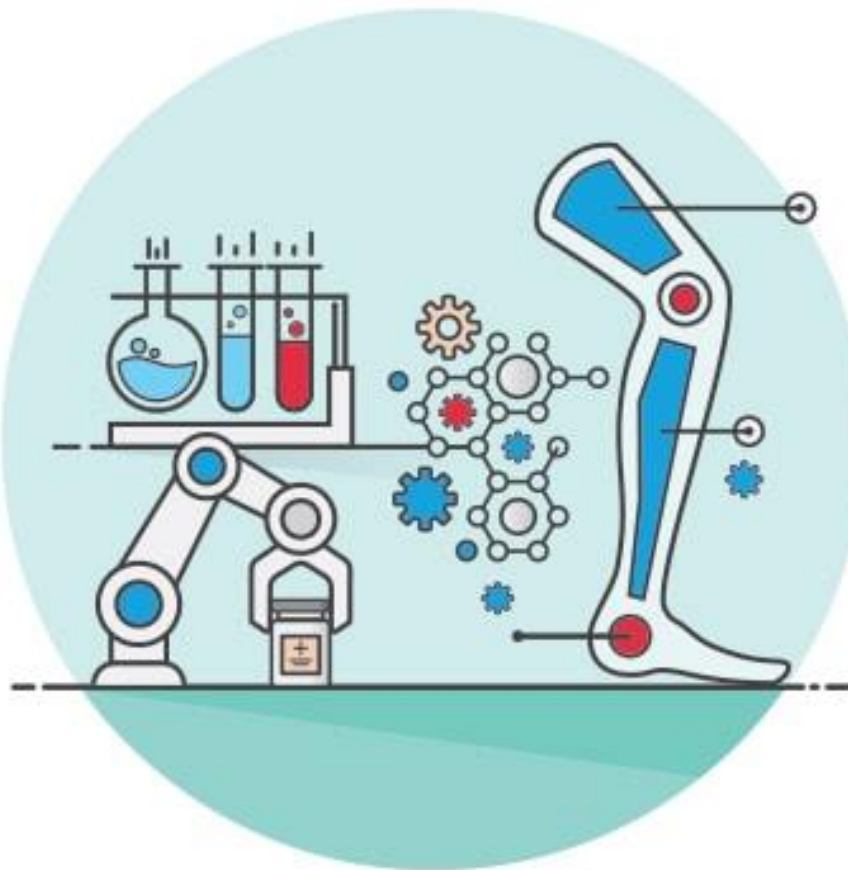


Knowledge spillovers in the booming Dutch Life Science

A qualitative study on knowledge spillovers from multinational enterprises to domestic small- and medium sized Dutch in the life science industry



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Preface

The last few months I have been studying the impact of multinationals on Dutch domestic life science firms through knowledge spillovers. Knowledge spillovers can be beneficial to domestic firms as certain knowhow might be crucial to firms in a research & development intensive industry. I laid focus upon different channels through which this knowledge can flow and what conditioning variables at firm-level and moderating variables at regional and national level might affect this knowledge flowing over between firms.

This thesis is part of my master program “Human Geography” in which I profiled on the economic geography; business & location track. This track specializes in entrepreneurship, from large multinational corporations to small-scale local business activity, start-ups and also multinational impact. I have always been interested in studies that are involved with business activity, but studies such as business economics were too mathematical and economically oriented. What I like so much about this master, is that it has a strong economic orientation, but then with the focus on spatial aspects as regional development, locational choice theories, cooperation in clusters and the exchange and facilitation of innovation (through knowledge spillovers) in certain areas. This last given aroused my interest most and therefore my choice for the thesis subject was an easy one.

This thesis is meant for a variety of groups of people. Besides domestic life science firms, this thesis can also be relevant to large multinational life science firms as the outcomes give them both insights on how knowledge flows over and what variables are valued as relevant in effectively exploiting this research. Moreover, policy makers from various spatial scales can draw important insights from this thesis.

Conducting the thesis was a very positive experience as I worked on it with motivation and enthusiasm. Also the interviewing itself with the respondents was a positive experience, even though it was sometimes hard to keep up with knowledge specific topics, which can be very complex in sub industries like the biotech- and pharmaceutical industry.

Last, I would like to thank a group of people for helping me finalize this thesis. First of all I would like to thank my supervisor Dr. Nicola Cortinovia, who guided me in the process by helping me with the provision of feedback and sometimes pointing me in the right direction. Second I would like to thank all respondents from various life science firms over the Netherlands, who were very enthusiastic in cooperating and giving broad and detailed insights on the different concepts. Last, I would like to specifically thank Holland Bio and especially Robbert Wever and Hugo van Rooijen who helped me by providing datasets which made the data-collection process very easy for me. They also helped me by holding an interview.

I wish you a lot of fun reading and especially hope that the outcomes of this research draw your attention and might even be beneficial to some of you!

Abstract

This thesis is about the impact that multinational enterprises have on domestic firms in the life science industry in the Netherlands. Multinational enterprises can cause externalities on a place that they relocate in. Among these externalities are knowledge spillovers, in which multinationals act as knowledge diffusers by causing the ability for knowledge to flow over to other firms. This research focused on these knowledge spillovers since there are multiple knowledge spillover channels and there are several factors playing both at firm-, regional- and (supra-) national level that might affect this knowledge flowing over. Therefore, a qualitative study was conducted to analyze how and through which channels external knowledge from multinationals is being received by Dutch Life Science firms. In this study, first contextual information is provided in terms of industry specific characters and an analysis of the scientific debates regarding knowledge spillovers and multinational impact. Then, the justification of the methodology will be provided after which the results and conclusions will be drawn and put into perspective. Interviews were held with respondents from within board functions of those firms after which the following outcomes were found to be significantly interesting. From the analysis, it can be concluded that multinationals serve a facilitating role as knowledge diffusers as they not only actively cooperate and financially support domestic firms, but also indirectly have an impact on domestic firms by causing the ability for domestic firms to benefit from demonstration effects, labor dynamics and to lesser extent buyer-supplier linkages and competition effects. The realization and direction of knowledge spillovers might eventually be affected by a firm's capabilities and resources such as networks, talent, investors and the directing role of the entrepreneur that are relevant factors in providing opportunities for knowledge to flow. Moreover, firms should be aware of the effects of weak trial efficiency and the somewhat strict regulations and insecure subsidies because they can have a moderating effect on the flowing in of external knowledge.

Table of Contents

Preface	2
Abstract	3
1. Introduction	6
1.1. Inducement of this research	6
1.2. Research questions	8
1.3. Societal relevance	9
1.4. Scientific relevance	10
2. The Dutch Life Science & Health Industry	11
2.1. The Industry and cooperation	11
2.1.1. Venture capital	11
2.1.2. Local and regional cooperation	11
2.1.3. European cooperation	12
2.2. Regulations and Efficiency	12
2.2.1. Dutch & European Policy	12
2.2.2. Judicial and trial efficiency	13
3. Theoretical Framework	14
3.1. Multinational enterprises	14
3.1.1. MNE's and foreign direct investment	14
3.1.2. Why do multinationals relocate	15
3.1.3. Multinationals and local impact	16
3.2. Knowledge spillovers	18
3.2.1. Finding grip on different forms	18
3.2.2. Different forms of knowledge spillovers	18
3.2.3. Inter-Industrial spillovers	20
3.3. Conditioning variables at firm level	21
3.3.1. Entrepreneurship	21
3.3.2. Networks	22
3.3.3. Financial Situation	22
3.3.4. Talent & Knowledge	22
3.4. Conceptual Model	23
4. Methodology and Operationalization	24
4.1. Methodological justification	24
4.2. The respondents and process of interviewing	24
4.2.1. Who and why	24
4.2.2. Data collection and ethics	25
4.3. Validity, Reliability and Representativity	27
4.4. Operationalization and topic list	27
4.5. Data Analytics	29

5. Results	30
5.1. The response group	30
5.2. First impressions on MNE's	30
5.3. Different channels of spillovers	31
5.3.1. Demonstration effects	31
5.3.2. Competition effects	32
5.3.3. Buyer-supplier linkages	32
5.3.4. Labor dynamics	33
5.4. Inter-Industry knowledge spillovers	33
5.5. Moderating Variables	34
5.5.1. Dutch policies	34
5.5.2. European policies	35
5.5.3. Trial efficiency	35
5.6. Conditioning variables at firm-level	35
5.6.1. Networks	35
5.6.2. Talent & Skills	36
5.6.3. Entrepreneurship	36
5.6.4. Financial situation	36
6. Conclusions	38
6.1. Multinationals ad knowledge diffusors	38
6.2. Forms of knowledge spillovers	39
6.3. Analyzing moderating variables	40
6.4. Inside the firm	40
6.5. Main research question	41
7. Discussion; limitations and recommendations	42
8. Literature	44
9. Annex	48
9.1. Time planning thesis	48
9.2. Interface Nvivo	48
9.3. Code tree Nvivo	48
9.4. Topic list	49
9.5. Specific interview questions	50

1. Introduction

1.1. Inducement of this research

Globalization has been central to modern world development and has contributed to an integration process that is neglecting space more and more. Besides political and socio-cultural global integration, also economic integration has in the last few centuries been subject to rapid change (Chitadze, 2020). Furthermore, globalization opened the doors for large firms to operate abroad. It has generated matters that affect the worldwide operation processes of corporations. Decades later, this has led to an integrated global economy in which multinational enterprises serve as leaders in connecting economic activity between places at a global scale (Levinson, 2021). This has led to an interconnected economy where multinationals facilitate the capability to bridge space and make networks between independent countries (Kyove et al., 2021).

Moreover, this geographic phenomenon is related with an increased economic fragmentation at a global scale, as certain places e.g. nations, regions and cities contain particular advantages to specific economic activity that attract multinational enterprises to a certain extent. Global cities and regions for example, can reduce the liability of foreignness that a multinational enterprises experiences by reducing uncertainty and discrimination towards multinationals by offering them stability in terms of regulations. Consequently, multinationals prefer certain places that have a strong FDI serving climate with beneficial regulations, networks, infrastructures and institutions. (Goerzen, Asmussen & Nielsen, 2013).

With this relocation of specific assets of multinational enterprises, the places of relocation are likely to be affected by the multinational presence. Javorcik stresses the effects of multinational presence on the host country economy and indicates that they stimulate productivity enhancement, both in backward and forward linkages (demand and supply) in the supply chain, create job stability and diffuse knowledge to domestic firms (Javorcik, Lo Turco & Maggioni, 2018; Javorcik, 2015). This research will focus on this last particular aspect. Multinational enterprises have a generating capacity of internalizing knowledge from multiple locations. Therefore, the developed knowledge and innovation in these firms are more likely to be complex and technologically advanced because of this advantage (Crescenzi & Iammarino, 2017)

Because of their knowledge intensity, MNE's may offer critical information and knowledge assets especially in complex (more advanced and knowledge intensive) industries. To understand the role of MNE's to diffuse knowledge, this thesis analyses the life and health sector (being a knowledge intensive industry) in the Netherlands. Complex industries, like the life sciences & health industry are often subject to continuous innovation, which can be a very disruptive process. In industries like life science, smart manufacturing and the robotics industry, the fusion of new technologies can emerge rapidly which has a disruptive effect on these industries. This process can occur rapidly and can have a massive disruptive impact to all industries that coop with technologies that fit within the framework of this disruptive innovation (Bongomin et al., 2020). Bongomin et al., also mention that it is necessary, in order to survive in technological enhanced industries, to keep up with the changes and speed in which it is occurring. It is therefore exigent for firms in those complex industries to persevere

with these fast changing technological regimes in order to stay resilient to technological change (Balland & Rigby, 2017, Bongomin et al., 2020).

Because the life science industry is such a disruptive industry, with continuous innovation being central, this sector will be the focus of this thesis. Since 2011, the Dutch life science sector has been categorized as, and integrated into the so-called “top sector” policy that is carried out by the Dutch government. These top sectors preliminary contribute to a large share of the Dutch economy by stimulating innovation power, improving the Dutch international trading position and stimulating human capital to create an expertise working force (Topsectoren, 2022). Besides addressing societal challenges and improving overall life quality, the life science & health sector focuses on the valorization of innovation to become more technologically enhanced (Health Holland, 2022). Moreover, this industry has grown to become one of the most eminent industries globally with nearly 150 life science R&D companies and 700 life sciences companies (Holland Bio, 2022). From these companies, there are many multinational oriented life sciences & health firms who are located in the Netherlands but have subsidiaries at a global scale such as Sanofi, Novartis, Pfizer & AstraZeneca. Therefore, this industry is a viable industry for this research as it represents an industry where technological development and innovation is a continuous process which might reflect on it being subject to processes of knowledge spilling over between firms.

The Dutch life science & health industry is aware of the urge to keep up with these fast changing technological landscapes and therefore set up strategic alliances, knowledge institutions and make use of a so-called triple helix cooperation, where institutes, universities and governments cooperate (Geenhuizen, 2008). The industry is currently positively developing in terms of size, innovation, cooperation and competition. A vision report from Holland Bio was released on the expected growth of the Dutch Life sciences sector.

	2015	2030
Cluster Size		
# of companies	455	1,279
Micro (1-10 employees)	251	693
Small (11-50 employees)	129	407
Medium to large (>51 employees)	75	179
# of employees	24,000	60,000

Figure 1: Expected growth in firms in the Dutch Life science sector (Holland Bio, 2015).

Figure 1 as an example shows that the amount of companies of all sizes are expected to triple before 2030. Most companies in the sector are micro-companies consisting and employing only 1 to 10 people. Also, the report reflects on high levels of cooperation, foreign direct investment in the sector and that this contributes to rapid development and innovation in the sector (Holland Bio, 2015). Figure 2 provides a slight impression of the cooperation deals made between small and medium sized Dutch Life sciences firms and large-sized multinational enterprises. It can be concluded that the Dutch life science sector is currently attracting a lot of foreign direct investment (Real Staffing, 2021).

BELANGRIJKE DEALS VAN NEDERLANDS MKB IN 2015*					
MKB	Partner	Type	Datum	Upfront (M)	Potentiële waarde (M)
T-Cell factory	Kite Pharma	M&A	maart	\$ 21	
AM-Pharma	Pfizer	M&A	mei	\$ 87	\$ 600
Lanthio Pharma	Morphosys	M&A	mei	€ 20	
UniQure	BMS	Licensing	april	\$ 50	\$ 2307
BioNovion	Aduro	M&A	september	€ 29	
Dezima Pharma	Amgen	M&A	september	\$ 300	\$ 1550
NovioGendix	MDX Health	M&A	september	\$ 8,8	
Acerta Pharma	AstraZeneca	M&A	december	\$ 2500	\$ 7000
Galapagos	Gilead	Licensing	december	\$ 725	\$ 2075

Figure 2: An insight in some deals made by small- and medium sized enterprises and multinational partners (Holland Bio, 2015).

Furthermore, the report focuses on the expected rapid growth of the sector and how a strong innovative climate, professionalism of the sector and an increased overall competitiveness of the sector can help realize this growth (Holland Bio, 2015).

Now that figure 1 has shown that the life science industry in the Netherlands is growing rapidly since 2015 and that multinational activity is present (figure 2), it is interesting to investigate the impact these multinational enterprises can have in terms of spilling over knowledge and other externalities to domestic firms, and this specific case is yet to be studied. This research will therefore stress the impact that multinational enterprises have on the local environment and domestic firms and therefore provide a case-study on the impacts of multinational presence on the microlevel. What is understood under those domestic firms and so being the research group of this thesis are small and medium sized start-up firms in the life sciences & health sector in the Netherlands.

1.2. Research questions

This introduction led to the following research goal: to analyze how domestic firms receive external FDI knowledge through knowledge spillovers that multinational enterprises bring to the life science & health industry in the Netherlands and what variables might affect these knowledge spillovers from flowing.

Research Question:

“How are knowledge spillovers flowing from multinationals enterprises to domestic small- and medium sized enterprises in the Dutch life science sector”.

Sub Questions:

1. ***What knowledge diffusing role do multinational enterprises play in the Dutch life science sector?***
2. ***How do different forms of channels facilitate knowledge spillovers from multinational corporations to small and medium sized domestic firms in the Dutch life science sector?***

3. *How do moderating variables affect the probability of knowledge spilling over from multinational corporations to domestic small and medium sized life science enterprises?*
4. *What firm-level variables affect the probability of knowledge spilling over from multinational corporations to domestic small and medium sized life science enterprises?*

This research goal will be reached by holding interviews among domestic small and medium sized life science & health firms in the Netherlands. Based on theory and previous research, a framework of variables representing different channels and other factors that might affect (the direction of) knowledge spilling over will be created. In doing so, different insights and other variables from various studies will be combined in order to identify a comprehensive set of knowledge spillovers “channel variables” to analyze the specific findings as for this research.

1.3. Societal relevance

By conducting this research, the outcomes hopefully will be relevant on social terms. As mentioned before, the life sciences & health sector in the Netherlands will be studied by analyzing how small and medium sized enterprises in this particular sector benefit from possible knowledge spillovers and other externalities of multinational presence. Consequently, the outcomes of this research can be redundant for a various group of firms. First, domestic firms in the life science & health sector can use this research as a comprehensive framework on how to make use of the multinational presence and the knowledge they spillover. This might cause these firms to innovate their products more rapidly and eventually cause them to grow fast. Second, these knowledge spillovers might not only be relevant to same-sector firms since cross-sectoral spillovers, based on sectors with close technological relatedness to the life science & health industry, might also benefit from this multinational presence. Third, multinational enterprises themselves might benefit from this research. If an analysis is provided on how domestic firms value different kinds of FDI knowledge and other MNE externalities, this can be a framework for these multinationals to comprehensively direct and orchestrate the direction of these spillovers from which they eventually might benefit. Since these knowledge spillovers can lead to more product complexity and drive more innovation in domestic firms, MNE's can benefit from possible input linkages (in terms of production and innovation) of domestic firms. In this way, this research approach will try to create a better understanding of the mechanisms that lie behind any perceived impact of multinational enterprises on local firms. An attempt will be done to try and analyze different channels of knowledge spillovers that are crucial for the transferring of knowledge. A critical examination and analysis of these channels and thus variables will hopefully be provided, as well as the possible perceived opportunities barriers for knowledge exchange that might be present in this process. Last, this research might as well be relevant for policy makers as insights might draw attention to possible policy improvements or new policy instruments.

1.4. Scientific relevance

This research will also contribute to a scientific debate. The impacts of MNE's on the macro and micro environment is a widely studied phenomenon. Lo Turco & Maggioni noticed that high productivity and complex firms do benefit from knowledge transfers from MNE's more than less complex industries (Cortinovis, Crescenzi & van Oort, 2020; Lo Turco & Maggioni, 2019).

Also, Narula & Pineli (2019) highlighted how multinational intervention in the economy can have an impact on the development of macro- and micro mechanisms and in this way can be a central plank in the development of countries (Narula & Pineli, 2019). This impact can be translated into the flowing of knowledge spillovers and externalities from multinational corporations to domestic firms. A quote from their recommendation section (2019. p.19): *“while considerable effort in the academic literature is spent on quantifying the spillovers and externalities from MNE activity, the primary or ‘direct’ effects are less carefully studied”* (Narula & Pineli, 2019). This thesis will add to this by qualitatively studying these primary channels and effects on the direction of these knowledge spillovers. Furthermore, Smeets (2008) has investigated individual knowledge spillover channels from multinationals to domestic firms in multiple dimensions, concluding that a lot of these spillovers do occur throughout numerous different channels (Smeets, 2008; Djulius et al., 2018; Qian et al., 2019). However, research on how and why domestic firms value specific channels used within this “flowing over” of knowledge and other assets is yet to be studied. Smeets highlights that there is still a wide gap between theoretical and empirical research as for this matter, representing an urge for further qualitative empirical analysis of these specific channels (Smeets, 2008).

Also interesting, within the life science & health industry specifically, Geenhuizen (2008) & Buffet (2011) have shown that close cooperation with knowledge institutions, (local) governments and between industrial firms have led to an effective development of the life science & health industry (Geenhuizen, 2008; Buffet, 2011). However, these studies lack a specific focus on the role of multinational corporations in these cooperation and spilling over. Where the studies as mentioned above focusses primarily on quantitative research, this thesis will zoom in using a qualitative scope, by focusing on the direction of different kinds of knowledge spillovers and how certain variables affect those spillovers.

Concluding, none of these studies have stressed the specific impact that multinational enterprises have, by spilling over knowledge and other externalities, as experienced by domestic firms in the life science & health industry. Besides, no explicit research has yet been conducted on what specific channels and how knowledge can spillover between multinational corporations and local domestic firms in this industry. Therefore, this research will provide a case study on how domestic firms in this industry value and therefore make use of knowledge spillovers channels from multinational enterprises.

2. The Dutch Life Science & Health Industry, a contextual perspective

This section will provide a contextual background study on the Dutch Life science & Health industry. Whereas section 3 will focus on scientific literature, this section will provide background information on (different forms of) cooperation, policies (Dutch and supranational) and efficiency in the life science industry. By doing this, the core moderating variables, being entangled in nonscientific literature, of this research will be outlined in order to eventually be able to frame these variables into the conceptual model

2.1. The Dutch Life Science & Health industry and cooperation.

2.1.1. Venture Capital

Over the last few decades, the amount of venture capital in the industry has been rising. Deventer (2018) stresses the importance of the rise of these venture capitals, as they ensure the realization of a lot of new innovative techniques that lead to new and better life products. According to him, a new trend has occurred. As where until 2010 innovation was mainly driven by large life science firms, the recent decade has shown a shift. Due to a lack of patenting (which caused 5 to 10 billion dollars in loss for large life science firms), suppliers (the fact that simply too many manufacturers produce life products) and innovation, the role of large firms had been declining (Deventer, 2018). Moreover, the development of innovative medicine and techniques has shifted to the domain of small and medium sized life science firms (Seldeslachts, Malek & Newham, 2021). However, these rather small firms lack the financial resources to effectively carry out products due to a failing economy of scale ability. Consequently, a lot of venture capital has been emerging in which large life science firms invest in small- and medium sized enterprises to develop local knowledge throughout these firms (Deventer, 2018). Concluding, these venture capital have realized the partnership of large and small- and medium sized Dutch (domestic) life science firms. According to Seldeslachts, Malek & Newham (2021), this has led to an industry in where large corporations turned out to “buy instead of build” on smaller firms which has led to “killer acquisitions”, reflecting on an exploitative relationship (Seldeslachts, Malek & Newham, 2021).

2.1.2. Local and regional cooperation

As mentioned above, venture capital is a form of cooperation. However, there are multiple other forms of cooperation in the industry which are relevant. In 2015, in the Netherlands the “future pact” was set up. A cooperative agreement to ensure more transparency in the production processes so that local firms can learn from each other. However, a side note is that through this pact, the financial resources are high, reflecting a lot of costs and therefore high prices of eventual products which is not beneficial to the society and the buyers of life products (Bourgeois & Gerken, 2021). Also, as indicated by de Groot (2010), in de Dutch life science sector there are a lot of forms of clusters and networks with domestic firms operating in so-called “mega-centers”. However, this cooperation does not consist of interaction with local networks but relies more on firms and institutions outside the cluster. Yet, there is an exchange of knowledge at the local level through spinoff and labor mobility dynamics. Therefore he concludes that local cooperation is present, but the majority of life science firms value the knowledge through global pipelines more (de Groot, 2010). This an interesting finding since this reflects on the role of multinationals being relevant and dominant.

Also, the upcoming role of institutions as a coordinator of knowledge exchange has become highly relevant (Schoenmaekers, 2016). The industry falls under one of the so-called “top sectors” in which a lot of attention is paid to extensive export and continuous research and development in these industries. Therefore, institutions like universities, corporations and research centers and the government cooperate closely in order to realize this (Schoenmaekers, 2016). Interesting is that the strive for this local cooperation of the “Topsectorenbeleid” is that de Groot mentioned that local cooperation is less relevant for the industry than knowledge saturation throughout large pharmaceutical firms via global pipelines (de Groot, 2010).

2.1.3. European cooperation

Last, European cooperation also plays a role. According to van Weerd & Lassche (2021), European cooperation in for example the quantum- and biotechnology industries will lead to development and therefore strengthen the value chain in these industries for cooperating countries (van Weerd & Lassche, 2021). He also points out a shortcoming in this innovative climate, being the fact that to effectively cooperate in innovative research, central coordination is required which is yet lacking. Moreover, there should be investment initiatives for start-ups, a highly skilled labor force and legal obstacles should be tackled (van Weerd & Lassche, 2021).

2.2. Regulations and efficiency in the industry

2.2.1. Dutch and European Policy

The Dutch life science industry falls under the so-called “Topsectorenbeleid” as mentioned before. This is a policy guide set-up by the Dutch government to actively stimulate innovation and research in seven industries. The life science industry is one of those seven and therefore falls under this policy that stimulates innovation. However, Verhoeff (2019), stresses that over the last few years the Dutch government, just like in the United States and Germany, the subsidizing of research in the industry has been declining. Consequently, a lot of private research corporations and institutions now focus on attracting investors and other forms of research-related money (Verhoeff, 2019; Makady et al., 2019)). Eventually, this will cause a negative trend as research with private industry related financing often is oriented towards particular private goals and therefore is not in line with common life science related problems. This problem can lead to underdevelopment and weak resilience towards emerging multi-resistant bacteria and the development of antibiotics to prevent these from evolving and spreading (Verhoeff, 2019). Therefore, new regulations with stable and steadfast forms of subsidiary are necessary for the industry.

Also interesting is a study from van Dongen, Tak & Claassen (2018) on the “Bio Partner” program. This is a policy instrument designed to “*commercialize scientific research during the emerging stage of the biotechnology sector in the Netherlands*” (van Dongen, Tak & Claassen, 2018, p1.). The core goal of this policy instrument was the realization of more patenting in the industry, which is economically beneficial. Eventually, a net contribution of the program of 20% of all Dutch patents in the biotechnology industry was realized (van Dongen et al., 2018). There

are more programs like this at the local and regional scale and this example reflects on them being relevant in terms of promoting innovative and economic development in the industry.

At the European level, there are a lot of guidelines and regulations that complicate the eventual market implementation of new medicine and techniques in the sector. The European Medicines Agency (EMA) these regulations create obstacles for the process of bringing medicine to the markets and implementing new techniques. This eventually led to the fact that from the 1500 small- and medium sized Dutch enterprises as registered by the EMA, only 9 medicines made it to final market implementation. van Deventer (2018) mentions that this problem is not strictly European but both national and European policy should prevent this harsh trial efficiency from prevailing (van Deventer, 2018).

2.2.2. Judicial and trial efficiency in the industry

As mentioned above, a lot of regulations and guidelines from European and national governmental spheres affect the trial efficiency of the process of new medicine and technique implementation. According to Comi et al. (2019), judicial efficiency, meaning effective and well-functioning judiciaries, are crucial determinants of economic performance. Besides local domestic firms, multinational enterprises also seem to value regions where this judicial efficiency is high (Comi et al., 2019). According to van Deventer (2018) and Dam-Deisz et al. (2018), policies in the sector can still improve this efficiency by removing barriers for long trials of market implementation (Dam-Deisz et al., 2018). They highlight the current Dutch judicial efficiency as highly beneficial to large (multinational) firms. For start-ups however, a lot of regulations negatively affect this judicial efficiency, both at Dutch and European scale (van Deventer, 2018).

Also, weak trial efficiency in the life science sector lies in the production process itself. According to Makady, the outcomes of research studies in the life science sector are generally poor, which reflects on a low success rate of research (Makady et al., 2019). They stressed the impact of conditional financing on the sector and found that conditional financing improves the innovation process of the Dutch life science sector but there are improvement points and differences in perceived aims of stakeholders towards the functioning of conditional financing. Concluding, the study stresses that conditional financing improves the overall success rate and effectiveness of innovative research therefore improving trial efficiency in production processes (Makady et al., 2019).

Now that it has been analyzed how policies and weak trial efficiency are situated, it can be concluded that they can be relevant moderators in enabling knowledge spillovers to flow. Therefore these two variables will be analyzed on whether and how they have a moderating effect on knowledge spillovers and are therefore integrated in the conceptual model at the end of section 3.

3. Theoretical framework

In section 2, contextual information about the life science & health industry was provided. This section will additionally focus more on the scientific theories that are relevant for this research. Consequently, an overview of the scientific debates and theories, linkages, contradictions, analysis and frameworks from other scientific journals, articles and books will be provided. By analyzing and outlining these relevant insights, the core scientific topics of this thesis will be framed and put into perspective.

3.1. Multinational enterprises

3.1.1. Multinational enterprises and foreign direct investment

Multinational enterprises are firms as in organizations that engage in the production of activities to make profit. However, other than local firms, they neglect borders and therefore their activities are carried out across national borders (Barbarra-Navaretti & Venables, 2009). However, these activities are linked in a value chain where every subsidiary usually serves a goal in the production process which is possible by internalizing different assets from different locations (Bandick, Gorg & Karpaty., 2014). This “internalization” of assets cross-border according to Dunning & Lundan (2008) creates an advantage to internalize transactions and other border-crossing assets within the corporation. The impact multinational enterprises have had over the last few decades is extensive (Dunning & Lundan, 2008). At a global scale, there are thousands of multinational corporations who operate at a multi-locational level. However the functioning of their operations reflects on them being large-size enterprises, this is not always the case. A lot of multinational enterprises can be small-and medium sized enterprises as well (Michel & Shaked, 1986). However, the impact multinational enterprises have on local economies are incited by the big ones. Yet, the largest 500 multinational enterprises account for more than 90% of the global foreign direct investment (Rugman & Verbeke, 2004).

Interesting, over the last few decades, the role and functioning of multinational enterprises has been subject to rapid change. Goldstein (2007) highlights this change as that multinational enterprises are highly dynamic and their role and functioning can change over time. As from 1990 on, the role of these multinational enterprises and their impact was yet limited, MNE’s as “global players” therefore representing prominent and emerging economies have over the last two decades partly shaped the global economy (Goldstein, 2007). Also, the ownership of multiple subsidiaries results in the controlling of assets from multiple locations. If certain properties or intangible assets are owned by an enterprise, so the availability of resources and other assets are at hand which gives them this ownership advantage (Dunning & Lundan, 2008; Mudambi et al., 2018). Because of the fact that multinational enterprises coordinate flows of capital, being foreign direct investment (FDI), FDI now already accounts for more than 60% of private capital flows (Carkovic & Levine, 2005). Consequently, a lot of countries try to attract foreign direct investment and since multinational enterprises orchestrate this, they can be seen as transferrers of externalities and knowledge spillovers. Externalities in this matter are “external effects” that a certain region, city or nation can experience as a result of a (multiple) multinational subsidiary presence (Carkovic & Levine, 2005). More theory on these externalities will be provided later on in this theoretical framework.

3.1.2. Why do multinationals tend to relocate certain assets?

The impact of MNE's on local economies largely depends on the motives and thus mechanisms that lie behind the choice of the relocation of their assets and the investing in foreign countries. Dunning & Lundan (2008) have identified and summarized four main types of foreign production motives that are not mutually exclusive, meaning that one enterprise can have multiple motives and are not bounded by an individual one. Also, different core assumptions of the motives can be integrated. For instance, an enterprise that locates in a highly innovative climate has a strategic asset motive but is also looking for resources in terms of technological expertise.

At first, **natural resource seekers** are a group of enterprises that are prompted to have multiple locations abroad to acquire certain resources. These resources are usually of higher quality and have a better quality-price ratio which leads to an urge to operate abroad (Shapiro, Hobdari & Oh, 2018; Dunning & Lundan, 2008).

The second group are the **market seekers** enterprises. They best can be described as a group that relocates a subsidiary in a place in which they want to enter, protect or exploit certain markets. This is often because a current market in operation is encountered by induced trading barriers or the market size doesn't fit the enterprise anymore (Adeola, Boso & Adenji, 2018; Dunning & Lundan, 2008).

As for this research, multinationals who are natural resource and market seekers are less relevant since life science multinationals often relocate following efficiency and strategic asset seeking purposes. Therefore, the following motives are more relevant, since the life science & health industry is a complex industry with highly innovative products and research & development intensity, therefore relying less on the exploitation of certain resources and markets.

Efficiency seekers, according to Dunning & Lundan want to (2008, p. 72): "*rationalize the structure of established resource-based or market-seeking investment in such a way that investing companies can gain from the common governance of geographically dispersed activities*" (Dunning & Lundan, 2008). This reflects on them wanting to achieve new learning experiences in order to optimize their product and processes by making use of business-convenient markets, cultures, institutions and demand therefore taking advantage of differences and less cost of factor endowment that different subsidiaries can offer. Also, efficiency seeking multinationals can seek for places in which economies of scale can be adjusted to more easily than in the country of origin (Bircan, 2019; Dunning & Lundan, 2008). In the case of the life science industry, multinationals might tend to relocate to improve certain techniques and processes by obtaining knowledge from the place of relocation. In other words, they seek more efficiency by relocating to places that offer certain advantages in terms of knowledge, innovative culture and institutions that the Dutch life science & health industry offers (Roper, Love & Bonner, 2017).

The last group are the **strategic asset seeking** MNE's who tend to relocate because they have a long-term strategy. They consist of corporations that engage in foreign direct investment in order to serve long-term strategic goals in often a global or regional strategy (Rugman & Verbeke, 2004). Consequently, their goal is not to exploit or enter certain markets

and resources but to augment other physical and human competences that relocation in a specific place can offer on a long-term basis (Bircan, 2019; Rana, Prashar, Barai & Hamid, 2020). What the strategic asset group has in common with the efficiency-seeking group is they both try to make use of their multiple ownership and therefore multi-locational advantage, that is capitalizing diverse economic and potential environments through institutional, cultural and economic advantages (Dunning & Lundan, 2008). In the case of the life science industry, multinationals tend to relocate in order to establish themselves in a highly innovative climate where institutional and innovative advantages might be beneficial to them on a long term scale. Moreover, these FDI motives can also have a moderating effect on the externalities (among which knowledge spillovers) (Roper, Love & Bonner, 2017). Following this given, the FDI motives will be analyzed as a moderating variable and can be found in the conceptual model at the end of section 3.

3.1.3. Multinationals and local impact

We now know why multinationals tend to relocate at a global scale and how they operate based on different motives and therefore corporate strategies. Since these strategies differ under MNE's, it is relevant to highlight the different local implications that the relocation creates in the place of relocation, being the local environment.

Because of the spatial discontinuities multinationals cause, this might affect local places and economies differently. The role of multinationals has long been overlooked by business scholars and the role of space in reality is a discontinuing and heterogeneous moderator. Thus contributing to a comprehensive framework of economic activity, the local impact that multinationals have, come to be of significance to international business scholars regarding the analysis of spatial economic differences (Beugelsdijk & Mudambi, 2014). In other words, multinational enterprises locate their subsidiaries in places dependent on the advantages that such a place offers by neglecting national boundaries and have therefore become border-crossing multi-location enterprises (Beugelsdijk & Mudambi, 2014). The motives of these firms can vary from efficiency-, market-, resource- and strategic asset seeking (as mentioned in section 3.1.2) depending on what specific assets they want to relocate (Dunning & Lundan, 2008). For example, some multinational enterprises tend to relocate their assets to subsidiaries in places where a lot of high-intensive knowledge and innovation is present. These subsidiaries can be labeled as "strategic asset" driven types of foreign production (Lo Turco & Maggioni, 2019)

The impact that MNE's have on the local environment knows multiple dimensions, both in scale (local, regional, national) as in which sectors and variables the impact can be translated into. These effects, whether direct or indirect effects, are called "externalities". Resmini (2019) developed a framework to analyze foreign direct investment through multinationals and found that induced effects can be translated into both pecuniary (related with prices and the market) and non-pecuniary (outside these transactions) effects (Resmini, 2019). The nature of the impact can accordingly be measured by being framed as one of these two. The taxonomy also integrates whether induced effects are horizontal (intra) and vertical (inter) industrial. This taxonomy can be found below.

	Horizontal (intra-industry)	Vertical (inter-industry)
Pecuniary		Increase in the demand for labour and other intermediates Production of high-quality or cheap intermediates
Non-pecuniary (technological spillovers)	Imitation/demonstration effects Labour turnover Competition effects	Backward and forward linkages (when the transfer of knowledge is not paid)

Figure 3: The FDI induced effect taxonomy of Resmini (2019).

Furthermore, Javorcik stresses the MNE impact at the micro-level and distinguishes few effects on the host economy, such as the creation of jobs and greater job stability, better wages, productivity enhancement, demand- and supply linkages (due to demand of certain goods and services) and diffusion of knowledge (Javorcik, 2015).

At the regional and national level, multinational presence can create jobs and therefore boost employment, stimulate an innovative climate, and purchase more local services (which boosts domestic industries). These effects overall improve the economy of a region/nation and are especially present in the service-sector and other knowledge intensive industries (Ascani & Iammarino, 2018). However, it must be noticed that these externalities are not straightforward and there is no automatic effect. There are a lot of moderating factors at different spatial scales, such as policies, institutions and markets that might affect the reception and integration of these externalities (Javorcik, 2015).

Also, relevant is that according to Asmussen et al., (2020), creating attractive power among nations, regions and cities, is the fact that multinationals value certain conditions that favors them and points them into the direction of relocating in that specific place. Therefore, nations and regions can be anticipative towards this by creating a multinational serving environment. (Asmussen et al., 2020). This article stresses the importance of the presence of advanced producer services, a strongly embedded and well-functioning international infrastructure and (cultural) cosmopolitan environment in order to attract multinationals and FDI. These three factors can help reduce the liability of foreignness, which is the term used for the price multinationals pay to operate abroad (in terms of economic, political and cultural differences that create a knowledge gap) (Asmussen et al., 2020)

Among the externalities that multinationals can cause in a certain place, is knowledge diffusion, which can effectively be spilled over by the multi-locational advantage the MNE has. This is translated into them being a so-called "global pipeline", transferring knowledge from multiple locations into the local environment (Crescenzi & Iammarino, 2017; Ernst & Kim, 2002). These knowledge spillovers can have a lot of local impact. The spilling over of knowledge from MNE's to domestic firms can be found in both intra- and inter-industry effects as intra-industrial spillovers can lead to demonstration effects, competitions effects and labor market effects and inter-industry spillovers can occur in technologically related industries (Resmini, 2019). More theory on this will be provided in the next section as knowledge spillovers will widely be studied and put into perspective as for this research since this is the core focus of this research.

3.2. Knowledge Spillovers

3.2.1. Finding grip on different forms of knowledge spillovers

Now that theory on multinationals have been analyzed, we have come to the point where the latter part of the theoretical framework will provide insights on spillover related variables that are relevant for this research. Since the research goal was to analyze how knowledge spillovers from multinational enterprises to domestic firms flow, it is relevant to distinguish different kinds of knowledge spillovers on which attention should be paid.

As mentioned in section 3.2, multinationals overall have a large impact on the place of relocation. We define both externalities and more-specific knowledge spillovers as relevant for this matter. The impact of externalities, as described in 3.2, can have multiple meanings among which knowledge spillovers is one. Knowledge spillovers can flow between firms in the same industry (intra-industry). But besides these vertical linkages in the same value chain, there are also externalities that might flow between different value chains (horizontal spillovers) that are technologically related (more will be explained in section 3.2.3.).

Therefore, this section will further focus on knowledge spillovers. From an economic geographic perspective, knowledge spillovers are simply the process of knowledge indirectly flowing over between firms, which distinguishes them from knowledge transfers which are a result of conscious forms of knowledge transferring (Qian, 2018). The following selection of spillovers is ought to be interesting: Intra-industry, being vertical spillovers, attention will be paid to demonstration- and competition effects, labor dynamics, cooperation and demand-supply linkages between domestic and multinational enterprises (Smeets, 2006). Inter-industry, being horizontal spillovers, knowledge spillovers can be present as well, therefore theoretic principles of technological- and skill relatedness will be highlighted (Qian, 2018).

3.2.2. Different form of knowledge spillovers

Demonstration Effects

The first knowledge spillover channels are spillovers flowing as a result of demonstration effects. These effects are the adaptation and imitation of certain products and techniques that the multinational enterprise implements. Since new technologies and products might not be financially beneficial and very riskful for domestic firms, these effects can help them encourage development by copying certain techniques and products (Djulius, Juanim & Ratnamiasih, 2018; Li, Zhang & Lyles, 2013). This spillover is a non-market mechanism and the effect will eventually enhance greater productivity and/or efficiency in the production process of domestic firms (Demena, Murshed, 2018). Demena & Murshed (2018) also found that the benefits as received from demonstration effects are highly effective in advanced technology e.g. complex industries. Moreover, positive demonstration effects occur more frequently in industries that are technologically related and are not only restricted to high absorptive capacity firms as low capacity firms also benefit from these effects (Demena & Murshed, 2018). Also, negative demonstration effects can lead to failure among domestic firms as techniques and products are not correctly imitated or do not fit into the business structure of domestic firms (Li, Zhang & Lyles, 2013).

Competition Effects

Competition effects are a logical result of enhanced competition in a region. This mechanism finds its core in stimulating productivity enhancement of domestic firms as a result of increasing competition. Consequently, better technologies and management practices are developed (Djulius et al., 2018). Part of this competition effect lies in the desire to cooperate with a multinational corporation in terms of buyer-supplier linkages. Yet, multinational corporations value higher quality standards and products, therefore it is relevant as a domestic firm to be highly developed in terms of products and techniques. This phenomenon thrives on competition among domestic firms (Alfaro-Urena, Manlici & Vasquez, 2020). Also, it must be noticed that competition effects only account for intra-industry knowledge spillovers since competition with other industries is not possible.

Buyer-Supplier effects

The third knowledge spillover channel are buyer supplier effects or linkages. Buyer-supplier linkages can also be interpreted as backward- and forward linkages in the value chain which simply reflects on relations between buyers and suppliers in (or between) value chain(s), often being domestic and multinational enterprises. Several studies have outlined the positive impact that multinationals have on the export of domestic firms. Being forward linkages, not only can domestic firms enter the export market easily because of the supplying to foreign firms- which reduces costs such as network- and infrastructural costs (Djulius et al., 2018; Keller, 2021). Also, being backward linkages, multinationals can serve as suppliers to domestic firms which stimulated higher revenues, but once again offers an advantage of eventual imitation effects while learning from these products. Noticeable is that therefore buyer-supplier linkages can also occur in the same industry. Thus, buyer-supplier linkages can stimulate domestic productivity enhancement and new technique development due to both supply and buy sides within the value chain (Djulius et al., 2018). To put these effects into perspective, Alfara-Urena et al. (2020) stressed the impact that these vertical linkages have, by analyzing that domestic suppliers to multinational enterprises had “33% higher sales, 26% more employees, 22% more net assets, and 23% higher total input costs”, than domestic firms who did not supply to multinational enterprises (Alfara-Urena et al., 2020, p3). One pitfall of domestic firms is that the pressure to adapt fast to the desires and requirements of foreign subsidiaries can cause negative consequences (Alfara-Urena et al., 2020).

Labor dynamics

The last knowledge spillover channel is labor dynamics. This effect can be translated into labor dynamics with for example ex-employees transferring knowledge between firms. Simply put, this occurs if a domestic firm hires an ex-multinational employee which consequently applies its knowledge from its employment at the multinational to the domestic firm (Djulius et al., 2018). Overall, labor flows between firms stimulates productivity because it enhances new ideas and techniques to be implemented. Especially in large regions, there are often large flows of labor mobility which is likely to trigger positive development (Kuusk, 2021). A last interesting theory is that of spinoff- dynamics. Spinoffs are a group of firms which are usually established as a result of labor dynamics. In large corporations, there are often disagreements on certain factors which lead to employees leaving the firm (Klepper, 2007). If such an employee chooses to pursue its own beliefs in terms of production processes and techniques,

one can start an own firm in the same or sometimes different (related) industry. This is called “spinoff dynamics” (Buenstorf & Costa, 2018).

3.2.3. Inter-industrial knowledge spillovers

Knowledge spillovers, besides intra-industry (in the same value chain), can also occur through the same channels (as analyzed above) between different but related industries, but the direction and functioning of these spillovers should be put into perspective. This accounts for demonstration effects, buyer-supplier linkages and labor dynamics, but not for competition effects (since competition can only take place in the same industry). Knowledge spillovers can flow between different industries because there might be an overlap (relatedness) between different industries based on what technologies and skills are used in both. According to Doring & Schnellenbach (2006), research & development intensive firms are partly dependent on inter-industrial knowledge spillovers and that these spillovers have a positive impact on the patenting numbers of small- and medium sized enterprises (Doring & Schnellenbach, 2006). Therefore, these spillovers should be considered as relevant to this research.

Technological and skill relatedness

Several scientists have outlined the following theory that is relevant in the case of inter-industrial knowledge spillovers. They argued that because of the complex nature of certain industries (like the life science industry) they can be technologically related due to an overlap of certain techniques and mechanisms that frequently prevail in those industries (Rigby, 2015; Balland et al., 2019; Kogler, Rigby & Tucker, 2013). For example, there might be certain techniques and mechanisms that are utilized in the high tech industry that might be beneficial to the production and process mechanisms of life science. This is very interesting given the fact that since there is an overlap between industries, knowledge spillovers might also flow between different but technologically related industries, also called “inter-industry spillovers” (Cortinovis et al., 2020). Additionally, this “technological relatedness” is mostly translated into skill relatedness. Skill relatedness, according to Neffke & Henning (2013), is entangled in human capital. Their study analyzed that places are more likely to develop into other industries based on a degree of overlap in the human capital, called related diversification. Crucial for this research, is that since industries are more likely to develop into a related industry, this profound overlap of human capital used in both industries can lead to the exchange of certain knowledge spillovers between those industries (Neffke & Henning, 2013).

Inter-Industrial spillover channels

To put this theory into perspective regarding the inter-industrial knowledge spillovers, the same channels as with the intra-industrial spillovers will be analyzed (except for competition effects). Demonstration effects can also flow between industries, since certain techniques and products in complex and highly innovative industries can be used in other technologically related industries, it is possible that certain products and techniques are imitated and copied from related industries, since their technological composition might be applicable to related products/techniques (Hamida & Gugler, 2009).

When it comes to buyer-supplier linkages, these account for both linkages in the same value chain (intra-industry) as inter-industry effects, as the exchange of certain products and

techniques through buyer-supplier linkages are not only beneficial to same industry- but also other industry firms (Keller, 2021). Once again, these buyer-supplier linkages can stimulate productivity enhancement and new technique development in domestic firms due to both supply and buy sides with other industries (Hamida & Gugler, 2009).

Labor dynamics can also result in inter-industry knowledge spillovers since human capital that was obtained in one industry, might also be beneficial to other industries. If labor dynamics find place between industries, knowledge can flow between these industries accordingly. This lies in the fact that human capital in certain industries might result in skill relatedness with other industries (Neffke & Henning, 2013)

3.3. Conditioning variables at firm level

Now that multinational impact, through externalities and knowledge spillover channels have been analyzed, it is interesting to analyze conditioning variables at the firm level that have an effect on knowledge spillover channels. There have been identified two subtopics. First, entrepreneurship and how an effective entrepreneurial ecosystem can be crucial to the direction and flowing of knowledge spillovers will be closely analyzed. Second, there will be zoomed in on the absorptive capacity of a firm depending on these conditioning variables at firm-level

3.3.1. Entrepreneurship; The Entrepreneurial Ecosystem

In this section focus will lay on a few conditioning variables at firm-level that enable knowledge spillovers to flow more easily. A first essential thriver of an innovative climate in a firm can be related to entrepreneurship and the entrepreneurial ecosystem since entrepreneurs shape and structure the image and way of operating in a firm. Also, entrepreneurial attitudes shape economic ecosystems as for example ambitious entrepreneurs focus on achieving substantial growth, innovation and internationalization than an average entrepreneur (Stam, 2015). Moreover, entrepreneurs can be crucial to innovation in a region as they often exploit opportunities and therefore might result in new high growth start-ups. Consequently, a firm's innovative performance partly depends on comprehensive and appropriate entrepreneurship. Also, Yi et al. (2021) have studied that innovative entrepreneurs are more likely to be successful and innovate if they are clustered in space (Yi et al., 2021).

What lies at the core of successful innovative entrepreneurship, is the entrepreneurial ecosystem. This ecosystem consists of a few framework and systemic conditions which will eventually stimulate entrepreneurial activity and therefore value creation (innovation). Being framework conditions, Stam (2015) identified a few social and physical conditions that enable human interaction and therefore facilitate economic growth. These conditions are the presence of (formal) institutions, culture, physical infrastructure and demand (Stam, 2015). More interesting and relevant for this research are the systemic conditions that are enabled due to the existing framework conditions. These will now be separately analyzed because they are crucial as conditioning variables for knowledge spillovers at the firm level. Entrepreneurship has already been analyzed in this theoretical framework resulting in the fact that the active role of the entrepreneur is crucial in determining a firm's research & development climate and strategy. Moreover, according to Qian (2019), the networks, the financial situation of a firm and human capital (talent & skills) are also key factors in enabling

knowledge spillovers to flow more easily and therefore offer possible opportunities and/or barriers for knowledge spillovers to prevail (Qian, 2019).

3.3.2. Networks

Networks reflect on an entrepreneur being well- embedded and connected in a region. In places with a high network density, reflecting a high level of human interaction, knowledge is more likely to flow in that place due to more face-to-face contact and therefore enables knowledge spillovers (Dahl & Sorenson, 2012). Networks enable exchange effects, which can be referred to as effects that range from the provision of concrete resources such as employees and intangible resources, such as knowledge (Davidsson & Honig, 2003). They can be categorized into different kinds of networks depending on the stage of the firm and the entrepreneur. There are for example personal networks, business networks, strategic networks etc. Moreover, networks as a form of social capital enable entrepreneurs to better explore and exploit new business opportunities therefore stimulate innovation (Davidsson & Honig, 2003; Dahl & Sorenson, 2012).

3.3.3. Financial situation

As mentioned before, there is a lot of venture capital as small- and medium sized enterprises often lack the financial capacity to bring a product or technique onto implementation and are therefore cooperating with multinationals. According to Stam (2010), liquidity constraints often result in a factor disabling entrepreneurs from successfully developing their businesses. Therefore, new firms often enter the venture capital market to bridge the financial gap. But venture capital markets are not spatially equal and differ from place to place which causes an uneven regional distribution of capital intensive start-ups (Stam, 2010). Also, the access to financing is crucial for the long-term span of large and uncertain entrepreneurial projects and if this lacks, the long-term project is more likely to fail (Stam (2015)

3.3.4. Talent and knowledge

The presence of talent and knowledge in knowledge-intensive industries logically is the most crucial asset of the entrepreneurial ecosystem. In such industries, a diverse and broad presence of skilled people is crucial (Rabbi et al., 2015). Therefore, being located nearby universities, or having a high-skilled labor pool is highly necessary for life science firms. Knowledge does not only refer to knowledge specific production techniques but can also be found in domains of management talent, technical talent and experience within the company to gain awareness of how the company functions (Stam, 2015). The entrepreneur must therefore invest in talent as it is obliged for its firms functioning. The attracting, selecting and developing of the best strategic employee choices therefore is a must (Rabbi et al., 2015).

3.4. Conceptual Model

Below, a detailed conceptual model of the concepts of the theoretical framework is illustrated.

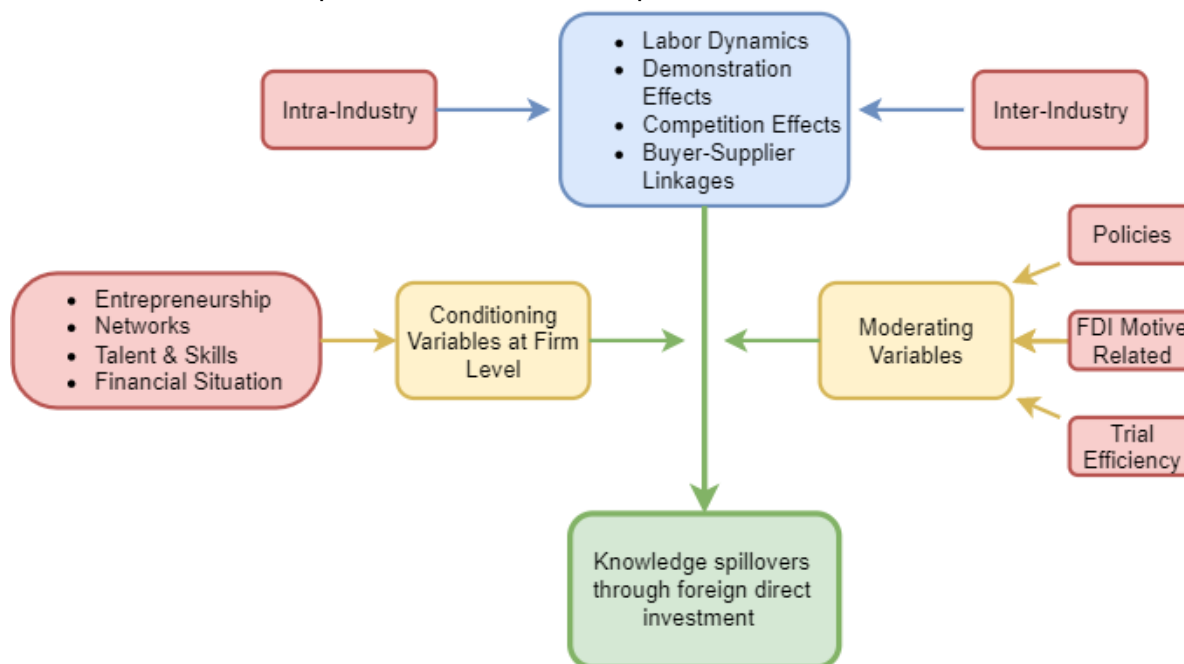


Figure 4: Conceptual Model of the Theoretical framework on Knowledge Spillovers

Figure 4, the conceptual model is illustrated to summarize the core concepts of the contextual and theoretical framework. Comprehensively summarizing all related (non-)scientific topics, this model reflects on the directions and relations between variables. The dependent variable, the flowing of knowledge spillover in this research, depends on many conditioning variables at firm level both as moderating variables as policy, regional and FDI related variables, therefore these are framed as directly affecting the relation between the dependent and independent variable(s). Being moderating variables (as selected and analyzed in section 2. and 3.1.2.), policy, efficiency and FDI motive related variables (motives and forms of cooperation) can have a moderating effect on the dependent variables and are therefore possibly affecting the relation between the independent- and the dependent variable. Last, the knowledge spillovers account for both inter-industry and intra-industry relations and therefore these will both be analyzed

4. Methodology and Operationalization

This section will provide the methodological justification of this research. Information will be given on the data collection process. Therefore, distinct units will be explained such as the respondents and how they were selected and recruited. Also, the justification of the core research will be given all inside the framework of the central question of this research. Research ethics will also be integrated into this section. This methodology section will therefore imply the specific data-generation methods and engagement process being used in this research throughout a critical methodological scope.

4.1. Methodological justification

At first, it is to justify which form of empirical research this thesis will adjust. After the theoretical framework, the decision has been made to do qualitative research. Since the goal of this research is to find out the impact of multinational presence on knowledge spillovers to domestic firms in the Netherlands, qualitative research is best suited within the ranges of this research because of the following: qualitative research is the best way to collect data in an explorative way. Conducting interviews can be a way of data-collection where stories and human experience are central, which will eventually say more about the “why and how” of specific topics, which is often lacking in quantitative research. By directing an interview, of course between the framework of a self-composed topic list, respondents are allowed to tell stories and give broader information on specific topics. This can lead to new insights which have not been found yet. Consequently, existing theories can be substantiated, contradicted or supplemented. Moreover, this qualitative approach will add a new analysis to the widely used quantitative approach in the knowledge spillover scientific field, in which the focus has been on quantitative (mainly patenting and dataset related) analysis.

Therefore, after extensive literature research into the different aspects of the main question of this research it is concluded that semi-structured in-depth interviews will be this research’ method. The goal is to hold such interviews over several life science companies active in this sector in the Netherlands. By conducting these interviews with respondents with leading and prominent roles within the company, in this way, insights and analyses can be collected by gathering information from people who know best how their companies are functioning and what possible knowledge spillovers there are. By using in-depth interviews, the goal is to coherently listen to stories of people from within board functions of the companies. These interviews will be semi-structured which means a topic list for the interviews will be set up, but the respondents are able to tell stories and give their impressions. In doing so, this strategy is consistent with the ontological and epistemological positions and perspectives which this research is embedded in.

4.2. The respondents and process of interviewing

4.2.1. Who and Why?

As for this research, people from upper layers within the domestic life science companies, for instance from the board of the company such as CEO’s were interviewed. They were selected because of their representative position meaning that they have correct inside information about what economic and innovation processes are playing within the company. They might

also give information on the conditioning variables at the firm level such as entrepreneurship, finance and networks. Therefore, 8 interviews with respondents from within board functions of life science companies were held. To be more selective and narrow down the geographic field of this research, the place of choice for this research is the Netherlands. The choice was explicitly not made to focus on one cluster or city region such as Amsterdam. This is because of the fact that geographical proximity is not the only proximity that is relevant in carrying out and facilitating knowledge spillover. Moreover, technological, institutional and structural proximity are relevant as well. Furthermore, there are many life science clusters present in the Netherlands but cooperation and knowledge spillovers are not strictly bounded by this geographical distance. Therefore, all Dutch small- and medium sized life science firms belong to the selection group. Besides the interviews with 8 firms, also one institution called "Holland Bio" was interviewed. Holland Bio is an interest group and connects life science firms in the Netherlands. They strive towards a life science industry with the goal to optimize efficiency, sustainability and economic growth by connecting, coordinating and helping life science firms. This interview was useful for this thesis as it enabled to look down at the results from the respondent' firms from an overall perspective.

4.2.2. Data-collecting process and research ethics

In figure 5, you can see a compound overview of all subsectors within the life science firms. Under biotech and pharmaceutical firms fall sub industries like drug delivery, bioinformatics and bioelectronics and industrial biotechnology. This figure is meant to illustrate the rich diversity that the Dutch life science industry offers as subindustries like industrial biotechnology, food and nutraceuticals, drug delivery, cosmetics and therapeutics are all part of it.

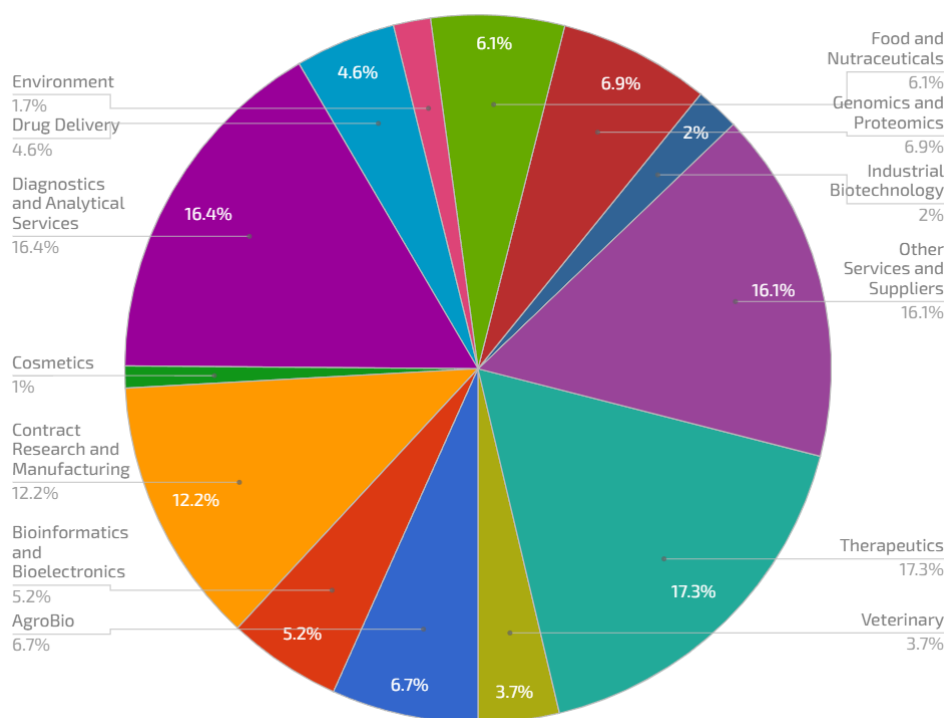


Figure 5: Sub-industrial composition of the Dutch Life Science industry (Holland Bio, 2022).

Since the life science is such a diverse industry and not firms from all subindustries were suited for participating in this research, this required a further selection process. As for the recruiting and selecting of the respondents, the data collecting process and recruiting of the respondents went as followed: Contact was made with a representative from Holland Bio in order to find a dataset with all life science in the Netherlands. After close contact, a confidential dataset was provided from 'Biotech gate'. This is an excel sheet with all present life science firms with additional information such as addresses, contact information and relevant information on the core activities of the firm. Besides, a more specified dataset which categorized all life science firms into subindustries, was provided as well. Out of the complete dataset, a selection was made based on three criteria. First, the firms needed to be autonomous and independent from multinationals meaning that they could not be a multinational firm themselves or be part of a MNE subsidiary, sister firm or subdivision because then knowledge spillovers from FDI firms to domestic firms would not be possible. Second, the firms needed to be research & development firms, with a requirement that they were R&D intensive firms focusing on innovation because in R&D firms knowledge influx is crucial to the performances of such a firm. Lastly, the firms needed to be biotech- and/ or pharmaceutical firms. After this selection, out of the complete dataset (over 800 firms) only 80 firms remained. Consequently, these 80 firms were contacted via email and 8 of them responded to be willing to participate resulting in a response rate of 10%. Since there is no strict minimum percentage for interview based research (since this is dependent on multiple variables and the total research population), it is hard to define the amount of interviews that are sufficient. Because the required amount of interview is dependent on the population and the population integrity (Vasileiou et al., 2018), a response group of 8 firms which resulted out of a population group of 80 firms is considered to be sufficient.

Following, meetings were planned, mainly via Microsoft Teams. In these video phone calls, the possible respondents were correctly informed on the cause and research goal of the research. Following ethical purposes, they were also informed on the possibility of making the interviews completely anonymous and that the information they provided would only be used for research purposes only. It must be noticed that the recruiting of respondents was hard as lots of possible respondents were busy with their companies and simply didn't have the time to take part in an interview.

As for the process of interviewing, the interviews were held via (video) phone calls. The upcoming trend of online meetings, due to the regulations and health measures regarding the COVID-19 circumstances, offered the possibility of taking the interviews online, which was less time-consuming and therefore favorable among the respondents. It must be noticed that the interviews were taken in Dutch. Beforehand, the respondents were informed that the core information of the interviews would be noted by the researcher for data analyzing purposes only, and approval was asked for this. Also, approval was asked for the recording of the Microsoft Teams Meetings, since these recordings were easier to be transcribed using a software program called "Amber Script". Furthermore, the received information from the respondents was not connected with personal and private matters and respect was shown towards the respondents as for the whole interview. The interviewing process was positive and most of them lasted for about 25-30 minutes each. The respondents were open and gave a lot of useful information on the research concepts without having to point them into the right direction too much and respect and a close ear was shown towards the respondents during

the whole interview. The specific topics of the interviews will be integrated in the operationalization part of this section.

4.3. Validity, Reliability and Representativity

As mentioned before, the process of interviewing was positive. The topic list was relevant in order to gain all the information out of the respondents. No specific questions were asked from the topic list but all of the topics were mentioned to the respondents. Consequently, the respondents gave me the data on the specific topics themselves without being too much directed by the interviewer. 9 interviews, as for this research, was enough. In the course of interviewing it became clear that after 9 interviews, no more different information and data was being collected. Therefore, it can be concluded that this number of interviews is sufficient. However no new insights were found after those 9 interviews, it can not be ruled out that pure methodological saturation was reached but 9 expert interviews with respondents in prominent positions in their firms seemed to be sufficient. As for the reliability, the respondents were all from people within board functions (mainly CEO's) of the companies which testifies the reliability. Because of their prominent position in the firm, they best know what economic and innovation processes play within their firm and are therefore best suited to comprehensively answer the questions. In terms of internal validity, being defined as the extent to which the observed results represent the truth in the population, this can be justified as sufficient as these 9 respondents all were situated in the same (life science) sector and all had, to some extent, experienced knowledge spillovers through multinationals and were situated in higher functions of the firms (board, CEO etc.). As for the external validity, being the representativity, of this research to other sectors: however this research and the methods used are explicitly focusing on the life science sector (specifically the biotech sub industry) in the Netherlands, the research can be conducted to other (e.g. related) sectors and countries/regions as well. Even though the core findings of this research are specifically oriented on the biotech sector, the framework to measure knowledge spillovers and what conditioning and moderating variables affect the direction and effectivity of the knowledge spillovers can be used to other complex and highly innovative and multinational rich industries as well. Therefore, findings and conclusions from this research are representative for these specific sectors only but the analysis framework can be conducted and put into perspective for other sectors as well.

4.4. Operationalization and Topic List

As for the operationalization of this research, the following information is necessary. The operationalization of concepts can be defined as a process in which the concepts of the research are put into perspective, in other words "operationalized". This is done by setting up indicators and evaluators which help to measure the concepts more easily in the final analysis. In qualitative research, therefore, operationalization is key in setting indicators to give meaning and definition to the concepts they want to analyze. Noticeable is that since the qualitative data in this research is explorative and gathered throughout "in depth" interviews, the operationalization of this research is not as specific and strictly framed as in quantitative research. Moreover, this operationalization will simplify the analysis by indicating which topics and indications to focus on. Hence, this section will provide the main concepts that are interesting in the process of giving meaning to the received data.

Main focus: relation between dependent variable and independent variable.

Respondents were asked to indicate their first experiences regarding multinationals, their impact and more specifically what knowledge diffusing role they play. As seen in the conceptual model the main concept to measure is the different channels and direction of knowledge spillovers through FDI. Therefore it was asked if, to their knowledge, they experienced any knowledge spillovers. If they indicated they did, then a positive relation could be measured. Specifically, for all four independent knowledge spillovers, it was separately measured meaning that respondents were asked (or told) whether:

- *Demonstration effects* were experienced and translated into additional knowledge through FDI.
- *Competition effects* were experienced and they thought that it stimulated productivity and innovation.
- *Labor dynamics* with FDI firms were an addition in terms of knowledge generation in the firm.
- *Buyer-Supplier linkages* with FDI firms enhanced productivity in a firm

Conditioning Variables: Firm-level variables

Before starting with the operationalization on the moderating and conditioning variables the following should be noted: the following section contains an analysis on whether different variables affect the probability of knowledge flowing between firms. However, the respondents were specifically asked about whether these variables had an effect on the effective integration of knowledge. The answers they gave, and so the data that was collected, did however not say anything (besides for a few exceptions which will be highlighted in the discussion) about eventual effective integration of knowledge, but provided some interesting results on whether independent variables had an effect on knowledge spilling over. Therefore, result sections on the conditioning and moderating variables will be written throughout the idea that these variables might affect the direction of knowledge spillovers and not (even though it was asked methodologically wise) whether they affected effective integration after knowledge influx. The operationalization of these variables can however not be changed since in the interviews (which are logically already held) it was measured as described below.

Moreover, if knowledge spillovers were indeed flowing from FDI firms to domestic firms, it was measured what conditioning variables within the domestic firm were having an (in)direct effect on the relation between the dependent and independent variables. Respondents were asked to indicate themselves, in terms of explorative research, what variables they valued as necessary to bridge new knowledge from outside their firm (thus being partly knowledge from multinationals). Furthermore, since concepts such as entrepreneurship and the financial situation were not easy to ask face to face ethically, these were measured indirectly by listening to the respondents closely throughout the interview and interesting insights were found on these concepts.

Moderating Variables

Lastly, the moderating variables were measured. As for the operationalization, these were asked separately by letting the respondents indicate whether they experienced policies at both national as well as European (in some cases American) level to be having an impact on the direction and influx of new knowledge from outside the firm. As for the Dutch policy specifically, information was asked on the "Topsectorenbeleid" and how they experienced the positive

impact of this policy. At the European level, it was asked if and how they experienced financial impact and an impact on the trial efficiency from European policies and regulations. Moreover, the trial efficiency was measured by letting respondents indicate whether they thought the (overall low in the industry, not firm related but a common industrial thing, frequently disturbed by regulations and other factors) trial efficiency had an impact on the direction and influx of knowledge spillovers. Finally, a close ear was paid in listening what the respondents indicated on certain motives and factors that were related to FDI firms that might have had an impact on the direction and influx of knowledge spillovers.

Topic List

To analyze and comprehensively cover all the concepts that needed to be measured, a specified topic list was composed which can be found in the annex. This topic list helped to order the semi-structured interview and make sure all components of the conceptual model were covered. Also, the more detailed questions are put in the annex. It should however be noted that these questions were not strictly followed as the interviews offered sufficient information on several topics and therefore not all questions were specifically asked to the respondents.

4.5. Data Analytics: NVivo 12

As for the data analysis, the software program NVivo 12 was used. This program helps to work more efficiently in terms of data analysis, with tools being accessible such as automatic coding, data importation and drawing relations between related concepts. In this way, the data analysis of this research was less time consuming. In NVivo, you can code different parts, sections or quotes to the different concepts in the code tree. Therefore, a code tree was created using the different concepts of the conceptual model. Eventually, after coding, NVivo creates a display in which the different references from different respondents are bundled based on their coding. This makes it easier to analyze concepts since bits of data are put in the same location. A picture of the NVivo display and code tree can be found in the annex of this thesis.

This chapter has framed the methodological justification in terms of this research. Now that the concepts have been operationalized, the data analytic tool has been explained and the methodological choices have been justified, the result section will now analyze the concepts by analyzing what the respondents have in common on these concepts.

5. Results

This section will provide the results as gathered from the interviews. As mentioned in the methodology part, the information from the respondents was analyzed with coding. In this process, a lot of useful information was gathered. This data will now be given in the form of results. The layout of this result will be based on the conceptual model so that all relevant concepts will be analyzed. In this way, the results will provide a layout by structuring basic to more profound concepts. Consequently, this chapter will be written in an integrative way, therefore comprehensively providing relations between different concepts. It should be noted that quotes integrated in this result section are all translated from Dutch to English, as all interviews were held in Dutch.

5.1. The response group

Resulting the response group, the following important data was collected. The response group was composed of people within board functions of the company, mostly the owners (CEO), or people at help desks or human resource functions. From the 8 firms, all of them were active in the life science and health sectors. More specifically, 7 out of these 8 firms had a specialization in the biotech- or biomedical industry. As for the size; most of the participating firms were small- and medium sized firms operating and had located their research & development centers in the Netherlands. As explained before in this research, since geographic proximity is not the only form of proximity relevant in the case of this research, the respondents were not necessarily geographically clustered meaning that the location of the respondents were not restricted to one region, municipality or cluster. Consequently, firms were analyzed from Amsterdam, Rotterdam, Leiden, Maastricht, Enschede and even Groningen. Also, most of the respondents acknowledged the desire to remain anonymous, therefore the results and especially quotes will refer to e.g. "respondent 1, 2 etc.." instead of quoting the respondents name and accessory firms. The outcomes of the interview with Holland Bio will be integrated along the different concepts as well.

5.2. First impressions on MNE impact and active cooperation

At first, all respondents indicated that there are, to some extent, multinationals operating in the same industry as them. This reflects on high levels of multinational presence in the industry. Moreover, their first impressions were quite positive as 6 out of 8 were cooperating with multinational enterprises and especially had buyer-supplier linkages with large multinational enterprises. Noticeable is that the motivations for the firms to cooperate with multinationals varied a lot. Thus indicated some of the respondents to cooperate seeking for knowledge and innovation, while others seek cooperation for more market-orientation purposes (since multinationals easily have access to large markets and have the financial capacity to carry related activities out) and financial purposes (since multinationals have the financial capacity to innovate more easily in terms of accessibility to certain machines and techniques). This is in line with the research from Deventer in which more venture capital and financial intervention of multinationals is present nowadays (Deventer, 2018). Also, some respondents indicated that they made use of multinationals by even carrying out parts of their production process by contracting licenses with multinationals since they offered higher levels of success rate than domestic firms. A supporting quote for this as indicated by respondent 3: *"So as a nationally operating firm we searched for an international firm to carry out parts of the research process, and this has everything to do with the fact that they have a higher scale of services in that sector"* (Respondent 3).

The other 2 firms who did not specifically experience active cooperation had frequent interaction with multinationals through meetings and congresses and buyer-supplier linkages. They experienced the multinationals' impact as positive, by making use of their role within the industry as knowledge "carrier", therefore interacting with them in meetings, congresses

frequently where knowledge exchange is the most crucial aspect. An example of a respondent, after indicating not to actively cooperate with multinationals: *“So we are learning intensively from the firms that are ahead of us to look at what they do, and there are also monthly congresses, so platforms where large parties in the industries are involved, to consult what is the most crucial aspect to demonstrate for our clinical picture”* (Respondent 1).

Furthermore, all respondents indicated that their firm, to some extent and through different framework channels (will be analyzed later), experienced knowledge spillovers flowing from multinational enterprises to their domestic firm, besides the case whether this was a consequence of active cooperation or more unconscious forms of knowledge spillovers. So the first impressions on the impact of multinationals on the industry can be analyzed as positive, as experiences of the respondents can be interpreted as positive, with high levels of cooperation as well as non-active forms of interaction leading to the multinationals having a positive impact on the small- and medium sized Dutch Life Science firms both as knowledge diffusers and financial supporters. Overall, these results are in line with the expectations that multinationals in this complex industry were thought to relocate due to strategic asset seeking purposes, looking for knowledge and other strategic assets on a long-term strategy (Bircan, 2019; Rana, Prashar, Barai & Hamid, 2020). Next result section will zoom in more on the direction and different channels of these experienced knowledge spillovers.

5.3. Different channels of knowledge spillovers

As mentioned in the previous section, all respondents experienced knowledge spillovers from multinationals. In the conceptual model, four main types of knowledge spillover channels are the concepts of focus in this research. Therefore, these will be analyzed separately; however a close eye will be paid towards potential overlap and relations between them.

5.3.1. Demonstration Effects

When it comes to demonstration effects the following analysis can be drawn. Interestingly, all the respondents indicated, to some extent, that they make use of certain products and techniques that other players in the market (among which multinationals) produce or have entangled in their production process. Consequently, the effect of this knowledge spillover eventually enhanced greater productivity in the domestic firms of the respondent. A lot of respondents indicated that they look closely at what the competition in the industry is doing and therefore analyze this as the learning effect from other (big) players in the industry is something that might thrive innovation in the firm. As a respondent said: *“Of course we do, it's the same as the bakery looking at the supermarket in the corner, we look at what they do, how they operate and then make sure that we provide the same quality as them. It's the same in our field: if they come up with a new machine or technique... can we copy that or can we add anything to it and in that way benefit from something”* (Respondent 6). Interesting is that the demonstration effects and the knowledge flowing over from these effects apply to both knowledge about the use of entire products or machines within the production process as well as the use of certain chemical and technical components within these specific production techniques (which is also a form of buyer-supplier effects as certain products and components are bought): *“there are certain pumping techniques such as insulin pumps and the mechanical components are derived from their products, so from these existing system of ours, some of it is derived from certain components”* (Respondent 5). Especially looking at multinationals, some respondents indicated that the demonstration effects were mostly present when they are connected with multinationals since these firms are mostly frontrunners in the industry: *“Look, some multinationals are currently operating in the same area of production techniques as us, and we want to benefit from this because they are simply ahead of us and we often make use of this”* (Respondent 1). This only accounts for the respondents who indicated that there are competitive multinationals and not for those who don't experience competition from multinationals since their business activities are very niche and therefore not much competition

is around. This analysis is in line with theories from Demena & Murshed (2018), Djulius, Juanim & Ratnamiasih (2018) & Li, Zhang & Lyles (2013) in which they indicated that demonstration effects are highly effective forms of knowledge spillover in technologically advanced industries. Overall, it can be analyzed that demonstration effects from multinationals are present and enable knowledge to flow between firms, therefore leading to more innovation. This happens more often when there are competing multinationals present who are frontrunners in the industry and knowledge can be transferred from both the use of entire production techniques and machines as well as the use of certain components (both mechanical and chemical).

5.3.2. Competition Effects

The channel "competition effects" was defined as the mechanism which finds its core in the fact that the willingness of domestic firms to cooperate or have "buyer-supplier" linkages with multinationals stimulates productivity enhancement of domestic firms as a result of increasing competition. The results from the respondents vary as for this concept. Around half of the respondents experienced these competition effects as positive for their innovation development: "Especially, the continuous development and related patenting of competitors in the industry leads to a thrive for more innovation among domestic firms. As indicated by a respondent: *"We experience a lot of competition in the preliminary phase, so with the publication of patents", "Yes a lot of competition is in the publication because you want to be ahead of your competitors, and this stimulates us to innovate more"* (Respondent 4). In the meanwhile, the latter did however not experience such an effect. This is because of the fact that some respondents and thus firms are in such a niche industrial environment where research and development is so complex and product/technique specific, that not many competitors are specifically present and if they are, tend to act not as competitors but as local cooperators therefore not being actors of competitive kind. A quote to illustrate: *"We work in a very innovative field. So we have a very open playground where no products are yet on the market. There are other actors who develop similar products among which a few international firms but they are in a phase of research & development just like us" "and we also cooperate with some of these firms"* (Respondent 3). Interesting is that the results regarding the competition effects are contradictory to what the theory indicated. According to Djulius et al (2018) and Alfaro-Urena et al (2020), competition effects are a consequence of the desire to cooperate with multinationals, however this is not the case in the Dutch life science industry. Concluding, if there is competition, this leads to more innovation but this is not specifically out of the motivation to eventually cooperate with multinationals, but to be the first in terms of developing a successful product for market implementation. If there is however less competition (in niche industries) this competition leads to more innovation but not out of necessity to stay ahead of (foreign) competitors. Since life science knows very complex sub industries, these are very niche industrial environments in which competition effects are restricted as competitors often are cooperators as well.

5.3.3. Buyer-Supplier Linkages

Buyer-supplier linkages with multinationals, simply put, are the least common forms of intra-industrial knowledge spillover as indicated by the respondents. Most of the life science firms of the respondents are firms that are still in a research & development phase, in which there are not many buyer-supplier linkages present since this is a highly innovative phase which is more experimental instead of relying on resources or market mechanisms. Moreover, since most firms are still in the development phase of their product, there is no product yet to be bought by the multinationals. However, there are few respondents who indicated they experienced some knowledge spillovers through buyer-supplier linkages. Active cooperation between the domestic and multinational can be seen as a form of buyer-supplier linkages, as not only knowledge is transferred but also sometimes certain products, machines, techniques are being provided by one to the other in this cooperation. This makes the buyer-supplier

knowledge spillover not a “pecuniary” form of multinational impact (market related) but is a more informal form of a buyer-supplier linkage stimulating knowledge and innovation. This is supported by the following quote: *“So we often deal with the big boys. It is hard to fight the big guys, this is because we don’t have a strict platform. This means we don’t have sufficient equipment, we only sell reagents and we use the equipment of multinationals we cooperate with”* (Respondent 6). This is in line with the theory from Alfaro-Urena et al. (2020), in which the backward linkages from the multinationals to the domestic firms stimulates innovation because domestic firms can eventually benefit from the products or equipment received from multinationals (Alfaro-Urena et al., 2020). Furthermore four respondents indicated to have a licensed contract with a multinational as *“it is beneficial in terms of finance to bundle together with multinationals because they have larger sales channels”* (Respondent 6), which reflects on domestic firms selling their product via multinationals. However, this kind of buyer-supplier does not directly thrive knowledge spillovers but can indirectly lead to more economic growth in the domestic firm eventually leading to more innovation and development. This again is in line with the theory from Djulius et al. (2020). Concluding, the analysis shows that buyer-supplier linkages between multinationals have a limited direct impact on knowledge spillovers compared to other forms of knowledge spillovers. However, the indirect consequences, as in more realized sales via multinationals and the influx of machinery and necessary products to support development purposes, might lead to more (effective integration of) external knowledge.

5.3.4. Labor Dynamics

The last knowledge spillover channel is labor dynamics. Labor dynamics is the effect that occurs when, for example, ex-employees transfer knowledge between firms by getting employed at a domestic firm while previously working for a multinational. Interestingly, all of the respondents indicated to have experienced a certain extra expertise when it comes to knowledge that previous multinational employees had. Moreover, a lot (6 out of 8) of the respondents (mainly CEO’s) indicated to have worked at large multinational enterprises themselves and that they gained knowledge there which they thought to have a significant impact, being an addition in terms of knowledge development, in the domestic firm. They indicated that they wanted to start a new firm in a different sub industry then their prior firms and can therefore be considered as “spinoffs”, being in line with theory from Klepper (2007) and Buenstorf & Costa (2018). Besides the respondents, they have a lot of employees who previously worked at a multinational enterprise. To illustrate this: *“A lot of people, also who we hire, all have worked at multinational enterprises and that is the whole multicultural aspect and is of significance....to look at complex things in different ways with people who have very different backgrounds and different views”* (Respondent 4). Noticeable is that two respondents indicated they did not have any ex-multinational-employees in the firm and they expected this to be caused by their geographical proximity, as these firms were located in Groningen & Enschede. Overall, labor dynamics can be perceived as a very crucial form of knowledge spillovers from multinationals to domestic firms since knowledge is transferred along with the employment transfer and is often an addition to the firm which is also in line with theories from Klepper (2007) and Buenstorf & Costa (2018).

5.4. Inter-Industry knowledge spillovers

Section 5.3 focused on intra-industry knowledge spillovers, meaning spillovers in the same industry and/or value chain. This section will shortly analyze the results regarding the inter-industrial knowledge spillovers, flowing from multinationals from technologically related industries to domestic life science firms. First, it should be noted that this section will not focus on the competition effects, as competition with other industries would be an interesting yet difficult concept to approach and analyze. Moreover, labor dynamics will not be analyzed in this section as no respondents had experienced inter-industrial labor dynamics which were an addition in terms of knowledge development. This is contradictory with theories from Neffke &

Henning (2013) who indicated that labor dynamics are a frequent form of inter-industrial knowledge spillovers in complex industries.

When it comes to demonstration effects and buyer-supplier linkages, being the most frequent forms of inter-industrial knowledge spillovers, the following interesting analysis was drawn.

Nearly all respondents (except for two) indicated to experience demonstration effects in gaining knowledge. In very complex industries, such as the life science industry, there are certain techniques from other related industries that might be very useful to existing production techniques in the life science firms. The copying, imitating and adapting of various techniques from very different sectors was used a lot of by the responding firms. To give a few examples: *‘We work with antibodies and to inject intra articular joints; for rheumatism we need a delivery mechanism. This delivery mechanism, we get it from multinationals in the polymer industry, so a very chemical industry’* (Respondent 2) and *‘You can see it also in artificial intelligence, we use a lot of AI in biotech at the moment, you have for example cells on a chip and in this way you can recreate a piece of cartilage’* (Respondent 7). Other respondents indicated they have made use of big data and machine learning. As indicated by Keller (2021) and Hamida & Gugler (2009), this exchange of knowledge cross-industry, might be beneficial to firms as they stimulate new technique development (Keller, 2021; Hamida & Gugler, 2009). Also, not only demonstration effects, but also some buyer-supplier linkages lead to inter-industrial knowledge spillovers. This can be drawn from the first quote above as certain products and components are delivered by large multinational enterprises which reflects on a buyer-supplier linkage. However this is only experienced by 3 out of 8 respondents while the demonstration effects were experienced by 7 out of 8 respondents.

5.5. Moderating Variables

5.5.1. Dutch Policies

When it comes to Dutch policies as a moderating variable on the knowledge spillovers, the experiences were mixed. The most relevant policy when it comes to innovation and subsidies in the Netherlands is the Topsectorenbeleid and the respondents were asked to talk about this. Focus was laid upon two sides of this policy, as one focuses on stimulating innovation through knowledge exchange- and cooperation (also between local firms) with knowledge institutions and universities. 7 out of 8 respondents indicated to experience a positive impact of this policy in enabling them to experience more knowledge spillovers due to networking and cooperation: *‘Yes, the universities cooperation is now maybe the most important form of collaboration to intensively and structural cooperate with universities.....and the policy has enabled this and pointed in this direction’* (Respondent 5), *‘Yes we have actors we meet and also funding which help us very much.. and we profited from this policy’* (Respondent 3), *‘Yes through this policy we get more in contact with big projects and it brings us more in contact with the latest developments’* (Respondent 4). As for the subsidiary part of the policy, there were surprisingly mixed experiences. All respondents indicated that they (desired to) made use of subsidies throughout the Dutch governments. However, 5 out of 8 indicated that the subsidies were often paid out with a delaying factor and/or often with a lot of restrictions to be eligible for these subsidies, which had a negative effect on the financial situation and therefore development of the firm: *‘Yes this was with a strong delayed factor... it could take a year before we finally got these subsidies.’* (Respondent 1). This resulted in a barrier for knowledge spillovers to flow because of an insecure financial situation. But also, 3 out of 8 respondents indicated to have experienced a positive effect of these subsidies as it helped them with their financial situation and thus simplified the opportunity to make use of knowledge spillovers. When this is compared with what the contextual chapter (section 2) has shown, it can be concluded that the direction of policies towards knowledge exchange through cooperation with universities, institutions and other local actors is positive. Moreover, the subsidies coming in through policy instruments are not beneficial which is also in line with Verhoeff (2019). This

was also indicated by Holland Bio, who referred to this as a logical problem since the provision of subsidies in such niche industries is hard because of the knowledge complexity which made it hard to correctly value a firm's proposition for a subsidy. Overall, as experienced by the respondents, the Dutch Topsectorenbeleid has had a positive impact in directing and coordinating domestic firms to cooperate with each other and with multinational actors, universities and institutions, but the subsidies often have reliability issues and are hard to be eligible for.

5.5.2. European Policies

As for the European policies, 5 respondents indicated to have experienced an interaction with European policies since the latter 3 only have restricted their production and R & D development to only Dutch jurisdiction. As for those 5 respondents, they all indicated that the strict regulations from the FDA were a delaying factor in certain business activities. *"So the quality systems have to meet very strict requirements and it is necessary to have all processes in order and documented"* (Respondent 6). This can be related to being a barrier for possible knowledge spillovers as knowledge might flow less fluent if there are a lot of restrictions and regulations. Analyzing the financial support from European policies, 3 experienced this as negative as the payments for the subsidies often come in very late: *"we had the settlements coming in yesterday from June last year"* (Respondent 2), therefore leading to financial struggles among some respondents, which was also the case with the Dutch policies.

5.5.3. Trial efficiency

First, the justification of trial efficiency as a moderating variable lies in the fact that since all interviewed firms experienced low levels of trial efficiency and theory supported this, this reflects on overall industrial low trial efficiency since in a R & D development, sometimes the realization of certain products and techniques is a time-consuming business. And so, being in line with theory (from Makady et al. (2019)) and expectations, all respondents indicated to (have) experience(d) low levels of trial efficiency. 5 out of 8 respondents are currently experiencing weak trial efficiency as their R & D development is entangled in very complex processes which might lead to the fact that major breakthroughs are seldom reached and they are in a business where repetition and the experimentation of new things is crucial to come to the desired product or technique. As one indicated *"you are busy with something and you don't know the end result... this goes wrong often and you have to start over again"* (Respondent 7). Also the other 3 out of 8 respondents who already have a market product running indicated their trial efficiency was weak when they were still in their developing phase. Therefore, the weak trial efficiency does not have a direct effect on the direction of FDI knowledge spillovers but it might be a barrier for knowledge spillovers to flow and is an important concept and will therefore be integrated in the discussion of this research. Also interesting is what was indicated by Holland Bio, as they said that knowledge often flows out of the Netherlands (to other countries, sometimes via multinationals) and that this has led to a "valorization" crisis in the Netherlands, as a consequence as an underdeveloped market orientation however the knowledge is here.

5.6. Conditioning variables at firm-level

5.6.1. Networks

The networks are defined as the local and regional cooperative actors that the firm is entangled with. Universities, institutions and other life science firms fall under this concept. Logically, all respondents indicated that strongly embedded networks serve as a key factor in enabling knowledge spillovers to flow. The direct networking with other multinational life science and especially biotech firms, and thus the impact on knowledge spillovers, was limited as only one respondent indicated to benefit from active cooperation with other firms in their industry.

However, a lot of networking took place through universities, institutions and congresses. Respondents indicated: *‘there are congresses, so platforms with a lot of parties involved among which QLP leaders and we discuss frequently’*, *‘My medical officer ... has tens of years of experience at NASH (large pharmaceutical firm)’* (Respondent 1), *‘So in this moment we have study trials in Cork, Glasgow and Chicago through a contract research organization’* (Respondent 3). Therefore, networks can be analyzed as having a positive effect on the flowing of knowledge spillovers since they enable domestic firms to interact (especially through congresses and universities) with multinational firms (in)directly. Also the active role of policies should be noticed as relevant since they direct domestic firms into local cooperation, therefore leading to the building of networks.

5.6.2. Talent & Skills

Talent & Skills is perhaps the most obvious conditioning variable as you need them both to be able to recognize the external knowledge that might be beneficial to the firm. Logically, all respondents indicated the presence of highly educated people with a lot of experience to be having a significant positive impact on the flowing of knowledge spillovers. A supporting quote *‘but it also a little bit of awareness and certain hunger to learn from other’* (Respondent 4). Interesting is, that all of the respondents indicated that talent among employees does not guarantee knowledge to flow into the company but that it need to be accompanied with strict entrepreneurship and thus guidance.

5.6.3. Entrepreneurship

The role of the entrepreneur, as indicated by the respondents, is also very important. They indicated that, if external FDI knowledge were to flow to a domestic firm, the role of the entrepreneur would be crucial in directing and coordinating this knowledge so that it would hopefully effectively reach the right places in the production process: *‘Sometimes you need to look at what knowledge from other projects you effectively use. So yes, that is always something for an advisor. To find a thorough balance of the knowhow, without wasting this external knowhow’* (Respondent 3) and *‘Yes of course you need to be able to focus, but you also need to be able to select the kind of knowledge. So I think that this selection is important as you get served 1000 things from outside the firm because the world is big’* (Respondent 2). This last quote also reflects on the absorptive capacity of a firm being dependent on selecting the right type of knowledge, in which the role of the entrepreneur is important as well, as indicated in previous research by Stam (2015) and Yi et al. (2021). It can be concluded that entrepreneurship is crucial in directing and selecting specific knowledge from certain knowledge spillover channels and therefore effective entrepreneurship can be considered a relevant variable in this by affecting the probability of certain knowledge to flow .

5.6.4. Financial Situation

Finally, the financial situation is a more complex one to analyze since this differs per firm. The financial situation of the firms who were already in a more advanced production phase, meaning already realizing market implementation (3 out of 8), was quite positive as they experienced high sales and therefore had a lot of budget to keep their R & D going. However, the other 5 firms indicated to sometimes experience negative consequences from their financial situation. As mentioned before in the Dutch policy section (5.5.1), the actualization of subsidies both from Dutch and European spheres is sometimes slow and full of strict regulations which makes it hard to make use of the positive consequences of this subsidies. Consequently this sometimes had a negative effect on external knowledge spilling over: *‘We are a R & D firm, so a lot of money flows in this industry and we need it but this money is not always in the firm. Big multinationals do have this financial capacity and it is easier for them to develop’* (Respondent 7). However, some firms experienced positive effects of subsidies and (European) grants as they really helped them to develop their production and

development processes and thus knowledge influx. A last important result is that two respondents indicated that a multinational enterprise invested in their firm (as a form of venture capital, being in line with theory from Deventer (2018)), which improved their study trails: *“For the studies we need money....we found international investors in the form of Johnson Johnson who are one of the biggest life sciences firms and they invested in us which is really good”* (Respondent 8). Overall, a positive financial situation has a positive effect on being able to let external knowledge flow into the firm and this is dependent on both subsidies and investments: *“You need to have the money to reach something, this is the highest priority to eventually absorb”* (Respondent 2).

Now that all results have been analyzed, the final section of this research will be the conclusions (where the research questions will be answered and results to be relativized to theory) and a discussion, in which limitations and recommendations for further research will be given.

6. Conclusions

This section will provide broader answers on the (sub)questions throughout the framework of the results from the previous section. At last, a discussion part will be added in which there will be written about the contribution and comparison of this research to ongoing scientific debates. It must be noted that the data collected in this research is valid for the life science sector only since this sector has certain specificities as defined in the theoretical framework.

As mentioned before, the goal of this research was:

“to analyze how domestic firms receive external FDI knowledge through knowledge spillovers that multinational enterprises bring to the life science & health industry in the Netherlands and what variables might affect these knowledge spillovers from flowing”

To realize this goal, four distinct sub questions and one main question were mentioned in the introduction. Those four sub questions will be answered using insights from the result section and so, this conclusion part will be written alongside the research questions.

6.1. Multinational enterprises as knowledge diffusers in the life science sector

At first, it can be concluded that multinationals are significantly present in the industry, as all respondents had experienced interaction with them and a lot of them even cooperated to some extent. The majority of the respondents have positive experiences with multinationals in this complex and niche industry as they serve both as knowledge providers, since their multi-locational knowledge input results in constant flowing of knowledge to smaller domestic life science firms, but also as large financial parties, who through their strong market position enable domestic firms to enter large markets and/or financially invest in these corresponding firms. Therefore this study shows that unlike theory from Seldeslachts (2021), the relationship between domestic and multinational firms is not that “exploitative” but instead they act as cooperative- instead of competitive actors. It should be noted in this case, that the amount of multinationals is often rather limited as the specific sub industries (for example molecular biotech) are such niche industries, that not many multinationals are likely to be entangled in the same industry. However, the multinational enterprises that are present in these niche industries are often crucial to domestic firms. Furthermore, for smaller domestic firms who do not benefit from active cooperation with these multinationals, their presence is more likely to be experienced differently. In their case, the market position of multinationals pulls away some possibilities for domestic firms for market entry and their highly developed innovation leads to them being more likely to (maintain) frontrunners. Therefore multinationals often stay miles ahead in producing new products or developing new techniques. Furthermore, when it comes to knowledge spillovers, whether this was a result of active forms of cooperation or buyer-supplier linkages or more indirect channels (labor dynamics and demonstration effects), multinationals play an important role in providing external knowledge to domestic life science firms. Therefore this thesis adds to the scientific debate in a way that it analyzes knowledge spillovers in a specific complex and research & development intensive industry thus being a case study. As where previous FDI spillover related research analyzed more the field of why and how multinationals spillover knowledge, this thesis adds another perspective on knowledge spillovers out of the view of domestic firms. With this said, **sub question 1: “What**

knowledge diffusing role do multinational enterprises play in the Dutch life science sector?”, is answered.

6.2. Forms of knowledge spillovers

Now that it is concluded that in this complex, sometimes niche industry, knowledge spillovers do flow from multinational to domestic firms, focus should be laid upon through which channels this knowledge flows. First, it can be concluded that through the many forms of active cooperation with multinationals, knowledge is flowing through more channels than were mentioned in the theoretical framework and thus conceptual model. Therefore this thesis adds to theories from Smeets (2006) and Qian (2018) that knowledge in more complex industries do not only flow through demonstration-, competition effects, buyer-supplier linkages and labor dynamics. Also, due to cooperation and interaction between domestic and multinational firms, knowledge flows through frequent meetings, large (inter)national congresses, and external studies (being orchestrated by a domestic firm but carried out by multinational enterprises). This can best be related to the “networking” concept with multinationals from the conditioning variable at the firm level section that has a positive effect on effective knowledge spillover integration.

Moving on to the knowledge spillover channels and thus answering **sub question 2: “how do different forms of channels facilitate knowledge spillovers from multinational corporations to small and medium sized domestic firms in the Dutch life science sector”**, it can be concluded that knowledge is flowing over through multiple channels. The demonstration effects and labor dynamics were the most frequent forms of spillovers with domestic firms often intimidating, implementing and consequently learning from certain production techniques and products of multinationals. Also, employees who were previously employed by a multinational enterprise, can really be an addition to a firm's knowledge climate as they are able to bridge this knowledge between firms therefore possibly adding certain knowhow which is beneficial to domestic firms. Buyer-supplier linkages and competition effects are less relevant as domestic firms often are in a developing phase without market interaction, therefore not being able to benefit from market-related buyer-supplier linkages. However some respondents were making use of certain products from multinationals therefore resulting in a private cooperative form of buyer-supplier linkage. Therefore, the outcomes of this thesis show that buyer-supplier linkages even in complex non-market (R&D) intensive industries, buyer-supplier linkages are still relevant however no market interaction is present. This thesis illustrates that multinationals. (who often have a lot of machinery etc..) act as providers (suppliers) to domestic firms which then might offer a possibility for knowledge to flow because of the availability of better equipment. Furthermore, competition effects were also rather limited as complex industries (such as biotech) are often very niche which results in low competition levels and if competition is however present, those competitors are more likely to be cooperative actors. When it comes to inter-industry knowledge spillovers, it can be concluded that only demonstration effects and buyer-supplier linkages are the only relevant forms of spillovers, as a lot of techniques and products from other complex but related industries are used such as robotics and chemical industries and certain products are implemented from other industries. Concluding, knowledge spillovers flow most effectively through demonstration effects (inter-industry especially) and labor dynamics, as this niche industry is often still in a development phase which counters the possibility to profit from market related knowledge spillovers such as buyer supplier linkages and competition effects. If

however a market entered phase is entered, buyer-supplier linkages and competition effects become more relevant in spilling over knowledge. These conclusions are relevant in a way that it lays emphasis on which knowledge spillovers in this industry prevail more and why. As where previous theories mainly focusses on identifying and framing different kinds of knowledge spillovers (Creszenci & Iammarino, 2017; Resmini, 2019; Roper, Love & Bonner, 2018), a major contribution of this research is that it, as for the life science industry, distinguishes more frequent from lesser forms of knowledge spillovers why. It therefore lays emphasis on several spillover channels and which ones prevail more and why.

6.3. Analyzing the moderating variables

To start off with the Dutch Topsectorenbeleid, it can be concluded that firms actively benefit from this policy by being pointed in the right direction in terms of innovative networking with universities, other (multinational) firms and institutions. However, the financial side of this policy is somewhat controversial as this often is a very time consuming and “regulation-full” process, often with a delay in payment which makes it hard for domestic firms to base long- and short term strategies on these subsidies. This also accounts for European policies. Moreover, the financial subsidies both from Dutch and European sphere can have a positive effect on knowledge spillovers, but only if the subsidies come in on time, are reliable and do not require to many strict regulations which results in a negative affection towards those policies (and consequently instead searching for private investors) among domestic firms. Therefore, this confirms theory from Verhoeff (2019) who also analyzed the restrictions from the financial side of Dutch policies. Going a bit further, this thesis adds to this that these subsidies restrictions can have a negative effect on the flowing of knowledge from FDI- to domestic firms.

Furthermore, the overall weak industrial trial efficiency, as experienced by all respondents and thus domestic firms, does not have a direct moderating effect on knowledge spillovers. However, knowledge is often interpreted and used wrong and the implementation and final role of certain knowledge might not reach its full potential, therefore negatively affecting the valorization problem in the industry as mentioned by HollandBio. Last, the role of multinationals' FDI motive can be concluded as having a positive effect on knowledge spillovers, as they seek for long term cooperation and invest in domestic firms, which reflects on their strategic asset seeking motive being beneficial to domestic firms in the industry since multinational firms might indirectly benefit from spilling over knowledge to domestic firms. This section has comprehensively answered **sub question 3: “How do moderating variables affect the probability of knowledge spilling over from multinational corporations to domestic small and medium sized life science enterprises”**.

6.4 Inside the firm, what affects knowledge spillovers to flow?

In answering **sub question 4: “What firm-level variables affect the probability of knowledge spilling over from multinational corporations to domestic small and medium sized life science enterprises?”**, it can be concluded that these conditioning variables at firm-level have turned out to be more control variables, since as expected, all of the analyzed concepts have (to some extent) a positive effect on the knowledge spilling over. Networks, with their bridging role between actors therefore offering possibility for exchange of (not only) knowledge, talent & skills which is logically crucial to be able to identify external knowledge

that might be useful and the role of the entrepreneur in coordinating the direction of knowledge spillovers are all crucial to the external FDI knowledge flowing into the firm. Furthermore, an insecure financial situation has a negative effect on the flowing in of external FDI knowledge as often access to machines and products is limited.

6.5 Main research question

Now that all sub questions have been answered and strict conclusions have been drawn, the main question can be answered which was:

“How are knowledge spillovers flowing from multinationals enterprises to domestic small- and medium sized enterprises in the Dutch life science sector”.

This study on knowledge spillovers in a complex industry has added to the larger scientific debate in a way that it analyzes knowledge spillovers throughout a more qualitative, explorative way, rather than working with large quantitative data such as patenting, surveys etc. From the outcomes of this research, it can be concluded that there is a severe impact of multinationals in this complex and niche industry. Domestic life science firms are often in a phase of R & D, in which knowledge influx and saturation is crucial to innovative development. Multinationals serve a facilitating role in this process as they not only actively cooperate and financially and/or market-related support firms, but also indirectly have an impact on domestic firms by causing the ability for domestic firms to benefit from demonstration effects (both intra- and inter industry), labor dynamics and to lesser extent buyer-supplier linkages and competition effects. It is the firm's capabilities and resources such as networks, talent, investors and the directing role of the entrepreneur that are crucial in enabling external FDI knowledge to flow through several spillover channels. Moreover, firms should be aware of the effects of weak trial efficiency and the somewhat strict regulations and insecure subsidies because they can have a moderating effect on the knowledge spilling over. Consequently, domestic firms should be able to learn from these results in a way that they gain awareness of how to make use of multinational presence in their industry.

Moreover, reflecting on the societal and scientific relevance, this thesis has contributed to both in the following way. In societal terms, this thesis has outlined a framework on how to make use of multinational presence in terms of knowledge spillovers by analyzing knowledge spillover separately (adding to previous research who didn't do this). Domestic life science firms can use this research in looking at how to realize certain knowledge spillovers to flow. Also, multinationals can learn from this thesis because they can reflect on what knowledge and channels domestic firms value from them. In terms of scientific relevance, this research has conducted a more qualitative way of analyzing knowledge spillovers in a technologically enhanced industry, as where previous research focused more on quantitative research. Therefore this research orientates on what domestic firms value from multinationals, how this knowledge is transferred between firms and what firm-level and moderating variables affect this relation, rather than only analyzing or framing different channels of knowledge spillovers. As indicated in the introduction, continuous innovation to keep up with the rapid technological changes in the life science industry is necessary, and knowledge spillovers in this case might offer possibilities for knowledge exchange therefore possible innovation. The next and last section will discuss the main limitations of this research, as well as the setting up of future research- and policy recommendations.

7. Discussion; limitations and recommendations

Section 6 has provided the main conclusions of this research. These conclusions and what this research has analyzed should however critically be analyzed. Therefore this section will outline the main discussions, implications and thus recommendations for further research. The comparison with previous knowledge spillover related research has been integrated in the result section.

Reflecting on the results and conclusions of this research, it should be noticed that the eventual knowledge diffusing role of multinationals were a bit different then expected. Multinationals in the life science industry often cooperate intensively with domestic firms and are therefore very much integrated. According to the respondents, this cooperation with multinationals lies in the fact that they seek for innovation as well as market orientation which reflects on them being strategic asset seeking multinationals, relocating their subsidiaries based on a long-term strategy. In hindsight, this made it relatively easy to analyze knowledge spillovers since multinationals are often consciously passing knowledge to domestic firms, therefore meaning that respondents were very aware of the knowledge spillovers in their industry/firm.

Looking at the internal validity of this research, it should be noticed that the outcomes are not having direct causal effects. This means that there can not be drawn any hard relations between knowledge spillovers and other variables. Since there might be other factors at both firm-, regional- and national level that might have an effect on knowledge spillovers, these factors might be relevant for further research. In terms of external validity, this research is only representative for this specific sector, as there was focused on the role of multinationals and moderating variables specifically. The framework for measuring spillovers, as well as the conditioning variables at firm level that might affect spillovers, can however be generalized to other industries as well. So further research might use parts of the conceptual model in qualitatively analyzing multinationals' knowledge diffusion role in other (knowledge intensive) industries.

Analyzing the limitations of this research, the following points are relevant. Looking at the core of the knowledge spillovers substantially was rough, since the industry is entangled in very complex and niche techniques which are difficult to understand for someone without any specific life science related knowledge.

This led to two limitations, first of them lying in the fact that a separate analysis on the effects of moderating and conditioning variables per knowledge spillover and the eventual implementation of this knowledge was hard to identify. Moreover, this would have been too time consuming. A recommendation for further research might be to focus even more on a specific form of knowledge spillover and lay attention on knowledge specific features, which is thus complex and this research should therefore best be carried out by someone with a life science professional background. For example it would be interesting to focus more on the specific role of inter-industrial demonstration effects of artificial intelligence and machine learning knowledge spillovers.

Secondly, a limitation of this research is that because of the fact that firms are often in a development phase, the eventual integration and final destination of external knowledge is (yet) hard to analyze and the experiences about this were therefore limited among the

respondents. It was therefore not possible to draw any conclusions about what happens with the external knowledge once it has arrived into a domestic firm. A solution for this would be to do a time-series research in order to analyze whether the external knowledge from multinationals, and therefore integration, reached its full potential and how. Future research might point out how firms eventually benefit from external knowledge and what knowledge specific components and conditioning variables inside the firm are noteworthy in this process. However no specific conclusions can be drawn related to the effective integration of the external FDI knowledge, there is a thin line in the data between knowledge influx and knowledge integration. Therefore some data from the interviews regarding this integration was collected that might be interesting and offer possibilities for future research:

There were a few variables which were indicated to have an effect on the direction of spillovers but do however also give some impressions about the effective integration of this knowledge. The knowledge flowing in through labor dynamics and inter-industrial demonstration effects were specifically indicated as these being an addition to the firms therefore reflecting (to some extent) on effective integration of that knowledge. Also, when it comes to the weak trial efficiency, this might however have an effect on final effective integration. Respondents indicated that they experienced weak trial efficiency what led to them not profiting from certain knowledge as in not knowing how to make use or to implement this. This reflects on the fact that due to this weak efficiency, the effective integration of external knowledge might be negatively affected. It was not the core of this research to focus on eventual effective integration of the external knowledge, but this information gives perspective for further research by measuring variables that might affect this effective integration.

Also, the outcomes of this research might be beneficial and useful to certain policy makers. Now that this research has focused on the role that multinationals play as knowledge diffusers, policy makers should be aware of this in directing domestic firms on how to possibly make use of this multinational presence. The experiences of the respondents on what knowledge spillovers were beneficial to them, offers the possibility for other domestic firms to benefit from this as well. Policies can therefore focus on pointing domestic firms into the right direction by showing them how to make use of certain (inter) industrial knowledge spillovers. The research & development intensive life science industry is perfectly suited for this kind of experimental orientation. Moreover, policymakers can learn from the experiences of the respondents towards the Dutch and European policy perspectives. Now that it can be concluded that subsidies are often not reliable and do require too many strict regulations, this results in a negative affection towards those policies among domestic firms. Policy makers can learn from this in improving the effectiveness of this policy instrument in order to make domestic firms benefit more from this. This will eventually also have a positive effect on the valorization in the industry, which was mentioned by Holland Bio as one of the main challenges in the industry. In doing so, more valorization in the industry will lead to more market implementation which will eventually stimulate economic growth and prevent knowledge from flowing out of the Netherlands.

8. Literature

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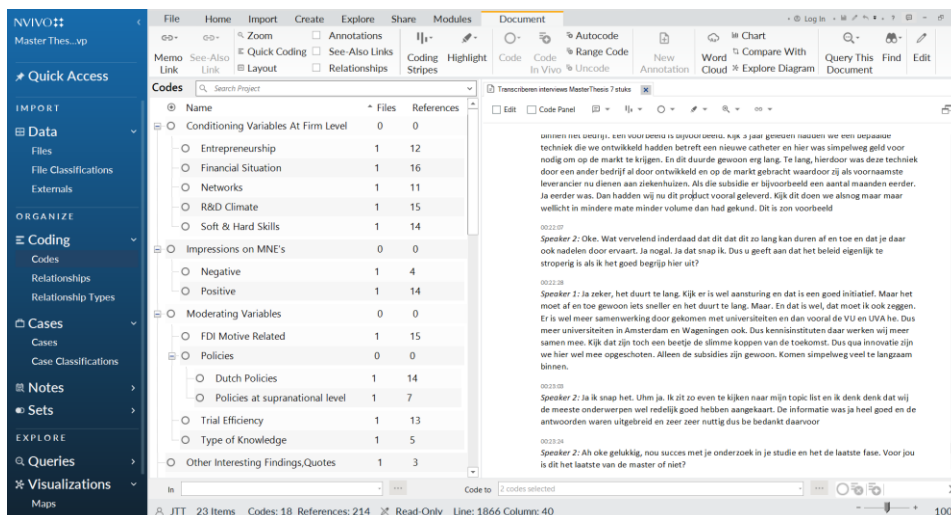
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9. Annex

9.1. Time Planning Thesis

Time Planning Master Thesis Multinational Enterprises						
DATE-TIMESPAN	Introduction	Theory	Methodology	Data collection	Results	Discus/Conclus
March	Start Introduction	Start Theory			Orientation DC	
March 8-17 FIELDTRIP						
End April	Concept Intro	Concept Theory			Start Surveying	
May 1-22	Finalizing Intro	Finalizing Theory	Start Methodology	Ongoing Surveying		
May 23-28 FIELDTRIP						
June 1-15			Concept Methodology	If necessary....	Start Results	
June 16-31			End Methodology	DC DONE	Concept Results	
July 1-15					End Results	Start Dis/Con
July 16-31						End Dis/Con

9.2. Interface NVivo



The screenshot shows the NVivo software interface. On the left, there is a sidebar with navigation options like 'Quick Access', 'IMPORT', 'ORGANIZE', 'EXPLORE', and 'Visualizations'. The main area is divided into two panes. The top pane shows a 'Codes' tree with a list of codes and their file and reference counts. The bottom pane shows a text document with several paragraphs of text, some of which are highlighted in blue, indicating they are coded. The status bar at the bottom shows 'JTT 23 Items Codes: 18 References: 214 Read-Only Line: 1866 Column: 40'.

9.3. Code Tree Nvivo

Name
Conditioning Variables At Firm Level
Entrepreneurship
Financial Situation
Networks
R&D Climate
Soft & Hard Skills
Impressions on MNE's

Name
Negative
Positive
Moderating Variables
FDI Motive Related
Policies
Dutch Policies
Policies at supranational level
Trial Efficiency
Type of Knowledge Spillover
Buyer Supplier Linkages
Competition Effects
Demonstration Effects
Inter-Industry
Labor Dynamics

9.4. Topic List Interviews

Introduction and exploration about the firm

- What firm are they
- What do they know about multinational enterprises > cooperation?
- Know if there are MNE' s present producing similar products? What do they produce / similarities with these MNE's

Explaining and questions on knowledge spillovers

- What they are
- Do they experience spillovers through:
 - Demonstration effects
 - Imitating products? Copying
 - Competition effects
 - Higher productivity as a demand for competition > buyer supplier
 - Labor dynamics
 - Cooperation
 - Inter-industry are there > > these same spillovers from other industries (explain very simply relatedness)
 - What are industries that are very related? Are there some techniques that can be used in your industry as well? If so, through what channels

Last, what kind of knowledge is flowing ? > about what to do? how to do it

If knowledge spillovers flow, I want to ask few questions on how its implemented > at firm level

- Absorptive capacity
- R & D climate/culture? Attitude, ontsponnen uit specifieke kennis
- Entrepreneurship > how do you guide effective integration of knowledge spillovers
- Finance > ask about their financial situation and subsidies
- Acquisition of talent & the presence of skills
- Networks > what networks are relevant, how do you cooperate in this networks, are MNE's involved?

At the regional level, might be variables that affect the probability of them flowing over, to what extent do they experience impact from

- Cooperation > venture capital > small firms don't have financial capacity to carry out the product > European Cooperation?
- Dutch policies? > role of Topsectorenbeleid > does this help to innovate and integrate knowledge spillovers better?
- European policies > do you experience european policy that "moeilijkmaken" de productie van bepaalde technieken en zo ja op welke manier?
- Lack of trial efficiency

9.5. Specific questions from interviews; Interview Guide

First impressions:

- What firm are they?
- What are your first impressions from MNE's In your industry/field and how they operate (to find out about FDI related motives)
- (if they are present) > What about cooperation and market-relations with those multinational parties (to find out about buyer-supplier linkages)?

Knowledge spillovers:

- Do you receive external knowledge from multinational corporations?
- Through which channels?
 1. Do you experience knowledge flowing over through demonstration effects?
 2. Do you experience knowledge flowing over through labor dynamics?
 3. Is there a lot of competition (also from MNE's) in your industry/field

Moderating variables

- What do you think about Dutch and European policy, does it work effectively, do you benefit from it?
- Do you think it has a positive affect on the effective integration of knowledge?
- No specific questions about weak trial efficiency because this might be sensitive information for the respondents but try to hint them towards saying something in that direction

Conditioning variables

- Could you indicate which variables inside the firm enable knowledge to flow between firms, which firm variables help improve knowledge flowing over? >> let them answer, better if they indicate it without being pointed into the right direction.
- If they don't know > ask them separately:
 1. How do you think present networks with other actors and firms affect the effective integration of knowledge spillovers?
 2. How do you think talent & skills inside the firm affect the effective integration of knowledge spillovers?

3. How do you think effective entrepreneurship affects the effective integration of knowledge spillovers?
4. Not specifically ask for financial situation > might be sensitive information > try to hint them towards saying something in that direction