dynamics in the context of frugal innovation: Evidence from a Western MNC in India and Vietnam' presents a qualitative case study on the organisation of affordable innovation in Bühler's subsidiaries in India and Vietnam. It is single-authored, and has been submitted to a journal.

Paper III, titled 'Functional Disaggregation in Swedish Multinationals' Value Chains in the Chinese Market', was presented at the Euro-Asia Management Studies Association (EAMSA) conference in October 2021, where it received the best paper award, which highlighted the uniqueness and value of the study. The article is co-authored with Axèle Giroud and Inge Ivarsson, and has been submitted to a journal.

Paper IV, titled 'Reconciling the bright and the dark side of frugal innovation: A systematic literature review', is a single-authored paper that draws on bibliometric analysis and data-reduction techniques to analyse the extent to which the positive and negative effects have been addressed in the literature on affordable, frugal, reverse and good enough innovation. It identifies core concepts and antecedents in the different streams of literature. The paper has been submitted to a journal.

CHAPTER 2: Theoretical framework

This chapter introduces the main concepts and theoretical underpinnings of this thesis. First, it introduces an evolutionary perspective on MNCs and the external environment, and argues that firms compete based on their organisational routines and capabilities. In the face of environmental change, the ability to adapt and innovate influences firms' competitiveness. Second, changes in the external environment are conceptualised as the interplay among technologies, markets and institutions, apart from costs and resource endowments at the country level proposed by traditional location theory. Third, literature on value chain configuration and the organisation and geography of innovation within the MNC is reviewed and linked to the phenomenon of affordable innovation. To conclude, this chapter presents a conceptual framework, which allows for further analysis.

2.1. An evolutionary perspective on MNCs and context

Since 2006, an evolutionary perspective on the spatial distribution of economic activities has emerged (Boschma & Frenken 2006; Boschma & Martin 2010). Central to this the view are organisational routines at the firm level, the path-dependent nature of firm behaviour and the role of technological development. Thus, evolutionary theory pays significant attention to time and history, and posits that dynamic changes in the external environment produce changes in firm behaviour. While evolutionary thinking has long held the interest of scholars from various disciplines, the evolutionary perspective was first introduced to economics by Nelson and Winter (1982), who defined economic change as the response of industries and firms to changing market conditions. Market conditions encompass shifts in demand, supply and competition.

Evolutionary theory is rooted in the behavioural theory of the firm (Cyert & March 1963; Simon 1955) and encompasses two underlying behavioural assumptions. Simon (1955) pointed out that the rationality of actors is constrained by imperfect information and individual cognitive aspects, which influence perceptions and interpretations of the opportunities and constraints stemming from the external environment. This stood in sharp contrast to economic theory at the time, which built on rational actors making decisions on the basis of perfect information and deciding among a clearly defined set of alternatives (Nelson & Winter 1982). Yet, as Cyert and March (1963) argue, due to the bounded rationality of managers, firms' choices will not always be maximising. Instead, they may be satisficing or 'good enough' given that the rationality of actors is constrained by their knowledge about a situation. Thus, more attention must be paid to decision-making processes in order to discern

the environmental conditions that shape these choices and, thus, the behaviour of firms in specific contexts (Cyert & March 1963; Nelson & Winter 1982). This view is supported by recent studies that highlight the need to include behavioural assumptions in analyses in order to explain firm heterogeneity in diverse environments (Meyer et al. 2020; Surdu et al. 2021).

Organisational routines form the basis of spatial differences (Boschma & Frenken 2018). These routines are defined as durable habits or 'genes' that guide actors' behaviour (Nelson & Winter 1982). Central to this thought are notions of the roles of path dependency and organisational history in decision making. It is assumed that existing routines are difficult to change. The 'adaptive capability' of a firm refers to the firm's ability to change existing routines and deviate from long-established behaviour, and is central to firm survival (Ter Wal & Boschma 2011). A core underlying assumption is that firms compete based on their routines (Nelson & Winter 1982). In this regard, evolutionary theory builds on the idea of biological competition, which refers to three core principles: variation, selection and retention (Boschma & Frenken 2006; Essletzbichler 2009). Successful firms survive by developing a variety of routines and retaining those that are selected by the market. Notably, firms differ substantially in terms of their skills, routines and strategies (Nelson & Winter 1982), Accordingly, evolutionary modelling has focused on highlighting the similarities and differences among different types of routines that account for firm heterogeneity (Nelson & Winter 1982), and suggests that adaptation is key for explaining how MNCs modify their products and organisational routines to fit different market requirements (Bartlett & Ghoshal 1989; Jensen & Szulanski 2004).

Hence, the concepts of organisational routines, the notions of path dependency and history, and the focus on environmental constraints and opportunities that shape the behaviour of firms and individuals (Argote & Greve 2007) are central to evolutionary thinking. Accordingly, for the purpose of this thesis, it is important to reflect upon the conceptualisation of innovation at the firm level and what is meant by the 'external environment'.

2.2. The changing external environment

For the purpose of this thesis, it is necessary to consider the meaning of the 'external environment' or 'context'. In this section, I review the literature on traditional location factors and then introduce a more evolutionary perspective on the environment as the interplay among technologies, markets and institutions (Boschma & Frenken 2018; Nelson 1995)

2.2.1. Traditional location theory

Traditional location theory seeks to discern the underlying factors and conditions that influence firms' location choices and the patterns these decisions produce at an aggregate level, thereby manifesting the spatial structure of economic activity and interconnectedness between places. Transaction costs and resource endowments have traditionally been viewed as the main drivers of the dispersion of firm activities.

As a discipline, economic geography is concerned with the distribution of economic activity in space and time. The focus lies on identifying the conditions that shape processes of interactive learning and innovation among firms located in a specific territory or region. These territorial approaches to innovation are based on the assumption that geographical proximity between firms creates more opportunities for frequent face-to-face interactions (Boschma 2005; Dicken 2011). The localisation of activities in a specific place creates proximity to local suppliers, customers, universities and other actors and, thereby, facilitates the exchange of tacit, context-bound knowledge, which is a core element in the geography of innovation (Gertler 2003). This goes back to Marshall's (1920) argument that firms in the same industry benefit from being located in geographical proximity to each other, which reduces the cost of factor inputs and is conducive to learning and knowledge-creation processes. Hence, geographical proximity among actors plays a major role in this stream of literature.

However, geographical proximity is neither a necessary nor a sufficient condition for innovation. It must be complemented by other forms of proximity (Boschma 2005; Gertler 2003; Iammarino & McCann 2013; Maskell & Malmberg 1999). For instance, Boschma (2005) proposes that five proximity dimensions facilitate or constrain the innovation process at the firm level: cognitive, social, organisational and institutional. These can be complemented by other forms of proximity, such as technological proximity (Caragliu & Nijkamp 2016; Lo Turco & Maggioni 2019), or temporal and virtual proximity (Torre 2008). These various types of proximity mediate the interactions among actors involved in the innovation process. Hence, space is relational and multidimensional (Lefebvre 1974; Massey 2005), and matters when analysing firm behaviour (Shaw & Gilly 1999). After all, activities are not distributed randomly in time and space, but are constrained or enabled by environmental conditions, which are constantly changing.

In the international business literature, the location behaviour of MNCs has traditionally been analysed at the country level by drawing on Dunning's (1977, 1988) OLI paradigm. The core argument is that MNCs have four motives to engage in foreign direct investment (FDI) and locate activities in a

specific location: natural resource seeking, efficiency seeking, market seeking and strategic asset seeking (Dunning & Lundan 1993). Each motive involves a different combination of firm-specific and location-specific advantages. According to Dunning (1998), four types of firm-specific advantages facilitate or constrain the FDI activities of MNCs: economies of scale, the level of product diversification, the management of coordination capabilities and market access. Location-specific advantages, which are usually analysed at the country level, include cost advantages, access to resources and infrastructure, transport costs (Dunning 1998), FDI policy, intellectual property (IP) rights and the nature of the competitive landscape (McCann & Mudambi 2004). These factors relate to labour, land and capital, and often entail analyses of agglomeration economies, labour-market conditions and market access (Crescenzi et al. 2014).

However, resource endowments and costs are not the sole explanatory factors for firms' location decisions (Storper & Walker 1989). Beyond traditional location-specific factors related to labour, land and capital, Storper and Walker (1989) and Porter (1990) identify upgrading and innovation as core processes in changing the composition of economic activity in a territory. These contributions highlight the importance of the 'pre-existing industry grid' (Storper & Walker 1989), which influences firms' location decisions and plays a key role in the economic development and competitiveness of countries and regions. This indicates that not only costs and resources but also industry networks influence firms' location decisions. Analyses of the drivers leading to the localisation and reconfiguration of a firm's value chain in a foreign country are vital, as traditional factors motivating FDI decisions, such as low-cost labour, may become less important as technological convergence produces shifts in the competitive landscape towards new drivers, such as market proximity, digital standards and regulations, quality, and scientific knowledge (Lee et al. 2020). Furthermore, from an international business perspective, location tends to be analysed at the country level and is usually conceptualised in the form of location advantages. This is problematic for two reasons. First, the influence of the (subnational) region as the scale on which economic activity accumulates tends to be ignored. Second, there is a risk of omitting negative constraining effects that location factors could have on the firm. Therefore, this thesis argues for a more careful conceptualisation of locational factors as constraining or facilitating firm behaviour.

Hence, in order to understand how innovation at the firm level is influenced by the external environment, this thesis combines traditional location theory with insights from evolutionary economic geography, and examines the co-evolution of technologies, markets and institutions (Boschma & Frenken 2011). Hence, apart from cost differentials and resource endowments as the

traditionally discussed factors influencing the location of firm activities, for the purpose of this thesis hard location factors, industry networks and socio-economic changes in the environment matter. In this regard, the firm's external environment is conceptualised as the interplay among technologies, markets and institutions (Nelson 1995).

2.2.2. Technology

Technological change and innovation are key drivers of economic growth and development (Dosi 1982; Nelson & Winter 1982; Rosenberg 1986). Traditional measurements of the globalisation of innovation include R&D expenditures and patents by country (Dicken 2011). Until the beginning of this century, innovation capabilities were concentrated in the EU, the US and Japan (Storper & Walker 1989). However, this has changed with the growth of the 'Four Asian Tigers' (i.e. Hong Kong, Korea, Singapore and Taiwan), the 're-emergence' of China, and the growth of India and other East Asian economies, such as Malaysia, Indonesia and Thailand (Dicken 2011).

Learning and innovation are fundamental prerequisites for sustainable economic growth and development (Lema et al. 2018) as well as industrial upgrading (Ernst 2002). Research recognises that technologies transferred from Western firms play an important role in the technological upgrading of domestic firms in emerging economies (Ernst 2002; Ivarsson & Alvstam 2011; Mudambi 2008). An extensive body of literature examines technology transfers between Western firms and domestic suppliers, while another extensive stream of literature focuses on technology spillovers. Nevertheless, studies suggest that Western MNCs and MNCs from emerging economies differ in their capabilities and in the type of innovation on which their competitive advantages are built (Corsi & Di Minin 2014; Ramamurti 2012; Ramamurti & Williamson 2019). Firms from the EU, the US and Japan still largely compete on the basis of their innovative power, while firms from India and China are uniquely positioned to combine cutting-edge technology with low-cost production (Altenburg et al. 2008). Western MNCs tend to have a strong technological base but lack an understanding of local market contexts. In contrast, emerging-market multinational enterprises (EMNEs) often have an understanding of the local context but lack technology (Corsi & Di Minin 2014).

Traditional product life-cycle theory argues that due to location-specific advantages of advanced economies, such as highly skilled labour, proximity to customers and advanced manufacturing capabilities, MNCs from those economies are better equipped to discover new technological solutions (Vernon 1966). From this perspective, technologies are innovated in the West

and then exploited in emerging economies. From the point of view of the Western MNC, this means that innovation is best carried out at 'home' in advanced economies. Then, as demand emerges in other locations, products that have passed the life-cycle in the West are transferred to developing economies through licensing agreements, exports, joint ventures or subsidiaries. In this view, customers in emerging economies are portrayed as passive consumers of outdated technologies developed in the West, and competitors and suppliers are depicted as technologically inferior by default. This is problematic, as it imposes a 'top-down' view on innovation and, therefore, remains prone to ignoring contemporary complexities.

The assumption that Western MNCs have technologically superior knowledge when compared to emerging-economy firms that possess manufacturing capabilities characterised by productivity and volume at a low cost is also found in the GVC literature, which offers a framework to explain the shifting distribution of economic activities across countries (Benito, Petersen, & Welch 2019; Gereffi et al. 2005). MNCs or global lead firms play a central role in this stream of literature as the main coordinators of relationships among different actors in industry-specific chains (Gereffi et al. 2005). A core pillar of this literature is the concept of governance. According to GVC scholars, the choice of governance mode is influenced by three factors: the complexity of the exchanged information, the codifiability of knowledge and supplier capabilities (Gereffi et al. 2005). This decision influences and structures the opportunities for learning and upgrading among actors. The extant research argues that through interactions with lead firms from advanced industrialised economies, domestic suppliers can learn and upgrade their capabilities. Different governance modes offer suppliers varying opportunities for upgrading. Gereffi et al. (2005) contend that increasing supplier competence governance modes in GVCs has led to a shift from hierarchically organised, vertically integrated value chains towards more intermediate types of governance (e.g. modular, captive, relational). The question of governance is relevant, as it identifies the organisational forms, practices and power dynamics that shape interactions among different actors in cross-border networks of value creation (Ponte & Sturgeon 2014).

Hence, the literature generally assumes that emerging-economy firms will eventually catch up with incumbent firms through the upgrading process. Industrial upgrading is a multi-scalar phenomenon that occurs within factories, between firms, within countries or regions, and within supranational regions (Gereffi 1999). Four types of industrial upgrading are commonly distinguished: product upgrading, process upgrading, intra-chain upgrading and inter-chain upgrading (Gereffi 2001). Product upgrading refers to situations in which firms move from basic technologies and products towards

the production of more complex products and services. For instance, Chinese firms in the construction industry started by producing wheel loaders. Only in the past decade have they engaged in the development of more complex machines, such as excavators (Brandt & Thun 2016). Process upgrading refers to improvements in manufacturing, innovation and other organisational processes through the more efficient transformation of inputs into outputs. Intra-chain upgrading refers to situations in which firms take on more knowledge-intensive functions within the industry's value chain. An extensively discussed example in this regard is the upgrading of suppliers of lead firms from the manufacturing of non-core components to more knowledge-intensive activities. Inter-chain upgrading refers to situations in which firms apply the knowledge gained from the production of a product to produce a product for a different industry.

A slightly different perspective is offered by Ramamurti and Williamson (2019), who argue that Western MNCs and EMNEs have different 'capability holes'. For instance, they suggest that EMNEs are characterised by technological backwardness, weak brand and marketing expertise, and a limited international presence and experience (Ramamurti & Williamson, 2019). On the other hand, Western MNCs lack the mindset needed to succeed in emerging markets as well as access to ultra-low-cost production, the ability to offer value-for- money products and an understanding of emerging-market customers (Ramamurti & Williamson, 2019). According to this line of thought, a core capability of EMNEs is developing 'good enough' or equal solutions at a low cost and produced at high volumes. The core competitive advantage of Western firms lies in their ability to develop technologically sophisticated, state-of-the art solutions, which are sold at a price premium, often to niche customers. The capabilities, organisational routines and cost structures of emerging-economy firms differ substantially from the traditional business model of Western MNCs. Hence, the competition between Western firms and firms from emerging economies could be described as a 'global learning process' (Ramamurti & Williamson 2019).

As discussed above, over the past ten years, emerging-market firms have upgraded their technological capabilities and increasingly competed with Western MNCs in the higher-income segments (Govindarajan & Ramamurti 2011; Ramamurti & Williamson 2019). However, they are doing more than just upgrading their technological capabilities (Lall 2000; Ivarsson & Alvstam 2005, 2011). Pananod (2016) suggests that re-positioning within a GVC can serve as an alternative trajectory for the upgrading of local suppliers. In a similar vein, some evidence suggests that the technological gap between the West and emerging economies in Asia, especially China, is narrowing (Altenburg et al. 2008; Diemer et al. 2021). This is particularly true in

industries like batteries and microchips, which are related to rare-earth minerals, where China has a leading position (Diemer et al. 2021).

2.2.3. Markets

In traditional theories on the location of industries (Von Thünen 1926; Weber 1909), the market is understood as an area with a fixed and central location, where farmers can sell their goods. This implies the presence of buyers and suppliers. For the purpose of this thesis, 'changing market conditions' refers to shifts in demand, supply or competition (Nelson & Winter 1982).

In contemporary economic geography, the role of demand and its impact on economic development and innovation has only recently resurfaced (Barnes 2008; Chaminade et al. 2020; Grabher et al. 2008; Hall 2012). It is argued here that both supply and demand factors in territories must be taken into consideration when analysing the innovative potential of regions. Furthermore, especially in evolutionary economic geography, the role of markets has been rather vaguely portrayed as an environment for the selection and retention of new technologies and innovations. From this perspective, markets act as 'a system of rewards and penalisations' (Dosi 1982) and shape the direction of technological development by serving as a 'natural market selection environment' for these technologies (Nelson & Winter 1982).

Markets are diverse. Within one country and industry, demand differs based on the products and solutions actors require (Brandt & Thun 2016; Ernst 2002; Gertler 2003). For instance, in East Asia, firms first established themselves as a competitive production base and, over time, engaged in the development of their own lead markets and R&D capabilities. In this regard, Ernst (2002) points to the upgrading of demand, referring to upgrading 'within a hierarchy of consumption, that proceeds from "necessities" to "conveniences", to "luxury goods"'. In his studies on Japanese machinery producers in Germany, Gertler (2003) alludes to the difference between high-end and low-end segments of demand within one country. Similarly, in the context of affordable innovation, Brandt and Thun (2016) propose the concept of 'quality ladders' to analyse how foreign MNCs and domestic firms compete. Discussing the notion of different market segments in the Chinese context, the authors distinguish among low-, medium- and high-end market segments on the quality ladder (Brandt & Thun 2016). The low-end market segments serve as incubators in which domestic firms in emerging economies can learn and upgrade capabilities, while until recently the premium segment was dominated by competitors from advanced economies. In the medium-end segment, local firms that have developed into 'national champions' meet international competition from MNCs. While these processes are highly industry specific,

domestic firms from emerging economies have increasingly upgraded their capabilities and targeted the higher-end segments in recent years (Brandt & Thun 2016). Thus, high domestic demand is proposed as a driving force for industrial upgrading and the economic development of countries and industries (Brandt & Thun 2010, 2016).

Neumann et al. (2020) analyse 237 cases of frugal innovation and find that market choice is a core determinant of the organisation of affordable innovation at the firm level. On the one hand, affordable innovations either target the low end of an existing market or create a new market. On the other hand, during the innovation process, the focus can either be on developing a suitable value chain configuration that lowers the cost of the product or on the solution that the product or service itself offers (i.e. the problem it solves). However, the literature tends to lump together innovation initiatives that differ in terms of how value chain activities are organised and the markets that are addressed (see Neumann et al. 2020; Winterhalter et al. 2017). Yet, the BOP and the mid-market are distinct market segments with different customer characteristics. Moreover, they are highly heterogeneous (Bergakker & Speetjens 2015; Singh 2005). In the mid-market, continuing urbanisation, rising disposable incomes, the absolute and relative increase in the working-age population, and the rise in women's labour participation have lifted incomes among the Asian middle class, thereby spurring consumption and economic development (Bergakker & Speetjens 2015; Brandi & Büge 2014; Kharas 2010, 2017; Singh 2005). In contrast, the BOP markets often remain rural and remote (Prahalad & Hart 1999; Prahalad & Hammond 2002). Hence, identifying the market segment and its characteristics is vital for analysing how conditions in the external environment influence firm-level innovation.

In response to the diversity in demand, MNCs develop different product lines tailored to specific market segments. Therefore, products are not homogenous, and firms compete by developing different product lines based on varying levels of performance, reliability, availability, ease of use, design and cost (Abernathy & Clark 1985). Firms gain a competitive advantage by positioning themselves relative to their competition in different geographical environments. Products and their characteristics influence firm-level processes. Moreover, depending on technological novelty and market novelty, different types of products rely on different types of innovation, which require different skills and organisational routines (Abernathy & Clark 1985; Hobday 1998; Storper 1997).

Storper (1997) proposes a distinction between standardised and specialised products for generic or distinct markets. Organisational theory differentiates between product and market novelty (Abernathy & Clark 1985; Ansoff 1965).

From a firm perspective, 'market novelty' refers to an existing or new segment of demand or geographical market, while 'technological novelty' refers to the extent to which an innovation rests on existing technologies available to the firm or requires an extensive amount of basic research for its development. According to Ansoff (1965), there are four options: a new product for a new market, a new product for an existing market, an existing product for a new market and an existing product for an existing market. The last option does not count as innovation but is described as a market-penetration strategy. In other words, when firms expand to new markets, they can do so by adapting an existing product, or by developing a novel product or solution. Hence, this thesis distinguishes between existing products and novel products, which allows for a discussion of the nature of innovation. Between these two points lies the firm-level innovation process. In essence, there is an existing value proposition that the MNC is using to target different markets at a given point in time (t0), while a new value proposition emerges as an outcome of the innovation process at a later point in time (t1).

This dissertation combines these ideas to argue that markets not only serve as passive selection environments but also actively shape the innovation process at the firm level. Hence, apart from technology and low-cost labour, more attention should be paid to the nature and diversity of demand and competition if we are to understand how the external environment in emerging economies influences innovation as well as the development of new routines and business models at the firm level. This entails notable opportunities to advance economic geography as a discipline.

2.2.4. Institutions

Apart from technologies and markets, the third element of the conceptualisation of changes in the external environment is institutions. While this thesis focuses on markets and innovation, a short discussion on institutions is necessary to provide an overall picture. A country's institutional environment shapes how firms do business. North defines institutions as the "rules of the game' or 'humanly devised constraints that shape human interaction" (1990, p. 3), and distinguishes between formal institutions (i.e. laws, government policies and regulations) and informal institutions (i.e. norms, values and habits). Informal institutions manifest through the establishment of cultural norms, routines and processes in a specific context (Gertler 2003, 2004). For instance, Gertler (2004) points to institutionalised work practices as a main factor shaping the adoption and diffusion of new processing technologies. Thus, institutions influence and constrain the behaviour of actors in a given territory, and affect how different locations around the globe respond to the pressures of globalisation (Storper 1997). To

capture the effects of both formal and informal institutions in the context of the innovation process at the firm level, recent contributions call for more 'context-sensitive' approaches (Meyer et al. 2020; Rosenbusch et al. 2019).

The relation between institutions and innovation has been at the core of the territorial innovation systems literature (Freeman 1995; Lundvall et al. 2002). In this regard, the focus lies on how the institutions of a specific territory influence the interactions and learning processes among actors (Asheim & Gertler 2005). The core argument is that geographical proximity facilitates the exchange of tacit, context-bound knowledge (Gertler 2003), which seems to favour of localisation of activities (Schmitz & Strambach 2009). The unit of analysis tends to be interactions among firms, universities and governments, which form the 'triple-helix' constellations inherent to any innovation system. While innovation systems can be narrowly defined by only focusing on science- and technology-based modes of innovation, since the early 2000s, scholars have increasingly focused on DUI-based modes of innovation in engineering and creative industries. Researchers argue that institutional proximity is important, especially in engineering-based industries that rely to a significant extent on tacit knowledge and experience gained in real-life contexts. Moreover, the links among official government institutions, universities and firms might be weak or non-existent in emerging economies, such that relations rely on informal institutions and networks to a larger extent (Khanna et al. 2005).

Institutions operate on different scales. They are generally analysed at the macro level, where a variety of indexes (e.g. the Global Innovation Index) are used to compare the quality of institutions among countries. This alludes to the inherent assumption in North (1990) that a specific set of institutions is necessary to limit the opportunistic behaviour of actors, meaning that there are differences in degrees between countries' institutions. The idea is that owing to differences in institutions, firms must develop new processes and routines that fit the local context. In contrast, from a more sociological perspective (Scott, 1997), institutional environments different in kind rather than in degree. This argument starts from a different angle and suggests that firms must adapt their behaviour to the institutional environment not because the environment is different but because the existing routines do not fit the new context. For further discussion of this issue, see the recent contribution by Kostova et al. (2020). For the purpose of simplicity and comparability, this thesis adopts North's (1991) definition, which distinguishes between formal and informal institutions.

Through their subsidiaries, MNCs are embedded in multiple institutional environments, while subsidiaries are dually embedded in the internal

environment of the MNC as well as the external environment of the host country (Meyer et al. 2011). Stensheim (2012) refers to the institutional framework as a heritage that 'gives each plant its own fingerprint'. Considering the behaviour of MNCs in relation to changes in institutions, markets and technologies helps to 'anchor the chain analysis in regional and national contexts' (Jurowetzki et al. 2018), and increases the focus on how firms' strategies are constrained or facilitated by institutional contexts and government policies. While formal institutions can change quickly as governments introduce new policies, rules and regulations, informal institutions are more persistent over time and are often deeply rooted in cultural norms of behaviour. Overall, territorial approaches to innovation and economic development typically treat institutions as stable, enduring contextual conditions, and often fail to account for heterogeneity across firms, as knowledge is assumed to be equally available among the firms in a certain location.

However, from an evolutionary perspective, this is problematic for several reasons. First, the effect of institutions varies greatly depending on firm-level characteristics and the industry under consideration (Boschma & Frenken 2018). While firms located in the same territory are constrained by the same institutional environment, resource endowments and cost-advantages, these context-specific drivers are not equally distributed among firms. In other words, not all knowledge resides in a region or country, and the development of a territory also depends on extra-territorial knowledge and global networks. Second, from an evolutionary perspective, institutions are not stable. Instead, they co-evolve with technology and markets (Nelson 1995). As was evident in the above discussion on technologies (see Dosi 1982; Nelson & Winter 1982), the government and institutions are core explanations of how change occurs. Third, firms do not respond to the same set of institutions in the same manner**.** The same market signals are perceived differently based on the extant knowledge base and the experiences of decision-makers at the firm level. In the end, an individual is making the decisions and taking actions, which are subject to different types of constraints. Hence, differences in the organisation of innovation at the firm level tend to be explained in terms of industry-specific differences rather than regional differences (Boschma & Frenken 2018). Therefore, some have argued that combining institutional approaches in economic geography offers a "promising synthesis" that can further advance evolutionary economic geography (Boschma & Frenken 2018).

2.3. Innovation within the MNC

2.3.1. Innovation as an interactive learning process

Learning and innovation are core concepts in evolutionary thinking. Innovation builds on Schumpeterian "new combinations" (Schumpeter 1934, pp. 65-66) of existing and new knowledge. This accentuates the idea that most innovation rests on a "recombination of conceptual and physical materials that were previously in existence" (Nelson & Winter 1982, p. 130). Hence, innovations in organisational routines largely rely on new Schumpeterian combinations of existing routines (Nelson & Winter 1982).

Traditional neoclassical theory conceptualises innovation as a linear process based on the invention of new technologies in official R&D laboratories, universities and governmental agencies (Schot & Steinmueller 2018). According to this view, innovation rarely goes beyond R&D. Traditional measures include patents, R&D spending and the number of R&D employees. This dominant view was criticised in the 1980s by evolutionary scholars like Nelson and Winter, Dosi, Kline and Rosenberg, and Lundvall, who argued that this conceptualisation of innovation only captured one side of the coin. Building on Schumpeter's (1934) idea that innovation goes beyond invention and entails the commercialisation of a newly developed product or service (Schumpeter 1934), a more interactionist view on innovation that aimed to transcend the dominant, rather 'narrow' and linear understanding of innovation emerged. At this stage, other factors, such as competition (Abernathy and Clark 1985), knowledge (Lundvall 1992; Nelson 1982), users (von Hippel 1994), routines (Nelson & Winter 1982) and absorptive capacity (Cohen & Levinthal 1990), entered the picture.

Three central arguments are inherent to the interactionist view on innovation: a) innovation involves not only R&D but also other internal and external actors along the value chain, b) innovation is not a linear process and c) innovation differs by industry. First, innovation goes beyond R&D. Notably, new knowledge is not necessarily generated solely by official R&D laboratories, universities or technical institutions. It might equally stem from interactions with, for instance, customers, and production and marketing personnel (Fagerberg et al. 2013; Freeman 1995; Lundvall 2005). Conceptualising innovation as an interactive process means that one has to go beyond R&D and consider the inputs of all functions along the value chain as well as those of external actors, such as suppliers and customers. As Lundvall and Johnson (1994) conclude, innovation 'must involve all layers of the firm'. The adoption of a broader conceptualisation of innovation as an interactive learning process is important, as studies measuring the changing geography of

innovation still tend to rely on patents and R&D spending, which are outputs of R&D (Malecki 2014; Reddy 2011) and, as such, offer little information on the organisation of innovation at the firm level. In an extensive body of literature on national (Freeman 1995; Lundvall 1992), regional (Asheim & Gertler 2005) and sectoral (Geels 2004) innovation systems, innovation is understood as an interactive learning process that involves various internal and external actors, including firms, customers, suppliers, universities and governments (Lundvall et al. 2002). Based on these arguments, 'innovation' is defined as an interactive learning process involving a variety of internal and external actors (multi-actor) from different geographical locations (multi-place) (Asheim & Gertler 2005).

Second, innovation is a non-linear process. As highlighted in Kline and Rosenberg's (1986) chain-linked model, feedback loops exist among the idea, conception, development and diffusion phases of the innovation process, as activities in the different phases are interdependent. For instance, the interdependencies between design and manufacturing are most apparent in engineering-based industries developing complex products and systems, as minimal changes in design can have major implications for manufacturing and vice versa. Along these lines, Hobday (1998) highlights products and their characteristics as a main factor that influences firm processes. The central argument is that the nature of the product measured in terms of complexity and costs shapes innovation processes, organisational forms at the firm level and industrial coordination at the sectoral level. Hobday (1998) compares highly complex products and systems with mass-market commodities, and shows how they differ in terms of how value is created, delivered and captured, as well as the structure of the network. He contends that 'major organisational differences' exist depending on the industry, the function and the system of interconnected actors creating the product (Hobday 1998). The more complex and costly a product is, the more information uncertainty is involved, making feedback loops among the different stages of the production process more important. Researchers have suggested that innovation in engineering-based industries is best conducted in close proximity to established manufacturing units. This is supported by, for instance, Pisano and Shih (2012), who highlight the link between R&D and manufacturing in building innovation-related capabilities. In an empirical study, Ivarsson and Alvstam (2017) demonstrate that Sweden's largest manufacturing MNCs co-locate manufacturing and R&D, and propose that the frequent interaction between these co-located functions is particularly relevant for competing with low-cost manufacturers in emerging economies in Asia. On this basis, we contend that feedback loops and cross-functional interdependencies are likely to influence the location of innovation.

Third, innovation differs by industry. In their seminal work on the 'learning economy', Lundvall and Johnson (1994) distinguish between two dominant modes of innovation: science, technology and innovation (STI), and DUI. The former refers to activities that aim to build knowledge through 'intentional learning', such as R&D, market research and personnel training. The latter occurs through the routine execution of an activity, such as established production, sales and marketing activities. Thus, the dominant mode of innovation in an industry affects the extent to which geographical proximity between internal functions matters and, thus, the firm's locational behaviour.

In sum, innovation involves different internal and external actors, and should be analysed by taking the entire value chain into account. Moreover, it is a non-linear process in which functional interdependencies matter, and the predominant learning mode differs based on the industry under consideration.

2.2.3. Value chain configuration

The value chain includes 'the full range of activities that firms and workers perform to bring a product from its conception to end use and beyond' (Fernandez-Stark & Gereffi 2011). 'Value chain configuration' refers to the spatial distribution and organisation of the firm's corporate value chain, which changes over time (Contractor et al. 2010; Hernández & Pedersen 2017) and is one of the most obvious examples of how firm behaviour manifests in space.

Notably, value chains can be analysed not only in terms of the distribution of value among actors but also in terms of activities. Porter (1985) moved from the analysis of industry-specific chains to the analysis of the corporate value chain, and focused on the individual activities that make up a firm's input-output structure. Porter's (1985) value chain identifies the central aspects of competitive advantage as well as activities that do not belong to the core and can be outsourced. Firms simultaneously disaggregate their value chains and select activities over which to maintain control, making it crucial to identify and internalise those activities that may offer a competitive advantage (Prahalad & Hamel 1990). From an activity-based perspective, R&D has traditionally been the least internationalised segment of the MNC value chain. Production, marketing and other functions have moved abroad faster (UNCTAD 2005). The dominant pattern until the early 2000s was that high-value-adding activities, such as R&D and marketing, tended to be located close to the MNC's headquarters in advanced economies, while low-value adding activities were performed in emerging economies, such as China, India, Brazil and Mexico (Mudambi 2008).

However, this pattern may no longer mirror the complexity of today's value chain configurations for two reasons. First, driven by advancements in ICT,

MNCs increasingly fine-slice individual value chain activities into smaller activity subsets, thereby deepening the international division of labour (Buckley & Ghauri 2004). The ability to disaggregate each function into separate tasks has stimulated the offshoring of finer slices of manufacturing activities to China, and created a wave of offshoring of service activities and business processes to India (e.g. call centres, medical analytical services) (Buckley & Ghauri 2004) This 'fine-slicing' tends to occur through the categorisation of activities into standardised, repetitive tasks and routines, and more complex, non-repetitive, knowledge-intensive tasks (Cano-Kollmann et al. 2016). These activity bundles may then be performed within the organisational boundaries of the MNC or externalised to a partner (Contractor et al. 2010; Kedia & Mukherjee 2009). Second, Western MNCs are increasingly locating high-value adding activities, like R&D, or slices thereof, in emerging economies (Kano et al. 2020; Zhao et al. 2021).

So far, the value chain literature has focused on industry-specific modes of governance that the lead firm uses to coordinate and control these increasingly complex networks. However, recent studies indicate that firms combine different modes of governance for different activities along the value chain. Recent contributions call for more studies concentrating on decision-making processes at the micro level (Kano 2018) and analyses of the entire value chains of individual firms (Baldwin 2006; Cortinovis et al. 2020; Hernández & Pedersen 2017) to move us closer to the aim of linking micro-level decisions to macro-level outcomes (Fuller & Phelps 2018; Kano et al. 2020; Lee & Gereffi 2021).

According to extant theory, outsourcing and offshoring have three main benefits (Dunning & Lundan 1993). First, they create efficiency and opportunities for cost reduction. Second, they offer opportunities to explore new knowledge by creating access to talent. Third, they offer an opportunity to exploit existing resources to enter new markets. Moreover, a reduction in the cost of coordination, an increased focus on core activities, and improved responsiveness due to more modular structures that increase flexibility and speed are viewed as three key advantages stemming from the disintegration of value chain activities (Kedia & Mukherjee 2009). Crescenzi et al. (2014) argue for a broader view that goes beyond the location-specific advantages traditionally used to explain MNCs' FDI decisions. More specifically, they suggest taking socio-economic factors into account when analysing the location of R&D.

This is supported by empirical evidence suggesting that demand-led factors play an important role in the evolution of subsidiaries towards more competence-creating mandates and increase headquarters' attention

(Haakonsson & Ujjual 2015). In another empirical study, Ivarsson and Alvstam (2017) emphasise the importance of demand-side factors as drivers of the organisation of affordable innovation within the MNC. In order to capture these complexities, previous studies have called for more research that analyses the location decision at the level of the individual value chain activity (Crescenzi et al. 2014; Hernández & Pedersen 2017; Rugman et al. 2011). "At the micro-level, we need to pay greater attention to individual behaviour and motivations, and ways in which these individual characteristics play out as MNEs expand their value chains across geographies and product markets" (Kano et al. 2020).

This is particularly important in the context of this thesis. According to this view, affordable innovation conducted in emerging economies represents a slice of R&D undertaken within the MNC's network. This serves as an example of how MNCs are reconfiguring the existing organisational and geographical dimensions of their corporate value chains in order to respond to changes in the local context, assuming that the MNCs analysed are already present in the focal country. Extant theories have been deemed insufficient for explaining firms' behaviour in foreign markets after market entry (Meyer et al. 2020). In fact, decisions concerning international market adaptations in changing host-country environments over time have recently moved to the top of the research agenda (Meyer et al. 2020; Surdu et al. 2021).

2.2.4. Innovation at the subsidiary level

The ways in which subsidiary roles change over time are discussed in the literature on subsidiary evolution. Ronstadt (1978) and Prahalad and Doz (1981) were among the first to acknowledge that subsidiary roles change over time through the accumulation of capabilities and resources. The subsidiary-evolution process is influenced by demands and mandates received from the headquarters, the local environment in which the subsidiary is embedded, and the subsidiary's own initiative. Different types of activities are located in different locations. Each subsidiary operates its own portfolio of value chain activities and, thus, has a different scope of responsibilities in terms of the products manufactured, the markets served and the technological knowledge accumulated (Birkinshaw & Hood 1998).

The old discussion on global efficiency and local responsiveness (Bartlett & Ghoshal 1989) of MNC strategies, to what extent is it needed to create a new offering that corresponds to the contextual market conditions of a specific market, and to what extent can a firm rely on existing resources and knowledge to expand to a new market. The types of innovation vary based on their locational needs. Kuemmerle (1997) proposes a distinction between

headquarters-augmenting and headquarters-exploiting R&D or innovation. Headquarters-augmenting R&D tends to be located in scientific hubs, close to universities or at the headquarters level, and its main role is to engage in the innovation of state-of-the-art technologies and, thereby, contribute new technological knowledge to the MNC. In contrast, headquarters-exploiting R&D units tend to be co-located with existing manufacturing plants near large target markets. Their mandate is to engage in the adaptation of existing products and contribute market knowledge rather than technological knowledge to the MNC. This distinction has also been adopted by (Cantwell & Mudambi 2005), who distinguish between competence-creating and competence-exploiting subsidiary roles.

Bartlett and Ghoshal (1989) differentiate among three types of innovation in which MNC subsidiaries engage based on the strategic importance of the (output) market as well as their capabilities and knowledge: a headquarters-augmenting role aimed at the creation of new technologies; a headquarters-exploiting role aimed at the adaptation of existing products to local market requirements; and the diffusion of innovations developed at the subsidiary level to the headquarters or to other subsidiaries with the aim of reversing the knowledge flow. Hence, the types of innovation in which subsidiaries engage seem to differ based on the institutional context in which they are embedded. A core underlying assumption is that MNCs leverage strategic assets from multiple locations to create global products (Kuemmerle 1997; von Zedtwitz & Gassmann 2002).

Hence, the traditional role of subsidiaries located in developing and emerging economies is to exploit products that have passed through their life-cycles in advanced economies (Vernon 1966). In these economies, these products are slightly adapted or modified to fit local market requirements. Alternatively, subsidiaries located in these economies have been tasked with handling slices of R&D activities to support R&D projects at the headquarters level (Bartlett & Ghoshal 1989; Kuemmerle 1997; Cantwell & Mudambi 2005). However, modern MNCs often adopt more sophisticated ways of managing the relationships between headquarters and subsidiaries, and go beyond the traditional top-down approach envisioned in classical life-cycle theory (McCann & Mudambi 2005). Subsidiaries of Western MNCs located in emerging economies in Asia are taking on more of a competence-creating role in the MNC's innovation network (Iguchi 2012; Jha et al. 2018; Ryan et al. 2020; Schweizer et al. 2020). In particular, they develop new products and solutions, often specifically for the local market. Yet, how subsidiary roles evolve over time has only been addressed in a few studies (Haakonsson et al. 2013; Jha et al. 2018; Ryan et al. 2020). Moreover, the underlying conditions

and drivers that lead to the establishment of an R&D unit often remain unexplored (Schweizer et al. 2020).

In an emerging-economy context, Jha (2018) identifies two trajectories for subsidiary development: arbitrage and adaptation. Both are driven by the availability of skilled labour at a low cost in emerging economies. The arbitrage trajectory starts with the offshoring of well-defined, standardised R&D tasks to support R&D at the headquarters level. Over time, the subsidiary engages in the development of a technology unit, gains mandates to develop new technologies and pursues end-to-end product development, mainly by connecting with local business partners, creating market understanding and engaging in the development of affordable innovations (Jha et al., 2018). This is followed by the innovation of global products for export markets. The adaptation trajectory represents the traditional move described in the extant literature (Cantwell & Mudambi 2005; Bartlett & Ghoshal 1989). It starts with the establishment of a headquarters-exploiting subsidiary engaging in the modification of existing products and technologies to fit local market requirements. This is followed by the establishment of a local product unit and, finally, a move towards a global product unit. Hence, the strategic importance of the local market is a main driver for developing into a global product unit that exports locally developed products to new global market segments (Jha et al. 2018). As such, advanced-economy MNCs have two main motivations to establish an R&D unit in emerging economies: a) to take advantage of low-cost human capital and b) to develop affordable innovations (Jha et al., 2015, 2018).

This highlights two notable facts. First, subsidiary roles in the MNC's innovation network evolve over time in connection with changes in the internal and external environment. However, they do so by following different trajectories depending on the motivation of the investment. This is in line with Haakonsson and Ujjual (2016), who argue that R&D activities do not always evolve along a sequentially ordered trajectory. These authors suggest that from an evolutionary perspective, there is no one path along which subsidiaries develop into more competence-creating roles – there are multiple trajectories. To understand these differences in organisational routines and structures, it is important to analyse the underlying conditions leading to these decisions over time. Second, subsidiaries in emerging economies tend to engage in affordable innovation. This new phenomenon seems to be driven by different factors than the traditional roles of slightly modifying existing solutions or conducting standardised sub-activities to support global innovation projects.

2.2.5. Affordable innovation

Recent studies suggest that subsidiaries of Western MNCS often engage in the development of affordable innovations for the large lower-income segments in emerging economies (Ernst et al. 2015; Jha et al. 2018; Zeschky et al. 2011). This stream of literature is characterised by several underlying assumptions. First, an important antecedent of the debate on affordable innovation is the literature on disruptive innovation. Based on the example of Honda challenging Harley Davidson in the US, Christensen (1997) argues that firms from developing and emerging economies are upgrading their capabilities and increasingly challenging the position of advanced-economy MNCs in the lower-income segments of their home markets (Christensen 1997). For instance, Chinese companies have gained the knowledge necessary to develop their own products for international markets (Williamson & Zeng 2004; Gadiesh et al. 2007). This is especially true in the relation to household appliances and telecommunications (Dowling et al. 2011). Thus, affordable innovations are typically viewed as a common practice among firms from emerging economies and have disruptive potential.

Second, Western MNCs are assumed to have a strong technological base but lack market knowledge, while emerging-market firms are believed to lack technological knowledge but have a better understanding of market needs (Corsi & Di Minin 2014). This suggests that domestic firms have an advantage over Western firms when engaging in affordable innovation (Winterhalter et al. 2017). Third, the difficulties Western MNCs face in developing attractive value propositions and adapting their organisational practices are generally attributed to the weak institutions or institutional voids found in emerging economies, such as weak IP protection or a lack of infrastructure or education (Khanna et al. 2005). MNCs' current strategies aiming at national responsiveness, global efficiency and worldwide learning are insufficient for explaining their behaviour in low-income markets (London & Hart 2004). In one of the first empirical case studies on the topic, London and Hart (2004) argue that in order to target the low-income segments in emerging economies, managers must rethink their business models, innovate solutions from the 'bottom up' by leveraging the strengths of the host country's institutional environment and include non-traditional partners.

The main argument is that to overcome the lack of market understanding and institutional distance and, in turn, compete with emerging-market firms, MNCs should conduct R&D locally, establish local organisational units and employ local personnel (Govindarajan & Ramamurti 2011; Immelt, Govindarajan & Trimble 2009; Winterhalter et al. 2017; Zeschky et al. 2011). For instance, Immelt et al. (2009) examine the case of GE Healthcare's

portable ultrasound devices. They argue that affordable innovations are facilitated by the establishment of an organisational unit that is independent from the headquarters to develop and commercialise these new types of products. Low-cost manufacturing, low-cost materials and design, a focus on basic functionalities, and a reduction in features are seen as the core capabilities firms need to successfully develop affordable products for and in emerging economies (Zeschky et al., 2011). It is argued that Western MNCs must give their R&D units in emerging economies the autonomy needed to engage in the development of new solutions from the bottom up instead of pursuing the traditional path of slightly adapting existing products to meet local market needs. Schweizer et al. (2021) contend that even though an expansion to the mid-market is seen as imperative, such subsidiary initiatives tend to meet resistance in the corporate system, which results in a lack of resources to engage in this type of market expansion.

This is problematic, as previous studies find that innovation in emerging economies largely rests on the recombination of technologies already held within the MNC (Jha et al. 2018; Pietrobelli & Rabellotti 2011). For instance, (Dowling et al. 2011) argue that affordable innovation often takes the form of high-tech, low-cost innovation and thus depends on the technological knowledge held at the headquarters level. Thereby, the authors contest the recurring argument for a separate organisational unit advanced in earlier works (e.g. Christensen 1997). They argue that such an approach may only be favourable in situations in which the affordable innovation does not rely on technologies that form the basis of the firm's competitive advantage, the subsidiary is experienced in new product development and the solution is specifically developed for that geographical market (Dowling et al. 2011). Hence, affordable innovation does not automatically mean lower quality and less technological sophistication. On the contrary, the high-quality, low-cost, thin-margins dilemma creates headaches for managers in developed countries (Dowling et al. 2011; Eriksson 2016; Lim et al. 2013; Thun 2018). Lim and Fujimoto (2019) call for a reconceptualisation of frugal innovation, as the association with simple, low-cost products does not allow for the possibility that affordable innovation may improve performance and create new technological knowledge.

Most studies neglect the fact that most affordable innovations (at least in Western MNCs) are complements rather than substitutes (Markides & Charitou 2004; Winterhalter et al. 2017). On the one hand, this means that affordable innovation is a relative concept. On the other hand, it induces multiplicity into the firm's supply chain. Thus, firms have to determine the extent to which the new 'low-cost' business model should be managerially integrated with or separated from the existing premium business model as well

as the extent to which the value chain configurations may overlap (Winterhalter et al., 2016). Wintherhalter et al. (2016) find that the 11 Western firms in their sample tended to build separate teams for R&D and sales. However, more studies are needed to analyse how MNCs manage this duality. "Handling both high-end innovation and frugal innovation in one company is a severely underexplored theme that requires in-depth empirical investigation" (Neumann et al., 2020).

Moreover, the contributions discussed thus far have mostly focused on the organisation of R&D and the internal headquarters-subsidiary relationship. While research shows that affordable innovation goes beyond R&D and involves the reconfiguration of existing business models at the level of the individual value chain activity (Johnson et al. 2008; Landau et al. 2016; Lim et al. 2013; Priem et al. 2018; Winterhalter et al. 2016, 2017), "studies on more sophisticated technical products that require a whole new value chain (incl. new product development) are almost absent" (Winterhalter 2017).

Winterhalter et al. (2017) use empirical evidence on five firms in the Indian medical-device industry to show how foreign and domestic firms organise their value chains to create an affordable value proposition. They find that affordable innovation requires the minimisation of costs throughout the value chain, including in R&D, supply, manufacturing and sales. They argue that the offshoring of R&D and manufacturing lowers costs and provides additional benefits due to lower transport costs. Furthermore, the outsourcing of sales and marketing to local partners saves costs when compared to building a new internal sales team for these new product lines. Nevertheless, the most potential for cost reduction lies within R&D, as most of the costs are built in during the design phase (Winterhalter et al. 2017). This also has implications for the location of R&D activities. In their empirical study, Ivarsson and Alvstam (2017) identify functional interdependencies between R&D and manufacturing as a driving force that, along with the traditionally analysed supply and demand factors, influences decisions on where to locate R&D. They suggest that the co-location of R&D and manufacturing may be particularly crucial in the context of developing novel, affordable innovations in emerging economies due to the focus on cost reduction (Ivarsson & Alvstam 2017).

In sum, these studies highlight that firms need to adapt all elements of their value chains or business models – not only the location of their R&D activities – to the idiosyncrasies of the local context. At the same time, there seems to be consensus that affordable innovation is in need of theoretical grounding and contextualisation.

2.3. A short summary

As this review shows, establishing a link between changes in the external environment and the organisation of innovation at the firm level is not an easy endeavour. To address this issue, the above section conceptualised changes in the economic landscape as the interplay among technologies (country, industry level), markets (demand, suppliers, competition) and institutions (formal and informal), in addition to resource endowments and costs at the country level. However, if we accept the idea that the changing geography of innovation is largely an outcome of MNCs' micro-level decisions, then we need to know more about how individual MNCs organise their value chains to innovate new products and solutions, and identify the main driving forces stemming from changes in technology, institutions and markets in countries and their respective industries. This is important for improving our understanding of how the economic development and industrialisation of emerging economies leads to the adaptation of organisational routines and produces changes in the geography of innovation within the MNC. In addition, by paying significant attention to the development of new routines at the micro level in response to changes in technologies, markets and institutions over time (Boschma & Frenken 2018; Boschma & Martin 2010), we can advance evolutionary economic geography. As such, more qualitative research is needed to explore these complexities, which are inherent in the social sciences (Boschma & Frenken 2011; Markusen 1999).

2.4. Conceptual framework

In order to understand the changing spatial distribution of innovation, this thesis builds on the idea that innovation is an interactive learning process involving multiple actors residing in different geographical locations (Asheim & Gertler 2005). This process is subject to complex functional interdependencies involving all layers of the firm. Furthermore, this thesis acknowledges that innovation differs among products (Hobday, 1998) and industries (Asheim & Gertler 2005). Different modes of innovation require more or less interaction among different actors along the value chain (internally and externally). Therefore, different modes of innovation are subject to the contextual conditions (cultural, institutional, economic, infrastructural and relational) found in different countries or regions, which affect the organisation of innovation at the firm level. In other words, products are differentiated based on the technologies used and the markets they address (Storper 1997). Therefore, firms must develop machinery that is particularly suited to the contextual conditions found in the respective geographical space, while protecting their proprietary knowledge and capabilities.

This literature review has identified three main 'grey' areas in the literature on affordable innovation. First, more studies focusing on the entire value chain configuration (rather than solely focused on the organisation's R&D) are needed to develop an understanding of how each value chain activity is adapted relative to the existing value chain configuration. In this regard, it is important to note that affordable innovation is conceptualised as a relative concept, such that its affordability or cost can only be determined by comparing it to an existing product or solution. Thus far, little has been said about how MNCs manage multiple business models to simultaneously target different market segments. Second, to advance the literature, we must focus on the broader contextual conditions, such as technology, markets and institutions, at the macro and industry levels in order to improve our understanding of the forces that determine firms' decisions regarding the adaptation of the organisation and the location of their value chains. Third, the importance of time has thus far been a rather neglected aspect in the literature on affordable innovation.

Thus, to understand affordable innovation by Western MNCs in emerging economies, this thesis adopts an evolutionary perspective on firms and their responses to changes in the technological, institutional or market conditions of a specific country or region. To do so, the external focus of the economic geography literature on territories and regional development must be complemented with insights from the international business literature in order to build a bridge between firm behaviour at the micro level, meso-level structures and macro-level conditions. Figure 1 presents the overall conceptual framework developed from this literature review.

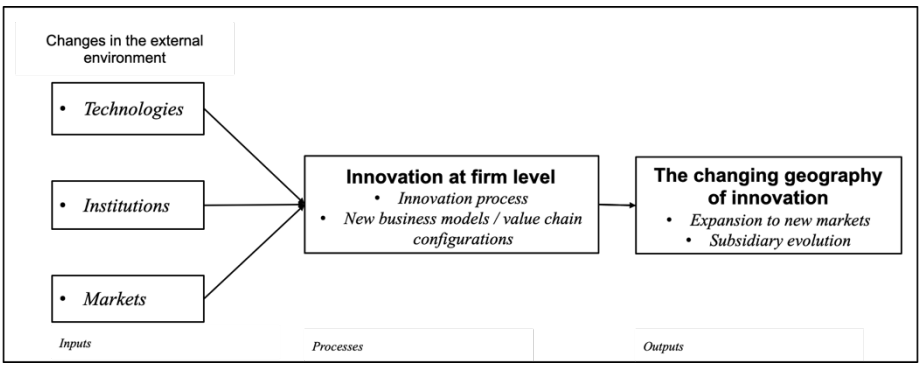

Figure 1. Conceptual framework. *Source: Author's visualisation*

CHAPTER 3: Research design

This chapter starts with a discussion of my ontological and epistemological assumptions as well as the methodologies used. It then proceeds with an outline of the concrete methods applied for data collection, including qualitative interviews, site visits, desk research and the construction of innovation biographies, as well as the tools used for data analysis.

3.1. Ontological and epistemological underpinnings

It is important to reflect on an author's ontological and epistemological assumptions, as they influence how the study is carried out and the conclusions drawn (Pratt 1995). From a philosophical standpoint, ontology asks 'What is reality?', while epistemology is concerned with how we can gain knowledge about that reality. Methodology, in turn, specifies the methods we use to do so.

There are two opposing ontological positions: positivism and social constructivism. Positivism, which is rooted in the natural sciences, argues that reality is observable, measurable and generalisable. Logical positivism, as described by the Vienna circle[1] in the 1920s, argues that scientific knowledge can only be obtained through observation. Essentially, the aim is to create numerous experiences that confirm the same phenomenon through replication. This means that whatever we, as individuals, see and perceive is real until falsified. In contrast, social constructivism proposes that reality is always conditioned by its context and that, therefore, there is no single reality but a multitude of realities that always depend on the individual's interpretation of the experience. This idea of reality based on subjective meaning is more dominant in the social sciences.

Critical realism leverages aspects of both traditional paradigms. It emerged out of a critique of the positivist or empiricist tradition of science prevalent at the beginning of the twentieth century. From an ontological standpoint, critical realists agree with the positivist strand in the sense that they believe an at least partly observable reality exists. However, they also acknowledge the existence of a reality that is independent of our knowledge thereof. From an epistemological standpoint, critical realism sympathises with the interpretivist paradigm in the sense that knowledge is viewed as socially produced and, thus,

[1] In the 1920s, the Vienna circle brought together scholars from different disciplines, who developed the idea of logical positivism based on past experiences and inductive reasoning. Their aim was to move away from the discussion of metaphysics and religion of philosophy, which was mainly based on grand, abstract ideas prevalent at the time, and to develop a philosophy based on human experiences and interactions with the physical world (Sousa 2010).

context dependent and fallible. Along these lines, Haraway (1988, p. 581) argues for "situated knowledge", which means that all knowledge is conditioned by the context of the place in which it is produced and the social identity of the individual.

The different forms of critical realism are not entirely consistent with each other (Yeung 1997). One of the first key figures to adopt this form of post-positivism was Karl Popper (1902-1994). Opposing the ideas of logical positivism put forth by the Vienna Circle, Popper (1934) argued that even if a principle has been tested and verified multiple times, it is not necessarily true. For Popper (1934), science and reality are not static but are instead subject to a process of alteration in which new theories are developed, corroborated and eventually falsified as other theories emerge. This resembles Kuhn's (1962) view on scientific progress, which suggests that science progresses over time through shifts from one paradigm to another. A second important figure in critical realism is Roy Bhaskar, who published his first book, *A Realist Theory of Science*, in 1975. The book presented a critique of the positivist tradition and proposed what Bhaskar (1975) called 'transcendental realism' in the sphere of the natural sciences. His second book, *The Possibility of Naturalism* (1979), transferred his arguments to the social sciences (Castañeda 2010). It argued that there is intentional causality, as individuals make their own choices, which implies agency – a core pillar of social sciences (Bhaskar 1979). From these two seminal writings, the term 'critical realism' was coined.

The point of departure is the argument that positivism has a 'flat ontology', which means that positivists believe in the ability to directly see the world as it is (Bhaskar 1975). However, as highlighted by Van Maanen (1979), we tend to theorise in advance of the facts, such that our assumptions about the world are 'theory laden' (Bhaskar 1979). In other words, we never approach the world with a 'clean slate' – the assumptions we make orient our thinking and predispose us toward certain findings. From this perspective, what is real can never be directly observed. To address this dilemma, Bhaskar (1979) proposes a stratified ontology that distinguishes among the real, the actual and the empirical, although only the latter can be directly observed. The 'real' describes everything that exists in the world, regardless of whether we are aware of it. This domain includes structural entities and underlying mechanisms that are always there but, under certain conditions, might be activated to produce a time-space-specific outcome. In the context of this thesis, a mechanism is understood as a causal power or tendency that activates the MNC's innovation network, and causes interactions among the subsidiary, its customers, suppliers, the headquarters or peer subsidiaries (Morais 2011). The 'actual' describes the sum of all empirical events that can be observed when casual powers have activated the structures and mechanisms necessary

for them to occur. However, the event depends not only on the activation or combination of causal powers of a social structure but also on the contextual conditions, which are in constant flux. The third dimension, the 'empirical', describes the parts of reality that are observable – our knowledge of something generated through experiences (i.e. individual perceptions and experiences). In sum, critical realists argue that individuals are unable to grasp the full picture of what is real, as there are parts of reality that are beyond our perceptive abilities.

In practice, this is operationalised as follows. First, in order to create awareness of the theory-laden assumptions that are inherent to every research field, I traced the antecedents of the concept of affordable innovation and the theoretical perspectives used. Thereafter, I identified several related research streams, such as research on subsidiary evolution, R&D internationalisation, the institutional environment, business models, economic development and upgrading.

Second, the purpose of this thesis is to generate potential competing explanations for the focal phenomenon. Thus, in contrast to positivism, which seeks to produce generalisable results, critical realism focuses on the causal explanations of a social phenomenon by asking what interactions must occur between structured entities and contextual conditions to produce a sequence of events (Wynn & Williams, 2012). Bhaskar (1979) proposes a different view on causality. More specifically, he uses the term 'intentional causality' (Castañeda 2010) to differentiate his approach from the traditional view on causality proposed by David Hume, which argues that if A is present, then B will succeed. Thus, according to the empiricist view, causality can only be inferred and can never be observed. In contrast, realists propose the notion of 'generative causality', which focuses on the contextual conditions under which A leads to B (Pratt 2009). From a Bhaskarian critical realist perspective, *objects (i.e. market actors, such as firms, suppliers, competitors, demand and governments)* interact under certain environmental *conditions (i.e. space and time)* and generate an *effect (e.g. a change in the geography of innovation and expansion to new market segments)*. According to this view, we can only approximate the cause of an event by distinguishing the situational conditions. However, we cannot predict that if these conditions are present, then the same results will occur. Hence, critical realist models do not aim at prediction but instead attempt to provide information on how reality is (Pratt 2009). Therefore, this thesis pays significant attention to the contextual conditions found in the external environment (= C) that facilitate or constrain the organisational projects undertaken at the firm level (= OP) and produce an effect (= E). Thereby, this thesis aims to produce multiple possible explanations for the occurrence of a phenomenon (i.e. affordable innovation).

Third, this thesis conceptualises space as relational and multidimensional. In his well-known book, *The Production of Space*, Lefebvre (1974, p. 29) introduces three main dimensions of space: the physical (perceived), the mental (conceived) and the social (lived). According to this view, space is not an empty container but is actively produced by society (Lefebvre 1974). Thus, it goes beyond the simple notion of location, and includes relative and relational aspects between actors in the analysis. In this thesis, spatial contextual *conditions* are referred to as the external environment or context, which would correspond to the dimension of the real from a critical realist perspective.

If we accept the idea that environmental conditions produce changes in the behaviour of individuals, and alter the structures and dynamics among market actors, we must also reflect upon how this happens over time. Time and space are interrelated (Hägerstrand 1970; Massey 2005) and produced simultaneously (Hägerstrand 1970). This means that space is open and dynamic (Massey 2005), and allows for the "coexistence of a multiplicity of trajectories" (Massey 2005, p. 63) and, thus, heterogeneity among actors.

Time-geography is a way of thinking rather than a theory by itself (Hägerstrand 1985; Ellgård 2019). One of the main underlying assumptions is that human activity is constrained by time and space (Pred 1977). Organisational projects comprise a set of activities that must be performed to realise these projects. Each of these activities can be sliced into smaller subsequent tasks. In the context of this thesis, an organisational project is an endeavour to innovate, produce and commercialise a new product or solution that specifically targets the lower-income segments in Asian markets like China and India. The individual articles presented in this thesis explore different aspects of innovation projects (i.e. organisational projects), and analyse where, by whom, how and when these projects are conducted. Specific attention is devoted to identifying drivers at the country and industry levels that shape these organisational projects. Ordering the activities comprising a project into a time-geographical sequence allows for the development of visual representations of the time-space path of an organisational project, and allows for the identification of possible drivers and contextual conditions.

A core element in time-geographic analysis is the concept of constraints (Hägerstrand 1970). The path of an organisational project is constrained by the capabilities of the individual or firm, authority structures that shape or limit the behaviour of the individual, and 'coupling constraints' – factors that impede meetings or information exchange with other individuals. Coupling constraints are understood as dependencies between people to be at the same place to fulfil a certain task (Hägerstrand 1970). According to Hägerstrand (1970), coupling

constraints "define where, when, and for how long, the individual has to join other individuals, tools, and materials in order to produce, consume, and transact".

Capacity constraints are typically associated with the knowledge and resources individual needs to undertake a certain task. In the context of this thesis, they take the form of the skills of the workforce internal to the firm as well as the knowledge and skills available in a given location or territory. Another set of constraints arises from the focal research topic. The type of affordable innovation under scrutiny is usually discussed in relation to the 'resource constraints' experienced by customers in emerging economies. These include access to capital, materials, and infrastructural services, such as energy, transportation, banking, mobile networks and education. One could argue that these types of constraints are, to some extent, included in the capability constraints discussed by Hägerstrand (1970), as he defines them as factors that 'limit the activities of the individual because of this biological construction and/or the tools he can command'.

Authority constraints, which operate on a social level rather than on the individual level, determine the boundaries and limitations of certain actions (Ellegård & Svedin 2012). For the purpose of this thesis, internal authority constraints concern the headquarters-subsidiary relationship and its power dynamics. This includes the organisational mode, such as a wholly owned subsidiary, relational modes of governance or arm's-lengths relationships. Authority constraints external to the firm are determined by the regulatory environment, including laws, trade agreements and FDI policies.

Coupling constraints are understood as dependencies between people to be at the same place to fulfil a certain task. According to Hägerstrand (1970), coupling constraints 'define where, when, and for how long, the individual has to join other individuals, tools, and materials to produce, consume, and transact'. Hence, they exist not only between people but also between people and material things. When couplings exist, a time-geographic bundle is formed. Last but not least, it is important to note that all of these constraints can also be experienced as opportunities. An overview of the different types of spatio-temporal constraints and opportunities is presented in Table 2.

Overall, authority, capacity and coupling constraints facilitate or impede the formation of bundles between people and/or between people and material things. They thereby influence the time-space path of the organisational project. Thus, for the purpose of this thesis, time-geographic thinking is applied to help analyse the data and develop visual representations of organisational projects.

Table 2. Types of environmental constraints and opportunities

Constraints/ Opportunities	Internal to the firm	External to the firm
Capability	Lack of local market understanding Limited low-cost engineering skills Mindset	Lack of technological knowledge Cheap labour Different price-quality ratio
Resource	Capital, Material resources, access to infrastructural services (transport, education, banking), Technology	Capital, Material resources, access to infrastructural services (transport, education, banking), Technology
Authority	HQ- Subsidiary relationship (autonomy, control)	Regulatory environment, FDI policy, trade agreements, Special economic zones,
Coupling	Social and institutional distance, language barriers, limited previous relationships, limited experience	Social and institutional distance, language barriers, limited previous relationships, limited experience, differences in consumption culture/nature of demand

Source: Author's interpretation of time-geographic constraints and opportunities

3.2. Methodological perspective

'Methodology' refers to the processes and procedures of creating knowledge, and include different tools for data retrieval and analysis. As Pratt (2009) states, Bhaskar's (1979) critical realism is 'ontologically bold and epistemologically timid', meaning that most of Bhaskar's writings ponder the higher questions of what reality is. Notably, ways of transferring these thoughts into empirical research have been neglected. Notably, Sayer (1992) made the often-abstract writings of Bhaskar accessible for many geographers and provided a more practical account of how these ontological beliefs could be translated into concrete methods.

Building on the idea of a stratified ontology and the relative nature of human perception, the processes and procedures must be able to connect the three layers of reality from a methodological perspective (Bhaskar 1975, 1979). The aim is to produce a causal explanation for the focal phenomenon by identifying how contextual conditions and structures interact to produce a certain event (Sayer 1992). To provide answers as to why and how something happened, one must first collect information on what we can directly observe (i.e. the experiences of individuals) (Mintzberg 1979 in Langley 1999).

Evolutionary economic geography remains open to a variety of methodological approaches, while case studies are particularly useful for investigating the actions and motivations of individuals and firms operating in a specific geographical context (Essletzbichler 2009). A qualitative in-depth case study is particularly relevant for exploring a contemporary phenomenon, like affordable innovation, in a real-life contexts where the boundaries between the phenomenon and the context are unclear, and multiple sources of evidence are used (Yin 2003). Variable-oriented approaches, such as patent analysis, only capture one part of the phenomenon, while the case-oriented approach allows for the production of a more complete picture and offers an opportunity to extract causal explanations for the outcomes of each case under investigation (Ragin 2009; Ragin & Becker 1992). Thus, the case study has been suggested as one of the best approaches to unravelling how structures, events and contextual conditions interact in order to generate explanations about causal mechanisms (Piekkari & Welch 2018; Wynn & Williams 2012). It allows us to produce more contextualised explanations about a phenomenon (Welch et al 2011), such that more focus is attributed to the conditions that are present when certain events occur. Open or semi-structured interviews are proposed as relevant for generating multiple explanations for an event, as they allow for differences to be taken into account and they lay out contrasting views rather than providing generalisations (Pratt 1995). Thus, compared to quantitative approaches, a qualitative investigation allows us to unravel causal mechanisms and structures that would otherwise remain hidden.

Furthermore, a qualitative case study is particularly useful for deepening our understanding of processes and practices over time (Langley 1999; Van de Ven & Huber 1990). Qualitative interviews provide an opportunity to collect real-time data and retrospective data on an event. In this context, it is important to note that evoking memories about a particular event in the past always bears the risk of 'post rationalization in retrospective sensemaking' (Schultz & Hernes 2013). In other words, the past is not stable – it is subject to alterations depending on the individual's perception of the event and the situational context in which it is evoked (Levitt & March 1988 in Schultz & Hernes 2013). We all suffer from *Vergangenheitsoptimismus* – the human brain's self-protective mechanism of remembering the good and forgetting the bad. This is taken into account by including a variety of perspectives from different hierarchical levels and all key functions (i.e. manufacturing, R&D, sales, service, human resources) in order to triangulate statements. For this thesis, the majority of interviews were conducted at the subsidiary level. In addition, I undertook interviews with customers as well as personnel at the headquarters level. The interviews were complemented by secondary data in form of annual reports, press releases, industry reports and country level data. The use of

multiple data sources allows for the triangulation among different perspectives, and increases the study's validity and reliability.

The thesis is designed as a compilation of four articles presenting three empirical studies and one systematic literature review. The papers explore the underlying structures and causal mechanisms that produce the overall phenomenon introduced in the introductory chapter – that is, how advanced-economy MNCs develop affordable innovations for mid-market segments in emerging economies and how the external environment shapes this process.

The first two articles build on data retrieved from the Indian and Vietnamese subsidiaries of Bühler, a Swiss manufacturer of food-processing technology. The third article is based on data gathered from the Chinese subsidiaries of VCE and Epiroc. These three firms were selected as the empirical objects of study because they share three characteristics. First, in recent years, Bühler, VCE and Epiroc have started developing products and solutions for the mid-market in Asian emerging markets. All of them have established local R&D teams in strategic core markets, such as China and India, and their share of sales stemming from emerging economies in Asia has risen substantially. Second, Bühler, VCE and Epiroc are active in engineering-based industries that produce complex products and systems (CoPs) (Hobday 1998) in which manufacturing plays a key role in product development and innovation (Pisano 1996; Pisano & Shi 2012). This was a conscious decision, as there has been some a debate over the extent to which R&D will follow the path of offshoring towards Asia seen in manufacturing in the 1990s (Pisano & Shih 2012; Schmitz & Strambach 2009).

Third, Sweden and Switzerland are small home markets with limited domestic demand, and both countries are continually ranked among the top innovators in the Global Innovation Index. Thus, they serve as examples of MNCs from advanced, 'knowledge-based' economies focused on global markets that have offshored significant parts of their manufacturing activities to Asia. Moreover, they only conduct high-value adding, knowledge-intensive activities in their home countries.

3.2.1 Methods of data collection

This thesis builds on extensive, in-depth interviews I conducted in five countries over the course of the last four years. A list of interviews included in the appendix provides a summary of all research visits and number of interviews conducted at each firm.

One of the main challenges of conducting this type of qualitative research in different contexts is gaining access to the firms, and convincing board members and managers of the project's relevance. In the case of Bühler, a

statement on the company's website talking about affordable innovations in emerging economies triggered my interest. Building on that information, I used an existing contact in the sourcing department at the headquarters level to establish contact with the head of one of Bühler's innovation satellites. Over the course of my research, this individual facilitated contacts with members of the board as well as managers of Bühler's Asian subsidiaries. Similarly, to gain access to VCE and Epiroc, I relied on the network of my supervisor, Inge Ivarsson. In all three cases, the extensive interviews would not have been possible without these important gatekeepers who supported the project, helped ensure the support of other managers and a generous grant from Swedish Society for Anthropology and Geography (SSAG), as well as Adlerbertska Scholarship Foundation, which helped to finance my research-related travels.

Most of the interviews were carried out at four points in time. To undertake the interviews and study the conditions in the various Asian countries, I travelled to India, China, Vietnam for research visits over the course of my PhD programme. During these visits, I carried out a total of 56 interviews. Starting with the first round of data collection at Bühler's Indian subsidiary in April 2016, my strategy was to conduct interviews with members of top, middle and lower management active in R&D and other functions, such as manufacturing, HR, sales and services. This approach supported my aim of developing an understating of innovation beyond the traditionally analysed role of the R&D function. Moreover, it allowed me to triangulate the individuals' statements and, thereby, alleviate a potentially biased view. The large quantity of qualitative interviews conducted at each MNC (45 at Bühler AG; 8 at Epiroc; 9 at VCE) allowed for a detailed understanding of the innovations carried out at the subsidiary level. In the case of Bühler, this information was complemented with customer visits in Vietnam. Furthermore, the data collected during my site visits was complemented with data from four additional interviews undertaken by Claes Alvstam, Axele Giroud and Inge Ivarsson at VCE and Epiroc in China in the spring of 2017. Additional data retrieval and personal visits planned for China and Vietnam were cancelled due to the pandemic-related travel restrictions introduced in March 2020.

The interviews covered the organisation and location of the Asian parts of the MNCs' innovation network over the preceding 15 to 20 years. On average, the interviews lasted between 30 minutes and 3 hours. They were recorded and complemented by written notes taken by the respective researchers as well as photos of illustrations and graphs drawn by the interviewees. All interviews were transcribed verbatim. My five years of experience as a consultant in the IT industry helped me understand internal processes and formulate questions based on the answers given by the interviewees. Thus, while the interview

guide served as a 'red thread', the interviews were conducted in an open manner, allowing enough room for the respondents' thoughts and emerging themes. As discussed previously, this approach ensured that I did not put too much emphasis on concepts and theoretical constructs derived from academic discourse, and allowed for interplay between case data and theory in a dynamic, iterative manner (Dubois & Gadde 2014). Hence, rather than starting with a review of the extant literature in which I searched for gaps and research questions in order to develop a potential theoretical contribution before commencing my fieldwork, I adopted a mixed approach. Although I skimmed previous work related to the focal phenomenon to derive an initial impression of what was already known, the final research question and theoretical unit emerged during the fieldwork alongside the findings. Thus, an emergent logic was inherent to this thesis (Ragin & Becker 1992), which allowed for redirections and the use of different theoretical lenses depending on the findings. Cases are not always evident from the start – they evolve throughout the study through a dynamic process based on the interplay between data and theory (Dubois & Gadde 2014; Ragin 2009).

The data obtain from the interviews in China, India and Vietnam was complemented with extensive desk research, which involved examination of annual reports, press releases, industry magazines and company presentations. The aim in this regard was to allow for triangulation (Yeung 1997). Furthermore, Paper II draws on the innovation biography method (Butzin & Widmaier 2012) to analyse the time-geographic path of the individual innovation project from a proximity perspective. Paper IV relies on the systematic literature review method (Briner & Denyer 2012; Rousseau et al. 2008) and uses VOSViewer (van Eck & Waltman 2010) to visualise different streams of literature within the field of affordable, frugal, reverse innovation, and to trace their antecedents and connections. This data-reduction technique helped in the navigation of the semantic jungle of concepts associated with the phenomenon of affordable innovation in emerging economies.

3.2.2. Methods of data analysis

I used several data-analysis techniques. I transcribed and coded all interviews according to statements alluding to the key concepts I identified during the literature review. For every event identified in the first two steps of analysis, I asked the following questions: How did it occur? Who was involved? Why did it happen? In seeking explanations to these questions, I read each of the interview transcripts and extracted relevant first-order statements (Van Maanen 1979). I then re-organised these statements into second-order concepts based on terms used to explain the facts voiced by the empirical enquiry (ibid.).

When I found multiple explanations for an event, I noted all variations given by the informants.

The visualisations developed for the individual articles over time were increasingly inspired by Hägerstrand's (1970) time-geographic thinking. A time-geographic approach fits well with this study's aim of deriving potential explanations for a contemporary phenomenon, as it allows for the sequential ordering of different empirical events over time and space. In this regard, the innovation process would be conceptualised as the individual organisational project that is constrained or facilitated by various events. While time-geographic thinking has typically been applied in human geography to outline individual paths, some previous applications of time-geography to organisational projects do exist, which served as a source of inspiration. To a large extent pioneered by Kajsa Ellgård's studies of Volvo's production plant in Uddevalla in the 1980s (Ellgård 2019; Westermark & Jansund 2019), the use of time-geographic thinking in the context of organisations has the potential to improve our understanding of how time and space influence firm behaviour. Moreover, in this thesis, I adopted the strategy of 'progression' to establish a link between the micro and macro levels (Kouamé & Langley 2018). This strategy is particularly relevant when analysing a temporal sequence of events. The focus lies on analysing 'sequential relations' between the micro and the macro levels over time.

CHAPTER 4: Discussion of findings

To guide the reader, Table 3 offers an overview of the research questions posed in the different papers as well as the main findings and the key takeaways of each article. In the following, I discuss each of these in relation to the two research questions posed in Chapter 1.

The findings of one paper often served as inspiration for the next paper. In short, Paper I presents an example of how a subsidiary of a Western MNCs located in India evolved to take on more competence-creating roles over a period of 20 years. The study identifies socio-technical changes, high domestic demand and competition in the Indian context as strong drivers of the subsidiary's evolution. Specifically, the study argues that manufacturing-related engineering capabilities gained through experience are vital for developing affordable innovations in emerging economies.

Based on the finding that functional interdependencies matter for affordable innovation, and the argument that Western MNCs must conduct R&D locally in order to lower costs and develop a market understanding, Paper II delves examines how different types of proximity among actors matter during the affordable-innovation process. By presenting the time-space trajectories of two individual innovation projects, the study shows that the different natures of demand and competition trigger affordable innovation at the firm level. The study contends that several types of proximity matter for affordable innovation: geographical proximity to the market in form of a local R&D unit; proximity among manufacturing, R&D and sales units; proximity to customers; and some degree of organisational proximity to the headquarters in order to gain legitimacy, access to technological knowledge and goal alignment.

Paper III departs from the observation that affordable innovation leads to the operation of two business models that target different customer segments in one market. As such, it sets out to explore the extent to which individual value chain activities are shared between the existing and new (affordable) product lines. The study identifies a large domestic market, a more conducive policy environment and changes in the competitive landscape as the main drivers of affordable innovation, and argues that Western MNCs not only have to localise the entire value chain but, in some cases, also separate certain activities from the existing operations. In this regard, the study highlights the functional disaggregation of a firm's value chain by product lines as an important tool for managing exploration and exploitation in one organisation.

Table 3. Overview of papers

No.	Research question(s)	Research design	Theory	Problem	Main findings
Paper I	*How do internal and external linkages and cross-functional interaction affect the evolution of innovative activity at an Asian emerging-market subsidiary of a Western MNC?*	Qualitative case study Context: India	Subsidiary evolution; Geographical proximity	Unexplored role of manufacturing and sales units in adopting a more competence-creating role in the MNCs innovation network	a) Highlights the role of manufacturing- and sales-related low-cost innovation capabilities in the context of affordable innovation b) Finds that the importance of internal linkages to headquarters and external linkages to local market actors varies based on the technology and the type of innovation. DUI mode of innovation external linkages prevails in terms of increasing speed and lowering costs. In the STI mode of innovation, linkages to the headquarters become more important. c) Shows that affordable 'value-based' innovation goes beyond R&D and relies on a recombination of knowledge of various functions along the value chain. This knowledge has been built over time (experience). d) Identifies socio-technical changes, high domestic demand and competition in the Indian context as strong drivers of subsidiary evolution
Paper II	*What role does proximity between actors play in the context of affordable innovation by Western MNCs in emerging economies?*	Qualitative case study; Innovation biography Context: India and Vietnam	Proximity framework; Innovation as an interactive process	Extant research argues that geographical proximity to the market is important in the case of affordable innovation to reduce costs and create market understanding, yet an understanding of other forms of proximity that drive the localisation of innovation is lacking	a) Changes in the external environment trigger the need to adapt existing organisational routines and structures. These include: cost-pressures stemming from the market, emerging segments of demand and increasing competition at the industry level due to the technological upgrading of the industry b) Affordable innovation is used as a strategy to move from global to local competition, and is linked to technological upgrading of local firms c) Localisation of R&D and a focus on low costs is not enough. Innovation biographies reveal that the organisation of affordable innovation differs from R&D at the headquarters level, and points to the proximity between functions, proximity to demand and some degree of organisational proximity to the headquarters as important spatial factors influencing the location of affordable innovation.

No.	Research question(s)	Research design	Theory	Problem	Main findings
Paper III	*How do Western MNCs functionally disaggregate their individual value-chain to compete across market segments in China? What shapes the functional separation or integration of value-chain activities?*	Qualitative case study Context: China	Value-chain disaggregation; Global value chains; Operational modes	MNC operate multiple product lines and business models simultaneously in China, but we need a clearer understanding of the extent to which individual value-chain activities are shared between the existing and new product lines	a) Shows that MNCs simultaneously operate multiple value-chain configurations in order to target different market segments and highlights the role of functional disaggregation b) Suggests that functional disaggregation represents a combination of governance modes at the same point in the value chain. It also increases subsidiary scope, creates additional learning opportunities for local firms, and leads to improved competitiveness, flexibility, speed and lower costs. c) Beyond well-established factors, such as costs and supplier capabilities, identifies important environmental conditions in the Chinese context: large domestic market with variations in demand, a more conducive policy environment and changes in the competitive landscape d) Finds that not every mid-market warrants a new value chain or product line, the size of the market and timing are important, and the mid-market is a global market. Also shows that this is a strategic question for Western MNCs
Paper IV	*What are the positive and negative effects of frugal innovation, and for whom? How can frugal innovation be reconceptualised to incorporate the bright and the dark side of frugal innovation?*	Systematic literature review using VosViewer	Innovation studies; Innovation as an interactive process	Links among innovation, growth and economic development are questioned in the debate on the dark sides of innovation; Need to know more about the negative consequences of affordable innovation	a) Argues that there is a 'double bias' in the literature on frugal innovation: sustainable and poverty-alleviating by default, combined with the previously identified positive bias identified in innovation studies b) Contends that negative and positive effects depend on whom is asked. Frugal innovation is a relative concept and a matter of perspective c) Proposes conceptualising frugal innovation as an outcome of a process in a system. Need for a more contextualised analysis that views frugal innovation in relation to socio-economic and technological change. Identifies Vernon's life-cycle theory and disruptive innovation as important roots in this field

Source: Author's visualisation

Given the observation that affordable and frugal forms of innovation are often assumed to have positive effects on poverty alleviation and economic development, Paper IV offers a systematic literature review that identifies the antecedents of these assumptions and assess the extent to which negative effects are considered. The study contends that there is a double bias in the literature and identifies the need for more contextualised analyses that examine frugal innovation in relation to socio-economic and technological change.

4.1. Dynamic environments driving affordable innovation

The following discussion aims to answer the first research question: *Why, when and how do changes in the external environment influence the development of affordable innovation by Western MNCs in emerging economies?*

By conceptualising changes in the environment as the interplay among markets, technologies and institutions (Esseltzbichler 2009; Lee & Malerba 2017; Nelson 1995; Storper 1997), which are in constant flux (Massey 2005), this thesis identifies technological upgrading resulting in changes in the competitive landscape as well as high and diverse demand as the main external drivers of MNCs' engagement in affordable innovation. Overall, this thesis contributes to a more co-evolutionary understanding of firm behaviour and local context (Cano-Kollmann et al., 2016; Gong & Hassink 2019; Haakonsson et al. 2013; MacKinnon et al. 2009), and advances our understanding of how dynamic changes in the external environment influence innovation at the firm level (Boschma 2018).

Technological upgrading

First, the results presented in the individual papers suggest that the emergence of affordable innovation is closely related to technological upgrading among emerging-economy firms. In the rice industry in India (Paper II) and in the construction industry in China (Paper III), this manifested in a consolidation of the market towards higher-capacity machines, a move from handheld tools to automated machinery and a focus on more energy-efficient solutions. Furthermore, the case of VCE presented in Paper III showed that more sophisticated technologies, like excavators, were only introduced relatively recently in China (i.e. in 2010). Similarly, in Vietnam, the rice market is developing towards an improvement in the quality of exported rice. As such, it requires more technologically sophisticated solutions, such as rice-polishing machinery. Thus, by upgrading their products, national champions are increasingly competing with advanced-economy MNCs. This supports the idea of quality ladders introduced by Brandt and Thun (2016), who argue that during the last ten years, domestic firms have quickly learned and moved from

the low end of the domestic market towards competing with Western firms in the middle and high-end segments, not only at home but also abroad. Essentially, this implies a shift from global to domestic competition. Quickly upgrading firms from emerging economies dominate the volume segments and are targeting the higher-capacity, top-mid and premium segments (Paper III). From an evolutionary perspective, this demonstrates how changes in the technological dimension produce changes in the market, which trigger the development of new routines and innovations (Storper 1997). Hence, the results of Papers I, II and III corroborate the idea that affordable innovation is related not only to large domestic demand but also to technological upgrading and the broader socio-economic changes in the emerging-economy environment that have taken place over the past 15 years.

Time, speed and technological convergence

In line with Lee et al. (2020), this thesis provides an empirical example of how technological convergence over time shifts the competitive dynamics between actors in the market (i.e. between domestic firms and international lead firms). While firms from emerging economies are still often viewed as technologically inferior to their Western counterparts (Corsi & Di Minin, 2014; Ramamurti & Williamson 2019), the results presented in this thesis suggest that this gap is closing, at least in the case of excavator and rice-processing technologies. The findings suggest that due to the fast-changing environments in emerging economies, the affordable innovation process tends to be quick and requires more flexible structures. This is supported by the findings presented in Papers II and III. In those papers, the managers of all three firms highlighted the need to react and adapt quickly in order to keep up with domestic competition. Moreover, depending on the level of industrial development in a specific country and the adopted government policies, the segmentation among the low-end, middle and high-end segments varies and is constantly changing. This stems from the observation that none of the firms began innovating more affordable solutions for the local market before domestic competition and demand for more sophisticated solutions began to grow. Some managers argued that, until that point, the strategy was to wait until the market was developed enough to enter (VCE, Epiroc). However, the competition upgraded itself very quickly over the span of 10 years and firms ran the risk of 'waiting too long', which would not only imply a failure to gain a strong foothold in the middle- and lower-income segments in emerging economies, but also a failure to learn about Chinese competitors that were increasingly targeting international markets. These findings support the idea that the mid-market and its role in economic growth and development should be assessed on a country-by-country basis (Bergakker & Speetjens 2015; Brandi & Büge 2014).

Moreover, they highlight that the mid-market strategies adopted by Western firms change over time, as demonstrated in Papers I and III.

Diverse markets

For the three MNCs analysed in this thesis, the share of sales stemming from emerging and developing economies in Asia has tripled over the past twenty years. For VCE, China was the only growing market in 2020 and 2021. The results support the idea that China is an 'indispensable strategic market' for modern MNCs (UNCTAD 2021) and that it is a diverse market.

More specifically, the case studies demonstrate that demand is not homogenous and, as suggested by Abernathy and Clark (1985), firms compete based on their product-line portfolios. As is particularly evident in Papers II and III, the mid-market is a very large market segment with a wide range of customer demands. The mid-market products developed by the MNCs analysed in this thesis sold under premium brands were, on average, 30% more expensive than those of local competitors (see Papers I, II and III), which indicates that Western MNCs still compete on branding – not only on costs. Thus, in line with the recent findings of Neumann et al. (2020), expansion to the mid-market involves careful positioning and a clear market choice. In the end, China is a collection of regional markets (Alvstam et al. 2016) in which firms have to carefully choose their battles (Neumann et al. 2020). Western MNCs must select a specific market segment within the huge mid-market segment, which are often differentiated based on machine-processing capacity, quality and cost. The results suggest that the abilities to recognise market opportunities, pick those that are most feasible and adapt existing routines to innovate solutions that fit the local context are critical for the success of Western MNCs.

This thesis highlights the role of foreign demand requiring novel solutions. Thus far, theories have focused on demand in the MNC's home country as a main driver of innovation (Porter 1990; Vernon 1966) or argued that foreign demand is only served by exploiting existing solutions (Dunning & Lundan 1993, Kuemmerle 1999). However, as this thesis shows, markets not only serve as passive selection environments but also actively shape the innovation process at the firm level. In all cases, differences in the nature of demand and the size of the market opportunity were identified as key triggers of engagement in affordable innovation at the firm level (Papers I-IV). Furthermore, as suggested in the literature on user-producer interaction, proximity to customers was important throughout the stages of the innovation process. For instance, Paper II shows that affordable innovation is conducted in close proximity to customers (who play a core role during the idea phase)

and during the development phase (in the testing of prototypes). One novel finding is that prototypes are tested in the field at an early stage, which suggests that the innovation process is relocated to the field much earlier than is the case when developing premium solutions. A few early customers help to improve the new machines in a real-life context and serve as reference customers.

Therefore, this thesis contends that there is a need to incorporate foreign demand and the diversity of product requirements as core elements that shape the organisation of innovation at the firm level. More specifically, the results of this thesis suggest that MNCs also disaggregate their value chains horizontally by product line in order to develop new routines and be able to compete in China.

Institutions

The case studies presented in this thesis point to differences in the institutional environment of the focal countries and industries. This supports the argument that the institutional environment of emerging economies is highly heterogenous and should be analysed on a country-by-country basis. 'Thus, understanding the fitness of routines requires an analysis not only of firms and markets but also of institutions as relevant enabling and constraining contexts' (Boschma & Martin 2010).

Enabling conditions in India included the availability of low-cost engineering talent, English language proficiency, high domestic demand for rice mills and food-processing equipment, and WTO membership. Constraining conditions included high attrition rates, the existence of multiple cultures and languages, bureaucracy, the variety of institutions and regulations at the sub-national level between states, export bans in the rice industry limiting the investments of big millers, and import tariffs on machinery.

In Vietnam, facilitating conditions included the high domestic demand for rice-processing equipment, the perception of the country as a good location for expanding to the ASEAN region, its role as a major producer of rice, a favourable FDI policy, the availability of low-cost engineering talent and its proximity to China. Constraints included the limited availability of technological knowledge, limited English language proficiency, strong hierarchical structures in society and a preference for local brands in the rice industry.

In China, enablers included a favourable FDI policy, the availability of low-cost engineering talent, the construction boom and investments in mining, good infrastructure, the availability of low-cost engineering talent, and technological advances in the field of digitisation. Constraints included limited

English language proficiency, strong government controls, a preference for national brands in government spending, rising wages and political tensions related to China in the world economy.

As the case studies suggest, the localisation of production and, later, innovation is not only based on the availability of low-cost skilled labour but also influenced by changes in policy and the need to assimilate the informal institutions guiding the business practises of local actors. Thus, while recent contributions highlight that differences in the institutional environments of emerging economies influence the organisation of affordable innovation at the firm level (Landau et al. 2016; Neumann et al. 2020; Winterhalter et al. 2017), this study argues that institutional changes, rather than institutional distance, matter. Moreover, it is important to note that although the institutional environment shapes firms' actions, the responses of firms located in the same institutional environment differ. For instance, Paper III examines two Swedish manufacturing MNCs active in related industries (i.e. mining and construction) and their responses to changes in the Chinese environment. The results point to firm-specific factors at the subsidiary level that might explain the heterogeneity of organisational routines (i.e. the value chain configurations adopted by the two focal MNCs). These factors include the motive behind the initial investment, the nature of existing activities and routines (scope), experience, length of operation, headquarters' commitment and access to technological knowledge, opportunity recognition and market choice. Thereby, this thesis enhances our understanding of the factors that produce variety in existing routines in the same institutional setting at the micro level (Boschma & Frenken 2011). Hence, while this thesis demonstrates how changes in technologies, markets and institutions shape innovation at the firm level, as proposed by Storper (1997), it highlights that the same conditions also produce heterogenous firm behaviour.

Furthermore, as suggested by Alvstam et al. (2016) and others, MNCs do not randomly locate within large emerging economies. Instead, they generally select major cities with good infrastructure and clusters of other foreign firms. Bühler, for instance, located in southern Bangalore alongside other major European engineering firms close to electronic city. In China, the main location was Wuxi on the outskirts of Shanghai. Epiroc had its main base in Nanjing, the former Chinese capital, while VCE produced in Shanghai and opted for a location in Jinan for R&D, driven by the need to be close to the joint venture partner SDLG in Linyi (due to the limited availability of engineering talent, it chose the bigger neighbouring city of Jinan). These examples demonstrate two key findings. First, the location of value chain activities is a cumulative decision. In other words, existing locations influence the location of new activities, which Hutzschenreuter and Verbeke (2011) discuss as 'added

distance'. In this regard, this thesis suggests that it could be beneficial to distinguish between inherited and emergent locations, as this distinction influences the decision of where to locate an activity in the firm's value chain. After all, today's MNCs are already present in a multitude of markets. Second, these findings support the argument that MNCs locate not in countries as such, but in specific places within a country, often in locations that form "small pockets of advanced local technological knowledge and high economic welfare" (Alvstam, Ström, & Wentrup 2016).

Overall, this thesis contributes to a more co-evolutionary understanding of firm behaviour and local context (Cano-Kollmann et al. 2016; Gong & Hassink 2019; Haakonsson et al. 2013; MacKinnon et al. 2009). Prior studies note the importance of the institutions that influence affordable innovation processes at the firm level (Gadiesh & Leung 2007; Landau et al. 2016; Winterhalter et al. 2017), and the institutional environment forms a core pillar in the literature on both regional development (Storper 1997) and evolutionary economic geography. In contrast, this thesis offers a more detailed picture of how the idiosyncrasies of the host-country environment and industry-specific policies shape the emergence of innovation at the subsidiary level as well as their organisation.

4.2. How Western MNCs organise for affordable innovation

With regard to the second research question, i.e. *how do Western MNCs reconfigure their value chains to expand to the mid-market segments in emerging economies in Asia,* the results of this study offer several insights.

Local innovation and new additional business models for competing in emerging economies

As the examples of the smart rice-processing machinery and the mini-Pesa mill from Bühler India (Papers I and II, respectively), and the reduced-capacity construction and mining equipment developed by VCE and Epiroc (Paper III) show, affordable innovation means not only innovating new products but also adapting entire value chains and business models to expand to new market segments. In line with previous studies, the results suggest that localising R&D is no longer sufficient (see London & Hart 2004; Zeschly et al. 2011). Firms must reconfigure their entire value chains and create new routines not only for R&D but also for their sales, manufacturing, services and marketing functions. Hence, this thesis contends that affordable innovation for Western MNCs is about more than differences in demand that influence product characteristics (e.g. ease of use, robustness, small size, less automation, lower price). This type of innovation implies a move from global to local competition as well as

moves from specialised to standardised solutions and from niche to volume markets.

Therefore, this thesis offers an example of how Western MNCs add novel, standardised products destined for generic volume markets to their existing product portfolios, which have traditionally been built on specialised products for distinct niche markets. In this regard, it shows that firms combine standardised and specialised product/market strategies (Storper 1997) in one organisation.

Multiple value chain configurations

Bühler, Epiroc and VCE all redesigned at least some elements of their value chain configurations for premium customers in order to create an offering that fit mid-market customers. Thus, rather than presenting a story of market entry, this thesis focuses on expansion within an existing market, and pays significant attention to how firms adapt their organisational routines and structures over time in response to changing host-country environments (Meyer et al. 2020; Surdu et al. 2021). However, these responses differ in terms of the type of activities that are localised or outsourced to a local partner, the timing of these decisions, and the success of these initiatives.

For instance, over time, VCE developed three value chain configurations: one for the premium segment and two that targeted the mid-market segment. First, in 2007, it invested in a 70% share of a formerly Chinese-government-owned leading manufacturer of wheel loaders, SDLG. From that point onward, SDLG was responsible for sourcing, manufacturing, sales and marketing activities for mid-market products, while the technological knowledge for new product development was provided by VCE's R&D unit. Over time, this contributed to the build-up of R&D capabilities in the joint venture (JV) partner. Second, VCE started to engage in the internal development of affordable innovations for the Chinese mid-market in 2010. To do so, it established a local R&D unit and produced the mid-market products at a new manufacturing hub, while sales and marketing remained integrated with the existing premium product.

Epiroc also developed three value chain configurations: one for the premium segment and two for the mid-market. First, in 2010, R&D was localised and began the development of a new product line for the Chinese mid-market, while manufacturing operations, sales and marketing remained integrated for the premium and the mid-market product lines. Second, Epiroc complemented this move by establishing a 51% majority-owned JV with a domestic Chinese firm that handled all value chain activities except R&D. This configuration mostly relied on technology transfers from the subsidiary.

Bühler India started to engage in the development of affordable innovations for the Indian mid-market in 2012 when it complemented the existing R&D resources of the Indian subsidiary with a corporate technology satellite in order to spur local innovation. As in the cases of Epiroc and VCE, R&D was separated from the premium R&D activities carried out at the headquarters, while manufacturing, branding and sourcing remained integrated for both premium and mid-market products sold in the Chinese market. However, Bühler diversified its sales function by outsourcing sales of mid-market products to local partners. In India, sales and services were handled by local channel partners, while a more cautious approach was chosen for Vietnam, where only the generation of sales leads was outsourced to locals working on a commission basis.

The foregoing discussion shows that: a) the MNCs in this study adopted multiple value chain configurations at different points in time in order to target different market segments within large, strategic host countries in Asia, and b) this multiplicity created a need to determine the extent to which the standardised and specialised business model would be integrated or separated (i.e. whether they would share the same set of activities).

Multiplicity and the trade-off between integration and separation

From a theoretical perspective, affordable innovation indicates that MNCs have both standardised and specialised products (Storper 1997), and their respective business models are often located within one organisation. The results support Storper's (1997) findings that each of these product-market strategies requires different capabilities and routines. In particular, this thesis highlights the challenge of creating synergies between the mid-market and premium-product activity systems by lowering costs in some functions and creating a new, distinct set of capabilities in other functions. In all three cases, R&D was localised and remained largely separate from headquarters' activities. The separation of sourcing and manufacturing was less common, while sales and service were more likely to be separated internally or even externalised. This thesis finds that firms respond with varying levels of activity localisation and that they must determine the extent to which it is feasible to rely on existing knowledge and routines, or to build new knowledge and capabilities by engaging in JVs or externalising activities. Moreover, the need for integration or separation between the premium and the mid-market strategies changes with the technological upgrading of domestic firms. This is further supported by the recent trend toward more reintegration between VCE and SDLG as the two firms move closer in some segments over time, thereby potentially reducing the need for a second brand. As such, this thesis contributes to our understanding of individual behaviours and motivations at

the micro level that influence how firms configure their value chains across geographies and product lines (Kano et al., 2020). In this regard, one of the main findings of this thesis is that the drivers of the integration or separation of the activity systems for the existing and new business models vary with the type of activity under consideration.

Low-cost innovation capabilities and proximities

As is particularly evident in Paper I, affordable innovation largely rests on manufacturing knowledge, which is built over time. In line with previous contributions, the results of this study highlight the role of proximity between manufacturing and R&D (Ivarsson & Alvstam 2017; Pisano & Shih 2012). However, this thesis argues that these functional interdependencies are particularly crucial in the case of affordable innovation. Knowledge about, for instance, materials, production processes and tools is critical if this form of low-cost innovation is to succeed. This is further supported by Paper II in which managers repeatedly stressed the importance of early interactions between manufacturing and R&D that followed the principles of designing to cost and manufacturability, which are particularly important in the case of affordable innovation. Some interviewees even argued that affordable innovation must be driven by manufacturing in order to achieve speed and ensure low costs.

Moreover, the results of this thesis highlight the need for proximity to high domestic demand and competition as important drivers of the location of the R&D function and the locus of the innovation process. This is supported by Paper II, which finds that proximity to customers and embeddedness in local networks in order to assimilate institutionalised behaviour are particularly important for affordable innovation, apart from only conducting R&D locally. Proximity to customers not only to understand market needs, as suggested in previous contributions, but also to engage in extensive on-site testing in a real life-context and over time creates trust and institutional embeddedness in the host country.

Furthermore, proximity between headquarters and the subsidiary was a topic of constant discussion among managers. In this regard, some voiced a need to gain access to the latest technologies, and suggested that headquarters' attention was vital if these affordable innovation initiatives were to succeed and be perceived as valid within the organisation. Others emphasised the need to keep the affordable innovation process separate from existing innovation efforts at the headquarters level, not only to protect IP rights but also to stimulate problem solving from the bottom up. In this regard, the results of this thesis are inconclusive and only contribute an additional piece to the bigger

picture. While these effects may be partly industry specific, potentiating the need for localisation, the nature of affordable innovation in terms of targeting a new market with a novel product calls for a location close to customers as well as access to the firm's existing resources in order to design the best possible solution at the lowest cost. As such, this thesis contributes to our understanding of the role of proximity among actors during the innovation process at the micro level and accentuates the influence of localised learning.

Subsidiary evolution – 'Strategic leaders for the domestic market'

In all three firms, the subsidiaries were initially established as low-cost manufacturing units. Epiroc and VCE in China were established to serve export markets. Only as business grew in China did the strategic focus shift towards the domestic market. Today, the subsidiaries innovate solutions for the domestic market. As the different examples of smaller capacity; and robust, cheaper rice- and flour-processing equipment, wheel loaders, excavators and mining equipment show, this type of innovation goes beyond adapting existing technologies to local market requirements.

From a subsidiary-evolution perspective, existing theories are poorly equipped to capture the complexities of the subsidiary roles adopted in an emerging-economy context in Asia (UNCTAD 2018). As discussed in the literature review, according to extant theory, subsidiaries are either implementers that adapt extant technologies or strategic leaders that develop new solutions for global markets (Bartlett & Ghoshal 1989; Kuemmerle 1997). The results of this study suggest that subsidiaries located in strategically important, large emerging economies initially engage in some adaptations of existing products to local market requirements. However, over time, they undertake the development of affordable innovations that combine market-specific quality with the latest technologies at a low cost (Jha et al. 2018). This differs from strategic leaders in the sense that these units are not focused on exports to global markets. Instead, they develop novel solutions for domestic markets in the host country. Therefore, one of the main contributions of this thesis is that it extends our understanding of the evolution of innovation in emerging economies by proposing that between adaptation and reverse knowledge transfer lies the role of the 'strategic leader of a domestic market'. In this role, subsidiaries develop novel solutions targeting a market segment that is new to the firm. As such, subsidiaries contribute to demand-side diversification and allow for expansion within a large, strategic host country.

CHAPTER 5: Conclusions and future research

The aim of this thesis has been to examine why, when and how changes in an emerging-economy environment in Asia influence the organisation and location of affordable innovation by Western MNCs. The three qualitative case studies and the systematic literature review presented in this thesis have served to elucidate different aspects of this question, and provide evidence that resource endowments and costs are not the sole factors influencing the innovation activities conducted by Western MNCs in large emerging economies in Asia.

This thesis emphasises the role of large domestic demand in emerging economies as a driver of the organisation of innovation the firm level. It suggests that large diverse markets, the upgrading efforts of competitors, technological advances and the unprecedented speed of these environments present numerous opportunities for Western MNCs. However, they also make it difficult to expand and survive in these markets. It is no longer only about 'being-there' (Gertler 2003) through the establishment of a local R&D unit. Instead, it increasingly involves complex decisions on how the organisational routines underlying each value chain activity need to be reinvented to produce results that fit these markets. What worked before for Western MNCs may not be relevant for evolving Asian markets, especially in relation to the lower- and middle-income segments.

This thesis provides a small piece of the puzzle that will help unravel these dynamics. Over the past 20 years, the three MNCs analysed in this thesis have increasingly developed products and business models for customers in emerging economies. The results suggest that MNCs operate a portfolio of product lines and perhaps even multiple business models for different countries and for different market segments within large, strategic host countries. These affordable business models coexist with their specialised, premium business models. They have led to a shift in the geography of innovation in the sense that Western MNCs' subsidiaries in emerging economies are taking on more competence-creating roles in which they develop new products to expand to the mid-market segments in these countries.

This thesis contributes to the fields of evolutionary economic geography (Boschma & Frenken 2018; Essletzbichler 2009; Kogler 2015; MacKinnon et al. 2009) and the changing geography of innovation (Crescenzi et al. 2012; Crescenzi & Gagliardi 2018; Ernst 2002; Fifarek & Veloso 2010; Mudambi 2008) in three ways. First, the results suggest that to better understand the

driving forces behind the innovation of new business models and the reconfiguration of firms' value chains due to the constantly changing economic landscape, demand and competition must be taken into account along with the traditional aspects of costs, supplier capabilities, institutions and technologies. This is particularly important for firms active in producer-driven value chains, which are typically not accustomed to demand-side strategies. More specifically, this thesis argues that the market should not only be seen as a passive-selection environment, as suggested by evolutionary theory and life-cycle theories. Instead, high strategic demand and variety in demand actively influence how Western and emerging-market firms compete in different market segments, and how Western MNCs organise for affordable innovation. Therefore, this thesis takes a small step toward bringing demand and markets back into the discussion on how firms and regions coevolve, which has been a neglected aspect in the economic geography literature (Hall 2012; Peck 2012). The results of this thesis support previous studies arguing for the need to pay more attention to the role of markets in regional development (Hall 2012; Martin & Sunley 2007; Peck 2012).

Second, this thesis extends the literature on subsidiary evolution by proposing the role of a 'strategic leader for domestic markets'. These subsidiaries engage in the development of new products for large domestic markets in the host-country. Thus, while they share the focus on new products and solutions with the strategic leader defined in previous literature (Rugman et al. 2011), they focus on the local market rather than the global market. This role might represent a step in the move towards more global innovation responsibilities, as indicated by Jha's (2018) idea of a local product unit. Hence, the detailed empirical studies on which this thesis builds contribute to our understanding of how changes in subsidiary roles (micro-level process) coevolve with macro-level structures (i.e. the formal and informal institutions guiding human behaviour) (Phene & Tallman, 2018) and the industry context (Storper & Walker 1989). The individual papers outline unique, context-specific conditions at the country and industry levels that shape MNCs' expansion strategies in these markets.

Third, the findings contribute to a more nuanced understanding of the organisation of affordable innovation within the MNC. They do so by, first, showing that the drivers of localisation and organisational separation or integration differ based on the type of value chain activity under consideration. Second, they show that modern MNCs combine both specialised and standardised product strategies into one organisation, thereby creating multiplicity in their value chains and increasing complexity. As Storper (1997) suggests, specialised and standardised products rely on different divisions of labour within the firm. Along these lines, this thesis suggests that this is true

for production and innovation as well as every value chain activity. This finding has important implications, as it suggests that the firm's value chain cannot be sliced by either activity sequence or by product line.

The key question for Western MNCs is how they can retain their competitive advantage, build on their technological leadership and sustain their positions in GVCs. While this thesis offers several empirical examples of how this may be achieved and derives several possible explanations for firms' behaviour in certain contexts, the findings point to a series of new questions that have yet to be explored.

Future researchers might find it interesting to investigate the extent to which products and solutions innovated by Western MNCs in emerging economies are sold in other emerging or developing economies. After all, the 'mid-market' is a global phenomenon (Christensen 1997). In this respect, it would be insightful to explore, for instance, the extent to which firms use their low-cost, manufacturing-related innovation capabilities gained in the Chinese environment to expand their footprint in Africa. The 'global mid-market' is an exciting area that warrants further study. From the MNC's perspective, more studies in different geographical contexts are needed to elucidate how the organisational duality or multidexterity created by simultaneous operation of multiple value chain configurations or business models are organised and managed. The influence of institutions, technologies and markets on innovation over time is a complex issue and a promising area for future research. Moreover, we lack insights into how this type of innovation by Western MNCs in emerging markets relates to the global innovation network as a whole. As the results of this thesis highlight, affordable innovation is a complement to, rather than a replacement for, R&D and innovation activities carried out at the headquarters' level in an advanced economy context.

Moreover, it would be interesting to explore how the increasing technological convergence between the East and the West in some industries, affects the mid-market strategies of Western MNCs. Will more or less diversification of firms' value chains be necessary? Will distinct mid-market products still be needed? How will China's lead in the field of digitisation help Western firms gain digital technology capabilities that can be exploited across various regions? Lastly, an understanding of the conditions that influence the reconfiguration of firms' value chains is needed. The Covid-19 pandemic has made the vulnerabilities of GVCs evident, created doubts about globalisation, and stimulated a vivid debate on reshoring and creating redundancies on the supply side (Gereffi 2020; Kano et al. 2022; Shih 2020). Diversification on the demand side creates opportunities to tap into new demand segments, but the simultaneous introduction of too many product variations adds complexity and

cost to the firm's value chain (Shih 2020). However, although the literature on affordable innovation argues in favour of localisation to reduce costs, the costs of these organisational changes have not been taken into consideration. Hence, future studies could further explore this trade-off between efficiency and diversification on both the supply and demand sides.

This thesis takes a first step towards explaining why, when and how changes in an emerging-economy environment influence the development of affordable innovation at the firm level. In addition, it outlines a multitude of value chain configurations adopted by Western MNCs. Thereby, this thesis turns the traditional question in economic geography of how firms influence the economic development of regions around, and focuses on how dynamic changes in institutions, markets and technologies shape innovation at the firm level. Such a perspective bears great potential to generate a better time-geographic understanding of the changing geography of innovation within the MNC and to advance economic geography as a discipline.

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