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Environmental sustainability and reshoring in the automotive industry: a multiple cases study

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Environmental sustainability and reshoring in the automotive industry: A multiple cases study

Tim Benjamin Becker

A thesis submitted in partial fulfilment of the requirements of Sheffield Hallam University
for the degree of

Doctor of Business Administration (DBA)

June 2021

CANDIDATE DECLARATION

I hereby declare that

1. I have not been enrolled for another award of the University, or other academic or professional organisation, whilst undertaking my research degree.
2. None of the material contained in the thesis has been used in any other submission for an academic award.
3. I am aware of and understand the University's policy on plagiarism and certify that this thesis is my own work. The use of all published or other sources of material consulted have been properly and fully acknowledged.
4. The work undertaken towards the thesis has been conducted in accordance with the SHU Principles of Integrity in Research and the SHU Research Ethics Policy.
5. The word count of the thesis is 79,057.

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DEDICATION

I wish to begin by saying that this research would not be possible without the uncompromising support of many people. Unfortunately, for reasons of privacy and data protection, I cannot acknowledge every single participant who brought their profound experiences to the interviews. These people have put a lot of time into this research and have strongly contributed with their knowledge to this thesis. I truly appreciate your support and kindness, as I know that this is an additional effort for everybody.

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ABSTRACT

Reshoring – the reversal of offshoring strategies – referring to a firm’s decision to bring previously offshored manufacturing activities back or close to the home country has become a key theme in the industrial location literature. This thesis investigates the interdependence between reshoring, environmental sustainability and supply chain reconfiguration through a multiple case study in the automotive suppliers sector. The purpose is to explore the perception of environmental sustainability, to investigate reshoring decision-making and to analyse the need for supply chain reconfiguration in the context of environmental sustainability. Research is far from reaching an in-depth understanding of how reshoring decision-making takes place concerning environmental sustainability particularly in the automotive supplier sector. The thesis gathers qualitative data from 17 interviews with experienced managers from nine internationally-active, mainly Tier-1 automotive suppliers.

The level of influence of environmental sustainability on reshoring decisions is not near to the top but on the rise. Issues such as cost and quality, efficiency of operations and qualified employees are more important than environmental sustainability to strengthen competitive advantage. The conventional idea of reshoring does not apply very well to Tier-1 automotive suppliers, since a key concern is bringing manufacturing sites closer to the OEM or to other suppliers in the supply chain regardless of the supplier’s home country. The findings from the study are used to develop models and frameworks of both reshoring and the relationship between reshoring and environmental sustainability. This contribution to knowledge is used to develop propositions for further research. The findings are linked to management theories such as Transaction Cost Economics and the Resource-Based View to deepen the contribution to theory. Some of the models and frameworks, such as the drivers and barriers for reshoring and environmental sustainability, together with the decision-making process and decision criteria for supply chain reconfiguration, have been developed so they can be used by practitioners to assist them with reshoring and supply chain management activities.

Keywords: *Reshoring, environmental sustainability, supply chain reconfiguration, decision-making, automotive, suppliers, TCE, RBV*

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ABBREVIATIONS

ACEA	European Automobile Manufacturers Association
AS	Automotive suppliers
CEE	Central and Eastern Europe
CSR	Corporate Social Responsibility
DC	Dynamic Capabilities
EHS	Environment, Health and Safety
ELV	End-of-Life Vehicles Directive
EM	Entry modes
EMS	European Manufacturing Survey
ERM	European Reshoring Monitor
ES	Environmental sustainability
ESRC	British Economic and Social Research Council
EU	European Union
FA	Framework analysis
GDP	Gross domestic product
GE	General Electric
GMS	German Manufacturing Survey
LCA	Life Cycle Analysis
MBS	Munich Business School
MGI	McKinsey Global Institute
N-RBV	Natural resource-based view
OBB	Organisational buying behaviour
OEM	Original equipment manufacturers
OL	Organisational learning
NAP	National Economic and Human Rights Action Plan
RBV	Resource-based view
SCR	Supply chain reconfiguration
SD	System dynamics modelling
SHU	Sheffield Hallam University
SME	Small and medium-sized enterprises

SDG	Sustainable Development Goals
TBL	Triple-bottom-line
TCE	Transaction cost economics
UN	United Nations
UNCTAD	United Nations Conference on Trade and Development
VDA	German Association of the Automotive Industry
VSM	Viable system model

CHAPTER 1

“Offshoring’s impact on the world environment has been significant through higher carbon emissions and other pollution from developing countries and from long-distance transport. Supply chains are responsible for up to four times the greenhouse gas emissions of a company’s direct operations [...]. By shifting production from China to the consuming market, the U.S., companies can reduce the environmental impact of electricity generation, industrial production and goods transport. The quantity and types of packaging needed to transport those goods will also be significantly reduced. Shifting to a local-for-local business model will reduce CO₂-levels and achieve higher environmental standards sooner”.

Harry Moser | President of Reshoring Initiative (Moser, 2019, p. 1).

1 INTRODUCTION

The first chapter consists of six subsections and aims to provide a comprehensive explanation of the research objective, the research questions, the research methodology, limitations and constraints as well as the structure of the thesis.

1.1 Background and rationale

According to Barbieri et al. (2017) “location decisions of manufacturing firms are among the most debated topics in the international business and supply chain management fields” (p. 80). Tate (2014) adds that location decisions are important and continue to be of significant interest to both managers and scholars. Especially in recent years, the reduction of costs and the transfer of risks and responsibilities to offshore subsidiaries and suppliers were the main reason for these strategic decisions (Manuj & Mentzer, 2008). However, by today, literature has reported numerous reasons for relocating production sites back to developed countries from a previous location (Stentoft, Mikkelsen, & Jensen, 2016). Deciding on where to locate manufacturing sites is an important part of a strategy to remain competitive. Ketokivi et al. (2017) point out “locations decisions must be understood not just through the lens of economic attractiveness of one region or country over another, but also as a decision where many organizational and technological interdependencies become relevant” (p. 20).

“In response, [...] some companies have started to carefully re-think their supply chain configuration choices; privileging domestic and regional developed country production” (Orzes & Sarkis, 2019, p. 481). Managers have started to reverse previous outsourcing and offshoring strategies (McIvor, 2009). This trend for repatriation back into high-wage countries has become popular across all industries to get access to better-qualified employees and to gain competitive advantages. Locations that offer competitive advantages in terms of access to innovation, a proper infrastructure and a firm’s ability to react to sudden demand changes are of utmost importance for global operating organisations (Moradlou & Backhouse, 2016). Forty percent of managers perceive a trend towards reshoring and insourcing activities within five years after their initial decisions (Tate, 2014).

The phenomenon of reshoring also raises global questions towards the sustainable design of supply chains and the location where production sites are located – in particular – how CO₂-emissions are affected. Tate (2014) found out “heightened emphasis on sustainability [...] drove firms to re-consider the appropriate shoring decision” (p. 66). Heikkilä et al. (2018) stress that sustainability is a new motive for the relocation of manufacturing sites arguing that “repeated environmental [...] violation” (p. 382) indicates a need to reconsider production activity locations. The literature review from Sirilertsuwan et al. (2008) on *proximity manufacturing*, meaning the proximity between manufacturing sites and the consumption point, found that researchers have so far tended to focus on the economic dimension and have only marginally considered aspects such as the environment and social issues. Consequently, “sustainability is an important topic in supply chain management research and practice” (Busse et al., 2017, p. 87). Especially the relationship between reshoring, global supply chain reconfiguration (SCR) and environmental sustainability (ES) plays a significant role for reshoring decisions (Orzes & Sarkis, 2019). Future research should consider the “impact of environmental and social issues on location and relocation decisions” (Fratocchi & Di Stefano, 2019, p. 450).

On top of that, the *British Journal of Management* currently calls for papers on a special issue for *Reshoring and Sustainable Development Goals*. The motivation for the special issue is triggered by recent debates on deglobalisation, the global pandemic, political issues (e.g. president election in the US) and geopolitical uncertainties (e.g. Brexit). For instance,

political developments in the US have started to encourage firms to move production activities back to the home country, which has created 171,000 jobs in the US during 2017. Government incentives such as the reduction of corporate taxes has made reshoring more lucrative (Gupta et al., 2021). At the same time, the Brexit has also created some political uncertainty and caused pressure on supply chains. This geopolitical event has also caused many firms to reshore their operations back to the UK (Cumming & Zahra, 2016).

On top of that, the global pandemic Covid-19 triggered a push for reshoring to avoid supply chain disruptions. The impact on the global economy because of the pandemic forced firms to rethink business strategies. The pandemic expanded the challenges for firms in dealing with globalisation while considering sustainability (Gupta et al., 2021). “All combined, the crisis caused by pandemic highlighted inability of manufacturing facilities in different countries [...]. Gupta et al. (2021) go on to say that “the crisis created by the pandemic posits tremendous challenges for MNEs related to governance, reconfiguration of supply chains, and regionalisation” (p. 2). The United Nations Conference on Trade and Development (UNCTAD) (2020) predicts that until 2030 there will be a significant transformation moving forward “because reshoring will result in short and less fragmented value chains with higher level of geographical concentration [...]” (Gupta et al., 2021, p. 2). Particularly the events mentioned above will lead to a new wave of reshoring. Lastly, Gupta et al. (2021) point out the need to link research gaps on reshoring with crisis management and sustainability. The interdependence between reshoring and sustainable development could inspire researchers and scholars to study these phenomena. Gupta et al. (2021) furthermore stress, for instance, that the impact from reshoring on a society (i.e. well-being of humans and environments) as well as the balance between economic growth and sustainability must be elucidated.

1.2 Purpose of the research

Emerging literature has shown that no sectoral analysis or case study research with automotive suppliers (AS) exists taking into account the relationship between reshoring and ES. With respect to sustainability, Fratocchi & Di Stefano (2019) specifically stress that the environmental and social dimensions require further investigation in the context of reshoring. While reshoring may have a positive impact on the environment, it may affect the host

country's employment levels significantly. They also call for more research to examine host country activities and determine whether a manufacturing facility will close or remain. Following the findings from Ashby (2016), extant literature lacks understanding on the effect a sustainability-based reshoring has on the reconfiguration of local supply chains. In terms of the role of a corporate executive, Ashby (2016) and Engström et al. (2018) suggest that perceptions of sustainability are not fully understood in the context of reshoring. As far as reshoring decisions are concerned, Fratocchi & Di Stefano (2019) and Engström et al. (2018) do not only stress the importance of reshoring and sustainability decision-making processes, but also the interdependences with product-related issues (i.e. end-of-life or re-design).

Investigating the relationship of ES, reshoring and SCR with regard to decision-making will make a valuable contribution to fill extant research gaps, as the role of ES is not entirely understood. This research sheds light on how ES affects reshoring decisions and how it extends to gain a better understanding of the strategic imperative of local manufacturing. Through this research, the level of influence ES has on reshoring motivations among AS becomes transparent. This is important because OEMs expect CO₂-neutral supply chains and thus, put pressure on suppliers (Wang et al., 2018). Literature indicates that the how and why firms make strategic reshoring decisions is less explored either. Understanding managerial motivations and techniques firms undertake to reshore, implement it and evaluate the result of that choice is of paramount importance (Barbieri et al., 2018). The aim is to enhance the understanding of ES' role and influence on reshoring.

Managers, researchers and scholars gain deep insights into the role of ES in consideration of managerial reshoring decision-making and its implications on supply chains. They will understand which drivers and barriers are important and how firms are organised internally to implement reshoring and ES strategies. Furthermore, they will gain deep insights into the decision criteria underlying the reshoring decision and SCR. These findings assist managers in the automotive industry to understand the importance and influence an ES-friendly supply chain has on strengthening competitive advantages. This is in accordance with Ashby (2016) stating that ES is a strong reshoring motivation and is recently gaining more importance as a decisive factor when it comes to the design and configuration of global supply chains. Even though the level of influence of ES is currently not near to the top, it could be a discriminatory

factor in the future when firms are obliged to ensure carbon neutrality for products and processes (Ashby, 2016).

As there is no case study research conducted yet in the automotive industry, the thesis aims to fill the methodological gap while taking into account the rising challenges associated with reshoring and ES. Since extant research is primarily focusing on certain countries, niche industries or reshoring in general, the thesis makes a valuable contribution to the discussion of reshoring and ES in the automotive industry. The findings lead to substantial insights into the extent to which ES is perceived by AS as a driver for reshoring and how it affects the competitive advantage and attractiveness of a firm. Furthermore, it becomes clear how the firms involved in this study deal with conflicting goals of considering ES versus acting cost-efficiently.

As stated above, the automotive industry is very well suited to study reshoring and ES due to four reasons. First, “the automotive sector is an industry that has largely implemented offshoring” and has moved large shares of production to emerging countries in the 1980s because of low manufacturing costs (Młody & Stępień, 2020, p. 145). However, in recent years, there is an increasing trend in employment in Europe in manufacturing sectors such as the automotive industry. The rise in employment confirms that this industry is starting to reverse its offshoring strategies (Młody & Stępień, 2020). The automotive industry is both the largest manufacturing sector in terms of its economic benefits to the world’s economy (Nieuwenhuis & Wells, 2015) and one of the most globalised industries because of the wide-ranging production network, supplier relationships and geographic structure (Pavlínek, 2020).

Second, due to the global orientation of the automotive industry, the widely spread supplier relationships and sourcing origins, this industry is ideally suited to study reshoring and ES. Much of the extant literature is only dealing with the *what* and *why* (Akpınar, 2020; Pavlínek, 2020; Dachs et al., 2019; Wan et al., 2019; Engström et al., 2018; Ketokivi et al., 2017). Consequently, this thesis aims to investigate the questions *how*, *why* and *which impact* of reshoring and ES, which are inadequately covered in the literature or only to a certain extent.

Third, Europe is the world's main production region, accounting for 23% of the global vehicle production. The automotive industry employs more than 2.5 million workers in the European Union (EU), making it the automotive industry one of the most important manufacturing industries in the EU (Pavlínek, 2020).

Fourth, the automotive industry is furthermore characterised by high energy consumption and CO₂-emissions and is thus linked to a variety of concerns with respect to sustainability (Nieuwenhuis & Wells, 2015). For example, the *Dieseldgate scandal* and public concerns are raising issues with respect to sustainability in the network of automotive firms that extends from the OEM to its Tier-1 or Tier-2 suppliers (Wolff et al., 2020).

These facts make it very interesting to study the phenomenon of both reshoring and sustainability. On top of that, other industries such as consumer goods, the agricultural sector, aerospace and aviation or electronics are of similar magnitude in terms of their pollution (Fratocchi & Di Stefano, 2019), manufacturing locations, sourcing countries, wide-ranging supplier networks or the need for critical raw materials. The findings of this thesis thus allow for generalisation to these industries as well.

1.3 Research questions

There is a growing interest in how ES affects reshoring decisions and vice versa and how it expands to gain a better understanding of the strategic need for local manufacturing. Ensuring ES in terms of reshoring may result in a better competitive advantage, for example, by avoiding CO₂-emissions. "Sustainability is becoming increasingly important in supply chains, particularly in those that function in highly competitive industries" such as the automotive industry (Flint & Golcic, 2009, p. 841). ES has also received increasing attention in the literature. Consequently, the research question is stated as follows:

Research question 1: How do managers in the automotive industry perceive environmental sustainability as a motivation or driver for reshoring?

Location decisions must be understood not only through the lens of economic aspects, but also regarding ES. Literature has indicated that the implementation of reshoring projects is not sufficiently researched yet and that reshoring for sustainability should be done with consideration and awareness. “The decision-making and implementation process still lacks empirical analyses” (Boffelli et al., 2020, p. 1). There is a need to understand why firms decide to reshore and if ES is one of the major drivers in decision-making frameworks. Thus, the second research question aims to investigate the process of reshoring decision-making and how ES is being considered. Extant frameworks from Gray et al. (2017), Bals et al. (2016) and Mugurusi & De Boer (2014) serve as a theoretical basis to extend the findings from this thesis. The research questions is stated as follows:

Research question 2: How does environmental sustainability fit within the wider decision-making framework for reshoring?

The third research question aims to understand the effects an ES-based reshoring event has on the reconfiguration of supply chains. Having a local supply chain is integral to achieving environmental and social commitments and is a rich avenue for investigation. There is a need to shed light on ES performance effects or global SCR. Although some nascent research exists at the firm level, supply chain analyses are unexplored (Orzes & Sarkis, 2019). “The incorporation of sustainability concerns into business practices is currently one of the most dynamic research issues in the area of supply chain management” (Martins & Pato, 2019, p. 997). The research question is stated as follows:

Research question 3: How does environmental sustainability affect the reconfiguration of supply chains when reshoring?

1.4 Method of study

According to the research philosophy, the researcher followed that of an interpretivist with respect to an ontological objectivist and epistemological subjectivist position. The thesis employs a qualitative research methodology, which allows investigating emerging phenomenon such as reshoring and ES. This approach seeks for detailed explanations and

perceptions. Moreover, this research is carried out by employing a multiple case study as a research strategy. Nine case studies were identified, each with one to three participants. The sampling technique followed a purposeful process to identify managers in the automotive industry with substantial knowledge and experience in reshoring and/or sustainability. This allows studying the cases within and across each other aiming for in-depth insights, which are used for theory building. Data collection was carried out by semi-structured interviews allowing the researcher to enter into a dialogue with the participants. The questions were open-ended and gave the researcher the opportunity to search for further explanations. Semi-structured interviews are particularly suitable for investigating research questions that focus on *why* and *how*. Concerning the interview guide, the researcher has built on previous research gaps and proposed research avenues. 17 interviews (excluding two pilot interviews) were conducted between July and November 2020.

The interviews were audio/video recorded and transcribed manually. The transcripts were made available to the participants for validation purposes. Content analysis was carried out by applying framework analysis (FA). FA is particularly suitable to identify themes per case, which were constantly refined. The researcher was able to identify 16 themes from reading, analysing and coding the data with the help of NVivo 11 (cross-reference to section 4.7.2).

1.5 Limitations and constraints

Although the research methodology and design for this study are carefully constructed and well thought out, this study does not come without limitations. Qualitative methods are particularly designed to deal with phenomena where little is known and are able to provide a deeper understanding of how something is happening. However, they cannot answer the questions such as What is the strength of a relationship between two variables?. Even though the case study approach in this study provides a mean to investigate complex situations, it is difficult to create a case that suits all objectives or meets all desired requirements. The sample size is constructed to be feasible for a doctoral thesis, however, it is not representative for all AS in the automotive industry. Furthermore, it must be made clear that the case studies in this thesis reflect the experiences, opinions, behaviour or meanings of certain people or firms, which may not necessarily apply equally to others.

1.6 Structure of the thesis

The thesis comprises six chapters as illustrated in figure 1:

Figure 1: Summary of chapters and sub-sections of the thesis

01 Introduction	Background and rationale	Purpose	Research questions	Method of study	Limitations and constraints	Structure
02 Theoretical Background	Reshoring		Environmental Sustainability		Theoretical perspectives	
03 Literature Review	Critical literature review	Research gap 1: Perception of ES as a driver for reshoring		Research gap 2: Decision-making framework	Research gap 3: Supply chain reconfiguration	
04 Research Methodology	Philosophical assumptions	Methodological choice	Techniques and procedures	Quality criteria	Ethical considerations	Introduction to data analysis
05 Data Analysis	Case description		Findings and propositions RQ1	Findings and propositions RQ2	Findings and propositions RQ3	
06 Discussion	Critical reflection and link to theory of the major research findings		Contribution to management theory, practice and policy	Limitations and future research		My research journey
Appendix	Interview guide (questions and pilot), participant information sheets, NVivo coding scheme, sample interview transcript, etc.					

Chapter 1 has outlined the scope of the study and provided initial background information of reshoring and ES. It also defined the purpose of the research, the research questions, the study's method and considered the limitations and constraints.

Chapter 2 introduces the concepts of reshoring and ES and highlights the history and terminology of both reshoring and ES. This chapter goes along to explain the different reshoring governance modes and introduces the concept of (environmental) sustainability. The current consideration of reshoring and ES in the automotive industry is being explained, too. This chapter is concluded by explaining extant theoretical perspectives on reshoring and ES.

Chapter 3 provides a systematic literature review of reshoring and ES. The objective is to synthesise the existing body of knowledge and to reflect on it critically. This section distinguishes four steps starting with a quantitative description and analysis of the identified literature. A critical analysis follows to screen and evaluate the chosen literature. In the

course of the critical literature review, the researcher focuses on the interdependence between reshoring and ES, extant decision-making frameworks as well as drivers and barriers. The chapter concludes with a contextualisation of the research gap, the research questions and a critical discussion.

Chapter 4 outlines the research methodology and justifies the selection of an ontological objectivist and epistemological subjectivist position as well as the application of an exploratory, qualitative research design with semi-structured interviews. This section furthermore explains the multiple case study approach and demonstrates how the researcher collects data in this study. The concluding sections concentrate on reliability and validity in qualitative research and explain the applied measures to ensure both.

Chapter 5 comprises the data analysis and findings section. The researcher analyses and discusses the findings from the interviews within and across the cases as well as in consideration of the literature review. A separate section is defined for each research question in order to present the findings per theme in a structured way.

Chapter 6 aims to discuss and reflect upon the most important findings from this study with respect to the literature review and main theoretical perspectives. In addition, the contribution to research and practice as well as the limitations and future research avenues are highlighted.

CHAPTER 2

2 RESHORING AND ENVIRONMENTAL SUSTAINABILITY

This chapter aims to introduce the background and terminology of reshoring and ES, which is important to understand the context of the study. Sections 2.1 and 2.2 describe the background and historical development and explain how reshoring and ES are defined. Reshoring is explained in more detail because it addresses the governance modes and the drivers and barriers, too. Each section is being concluded by relating reshoring and ES to the automotive industry. Lastly, section 2.3 addresses the main theoretical aspects of both reshoring and ES. This chapter concludes with a summary in 2.4.

2.1 The reshoring phenomenon – from offshoring to reshoring

“Since the early 1990s, offshoring – namely, the location of firms’ activities in foreign countries [...] – has emerged as one of the most widespread strategies implemented by Western manufacturing companies in order to maintain or to foster their competitive advantage. Although offshoring is far from petering out, in the last decade a counter trend has emerged, whereby companies that had offshored their production have started bringing production back to their home countries” (Di Mauro et al., 2018, p. 108). Extant literature defines this phenomenon as *reshoring* which means the voluntary relocation of value creation activities from offshore to closer locations. This term can be further distinguished into *backshoring*, *back-reshoring* or *insourcing*, which will be explained in section 2.1.2. The following section builds on this introduction and discusses the variety of reshoring definitions to shed light on governance modes and the application of reshoring in the automotive industry.

2.1.1 Historical background and development of reshoring

“Over the past decades, offshoring strategies, i.e. the relocation of production processes to foreign countries, has been frequently undertaken by companies in international business” (Wan et al., 2019, Introduction section, para. 1). The offshoring trend dates back to the 1980s. The pressure to improve efficiency and profitability grew constantly and forced firms to offshore business activities. “Companies heavily made use of offshoring to profit in particular

from low labor costs” (Wiesmann et al., 2017, p. 15). The motivation to reduce costs due to low wages or access to cheaper raw materials in developing countries is probably the most common (Gylling et al., 2015). At the same time, however, the availability of skilled labour and quality improvements are of equal importance. In the same vein, Slepnirov et al. (2013) stressed that quality improvements strongly depend on the availability of certain combinations, such as the availability of skilled labour and local knowledge. Therefore, outsourcing and offshoring were two of the most important business decisions for firms to remain profitable, efficient and competitive.

On the one hand, Grossman & Rossi-Hansberg (2008) define offshoring as “the performance of a task in a country different to from where a firm’s headquarters are located” (p. 3). Outsourcing can be defined as “the performance of tasks under some contractual arrangement by an unrelated party. The firm still maintains ownership over the activities conducted in the host country abroad. It thus differs from *offshore outsourcing*, which focuses on purchasing parts, components, products or services from an international firm located abroad. On the other hand, Bals et al. (2013) defined offshoring as “the relocation of value chain activities outside of the company’s home country based on the location of its headquarters” (p. 3). Although both definitions are one of many different ones and are interpreted very differently, they imply an “international relocation of disaggregated firm value chain activities in captive, collaborative or outsourced governance modes” (Bals et al., 2013, p. 3).

“However, in recent years the political and economic changes on the global chessboard, the thinning of location advantages in some low-cost countries, and the growing awareness of the total cost of offshoring have driven many companies to re-think the location of their international value chains” (Wan et al., 2019, p. 1). Increasing globalization has changed the rules of competition and led to a strong trend toward relocating value-adding activities to developing countries (Antrás, 2020).

Thus, in the past years, the strategic concept of reshoring is emerging. It implies that firms start to shift from offshore (low-cost countries) to local production (rather high-wage countries) (Wiesmann et al., 2017) and thus, reshape their global footprint. According to Di Mauro et al. (2018), this is because of two overarching reasons. First, firms reshore their

production sites back to their home country because the expected effects from the offshoring strategy were not met. Second, “some advantages of the offshore location may be mimicked by the home country, in the attempt to hinder/reverse the offshoring trend (e.g., “government incentives” for offshoring, “national subsidies for relocation” for backshoring)” (p. 111).

As all kinds of firms in the past decades considered offshoring as a successful strategy to benefit from low-labour costs, there is also a high number of failures associated with that strategy. Offshoring is not always advantageous because the total costs associated with all activities abroad are not assessed and, therefore, lead to significant negative financial results in the long term (Brown, 2010). “Global issues have also reduced the economic benefit gained through capital being tied up in inventories in transport and intellectual property theft (Wiesmann et al., 2017, p. 16). In line with these consequences, Eriksson & Svensson (2016) also stress that offshoring complicates the management of environmental and social issues. The reason for this is the presence of different sites, be it a production facility or a headquarter, which encompasses the indirect functions of a firm and makes environmental issues a challenge (e.g. logistics chains over long distances). In this context, Finley & Maurer (2013) emphasise that numerous firms are having challenges with their offshored operations from the United States, Canada or Europe and thus increasingly recognise that localising production is a potential solution. The challenges with the offshore location compared with the emerging benefits of local production are pressuring the reshoring trend. “The phenomenon is not a mass trend but its relevance is steadily increasing” (Fratocchi, et al., 2016, p. 99). A shift from low cost to high cost countries is not yet recognised in the literature and explains why the phenomenon of reshoring is new and emerging. Although some literature is already available, academic research is still limited (Wan et al., 2019).

2.1.2 Entry modes (governance) and types of reshoring

The following section aims to clarify the seemingly different interpretations of reshoring types. Wan et al. (2019) refer to the term *entry modes* (EM), which means the governance that a firm adopts to access a market. Pan & Tse (2000) point out that EMs can range from wholly owned subsidiaries through mere contractual agreements with suppliers. This is an important discussion, as reshoring takes into account various aspects, such as where

manufacturing activities are carried out and who is involved in their implementation. Many authors contributed to this discussion by defining reshoring, its features, characteristics and EMs.

According to Gray et al. (2013), reshoring is about “bringing manufacturing back home...” from an international location of a firm (p. 28). In that view, it is not clear “whether the manufacturing being brought home occurred in a wholly owned facility in an offshore location or in the factory of an offshore supplier” (Gray et al., 2013, p. 28.). For instance, General Electric (GE) is an American multinational corporation headquartered in Boston that operates in aviation, healthcare, power, renewable energy, venture capital and finance. GE reshored its manufacturing location from China back to the USA to its own plant to meet the demand of the US market. In contrast, Vaniman Manufacturing Company, a firm located in the US offering the latest technology for micro-abrasive sandblasters or small dust collectors, “decided to no longer buy sheet metal fabrication from an overseas supplier and to instead source from a local supplier to meet demand in the USA” (Gray et al., 2013, p. 28). More specifically, both cases from GE and Vaniman are considered as reshoring. Gray et al. (2013) furthermore clarify that reshoring “is fundamentally concerned with where manufacturing activities are to be performed, independent of who is performing the manufacturing activities in question – a location decision only as opposed to a decision regarding location and ownership” (p. 28).

The distinction between the actual location decision and the ownership of sites or components is an important aspect. It is a central piece that needs to be considered when conducting the interviews and gathering data about the particular cases. The reshoring cases will be classified accordingly. The following four governance modes can be distinguished and clarify the EMs that reshoring encompasses.

- 1. In-house reshoring:** A company based in the USA meets the demand in its local market by relocating production activities carried out in wholly offshore facilities back to wholly facilities in the USA.

2. **Reshoring for outsourcing:** A company based in the USA meets the demand in its local market by relocating production activities carried out in wholly offshore facilities back to suppliers in the USA.
3. **Reshoring for insourcing:** A company based in the USA meets the demand in its local market by transferring production activities carried out by offshore suppliers back to wholly owned facilities back in the USA:
4. **Outsourced reshoring:** A company based in the USA meets the demand in its local market by changing from offshore suppliers back to suppliers in the USA (Gray et al., 2013)

Figure 2: Types of reshoring

		<i>To: Onshore</i>	
		In-House	Outsourced
<i>From: Offshore</i>	In-House	In-House Reshoring	Reshoring for Outsourcing
	Outsourced	Reshoring for Insourcing	Outsourced Reshoring

Source: Gray et al. (2013)

Figure 2 above demonstrates the four possible types of reshoring. With that concept, Gray et al. (2013) combine location decisions, such as off- and reshoring, as well as make-or-buy decisions, such as in- and outsourcing. Even though all reshoring options are different from each other, they all refer to location decisions irrespective of the ownership mode. This is also consistent with what Kinkel & Maloca (2009) expressed that reshoring is a re-concentration of parts from own foreign locations or from foreign suppliers to local production sites of a firm. In the same vein, Arlbjørn & Mikkelsen (2014) agree with the former and emphasise that the differentiation between offshoring and outsourcing and their opposite directions reshoring and insourcing are important themes, too. They also point out that reshoring does not necessarily involve the relocation of production sites to the country

where it was originally offshored or outsourced to, however, it can also lead to reshoring to a production site owned by the company but located in a different country.

In contrast to what Gray et al. (2013) as well as Kinkel & Maloca (2009) claim, Arlbjørn & Mikkelsen (2014) stress that the governance mode is still important though, which other authors mainly disregard. However, this is not yet empirically confirmed and no distinction of reshoring motivations according to the ownership mode can be drawn. Still, many other authors, such as Ellram et al. (2013) partly disregard the ownership mode by seeing reshoring solely as a manufacturing location decision.

In conclusion, for many researchers or scholars it may seem obvious that reshoring is simply a location decision. However, the previous sections have demonstrated that it is “necessary to fend off the misspecification that comes from failing to define precisely what reshoring is and what it is not, especially as it is related to academic research” (Gray et al., 2013, p. 29). “Most often, reshoring is either described as a location and cost-related choice borrowing from internalization theory, as a phenomenon caused by diminishing cost advantages, volatile demand and smaller/segmented markets, or as an occurrence primarily concerned with network management and ownership issues” (Wiesmann et al., 2017, p. 25).

This discussion was directed to reduce the confusion concerning reshoring – a location decision – and make-or-buy decisions – an ownership decision. Since both reshoring and make-or-buy decisions are often traced back to the same concept, this discussion has led to a clearer distinction between the two concepts. Most importantly, it emerges that reshoring is therefore only possible if it has been offshored once before. This concept is also applied to the classification of reshoring cases being discussed with the participants. This helps to understand the cases better while being able to evaluate location decisions more differentiated.

2.1.3 Definition of reshoring

Reshoring or *backshoring* have been broadly defined by Ellram et al. (2013) as moving manufacturing back to the country of the parent company. However, there is still lack of

clarity about what it actually is and which forms it can take (Barbieri et al., 2017). It is thus relevant bringing together the sheer variety of definitions. A comparison of the theoretical concepts of the different strands of reshoring shows the terms and meanings being employed (table 1) and emphasises “there is no congruent definition available yet” (Wiesmann et al., 2017, p. 22).

Table 1: Comparison among theoretical concepts relevant for the definition of reshoring

Concept	Definitions	References
Relocation	“It is the movement of existing assets, resources and people from one location to another. It can be linked to divestment. Companies may decide to relocate all or part of value added activities in response to new environmental conditions or to reflect new strategies adopted by the firm. Relocation can take place within a host country or back to the home country of the company.”	UNCTAD (2013, p. 27)
Offshoring	“Offshoring refers to the relocation of value chain activities outside of the company’s home country based on the location of its headquarters, or more generally international relocation of disaggregated firm value chain activities in captive, collaborative or outsourced governance modes”.	Bals et al. (2016, p. 104)
Back-shoring	Back-shoring is the decision to partially or fully relocate value chain activities to the home country of the firm’s headquarters.	Fratocchi et al. (2014), Kinkel & Maloca (2009)
	“Accordingly, back-shoring will be defined as re-concentration of parts of production from own foreign locations as well as from foreign suppliers to the domestic production site of the company”.	Kinkel & Maloca (2009, p. 155)
Back-reshoring	“A voluntary corporate strategy regarding the home-country’s partial or total re-location of (in-sourced or out-sourced) production to serve the local, regional or global demands”.	Fratocchi et al. (2014, p. 56); Fratocchi et al. (2016, p. 100)
Nearshoring	”[...] locate a manufacturing plant within one’s region”	Fratocchi et al. (2014, p. 56), Ellram et al. (2013, p. 14)
Reshoring	“The term “reshoring” is used here to indicate a generic change of location with respect to a previous offshore country. This includes further offshoring (i.e. the relocation to another offshore location) and back-reshoring (i.e. relocation to the home country), which are two different specifications of the generic decision of changing location.”	Albertoni et al. (2017, p. 417)
	“Reshoring is defined as the relocation of value creation tasks from offshore locations to geographically closer locations such as domestic or nearshore countries and based on the following premises	Foerstl et al. (2016, p. 495)
	(i) it is the reverse decision of a previous decision to offshore;	

	(ii) it can refer to all or only a part of previously offshored activities; and (iii) it is irrespective of the ownership mode in the offshore country.”	
	“Frequently termed reshoring, it is generally defined as moving manufacturing back to the country of the parent company”.	Ellram (2013, p. 3)
	“Reshoring is defined as the relocation of value chain activities from offshore locations to geographically closer locations such as domestic or nearshore countries”.	Bals et al. (2016, p. 104)
Outsourcing	“Outsourcing [...] is about handing over all or part of an activity across organizational boundaries to an outside supplier”	Gylling et al. (2015, p. 93)
In sourcing	“In sourcing is the reverse, i.e. moving activities previously sourced from an external supplier back in-house”.	Gylling et al. (2015, p. 93)
	In sourcing proposes a special view on the “decision to reincorporate a given activity within a company that had formerly been transferred to an external supplier”.	Cabral et al. (2014, p. 366)

Starting with the definition of the term *relocation*, which has been introduced by the *United Nations Conference on Trade and Development* (2013). The definition in table 1 refers to foreign divestment, for example, moving production to a third country rather than back to the home country. Since the definition also refers to the relocation of activities within a host country, it does not consider that some activities are reshored back to the home country. In addition, it refers to environmental conditions, but thus to changes in the regulatory environment rather than to ES-related factors. Therefore, this definition is too broad for this research.

Ellram (2013) defines reshoring as bringing manufacturing back into its home country of the parent company or repatriating business operations back to geographically closer locations. Bals et al. (2016) furthermore define reshoring as the “relocation of value chain activities from offshore locations to geographically closer locations such as domestic or nearshore countries” (p. 104). A variety of terms is given to the idea of reshoring as, for instance, *backshoring*, *back-reshoring*, *inshoring*, *back-sourcing* or *onshoring*” (Barbieri et al., 2018) with lack of clarity about what production relocation back to the home country is and which characteristics it entails. Fratocchi et al. (2014) and Kinkel & Maloca (2009) use the term *back-shoring* to distinguish between the partial or full relocation of value chain activities to the home country of the firm’s headquarter. They also added to this definition that it does not

only focus on own foreign locations, but also on foreign suppliers where the value creation activities were previously outsourced. There are thus also parallels to the insourcing definition of Gylling et al. (2015) and Cabral et al. (2014) (table 1). For this research, the back-shoring definition is not suitable as it focuses specifically on the firm's headquarters. However, since an AS may have its headquarters in China, reshoring to Europe may still take place.

While acknowledging the previous definitions, Fratocchi et al. (2014) proposed an extension on *back-shoring* and *insourcing* and introduced the term *back-reshoring*: "A voluntary corporate strategy regarding the home-country's partial or total re-location of (in-sourced or out-sourced) production to serve the local, regional or global demands" (p. 56). This definition is directed to be more specific concerning the partial or total relocation of value chain activities taking into consideration the differentiation between own or foreign activities outsourced to a foreign supplier.

However, it might be argued that the second part of the definition focusing on serving local, regional or global demands is too specific although this aspect of the definition will be significant for this thesis. It includes two processes – the geographical move and the proximity to markets – but they are not necessarily aligned with each other. Nevertheless, this definition points out the voluntariness of the decision, a change in location and refers to all or part of previously offshored activities in common with Foerstl et al. (2016). Fratocchi et al. (2016) use the term reshoring instead of back-reshoring, because it is the most common term used in the literature. On top of that, relevant publications for executives and practitioners such as from MGI (2020), the European Reshoring Monitor (ERM) (2021) and the Reshoring Initiative – Bringing Manufacturing Back Home (2021) also refer to the term reshoring in their research or publications.

In conclusion, irrespective of the terminological choice, the definitions from Albertoni et al. (2017), Bals et al. (2016), Fratocchi et al. (2016; 2014), Ellram (2013) and Kinkel & Maloca (2009) above have several characteristics in common. With respect to the sources above, reshoring is based on the following premises:

- (i) For this research, reshoring is not necessarily a location decision back to the country where the headquarters is located, but usually the new location will be closer to the headquarters than the offshore location;
- (ii) Reshoring refers to all value-adding activities or only parts of them, i.e. an offshore location does not necessarily have to be closed down completely;
- (iii) Reshoring may involve in-house moves or in- or outsourcing (cross-reference to section 2.1.2);
- (iv) Reshoring may seek to serve the main markets for the firm's outputs better.

2.1.4 Reshoring within the automotive industry

The global financial crisis in 2008 forced firms across all industries to re-think manufacturing location decisions and has increased the reshoring trend. A study with 262 UK manufacturing firms has examined shoring decisions between 2008 and 2016 (Godsell, et al., 2017). In general, 70% of these firms were exposed to a location decision (reshoring and offshoring). More specifically, 52% decided to bring manufacturing back to the UK and thus to increase production capacity in the home country. With respect to the UK, there were more than 700 reshoring decisions over the past 9 years whereby a firm can take multiple reshoring decisions. With 13.5% (35 firms), the automotive industry was the second largest sector in this study next to *Industrial & Mechanical Equipment* (15%) and *Engineering & Construction* (9%). Among the 35 automotive firms that participated in this study, 30 reshoring decisions were made between 2008 and 2016. However, the financial crisis in 2008 led to a decrease in reshoring decisions as firms took a prudent approach. At the same time, the financial crisis has also significantly reduced offshoring decisions in the automotive industry and the strong recovery has increased reshoring opportunities (Godsell, et al., 2017).

According to recent figures from Statista (2020), the automotive industry is the world's most important industry and is forecasted to fall to a volume of 59.5 million units in 2020 because of the global pandemic, down from a peak of 79.6 million units in 2017. The forecast for global vehicle production is 110 million units for 2025 and 117 million units for 2030. In contrast to a global sales volume of 5.3 billion US dollars, the automotive industry is projected to be worth 8.9 billion US dollars in 2030. Still, it “makes the automotive sector

one of the crucial manufacturing industries in the EU” (Pavlínek, 2020, p. 510) because of their global presence of leading OEMs and AS in all kinds of sub-sectors including passenger cars and commercial vehicles. China is recognised as one of the largest automobile markets in the world in terms of both sales and production. Light vehicle sales in North America and Europe, in particular, peaked in 2017 and 2018, and were not expected to surpass this by 2026 (Appendix 1). A study including 600 AS showed that the global pandemic Covid-19 hit the AS industries very hard in 2020, with significant sales declines. More specifically, AS faced a -15% to -20% drop in sales in 2020 compared to 2019. Especially the dependence on exports and global supply chains made Europe and North America vulnerable to the pandemic (LAZARD, 2020). “Covid-19 and an uncertain economic outlook have made car sales plummet across the globe in early 2020 and require restructuring measures for automotive suppliers” such as adjusting production capacities, reducing overheads and optimizing financials (Dannenberg & Beckmann, 2020, p. 2).

The AS sector is dominated by Bosch (revenue of 46.6 bn €), Continental (revenue of 37.7 bn €) and Denso (revenue of ~38.7 bn €) (Statista, 2020). With regard to Europe, the European Automobile Manufacturers Association (ACEA) states that the automotive sector revenues account for 7% of the total gross domestic product (GDP). More than 13.8 million Europeans work in the automotive industry (directly and indirectly), which stands for 6.1% of all jobs in the EU. On top of that, OEMs operate more than 300 manufacturing locations for vehicle assembly in 27 countries across Europe (Appendix 11). More specifically, output of OEMs in Western Europe continued to grow until the early 2000s “as they continued to attract investment because of skilled labor, well-developed supplier networks, proximity to the large market and corporate headquarters, R&D competencies, and also the strong socioeconomic embeddedness of automakers in home economies and their preferential treatment by home country governments”. Increased regional concentration was also promoted by technological and organizational changes in the automotive industry (Pavlínek, 2020, p. 517). For instance, the region of the West Midlands in the UK has a long tradition in the manufacturing sector. The automotive industry counts 20 production sites and 25 OEMs in this region. In contrast to other industries, the automotive sector increased employment by 42,000 plus another 13,000 in automotive-related sectors in 2018. “This

positive trend in manufacturing employment could be driven by a reshoring trend” (Kinkel et al., 2020, p. 184).

Like any other industries, the automotive industry has been significantly influenced by outsourcing and offshoring strategies since the 1980s, too (Schmitt & Van Biesebroeck, 2013). Offshoring and outsourcing have dominated much of the discourse on automotive manufacturing in advanced economies over the last decade, with many manufacturing firms shifting sourcing to low-labour cost locations in Central and Eastern Europe (CEE) and South East Asia” (Bailey & De Propris, 2014, p. 379). This was particularly triggered by the spread of the Toyota production model and has led to a fundamental restructuring of how international component production is organised. “Traditional integrated production systems have given way to more dynamic, disintegrated supply chains” (Schmitt & Van Biesebroeck, 2013, p. 477). Sourcing strategies have been re-organised and production processes have become increasingly fragmented. Although firms in the automotive industry are still pursuing offshoring and outsourcing strategies, it has cooled down and is increasingly leading to supply chains being partially or fully relocated back to the home countries. McKinsey Global Institute (MGI) (2020) has reported that the share of trade taking place within the same region (i.e. within Europe or Asia) has increased again by 3.7% since 2012. While labour cost at offshore locations increased, firms started to realise the advantages of bringing manufacturing back home. In the automotive industry, regional manufacturing, i.e. only within Europe or Asia, offers the opportunity of better collaboration between the OEM and its suppliers and leads to greater customer proximity (Appendix 10).

2.1.4.1 Current evidence of reshoring and ES in the automotive industry

Among others, the ERM (2021) offered some valuable insights into current reshoring practices in the automotive industry. For instance, the car manufacturer Peugeot reshored parts of its production of a certain car model *Citystar Air* from China back to France in 2016 (governance mode: in-house reshoring). The reasons given for reshoring are to improve customer service and to increase customer proximity. Another example is the car manufacturer Volvo that has reshored parts of its production from the US back to Sweden in 2016 (governance mode: in-house reshoring). This was due to the firm’s global reorganisation, proximity to customers and an increasing unattractiveness of the offshore

market. In addition to the automotive industry, other industries have moved their production from offshore locations back to Europe, too. These include, for example, the two textile manufacturers Prada and Mango, which have relocated their production from China back to Italy and Spain respectively. The reasons for reshoring relate to the “made-in” effect, delivery time, know-how in the home country, complexity of the offshore operation and proximity to customers. The pharmaceutical sector also engaged in reshoring. Bee Health is a British firm and produces pills, tablets and capsules. Bee Health decided for in-house reshoring from India back to the UK in 2014 due to a change in total costs of sourcing, delivery times, government support for reshoring, high inventory costs and logistics costs.

It is interesting that all examples mention costs or proximity to the customer as reshoring reasons, but the issue of sustainability is not mentioned. One could argue that the topic of sustainability has only gained momentum in the last 2-3 years, yet at least the reduction of greenhouse gases has been a more longstanding objective. It is thus important to point out that reshoring and ES in the automotive industry have not been discussed much to date. “In fact, the limited research and quantitative analyses do not support any conclusive considerations about if and how industry-specific characteristics influence companies’ propensity toward reshoring. However, firms active in “traditional” industries and sectors but increasingly concerned about sustainability issues, such as clothing and footwear, mechanical goods, furniture, and furnishing tend to be more predisposed toward reshoring than others (e.g., pharmaceuticals)” (Cosimato & Vona, 2021, p. 7). Cosimato & Vona (2021) furthermore stress that smaller firms tend to bring manufacturing sites back home earlier than large corporations “as well as those active in electronics and automotive sectors” (p. 9). That means, SMEs in particular have a higher propensity towards reshoring and make these decisions earlier (Cosimato & Vona, 2021). The authors do not elaborate on the reason for this, but one could argue that the automotive industry does not immediately shift production back due to its global supplier networks and highly automated production sites. In the case of textile or food manufacturers, reshoring is presumably easier due to the lower level of automation.

Regardless of the industry, the location of the manufacturing site has a significant impact on the sustainability of a firm at both global and local level. However, research investigating the

interdependence between reshoring and ES as well as related strategies remains scarce Cosimato & Vona (2021). Among others, particularly Orzes & Sarkis (2019) stress that this relationship is still unexplored and point out the need for further research. On top of that, politics and society have become concerned about the climate and thus sustainability where firms can make a major positive contribution (e.g. reduce CO₂-emissions). In fact, the 2030 Agenda for Sustainable Development from the United Nations (UN) established the 17 Sustainable Development Goals (SDGs). The SDGs focus on poverty, health and well-being, zero hunger, inequalities, climate action and economic growth. These SDGs must be adopted by all member states and help firms align their sustainability activities with these goals. Consequently, firms follow these goals or other governmental programs and engage with reshoring “(1) to better respond to their own economic goals and (2) to better meet market expectations and demand also in terms of both production processes and final products sustainability” (Cosimato & Vona, 2021, p. 2).

2.1.4.2 Appreciation of the automotive industry in the literature

Extant literature does not deal in-depth with location decisions of OEMs or AS. Much of the growing body of literature on reshoring relates to the manufacturing industry, but not necessarily to OEMs or AS. However, ten studies are published that cover the automotive industry over a period from 2013 to 2020 and examine competitive strategies to explain manufacturing location decisions (Akpınar, 2020), global production networks (Pavlínek, 2018), international production relocation or re-insourcing as a manufacturing-strategic option (Lampón et al., 2017). The seven remaining studies relate to Lund & Steen (2020), Pavlínek (2020), Moradlou et al. (2017), Ocicka (2016), Bailey & De Propriis (2014), Drauz (2014) and Schmitt & Van Biesebroeck (2013).

Out of these ten studies, there are two recent studies by Pavlínek (2020) and Lund & Steen (2020) as well as one from Bailey & De Propriis (2014) that look at reshoring and location decisions in the automotive industry in more detail. In contrast to Pavlínek (2020) and Lund & Steen (2020), the study from Bailey & De Propriis (2014) is also frequently quoted by Wan et al. (2019), Lampón & González-Benito (2019), Theyel et al. (2018), Di Mauro et al.

(2018), Barbieri et al. (2017) and Wiesmann et al. (2017) who focus their research primarily on reshoring even if not directly related to the automotive industry.

The research on which the study from Bailey & De Propris was conducted in 2013 and 2014 attempted to examine the significance of reshoring and its drivers in the case of the British manufacturing industry and the automotive industry. Bailey & De Propris (2014) found that such a repatriation of manufacturing locations back in the UK is particularly driven by the “combination of a more competitive exchange rate [...], increased transport costs, quality concerns, rising wages in key areas of China and CEE¹, and a greater awareness of the importance of supply chain resilience” (p. 392). However, “although the reasons for the location decisions of automotive firms and the changing geography of the automotive industry are complex and cannot be reduced to one or two factors, they are ultimately tied to profit-seeking behaviour”, at least in labour-intensive manufacturing operations (Pavlínek, 2020, p. 511). Pavlínek's study was recently published and addresses the restructuring and internationalisation of the European automotive industry taking into account 2,124 restructuring events between 2005 and 2016 based on 91 interviews with automotive firms in Czech and Slovakia. It is important to emphasise that Pavlínek's study focuses on restructuring events (e.g. downsizing, automation, rationalisation, corporate reorganisation) and primarily attempts to examine the creation and reduction of jobs. The central result is that restructuring plays a dominant role in the creation and reduction of jobs than location decisions. Location decisions are also investigated but are more in the background of the study.

However, four important implications arise from this study, which is relevant to this thesis. First, Pavlínek (2020) claims “despite lower levels of investment and higher wages, existing locations may maintain their production and employment for a number of reasons, especially due to high sunk costs and geographic proximity to suppliers and markets” (p. 513). Second, although this is one of the most unlikely scenarios, a complete closure of a production site abroad may have a negative impact on the existing sites at offshore locations. However, lower-tier suppliers confronted with the labour-intensive production of standardised

¹ Central and Eastern Europe

components (e.g. assembly of wiring harnesses) are more likely to reshore their value-added activities again as wages rise. Third, due to domestic political pressure, possible strikes and negative publicity, car manufacturers are more likely to close production in international (offshore) locations than in their home countries. This makes international locations with less developed infrastructures more vulnerable to reshoring. Fourth, Pavlínek further notes that the decision on a particular location is influenced by technological fixes that help firms to reduce transport and logistics costs.

Lund & Steen (2020) investigated the drivers for the emerging trend of reshoring from low- to high-cost countries by focusing on Norwegian manufacturing firms. Even though the authors considered AS in their research, the sample of case firms is quite diverse. Still, one important key result is that time-to-market is a crucial factor for the automotive industry and a driver for regionalisation. According to the case firm that they took for their study, this was one of the most important driver for the decision to reshore production back to Norway. “Proximity to markets (including B2B) is thus, in combination with other drivers, an important aspect in manufacturing reshoring, especially in the case of mass produced products with relatively low margins, as transport costs can erode the comparative advantage of low production costs. In turn, these reshoring processes influence the configuration of global production networks” (Lund & Steen, 2020, p. 161).

In contrast to offshoring, which is beneficial for firms to operate in low-cost locations, reshoring is rather limited by the characteristics of the domestic market (e.g. labour, quality, size, finance options). More specifically, the main obstacles to the expansion of production facilities identified in the research by Bailey & De Propris (2014) are high energy costs and restrictive regulations (e.g. visa or trade restrictions). According to Pavlínek (2020), high labour costs, lack of skilled labour and access to finance are additional obstacles for the automotive industry to reshore manufacturing operations. Consequently, especially the automotive industry needs to address these issues on a long-term perspective. It needs support from governments and an industrial policy to create favourable business conditions to convince firms to move back. Precisely because “the degree of government support was not seen as a major barrier to reshoring [...] and policy interventions can actually help [...] to push reshoring further” (Bailey & De Propris, 2014, p. 388).

However, what the study from Bailey & De Propris is still lacking is its preciseness on which automotive OEMs or AS were agreeing to take part in their study and who is particularly affected. It does not shed light on the characteristics of the reshoring cases they were investigating either. Moreover, the case firms considered in the Lund & Steen study (2020) were quite different and included only one tier-1 AS. However, the small number of studies conducted and published on the topic of reshoring in the automotive industry and the rather general focus on the automotive industry are a good starting point for further research and especially for this thesis on research questions two and three.

2.1 Environmental sustainability

This section aims to describe the historical background and development of ES, to discuss the terms *sustainability* and *environmental sustainability* and to show its importance for the automotive (suppliers) industry. Defining these terms is crucial due to two reasons: On the one hand, sustainability is a broad topic that extends across three pillars *environmental*, *social* and *economic* and, thus needs to be further distinguished. On the other hand, it aims to build a unified understanding because sustainability is becoming an important driver to investigate its relation to reshoring decisions.

2.2.1 Background and definition of environmental sustainability

Sustainability “was originally developed in the forestry field of study by stating that harvesting should not be larger than the amount of wood the forest yields in new growth” (Fratocchi & Di Stefano, 2019, p. 449). The United Nations (1987) have defined sustainability as a policy and see it as the ability to meet the needs of the present generation without compromising those of future generations. More specifically, sustainability refers to the well-being of future generations, which is mainly characterised by reducing or avoiding the consumption of irreplaceable natural resources (Kuhlman & Farrington, 2010). “Consequently, it is becoming increasingly necessary for manufacturing firms to include all aspects and dimensions of sustainability in their manufacturing facility location decisions” (Chen et al., 2014, p. 155). In addition, the UN’s definition of sustainability has been further refined by differentiating between *strong* and *weak* sustainability and by establishing the

three-pillar concept. With *strong* sustainability, Kuhlman & Farrington (2010) refer to the “stock of environmental assets” and is generally applied by ecologists. The concept of *weak* sustainability is usually adopted by economists and means assuring the next generations “a stock of wealth, comprising man-made assets and environmental assets” (p. 3443).

The three-pillar concept known as the Triple Bottom Line (TBL) is much more widely accepted and applied in the existing literature. In contrast to the UN’s definition, the TBL employs three interconnected pillars encompassing environmental, economic and social factors, which allow for a better differentiation. Some references also consider additional pillars such as institutional (Spangenberg et al., 2002), cultural (Soini & Birkeland, 2014), technical, biological or health-related aspects (Hill & Bowen, 1997), however, the TBL concept is much more established. In some cases, the TBL concept is also referred to *planet, people and prosperity* (Elkington, 1994) or *planet, people and profit* (Purvis et al., 2019). In particular, the term *profit* is also related to economic sustainability. This does not simply imply exchange rates, inflation, GDP or costs, but it does also entail the efficient usage of resources in production and a responsible consumption of raw materials and goods (Mohamed et al., 2021).

Elkington's TBL approach appears to be the first attempt to apply the three-pillar principle. “It seems that the TBL, which is presented in many cases as synonymous with sustainability, may have been influential in cementing its position in the mainstream into the 21st century” (Purvis et al., 2019, p. 689). “Literature has shown there is no universal definition of sustainability, however, the conceptualisation of the three interconnected pillars is predominantly used. In 2001, the three-pillar concept has been presented as commonplace and – despite the lack of literature – the conceptualisation has gained widespread traction” (Purvis et al., 2019, p. 685). What follows is a consolidation of theoretical definitions and perceptions of sustainability from literature, although there is no claim for completeness and probably other definitions available in either high-ranked literature or from practitioners. Table 2 shows the development of the theoretical concepts of sustainability in a chronological order:

Table 2: Chronological order of the academic discourse and definitions of sustainability

References	Definitions	Interpretation
Brown et al. (1987, pp. 716-717)	Brown et al. identified three perspectives in which the term sustainability is used. “The ‘social’ perspective concerns itself with the continued satisfaction of basic human needs of individuals, the ‘ecological’ focuses on the “continued productivity and functioning of ecosystems as well as the protection of genetic resources and the conservation of biological diversity, and the elusive ‘economic’ definition entails resolving the limitations that a sustainable society must place on economic growth”.	Brown's definition seems to be very comprehensive, but as early as 1987 it refers to the "triple bottom line" of sustainability established by Elkington.
Barbier (1987, p. 104)	Barbier articulates the development process as an “interaction among three systems: the biological (and other resource) system, the economic system, and the social system”.	In Barbier’s definition each system is ascribed goals where the intention is to “maximise the goals across all these systems through an adaptive process of trade off’s”.
Cocklin (1989) in Purvis et al. (2019, p. 687)	“Cocklin draws on Barbier, conceptualising ‘sustainability’ in terms of a set of goals relating to social, economic and environmental subsystems”.	The relationship between sustainability and other management objectives such as resilience and economic efficiency is considered to be ultimately ideological, and compromises are therefore made both internally and externally.
Campbell (1996) in Purvis et al. (2019, p. 689)	“Parallels to the three pillars can be seen in Campbell’s ‘planning triangle’. Campbell produced a model of what he perceived as three major goals or priorities of urban planning: social justice, economic growth, and environmental protection”.	He argues that this model represents the fundamentals of sustainability. Campbell stresses the notion of conflict between these goals and the need for an interdisciplinary approach in elaborating them.
Elkington (1997) in Purvis et al. (2019, p. 689)	“Drawing strong parallels with three pillars, the traditional financial ‘bottom line’ of a corporation is complimented by bottom lines for social and environmental performance, termed ‘people, planet, profit’, encouraging firms to consider longer-term perspectives in their decision making”	This approach has been “met with scepticism in academic circles, however, with little evidence of effective use among the bodies that claim to advocate it” Elkington (1997) in Purvis et al. (2019, p. 689)
Kuhlman & Farrington (2010, p. 3442)	“A state of affairs where the sum of natural and man-made resources remains at least constant for the foreseeable future, in order that the well-being of future generations does not decline”	Kuhlman & Farrington conclude that the economic and social pillar are strictly interconnected and must be seen jointly, however, Fratocchi & Di Stefano (2019, p. 450) argue that “such a theoretical position may be useful for policy assessment, it is less useful when evaluating a firm’s strategies, as in the case of reshoring and sustainability”.

Source: Own illustration

Taking into consideration the term *environmental* in connection with sustainability, it generally tends to be associated with human impact on natural systems. This distinguishes it from the term *ecological*, which is in better accord with biological conservation. More precisely, the general meaning of the term *ecological* implies a broader context than just human (inter-) action. Ecological sustainability is “meeting human needs without comprising the health of ecosystems” (Morelli, 2011, p. 4). It seems reasonable to view *environmental* as part of the ecological dimension or rather as the intersection between human activities and

ecological systems (Morelli, 2011). The environmental dimension “refers to the ability to avoid the extinction of non-renewable resources and to reduce pollution creation” (Fratocchi & Di Stefano, 2019, p. 450). Protecting scarce resources and minimising environmental impacts (e.g. through less CO₂-emissions) from value-adding or transportation and logistics activities is, therefore, one of the main concerns of ES. Following the reasoning from Fratocchi & Di Stefano (2019), the researcher will use the term *environmental* in this thesis.

In conclusion, the examination of the three-pillar approach revealed there are many positions in extant literature on the definition of sustainability that have not led to a universal definition of ES in recent years. This is made clear by the different definitions and dimensions illustrated in table 2. Even though Kuhlman & Farrington (2010) established one of the most recent definitions in 2010, it was criticised by Fratocchi & Di Stefano (2019) as it is not suitable to evaluate a firm’s strategy when it comes to reshoring and sustainability. Therefore, the definitions of Campbell (1996) and Elkington (1997) are most closely related to the research topic by taking into consideration environmental performance and protection. Consequently, the thesis is particularly designed to take into account these definitions when evaluating reshoring cases impacted by ES.

However, economic and social aspects cannot simply be separated from this, as reshoring decisions are usually not taken in isolation by firms and are based on a number of decision-making criteria. Although Elkington’s definition (1997) refers to the financial bottom-line, in this thesis the terms *financial* and *economic* are used synonymously. In this sense, the economic dimension has historically dominated the field of decisions on production sites, but “environmental and social issues have gained importance in recent years as organizations seek competitive advantage” (Chen et al., 2014, p. 154). This is also in line with Sutherland et al. (2016) stressing that production activities affect every dimension of the TBL approach and, therefore, “decisions regarding where products are manufactured have a tremendous impact on a firm’s sustainability” (Fratocchi & Di Stefano, 2019, p. 450). This is the point where reshoring and ES overlap and that an increasing emphasis of sustainability influences the reshoring decision for a firm’s global manufacturing footprint (Tate, 2014). Consequently, the main focus is on ES, but the two other dimensions, social and economic, cannot be excluded in the analysis phase.

2.2.2 Environmental sustainability within the automotive (suppliers) industry

According to the German Association of the Automotive Industry (VDA), the automotive industry is aware of its responsibility for sustainable actions across a product's lifecycle of a vehicle. This extends from the selection of materials, via production and manufacturing, fuel-efficient operations through closing material loops at the end of a product's lifecycle. "The automotive industry works on aligning its production more closely to the principles of sustainability" (VDA, 2020, Para. 1), which covers manufactures and suppliers alike. Furthermore, the VDA (2020) states that sustainability does not end at the factory door and stresses its importance throughout the entire supply chain for which the automotive industry has a major responsibility. This industry is also particularly affected by country-specific regulations and legislations because of its global presence. Especially requirements on minimum distances between operational facilities are of high relevance.

According to Winkler et al. (2020), they point out the automotive industry has been under considerable pressure from governments and society, too, and that their business model requires a shift towards more sustainable ones. This is reflected in rising CO₂-emissions of transportation whereof road transportation accounts for 18% of the world's global emissions. Besides CO₂-emissions, the degradation of natural ecosystems is another field of action where an "increased demand along with lax environmental regulations have led to crop failures, soil pollution, water contamination and large-scale environmental degradation" (Winkler et al., 2020, p. 4). Non-biodegradable waste from a product's end-of-life manufacturing waste have resulted in landfill or toxification of lands (e.g. 3.1 million tons of plastic waste were exported from the US, Europe and Japan to developing countries between January and June 2017). It is therefore important that the entire automotive industry focuses on avoiding waste throughout the supply chain. Suppliers play an important role in this, as they are responsible for a large part of the emissions in the supply chain through production and logistics activities. "With purchased materials accounting for 60%-70% of the total manufacturing cost of a car [...], automotive suppliers can be expected to account for major proportion of the energy use and emission of carbon in this industry" (Böttcher & Müller, 2016, p. 1452).

In brief, pursuing sustainable actions is a strategic issue for the automotive industry, however, the landscape is still fragmented and lacks effective as well as credible actions. “Some areas such as sustainable R&D (research and development) and sustainable manufacturing [...] receive greater attention”, however, there is no consistent focus on measures across the whole supply chain nor do all firms in this sector have ambitious sustainability targets (e.g. to increase the share of recyclable materials in their products with regard to a *Circular Economy*). “Currently only 32% of the automotive organisations’ supply chain contributes to the circular economy” (Winkler et al., 2020, p. 2). Circular Economy can be defined as “a regenerative system in which resource input and waste, emission, and energy leakage are minimised by slowing, closing and narrowing material and energy loops. This can be achieved through long-lasting design, maintenance, repair, reuse, remanufacturing, refurbishing and recycling” (Geissdoerfer et al., 2017, p. 759).

2.2 Theoretical perspectives on reshoring and environmental sustainability

Several journals, such as those by Wan et al. (2019), Di Mauro et al. (2018), Wiesmann et al. (2017), Barbieri et al. (2017) and Gylling et al. (2015) addressed the theoretical perspectives for off- and reshoring strategies. These theoretical perspectives opt for a deeper understanding and interpretation of the phenomenon. Theories, such as Resource Based View (RBV), Natural Resource Based View (N-RBV), Dynamic Capabilities (DC) and Transaction Cost Economics (TCE) are the most relevant ones for this discussion. It is important to emphasise that literature already covers theory for offshoring strategies extensively, however, these are still fragmented and lack substantial foundations. For instance, with regard to the reversal of offshoring movements, Barbieri et al. (2017, p. 82) found the “majority of sampled articles do not refer to any theoretical approach”. This finding also coincides with the offshoring and outsourcing research of Mugurusi & de Boer (2014) who found reshoring lacks a substantial theoretical basis as well. “Even though the evidence for a reshoring trend is limited, the topic has provoked debates in several countries” (Wiesmann et al., 2017, p. 25). Fascinated by this debate, scientists turned to reshoring and tried to present a theoretical basis taking into account TCE, RBV or N-RBV. These theories were also most frequently adopted to explain the EMs (Schellenberg et al., 2018), which are outlined in the previous section 2.1.3.

Transaction cost economics (TCE)

TCE is applied in the debate of manufacturing location choices. It is extensively used for make-or-buy decisions because it provides deep insights into the cost of exercising ownership. TCE has been “developed and operationalised by Oliver Williamson and is one of the most prominent and influential developments in the social sciences” (Carter & Hodgson, 2006, p. 461). Williamson won the Nobel Memorial Prize in Economic Sciences for his analysis of economic governance, especially the boundaries of the firm” (Gibbons, 2010, p. 263). Martínez-Mora & Merino (2014) argue that TCE “can provide valuable insights into the cost of exercising ownership in distant locations despite being developed to evaluate in-house and arms-length decisions” (p. 227). On top of that, TCE has important implications for supply chain management with respect to the choice of a location, too. Important conclusions from TCE can be incorporated for two reasons: First, since almost any activity can be offshored while remaining in-house, the relationship with a production site in an international location can be very complex due to social, economic or cultural circumstances. Consequently, it can also be more cost-intensive due to, for example, negotiate, monitor and coordinate activities with suppliers. Rising transaction costs can trigger a change of location and can be used as arguments for explaining a change in location (Lampón & González-Benito, 2019). Thus, Kinkel & Maloca (2009), Gray et al. (2013), McIvor (2013) and Foerstl et al. (2016) use TCE as a theoretical basis for explaining reshoring.

Second, firms will develop these international activities internally if there are benefits for internalisation. This is closely related to Dunning’s (1980) *Ownership, Location and Internalisation* model and draws from conclusions of TCE theory. Thus, with respect to the choice of the location, conclusions from TCE are helpful “since ownership and location decisions are interrelated from this perspective” (Martínez & Merino, 2014, p. 227). It is therefore important to consider the interrelation between ownership and location decisions of the individual parts of the supply chain. This is specifically important for research question three, which investigates the effects an ES-based reshoring event has on SCR and how it must be reconfigured. From a business perspective, “the in-house option will be favoured when there are elements that can generate transaction costs” (Martínez & Merino, 2014, p.

227), which consequently means that most activities are likely to be carried out domestically, i.e. in the home country.

Furthermore, the theory entails that firms will move from high- to low-cost countries or environments, however, in line with Martínez-Mora & Merino (2014), McIvor (2013) found that cultural differences or intellectual property are barriers for this movement and create high potential for opportunism. This makes low-cost countries even less attractive if there are cultural, social or economic factors that are not advantageous. When it comes to the investigation and analysis of the underlying processes behind reshoring decisions, Bals et al. (2016), for instance, proposed TCE as a theoretical perspective.

Resource-based view (RBV)

RBV deals with the question of how an organisation develops its competitive position (Lampón & González-Benito, 2019) and is related to the choice of a firm's manufacturing location. From a managerial perspective, Lampón & González-Benito (2019) found that the "analysis of the firm's internal factors is especially interesting as managers are only able to decide on its internal operating costs" (p. 6270).

The general idea from TCE can also be combined with the RBV to describe what reshoring is and why it occurs. While TCE focuses on reviewing the governance structure, RBV deals with the search for competitive advantage (McIvor, 2013). This means, firms invest their capital in areas where they have key competences and outsource all other non-critical activities. "The RBV raises the need to pay attention to those elements that generate the competences of the firm, since the firm's allocation decision may differ for those activities that provide its competitive position" (Martínez & Merino, 2014, p. 227). "Firms are bundles of tangible and intangible resources/capabilities (assets, knowledge, and capabilities). To provide sustainable competitive advantage, these resources/capabilities should be valuable, rare, imperfectly imitable, and non-substitutable" (Wan et al., 2019, Literature section, table 1).

Following the idea of the RBV and transferring it to the concept of reshoring, a relocation of a firm's production facilities could also be encouraged or rather motivated by the inability of

a company “to properly exploit the host country’s resources in order to establish competitive advantage” (Di Mauro et al., 2018, p. 109). Besides TCE, DC theory is also closely related to RBV and has complemented TCE in various studies “as it claims that a firm’s invisible assets are essential for creating a sustainable competitive advantage” (Lampón & González-Benito, 2019, p. 6270). This could compensate for the RBV, which does not explain the *why* firms can have a competitive advantage in unpredictable environments subject to rapid change. The RBV is lacking another important feature, as it does not support the knowledge of how it happens either. This is in line with Bals et al. (Bals et al., 2016) emphasising that “for offshoring and outsourcing decisions at the firm level this has been captured in frameworks that introduce a capability assessment based on the RBV, but for the reverse decision making this has not yet been addressed” (p. 112).

Natural resource-based view (N-RBV)

In contrast to the RBV, the N-RBV was established by Hart (1995) and takes into consideration the biophysical natural environment. The theory incorporates the natural environment given the growing magnitude of ecological problems faced by firms. In the future, it appears inevitable that strategy and competitive advantage “will be rooted in capabilities that facilitate environmentally sustainable economic activity” (p. 991). Thus, the N-RBV is focusing on pollution prevention (e.g. to minimise or eliminate CO₂-emissions), product stewardship (e.g. to integrate sustainability into product development processes) and sustainable development (e.g. to make use of low-impact technology and products as a basis for market entry). The general idea of the N-RBV is that a “better environmental performance over competitors is instrumental to create a better reputation such that it is possible to ask for premium prices and set new rules in the industry to gain financial advantage” (Wong et al., 2018, p. 380). Wong et al. (2018) also argue that firms effectively structure and bundle resources in terms of knowledge, skills or technologies to create competitive advantage with sustainability. These resources are directed towards a firm’s internal resources (e.g. knowledge, technologies) and external relationships (e.g. with suppliers, customers and stakeholders)

2.3 Conclusion

Chapter 2 has shown that a contrasting trend has been observed in recent years: away from offshoring and towards reshoring back to the home countries or even closer to the actual customer (e.g. the OEM). The main reasons are rising labour costs in low-wage countries, lower speed or efficiency and increasing sustainability requirements. Various terms for this trend are discussed in the literature. These include, for example, backshoring, back-reshoring, nearshoring or reshoring. This thesis takes into account a combination of the definitions of back-reshoring and backshoring by Fratocchi et al. (2014). This combination refers to a firm's voluntary decision to partially or fully reshore value-creating operations from offshore countries back to the home country or back into a certain market to serve local and regional demands. With regard to ES, the researcher considers the definition of Campbell (1996) and Elkington (1997). Both definitions focus equally on the factors (i) people (e.g. avoiding social inequality), (ii) planet (e.g. protecting the environment) and (iii) profit (e.g. ensuring financial and economic stability). The TBL allows the researcher to focus primarily on the environmental aspects, but not to leave out the social and economic factors.

It became clear that the automotive industry, with its global orientation and worldwide supplier networks, is a suitable industry to investigate location decisions of AS. As many value-adding activities have been relocated to offshore locations in Asia, for example, the opposite trend – reshoring – can be well examined based on this development. Although offshoring decisions are still being made, the MGI (2020) has shown that the trend is clearly declining. With rising labour costs in Asia, many suppliers have understood the advantages of local production sites close to the OEM or at their own production sites. This is linked to the possibility of collaborating, being more efficient and cost-effective, as well as achieving sustainability targets with regard to CO₂-emissions.

3 LITERATURE REVIEW AND CURRENT STATE OF RESEARCH

The main objective of this section is to summarise the existing body of research in the field of reshoring and ES, as a solid basis for identifying areas in which research would be beneficial (Rowley & Slack, 2004). The literature review is “a systematic, explicit and reproducible design for identifying, evaluating and interpreting the existing body of recorded documents” (Fink, 2005, p. 3). This process of reviewing literature is an iterative cycle of defining and refining parameters and keywords, searching for literature based on these keywords, evaluating and recording the body of literature (Saunders et al., 2009). It helps to narrow down the research topic as well as explaining research objectives, the overall research design and methodology used (Hart, 1998). It aims to map, assess and consolidate theory and research gaps to identify and formulate the research question (Mentzer & Kahn, 1995).

3.1 Introduction

The existing state of research and available literature is summarised and critically evaluated by the process model of Seuring and Gold (2012). This specific process model for systematic qualitative content-based analysis consists of four steps with the last step being the most important in terms of a detailed critical appraisal of the literature with regard to the three research questions:

1. **Material collection:** Description of the search process in terms of databases, search terms, delimitations and justification of excluded articles
2. **Descriptive analysis:** Assessment of the formal characteristics to provide the background for subsequent content analysis (e.g. publications per year, type of journal)
3. **Category selection:** Definition of structural dimensions and related analytic categories (what, why, where, when, who, which impact and how)
4. **Material evaluation:** Analysis and critical literature review of the material identified for reshoring and ES

3.1.1 Material collection on reshoring and ES

Concerning the first step *material collection*, the literature review needed a clear definition of boundaries to delineate the research for which the following parameters were determined. Relevant literature has been searched in the following databases: EBSCOhost, Emerald Insights, SAGE Journals, Science Direct (Elsevier), Scopus, Springer Link, Taylor & Francis Online, Oxford Academic Journals, Elsevier, Research Gate and De Gruyter. The choice for these particular databases was based on their relevance for publications in the field of business administration (e.g. supply chain management, purchasing or decision-making). This search has resulted in 2,920 academic articles and chapters in scientific books (incl. duplications), which are listed below in table 3. It is important to explain that the search strings did not return mutually exclusive results, so there may be some duplications. This can also be attributed to the high number of publications. The first search for literature took place in the course of 2018, where the researcher has written his research proposal. For the thesis, the literature search considered a period from 2008 through 2021 in order to capture the most recent studies and to add new studies such as from Sarkis (2021), Bals & McIvor (2021), Barbieri et al. (2020), Lund & Steen (2020) and Boffelli et al. (2020).

Besides *reshoring*, terms such as *backshoring*, *back-reshoring*, *reverse offshoring*, *insourcing*, *back-insourcing* as well as *environmental sustainability* have been used to search for in titles, abstracts and keywords. For instance, the terms *reshoring* and *environmental sustainability* have also been combined with *AND* queries to identify studies relating to both reshoring and ES. For some terms, the search has been conducted each with and without hyphen, too. Some authors also use the term *relocation* in paraphrases or explanations of *reshoring*. It offered too many search results and has shown that it is rather related to other industries. The publications identified and considered for *relocation* are those by Lampón et al. (2017), Uluskan et al. (2017) and Stentoft et al. (2016). Data collection has been limited to English and German papers and to those that are available online with access free of charge. Any other languages were excluded.

Table 3: Search strings used for structured keyword search

Search strings	Hits
Reshoring OR backshoring (with and without hyphen)	90
Reverse offshoring	994
Back-reshoring (with and without hyphen)	4
Back-insourcing (with and without hyphen)	-
Insourcing OR reinsourcing (with and without hyphen)	31
Re-shoring OR back-reshoring	218
Environmental sustainability	1,406
Environmental sustainability AND Reshoring	68
Environmental sustainability AND Reshoring OR Backshoring	109
Total	2,920

Source: Own illustration

The search was further narrowed down to more relevant categories such as Business & Economics, Operations Management, Manufacturing, Supply Chain Management, Decision Science as well as to peer-reviewed journals. In addition, the researcher closely examined the search results to determine which literature actually related to reshoring and ES or both and where the automotive industry is addressed. To do this, the researcher created an extensive list of all literature to better compare the type of article, title, journal, authors and focus of the publication (e.g., what, why, how, which impact). An extract of this list can be found in Appendix 15. As a result, the number could be limited to 88 articles, which are in the scope for the literature review. The author has chosen this strategy to search for relevant literature on reshoring and ES for two reasons. First, since the concept of reshoring has not yet been fully explored and refers to different terms, the search was kept open to cover most of the literature relevant to reshoring. Second, the search was limited to peer-reviewed journals and to specific subject areas, thus excluding the majority of journals that do not meet the quality required for this research. Following this data collection strategy, it is important for the researcher to distinguish which material is acceptable and which is not. The delimitations for this literature review can be found below in table 4.

Table 4: Delimitations of the search in the literature

Delimitations	Explanation
Field	Business & Economics, Operations Management, Manufacturing, Supply Chain Management, Reshoring, Offshoring, Backshoring, Outsourcing
Databases	EBSCOhost, Emerald Insights, SAGE Journals, Science Direct (Elsevier), Scopus, Springer Link, Taylor & Francis Online, Oxford Academic Journals, Elsevier, Research Gate, De Gruyter
Period	2008 – 2021
Search areas	Title, Abstract, Keywords
Document type	Articles
Source-type	Peer-reviewed journals with access free of charge
Language	English, German

Source: Own illustration

3.1.2 Descriptive analysis

The second step is the assessment of the formal characteristics by a descriptive analysis. The body of literature for this thesis meeting the criteria defined in table 4 consists of 88 articles with the earliest paper published in 2008 and the latest ones in 2021. The distribution of the journal papers is demonstrated in figure 3 and shows that reshoring dominates the periods between 2013 and 2017. This is reflected in almost half of the contributions and indicates that reshoring has been gaining in importance since 2013. The first years from 2008 to 2012 exhibit an unstable pattern for both reshoring and ES, and this pattern has continued for ES over the years 2013 to 2021.

Figure 3: Breakdown of reviewed studies from 2008 – 2021 (n=88)



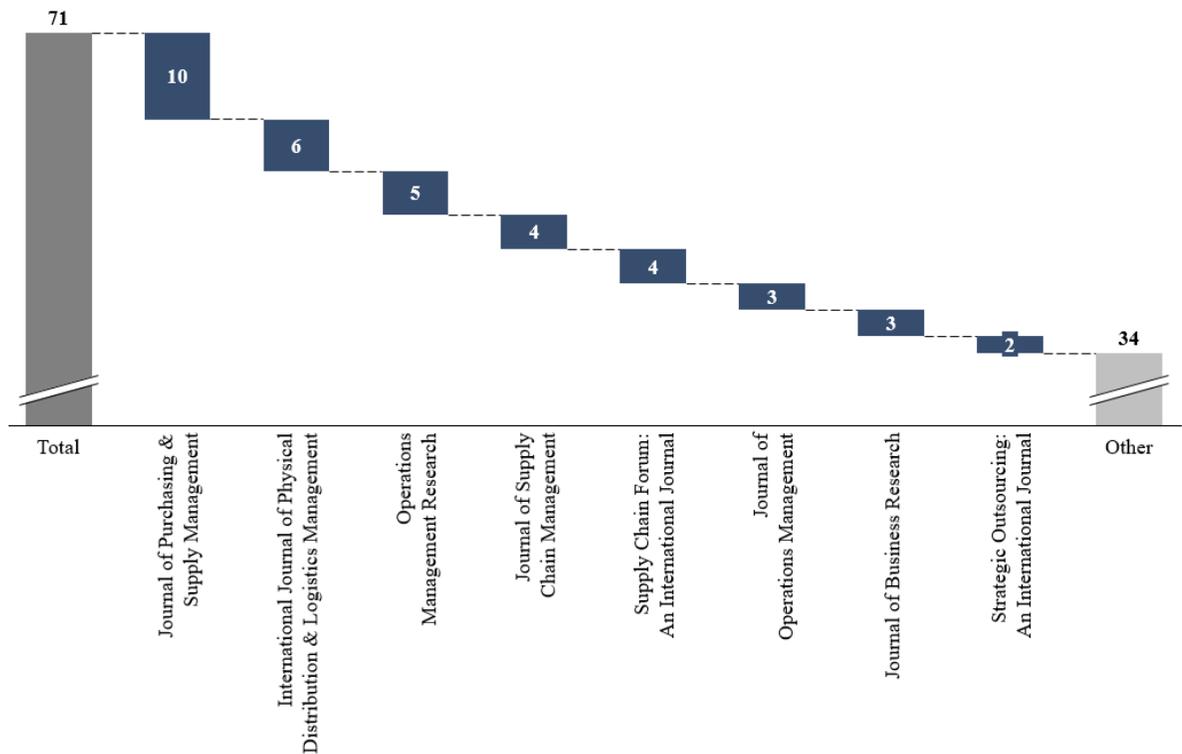
Source: Own illustration

Even though nine articles have been published on the relationship between reshoring and ES since 2015, there is no clear pattern or increase in new publications. In relation to the total number of identified literature, however, nine articles are still relatively few. This expresses the novelty of ES in connection with location decisions and emphasises that more research is needed in the future. This goes along with Orzes & Sarkis (2019) who pointed out “the relationship between reshoring and sustainability is a foundational unexplored relationship” (p. 482). Orzes & Sarkis (2019) go on to say that the “evolution and tension in globalisation poses a major question for sustainable supply chain management scholars” in terms of the relationship between reshoring and ES (p. 481). Research is needed to understand this relationship and requires more investigation of the role of ES in a reshoring context. Research questions such as how reshoring is perceived from an ES perspective or what reshoring means to a home country’s ES performance are arising in extant literature (Orzes & Sarkis, 2019). There is empirical evidence that sustainability-related issues are becoming increasingly important for the academic debate and managerial decisions (Fratocchi & Di Stefano, 2019). This confirms both topics and the combination of reshoring and ES have not been sufficiently researched and that there is a potential to tie in with these questions.

Concerning available literature on the reshoring phenomenon, with ~11% (10 articles) the *Journal of Purchasing & Supply Management* has published the majority of material

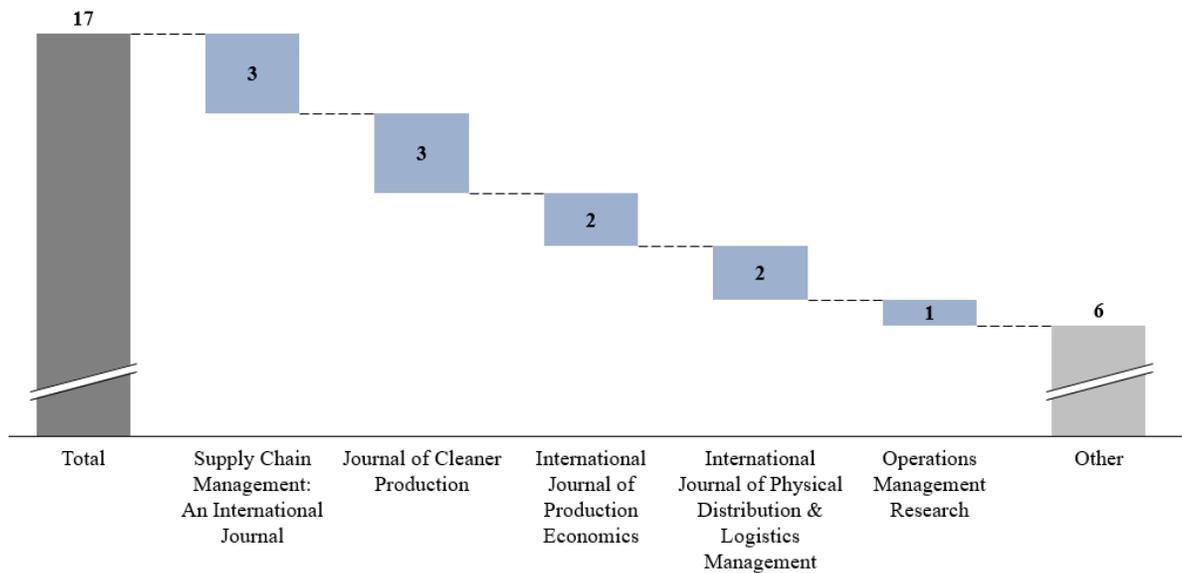
followed by six articles in the *International Journal of Physical Distribution & Logistics Management*, five articles in *Operations Management Research* and four articles in *Journal of Supply Chain Management* (figure 4). Articles for ES have not been published in one central journal, but rather in about five different journals (figure 5). In the centre of attention are *Supply Chain Management: An International Journal* (three articles) and *Journal of Cleaner Production* (three articles). It is notable that studies on *sustainability* are not necessarily published in journals that deal exclusively with environmental research issues, but also in business-related ones, such as Business Administration, Purchasing & Supply Chain Management and/or Operations Management. Nevertheless, the *Journal of Cleaner Production* deals with subjects such as energy (renewable energy, sustainability and the environment) and environmental science, which is particularly applicable for the topic of this thesis.

Figure 4: Main journals of the literature review for reshoring



Source: Own illustration

Figure 5: Main journals of the literature review for environmental sustainability



Source: Own illustration

3.1.3 Category selection

The third step of the literature review is *category selection* to define analytical categories to classify the contents of the articles (Barbieri et al., 2018). The researcher decided on the following questions *what, why, where, when, who, which impact and how* to assign the literature correspondingly. This approach has strongly facilitated categorising the material identified in the search for literature. According to Barbieri et al. (2018), this approach was also previously applied to classify extant literature for offshoring (Mugurusi & De Boer, 2014) and outsourcing (Hätönen & Eriksson, 2009). “With respect to reshoring the approach was suggested by Gray et al. (2013) and applied by Wiesmann et al. (2017); however, in the latter reference, the question “who” is not considered and the analysis of questions “when”, “where” and “how” were not deeply analysed” (Barbieri, Ciabuschi, Fratocchi, & Vignoli, 2018, p. 85). In order to follow the same approach as Mugurusi & De Boer (2014) and Hätönen & Eriksson (2009), it was important to cover the literature as completely as possible and thus to include the category *who*, too. The following paragraph contains a brief description to explain what is meant by each question, which is in accordance with Barbieri et al. (Barbieri et al., 2018, p. 85):

- *What*: The *what* question refers to the majority of articles that attempt to explain the reshoring phenomenon, its features, characteristics or drivers (e.g. sustainability) that influence it.
- *Why*: This question aims to understand motivations, drivers and barriers for reshoring in the context of ES.
- *Where*: This question is directed to understand the geographical aspects of offshoring and reshoring concerning home and host country levels.
- *When*: The question of *when* aims to analyse the duration of the offshoring experience and how it might influence contingency factors of firms.
- *Who*: This question “aims to provide a more meaningful picture of the phenomenon by investigating whether firms’ propensity to reshore depends on factors such as their size, industry and export intensity” (Barbieri et al., 2018, p. 85).
- *Which impact*: This question was added by the author because the current framework does not take into account the impact, for example, on the reconfiguration of supply chains, the environmental performance of firms or competitive advantages in achieving ES-related objectives.
- *How*: This question is particularly relevant to understand decision-making processes and to explore how managers put these decisions into practice.

Concerning the objective of this thesis to explore the perception of ES in the context of reshoring, to understand decision-making processes and to analyse the effects on value chains, the categories *why*, *how* and *which impact* are particularly important for this literature review. Although the category *why* has already been extensively investigated, it has been shown that drivers related to ES, especially in the automotive industry, are not yet fully covered. Table 5 below illustrates to what extent the respective category is covered in the literature. The three prioritised categories are highlighted in bold. This is based on an extensive literature review, in which 88 articles were read and evaluated (focusing on research design, methodology, findings, research implications, practical implications and proposed research avenues) in how far they relate to the seven categories. The data summarised in table 5 shows that the *what* question of reshoring and ES is treated almost uniformly in the literature, but only very few articles actually dealt with the question of

whether and to what extent reshoring or ES have a significant influence, for example on the reconfiguration of value chains. The question of *which impact* is only covered by about 4.2% and 5.9% for both topics and shows that further research is required to investigate the influence a reshoring event has on the reconfiguration of supply chains. The relevant category for the second research question, which has not yet dealt with sufficiently – at least for reshoring – is the question of *how*. Decision-making processes and methods, especially for reshoring decisions, are covered in the literature by about 16.9%. For ES it is somewhat higher at 47.1%, although it must be emphasised that this does not necessarily always go hand in hand with a reshoring decision. In this context, Barbieri et al. (2018) stress their “analysis suggests that [...] decision-making and the implementation processes of reshoring, are comparatively less understood” (p. 81). The category of *why* is the second most frequently covered by reshoring. The literature review has shown that the discussion about the reshoring phenomenon and its characteristics is usually always accompanied by an assessment of the motivation, drivers and barriers. However, it should be made clear that ES has not yet played any or only a subordinate role, especially in articles published in 2013 and 2014. ES has therefore only been discussed as a driver or barrier in later articles from 2016 and 2017 onwards. This literature review and allocation to the seven categories thus provides a transparent overview to show the research needs or gaps for reshoring and ES on a purely descriptive level.

Table 5: Literature review according to analytical categories (n = 88)

#	Overarching categories	Proportion covered in literature	
		Reshoring	ES
1	What (e.g. clarification of the phenomenon <i>reshoring</i>)	50 (70.4%)	14 (82.4%)
2	Why (e.g. identification of perception, drivers and barriers)	53 (74.6%)	5 (29.4%)
3	Where (e.g. evaluation of geographical aspects)	9 (12.7%)	-
4	When (e.g. duration of the offshoring experience)	4 (5.6%)	1 (5.9%)
5	Who (e.g. differentiation of firms implementing reshoring)	15 (21.1%)	1 (5.9%)
6	Which impact (e.g. influence on global value chains)	3 (4.2%)	1 (5.9%)
7	How (e.g. decision-making schemes and procedures)	12 (16.9%)	8 (47.1%)
Total share of articles covering both reshoring and ES		9 (10.2%)	

Source: Own illustration

The identified literature was also classified into 15 categories with regard to their applied research methodology, which is illustrated in table 6 below. A variety of methodologies has been used to study both reshoring and ES. With regard to reshoring, 27 articles were found which were purely conceptual, i.e. they had no empirical reference. “This large number does not come as a surprise, as the topic of reshoring is emerging and thus unexplored” (Wiesmann et al., 2017, p. 20). The conceptual papers most recently published are dealing with the reshoring decision-making process (McIvor & Bals, 2021), backshoring of production activities in the European manufacturing industry (Dachs et al., 2019) or the exploration of the insourcing decision-making process (Bals et al., 2016). Conceptual papers for ES are published much less with seven articles, however, some of those articles already make a reference to the reshoring phenomenon, location decisions and supply chain management. For instance, these papers are dealing with reshoring and ES (Orzes & Sarkis, 2019), the evolution of sustainability in supply chain management (Rajeev et al., 2017) or reshoring for sustainability (Ashby, 2016).

Numerous (large-scale) surveys, case studies, qualitative and quantitative empirical analysis focusing on the *what* and *why* of reshoring have been carried out, which explore a relatively new and emerging phenomenon particularly well. Especially surveys (13) and case studies (10) were predominantly used as a research methodology “whose methodological choice allow them to explore the reshoring phenomenon and provide empirical evidence” (Wiesmann et al., 2017, p. 20). These surveys and articles are particularly focusing on understanding the *what* and *why* of reshoring in certain countries (e.g. Norway, Sweden) or specific industries (bicycle, automotive). However, the automotive industry is hardly considered in studies or is only mentioned in the overall context of various other sectors.

Secondary data is mainly referred to survey data from the European Manufacturing Survey (EMS), the German Manufacturing Survey (GMS) employed by the Fraunhofer Institute or the ERM. The category *literature review* was also added as a category, since there are at least three literature reviews that have been carried out for reshoring and five for ES. These literature reviews are not always stand-alone articles, but often also part of surveys or case studies. Nine articles were found, which specifically focus on the relationship between reshoring and ES. These are included in the 88 articles identified. Out of these nine articles,

five of them are classified as *literature reviews* while four of them are *conceptual papers*. None of those nine articles dealing with reshoring and/or ES is an empirical paper.

Table 6: Categorisation of literature in consideration of their research methodology

#	Research methodology	Reshoring	ES
1	Conceptual paper (non-empirical)	27 (38.0%)	7 (41.1%)
2	Survey	13 (18.3%)	-
3	Case study research	10 (14.1%)	1 (5.9%)
4	Literature review	3 (4.2%)	5 (29.4%)
5	Qualitative empirical analysis	5 (7.0%)	1 (5.9%)
6	Multiple case study	3 (4.2%)	1 (5.9%)
7	Quantitative empirical analysis	3 (4.2%)	-
8	Research paper	1 (1.4%)	1 (5.9%)
9	Quantitative empirical analysis (case study)	1 (1.4%)	-
10	Case study research (mixed-methods)	1 (1.4%)	-
11	Large-scale survey	1 (1.4%)	-
12	Case study research (longitudinal)	1 (1.4%)	-
13	Survival analysis	1 (1.4%)	-
14	Editorial	1 (1.4%)	-
15	Conference Paper	-	1 (5.9%)
Total		71	17

Source: Own illustration

The author has also examined whether the automotive industry has been considered when investigating reshoring. Of the 88 articles, ten relate specifically to the automotive industry and were published in the period between 2013 to 2020. Among others, these authors specifically focus on manufacturing location decisions in the automotive industry: Akpınar (2020), Lund & Steen (2020), Pavlínek (2020; 2018), Moradlou et al. (2017) and Lampón et al. (2017). They include three conceptual papers, three surveys, two empirical studies and two case studies. However, it is important to stress that these authors mainly focus on reshoring. Sustainability in general is considered in these articles only as a marginal topic (e.g. as a driver), if at all. Among these ten articles, the majority of the authors referred to the automotive industry as such. Only Lampón et al. (2017) limited their quantitative empirical analysis to AS in Spain by shedding light on location theory to formulate a model for international relocation of production.

3.1.4 Critical review and research questions

The last step of Seuring & Gold's process model for content analysis (2018) led to a critically review of the selected literature. An important prerequisite for conducting a proper material evaluation was the reading of all identified articles on reshoring and ES. When reading the articles, the focus was strongly placed on the three categories *why*, *how* and *which impact*. The following section is thus based on these three categories to derive the research questions. According to table 5, the *why* concentrates on section 3.1.4.1 (e.g. drivers and barriers of reshoring and ES), the *how* on 3.1.4.2 (e.g. existing decision-making framework) and *which impact* on 3.1.4.3 (reconfiguration of supply chains due to reshoring and/or ES).

Consequently, the remaining four categories *what*, *where*, *when* and *who* are not explicitly addressed. For example, the question of *what* is already covered in the literature with a share of about 70.4% (reshoring) and 82.4% (ES). Thus, this question is not being explored in this thesis. The questions of *where*, *who* and *when* are treated much less in the existing literature and are not of explicit importance for answering the three research questions.

3.1.4.1 Perception of ES as a driver for reshoring

A wide body of literature has explored the *why* firms rethink international location choices and particularly explored the motivations of the offshoring phenomenon (Barbieri et al., 2017). The motivation most frequently cited in the existing literature is cost reduction and is recognised as the most important one for offshoring. "Clearly behind, capacity bottlenecks at the German production location rank second as offshoring reasons, followed by the opening up of new markets abroad" (Kinkel & Maloca, 2009, p. 159). Offshore locations are advantageous as firms mainly benefit from lower labour costs or cheaper raw material that serves as input for production (Canham & Hamilton, 2013). Further offshoring drivers are access to products, technologies or local knowledge, which is not available at home (Lewin et al., 2009), the improvement of product quality (Ettlie & Sethuraman, 2002), better usage and development of foreign sales opportunities and channels as well as the improvement of delivery performances (Bozarth & Handfield, 1998). In contrast to offshoring, the motives for reshoring have been less explored. Consequently, the next section aims to address this gap by explaining the drivers and barriers of reshoring. Just as for offshoring, the reduction

of costs also applies to the reshoring decision. Despite this locational advantage of low labour costs, there are additional drivers and barriers relevant for this decision.

Even though the drivers and barriers of reshoring are less explored than for offshoring decisions, there is a vast array of reasons investigated by Wan et al. (2019), Engström et al. (2018), Wiesmann et al. (2017), Bals et al. (2016), Fratocchi et al. (2016), Stentoft et al. (2016), Gray et al. (2013) and Kinkel (2009). For instance, while Gray et al. (2013) or Wiesmann et al. (2017) distinguished firm-, country- and supply chain-specific reshoring drivers, Stentoft et al. (2016) investigated reshoring drivers according to seven distinctly different categories: (i) cost, (ii) quality, (iii) time and flexibility (iv) access to skills and knowledge, (v) risks, (vi) market and (vii) other factors.

Another approach is related to theory-driven criteria according to Ellram et al. (2013) and Ancarani et al. (2015) by adopting the dimensions of location advantages from the eclectic paradigm from Dunning (1998). More recently, Bals et al. (2016) and Foerstl et al. (2016) suggested a joint classification of motivations related to both insourcing and reshoring in accordance with TCE and organisational buying behaviour (OBB).

However, even if all authors use different categories, the drivers and barriers differ only to a certain extent. Table 7 provides a summary of 61 reshoring drivers and barriers identified by the content analysis of extant literature mainly with reference to Orzes & Sarkis (2019), Fratocchi & Di Stefano (2019), Di Mauro et al. (2018), Wiesmann et al. (2017) and Stentoft et al. (2016). The three categories *firm-, country- and supply chain-specific* from Wiesmann et al. (2017) served as a starting point to consolidate reshoring drivers and barriers. In the category *country*, the two perspectives *host- and home-country* were distinguished. In addition, a fourth category *market-specific* was added as some drivers refer, for example, to the instability of exchange rates or political risks. Since the thesis considers ES besides reshoring, it is insightful to respect drivers and barriers for this topic, too. Orzes & Sarkis (2019) and Fratocchi & Di Stefano (2019) have published the results of their literature review on both reshoring and ES, which is thus being considered. However, it is also clear that there are certainly other drivers mentioned in the literature that have not been considered here.

Table 7: Consolidation of reshoring drivers and barriers with reference to the literature

Category	Drivers and barriers	Fratocchi & Di Stefano (2019)	Orzes & Sarkis (2019)	Di Mauro et al. (2018)	Srai & Ané (2016)	Tate (2014)	Arlbjørn & Mikkelsen (2014)	Kinkel (2014)	Martinez & Merino (2014)	Bailey & De Propris (2014)	Canham & Hamilton (2013)	Elfram et al. (2013)	Gray et al. (2013)	
1 Firm-specific	Drivers													
	Wrong estimation of benefits and risks in the offshoring decision			X										
	Correction of earlier managerial mistakes			X										
	Lack of knowledge about the host country during the offshoring decision	X						X						
	Overhasty offshoring decisions							X					X	
	Over-estimation of cost savings during the offshoring decision										X			
	Change in firms business strategy as a response to changing environments	X		X										
	Barriers													
	Too late to go back									X	X			
	Immature reshoring process							X						
	Lack of capacity, resources and internal competences							X		X	X			
	Lack of proper decision data		X					X						
	2a Host country-specific	Drivers												
		Diminishing growth opportunities; shrinking market size				X			X					
Inadequate quality or not at an acceptable level					X	X	X	X	X	X	X	X		
Theft of intellectual property and patent enforcement						X						X		
Risk of public relation disaster due to supplier malfeasance						X								
Lack of trust and commitment among staff or suppliers								X						
Increasing labour, logistics or operating costs				X	X					X				
Eroding cost advantages				X	X					X				
Higher than expected coordination efforts and transaction costs				X						X				
Miscalculation of actual costs		X							X	X				
Barriers														
Risk of losing access to market and foreign distribution channels												X		

	Inability to provide services related to the product		X					X	
	Difficulties due to physical and mental distance		X	X		X			X
	Demand volatility and supply chain resilience							X	
	Production and delivery reliability		X						
	Changes in energy costs		X	X				X	
	Drivers								
	Changes in the global economy				X	X	X	X	X
	Political risks				X		X		X
	Eroding comparative advantages				X	X	X	X	X
	Instability in exchange rates	X	X	X				X	X
	Increased competition on resource assets				X		X		X
	Customs duties for re-import	X	X						
	Payment terms	X	X						
	Barriers								
	Large economic differences							X	
	Instability in exchange rates				X				X
	Large differences in resource availability							X	

Source: Own illustration

Reshoring appears to be a very heterogeneous phenomenon (cross-reference to table 1 in section 2.1.2) “in the sense that it represents a common response to diverse offshore challenges firms may face” (Di Mauro et al., 2018, p. 110). This is particularly evident in the variety of drivers and barriers mentioned in the literature, which are based on different frameworks. However, the cost perspective was given broad attention and was the most frequently mentioned driver for moving manufacturing back to the home country. Even if Stentoft et al. (2016) and Fratocchi et al. (2016) claim that costs are the most common reason mentioned in extant literature as a reshoring driver, it is not mentioned in the extensive literature review from Wiesmann et al. (2017). Still, particular issues mentioned include high labour and personnel costs, high operating and logistics costs, change of energy costs, eroding cost advantages, higher than expected coordination efforts or miscalculation of actual costs (Wiesmann et al., 2017). “Thus, cost is a major consideration for moving manufacturing, not only for offshoring, but also for backshoring” (Stentoft et al., 2016, p. 57).

Firm-specific drivers and barriers

Firm-specific factors mostly refer to a firm's internal competences in assessing internal or external data and information (e.g. lack of knowledge about the host country during the offshoring decision) and decision-making procedures (e.g. overhasty offshoring decisions). In some instances, for some firms it is too late to go back as they, for example, over-estimated the desired cost-savings during the offshoring decision or they estimated benefits and risks not sufficiently (Di Mauro et al., 2018). Wiesmann et al. (2017) state that "all these point to the same conclusion. That is, offshoring is a decision that should not be taken lightly, and there are multiply ways in which it can backfire" (p. 33). Furthermore, Bals et al. (2016) argue that reshoring could also be considered as a deliberate strategy or as a reaction to offshoring failure. This dual perspective on the reshoring decision combines to interpretations: reshoring is considered either as a correction of earlier managerial mistakes (Di Mauro et al., 2018) or as an immediate response to a changing business environment (Fratocchi & Di Stefano, 2019).

Host country-specific drivers and barriers

It appears that host country-specific drivers and barriers positively influence the reshoring decision. Especially inadequate quality of semi-finished goods or products seems to be a decisive driver to move manufacturing back to home countries. This has been reported by seven sources of table 7 above and is in line to what Barbieri et al. (2018) found out that quality is the most cited motivation besides costs. They further distinguished between "poor level quality of offshored manufactured products", "production and delivery time impact" and "reduction of labour cost gap between the host and home country" (p. 92). However, production and delivery time must rather be allocated to the supply chain-specific category while reduction of labour costs rather belongs to the set of cost-related drivers. Still, this seems to confirm the idea that manufacturing reshoring strategies have a complex nature and are not only based on efficiency issues. In contrast to the variety of host country-specific drivers, there is not too many barriers identified in the literature review. The risk of losing access to market and foreign distribution channels may threaten a firm's revenue in a certain region. The risk of losing access to raw material and components only available in the host country is similar to the previous one. This risk underlines the fact that the advantages of local production are not only related to the proximity of the headquarters, but also play an

important role in supply chains. The third risk refers to losing supplier knowledge and is related to the capabilities established across the supply chain and the level of vertical integration.

Home country-specific drivers and barriers

Compared to the situation in the host country, the home country-specific drivers are often seen as attractive for a firm initiating a reshoring decision. On the one hand, if a firm decides to reshore its operations back to its home country, the local advantages should be evaluated before the company implements that decision. On the other hand, Bailey & De Propris (2014) and Arlbjørn & Mikkelsen (2014) point out that markets are dynamic, change over time and certain regulations can be changed to the firm's advantage. For instance, one of the nine drivers identified in the category *home country* refer to political or governmental incentives, which can be adapted over time and make it more or less attractive for a company to reshore. "Political incentives to improve domestic production is a commonly mentioned driver in the literature" (Wiesmann et al., 2017, p. 32). It is worth highlighting "institutional factors (such as local incentives) may be a significant support to firms' decisions to relocate manufacturing activities to the home country, but only if combined with strategic and operation elements" (Srai & Ané, 2016, p. 7209). This is viewed critically by Srai & Ané (2016) stressing that offshoring and reshoring is a firm's decision whereas proximity to important markets and strategic valuable resources is more relevant for the location decision than institutional incentives.

Another driver is access to qualified personnel or proximity to R&D resources and skilled labour, which can be associated both as a driver for the home and host country in terms of specific know-how or competences. However, access to qualified personnel in terms of know-how and competences can both be a driver and barrier for reshoring. For instance, lack of internal know-how and competences can make it hard to establish production at the home country (Wiesmann et al., 2017). In addition, Kinkel (2014) states that in some cases it is not possible to replace product and process competences lost during outsourcing or offshoring activities in the past. Kinkel argues that firms should rather concentrate on building new local resources with certain know-how and competences to comply with future product and

process requirements. This would lead to a larger proportion of firms leaving their operations at the outsourced site.

An important driver is the increased awareness of environmental impacts and a higher focus on sustainability. These drivers have been particularly identified in recent articles in the period 2018-2019 and show that ES is of increasing importance or has received less attention in the last 10 years. It also shows a “better understanding of how production and the supply chain affect the environment and sustainability has gained importance among stakeholders both inside and outside the company” (Wiesmann et al., 2017, p. 32). However, strict requirements on ES can also lead to firms producing more abroad, especially where low requirements prevail. In addition, it also requires firms with complex supply chains to rely on the availability of environmentally sustainable suppliers. Nevertheless, ES is expected to gain importance as a possible reshoring motivation due to either a focus on a sustainability-oriented strategy (Ashby, 2016) or to home country legislation (Sardar et al., 2016). Other barriers in this category refer to a lack of qualified staff or raw materials only available at the host country.

Supply chain-specific drivers

No barriers for reshoring are listed in the category of supply chain-specific factors. As the offshoring decision results in a more complex and longer supply chain, it is no surprise that many reshoring drivers are considered with this category. Goods and information usually have to travel longer distances and make it even more difficult to control the supply chain. Synchronising business functions along the supply chains is more difficult, too. For instance, Amaral et al. (2012) observed, that if R&D departments are located close to manufacturing, it is more beneficial for product development or innovation. Consequently, Di Mauro et al. (2018), Tate (2014), Arlbjørn & Mikkelsen (2014) and Bailey & De Propris (2014) argued that innovation and R&D suffer due to the distance to manufacturing. In addition, global supply chains have high coordination costs, although some cost savings are offset by cheap labour. Still, the risk of disruption increases as supply chains usually span across different countries or even continents. In this context, especially Wiesmann et al. (2017) reported numerous drivers and barriers in their extensive literature review, however, there is no driver mentioned concerning global pandemic crisis. It is clear that this latest phenomenon of a

pandemic crisis has not yet been researched, yet it could become a driver for reshoring in the future.

Market-specific drivers and barriers

Market-specific drivers and barriers are not specific to the reshoring or location decision, but apply to any international location decision of firms. Some of those drivers and barriers are relatively unpredictable, hard to influence on macro- or micro-level and dynamic in terms of a constant change (e.g. exchange rates or political risks). For example, exchange rate instability is of considerable importance for a global production network and supply chains, as an unfavourable development may outweigh factors previously perceived as beneficial for a particular location (Tate, 2014). Furthermore, exchange rate instability can be both a driver and a barrier to reshoring decisions. In this context, Ellram et al. (2013, p. 19) argue for the need to recognise “location differences are dynamic and important with regard to the manufacturing location decision” as the parameters influencing a region’s attractiveness for businesses constantly change.

The drivers that were mentioned most frequently are eroding comparative advantages and changes in the global economy. Both drivers are rather general and do not refer specifically to reshoring, however, eroding comparative advantages, which are of primary importance for location decisions (e.g. tax rates, labour costs), are decreasing. Jonsson et al. (2011) point out it needs thus be understood in relation to other levers for cost savings. Changes in the global economy are referred to the general developments and trends the economy is exposed to (e.g. digitization and automation, e-mobility).

Conclusion

The literature review has shown that rather drivers have been identified and much less the barriers that prevent a reshoring decision. This is probably because the phenomenon is still relatively new and has not yet been fully researched. In addition, the aim is to investigate how to support reshoring activities rather than to restrict them. It is also notable that literature does not distinguish between different sizes of firms (e.g. employees, locations, revenue). However, Arlbjørn & Mikkelsen (2014) considered this when investigating the motivation of firms to relocate. They claim that medium and large enterprises look for automation

opportunities in the home country when problems with lead times arise, but that this may not be true for small firms. “A plausible explanation for this could be that larger companies have already been through automation processes and that small companies find it difficult to cope with automation because of limited resources” (Arlbjørn & Mikkelsen, 2014, p. 61).

The Covid-19 pandemic has highlighted the vulnerability of global supply chains. In response, firms may consider reshoring as a risk mitigation strategy in the future, which could thus be considered as a further driver. Although Covid-19 in particular has not been known until the end of 2019, there is also no general discussion of such pandemic crises as a driver for reshoring and to stabilise supply chains through a more localised footprint (Baldwin & Evenett, 2020). Nevertheless, there are already individual conceptual papers, such as the one by Barbieri et al. (2020), which deals with the learning effects of the pandemic and shows what need for action for reshoring could result from this.

It is notable that ES aspects were mentioned especially in recent articles from the years 2018 and 2019. Although not mentioned by all authors, it shows that sustainability in terms of a better carbon footprint plays a role in reshoring decisions. This expresses ES drivers and/or barriers have gained in importance at least in the last two years, but are still addressed in a very general way. Pal (2018) adds that an increasing awareness for ES facilitates reshoring initiatives by manufacturing firms. Although there is a lot of current interest in the phenomenon of reshoring and ES, a complete picture of the extent, drivers and relationship is still lacking (Fratocchi & Di Stefano, 2019).

For instance, any sector-specific particularities for the automotive industry are not discussed in the context of reshoring and ES drivers or barriers. “Collected evidence clearly shows that the attention given to the impact of environmental and social sustainability issues on backshoring decisions has increased in recent years” (Fratocchi & Di Stefano, 2019, p. 452). Reducing CO₂-emissions was mentioned by Srai & Ané (2016) as the only driver. They associated the reduction of CO₂-emissions with an improvement of logistics issues, reduced delivery times and reliability of supply chains. Their example of a French company decided to come back to France for logistics reasons specifically concerning stock management, delivery times and thus a reduced carbon footprint. The reason for choosing a French

company for data collection is that they are large developed production nation. It is precisely these nations such as France, Spain or Italy that have experienced a significant offshoring movement in recent decades, where reshoring is now being actively encouraged (Srai & Ané, 2016).

Reshoring may put undue pressure on local communities through a localised production and a higher demand on transport infrastructure. Even though it is considered as economically beneficial, it can have negative effects on the environment and the quality of life for local communities (Orzes & Sarkis, 2019). With respect to the three sustainability dimensions of environment, social and economy, it became clear that environmental and social drivers or barriers are less pronounced. The numerous economic drivers such as costs, quality, growth, customer and supplier relations or access to knowledge or markets still dominate the field.

Literature does not entirely explain yet to what extent ES is perceived as a driver or barrier for reshoring strategies. Fratocchi & Di Stefano (2019) argue that “scarce attention has been paid, until now, to the interdependences (if any) among sustainability issues and the firm’s decision to backshore its manufacturing activities” (p. 451). There is also a lack of research on the awareness of certain industries (e.g. automotive, pharmaceuticals, consumer goods) of how reshoring and ES are perceived. Neither is there any research that sheds light on the perceptions of different firms in an industry, nor on the perceptions of specific individuals in an organisation. This major research gap has also been stressed by Rajeev et al. (2017) that “more focus on industry-specific studies is required because problems addressing industries that are serious polluters, especially those in emerging countries, remains largely unaddressed” (p. 299). They furthermore point out the pressing demand “to include more industry specific industries, as the sustainability needs and performance of all the industries are not equivalent” (p. 310). Concerning ES, especially the automotive industry is one of the less investigated industries compared to the electronics industry followed by agricultural and food and logistics (Rajeev et al., 2017). Furthermore, Dachs et al. (2019) emphasise that reshoring is “most likely for manufacturers of final products and in high-technology sectors” such as electrical equipment, information, communications and the automotive industry (p. 1). For these reasons, the researcher has decided to investigate the automotive industry with respect to reshoring and environmental sustainability.

Fratocchi & Di Stefano (2019) also stress “that the attention of scholars to the environmental and social sustainability as a motivation/driver of manufacturing back-shoring decisions is still at generic level” (p. 458). In this context, they also address “the need for future investigation to specifically address each of the two investigated pillars (environmental and social), since these two issues may have different impacts on back-shoring decisions (p. 468). In line with this reasoning, the first research question is formulated as follows:

Research question 1: How do managers in the automotive industry perceive environmental sustainability as a motivation or driver for reshoring?

3.1.4.2 Extant decision-making frameworks for reshoring and ES

This section concentrates on reviewing extant literature with regard to reshoring decision-making. The main objective is to discuss decision-making frameworks and to elucidate to what extent ES is covered in these frameworks. According to Barbieri et al. (2018) “the decision-making and implementation process of reshoring (i.e. “how” firms decide to reshore and “how” they put that into practice) is a key aspect for a comprehensive study of the phenomenon [...]” (p. 92). The authors argue that interest in these research gaps is increasing especially between 2015 and 2017, which is also in line with the descriptive literature review from this study (figure 3).

“Decision-making processes with regard to reshoring generally appear to be under researched” (Wiesmann et al., 2017, p. 27). Barbieri et al. (2017) furthermore point out that “the *how* question is clearly an under-investigated topic, perhaps because of the novelty of the phenomenon” (p. 32). Bals et al. (2016) also stress that reshoring decision-making remains large unexplored. Future research should focus on how organisations should support reshoring strategies, for instance in terms of [...] decision-making processes. They do also believe that reshoring decision-making is of high significance as it can have several company-wide implications. In accordance with Theyel et al. (2018), they point out that “processes within companies to make location decisions are multifaceted and complex” and found that these company-wide implications for reshoring decision-making range from an assessment of location factors to an evaluation of a firm’s resources and competencies (p.

300). Locational factors are focusing on the external perspective of a firm and include the cost of input (e.g. raw materials, energy, labour), availability of complementary products and services or access to customers. Resources and competencies are concerned with evaluating a firm's internal capabilities (e.g. knowhow, resources or capabilities). The findings from Theyel et al. (2018) are also in accordance with Hartman et al. (2017) who stress that "it became increasingly clear that firms lacked a detailed understanding of the process complexities" which "limited the decision makers' ability to identify and then obtain the information needed to evaluate the spectrum of manufacturing relocation options fully" (p. 366).

More precisely, Barbieri et al. (2018) recently stress that "other related aspects, such as decision-making and the implementation of processes of reshoring, are comparatively less understood" and that growing interest among scholars occurred (p. 81). "To date the topic has been covered only by a limited number of contributions" (Barbieri, Ciabuschi, & Fratocchi, 2017, p. 23). With regard to this research, this is also in line with previous research from Chen et al. (2014) stating that sustainability has been raised as a major strategic issue for firms, however, it is not considered in decision-making techniques as an important criterion. More recently, McIvor & Bals (2021) also stress "the potential of sustainability to drive additional reshoring" (p. 1). Even though reshoring is gaining momentum as an important strategic driver for firms to relocate production facilities, the interdependence with sustainability as a central decision criterion has not been addressed yet. According to a recent study from Fratocchi & Di Stefano (2019), they found that this relationship is not explored in much detail. Consequently, this has invited scholars, researchers and practitioners to explore the interrelation between reshoring and ES, however, by today decision-making models are not much covered in extant literature. Table 8 emphasises that decision-making is still largely focusing on reshoring and economic-related criteria only such as costs. Gray et al. (2020) stress that "sourcing decisions are often heavily weighted towards minimizing costs, even though these decisions also can affect revenue, risk, and other stakeholder values". They furthermore argue that firms do not compete on cost alone, but on value as well. Their approach builds on extant literature and knowledge about decision-making processes "to offset human biases and organizational incentives that emphasize cost reduction" (p. 735).

Thus, the researcher found eight decision-making frameworks for reshoring. Two decision-making frameworks from McIvor & Bals (2021) and Chen et al. (2014) are specifically referring to sustainability as a criterion for location decisions.

Table 8: Extant reshoring decision-making frameworks in a chronological order

#	Decision-making frameworks	Explanation	References
01	A framework for the reshoring decision	McIvor & Bals (2021) created a three stage prescriptive framework for the reshoring decision taking into consideration the logic of eclectic theory, TCE and RBV. The framework specifically deals with the reshoring decision-making process and does not refer to the implementation stage. The framework considers issues such as a firm's boundaries, performance, costs and sourcing options.	McIvor & Bals (2021)
02	Manufacturing location decision-making model	Theyel et al. (2018) designed a framework, which provides companies orientation on manufacturing location decision-making and how it can be integrated into the company's strategic assessments. In addition, the model is focusing on four overarching directions which is "retaining, offshoring, and reshoring manufacturing or a combination there of (i.e. hybrid approaches)".	Theyel et al. (2018, p. 309)
03	System Dynamics Modelling (SD)	Gray et al. (2017) found that through experimental learning, SMEs can develop a more effective process of location decision making that takes into account previous offshoring experiences and avoids the reversal of the next location decision.	Gray et al. (2017)
04	Reshoring decision-making framework	Bals et al. (2016) build on already established sourcing decision-making frameworks and offshoring implementation processes to derive a framework how reshoring decisions should be taken. This framework consists of eight steps: <ol style="list-style-type: none"> 1. Determine the firm's boundaries 2. Analysis of capabilities and performance 3. Gather information on alternatives 4. Analysis of data and development of solutions 5. Make shoring decision 6. Disintegration at former source/location 7. Relocation to new source/location 8. Reintegration to connect with other value creation activities 	Bals et al. (2016)
05	Viable System Model (VSM)	Conceptualizes the firm as "a dynamic adaptive system in search of ways to cope effectively with external forces that undermine its viability [...]. Reshoring serves to increase the stability of the system" by adopting a four-step process:	Mugurusi & De Boer (2014, p. 275)

		<ol style="list-style-type: none"> 1. Design the ex ante VSM firm's map by describing the systems that form the company and their interconnections 2. Identification and analysis of reshoring motivations and design of ex post VSM firm's map (i.e. after reshoring decision implementation) 3. Take the decision and implement it 4. Monitor the performance of reshored activities 	
06	Multi-step representation of the internationalisation of production	<p>Fratocchi et al. (2014) considered the reshoring decision as a strategic part of the internationalisation of production and distinguished two steps:</p> <ol style="list-style-type: none"> 1. Decide to internationalise and determine governance structures (in- vs outsourcing) and geographical scope (either near-shore within their region or offshore) 2. Change production location strategy <ul style="list-style-type: none"> - increase geographical scope (e.g. from Mexico to China for US firms) - relocate production to a closer destination country (near-shore) (e.g. from China to Mexico for US firms) - reshore production by repatriating to its home country (e.g. from China to US for US firms) 	Fratocchi et al. (2014)
07	Framework for sustainability in manufacturing facility location decision-making	<p>First, the conceptual framework suggests that sustainability should be evaluated "on an integrated viewpoint on the economic, environmental and social perspectives and aspects [...]". Second, the manufacturing location dimension and strategy of the firm is added as this is largely absent in the current literature.</p>	Chen et al. (2014, p. 160)
08	Host country opportunity matrix	<p>Arik (2013) argued for a model where reshoring decisions are driven by global competitive dynamics, home state competitive environment and firm-specific factors. Consequently, decisions are mainly influenced by global constraints and incentives. The established "host country opportunity matrix" considers risks, low cost of production, market failure and low market potentials.</p>	Arik (2013)

Source: Own illustration

With the exception of *System Dynamics Modelling* from Gray et al. (2017), the author is critical of the fact that none of the decision models refer to a specific group of firms (e.g. turnover €100-500 million; > €500 million) or a certain industry (e.g. pharmaceuticals, aerospace, consumer goods, services, automotive). A study by Hammer & Plugor (2016) also stressed that sustainability of reshoring decisions "need to be assessed in the context of a range of institutions at macro and micro level" (p. 415), however, there is only one model

from Gray et al. (2017), which is taking into consideration small and medium-sized enterprises (SMEs). For clarification purposes, according to a definition from the European Commission (2012), SMEs are characterised by a staff headcount <250, turnover \leq 50 million € or balance sheet total \leq 43 million €. They argue that through experimental learning, SME can develop a more effective process of decision-making by taking into consideration previous offshoring experiences. It can therefore be assumed that decisions on reshoring can be size- and sector-specific, especially if sustainability aspects are taken into account. Each firm has different offshoring experiences, is exposed to other country-specific factors or has to meet different customer expectations. “For actors of the global automotive industry, location decisions play a particularly important role in their long-term competitiveness” (Csiki et al., 2019, p. 14). On top of that, Gray et al. (2017) also argued that more case research is needed to understand decision-making better. Moreover, they stress that very few studies focus on specific industries or geographical settings. Therefore, this strengthens the research purpose to focus on AS and to come up with a specific reshoring decision-making framework for this sector.

It is also notable that there are two categories of decision-making frameworks. Notwithstanding of the consideration of ES-related aspects, one category is dealing with decision-making frameworks on a strategic level, while the other category is focusing on the operational perspective of the reshoring process. For instance, taking into consideration the frameworks from McIvor & Bals (2021), Chen et al. (2014), Fratocchi et al. (2014) and Arik (2013), they perceive reshoring and sustainability to be part of the strategic direction of a firm and that reshoring follows a strategic plan. This is reflected in assessing geographical scopes, governance structures required for off- or reshoring, evaluating locational factors that are beneficial for a firm or considering its competitive position in the market. Most importantly, that entails that reshoring is not triggered by a particular event (e.g. quality standards, capacity utilisation) that caused a firm to reshore, but follows the strategic direction of a firm to change its manufacturing location (Hartman et al., 2017). This is also in line with Diamantopoulos et al. (2011) who argue that manufacturing location decisions are still very often motivated by cost elements (e.g. labour costs). However, the strategic perspective is gaining momentum for reshoring, in terms of the “made in effect”, co-location of R&D and design and the impact on innovation (Fratocchi, et al., 2015). Especially

responsiveness and short lead times are important factors to reduce friction in the supply chain (Pegoraro et al., 2020). The decision-making frameworks from Gray et al. (2017), Bals et al. (2016) and Mugurusi & De Boer (2014) are rather concentrating on the process itself to make the decision. Compared to the more strategic-oriented frameworks, these ones are more detailed in terms of the exact steps that need to be taken. More precisely, they articulated models with a concrete set of actions to guide the one who employs the model in practice.

Manufacturing location decisions must be understood not only through the lens of economic or financial aspects, but also with regard to ES. Literature has indicated that the implementation of reshoring projects is not sufficiently researched yet (Fratocchi, et al., 2016). Orzes & Sarkis (2019) stress that the reshoring implementation process requires investigation. In this context, “reshoring for sustainability should be done with consideration and awareness” (Ashby, 2016, p. 85). There is a need to understand why firms decide to reshore and if ES is one of the major drivers in decision-making frameworks besides reducing logistics costs, value chain complexity and improving lead times (Ashby, 2016). Orzes & Sarkis (2019) point out “the role of environmental sustainability remains even less understood” (p. 482). The research implication from Fratocchi and Di Stefano (2019) revealed that “neither scholars nor firms’ managers and entrepreneurs considered the environmental [...] pillars of sustainability as the most relevant in terms of back-shoring drivers/motivation, outcome/benefit and/or barrier/enabler” (p. 449). In this course of research, Fratocchi & Di Stefano (2019) have done some initial research on how reshoring decisions are carried out in the context of ES. For instance, their research is dealing with a Swedish food company. The firm originally offshored its packaging locations to Poland although the raw materials were mainly sourced from Sweden and Finland. With the goal to reduce its supply chain, logistics costs and complexity, the CEO’s reshoring decision was also based on corporate responsibility issues, the reduction of the environmental impact and the return deliveries of the assembled products. This example shows that reshoring decision-making is already partly build upon sustainability criteria and shows that it has positive effects for the home country when employment rates rise. Even though there is some initial research, the interdependencies between a firm’s reshoring motivation and ES decisions have been poorly investigated. Especially the analysis from Barbieri et al. (2018) suggests

“decision-making and the implementation of the process of reshoring are comparatively less understood” and adds that decision-making is one of the less explored avenues in reshoring research (p. 81). Consequently, the second research question is stated as follows:

Research question 2: How does environmental sustainability fit within the wider decision-making framework for reshoring?

3.1.4.3 Need for supply chain reconfiguration when reshoring

“Globalisation and economic trends have created highly complex supply chains across multiple industries and there has been a tangible and significant shift to firms’ offshoring their production activities. Sustainable practices, and ensuring supplier responsibility are additional challenges when offshoring, but an increasingly important consideration” (Ashby, 2016, p. 75). These challenges not only apply to ensuring supplier responsibility, but are also relevant to the innovation potential of a company. “The physical distance/separation between design and manufacturing functions can lower the innovation potential” (Barbieri et al., 2017, p. 111). “Although offshoring trends have existed, some companies have started to carefully re-think their supply chain configuration choices; privileging domestic and regional developed country production” (Orzes & Sarkis, 2019, p. 481). Especially the consideration of sustainability concerns in SCM is an important research direction (Martins & Pato, 2019). Tate (2014) stressed that “heightened emphasis on sustainability [...] drove firms to re-consider the appropriate *shoring* decision” (p. 66) while at the same time, Heikkilä et al. (2018) expressed the relevance of sustainability and ethicality of the supply chain, which is a dominant driver for re-examining location decisions. More specifically, they argue in terms of environmental and human rights violations. It is notable that the environmental and social pillars of the TBL are mentioned in the same context when it comes to sustainability in the supply chain. In particular, respecting human rights and ensuring fair working conditions are two important issues that apply to the social pillar. However, it is notable that neither human rights nor fair working conditions are mentioned in table 7 (section 3.1.4.1; *supply chain-specific drivers*). It can be assumed, however, that the driver *increased focus on sustainability* with regard to TBL also considers social aspects, even if they are not further explained.

However, Orzes & Sarkis (2019) raise an important question in closing an important research gap by investigating the relationship between reshoring, supply chain management and SCR. Very often, these location strategies are coupled with decisions on the (re-) configuration of supply chains. Among others, this is because of changes, for example, in the relative attractiveness of locations, which “lead firms to reconsider their offshored production location decisions” (Barbieri et al., 2018, p. 80). When assessing the attractiveness of a location, the evaluation of the supply chain is as important as the reshoring decision. Thus, this has attracted researchers to consider SCR and to investigate if reshoring requires a firm to change the global supply chain network.

For instance, Ashby (2016) conducted a case study with a firm for the technical sportswear industry in the UK and found that it is not only important to redesign supply chains, but also to assess environmental impacts. In this case, Ashby’s aim was to examine the impact on the supply chain when a sustainable substitute is used as a raw material for clothing. This case concerned the use of a specific type of sheep wool to avoid importing cashmere from Mongolian suppliers. In line with the case from Ashby (2016), Orzes & Sarkis (2019) also argue “ethical and environmental scandals may significantly affect sales of globalized organizations who are unable to control their supply chains” (p. 481). This is also in line with what Heikkilä et al. (2018) have noted with regard to the simultaneous consideration of environmental and social issues.

According to Preuss (2005), the improvement of environmental impacts or using sustainable or recyclable raw materials while working closely with (local) suppliers along the supply chain, is of utmost importance for firms to ensure these goals are met. Because of the global spread of supply chains and the location of suppliers, achieving these goals is a significant challenge. Referring to the case with the Swedish food company of Fratocchi & Di Stefano (2019), Ashby (2016) also calls for more research on the impact of sustainable reshoring on SCR or the reconfiguration of a local supply chain. Taking into consideration the sustainability perspective, this discussion is flanked by two dominating drivers: *increased awareness of environmental impact* and *increased focus on sustainability*. These two drivers in particular are an important assessment criterion when it comes to implementing a local supply chain. Many authors, for example, Fratocchi & Di Stefano (2019), Orzes & Sarkis

(2019), Di Mauro et al. (2018), Srai & Ané (2016), Tate (2014), Ellram et al. (2013) and Gray et al. (2013), have assigned this driver a high relevance in category *2b home country-specific* (table 7 in section 3.1.4.1). This rising awareness led to the development of green supply chain management, which is directed to examine environmental aspects of efficient supply chain operations (Rajeev et al., 2017). In this context, Srivastava (2007) defines green supply chain management as the integration of environmental considerations into the whole supply chain management, covering the entire life cycle. This starts with the procurement of raw materials and extends through material selection and manufacturing processes to the end-of-life management of products. Through this definition, the complexity of supply chain management becomes apparent. It reveals that “since the late 1990s, a marked increase in sustainability concerned articles (or reports) has occurred [...] and from early 2000s, sustainable operations management developed as an area that integrates environmental and social issues along with economic aspects of supply chains into a common framework” (Rajeev et al., 2017, p. 300). According to Ahi & Searcy (2013), this development has led to the emergence of sustainable supply chain management, which has been a dominant research area since 2000. They have also refined the existing definition of green supply chain management, adding that it must entail the voluntary integration of environmental, social and economic aspects. Ahi & Searcy (2013) also stress that sustainable supply chains must “meet stakeholder requirements and improve the profitability, competitiveness, and resilience of the organization over the short- and long-term” (p. 339). This highlights the strategic relevance of sustainable supply chains and makes clear that it is not only operational in nature. Emphasising that sustainable supply chains are also relevant to the profitability, competitiveness and resilience of organisations, it also expresses the need to move more towards local supply chains.

The third research question is thus directed to understand the effects an ES-based reshoring event has on the reconfiguration of a local supply chain. This is a rich avenue for investigation provided by Ashby (2016) stating, “having a local supply chain is integral to achieving environmental and social commitments” (p. 85) and by Orzes & Sarkis (2019) that “there is a need to shed light on environmental sustainability performance effects [...] or global supply chain reconfigurations. Although some nascent research exists at the firm level (e.g. Ashby, 2016); supply chain, country and global level analyses are unexplored” (p. 482). According

to Caniato et al. (2013) global supply chains “cannot be as fast and seamless as local ones “, so reshoring can improve speed, flexibility and simplicity to enable a leaner, more responsive supply chain (p. 286). This will inevitably lead to a reconfiguration of the supply chain. Benefits include a greater transparency and the opportunity to make a positive contribution to local communities and thus on ES, too (Tate, 2014). Taking into consideration the current state of research and the proposed research directions, the research question is derived as follows:

Research question 3: How does environmental sustainability affect the reconfiguration of supply chains when reshoring?

3.2 Discussion and conclusion

The literature review has led to a high degree of clarity regarding academic contributions and research gaps for all three research questions. Starting with a critical reflection on the literature review, the studies in the literature review offer some unique insights into reshoring and ES. It became apparent that academic contributions are limited through its focus, for example, on single case studies in niche industries. Case studies or academic insights with AS are lacking. Particularly the role of suppliers in the automotive industry, or customers’ awareness are hardly considered either in only two references (Ashby, 2016; Bailey & De Propriis, 2014). “There is therefore a research need for multiple comparative case studies of firms that have or are in the process of reshoring previously offshored production activities” (Ashby, 2016, p. 75).

With respect to reshoring, research is primarily focusing on *why* firms rethink their international locations and move their manufacturing activities back to the home country. Thus, much is known about the drivers and barriers for reshoring. Especially the cost perspective was identified as one of the main reasons to bring manufacturing back home as firms are not able to make use of the low wages in developing countries. Further reshoring drivers and barriers have also been researched in extant literature, however, the researcher did not find any which are specific for the automotive industry. As far as reshoring decision-making is concerned, particularly the process to decide on a location is not covered yet. Even

if there are already some decision-making models (cross-reference to table 8), none of them is precise enough to take into account, for example, the process, the departments involved or the decision criteria. So, these are valuable areas of research from a reshoring perspective that should be covered.

A firm's manufacturing activities affect ES on a global level significantly. Consequently, a firm's decision where to manufacture its products has a significant impact on the level of sustainability. As many firms have started to implement offshoring strategies in the past, reshoring has been gaining attention among scholars. However, "scarce attention has been paid, until now, to the interdependences (if any) among sustainability issues and the firm's decision to backshore its manufacturing activities" (Fratocchi & Di Stefano, 2019, p. 451). In addition, Orzes & Sarkis (2019) highlighted that "little is understood, the relationship between reshoring and sustainability is a foundational unexplored relationship" (p. 482). ES issues are also becoming more relevant among operations and supply chain management research, but have not yet been researched. Less attention has been paid to the implications ES has on reshoring decisions or how this is being considered as a decision criteria. ES seems to be still at generic level when it comes to reshoring decisions and the aspects that are related to that (e.g. perception of ES on firm level, attractiveness of reshoring for ES, strengthening competitive advantages). This is explicitly pointed out by Ashby (2016) and Engström (2018) calling for future research if ES is perceived as a motivation for reshoring or global SCR.

While reshoring is of particular interest since 2012, the effects ES has on reshoring decisions and on the reconfiguration of supply chains is of importance that is more recent. This has not yet been discussed and fully researched. "The impact of off-shoring and global sourcing on sustainability issues has grown in importance in the last years" (Jia & Jiang, 2018, p. 595).

Since a large part of available studies so far has only referred to offshoring, there is a growing demand for more research on reshoring and ES. Recent studies increasingly point to a combination of both topics. For instance, current research has a very specific focus on reshoring and ES, for example, on UK-based apparel firms (Robinson & Hsieh, 2016), bicycle manufacturers in Sweden (Gylling et al., 2015) or the wine industry in New Zealand (Canham & Hamilton, 2013). Irrespective of this, many studies lack a consistent, solid

theoretical basis or framework. On top of that, reshoring and ES are not discussed within a specific industry (e.g. automotive). With reference to reshoring, this is in accordance with Fratocchi et al. (2016) who found out that “little systematic analysis has been conducted on the phenomenon to date, so that for instance its sheer size is still unknown”. Even prominent theories are still missing. Different views of reshoring also propose to “interpret the phenomenon either as an adjustment to changed location advantages, or as a correction of a (previous) erroneous location choice” (p. 99). This trend is reinforced by an increased emphasis on sustainability that “drove firms to re-consider their reshoring decision” (Fratocchi & Di Stefano, 2019, p. 450). This can be specifically related to rising carbon emissions due to the longer creation of supply chains, which is a consequence from offshoring initiatives and globalisation in the past. “This has induced scholars to invite managers taking into account the carbon footprint and social impact of their supply decisions” (Christopher et al., 2011, p. 72). When considering the social aspects of sustainability, researchers have mainly conceptualised the implications sustainability-related decisions have on labour markets, labour safety, ethics and employment levels.

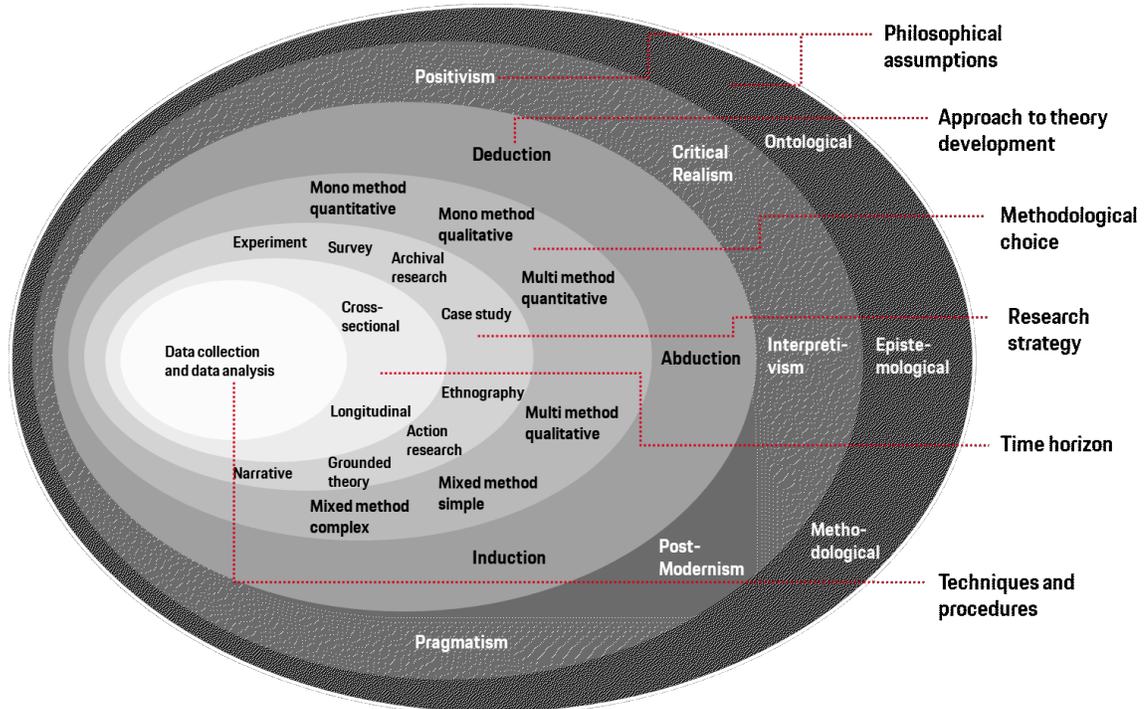
CHAPTER 4

4 RESEARCH METHODOLOGY AND DESIGN

This section explains the methodological choices underlying this research and covers, among others, the research philosophy, approach to theory development and the research strategy. This section aims to justify the research methods and explains the operationalisation of the research questions into a meaningful research process. The choice of methods is described following the framework by Saunders et al. (2016) called the *research onion* (figure 6). This framework provides a systematic approach to peel back each of the subsequent layers considering the philosophical assumption, approach to theory development, methodological choice, research strategy, time horizon and techniques and procedures of data collection. This is important for the development of an appropriate and coherent research design (Saunders & Tosey, 2013). In addition to the Saunders et al. (2016) research onion, there are other approaches that could have been used as well (Appendix 16). Due to the variety of approaches to structuring research projects, the researcher will address only three other approaches at this point. First, Kuada & Kuada (2012) propose a research framework that consists of a four-step logical sequence of activities: (i) philosophical and theoretical viewpoints, (ii) epistemological choice, (iii) methodological decisions and (iv) choice of methods and techniques. It thus also provides a clear guideline to decide on a research approach and to identify an approach that addresses the research question best. Second, Krishnaswamy, Sivakumar & Mathirajan (2009) propose a five-step structure to define the parameters of a research project. These entail (i) research problem identification, (ii) theoretical framework, (iii) research design, (iv) data collection, analysis of data and reporting. Third, the research methodology proposed by Buckley, Buckley & Chiang (1976) is much more detailed compared to the two previously mentioned approaches and is thus more closely aligned with the research onion of Saunders et al. (2016). This methodological framework for research consists of six steps. (i) problem genesis, (ii) problem, (iii) mode, (iv) strategy, (v) domain and (vi) techniques. Steps number one and two thus focus on the identification of the problem while steps three to six deal with problem solving techniques for the research project (e.g. induction vs. deduction, empirical vs. archival, case vs. field research, etc.). The researcher chose the research onion of Saunders et al. (2016) because it

is the most systematic methodology and the most comprehensible to the researcher. In addition, large parts of the research proposal were based on the research onion, which is why it was a good starting point at the beginning of the thesis.

Figure 6: Systematic research process according to the “research onion”



Source: Adapted illustration according to Saunders et al. (2016)

Table 9 provides a summary of the chosen methodologies and positions that the researcher applies for this research:

Table 9: Underlying research framework and methodological choices

Criteria	Methodological choice and position	Section
Philosophical assumption	Interpretivism with respect to an ontological objectivist and epistemological subjectivist perspective	4.1
Approach to theory development	Inductive	
(i) Logic	Known premises are used to generate untested conclusions	4.1.3
(ii) Use of data	Data collection is used to explore a phenomenon, identify themes and patterns and create a conceptual framework	
(iii) Theory	Theory generation and building	

Methodological choice	Qualitative	4.2
Purpose of research design	Exploratory study	4.2
Research strategy	Multiple case studies within or across the automotive industry (sectoral approach)	4.3
Time horizon	Cross-sectional study (3-6 months)	4.4.3
Techniques and procedures	Primary data by conducting semi-structured interviews	4.4

Source: Own illustration according to Saunders et al. (2019)

4.1 Philosophical assumptions

The outer layer of the *research onion* draws attention to five research philosophies and three research paradigms. The philosophies are *Positivism*, *(Critical) Realism*, *Interpretivism*, *Postmodernism and Pragmatism* and relate to the “development of knowledge and the nature of that knowledge in relation to research” in terms of a system of beliefs and assumptions (Saunders & Lewis, 2018, p. 106). “Assumptions shape the outcome of the research” and the choices made about the research methodology “profoundly affect what I find” (Kincheloe & Berry, 2004, p. 6). Whether the researcher is consciously aware of them or not, at every stage a number of types of assumptions have to be made (Burrell & Morgan, 1979). This includes assumptions about human knowledge (epistemological), about the realities in research (ontological) and the procedures for the research (methodological). The terms are defined as follows and are covered in section 4.1.1, 4.1.2 and 4.1.3.

- *Ontology* is the philosophy of reality and the nature and form of reality to constitute legitimate researchable questions (Guba & Lincoln, 1994).
- *Epistemology* is the philosophy of knowledge or how we come to know and what counts as knowledge (Guba & Lincoln, 1994).
- *Methodology* refers to the procedures that researchers use to investigate what they believe can be known and the rationale behind the procedures (Sarantakos, 1998).

These assumptions inevitably shape the way the researcher interprets the findings (Crotty, 1998). Saunders et al. (2016) point out that a well thought out and consistent set of assumptions will constitute a credible research philosophy, which underpins the methodological choice, research strategy, data collection and analysis procedures.

What follows is a brief explanation of the five research philosophies based on Saunders & Lewis (2018):

- *Positivism* relates to the philosophical stance of the natural scientist where observable social realities are studied to come out with law-like generalisations. Positivism strives for unambiguous and accurate knowledge supported by pure data and facts;
- *Critical Realism* focuses on explaining what we see and observe aiming to understand the deeper structures and relations that are not directly observable but lie beneath the surface of social reality;
- *Interpretivism* is the study of social phenomena in natural environments aiming to understand what is going on in an organisation. This philosophy is particularly important for business and management research in fields of organisational behaviour (e.g. decision-making);
- *Postmodernism* stresses the role of language and power relations aiming to accept different ways of thinking by considering alternative marginalised views or opinions. Postmodernists go beyond interpretivism by criticising positivism attributing more importance to the role of language;
- *Pragmatism* assumes that the most important determinant of research design is the research question(s) and objectives. It usually aims at practical solutions, for example, by combining different methods (both qualitative and quantitative) for research problems that do not clearly point to one particular type of method (Saunders & Lewis, 2018).

The next sections aim to explore the epistemological and ontological principles concerning their range across different disciplines. Epistemological and ontological assumptions can be seen as a paradigm, which is defined as “a basic belief system or world view that guides the investigation” (Guba & Lincoln, 1994, p. 105). Thomas Kuhn initially introduced the term *paradigm* in 1972 in his book *The structure of Scientific Revolutions*. It is of significance to assess the main foundations concerning epistemology and ontology critically as these dimensions inevitable influence the way of thinking, to engage with it and to understand organisations. Very often people do not “reflect upon how tacit answers to these philosophical issues influence how we understand the world” (McAuley et al., 2007, p. 28).

It is crucial to consider the conceptual background carefully including ontological and epistemological perspectives in order to make informed decisions. This also applies to the chosen methodology in seeking answers to the research questions. “By strengthening the rationale for the methodology, the researcher is in a better position to justify the research process and defend the outcomes, making use of various philosophical tools to help clarify the process of inquiry and provide insight into the assumptions on which it conceptually rests” (Kincheloe & Berry, 2004, p. 8). “Through justification of the chosen methodology as matched to the research questions, credibility of the research can be strengthened” (Jackson, 2013, p. 49).

According to Fleetwood (2005), it is important to realise that any scientific endeavour is underpinned by philosophical assumptions about ontology and epistemology and that no one is immune from their influence. People inevitably have to deal with these philosophical issues all the time – consciously or unconsciously. A researcher makes claims about reality (ontology), the knowledge someone has (epistemology) and about the process to study it (methodology). Crotty (1998) claims that every researcher can choose on its own what he wants to start with: ontological, epistemological or methodological assumption. In contrast to Crotty, other authors argue that good research has to be performed by identifying his ontological position first. For instance, with reference to Grix (2010), research is best being performed by “setting out clearly the relationship between what a researcher thinks can be researched (ontological position) linking it to what we can know about it (epistemological position) and how to go about acquiring it (methodological approach), you can begin to comprehend the impact your ontological position can have on what and how you decide to study” (The foundations of research, p. 67). Ontology and epistemology are closely related to each other, however, they need to be kept separated as all research starts from an individual’s view of the world.

4.1.1 Ontological perspective

According to (Hennig, 2008), ontology is a neologism coined in early modern times from Greek roots and is easy to grasp: *On* is the present participle of the Greek *einai*, which means *to be* and *logos* derives from *legein* which means *to talk about*. Ontology is the discourse that

has being as its subject matter. That means, “ontology is concerned with the nature of phenomena and their existence” and raises questions whether or not a phenomenon we are interested in actually exists independently of our knowing and perceiving it (McAuley et al., 2014, p. 32). The authors furthermore describe that it is “primarily concerned with the ontological status of social reality and the phenomena we take to constitute aspects of that reality”. From an ontological perspective, the researcher deals with “issues such as whether the world exists independently of your perceptions of it” (Greener, 2011, p. 6). Ontology deals with the fundamental nature of existence and for which there is no right or wrong answer as researcher argue and justify things differently depending on their role as a researcher, their values and beliefs, or professional background (Diltz & Delozier, 2000).

Ontology and ontological positions – Realist vs Subjectivist:

Each researcher will set his/her individual filter for preferences according to his role, values, beliefs, or background. Bryman (2001) and McAuley et al. (2014) argue that it is beneficial to distinguish between realist and subjectivist assumptions. Both authors express these differences by referring to two frequently used examples in social science – organisation and culture. Concerning the ontological status of a realist, it entails that an organisation as tangible object really exists and have clear rules, regulations, standards and procedures. Bryman (2001) does not only refer to organisations, but also to culture, which can be seen as a collection of shared values and customs into which people are socialized to conform. As a firm is strong in expressing and sharing its values, new employees become integrated very quickly as they are dedicated to the firm’s culture. Lastly, ontological objectivism usually refers to quantitative research where reality is measurable directly or indirectly (Bryman, 2001).

In contrast to the ontological realist assumption, the subjectivist is convinced that meanings are continually being changed and revised through social interaction. “This entails the view that what we take to be social reality is a creation or projection of our consciousness and cognition. What we usually assume to be out there has no real independent status separate from the act of knowing” (McAuley et al., 2014, p. 32). Ontological subjectivist perspectives are usually referred to qualitative research where social reality is engaged through cognition

and knowledge is based on observation. Theory derived from observations depends on individual situations and is specific to a given context.

4.1.2 Epistemological perspective

Epistemology refers to the study of the nature of knowledge that is “how it is possible, if it is, for us to gain knowledge of the world?” (Hughes & Sharrock, 1997, p. 5). The philosophical term derives from the Greek words *episteme*, which means knowledge or science, and *logos*, which means *information, theory or account* (Duberley & Johnson, 2000). This paradigm “is the study of criteria we deploy and by which we know and decide what does and does not constitute a warranted claim about the world or what might constitute warranted knowledge” (McAuley et al., 2014, p. 28). What are the sources of knowledge? How reliable are these sources? What can someone know? How does someone know if something is true? Duberley & Johnson (2000) point out “everyone adheres to some theory about what constitutes warranted knowledge – a set of epistemological commitments which provide us with criteria for distinguishing between reliable and unreliable knowledge” (p. 5). Thus, epistemological commitments also provide tacit answers to the following questions: What are the origins, nature and limits of scientific knowledge? What constitutes scientific practice? What are the processes through which scientific knowledge advances or is such progress forlorn hope? Understanding the epistemological assumptions is important to frame the researcher’s perspective on a specific problem that awaits to be investigated.

Epistemology and epistemological positions – Objectivist vs Subjectivist:

In line with the ontological positions, epistemology does also distinguish two positions, which are *objectivism*, and *subjectivism*. McAuley et al. (2014) define epistemological objectivists as “those who assume that it is possible to neutrally observe the social world and the behaviour of social phenomena such as organisations (i.e. without influencing or distorting what we see through that act of observation or perception)” (p. 34). More specifically, objectivists tend to find evidence with what they see, hear, touch, smell and taste. In contrast, the subjectivist (or idealist) assumes “that what we perceive is [...] an outcome of us and our conceptual understanding of the world [...]” (McAuley et al., 2014, p. 34).

4.1.3 The methodological question

Methodology describes the approach to theory development. This is a form of logical reasoning and is used in every form of research (qualitative and quantitative alike). It is characterised by three different strands: deduction, induction and abduction, whereby this thesis applies an inductive approach. “These forms of thinking are not concepts, nor are they methods or tools of data analysis, but means of connecting and generating ideas” (Flick, 2014, p. 123).

Deduction is an approach aiming to test a theoretical proposition mostly with quantitative data. This approach usually consists of three steps with the first starting to explain causal relationships between variables and defining corresponding research questions. The second step aims to transfer these research questions into testable hypothesis. The last step is directed to collect and analyse data to investigate whether or not existing theory is confirmed (Saunders & Lewis, 2018). In contrast to deduction, an inductive approach is considered as a bottom-up procedure to theory development from explanations that arise. It thus moves from specific considerations to broader generalisations and theories. The inductive approach aims to understand meanings that humans attach to events, which requires a deep understanding of the research context. Induction is also a more flexible approach and allows the research to permit changes during the research. “Inductive conclusions contain knowledge claims not analytically implied by the premises [...]” and the researcher is “only able to observe particular events, not generalities”, where all events the researcher observes are past occurrences. Inductive reasoning lacks a solid normative foundation compared to deduction and it is thus methodologically incomplete (Ketokivi & Mantere, 2010, p. 316). Acknowledging these critiques of inductive reasoning represents a permanent challenge for all empirical organisation science.

“Instead of moving from theory to data (as in deduction) or from data to theory (as in induction), an abductive approach moves back and forth” (Saunders & Lewis, 2018, p. 113) and is in line to what business management researchers conduct. Abductive reasoning starts with observing an unexpected occurrence while developing a plausible theory to explain this

occurrence. “Some plausible theories can account for what is observed better than others, and these theories will help uncover more surprising facts” (Van Mannen et al., 2007, p. 1149).

However, understanding the logic of the researcher’s reasoning can help to build consistency and transparency into how the researcher seeks justification. Applying an inductive approach is “one of the main challenges for an empirical organization scientist is drawing theoretical conclusions from empirical data in a manner that is credible and understandable to the scientist’s audience” (Ketokivi & Mantere, 2010, p. 315). Convincing a reader or audience of the credibility of the arguments leading to research findings is challenging due to the unpredictability researchers experience when evaluating their findings. Drivers for this unpredictability, for instance, are the lack of standards for qualitative research (Pratt, 2008) or the difficulty to position arguments in a broader theoretical discourse and demonstrating contribution (Locke & Golden-Bibble, 1997).

This thesis applies an inductive approach for theory development to collect data and develop theory as the result of data analysis (Saunders, 2015). Especially “social science research must entail analysis of human action generated inductively from an *a posteriori* understanding of the interpretations deployed by the actors who are being studied”. This claim has a practical significance for researchers since they demand an inductive approach to gathering data about constellations of norms, beliefs and values (Johnson & Duberley, 2015). Since both reshoring and ES have been little explored and only limited literature is available, research does not allow existing theories or frameworks to be tested, as it would be the case with a deductive approach. By employing qualitative methods, it facilitates the exploration of patterns, frameworks or themes, particularly if the relationships between constructs such as reshoring and ES are undefined or poorly understood (Edmondson & McManus, 2007).

4.1.4 Justification of the philosophical positions

For this study, the chosen research philosophy is following that of an interpretivist with respect to an ontological objectivist and epistemological subjectivist. An ontological objectivist assumes that reality exists whether the researcher is conscious of it or not (Hiller,

2016). “Objectivists belief that social phenomena and their meanings have an existence that is independent of social actors”. Social phenomena have an existence that is independent or separate from actors“ (Bahari, 2010, p. 25). Therefore, what the researcher finds regarding, for example, a reshoring case reflects a kind of reality that is more than just an individual interpretation and independent of the people involved. The findings of this research are not generalizable to all reshoring cases, but the researcher assumes that the findings are transferable to other similar Tier 1/-2 events in the automotive industry. While generalizability is referred to an “act of reasoning that involves drawing broad inferences from particular observations”, transferability “involves the use of findings from an inquiry to a completely different group of people or setting [...]” (Polit & Beck, 2010, p. 1451; 1453).

As far as the epistemological subjectivist position is concerned, it refers to the “belief that there is nothing like “ultimate true knowledge” out there but whatever we perceive as “truth” is as a result of our intersubjective socio-cultural consensus of views, which is perceived as “reality” or “objectivity” in terms of knowledge” (Kamil, 2011, p. 68). Concisely, a subjectivist epistemological stance is driven by the idea that socially constructed versions of reality are generated (Kamil, 2011). Thus, the researcher describes findings of this study how he perceives or interprets them. That means facts cannot be separated from values or experiences. According to this position, the researcher must be humble with his findings and allow for dissident’s opinions. It is also not possible to claim findings represent the “ultimate truth because there is no standard set of criteria which enables such assessment” (Khin et al., 2011, p. 878).

“Interpretive methodology is directed at understanding phenomenon from an individual’s perspective, investigating interaction among individuals as well as the historical and cultural contexts which people inhabit” (Creswell, 2009, p. 8). “It is interpretive because researchers need to make sense of the subjective and socially constructed meanings expressed about the phenomenon being studied” (Saunders et al., 2016, p. 168). It is “important to understand motives, meanings, reasons and other subjective experiences” (Carson et al., 2001, p. 6) as different people of different cultural backgrounds under different circumstances make different meanings, and so create different social realities (Saunders et al., 2016).

The researcher believes that it is necessary to understand differences between humans in their roles as social actors and to understand the world from their point of view. Different interpretations are possible that can be subjective in nature. Research and corresponding findings from the interviews must not be evaluated one-directional, but from different perspectives in a consistent, standardised way. Different people's perspectives and perceptions about their experience in reshoring or ES make theories even more complex and are thus seen as a crucial task for this research.

4.2 Methodological choice and design

Research distinguishes two main types of data: qualitative and quantitative data. Since the researcher chose a qualitative research methodology, this section concentrates on the explanation of this type. The section is concluded with a justification for applying a qualitative approach.

4.2.1 Qualitative research methodology

Qualitative research is a broad topic that extends across many different techniques and philosophies. In general, this approach aims to gather people's opinions or experiences by employing research methods such as, for instance, in-depth interviews, semi-structured interviews, focus group discussions or observations. The most characteristic feature of qualitative research is that it enables the researcher to examine issues from the perspective of the people involved in the data collection, for example, the respondents, and to understand the meanings and interpretations that these people attribute to a phenomenon or event (Hennink et al., 2020). This is why qualitative research is often associated with "interpretivist philosophy because researchers need to make sense of the subjective and socially constructed meanings expressed by those who take part in research about the phenomenon being studied" (Saunders et al., 2016, p. 568). Another philosophical stance that plays an important role is social constructivism. This means that "partially shared meanings and realities are dependent on people's interpretation of the events that occur around them" (p. 568). Since qualitative research is conducted based on interviews, i.e. social interaction, there is a greater variance, elasticity and complexity compared to quantitative data collection. Furthermore, words and images may have multiple meanings and the researcher is therefore called upon to handle the

collected data very sensitively and to evaluate them accordingly. However, according to Brekhus et al. (2005) and Dey (1993) qualitative data is beneficial for studying a new phenomenon because of its richness and fullness. It also enables the researcher to study a phenomenon in its real life or business context.

Qualitative research entails four important advantages. First, it generates detailed explanations of people's feelings, perceptions or opinions of a certain phenomenon while the researcher is able to interpret the meanings of it (Denzin & Lincoln, 1998). Second, "qualitative research is an interdisciplinary field which encompasses a wider range of epistemological viewpoints, research methods, and interpretive techniques of understanding human experiences" (Rahman, 2017, p. 104). It is considered as ideographic research by focusing on the study of individual events or cases. It has therefore the ability to understand different people's perceptions, meanings or opinions (Richardson, 2012). Third, Corbin & Strauss (2008) point out that qualitative research allows to discover participants' inner experiences and to figure out how meanings are created. Fourth, data collection is performed through unstructured or semi-structured interviews, which allows the researcher to interact with interviewees directly. This allows to ask clarifying questions. In addition, the researcher may ask the interviewees to provide a higher level of detail per answer. With qualitative research, the researcher can therefore respond much more individually to the answers of the respondents (Rahman, 2017).

With all these advantages associated with qualitative research, however, there are also five major critical aspects and limitations that should be highlighted. First, a main disadvantage "is that their findings cannot be extended to wider populations with the same degree of certainty that quantitative analysis can. This is because the findings of the research are not tested to discover whether they are statistically significant or due to chance" (Atieno, 2009, p. 17). This limitation is also in line with Harry & Lipsky (2014) who stress that smaller sample sizes raise issues of generalisability. Especially "qualitative methodology does not pursue objectivity and generalizability, because both conditions are viewed as unachievable from ontological and epistemological perspectives" (Slevitch, 2011, p. 78). Second, data analysis is more difficult and complex compared to quantitative approaches (Richards & Richards, 1994). Berg & Lune (2012) argue "qualitative research is a long hard road, with

elusive data on one side and stringent requirements for analysis on the other” (p. 4). Third, case analysis in qualitative research requires a considerable amount of time and costs (Rahman, 2017) due to the volume of data generated. The challenge for the researcher is to perform a detailed analysis of the interviews and to present to findings in a concise and logical way (Clifford, 1997). It also requires a labour-intensive process to transcribe, translate, code and analyse the data and skills of the researcher to conduct a proper analysis. Fourth, in semi-structured interviews, the researcher has the opportunity to ask clarifying questions, but this also means that the participants have more control over the data collected. Lastly, “because of the subjective nature of qualitative data and its origin in single contexts, it is difficult to apply conventional standards of reliability and validity” (Mohajan, 2018, p. 19).

4.2.2 Justification for the use of qualitative data analysis

Given the nature of qualitative research and its limitations, this section explores the justification of applying qualitative research methodology for this thesis under an interpretive paradigm to investigate reshoring and ES. The purpose of this research is threefold to investigate the perception of reshoring and ES of AS, to explore reshoring decision-making and to what extent ES is considered as well as to investigate the reconfiguration of supply chains after reshoring. This purpose fits with the intentions, philosophy and strategies of the interpretive research paradigm, which has the potential to generate new findings of an emerging concept, such as reshoring and ES to be investigated in this research. In line with this reasoning, qualitative research was chosen as a suitable approach for this thesis as it generates detailed explanations of people’s meanings, feelings and perceptions. It does also provide “robust insights from actions that have occurred in a real-life context [...] meaning in a business/management environment” (van Esch & van Esch, 2013, p. 220).

This is specifically important for reshoring and ES because the interdependence of this phenomenon is not entirely investigated yet. More specifically, this is important to investigate the first research question, which aims for an exploration of the perception of reshoring and ES from people in the AS sector. According to Guba & Lincoln (1994) qualitative research entails capturing the actual meanings and interpretations that people subjectively ascribe to a phenomenon, such as reshoring and ES, in order to explain

behaviour through investigating how they experience, articulate and share with other socially constituted everyday realities. Moreover, it aims to obtain the views, attitudes and perceptions of participants. Using semi-structured interviews also enabled the researcher to interact with interviewees effectively and to obtain in-depth insights from different perspectives. It also makes it easier for the researcher to ask specific questions in the interview session in order to extract more in-depth information from the participants (Abd Gani et al., 2020).

In consideration of the second and third research questions to investigate reshoring decision-making processes when looking at ES in parallel and to understand impacts on value chains, semi-structured interviews are an appropriate method to understand these processes and techniques in detail. As reshoring decision-making and the reconfiguration of supply chains are complex issues for every firm, this technique allows the researcher to probe answers where he wants participants to explain their responses in more detail. The participants may use words or ideas in a particular way that add significance to the questions asked during the interviews. Semi-structured interviews were also beneficial to ask a wider set of follow-up questions to obtain thoughts and ideas of participants on top of the original questions.

Quantitative and mixed-methods research were deemed unsuitable for this research. Reshoring and ES are less researched yet and thus requires a deeper, qualitative understanding of meanings and perceptions, however, this does not exclude a quantitative research approach. This research furthermore focuses on generating insights from the interaction with people being confronted with the phenomenon of reshoring and ES. Thus, it involves large amount of in-depth data.

4.3 Multiple cases study as a research strategy

This section illustrates the multiple case study approach, which facilitates the researcher both to elaborate theoretical claims systematically to demonstrate the study's scientific and practical contribution. The aim is to understand reshoring and ES cases "in depth and in its natural setting, preserving its wholeness, unity and integrity" (Ridder et al., 2014, p. 374). "Accordingly, case study is a research strategy which focuses on understanding the dynamics

present within single case settings” (Eisenhardt, 1989, p. 534), which are then jointly compared and evaluated. Especially in the field of management and strategy research, to which reshoring and ES belong, case studies aim at detailed, nuanced descriptions of a phenomenon with inductive and interpretative directions, which are used for theory building. More importantly, according to Guba & Lincoln (1994), this can be allocated to different philosophical paradigms such as to the interpretivist perspective, which is also the underlying paradigm for this thesis.

Selection criteria for choosing a multiple case study strategy:

“Case studies are generally strong precisely where quantitative studies are weaker” (Starman, 2013, p. 36). This section therefore deals with the justification of the case study approach by

1. explaining the reasons for using the case study strategy,
2. highlighting the most important advantages and
3. to conclude the section with a critical appraisal.

Justification of the case study strategy

The researcher has selected a multiple case study approach for five reasons. First, the literature review has indicated that the implementation of reshoring initiatives and ES aspects are not sufficiently researched yet. There is a need to understand why firms decide to reshore from an ES perspective and how it affects extant decision-making procedures (Fratocchi & Di Stefano, 2019). “[...] The multiple case study is appropriate when there is some knowledge about the phenomenon but much is still unknown” (Meredith, 1998, p. 452). In such a stage, a qualitative approach that is based on case studies facilitates to explore patterns, frameworks or themes, particularly if the relationships between constructs are undefined or poorly understood (Edmondson & McManus, 2007). Consequently, applying case studies to explore these phenomenon and elaborate theory accordingly is an ideal research strategy because reshoring and ES are less explored (Barrat et al., 2011).

Second, case studies allow to collect data in its natural setting (e.g. via MS Teams, Zoom) while generating meaningful, relevant theory through observing actual practice. It allows asking clarification questions during the interviews focusing on the *Why?* rather than just on

the *What?* and *How?*. This enhances validity of the study and increases richness of explanations (Meredith, 1998). It also helps to make research results even deeper and more substantial (Eisenhardt, 1989).

Third, case studies enable the researcher to get into close interaction during the interviews with practitioners who are affected with real management situations. This enables triangulation, where the perspectives of the informants are better understood (Boyer & Swink, 2008). “Case studies therefore represent a methodology that is ideally suited to creating managerially relevant knowledge” (Gibbert et al., 2008, p. 1465) due to the involvement of managers facing reshoring and ES business challenges. It is also flexible and adaptive in nature as it allows the researcher to go back and forth by exploring reshoring and ES phenomenon through the interviews. It thus generates insights from intensive and in-depth research within its real-life setting (Yin, 2014) leading to rich, empirical descriptions and the development of theory (Dubois & Gadde, 2002).

Fourth, according to Cartor & Easton (2011) and Tate et al. (2012) case studies are considered as a method of choice when developing rich understandings of theory in supply chain management. The case study approach from Tate et al. (2012) was also related to firms integrating sustainability aspects into their internal operations and broader supply chains and thus goes along with the main research focus of the thesis. Further research by Brandl (2017), Hartman et al. (2017) as well as Moradlou et al. (2017) has also chosen the multiple case study strategy to investigate direct and indirect value creation in offshored knowledge-intensive services, to examine insourcing experiences with 12 manufacturing firms and to conduct interview-based research in the UK and India focusing on reshoring manufacturing activities. Earlier studies are therefore very much in line with the research objective of this thesis and express that this approach is widely used in research on reshoring.

Lastly, one of the thesis’ objectives is to investigate how managers in the automotive industry perceive ES in the context of reshoring and why they decide for a certain location. Consequently, research questions are rather concerned with *why* to investigate reshoring motivations, behavioural traits, to develop decision-making schemes, and to gain a “relatively full understanding of the nature and complexity of the complete phenomenon”

(Meredith, 1998, p. 444). This is in contrast to a survey strategy, which is a suitable method for asking *who*, *what* or *when* questions.

Following this line of reasoning, an essential requirement of case study research is to determine the boundaries of the case and thus the unit of analysis (Flyvberg, 2011). The following table 10 illustrates the unit of analysis for employing a multiple cases study by clearly differentiating the boundaries of the research:

Table 10: Differentiation of level of investigation and the unit of analysis

Level of investigation	Unit of analysis
Industry	Automotive industry
Sectors	Tier-1/-2 automotive suppliers (OEMs are disregarded)
Organisations (<i>selection criteria</i>)	<p>Large, internationally active firms with a global production network</p> <ul style="list-style-type: none"> - exposed to reshoring- and ES-related activities and challenges, - have previously offshored manufacturing activities to low-wage countries, - buy raw materials potentially harmful to the environment and - affected by pressure from OEMs, customers or stakeholders in terms of public awareness
Individuals	<ul style="list-style-type: none"> - CEOs, Managing Director, Upper Management - Production, Logistics or Supply Chain Manager - Environmental Sustainability Manager or Sustainability Manager (in general)
Cases	<ul style="list-style-type: none"> - Range: one to three participants per case - Target: between seven to ten reshoring cases - Premise: one firm counts as one reshoring case
Research focus	<ul style="list-style-type: none"> - Perception of ES as a driver for reshoring (individual level) - Integration of ES in decision-making framework (individual level) - Impact of ES on the reconfiguration of supply chains (sectoral level)

Source: Own illustration

Advantages of case studies

George & Bennett (2005) identified three advantages of case study strategies compared to quantitative methods. Concisely, (i) case studies have the potential to achieve high conceptual validity, (ii) strong procedures for fostering new propositions, (iii) usefulness for closely examining the hypothesized role of causal mechanisms in the context of individual cases.

First, “conceptual validity refers to the identification and measurement of the indicators that best present the theoretical concepts that a researcher wants to measure” (Starman, 2013, p. 9). Many variables, which are difficult to quantify and to measure (e.g. perception of a certain phenomenon), require the researcher to perform a contextualized comparison. “This requires a detailed consideration of contextual factors, which is extremely difficult to do in quantitative research but is very common in case studies” (George & Bennett, 2005, p. 19). In comparison to case study research, quantitative research runs the risk of “conceptual stretching” by throwing together dissimilar cases to get a larger sample. Case studies do rather allow for conceptual refinements with higher level of validity over fewer numbers of cases (George & Bennett, 2005).

Second, where quantitative research lacks methods for the inductive generation of new hypotheses, case studies are suitable to serve heuristic purposes of identifying new propositions. In addition, case studies allow for analysing qualitatively complex phenomenon and can take into account numerous variables. This is because case study research does not require many cases (George & Bennett, 2005).

Third, case studies are designed to examine causal mechanisms of individual cases in detail, which is also referred to as *process tracing* (Beach, 2016). Within a specific case, researcher look at many different variables and inductively observe any unexpected aspect of a certain causal mechanism, whereas in quantitative studies this causality does not exist. For example, the researcher is interested in investigating the extent to which ES leads to reshoring. However, it is important to point out that it is not entirely correct to assume that quantitative research does not achieve causality. With regard to case study research, it only refers to “quantitative research’s inability to take into account contextual factors other than those that are codified within the variables being measured” (Starman, 2013, p. 37).

Case study research entails some more advantages such as being connected to the everyday life of the interviewee. It thus helps the researcher to understand his position from different perspectives and for developing different realities, “including the awareness that human behaviour cannot be understood merely as an act that is driven by a rule or a theory” (Starman, 2013, p. 37). In addition, Flyvberg (2006) points out that case studies contribute

to the development of a researcher because they provide concrete, context-dependent experiences that increases research skills.

Critical thoughts on the application of the strategy of multiple case studies:

“Case studies as a tool for generating and testing theory have provided the strategic management field with ground-breaking insights. Despite this, the case study method has been prone to concerns regarding methodological rigor in terms of validity and reliability” (Gibbert et al., 2008, p. 1465). Methodological weaknesses are a general problem for all research strategies, however, lacking rigor in a multiple case study approach is problematic. This is due to three reasons: First, especially in the early stages of developing new management theories, case studies are used as the primary research strategy to study variables and relationships (Yin, 2014). Consequently, “a rigor problem in the early stages of theory development would therefore have ripple effects throughout later stages when relationships between variables are elaborated and tested” (Gibbert et al., 2008, p. 1465).

Second, typically, case studies are carried out in close interaction with interviewees such as practitioners facing real business challenges. Thus, case studies represent an ideal methodology to gain managerially relevant theories and knowledge. However, “without rigor, relevance in management research cannot be claimed” (Scandura & Williams, 2000, p. 1263).

Third, compared to quantitative data collection (e.g. surveys), case studies usually take smaller sample sizes into account and are therefore criticized for their weak generalisability in building and developing substantial theories. Thus, “the idea of representative sampling and statistical generalizations to a wider population should be rejected, and analytical induction should be chosen instead” (Starman, 2013, p. 35).

4.4 Techniques and procedures for data collection

The first section 4.4.1 explains the different types of interviews, where semi-structured interviews are justified as a method for this thesis. Second, diverging perspectives on appropriate sample sizes are discussed. Furthermore, the researcher justifies the choice of the

sample size for this thesis (4.4.2, 4.4.3). Lastly, the data collection process is explained by focusing on the pilot study (4.4.4.1), scaling of interview questions (4.4.4.2), the interview process (4.4.4.3) itself and the procedure for transcribing and translating the interviews (4.4.4.4).

4.4.1 Types of interviews

The researcher has chosen semi-structured interviews as a method of data collection. These are part of three different interviewing methods in qualitative research, which cover structured and unstructured interviews as well. These interviews can be conducted individually or in groups, face-to-face, virtually or by telephone, with the interviewer asking closed or open questions (Roulston, 2010). The major benefit is that “interviews provide in-depth information pertaining to participants’ experiences and viewpoints of a particular topic” (Turner, 2010, p. 754) with the following table 11 illustrating the three forms of interviews:

Table 11: Range of interviews

Structured interviews	Semi-structured interviews	Unstructured interviews
The interviewer follows scripted questions in a particular sequence	Interview protocol is used as a guide and questions may not always be asked in the same order; the interviewer initiates questions and poses follow up probes in response to the interviewee's descriptions and accounts	Both interviewer and interviewee initiate questions and discuss topics
The interviewee chooses responses from a range of fixed options that are coded quantitatively; responses are provided by interviewer	The interviewee selects own terms to formulate answers to questions; responses are guided by the interviewer's questions	The interviewee selects own terms to participate in free-flowing conversation
Asymmetrical structure	Asymmetrical structure	Possibly less asymmetrical structure
Data analysed via deductive analysis for hypothesis testing in multivariate studies	Data analysed via inductive analytic and interpretations in interpretive studies	Methods for descriptions

Source: Roulston (2010)

Structured interviews aim to present the questions by providing a pre-defined list of possible answers to the interviewee. From this list of potential answers, the respondent then has the opportunity to select his or her answer. It is important that the interviewer adheres strictly to the pre-defined script and conducts each subsequent interview in exactly the same standardised way. This has proven to be very challenging, as there is still a conversation between the interviewer and the respondent while conducting the interview. This is because of the respondent who may not understand questions and thus requires clarification from the researcher.

Compared to structured interviews, the researcher may make use of unstructured interviews in which the researcher proceeds without any formal interview guide or script. In unstructured interviews, questions are asked relatively spontaneously during conversation with the respondent and thus deviate strongly from (semi-) structured interviews, where the interview follows a standardised procedure. Nevertheless, researchers who have opted for an unstructured interview have their research or interview questions roughly in mind and are thus able to steer their interview. As in a normal conversation, unstructured interviews are less asymmetrical than (semi-) structured interviews. A major disadvantage of unstructured interviews is “that the talk may not generate useful data given that any and every topic can be introduced at any point by either of the speakers, and topics may not be relevant to the researcher’s interests” (Roulston, 2010, p. 9).

Semi-structured interviews combine parts of both structured and unstructured interviews, however, according to Longhurst (2003) “a semi-structured interview is a verbal interchange where one person, the interviewer, attempts to elicit information from another person by asking questions” (p. 143). Questions are usually open-ended and give the interviewer the chance to follow up with probes seeking for further details or explanations about what has been said (Roulston, 2010). Although the interviewer prepares a list of pre-determined questions, semi-structured interviews unfold in a conversational manner offering participants the chance to explore issues they feel are important. Fylan (2005) adds that semi-structured interviews are an ideal method for research to focus on *why* questions rather than on *how many* or *how much*. The reason for this is that this form of conducting interviews is more

flexible compared to the other two and offers the possibility to change questions during the interview or to ask follow-up questions if an answer requires more details.

4.4.2 Sample size

Identifying and justifying sample sizes in qualitative studies is a difficult process. This is because specific rules or guidelines are not available (Morse, 2000). Still, researchers often try to provide an indication of sample sizes that could be used as a reference. For instance, Mason (2010) has investigated 560 PhD studies using qualitative research and interviews concerning their samples sizes. The result has shown that sample sizes around 20 to 30 are most commonly used. The authors Hine & Carson (2007) suggest to conduct 35 interviews while other indicate samples around 30 interviews (Carson et al., 2001) or a range between seven to 36 research participants (Pitney & Parker, 2009). While Meredith (1998) suggests a range between two to eight situations, Eisenhardt (1989) recommends two to ten to extend generalisability of single case findings with considerably more effort.

Another difficulty that comes into play is the concept of saturation (Glaser & Strauss, 1967). This concept is specifically applicable to studies using interviews as primary data source. It allows the researcher to bring in new participants as long as new ideas are being added to the research. A complete data set usually indicates redundancy or replication of ideas or data (Marshall et al., 2013). For this thesis, the researcher has done everything possible to build the widest possible sample size (e.g. use the European Reshoring Monitor, approach contacts of the researcher's own network). As a result, nine different cases with Tier 1/-2 AS were identified across the 17 participants. Furthermore, the nine AS represent a wide range of products sold to OEMs in the automotive industry (e.g. windows, car body, camshafts, pistons, screws and fastening systems). Thus, they represent a good sample for this sector. Nevertheless, since all cases are very different from each other (e.g. firm size, international presence, clients, and revenue) the researcher does not claim saturation.

4.4.3 Sampling technique

The sampling technique followed a purposeful process. The researcher focused on the selection of large, internationally active firms from the AS sector. The researcher specifically searched for firms from different sectors of this particular industry. These sectors could be, for example, tyre and bearing manufacturers, suppliers of electrical systems or globally active companies in the drive, chassis and safety technology sectors, which are exposed to reshoring and ES challenges. This cross-industry focus promotes a deeper understanding of each sector (Seawright & Gerring, 2008). In addition, the selection of firms was not made based on revenue (e.g. >500 million euros) or number of employees (e.g. >5,000 employees), but rather according to the following three criteria:

First, due to their complex and extensive supply chains around the world, the sampled firms face challenges regarding the global location of their production sites and thus their environmental impact (Choi & Hong, 2002). This also means that all firms involved have their own value creation activities in terms of production sites and an extensive network of suppliers that are eligible for reshoring projects. Second, they source and sell goods internationally and buy raw materials for their value creation activities, which are potentially harmful to the environment (e.g. metal, plastic, rare earths, and adhesives). This may be related, for example, to high CO₂-emissions in the supply chain or high-energy consumption during recycling. Third, large internationally operating firms are affected by stakeholder pressure (e.g. investors, employees) in terms of their public awareness and are required to actively manage ES in their supply chains (Busse et al., 2017).

The selection of participants considers knowledgeable global operations or plant managers, operations, production, purchasing or logistics managers with sound experience and knowledge of the automotive industry, with particular emphasis on reshoring and ES. The criteria to select participants for the interviews are decision-entitled managers or employees with considerable working experience in managing global production-, logistics- or purchasing-oriented issues along the value chain with a focus on ES. For each case study, particular care was taken to ensure that both a participant with reshoring experience and a participant with sustainability expertise (e.g. Head of Sustainability) were interviewed. In

this way, both priorities, reshoring and ES, can take sufficient account of this thesis. The geographical scope is limited to contacts from Europe, although the interviewee's associated firm may operate on a global scale.

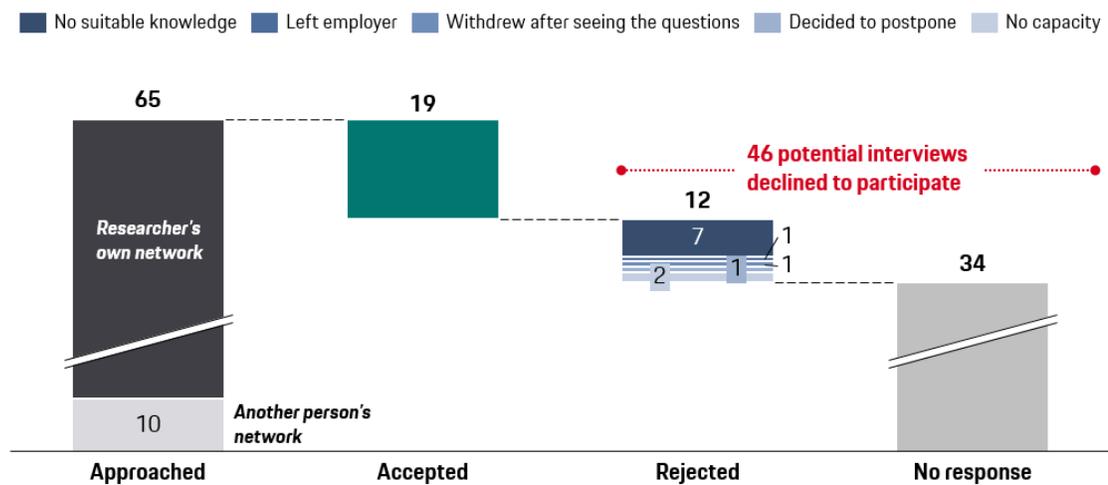
In particular, the researcher was working with the European Reshoring Monitor, which is a collaboration between Eurofound and Italian universities to carry out research activities on the international transfer of production with a particular focus on reshoring. The research group *Uni-CLUB Reshoring MoRe* provides access to a comprehensive list of reshoring cases, which served as an additional source to find possible interviewees. Furthermore, established contacts from previous projects with the researcher's employer, Porsche Consulting, from the researcher's own network or recommendations from other colleagues or supervisors are the primary source of contact with these companies and potential interview partners. Since the researcher has been working on sustainability topics at Porsche Consulting such as decarbonisation, circular economy or sustainability strategies with OEMs and suppliers for more than two years, the interviews could be conducted in a very targeted manner. However, as part of the ethical section, the selected participants must be informed about the role of the researcher in working for a consultancy firm active in the automotive industry, while at the same time acting as a researcher. On the part of the participants, however, this did not lead to any limitations in their answers, but rather helped them to conduct a conversation that was as goal-oriented as possible. Snowball sampling during the data collection phase was considered as an additional approach for contacting potential respondents. This method of sampling is widely applied across qualitative research and facilitates the researcher to access participants through contact information that is provided by previous participants during interviews and helps to increase the credibility per interview (Noy, 2008).

The research considers a cross-sectional time horizon over period of three to six months. A cross-sectional study is particularly suitable for investigating the prevalence of a certain behaviour in a population and is thus appropriate for this research (Sedgwick, 2014). The opposite of a cross-sectional investigation is a longitudinal study aiming to study a phenomenon over a period. The advantage of a longitudinal study is to consider changes and

developments of a phenomenon, however, it is not suitable for this research, which is subject to a limited period (Saunders & Lewis, 2018).

The researcher approached the participants between June and November 2020. 55 participants were contacted via e-mail and LinkedIn whereof another person in the researcher’s network contacted ten participants, too. Ten further potential participants suitable for the interviews were identified by snowball sampling during the interviews whereof seven participants agreed to participate. Out of the participants that were contacted in total, 19 interviews resulted. These interviews were conducted in July (five interviews), August (four interviews), September (three interviews), October (six interviews) and November 2020 (one interview). 46 potential interviewees declined to participate in the interviews, as they did not respond, do not have suitable knowledge in the area of reshoring or sustainability or withdrew from the interview process after seeing the overview of interview questions. The following figure illustrates the number of participants approached as well as the reasons why someone rejected the interview request (figure 7).

Figure 7: Breakdown of interviewees involved in this research



Source: Own illustration

The final list consists of 19 participants who have agreed to participate in this study, two of whom were included in the pilot interview and are therefore not included in the data analysis (table 12). As far as the reference to the participants is concerned, the following logic applies:

- Letters (A, B, C, etc.) stand for the case
- Numbers (1, 2, 3, etc.) denote the interviewee from the case

The ‘level of experience’ is based on a three-point scale from 1-3 where 1 means ‘rudimentary knowledge’, 2 means ‘good theoretical, but less practical experience’ and 3 means ‘profound theoretical and practical knowledge’. This helps the reader to understand section *Chapter 5: Data Analysis and Findings* better, as it refers to the respective cases and interviewees.

Table 12: List of participants in the interview process

Identifier	Functional areas & job titles	Level of experience		Sector	Professional experience
		Reshoring	ES		
Pilot 1	Procurement Manager (Pilot interview)	2	1	Car manufacturer	More than seven years of professional experience in the automotive industry Educational background in Business Administration Responsible for procurement and supplier relocation projects
Pilot 2	Management Consultant (Pilot interview; not considered in data analysis)	2	3	Various automotive suppliers	More than eight years of professional experience Educational background in “Engineering” Previous experiences with automotive suppliers, OEMs and consulting
A1	EHS Manager (Environment, Health and Safety)	2	2.5	Rolling element bearings	Mechanical engineer with cross-functional expertise in sales, product design and operations Master program in “Environmental Energy Technology” More than 30 years of work experience Abroad experience in China and USA for several years Substantial sustainability experience since 2005/2006 as “Head of Sustainability”
A2	Manager Product Stewardship, Energy & Climate	1	3		Industrial engineer with more than 23 years of work experience Cross-functional experience in Business & Strategy Development for Aerospace business Since 2006 involved in sustainability-related topics PhD in “Sustainability & Strategy”
A3	Manager Product	2	3		Background in “Material Science & Chemistry”

	Stewardship & Sustainability				Since 2008 involved “Environmental R&D & Lifecycle Assessments” Current position is “Knowledge Area Manager for Products & Service Sustainability Performance”
B1	Senior Project Manager	1	1	Lighting and electronic components	More than ten years of professional work experience at automotive suppliers Currently project manager for series development for sensor technology (ca. five years) Previously five years of experience with the same company in pre-development as technical project manager
C1	Director Operational Restructuring	3	1	Seating systems, body structure, transmissions	More than 20 years of experience with automotive suppliers and leading consulting companies (“Director Operational Excellence”) Experience in managing global production system at global sites and project manager for plant construction Experience with “Environmental Management Systems” (e.g. ISO14001) Today “Director Operational Restructuring” for a leading consulting company
D1	CEO Assistant (formerly “Head of Production”)	1	2	Screws, connections and processing systems	More than eight years of professional work experience with automotive suppliers Experience as assistant for the Technical Director from 2014 through 2017 Responsible for investment controlling, production planning and business plans in the U.S. Experience in expanding production sites by implementing new product lines
D2	Director Sales Account Management	2	2		More than 20 years of professional experience Responsibility for Germany and Eastern Europe sales and production channels
E1	CEO	2	1	Packaging systems	Master’s degree in Finance & M&A Previous experience at Investment Banking companies Since 2016 “Head of Corporate Development” Since 2017 “Managing Director” Since 2018 CEO of the company (Chairman of the Board)
E2	Head of Corporate Development	2	1		More than eight years of professional experience in (financial) advisory of energy-related companies Educational background in Business Administration with a focus on Finance Responsible for location management of manufacturing sites
F1	CEO	2	2	Engineering Services	More than 25 years of professional work experience with OEMs and automotive suppliers

					<p>Educational background in “Mechanical Engineering”</p> <p>Divisional and Department Manager from 1994 to 1998</p> <p>Became CEO of an automotive supplier for engineering services ~5 years ago</p>
F2	Group Director Operations	1	2		<p>International experience in the IT and telecommunications industry in the areas of operations</p> <p>Previous experience with M&A, R&D, sales, service and portfolio management</p> <p>Currently COO and Managing Director</p>
G1	Sustainability Manager	2	2	Fastening products	<p>More than ten years of professional work experience with automotive suppliers</p> <p>Educational background in “Mechanical and Industrial Engineering”</p> <p>Responsibility as “Sustainability Manager” for the whole company since 2015</p>
G2	Production Network & Digitalization	2	3		<p>More than seven years of professional experience</p> <p>Educational background in “Industrial Engineering”</p> <p>Current role as an “International Relocation Process Planner” and “Plant Development”</p>
H1	Head of PCU Technology-Light Vehicles	2	2	Pistons, camshafts, cooling, electronics	<p>Approx. 20 years of professional work experience with automotive suppliers</p> <p>Educational background in “Industrial Engineering”</p> <p>Professional background as “Technical Key Account Management” and “Project Management”</p> <p>Currently responsible for “(Pre-) Development”</p>
I1	Director Operational Excellence Automotive	2	2	Advanced polymer and composite products	<p>Experience in managing production systems for the last 10 years</p> <p>Responsible for “Operational Excellence” department</p> <p>Further experiences with “Green Supply Chain Management”</p>
I2	Senior Project Manager Sustainability	0	3		<p>More than 20 years of professional experience as an engineer in textiles and plastics industries</p> <p>Sustainability experience in managing material flows, recycling and circular economy</p>
I3	Manager Connected Supply Chain	2	2		<p>More than five years of professional experience</p> <p>Responsible to manage cross-divisional supply chain projects and to assess the company’s global footprint</p>

Source: Own illustration

4.4.4 Data collection process

This subsection provides an overview of the data collection process and techniques. It explains the development of the interview guide, the deployment of a pilot study as well as the amendments incorporated after the pilot study. The researcher also explains which interview questions required scaling. This process follows the framework from Kallio et al. (2016) for the development of a qualitative semi-structured interview guide. Lastly, the process for transcribing and translating data is explained.

4.4.4.1 Pilot study and development of an interview guide

“A pilot study is referred to as feasibility study that comprises small-scale versions of the planned study, trial runs of planned methods, or miniature versions of the anticipated research in order to answer a methodological question(s) and to guide the development of the research plan” (Kim, 2011, p. 191). Sampson (2004) states that pilot studies are invaluable in qualitative research. It gives the researcher the unique opportunity to review the design of the interviews, to minimize observer bias, to determine the best course of action and to identify potential gaps. Due to the complexity of both reshoring and ES, a pilot study has been conducted with two interviewees to test the feasibility of the interview guide. The pilot study’s aim is “to confirm the coverage and relevance of the content of the formulated, preliminary guide and to identify the possible need to reformulate questions [...]” (Kallio et al, 2016, p. 2960). Two pilot studies with two different interviewees were conducted in July 2020. The first pilot interview was used in particular to test the entire interview guide. The second pilot interview with another participant was conducted again with the objective to test the revised questions. The results of both interviews are not included in the data analysis. This is because the two participants come from two different firms and therefore cannot be counted as a reshoring case. In conclusion, the primary objective of the pilot study was to test the prototype of the interview guide and to adjust it for the actual interviews accordingly.

The following table 13 illustrates the interview guide and rationale for each question by linking it to the corresponding research gaps in the literature. In addition, the changes from the pilot interviews are included as well:

Table 13: Preparation of the interview guide and adjustments of the pilot interview

Section 1: Background information of the participant		
Findings from literature review (rationale)	Interview question	Changes due to implications from pilot interviews
Biebrach (1986) suggests to ask for the interviewee’s background information	1. Please provide the industry and the following numbers of the company you are working for: sites, revenue and employees.	2 nd pilot interview: Added a fourth criteria “tier” to classify the firms according to their role in the supply chain “Please provide the industry and the following numbers of the company you are working for: sites, revenue, employees and tier-level in the supply chain.”
Biebrach (1986) suggests to ask for the level of experience and the interviewee’s professional background	2. Please describe your work experience with respect to previous professions, your current role in your company and your experience with reshoring and ES.	N/A
	3. Please indicate your familiarity for both reshoring and ES on a scale of 1 to 3 (1 means <i>rudimentary knowledge</i> , 2 means <i>good theoretical, but less practical experience</i> and 3 means <i>profound theoretical and practical knowledge</i>).	1 st pilot interview: Added a question to briefly explain the experiences that the interviewee indicated “To what does your experience relate in each case?”
Orzes & Sarkis (2019) suggest to conduct research on different reshoring scenarios to understand the relationship between reshoring and ES at all levels.	4. Is there any central responsibility for (i) offshoring/reshoring and (ii) sustainability in your company? If yes, in which department is the responsibility for each of these issues allocated? What is the person’s role and responsibility?	N/A
The second part of the question refers to Grandinetti & Tabacco (2015) who found that it is relevant to consider product complexity, as highly customised products require firms and suppliers to collaborate closely. It furthermore involves tacit knowledge, which also leads to frequent face-to-face interactions.	5. If there is a case of reshoring in your organisation, please indicate the case(s), even if you have only considered reshoring (i) as a purely theoretical concept and have not yet dealt with it practically or (ii) if you have considered reshoring from a purchasing perspective by switching from an offshore to a local supplier.	1 st pilot interview: In the pilot interview, the interviewee stated that the complexity of the product played a central role in reshoring. Therefore, a follow-up question is added, which provides a rough estimate of the product's complexity. In order to ensure anonymity, the product is only classified on a scale and not named. “Please also indicate the complexity of the product considered in your reshoring case (1 means <i>less complex, standardised and easy to replace</i> ; 2 means <i>medium complexity with minor individualizations</i> and 3 means <i>highly customised with significant research and development efforts</i>).”
Section 2: Perception of ES as motivation or driver for reshoring (RQ1)		

<p>According to Fratocchi et al. (2014) the reshoring phenomenon is new and emerging. Even though there are a few cases since the 1980s, business and science are still catching up meaning that the phenomenon is still under-researched (Arlbjørn & Mikkelsen, 2014). It is thus necessary to conduct research on phenomenon to understand its occurrence better (Wiesmann, Snoci, Hilletoft, & Eriksson, 2017).</p>	<p>6. When and why did the concept of reshoring come up in your company?</p>	<p>1st pilot interview: The question was shortened to ask exclusively for the "when" and not already for the "why". This is asked in the following question</p> <p><i>“When did the concept of reshoring come up in your company?”</i></p>
<p>Barbieri et al. (2018, p. 90) stressed that reshoring is a recent topic and that scarce attention was given to why firms reshore. This is a key issue to understand why firms decide for internationalisation and thus manufacturing locations. Wiesmann et al. (2017, p. 38) also raised that “future research must</p>	<p>7. What were the key drivers or motivations to reshore?</p>	<p>1st pilot interview: Added two questions to ask for the purpose of the offshoring strategy and to ask for ES if interviewee has not mentioned this driver</p> <p><i>“What were the key drivers or motivations to reshore? Was reshoring a consequence of failing with the offshoring strategy? How do you see ES as a key driver?”</i></p>
<p>elucidate the drivers and barriers of reshoring. Especially, the connection between offshoring and reshoring motivation needs clarification, as it appears that these two might have a reciprocal relationship as drivers for offshoring often seem to be barriers for reshoring and vice versa”.</p>	<p>8. <i>[If interviewee has not mentioned ES as a driver, ask clarifying questions why he/she did not consider ES aspects; if the interviewee has mentioned ES as a driver]</i> Have you considered reshoring because ...</p> <ul style="list-style-type: none"> a. of increased awareness of environmental impact and focus on sustainability? b. of establishing a local supply chain as transportation and logistics account for the majority of CO₂-emissions in the value chain? c. of the limited availability of environmental sustainable suppliers? d. of ES issues with the offshore supplier’s production process in terms of pollution problems or not considering measures to improve e.g. CO₂-emissions? e. of government policy on ES issues such as a CO₂-tax, sustainability rules or EU targets for the circular economy? f. of changes in energy costs? g. of the uncertainty, as the supplier is located in a region where environmental sustainability is more of a secondary objective? h. developing a product brand and corporate reputation requires more local and sustainable sourcing and production? 	<p>N/A</p>

	<p>i. the strategy has shifted and more local production is required due to customer demand for sustainable products?</p> <p>j. of meeting ES requirements of your company's top management or stakeholders (e.g. CO₂-emission targets)?</p> <p>k. you remain attractive to end users or OEMs to secure future orders and contracts?</p> <p>l. other drivers not mentioned in the previous list?</p>	
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<p>As far as research from Wiesmann et al. (2017) and Theyel et al. (2018) is concerned, they claim that, for example, lack of proper decision data deters a company from moving back. This can be a lesson learned through an unsuccessful offshoring project, which requires further investigation.</p>	<p>9. Where reshoring has been completed, have the drivers for reshoring been achieved in practice? Are there any key lessons for future strategies on reshoring?</p>	N/A
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<p>It is important to understand the significant impact sustainability has on reshoring decision. Tate (2014) noted that an increasing emphasis on sustainability leads firms to re-evaluate the manufacturing location decision.</p> <p>In addition, Heikkilä et al. (2018, p. 382) found that the consideration of sustainability across the supply chain is a new motive for the relocation of manufacturing locations. They stated that “repeated environmental and/or human rights violation” indicate a need to re-think the location decision.</p>	<p>10. How has the degree of importance for reshoring increased due to the growing debates and emerging demands on ES (1 means <i>rather low</i>, 2 means <i>moderate rise</i> and 3 means <i>substantial rise</i>)?</p>	<p>1st pilot interview: Answering this question on a scale did not lead to any significant findings in the pilot interview. Therefore the question is formulated openly and the scale is removed.</p> <p>It was also found that ES did not play a significant role in the past, so a follow-up question is added to better understand the future priority of ES.</p> <p>“How has the degree of importance for reshoring increased due to the growing debates and emerging demands on ES? How do you expect it to be in the future (next 4-5 years)?”</p>
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Section 3: Consideration of ES in reshoring decision-making (RQ2)

<p>Understanding the operative reshoring process is crucial as “an immature reshoring process can lead to over-hasty decisions, continuing a spiral of adverse effects”. Thus, this questions aims to explore extant reshoring processes and to put them into context with reshoring decision-making (Wiesmann, Snoei, Hilletoft, & Eriksson, 2017, p. 33).</p>	<p>11. What does your reshoring process look like?</p>	<p>1st pilot interview: The question was too complex for the interviewee. It is therefore reduced to ask for the reshoring process only. The ES dimension is covered in the following questions anyway. The question was also clarified in order to ask specifically about the operational process and not yet about decision paths.</p> <p>“If there is one, what does your operative reshoring process look like?”</p>
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<p>This question in the interview guide refers to Wiesmann et al. (2017, p. 27) stating “decision-making processes with regard to reshoring generally appear to be under-researched”. Following this argumentation, Bals et al. (2016) also observed that reshoring decision-making remains largely unexplored.</p>	<p>12. How does the current decision-making process look like and who (departments, job roles, hierarchy level) is involved at what stage in these decisions? Why?</p>	<p>N/A</p>
<p>Recently, Fratocchi & Di Stefano (2019) elucidated that scarce attention has been paid to the interdependence between sustainability and reshoring. Orzes & Sarkis (2019, p. 482) furthermore explained that “the relationship between reshoring and sustainability is a foundational unexplored relationship”.</p>	<p>13. What is the role that ES plays in deciding where to reshore compared to other factors such as low wages or better access to raw materials?</p>	<p>N/A</p>
<p>Previous studies conclude that “models about reshoring decisions need to include several decision criteria, which goes beyond financial metrics” (Wiesmann, Snoei, Hilletoft, & Eriksson, 2017, p. 15)</p> <p>Besides considering several decision criteria, Barbieri et al. (2017, p. 101) found that after taking the decision and implementing it, managers must “carefully monitor the performance of the reshored manufacturing activities”.</p>	<p>14. What is the decision criteria that you take into account beyond financial metrics? How do you specifically consider the environmental dimension?</p> <p>15. How did you evaluate the decision with respect to reshoring and ES and what were the main aspects you looked at, for example, to assess that you were getting a better ES performance? Or do you rank and compare specific locational factors such as the cost of input goods, energy, knowledge, labour cost, access to markets, availability of suppliers, etc.?</p>	<p>1st pilot interview: This question was asked directly as a follow-up to question 12 in the pilot interview and is therefore reassigned accordingly.</p> <p>1st pilot interview: The pilot interview showed that this question did not lead to further substantial findings. The interviewee has already implicitly provided this as an answer to questions 11-14. Nevertheless, the question remains included as a potential follow-up for further interviews.</p>
<p>Orzes & Sarkis (2019, p. 482) called for further research on the relationship between reshoring and ES. They suggest investigating whether ES can be a significant motivation for reshoring. “If yes, under which conditions, for which industries and countries, for which type of firms [...]?”</p>	<p>16. How strong do you rate the level of influence of ES on strategic reshoring decisions in your firm on a scale from 1 to 3? (1 means <i>weak influence</i>, 2 means <i>moderate influence</i> and 3 means <i>strong influence</i>)? Why? Do you expect it to rise or fall in the future?</p>	<p>N/A</p>
<p>Section 4: Influence of ES on the reconfiguration of supply chains when reshoring (RQ3)</p>		
<p>Following the proposed research avenues from Orzes & Sarkis (2019, p. 482), they furthermore ask for investigating whether ES leads to supply chain reconfiguration. “From a</p>	<p>17. Which reshoring and ES cases have led to a reconfiguration of your supply chain and to what extent (1 means <i>minor process-related reconfigurations</i>, 2 means <i>moderate adjustments in terms of</i>, for example, <i>management of logistics streams</i> and 3 means <i>total reconfiguration including the</i></p>	<p>N/A</p>

<p>locations selection process, determination of configurations (designs) that are closer or further from suppliers and customers can greatly influence environmental sustainability of the supply chain.”</p>	<p><i>exchange/replacement of suppliers with new contractual agreements)?</i></p>	
<p>Bals et al. (2016) add that besides understanding decision-making processes, the question of supply chain reconfiguration is quite a relevant issue for both scholars and managers.</p>	<p>18. How was your supply chain designed before and after the reshoring process and which parts of it were mainly affected?</p>	<p>N/A</p>
<p>The researcher derived further questions out of these proposed research avenues to investigate the phenomenon of reshoring, ES and supply chain reconfiguration at all levels.</p>	<p>19. How do you consider ES aspects when you have the opportunity to reconfigure your supply chain?</p>	<p>N/A</p>
<p>Recently, a considerable amount of literature has been published on supply chain reconfiguration (Orzes & Sarkis, 2019) and its interdependence to product and process development as this can have an impact on both innovation capability and time-to-market (Wan, Orzes, Sartor, Di Mauro, & Nassimbeni, 2019). The authors stress, “intense globalization processes have favoured the shift of many production activities to developing countries and the reconfiguration and repositioning of the operations” (p. 6).</p>	<p>20. Did the implementation of a local supply chain require you to switch to suppliers that follow stricter sustainability practices? If yes, how did you manage the transition phase when switching from an offshore to a local supplier?</p>	<p>N/A</p>
<p>Consequently, the researcher was interested to investigate if supply chain reconfiguration has resulted in a product re-design.</p>	<p>21. Due to your reshoring strategy, have you re-designed products to make the offshore supplier redundant or to develop an environmental-friendly product?</p>	<p>1st pilot interview: The question has been slightly adapted to avoid limiting it to just two examples. “<i>Due to your reshoring strategy, have you re-designed products, for example, to make the offshore supplier redundant or to develop an environmental-friendly product?</i>”</p>
<p>Until recently, little is known about the short- and long-term effects of the Covid-19 pandemic, however, it is already obvious that this pandemic will have dramatic consequences for national and global economies as well as on the structure and organisation of a firm’s operations and supply chain (Samson, 2020).</p>	<p>22. What is the influence on your supply chains due to Covid-19 and what are the implications for ES?</p>	<p>1st pilot interview: Questions 20 and 21 were assigned at the end of the interview guide because they relate more to long-term effects</p>

Precisely because reshoring and supply chain reconfiguration are extremely timely topics in terms of the Covid-19 pandemic, the researcher wanted to investigate how this relates to decisions along the supply chain.

The search for competitive advantage when making location decisions is a theme being discussed in the literature quite frequently (2013). “Reshoring decisions can reflect a firm’s inability to develop critical [...] assets [...] and exploit the host country’s resources in order to create competitive advantage (Barbieri, Ciabuschi, & Fratocchi, 2017, p. 108).

Barbieri et al. (2017) furthermore suggest that reshoring foster a firm’s ability to strengthen its competitive advantage.

According to Theyel et al. (2018), location decision making consists of multiple stages and is associated with a high level of uncertainty. Consequently, the decision may has considerable effects on the competitive advantage of firms.

For these reasons, the researcher has decided to integrate this question into the interview guide.

23. What is the effect of a local supply chain on your competitive advantage? Which benefits do you see to improve your environmental performance? Why?

1st pilot interview: The second question about the benefits was not directly related to the competitive advantage and rather confused the respondent. It is therefore removed.

“What is the effect of a local supply chain on your competitive advantage? Why?”

According to the findings from the literature review so far, this question is specifically applicable to the discussion of competitive advantages and the use of location decisions by the firms studied (automotive suppliers).

24. From a strategic point of view, how do you position yourself in the supply chain to remain attractive for your customers (OEMs)?

2nd pilot interview: Question added as the interviewee was referring to the supplier’s future strategic position in the supply chain network

Section 5: Summary and conclusion

Ensure not to miss anything that the participant would like to add and that has not been covered in the previous questions

25. Is there any other issues concerning reshoring or ES that we have not discussed yet, but which are of major relevance for you?

N/A

This type of sampling procedure facilitates the researcher to access participants through contact information that is provided by previous participants during interviews (Noy, 2008)	26. Is there another employee in your company whom you would recommend for a further interview?	N/A
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Source: Own illustration

4.4.4.2 Scaling

Four questions in the interview guide make use of scales as part of the answer. “The purpose of scaling is to quantify qualitative data. Scaling procedures attempt to do this by using rules that assign numbers to qualities of things or events” (Young, 1984, p. 55). The purpose is to facilitate the researcher after the interview process to identify and structure themes as well as to compare findings with each other. The following section highlights the questions and explains the rationale why a scale has been used in the interview process:

The first question aims to gather the interviewee’s experience with reshoring and ES and to compare the interviewees according to their corresponding level of knowledge respectively experience. As participants usually describe their experience in a different, non-comparable way, this question aims to provide a scale to assign them into three categories (Bernard, 2017). This helps the researcher when analysing the reshoring cases and to investigate the level of familiarity with reshoring and ES. It also aims to understand the level of involvement, i.e. whether someone was involved in implementing a reshoring project or not. The question is stated as follows:

1. *Please indicate your familiarity for both reshoring and ES on a scale of 1 to 3. (1 means rudimentary knowledge, 2 means good theoretical, but less practical experience and 3 means profound theoretical and practical knowledge)*

The essence of the next question is to clarify the level of product complexity per case. The researcher is interested in to understand if there is a relationship between firms with simple or rather complex products and if it relates to SCR or reshoring. On the one hand, Grandinetti & Tabacco (2015) found that product complexity is an indicator for OEMs to collaborate

closely with their suppliers since it involves tacit knowledge. On the other hand, literature indicated that, for example, German manufacturing firms were more active in reshoring compared to other firms. According to Kinkel (2014), this could be because, for example, complexity, product customisation or small batch sizes play a decisive role. Consequently, the researcher decided to collect this data as well as part of this research. The question is stated as follows:

2. *Please also indicate the complexity of the product considered in your reshoring case (1 means less complex, standardised and easy to replace; 2 means medium complexity with minor individualisations and 3 means highly customised with significant research and development efforts)*

The objective of the third question is to understand to what extent the interviewees see an increasing impact of ES on reshoring in the future. According to Heikkilä et al. (2018) and Tate (2014), it is of importance to understand the impact sustainability has on reshoring because it puts an increasing emphasis on the location decision. Especially environmental and/or human rights violation indicate the need to reshore. The question is stated as follows:

3. *How strong do you rate the level of influence of ES on strategic reshoring decisions in your firm on a scale from 1 to 3? (1 means weak influence, 2 means moderate influence and 3 means strong influence)*

The fourth question aims to explore the impact reshoring and ES have on the needs to re-design the supply chain of a firm. As the third research question on SCR is very complex, participants should be allowed to give a clear answer. This will ultimately help to compare the answers better. This research gap has also been addressed by Orzes & Sarkis (2019) and Bals et al. (2016).

4. *Which reshoring and ES cases have led to a reconfiguration of your supply chain and to what extent (1 means minor process-related reconfigurations, 2 means moderate adjustments in terms of, for example, management of logistics streams and 3 means*

total reconfiguration including the exchange/replacement of suppliers with new contractual agreements)

4.4.4.3 Interview process

According to Pitney & Parker (2009) “interviews are the most common source of qualitative data. They let researchers enter the world of their participants and learn rich and valuable information about their experiences” (p. 45). This requires the researcher to understand participants’ views entirely and to conduct the interviews effectively. An effective interview is characterised by addressing central aspects of the research and by attempting to collect all information related to the research questions. Pitney & Parker (2009) stress that five important components must be considered when planning for the interview. These consist of providing the interviewee with a framework for the study, setting the tone for the relationship and to help the interviewee to feel comfortable, ask interview questions, conclude the interviews by rephrasing what the researcher has learned and thank the participants for the opportunity to learn about their experiences. These components are considered within the interview guide and corresponding documents in appendices 2 through 7.

Every interviewee who was willing to participate in the research was provided with the brief *Overview of the Interview Questions* (Appendix 2), the *Participant Information Sheet* (Appendix 5) and the *Participant Consent Form* (Appendix 6). The participant information sheet is intended to describe the background and aim of the research while the participant consent form aims to receive the participant’s consent before the interview is conducted. In addition, when approaching the participants, they were offered the opportunity to raise any questions or concerns before the interview. The actual interviews were conducted according to the *Interview Guide* (Appendix 4). The researcher asked clarifying questions in-between every question to receive in-depth information. The interview was concluded with an open question to ask, if the interviewee would like to add anything else, which has not been covered by the previous questions. After conducting the interview, the researcher thanked the interviewee for the time, the contribution with his knowledge and experience to the research. The interview was finished by explaining the next steps and that the interviewee will receive a *Participant Debriefing Form* (Appendix 7) via e-mail.

The interview process according to the duration and the date of the interview is described in the following table 14:

Table 14: Interview process (July – November 2020)

Identifier	Job title	Interview duration (in minutes)	Date of interview
Pilot	Procurement Manager (Pilot interview; not considered in data analysis)	31:46	July 09 th , 2020
Pilot	Management Consultant (Pilot interview; not considered in data analysis)	29:47	July 16 th , 2020
A1	EHS Manager (Environment, health and safety)	52:26	July 17 th , 2020
B1	Senior Project Manager	49:28	July 24 th , 2020
C1	Director Operational Restructuring	59:14	July 28 th , 2020
A3	Manager Product Stewardship & Sustainability	51:45	August 04 th , 2020
A2	Manager Product Stewardship, Energy & Climate	45:41	August 12 th , 2020
D1	CEO Assistant (formerly Head of Production)	57:27	August 13 th , 2020
E1	CEO	56:45	August, 20 th , 2020
F1	CEO	41:11	September 16 th , 2020
G1	Sustainability Manager	61:01	September 17 th , 2020
H1	Head of PCU Technology-Light Vehicles	36:25	September 25 th , 2020
F2	Group Director Operations	51:47	October 13 th , 2020
I1	Director Operational Excellence Automotive	34:57	October 14 th , 2020
G2	Production Network & Digitization	31:48	October 20 th , 2020
I2	Senior Project Manager Sustainability	23:09	October 20 th , 2020
D2	Director Sales Account Management	29:31	October 22 nd , 2020
I3	Manager Connected Supply Chain	40:39	October 27 th , 2020

Source: Own illustration

4.4.4.4 Transcribing and translating data

Interviews were carried out remotely because of the situation regarding the Covid-19 pandemic. This was particularly important to protect the well-being of the participants and the researcher. Due to time and resource constraints as well as to improve the quality, the interviews were conducted via Microsoft Teams including audio and video function. This made it possible to compensate for the absence of physical interviews and at the same time to ensure that social interactions (e.g. facial expressions, gestures) were taken into account. The duration of the interviews, on average, was between to be 30 to 60 minutes. The interviews were recorded in a professional way with Microsoft Teams to ensure a proper transcription and translation of the data after the interview was conducted. Depending on the nationality of the participants, the interviews were conducted in English (three interviews) or German (16 interviews). The interviews conducted in German were all translated into English so that all statements made by the participants could be understood and quoted in this thesis.

4.5 Quality criteria

According to Denzin & Lincoln (1998), qualitative research is a field of inquiry that crosscuts disciplines, fields and subject matters. It is considered as a complex, interconnected conglomerate of terms, concepts and assumptions. Denzin & Lincoln (1998) furthermore argue that qualitative research studies things in their natural setting to interpret phenomena by investigating people's meanings, feelings or perceptions. In addition, Golafshani (2003) sees qualitative research as a naturalistic approach that is directed to understand phenomena in real-world settings where the researcher does not attempt to manipulate phenomenon, but to unveil the ultimate truth. That means, qualitative research does not generate findings based on quantitative or statistical principles, but collects a variety of empirical materials (e.g. through interviews and case studies) and studies phenomena in its real-life context attempting to make sense of terms that people ascribe to them. However, what both qualitative and

quantitative research need is credibility, which is also defined as reliability and validity of research (Guba & Lincoln, 1994).

Especially case studies are suitable tools for generating and testing theory in strategic management, however, this “method has been prone to concerns regarding methodological rigor in terms of validity and reliability” (Gibbert et al., 2008, p. 1465). To understand the relevance of reliability and validity for this qualitative research and case study method, the researcher explains both strands of testing and evaluating qualitative data. This section is concluded with a summary of the implemented measures to ensure reliability and validity.

4.5.1 Reliability in qualitative case study research

The traditional understanding of reliability is directed to standardise data collection instruments, however, “this is premised on the assumption that methods of data generation can be conceptualised as tools, and can be standardised, neutral and non-biased” (Mason J. , 1996, p. 145). According to Hammersley (1992), this may be acceptable for quantitative studies, but not for qualitative approaches. He questions the non-standardisation of qualitative methods. As a countermeasure Brink (1991), suggests three tests of reliability, which is (i) *stability*, (ii) *consistency* and (iii) *equivalence*. First, *stability* is directed to ask identical questions at different times during an interview, which results in consistent answers. Second, *consistency* refers to the integrity of issues in an interview and is expected that an interviewee’s responses remain concordant. Third, *equivalence* is ensured by employing alternative forms of questions during a single interview. These three methods seek to standardise qualitative data collection and to ensure replicability.

According to Long & Johnson (2000), “there seems to be a growing popular movement within qualitative circles to insist that *dependability* is a more appropriate term than reliability for qualitative research” (p. 31). Guba & Lincoln (1989) argue that “*dependability* is parallel to the conventional criterion of reliability” (p. 242), which means the stability of data over time. However, the objective of ensuring that data collection is consistent and free from undue variations that occur unknowingly is the same as *reliability* (Long & Johnson, 2000).

However, the challenge that a qualitative researcher faces when studying situations, people, events or phenomena is that there is only a limited possibility to repeat the findings in the exact same way. This is because over a certain period, locations, situations, people change due to external impacts and thus may not respond in the same way as they did before. “We cannot be sure that there was no change in extraneous influences such as an attitude change that has occurred [...] these kinds of errors will reduce the accuracy and consistency [...]” (Golafshani, 2003, p. 599). Consequently, the researcher has to take into account that the characteristics of a respondent change over time and that the setting in which an interview took place needs to be described in detail. This is particularly important where there is a possibility that results will not be repeated (Jackson, 1995).

4.5.2 Validity in qualitative case study research

Joppe (2000, p. 1) explains, “validity determines whether the research truly measures that which it was intended to measure or how truthful the research results are. In other words, does the research instrument allow you to hit “the bull’s eye” of your research object? Researchers generally determine validity by asking a series of questions and will often look for the answers in the research of others”. From a quantitative perspective, validity means “the determination of whether a measurement instrument actually measures what it is purported to measure” (Lobiondo-Wood et al., 1990, S. 561) or “the degree to which an instrument measures what it is intended to measure” (Polit & Hungler, 1989, S. 656).

In contrast to the quantitative perspective, Hammersley (1992, p. 69) provides a definition for validity in qualitative research: “An account is valid or true if it represents accurately those features of the phenomena that it is intended to describe, explain or theorise”. Just as with reliability, there are slight differences between quantitative and qualitative perspectives on validity. Golafshani (2003) goes on to say that these two strands, reliability and validity, are viewed differently by qualitative researchers and address the problem that these are adequate for quantitative researchers. “The question of replicability in the results does not concern them, but precision, credibility, and transferability provide the lenses of evaluating the findings of a qualitative research” (Golafshani, 2003, p. 600). Creswell & Plano Clark (2011) also argue that in qualitative data collection the term *credibility* is more appropriate

than *validity*. They stress that the overarching goal of a qualitative researcher is to establish credible research in the eyes of the researcher's audience. According to Polit & Beck (2012), credibility refers to the truth of data and the meanings, opinions and views from the participant as well as the interpretation by the researcher. Sandelowski (1986) adds that research is considered credible if the individuals who share the same experience can recognise the interpretations of human experience.

A major concern for qualitative research is that researcher have to overcome a special temptation with their in-depth access to single cases. The challenge is to convince themselves and their audience that findings are based on a critical investigation of their case studies or interviews and “do not depend on a few well-chosen examples“ (Silverman, 2010, p. 286). The strength of qualitative studies to provide deep and rich insights of phenomena on the one hand side can also be a major weakness on the other hand side (Mehan, 1979).

Lastly, generalisability is concerned with the extent to which findings or conclusions from a sample can be transferred to a broader population (Lee & Baskerville, 2003). Gibbert et al. (2008) argue that “generalisability is grounded in the intuitive belief that theories must be shown to account for phenomena not only in the setting in which they are studied, but also in other settings” (p. 1468). This research does not seek to generalise the insights and findings from the interviews.

4.5.3 Implemented measures for reliability and validity

This section is divided into two parts. The first part relates to the implemented measures proposed by LeCompte & Goetz (1982) and Silverman (2010) to ensure reliability in qualitative research and that promote collecting data in a consistent manner. The second part relates to validity and the measures proposed by Long & Johnson (2000) and Abd Gani et al. (2020), which were examined and rigorously followed by the researcher. Table 15 provides an overview of proposed measures from LeCompte & Goetz (1982), which are directed to increase reliability of research and thus increase the chance to replicate. The researcher has implemented the following three strategies:

Table 15: Strategies and implemented measures to increase reliability in qualitative research

Strategies	Measures implemented by the researcher
<p>1. Low-inference descriptors Concrete and precise verbatim accounts of what people say as well as narratives of behaviour and activity are considered to be most credible</p>	<p>All interviews were recorded, transcribed and translated</p> <p>Where possible, narratives of behaviour, mimics or gestures were noted</p> <p>For the purpose of validity, the original interview transcriptions as well as the translations were provided to the interviewees</p>
<p>2. Peer examination Confirmation of findings by researchers who operate in similar fields</p>	<p>One of the researcher’s supervisors, Prof. Dr. Kai Foerstl has conducted research on reshoring and supply chain management since 2011 and published 32 articles</p> <p>Peer examination was ensured by discussing specific findings on reshoring with the supervisor</p>
<p>3. Mechanically recorded data Use a variety of devices to record and preserve data, so that the veracity of findings can be confirmed</p>	<p>All interviews were recorded and transcribed with MS Teams including audio and video function.</p> <p>All data generated by the interviews are stored securely on the researcher's laptop (offline). The strict security requirements for the laptop of the researcher at the firm he works for ensure data protection.</p>

Source: Own illustration; contents according to LeCompte & Goetz (1982, pp. 41-43) and Silverman (2010, p. 299)

With reference to the introduction and critical appraisal of what is meant by *reliability*, Silverman argues that “unless you can show your audience the procedures you used to ensure that your methods were reliable and your conclusions valid, there is little point in aiming to conclude a research dissertation” (Silverman, 2010, p. 301).

With regard to the researcher's objective of ensuring the validity of this research, table 16 below gives an overview of the five measures considered and implemented by the researcher. First, the researcher prepared an interview guide to ensure that “essentially the same information is obtained from a number of people by covering the same material” (Patton, 1987, p. 111). This guide provides defined topics and subject areas to conduct research and collect data in a consistent manner and enables the researcher to be free to explore, probe and

ask clarifying questions about an issue (Suzuki, 1999). The researcher also conducted two pilot interviews to ensure validity, which was considered as a pre-test before conducting the actual study. It has helped to detect any possible flaws at an early stage by identifying potential problems that may occur during the interview process (Abd Gani et al., 2020).

Second, the researcher constantly reflected on the findings derived from the interviews and reviewed them critically. “Reflective writing has become established as a key component and is central to the notion of learning from experience” (Jasper, 2005, p. 247). It has challenged the researcher to think critically about the findings and conclusions. Being reflective and reflexive is a difficulty, however, it has enabled the researcher to understand the myriad ways in which data can be analysed (Fook, 2002).

Third, the researcher has provided every participant both the original and the translated version of the interview. He also asked the interviewees to read and check the transcripts to avoid possible mistakes. Fourth, since the beginning of the thesis, the researcher is deeply involved in sustainability-related (business) challenges and advises clients in the field of sustainability. Consequently, the researcher was able to ensure a constant transfer of knowledge between both his job and his thesis. Fifth, in line with strategy #2 from table 15, the researcher discussed the findings of the cases with his supervisors, one of whom had been involved in reshoring for several years.

Table 16: Strategies and implemented measures to increase validity in qualitative research

Strategies	Measures implemented by the researcher
<p>1. Pre-test version of interview guide (pilot) A pilot test is conducted in any research with the aim to ensure that validity is achieved</p>	<p>The researcher has employed a two-stage pilot interview process: after having conducted the first pilot interview with Pilot 01, the researcher incorporated the changes into the interview guide and conducted another pilot with Pilot 02 (cross-reference to table 12).</p>
<p>2. Self-description and reflective journal-keeping Be reflexive as a researcher, by reflecting your own beliefs in the same way as those of the respondents</p>	<p>During the data analysis, which includes interviewing, transcribing, translating or coding activities, the researcher constantly reflected on and critically evaluated the statements of the respondents.</p>

<p>3. Respondent validation Check results on completion of data collection with the respondents to meet requirements of diachronic reliability (stability over time)</p>	<p>This strategy corresponds to #1 in table 15, where the researcher provided the respondents with transcripts and translations of the interviews for validation purposes.</p>
<p>4. Prolonged involvement and persistent observation Staying in the respondent's environment increases the likelihood of their significance, and it is a means of increasing validity if the researcher spends a longer period in contact with the respondents or with the subject in general.</p>	<p>The researcher has already been working on the topic of "sustainability" for two years, advises and supports clients at Porsche Consulting on this topic and therefore has a large overlap between his thesis and his job.</p> <p>Not only out of professional interest, but also out of personal motivation, the researcher therefore deals with sustainability on a daily basis.</p>
<p>5. Peer debriefing Exploring findings on a continuous basis, for example, with supervisors who have a key role with research students to ensure rigour or discussing findings with knowledgeable colleagues to stimulate exploration of additional perspectives</p>	<p>Due to the sensitivity and anonymization of the data from the interviews, individual results cannot be discussed with other peers.</p> <p>However, fundamental or general topics that do not provide a conclusion on the collected data are carried out with experienced colleagues as well as with the researchers' supervisors (cross-reference to strategy #2 from table 15).</p>

Source: Own illustration; contents according to Long & Johnson (2000, pp. 33-35) and Abd Gani et al. (2020)

4.6 Ethical considerations

The main objective of research is to ensure maximum protection for the participants involved in the data collection phase, who contribute with their individual knowledge and deep insights in the course of the investigation. Consequently, the following section sets out the ethical considerations, which are relevant for this research.

4.6.1 Ethics in research

Silverman (2010) sets out five main instructions to consider ethics in research. This is linked to the British Economic and Social Research Council (ESRC). The principle of the ESRC is quoted first and then referred to individually:

1. “Research staff and subjects must be informed fully about the purpose, methods and intended possible uses of the research, what their participation in the research entails and what risks, if any, are involved” (p. 162):

Because of the Covid-19 pandemic, the interviews were conducted online. This is important to protect the well-being of the participants. Therefore, the participants were contacted at least three to four weeks before the actual interview to inform them about this procedure. This ensured that all participants were informed and agreed with this approach. Every interviewee received a *Participant Information Sheet* and *Participant Consent Form* before the interview and a *Participant Debriefing Form* after the interview. These documents contain an overview of the topics covered in the interview, explain the background of the researcher, the objectives of the research, the criteria why a respondent was selected and refer to the instructions for the interview (e.g. duration, location, voluntary participation, decision to withdraw). These documents are attached in appendices 5, 6 and 7. The participants had the chance to pre-read the consent form. The *Participant Debriefing Form* was handed out together with the transcript. It expresses the appreciation of the researcher and contains contact information in case of questions.

2. “The confidentiality of information supplied by research subjects and the anonymity of respondents must be respected” (Silverman, 2010, p. 162):

The participants were informed that the interviews will be recorded and that it may be stopped at any time. Data, information and knowledge provided during the interviews from the participants were treated confidentially, as it may contain sensitive company-related information. Any personal data is treated anonymously and the results from the interview were treated confidential. No one except the researcher has access to the data generated in the interview. After completion of the study, the data from the interviews will be destroyed in a professional way. To meet confidentiality during the study, data was stored on a password-protected device. Participants must agree on the research objectives of the interview before agreeing to take part and sign the *Participant Information Sheet*. The participants received a copy of the transcribed interviews to ensure the accuracy and prove validity. All data-related rules have been set out in a *Data Management Plan*, which has been

uploaded on *Converis* in the course of the ethics approval process. This is the research management system from Sheffield Hallam University (SHU) and is used to record the applications for ethics reviews.

The protection of participants' privacy is a core element of research ethics and a common practice to change the names of study participants when publishing qualitative data to ensure anonymity. However, this is not sufficient when results are presented that anonymity is ensured. For example, this is because of the demographic description, job titles or other identifiers being provided to contextualise the sample. This may compromise confidentiality. To minimise the risk of violating confidentiality, a table that lists participants' demographic information (age, gender, occupation, employment, etc.) line by line is not incorporated when publishing results. Consequently, when describing the study for publication purposes, demographic characteristics will be presented as group data. Codes that may identify a participant or a case, which are located in the document or footnotes will be removed. This will mitigate the risk of violating confidentiality or that a participant will be identified. In addition, anonymization of data is another important issue raised by concerns of confidentiality. This includes the following:

- Maintaining confidentiality of data/records will ensure the separation of data from identifiable individuals
 - Ensuring the people who have access to the data maintain confidentiality
 - Anonymising individuals, places, etc. in the dissemination of the research results to protect their identity
3. “Research participants must participate in a voluntary way, free from any coercion” (Silverman, 2010, p. 162):

As explained in principle #1, the participants were provided with a *Participant Information Sheet* in which it was explained that any participation is voluntary (Appendix 5). The interviewee was allowed to withdraw at any time without giving a reason, but this did not happen.

4. “Harm to research participants must be avoided” (Silverman, 2010, p. 162):

Especially due to the Covid-19 pandemic, the health safety of the participants was a key priority. In consultation with the supervisor and the ethics committee of SHU, it was decided that the interviews would be conducted remotely in order to avoid exposing the participants to any danger. The participant may not be willing to talk via remote as a matter of data protection issues to meet confidentially or video recording.

Furthermore, the long-term negative consequences of the interviews were considered, too. Usually, participating in an interview is a rewarding experience as the participants have the chance to tell their professional stories to an attentive listener. Thus, interviews may be considered interesting, informative, thought-provoking and sometimes also beneficial for the interviewee. However, this situation may also encourage participants to think about information, feelings or situations they otherwise would not have. Even though the researcher explained the background, objectives and settings of the interview, the participant may still feel uncomfortable with some questions during the interview process. Reis & Judd (2000) found that even though participants are free not to answer a particular question, most respond to every question being asked. They do even if they feel uncomfortable with the question. Consequently, there is a chance that participants have long-term negative effects from the interview. Participants may feel desperate if they know that they have revealed too much, or they may not stop thinking about certain (personal) information that was provided. Thus, the goal was to assess the potential short- or long-term effects on the interviewee carefully. In addition, the researcher treated participants with utmost consideration in conducting the interviews that deal with personal information or sensitive questions.

5. “The independence and impartiality of researchers must be clear, and any conflicts of interest or partiality must be explicit” (Silverman, 2010, p. 162):

The double role of the researcher needed to be considered while working for Porsche Consulting and acting as a researcher. The researcher must have the ability not only to apply ethical theories, but also to apply them to individual situations of the participants. For example, if the interviews involve a production manager of an AS who has business relations

with the VW group, the participant may not provide sensitive company information, as Porsche Consulting also belongs to the VW Group. As research is honest, participants must also be informed about the business purpose of Porsche Consulting and further business relations to other clients and industries. However, the researcher mentioned this relationship at an early stage by e-mail and also pointed out that the data is not used in any way at Porsche Consulting or with clients. This has not been a problem for any interviewee.

In addition, the researcher needed to be aware of a potential bias in terms of individual judgements or decisions during interviews. Thus, ethical considerations required the ability of the researcher to make informed decisions based on information provided and to ensure that all participants and their information are treated equally.

4.6.2 Research ethics approval procedure

Complying with ethical requirements and the integrity of research are paramount to the SHU. It was agreed between SHU and Munich Business School (MBS) to use SHU processes and not to duplicate them. Consequently, before the actual research project began, the researcher was required to go through the official ethics process of the SHU. Every research project is required to act in accordance with standards of good practice. SHU has defined these standards in the Declaration of Helsinki by the Research Councils and the European Science Foundation. The key ethical issues of SHU can be found in the form *Guidance for students undertaking research for a dissertation*, which is available on:

<https://www.shu.ac.uk/research/quality/ethics-and-integrity/ethics-approval-procedures>.

The researcher has undergone an ethical approval process, which is mapped on the *Converis* platform. This process is designed to help doctoral researchers to fulfil the desired ethical requirements in a structured way and covers the following sections:

- General information
- Project outline
- Research with human participants
- Research in organisations
- Research with products and artefacts

- Human participants (extended)
- Health and safety risk assessment
- Attachments (with exception of the *Covid-19 Risk Assessment Form* and *Data Management Plan*)
- Adherence to SHU policy and procedures
- Review
- Response to advisory comments
- Post approval amendments.

The ethics application can be retrieved with the following code *ER19526334* and is listed with the title of thesis: “Environmentally sustainability and reshoring in the automotive industry: A multiple cases study”. The application for ethical approval has been confirmed by the SHU on June 26th 2020.

4.7 Objectives of data analysis

The objective of qualitative research is to analyse subjective meaning or the perception of issues, events, situations or practices by collecting non-standardised data (e.g. texts, images) and does not primarily focus on numbers and statistics (Flick, 2014). As qualitative research is concerned with an array of multiple aspects, meanings and interpretations, the analysis of data is a challenge (Rahman, 2017). Dierckx de Casterlé et al. (2012) point out “data analysis is a complex and contested part [...], which has received limited theoretical attention” and thus express its difficulty (p. 360). It requires the researcher to concentrate on both intricate and subtle details while not losing sight of the overall picture. The researcher has also spend a considerable amount of time learning to work with transcripts and field notes, reflecting upon relationships until he can derive some evidence-based pronouncement of what he has learned from his observations (Chenail, 2012).

Notwithstanding of this challenge, the objective of this qualitative inductive research is to use “raw data to derive concepts, themes, or a model through interpretations made from the raw data [...]. The primary purpose of the inductive approach is allowing research findings to emerge from the frequent, dominant, or significant themes inherent in raw data [...]”

(Thomas, 2006, p. 238). This understanding is consistent with Strauss & Corbin's (1998) definition: "The researcher begins with an area of study and allows theory to emerge from the data" (p. 12). According to Thomas (2006), the following purposes underlying the development of inductive approaches apply for this research:

- Condense extensive raw text data into a concise format
- Establish clear links between research objectives and the summary of findings derived from the raw data
- Develop a model or theory about the findings that are evident in the text data

4.7.1 Data analysis and process

Taking into consideration that qualitative data analysis is a complex field, which has received limited attention in research literature, and thus lacks guidelines on how to analyse qualitative interview data, this section aims to explain the researcher's data analysis process. However, in trying to meet this need and remedy this shortcoming, the researcher must be aware, on the one hand, that there is a growing consensus that the sole application of a prescribed method of analysis is not sufficient to provide rich knowledge and fill a research gap (Froggatt, 2001). On the other hand, the researcher has to bear in mind the so-called *Aha-erlebnis*, the moment where one makes meaning beyond the facts (Hunter et al., 2002). This requires the researcher to deeply read, think, imagine, conceive, conceptualise, connect, condense, categorise and create new themes or models (Dierckx de Casterlé et al., 2012).

The following table 17 provides a summary of the procedure for qualitative data analysis, which has been derived from Dierckx de Casterlé et al. (2012) and Sarantakos (1998).

Table 17: *Qualitative data analysis process for this research*

Summary of proposed steps	Implementation of the proposed steps
<i>Preparation of coding process</i>	
1. Transcription of the interviews	<p>The digital audio recordings were used as a basis for the transcription of the interviews</p> <p>Interviews held in German (14 out of 17) were first transcribed into the same language and manually translated after the transcription was completed</p>
2. Thorough (re-) reading of interviews	<p>The transcripts were thoroughly read many times to become familiar and immerse with the data</p> <p>The researcher took some initial notes of correlations and relationships between the cases</p> <p>The transcriptions were returned to the respondents for validation purposes and released for use without further adaptation requests</p>
3. Constant (within-) case comparison process	<p>The researcher moved back and forth between the interviews to facilitate the identification of common themes or concepts</p> <p>New themes or concepts discovered in interviews were constantly checked if they occur in other data as well</p> <p>This has also involved making systematic comparisons across cases to refine concepts or themes</p>
<i>Actual coding process</i>	
4. Coding and drawing up list of concepts and themes	<p>Content analysis of the interviews was performed with the software NVivo 11 to code every interview</p> <p>In line with the research questions, the researcher presented three overarching categories and added a fourth category to consider statements related to the (iv) <i>organizational structure</i>. A fifth category was needed to gather (v) <i>others</i> raised by the respondents</p>
5. Analysis of concepts and themes	<p>After completing the coding, the researcher has set up a matrix to analyse the case studies based on the categories (columns: themes and concepts; rows: case studies; cross-reference to figure 10)</p> <p>Every code was thus analysed through a careful exploration and study of all statements the interviewees have made</p> <p>The researcher's goal was to understand and articulate the specific meanings of the concepts in his own words, which allowed the researcher to provide a clear description of concepts and themes</p>
6. Generalisation of findings	<p>This research does not seek to generalise the insights and findings from the interviews.</p>
7. Verification and review of findings	<p>Lastly, for verification and validation, the researcher compared the interview transcripts with the findings</p>

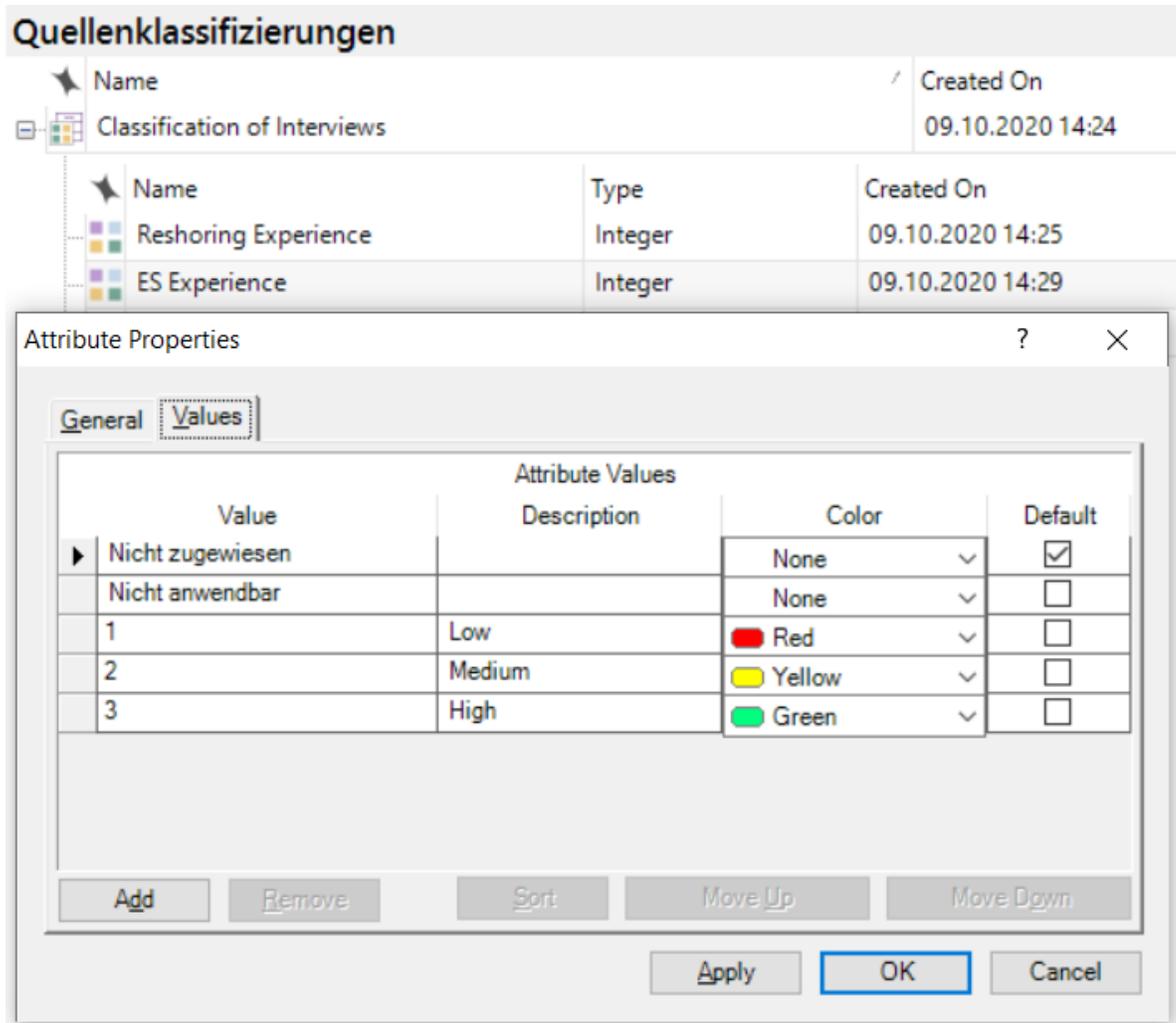
Source: Own illustration; contents according to Dierckx de Casterlé et al. (2012) and Sarantakos (1998)

In accordance with Dierckx de Casterlé et al. (2012) and Sarantakos (1998), the data analysis process shown above is applied in this thesis. This procedure has strongly helped to examine the case studies on a cross-case and within-case basis. According to Patton (2004), this means grouping together responses, views and meanings from different interviewees. This case-oriented analysis approach focuses the understanding of *a particular in the all-together*. “The combination of within-case and cross-case analysis techniques produces contextually grounded findings, retaining the integrity of each interview and taking into account the context of other interviews [...]” (Dierckx de Casterlé et al., 2012, p. 368).

According to table 17, the researcher has started coding the interviews, where “a code represents an interpretation of the researcher of the exact text in the document (Peters & Wester, 2007, p. 641). According to Charmaz (2006) “coding is [...] categorising segments of data with a short name (a code), and using these codes to sort and develop an understanding of what is happening in the social situation being studied” (pp. 42-43).

A prerequisite for the coding process is that all 17 interviews have been imported into NVivo. In addition to coding the data qualitatively, the researcher also considered the data for the level of experience for reshoring and ES (attribute properties). This was one of the questions that was given a scale in the interview guide in order to establish clear comparability and to be able to check to what extent a strong or rather low experience correlates with the findings (cross-reference to section 4.4.4.2). These attributes were therefore supplemented for each interview in which a question with a scale was used (figure 8).

Figure 8: Attribute properties of interviews according to questions with scales



Source: Screenshot with attribute properties from NVivo taken on November 05th 2020

When coding to differentiate between reshoring and ES, the relevant statements in the transcripts were highlighted in NVivo and provided with a clear coding (e.g. reshoring drivers, decision criteria or customer expectations). In order to ensure that the research focuses on the three research questions, three overarching codes were defined that target the questions precisely: (i) *Perception of reshoring and ES*, (ii) *reshoring decision-making process* and (iii) *SCR*. In addition, a fourth overarching code, (iv) *organisational structure*, was defined, as topics related to this code were frequently mentioned in the interviews. A fifth code (iv) *others* was also defined for any further topics raised by the interviewees. All sub-themes respectively sub-codes have been assigned to these five codes. Lastly, all 17 interviews were finally coded one after the other. The following figure 9 illustrates an extract

of codes that have been assigned to the five overarching codes in NVivo. The complete table with all codes is illustrated in Appendix 8 *NVivo Coding Scheme*.

Figure 9: Extract of codes defined in NVivo for every interview

Knoten			
Name	Sources	References	
1. Perception of reshoring and sustainability		15	81
Competitive advantage		14	29
Level on influence of sustainability on reshoring		10	20
Cost vs. sustainability		6	17
Barriers (resh & sust)		6	13
Sustainability driver		7	12
2. Reshoring decision-making (process)		10	38
Decision criteria		14	65
Reshoring driver		12	57
Reshoring process		8	20
Stages and (organisational) level		8	15
Strategy		4	12
Reshoring definition		5	8
3. Supply chain reconfiguration		9	28
Criteria to look at when redesigning the supply chain		9	20
Low extent of supply chain reconfiguration		8	9
Derivation of sustainability when redesigning the supply chain		1	0

Source: Screenshot from codes with NVivo taken on November 05th 2020

In addition, the researcher derived and aggregated themes for the three research questions based on the coding carried out in NVivo. The first category refers to the case description and contextualisation and categories two to four to the research questions. These are summarised in the following table 18:

Table 18: Identified themes according to the qualitative data analysis

Topics & Categories questions	No.	Themes	Section of the thesis
1. Case description and contextualisation	1	Introduction and classification of reshoring cases (types of firms; reshoring governance mode)	5.1.1
	2	Level of experience and familiarity with reshoring and ES	5.1.2

2. Perception of ES when reshoring	3	Perception of reshoring in the automotive suppliers industry	5.2.1
	4	Drivers and barriers of reshoring and ES	5.2.2
	5	Level of influence of ES on reshoring decisions	5.2.3
	6	Relevance of ES for competitive advantages when reshoring	5.2.4
	7	Success factors and lessons learned from reshoring	5.2.5
3. Integration of ES in reshoring decision-making	8	Embedment of reshoring and ES in the organisational structure	5.3.1
	9	Decision criteria for reshoring and ES	5.3.2
	10	Reshoring process and consideration of ES as a decision criterion	5.3.3
	11	Conceptual model for a holistic decision-making process	5.3.4
4. Influence of ES on the reconfiguration of supply chains after reshoring	12	Extent of supply chain reconfiguration after reshoring	5.4.1
	13	Perception of ES when redesigning the supply chain	5.4.2
	14	Implications for reshoring decision-making processes	5.4.3
	15	Product re-design because of supply chain reconfiguration	5.4.4
	16	Implications of the Covid-19 pandemic on supply chains	5.4.5

Source: Own illustration

According to the codes illustrated in figure 9, NVivo was a straight-forward and helpful tool to store the raw data as well as to analyse and categorise every interview. Since this is a software-based method of coding, the researcher was able to react flexibly to changes (e.g. rename existing codes or add new codes). This was particularly important at the beginning, as the researcher was still familiarising himself with the data and therefore worked with the first designations for the codes. These were then further specified or deleted again in the course of data analysis. NVivo has thus helped to structure this section in a logical and structured way so that people from outside can clearly understand the data analysis process. It was also important to have a proper structure for the analysis of the three research questions. Jackson (1995) clearly points out that NVivo helps researchers to immerse themselves in the data and capture the overall picture of the data, as the software enables the visualisation of coding schemes.

4.7.2 Content analysis by applying framework analysis

Data analysis of the interviews is a difficulty as it involves words, patterns or themes instead of numbers that are collected in quantitative research. In order to describe and interpret the views of the participants, various approaches such as framework analysis (FA) (Attride-Stirling, 2001) and thematic analysis (Ritchie & Lewis, 2003) are gaining popularity, which aim at a systematic qualitative analysis. Especially FA is considered “an appropriate, rigorous and systematic method for undertaking qualitative analysis” and allows for case-based analysis (Ward et al., 2013, p. 2423). As this method provides a structured process for managing data and the opportunity to compare emerging concepts and themes, it is applied in the thesis.

More specifically, FA is straightforward, provides transparent results and offers conclusions that can be related back to original data (Johnston et al., 2011). “This results in the constant refinement of themes which may lead to the development of a conceptual framework” (Smith & Firth, 2011, p. 55). For the aim of the thesis, to examine reshoring and ES with regard to a multiple case studies in a sectoral approach (AS sector), the FA fits particularly well with this methodological choice. This is due to the following:

- The “possibility for individual but linked studies to be analysed separately and then combined in the final analysis to identify crossing themes” (Furber & McGowan, 2011, p. 437)
- “It allows flexibility and the easy retrieval of data to show others how decisions were derived” (Swallow et al., 2011, p. 515)
- “It provides a clear track of how data moved from interview to transcripts to themes” (Furber et al., 2009, p. 515)
- FA accommodates homogenous data, i.e. “data covers similar topics or key issues so that it is possible to categorise it” (Gale et al., 2013, p. 2)

As it is not aligned with a specific epistemological or philosophical assumption, it can be used as a flexible tool for qualitative approaches that aim to generate themes. The most important feature is the matrix output in terms of rows (cases) and columns (codes) and the

cells to incorporate the content. This allows analysing the interviews by case and by code across and within each other. According to Gale et al. (2013, p. 5), the matrix structure is also “straightforward and facilitates recognition of patterns in the data [...] including through drawing attention to contradictory data, deviant cases or empty cells”. For the purpose to analyse interview transcripts where it is important to compare data by themes across many reshoring cases while also situating each perspective in context of ES by retaining the connection to other aspects, FA is considered a suitable approach (Gale et al., 2013).

Although there are a number of important advantages associated with FA, the disadvantages of this method of analysis must also be viewed critically. Gale et al. (2013) specifically point out that FA is particularly appealing to those who are quantitatively trained and further criticise the *spreadsheet* look, which increases the temptation to quantify qualitative data (e.g. five out of 13 interviewees argue for X). They furthermore emphasise that FA is time consuming and resource-intensive. In multidisciplinary teams, it requires a high level of competence to code, index and map data and to think reflexively. However, since only one researcher carries out this research, he is able to manage the coding and analysis process. Nevertheless, the researcher should be aware of the time required and the high demands associated with FA.

Figure 10 below provides an excerpt of the FA and explains how the researcher has investigated the different cases across and within each other. The coding columns extend across five thematic blocks, which have been defined during the coding process in NVivo: (i) *Perception of reshoring and ES*, (ii) *Reshoring decision-making*, (iii) *SCR*, (iv) *Organisational structure* and (v) *Others*. This is reflected in 36 columns, which cannot be illustrated here in full due to the page format and the amount of data (figure 10). The cases with the respective participants are shown row by row (e.g. I1, I2, I3). After coding the interviews, the researcher decided to investigate the cases again to make another within and cross case analysis. The findings are presented in green font. At the end of every column, the researcher made a summary of the most important findings from all cases (blue font). It has also facilitated the in-depth analysis of the cases and their comparison with each other.

Figure 10: Structure of the framework analysis for the case analysis (extract)

	A: 1. Perception of reshoring and sustainability	B: Barriers (resh & sust)	C: Competitive advantage
Q1	I'm currently doing... an extremely large project that focuses on our production strategy. And that's exactly the topic, we want to produce closer to the customer again . We are focusing on Europe, because the Automotive Division currently has its main business in Europe. We will of course also build it in America or in America as well as in Asia. But nevertheless our main business is Europe. That is why the main focus is Europe. And	Because, as a matter of fact, the transport costs, if you take that into account, are a fraction of what the final product will cost . And then, if I put these costs in relation to high-wage countries such as Germany, which on average have, one could say,	I: Personally, I rather see the advantage in five years. I have to say this quite openly and honestly. But I also always see the new tenders that come in. And they are, it has to be said, extremely price-driven. As long as I'm somewhere within a radius of
Q2	When did the concept of reshoring in general or the idea of reshoring in general come up? Did it come up in the context of the sustainability debate that people started to think about it? Or did it come about a long time ago, or many, many years before, because it was seen as having other advantages besides sustainability? #00:06:53-3#		Well, honestly, I think a few years ago it was more of a marketing and lip service, but now I can answer that with conviction: It is a top topic, a CEO topic. And not only from a marketing or greenwashing point of view, it has become a real competitive
Q3	I: Yes, it has turned completely, I would say. We have been producing a sustainability report for several years now, and we have been paying more attention to the whole issue. It is a bit different within the divisions, but it is / We also have divisions such as our Windows Solutions Division, for example, which have really turned it into a business model. Our window profiles have a recycled core. It took a while for this to be accepted on the market		But when it comes down to it, we still cart polymer around the world to get a good price. And thus to be able to offer competitively.
	CO2 not in evaluation matrix, but it is important		R: Yes, exactly, that would now be the next question
Findings	Energy management is high on agenda New management is committed, CEO topic, competitive factor ES important, but still not a decisive factor Global footprint is a matter of costs	- Transportation costs vs. labour cost advantages	- Competitive advantage in 5 years; tenders are still price-driven - It has become a real competitive factor in the long-term - Beautiful topic, but priority #1 by far is still the
Overall Findings	- Reshoring is rather perceived as an optimization of a company's global footprint and is being seen as an important topic - Sustainability in general and ES in particular are on the strategic agenda of all companies - It is also perceived as an on-going topic for future discussions - Still, economic aspects are dominating the debate among reshoring and ES - Offering competitive prices with sustainability is a trade-off/conflict - ES is important, however, not considered as a primary driver for decision-making - Aspect of optimizing the supply chain is rather being discussed than reshoring sites	- Barrier to go into countries with uncertain political or regulatory conditions - Availability of raw materials - Presence of competitors - Poor price ranges in Europe compared to Asia - Especially for mid-sized companies it is hard to get qualified workers - Difficult to produce "standardized" components such as screws for mid-sized companies in Europe	- Environmental impact of "supply chain performance" are high up on the agenda - Especially mid-sized to small suppliers are in a poor position concerning the supply chain because e.g. CO2-targets are just passed down the chain - Choice of locations was appreciated by customers and thus is a competitive advantage, too - Sustainability is a competitive advantage,

4.7.3 Propositions as a result of the research findings

This thesis offers various theoretical contributions and provides empirically grounded findings on the phenomenon of reshoring and ES in the AS sector. According to the themes shown in table 18, the corresponding findings will be explained in the following Chapter 5. Every theme is accompanied and supported by a conclusion and a proposition to capture the *how* (i.e. how are the findings related to each other) (Whetten, 1989).

In extant literature, there is disagreement whether the relation of themes or constructs to each other is expressed as a *proposition* or as a *hypothesis*. According to Cooper & Schindler (2014), a proposition “may be used to assess the truth or falsity of relationships among observable phenomena” and is thus used by researchers to state the expected results of their observations (p. 71). Advancing a proposition for testing is called hypothesis – “a tentative descriptive statement that describes the relationship between two or more variables” (p. 658). Concisely, “while propositions state relations among constructs, and on the more concrete level, hypothesis (derived from the propositions) specify the relations among variables”

(Bacharach, 1989, p. 500). Propositions are thus rather qualitative in nature and at a higher conceptual level than hypothesis. They are written in declarative form and indicate a cause-effect relationship. Moreover, the propositions are not tested statistically but approached through qualitative research methodology. In contrast, hypothesis require data allowing the researcher to test variables among each other. The researcher thus decided to use the term *proposition* for this qualitative study, however, the *propositions* can be taken forward as hypotheses in future studies.

5 DATA ANALYSIS AND FINDINGS

This chapter aims to present the findings from the semi-structured interviews by addressing the three research questions. The first part of this section aims to describe and classify the underlying case studies and to differentiate the firms based on company size, reshoring directions and governance modes. The most important section in this chapter relates to responding to the three research questions in sections 5.2, 5.3 and 5.4.

5.1 Case description and contextualisation

Before presenting the findings, the reshoring cases derived from the 17 interviews are described and explained in section 5.1.1. The researcher goes into detail about the type of firms involved and describes the reshoring cases. Since the levels of experience for reshoring and ES of every interviewee play a major role in the evaluation of the cases, the researcher also discusses the findings from these data in section 5.1.2. The themes covered in this section are presented in table 19. This chapter is concluded with a critical discussion.

Table 19: Identified themes related to the description of the cases

Topics & research questions	No.	Themes	Sections
1. Case description and contextualisation	1	Introduction and classification of reshoring cases (types of firms; reshoring governance mode)	5.1.1
	2	Level of experience and familiarity with reshoring and ES	5.1.2

Source: Own illustration

5.1.1 Introduction and classification of reshoring cases

This investigation takes into account nine reshoring cases with AS. Table 20 below provides the descriptive data on type of firms (business focus), size (employees, revenue, sites and locations), reshoring governance mode as well as the *from...to...* direction of the reshoring project.

As far as possible, at least two persons were interviewed for each reshoring case in order to be able to compare, verify and validate the cases across or within each other. Five reshoring cases relate to medium-sized firms with a revenue between € 0.2 and 1 billion and five relate

to larger firms with an annual revenue between € 3.3 and 12 billion. Furthermore, with the exception of case A, all remaining ones are defined as Tier-1 suppliers who are positioned directly at the OEM within the supply chain. Case A is defined as Tier 2-3 supplier. According to Kito et al. (2014), Tier-1 suppliers are those firms that directly supply the OEM, while Tier-2/-3 suppliers do not directly supply the OEM but do supply any of the Tier-1/-2 suppliers. According to Wilhelm et al. (2016), Tier-1 suppliers are of central importance to ensure sustainability within the supply chain. This is because a high proportion of value creation takes place on Tier-1 level, “giving upstream processes a significant influence on a company’s sustainability metrics” (Lechler et al., 2020, p. 426), especially in the automotive industry. Furthermore, all AS in this research are supplying OEMs in the automotive industry with parts and components. Even if every AS offers its OEM special after-sales services (e.g. repair, maintenance), the majority of the revenue is generated in the initial business, i.e. with parts and components. On top of that, it is important to point out that all firms offer a wide range of products regardless of the vehicle technology (e.g. electric vehicles and internal combustion engine) such as screws and fastening products, windows and frames, bearings, pistons and camshafts.

All firms are present throughout Europe with manufacturing sites, if not worldwide. Generally, the larger the firm, the more manufacturing sites it has. This was an important requirement for the data collection to explore a firm’s voluntary decision to relocate manufacturing sites. In conclusion, as discussed in table 10 (section 4.3), the sample has considered the desired firms, which are large, internationally active firms with a global production network. Furthermore, all firms are exposed to reshoring- and ES-related activities and challenges concerning their business activities, source raw materials such as composites, aluminium or steel, which are potentially harmful for the environment and are affected by stakeholder pressure in terms of their public awareness. This has also been an important factor in examining the effects on the reconfiguration of supply chains.

The researcher also asked for the degree of product complexity on a scale from 1-3 (1 means *less complex, standardised and easy to replace*; 2 means *medium complexity with minor individualisations* and 3 means *highly customised with significant research and development efforts*) so that he could later investigate whether this is a decision criterion for reshoring.

The researcher also wanted to understand what phase the individual reshoring projects are in, i.e. whether they are theoretically conceived, in implementation or completed. The status of the reshoring projects in each firm differs greatly, with the majority still either being worked out theoretically or successfully completed. Furthermore, all cases did not close the offshore location, but decided to reshore parts of their value creation activities.

As far as the offshore location decision of the cases is concerned, all firms have previously relocated their production activities to existing, owned sites in countries abroad (e.g. Asia, US). Only case B has previously outsourced its production activities to another supplier within Germany and thus did not engage in offshoring (Gray et al., 2013). Regarding the choice of the governance mode of the reshoring decision (section 2.1.2), the data shows that with the exception of cases B and G, all other seven cases adopted *in-house reshoring* and are in line with the three premises of the reshoring definition for this thesis (cross-reference to section 2.1.3). “In-house reshoring refers to relocating manufacturing activities being performed in wholly owned offshore facilities back to wholly owned domestic-based facilities” (Robinson & Hsieh, 2016, p. 91; cross-reference to figure 2). This may involve all or part of the previously offshored activities (Foerstl et al., 2016). It is also important to emphasize that this is different from production activities that were previously outsourced to another supplier. This would be referred to as reshoring for insourcing (Robinson & Hsieh, 2016).

B1 argued that they are seeking to bring their previously outsourced value creation back into their own firm from another supplier within Germany. This decision can neither be assigned to the governance modes (section 2.1.2) nor to the reshoring definition for this thesis (cross-reference to section 2.1.3). Rather, this is referred to as local insourcing (Foerstl et al., 2016). However, case B is useful to include with a view to the perception of ES in location decisions. In addition, Case G moves from Italy to the Czech Republic, which is also not defined as reshoring and is more likely to be associated as “a generic change of location with respect to a previous offshore country” (Albertoni et al., 2017, p. 417).

Very few of the respondents were able to comment on the exact dates on which a value-adding activity or production site was offshored abroad, however, it could be confirmed when

it was reshored again. Furthermore, if a reshoring case was not only theoretically conceived but also completed in practice, each participant could also talk about the exact countries in which the site is currently located and where it should be reshored. Only E1 and E2 were not able to make a statement about potentially affected sites. The discussion here was therefore purely at the conceptual level, which nevertheless led to substantial findings with regard to the perception of reshoring and ES, decision-making, decision-criteria and SCR. It is notable that some reshoring projects were not just relocated within Europe, but also to Germany (e.g. cases D and I) – a country where even higher wage rates are generally the norm compared to emerging or developing countries. Table 20 demonstrates the nine reshoring cases:

Table 20: Summary of reshoring cases: Theme 1 'Introduction and classification of reshoring cases'

Case	Identifier	Business	Sites	Revenue (in bn €)	Employees	Tier-Level	Product Complexity	Stage
A	1	Rolling element bearings	103	8	34,000	2-3	-	Completed
	2						3	
	3						N/A	
B	1	Lightning and electronic components	100	4.7	40,000	1-2	2	Theoretically considered
C	1	Seating systems, body structure, transmissions	10-15	0.3	2,600	1-2	2	Completed
D	1	Screws, connections and processing systems	3	0.2	1,100	1	2-3	Theoretically considered
2								
E	1	Packaging systems	8	0.3	2,200	1	N/A	Theoretically considered
2								
F	1	Engineering services	10	0.4	2,300	1	N/A	Theoretically considered
2								
G	1	Fastening products	49	0.9	5,200	1	1-2	Being implemented
2								
H	1	Pistons, camshafts, cooling, electronics	160	12	77,000	1	1-2	Completed
I	1	Advanced polymer and composite products	170	3.3	20,000	1	2-1	Being implemented
	2							
	3							

Case	Identifier	Organised from...	From...	To...	What	Offshored (Year)	Reshored (Year)
A	1	Sweden	Korea	Spain	Bearings	-	2015
	2						
	3						
B	1	Bremen	Thuringia	Bremen	Sensors	2016	2024
C	1	Austria	Slovakia	Austria	Interior components	2016	2018
D	1	Germany	USA	Germany	Screws	-	-
	2						
E	1	-	-	-	Packaging systems	-	-
	2						
F	1	Germany	Asia	Hungary	-	-	-
	2						
G	1	Germany	Italy	Czech Republic	Screws	2010	2020
	2						
H	1	Germany	-	-	-	-	-
I	1	Germany	Czech Republic, Indonesia, Turkey	Germany	Composite materials	-	2020

Case	Identifier	Entry & Governance Modes (cross-reference to section 2.1.2)				Reshoring Characteristics (cross-reference to section 2.1.3)			
		In-house reshoring	Reshoring for outsourcing	Reshoring for insourcing	Outsourced reshoring	(i) a decision, regardless of where the headquarter is located	(ii) it refers to all or part of offshored activities	(iii) it involves insourcing or outsourcing	(iv) seek to serve the main markets for the firm's outputs better
A	1	X				X	X		X
	2								
	3								
B	1			X			X		
C	1	X				X	X		X
D	1	X				X	X		X
	2								
E	1	X				-	-		-
	2								
F	1	X				X	X		X
	2								
G	1	Case G is more likely to be associated as "a generic change of location with respect to a previous offshore country" (Albertoni, Elia, Massini, & Piscitello, 2017, p. 417)				X			
	2								
H	1	X				X	X		X
I	1	X				X	X		X
	2								
	3								

Source: Own illustration

5.1.2 Level of experience and familiarity with reshoring and ES

The interviewees were asked to provide an indication of the extent to which they are familiar with reshoring and ES (table 21). The scale used for this took the following values into account: 1 means *rudimentary knowledge*, 2 means *good theoretical, but less practical experience* and 3 means *profound theoretical and practical knowledge*. The answer from one interviewee also led to the fact that the value ‘0’ is also considered, which means *no experience yet*, however, this was only applicable for interviewee I2 who is responsible for sustainability-related aspects and thus does not have any reshoring experience.

Table 21: Findings: Theme 2 ‘Level of experience and familiarity with reshoring and ES’ (Evidence 1)

Case & identifier	Role of interviewee	Level of experience	
		Reshoring	ES
A	1 EHS Manager (Environment, Health and Safety)	2	2-3
	2 Manager Product Stewardship Energy & Climate	2	3
	3 Manager Product Stewardship & Sustainability	1	3
B	1 Senior Project Manager	1	1
C	1 Director Operational Restructuring	3	1
D	1 CEO Assistant, formerly “Head of Production”	1	2
	2 Director Sales Account Management	2	2
E	1 CEO	2	1
	2 Head of Corporate Development	2	1
F	1 CEO	2	2
	2 Group Director Operations	1	2
G	1 Sustainability Manager	2	2
	2 Production Network & Digitization	2	3
H	1 Head of PCU Technology-Light Vehicles	2	2
I	1 Director Operational Excellence Automotive	2	2
	2 Senior Project Manager Sustainability	0	3
	3 Manager Connected Supply Chain	2	2
Average		1.7	2.0

Source: Own illustration

Even if some roles or functions may sound different by name, they still have a responsibility for reshoring or ES. This has been ensured by the previously established selection criteria for

participants in this research (section 4.4.3). This is merely for clarification purposes to avoid misinterpretation of the job title in relation to experience in the field concerned. This applies to respondents who, for example, in their role as CEO, are responsible for both issues in the organisation (e.g. E1, F1). Other than that, D2 is responsible for the locations in Germany and Eastern Europe and partially also for the business in North America and, consequently, does not only take care of *Sales Account Management*. On average, it can be concluded that there is a higher level of experience for ES-related topics (2.0) than for reshoring (1.7).

A further distinction must also be made between the following two situations. First, in smaller firms (e.g. case E and F), it is often the case that either the CEO or COO is responsible for both topics or that areas such as sales (e.g. case D) are so closely linked to the management that they are correspondingly meaningful. The second situation refers to larger firms: it emerged that the experience with reshoring or ES is rather concentrated in certain departments and not everyone in the organisation is able to contribute their experience (e.g. case H and I). More precisely, this can be seen in I2 who is responsible for sustainability, but has no experience in reshoring, for which his counterpart I1 is responsible. Nevertheless, with the available experience of the participants it was possible to ensure that sufficient experience is available for each area, i.e. reshoring or ES.

5.1.3 Discussion

Section 5.1 has had the objective of presenting, describing and contextualising the reshoring cases and critically examining the respective experiences in the areas of reshoring and ES. The nine cases are sufficient for answering the three research questions in the following chapters. This is because the Tier-1/-2 suppliers in this study are responsible for a high proportion of value creation activities, which are concerned with sustainability-related challenges within the entire supply chain (Wilhelm et al., 2016; Lechler et al., 2020). Furthermore, the AS in this study manufacture a wide range of products for the automotive industry and therefore represent a good sample. However, it must be viewed critically that this is also only a sample of firms in the AS sector. It can be noted that although sufficient cases were used for a cross- and within-case analysis, at least two participants were not identified and interviewed in cases B, C and H. This limitation must be considered in the

course of data analysis. As discussed in section 4.4.2, some experts might probably argue that this sample size is relatively small, however, it has been designed according to Meredith (1998), Eisenhardt (1989) and Pitney & Parker (2009) who suggest choosing a sample size between two to eight Meredith (1998), two to ten Eisenhardt (1989) or seven to 36 Pitney & Parker (2009). Furthermore, Patton (2002, p. 144) stresses, “there are no rules for qualitative inquiry”. The size does rather depend on a variety of factors, such as “what you want to know” or “what will have credibility”. The participants involved in this thesis were able to ensure that sufficient in-depth expertise was available for both reshoring and ES in each case.

5.2 RQ1: Perception of ES as a driver for reshoring

This section addresses the findings to research question one to investigate the perception of ES as a driver for reshoring initiatives of firms in the AS sector. These findings are based on 17 interviews and nine reshoring cases, which are discussed with reference to the available literature and theoretical frameworks. By coding the interviews, five themes could be derived for the investigation of the first research question. The themes covered in this section are presented in table 22. Every theme in this section is being summarised with a conclusion and a proposition.

Table 22: Identified themes related to RQ1

Topics & research questions	No.	Themes	Sections
2. Perception of ES when reshoring	3	Perception of reshoring in the automotive suppliers industry	5.2.1
	4	Drivers and barriers of reshoring and ES	5.2.2
	5	Level of influence of ES on reshoring decisions	5.2.3
	6	Relevance of ES for competitive advantages when reshoring	5.2.4
	7	Success factors and lessons learned from reshoring	5.2.5

Source: Own illustration

5.2.1 Perception of reshoring in the automotive suppliers industry

The researcher starts with a brief classification of how reshoring is perceived by the participants and what parallels or dissimilarities exist with the definitions in the literature. In the course of the literature review, it was found that reshoring is defined as bringing manufacturing activities back into its home country of the parent company on a voluntary basis or repatriating business operations back to geographically closer locations (Ellram et al., 2013). However, Wiesmann et al. (2017, p. 22) stressed, “there is no congruent definition available yet”. Furthermore, it was found that research lacks a definition of reshoring for the automotive (suppliers) industry in general. This is the reason why this research explores how it is perceived by this sector and how a definition could be derived from the findings. Throughout the analysis of the cases, case A argues that reshoring is rather concerned with a *footprint activity*, which is thus looking at the overall global manufacturing footprint of the firm. It became clear that case A perceives this footprint activity as something, which is

happening on a continuous basis and not something, that happens only when a reshoring project is being managed. Nevertheless, regardless of the firm’s location, Case A decided to relocate from Korea to Spain in order to be closer to the OEMs in Europe and thus be able to supply them with products. A2, E1 and I1 added that applying the local-for-local principle in the AS sector is crucial to be close to customers and markets and thus emphasises that this is also beneficial from an environmental perspective.

Table 23: Findings to RQ1: Theme 3 ‘Perception of reshoring in the automotive suppliers industry’ (Evidence 1)

Identifier	Quote
A1	I think it is definitely quite a large and significant on-going process. I would not necessarily call it...I don’t think we call it reshoring, but we have a ‘footprint activity’, which is looking at the overall manufacturing footprint [...] basically trying to apply principle of producing as close to the customer as we can. I think it is not a question of reshoring, it’s balancing production to match better with the customer footprint
A2	I think in the current work we see a lot of, what we call, local for local which means we want to have manufacturing as close as possible to the market, close to the customers. That is also an interesting thing from an environmental perspective. I think there have been cases like that going on over many years, basically since I started and without using the term reshoring. But it’s more to optimise the manufacturing footprint [...] which is always on-going
E1	But of course I still believe that it is always relevant for companies to be located somewhere close to the countries where they produce and where they sell their products, because no matter what we realize, time to market is a huge issue in this context as well. This also has sustainability components with reduced stock levels
I1	I’m currently doing... an extremely large project that focuses on our production strategy. And that’s exactly the topic, we want to produce closer to the customer again. We are focusing on Europe, because the Automotive Division currently has its main business in Europe

Source: Own illustration

By linking the statements from cases A, E and I back to the literature, this perception is close to the definition for *back-reshoring* from Fratocchi et al. (2016). This is because these cases seek a local-for-local approach and at the same time address ES aspects. VDA’s (2020) annual report of the automotive industry also reports an even stronger tendency towards local production. Addressing ES as such is in line with Heikkilä et al. (2018) who found that sustainability and ethicality in the supply chain are reshoring drivers, arguing that “repeated environmental and/or human rights violation” is a need to rethink the current location (p. 382). Sirilertsuwan et al. (2008) conducted research on the proximity between the manufacturing and the consumption point and found that the business dimension was more emphasised than environmental and/or social sustainability. What is not mentioned in these

two definitions from Heikkilä et al. (2018) and Sirilertsuwan et al. (2008), however, is the continuous process pursued in case A. H1 perceives reshoring as a conscious strategic decision by entering a desired market voluntarily in order to produce for local markets and customers (table 24).

Table 24: Findings to RQ1: Theme 3 'Perception of reshoring in the automotive suppliers industry' (Evidence 2)

Identifier	Quote
H1	<p>Researcher: "So, actually not real strategy reshoring, we shift back, but it is a conscious strategic decision: "We enter a market and see that we can really produce it locally". Then it would be, so to speak/ From the perspective of the South American market it would be a reshoring, so to speak, but in your strategy it would be a "local to local"? Interviewee: "Right. So if they do, it is more in the spirit of forward-looking growth that we say: "Okay, we have now won new contracts there and would like to offer them in a country where we do not yet have a site"</p>

Source: Own illustration

Regarding the second statement of H1, however, this concept is more applicable to an offshoring strategy and is rather not shifted back, but identifies existing markets as new regions for setting up new manufacturing sites. These thoughts are in line with the reshoring definition from Albertoni et al. (2017). This definition states, "reshoring indicates a generic change of location with respect to a previous offshore country" (p. 417). Accordingly, this includes the perspectives of both offshoring and reshoring. In terms of H1, from the European market perspective, it is considered as offshoring, from the foreign market perspective it would be considered reshoring. It emerged from the interview that reshoring decisions are not only made from Germany, but also from South America, for example. If the person responsible from South America wants to supply the OEMs in his market, the location decision is referred to as reshoring from this perspective.

The nine reshoring cases, however, show that the idea of reshoring is represented in the AS sector and that there are current projects to voluntarily reshore from a distant country back to geographically closer regions. Nevertheless, the debate is very much dominated by the idea of being closer to customers and markets, which is also a strict demand and requirement of OEMs. This is argued in case A below (table 25). MGI (2020) also found that two-thirds of OEMs and suppliers plan to nearshore suppliers and one-third plan to build regional supplier

networks for better coordination. This strategy goes along with expanding the existing supplier base to enhance the resilience of the supply chain. “As many companies move to consolidate their tier-one suppliers, their networks can also expand exponentially beyond tier one”.

In addition, it became clear that this does not only have implications for a firm’s proximity to its customers, but also to act faster to sudden changes in the supply chain or to bring products faster to the market. Especially the “inability to synchronize with downstream demand increases production costs through supply-demand mismatches, delays in addressing quality issues [...] and customer defections” (Schonberger & Brown, 2017, p. 83).

Table 25: Findings to RQ1: Theme 3 ‘Perception of reshoring in the automotive suppliers industry’ (Evidence: 3)

Identifier	Quote
A3	So, and if we supply a car manufacturer, they usually want a supplier close to them. I think certainly we have moved the production for a hub unit from say Korea to Spain or products like this

Source: Own illustration

Furthermore, the different cases in this study call reshoring differently. This can be a *footprint activity* or a *local-to-local* approach, which all contain the same idea of being closer to markets and customers. Finally, it should be emphasised that reshoring is seen by AS as an important long-term strategic activity, as it is associated with topics such as customer proximity, time-to-market and a fundamental idea of optimising the global orientation of a firm. For illustration, the ACEA reports 298 automobile factories, which are located in the European continent (Appendix 11). The automotive industry thus provides jobs to 14.6 million Europeans, which represents 6.7% of the total employment in the EU. On top of that, employment in the automotive industry increased by 9.6% from 2014 to 2018 in both direct and indirect sectors (Appendix 14). The increase in employment shows how strongly the automotive industry has been growing and highlights the importance for AS in Europe to be local, close to those factories of an OEM and thus able to react quickly to sudden demand changes. The importance of customer proximity for the competitiveness of a firm has also been emphasised by Womack & Jones (2003) and Schonberger (1986). Suri (1998) has demonstrated that short customer lead times and the ability to respond to customers (e.g.

product change requests in terms of technical features or design) are important for the competitiveness.

Conclusion

With the exception of case B and G, the investigation has shown that all other suppliers have completed reshoring or are still exposed to a location decision. It became clear that every firm has its own term to describe reshoring, however, the strategic importance to enter or return to a desired market voluntarily became apparent throughout every case. Customer proximity and access, time-to-market and the ability to match production in line with customers' expectations were the main drivers identified related to reshoring in this industry. New sales opportunities or new customers in a particular region to which a firm relocates its value creation activities or establishes an entirely new manufacturing site may drive this. This can also be attributed to the long time span between the offshoring and the reshoring decision and that the offshoring location may no longer be suitable. Consequently, this could also be considered as *reverse offshoring* and shows that this process is not irrevocable (Kinkel & Maloca, 2009; Ellram et al., 2013; McIvor, 2013). It emerges that reshoring in the AS sector tends to focus on customer proximity and efficiency (e.g. time-to-market, delivery time) and that the supplier's home country does not play a primary role.

Proposition 1: *When deciding on a manufacturing location, automotive suppliers are oriented towards the OEM's location in order to increase geographical proximity and efficiency (e.g. time-to-market, delivery time) regardless of the supplier's home country.*

5.2.2 Drivers and barriers of reshoring and ES for automotive suppliers

This section addresses *Theme 4: Drivers and barriers of reshoring and ES* as part of the first research question. The aim is to understand the underlying drivers and barriers especially with regard to the ES perspective. This is the first attempt to reveal the extent to which ES is a driving force for reshoring, as this relationship has received little attention so far (Fratocchi & Di Stefano, 2019). According to Barbieri et al. (2018), there is a “large number of motivations found in the extant literature”, which require a framework to classify and analyse the drivers accordingly (p. 90). Literature has shown that the majority established

homogeneous categories such as cost, quality and risks (Ellram, 2013), proposed a classification based upon TCE or OBB (Bals et al., 2016; Foerstl, et al. 2016) or distinguished firm-, country- and supply chain-specific reshoring drivers (Wiesmann, Snoei, Hilletoft, & Eriksson, 2017). Investigating the drivers and barriers for reshoring is also a response to the research gap raised by Wiesmann et al. (2017) “future research must elucidate the drivers and barriers of reshoring” (p. 38).

It is of particular importance to explore the importance of ES in reshoring decisions and to derive a theoretical model that classifies these drivers and barriers. The literature review has shown that the drivers and barriers in the AS sector are not yet sufficiently illuminated. Consequently, it seems useful to propose a classification according to the findings from the multiple case study analysis. More specifically, the researcher suggests a categorisation, which consists of six building blocks for the drivers and – with the exception of *customer proximity* – of five building blocks for the barriers of reshoring and ES: (i) *strategic importance*, (ii) *cost-related factors*, (iii) *operations issues*, (iv) *customer proximity*, (v) *regulations & environment* and (vi) *sustainability*. This distinction is extremely helpful, as it already differentiates the drivers and barriers well from one another and gives an initial indication of which themes will arise about them in the further course of the thesis.

For clarification, the block (iii) *operations issues*, among others, points out the driver *efficiency reasons* and states a few heterogeneous drivers such as better knowledge transfer, synergy effects, flexibility and time-to-market. The researcher has decided to group these drivers in the same category. For instance, better knowledge transfer between highly qualified employees and between the AS and the OEM can increase efficiency in product development or a firm’s operations. At the same time, the AS can create synergies with other suppliers, for example, when it comes to the joint purchase of raw materials. Among other things, this can also result in parts and components being delivered to the OEM more quickly, thus achieving a higher time-to-market.

With reference to the literature review in section 3.1.4.1, the following two tables 26 and 27 illustrate the categories for the drivers and barriers of reshoring and ES. The researcher

identified 31 drivers and 14 barriers, of which 12 drivers and nine barriers had not been identified in previous studies. Three drivers and three barriers appeared to be genuinely new, as they did not appear in table 7 (cross-reference to section 3.1.4.1):

Drivers (category)

1. Being in environmentally friendly regions to be attractive as an employer while respecting sustainability (**strategic importance**)
2. Site closure (e.g. customer (OEM) decides that a vehicle is longer build there) (**strategic importance**)
3. Access to energy systems and reliable energy supply (**sustainability**)

Barriers (category)

1. Supply chain aspects (e.g. too risky to redesign the supply chain) (**operations issues**)
2. Trade-off between costs and environmental advantages (**sustainability**)
3. Customers will not pay for a higher level of sustainability (**sustainability**)

The aspect that a factory is being closed because no more vehicles are being built there can be seen as an automotive-specific driver. If a car is no longer to be sold in a market, it may well be that the closure of the factory goes hand in hand with this. Although Pavlínek (2020) has defined this as “one of the most unlikely scenarios”, it nevertheless shows that it occurs as a driver in the automotive industry (p. 513).

Table 26: Findings to RQ1: Theme 4 ‘Drivers and barriers of reshoring and ES per case’ (Evidence 1)

Drivers	A	B	C	D	E	F	G	H	I	Literature Review
Strategic importance										
Strategic reasons (move to high-wage country and link that with a growth strategy)		X							X	X
Better access to qualified personnel and well-trained employees			X	X	X					X
Site closure (e.g. customer (OEM) decides that a vehicle is longer build there)								X		

Cost-related factors										
Economic factors (e.g. costs, profitability, cash flow)	X	X	X	X	X	X	X	X	X	X
Better cost positions (e.g. simply go by road instead via plane or ship)		X				X		X		X
Reduce import duties and taxes	X						X			X
Labour cost advantages in Asia have flattened						X				X
Wage-cost-optimised environments/regions			X		X					X
Achieve higher level of automation					X					X
Better quality	X					X	X			X
Operations issues										
On-time delivers and being able to supply on time	X							X		X
Avoid shipping large volumes of products and raw materials around		X	X					X		X
Improve logistics movements, modes of transportation (e.g. choice of carrier) and costs	X	X						X		
Location stability (e.g. concerning production processes)			X							
Avoid that sites become too large (stable and manageable processes)			X							
Efficiency reasons (e.g. better knowledge transfer, synergy effects, flexibility, time-to-market)		X		X	X		X		X	X
Customer proximity										
Being close to customers, markets and other suppliers (e.g. toolmakers)	X		X		X	X	X		X	
Better customer support	X						X		X	
Building up production capacity to support local automotive industry	X									
Fulfil customer's expectation who demand local production	X			X						X
Time criticality		X			X					X
Regulations & environment										
Environmental and legal conditions			X							X
Safe and stable environments			X							
Sustainability (across three dimensions)										
CO ₂ -impact/-emissions	X				X	X	X			X
CO ₂ -taxes/-pricing					X					X
Access to energy systems and reliable energy supply (grid factor)	X		X							
"Made-in" effect (e.g. respect human rights in supply chain)							X			
Being in environmentally friendly regions to be attractive as an employer while respecting sustainability			X							
Job creation and employment								X		
Government programs and subsidies					X					X
Sustainability (in general)	X								X	X

Source: Own illustration

Table 27: Findings to RQ1: Theme 4 'Drivers and barriers of reshoring and ES per case' (Evidence 2)

Barriers	A	B	C	D	E	F	G	H	I	Literature Review
Strategic importance										
No access to qualified personnel where competitors are already present (especially for smaller firms, which are less attractive)			X		X	X				X
No teams or resources available to deal specifically with ES or reshoring (e.g. also due to company size)					X					
Cost-related factors										
Better prices for raw materials when located in Asia						X	X			
No cost advantage (e.g. for producing a screw under German labour conditions)				X	X	X	X	X		
Currency risks								X		X
No labour cost advantages									X	
Operations issues										
Supply chain aspects (e.g. too risky to redesign the supply chain)						X				
Rust on steel (oxidation) after long transport routes e.g. by ship				X						
Scarce availability of raw material suppliers that sell at affordable prices				X						X
Regulations & environment										
Overall conditions in e.g. Eastern Europe too uncertain (e.g. politics)			X			X		X		X
Strict environmental standards in, for example, Eastern Europe were introduced			X							X
Sustainability (across three dimensions)										
Trade-off between costs and environmental advantages				X		X		X		
Negative effects for local communities and employment rates										
Customers will not pay for a higher level of sustainability				X	X					

Source: Own illustration

In the first category (i) *strategic importance*, it became clear that the drivers there were not mentioned very often compared to the other ones. Nevertheless, the researcher found that access to qualified and skilled employees staff is extremely important for AS. This aspect is also strongly related to the barrier of repatriating a manufacturing site and is due to the following circumstance: if strong competitors have already established themselves in the region, it is more difficult for new firms to find skilled and available employees. This study

showed that especially comparatively small firms (0.2-0.4 billion Euro revenue) have difficulties in finding qualified employees. Thus, already established competitors in a region are a high entry barrier for AS as argued by F2 (table 28). These findings can be related to the RBV theory and explain that firms in the AS sector deal with the search for competitive advantages when making location decisions (Lampón & González-Benito, 2019). Furthermore, the RBV is supplemented to the effect that the search for competitive advantages in a desired location is especially hindered by the availability of qualified employees.

Table 28: Findings to RQ1: Theme 4 'Drivers and barriers of reshoring and ES per case' (Evidence 3)

Identifier	Quote
C1	But then he noticed that it was difficult to achieve, that basically wages had risen massively, that you didn't get the right qualifications
D1	This also means that the production staff that we had and those that I had hired are all based on experience. That's why the level of knowledge is often very difficult to classify, or you just check it in your daily work. So and then it is always connected with a high risk, what you actually get now
F1	[...] before we even make a decision for something like that, we have to make sure that the plant we would relocate to is capable of producing this product, right?
F2	[...] and then...skill availability, employee skill availability, I get the people I need, okay, is a huge location criterion. It's often before costs, before space, before something like that, okay, do I get the people I need, okay, and do I still get the people I need ten years from now? So if today, as a small middle-sized company, I sit down between three planned factories of a [competitor] or [competitor], then I can stop, because then I know that in ten years I will no longer get the top people

Source: Own illustration

In addition, what is also somewhat more obviously linked to the strategic perspective is the long-term orientation of AS in a particular region. It can be derived that both smaller and larger suppliers associate reshoring with strategic growth beyond the achievement of cost advantages. This strategy may be related to increasing market shares in a region as well as to the aspect of not fully exploiting capacity limits at production sites. It could also be related to a political driver *government programs and subsidies*, which is an attractive opportunity for firms to relocate manufacturing back to its home country (table 29). For illustration, Russia offered subsidies to local producers as compensation and thus highlights that local aids are a reasonable driver for suppliers to relocate their manufacturing site (VDA, 2020).

Table 29: Findings to RQ1: Theme 4 ‘Drivers and barriers of reshoring and ES per case’ (Evidence 4)

Identifier	Quote
B1	They can be geostrategic orientations, for example. When you say that I want to get more involved in a certain area than I did before
C1	There was a certain, there is a company strategy at [company name anonymised] that locations don't become too large. However, there was also the strategy of giving them back to Eastern Europe in a second loop
I1	In other words, we have to link it to a certain growth strategy. That is also the reason. We are creating space for new growth and there are our Czech plants, i.e. we have two Czech plants, which are also perfectly located geographically, so that we are very, very close to the OEMs and offer our services accordingly In terms of growth, the question always arises as to how I want to align my plant or my network. Do I align it with customers, do I align it with technology?
E1	Well, it's government programs a pretty important topic in our industry.

Source: Own illustration

The seven drivers, which belong to (ii) *cost-related factors*, were found in all of the nine reshoring cases. In line with extant literature, it is obvious that economic drivers such as costs, profitability and cash flow are among the drivers identified by each case. In the Delphi study from MacCarthy & Atthirawong (2003), they also found that cost is one of the top factors that strongly influences a location decision. Findings from this study clearly emphasise the importance of cost-related factors in the AS sector. Besides acting in wage-cost-optimised environments or achieving better product quality, this is one of the main reasons for reshoring. Especially case D describes the relationship between ES and reshoring as dangerous while case F goes on to say the idea of being cost-efficient is not compatible with sustainability. Cost, quality and on-time delivery – as argued by Ellram et al. (2013) – are still the main factors to consider (table 30). Concisely, these findings are in line with Stentoft et al. (2016) who argued that costs are the most important driver to repatriate manufacturing back home even though it is not directly compatible with the idea of sustainability. As far as quality and on-time deliveries are concerned, MacCarthy & Atthirawong (2003) go on to say that intensive competition results in pressure to become more efficient and reduce a product’s time-to-market. On top of that, “higher levels of quality and improved delivery reliability” are of major importance for location decisions (p. 813). While Brandon-Jones et al. (2017) claim “that so-called ‘high-cost’ regions are sometimes more economically advantageous than ‘low-cost’ locations [...]”, it supports the findings from this study that quality and on-time deliveries are very important factors (p. 35).

Table 30: Findings to RQ1: Theme 4 ‘Drivers and barriers of reshoring and ES per case’ (Evidence 5)

Identifier	Quote
D2	The difficulty is that we also have to price the product in line with the market, and that is where desire and reality end. That means we simply have to think in cost-optimised terms, and that does not necessarily mean the most sustainable supplier, but the supplier who offers sustainability plus a good price. So I see a big danger of sustainability and costs, and that is extremely critical at the moment
F1	Unfortunately, it is so. Costs, quality, deadlines, yes the triangle [...] Yes, because, let me put it this way, if you...the topic CO ₂ -neutral and sustainability, first of all it is not directly compatible with the absolute low cost idea
G2	[...] a credible sustainability management system can very well achieve competitive advantages and that there is no longer any suspicion that it costs more than it delivers. Instead, we are now convinced that it is more effective than it costs

Source: Own illustration

In contrast to F1, G2 raised costs, profitability and cash flow as drivers for reshoring, however, G2 claims that “a credible sustainability management system can very well achieve competitive advantages and that there is no longer any suspicion that it costs more than it delivers. Instead, we are now convinced that it is more effective than it costs”. This clearly contradicts the statement by F1. Even if there are diverging perceptions across the cases, the majority still stress that costs are dominating the reshoring debate in this sector.

Following the third building block (iii) *operations issues*, it seems that these drivers are very heterogeneous distributed, however, efficiency reasons in terms of better knowledge transfer, synergy effects with other suppliers or the OEM, flexibility and time-to-market were mentioned quite frequently. As discussed in the previous section, many of these firms follow their customers (who are OEMs) and thus seek proximity to them, the idea of time-to-market appears to be the most appropriate one (Schonberger & Brown, 2017). This also became apparent in section 2.1.4, where Lund & Steen (2020) particularly highlighted that time-to-market and proximity are crucial factors for Tier-1 AS and drivers for reshoring – this is thus in line with this study.

As a result, these firms are also able to improve logistics and reduce distances, which also leads to a better carbon footprint, even if this is not of primary interest (table 31). The latter is also in line with the findings of a study by Srari & Ané (2016), who stressed that the objective of reducing CO₂-emissions by improving logistics and shorter delivery times is

being pursued. Furthermore, Engström et al. (2018) also point out the relation to ES and claim “environmental sustainability is more complex and also includes extraction, transportation, use and end-of-life” (p. 193). Consequently, the findings from this study add that logistical improvements (transportation) in the AS sector are perceived as a primary driver to optimise ES.

Table 31: Findings to RQ1: Theme 4 ‘Drivers and barriers of reshoring and ES per case’ (Evidence 6)

Identifier	Quote
A3	[...] it is the on-time deliveries, the security of us as a supplier being close, yeah, on-time deliveries, quality, cost of course. But, I think that being able to supply on time consistently is one of the really big ones
C1	So what were the main drivers? One was actually, let's say, the situation with regard to customers as well as key suppliers, since a relatively large volume was always driven around. So how can I keep my logistics costs, my transport costs correspondingly low?
D2	Well, the statement of the, yes, I can directly say local-to-local is much cheaper at the moment, because you simply have additional costs with the transport and handling on site, which no customer pays you
F2	[...] because I need certain cost advantages or because I want to have certain market proximity

Source: Own illustration

The fourth building block (iv) *customer proximity* is concerned with the idea of being close to customers, market or regions. This category was seen exclusively as a driver for reshoring. Almost every case has confirmed that customer proximity to OEMs, other suppliers in the supply chain or toolmakers is an important driver. Finally yet importantly, this is related to better customer support, the fulfilment of customer expectations of local production or a higher reaction speed. As discussed previously, Schonberger et al. (2017) point to the importance of customer focus for a firm’s competitiveness. Suri (1998) has demonstrated the impact customer proximity has on competitiveness, short customer lead times and the ability to respond to end-customers. The findings are also in line with Pavlínek (2020) who suggests location choices are influenced by technological reasons that help firms to reduce costs for transportation and logistics. By locating sites close to OEMs and accessing proper infrastructure (e.g. highways), AS attempt to reduce these costs.

However, case D also touched on the fact that although local production is expected, this can also be a high barrier for firms. This is strongly related to the limited availability of raw

material suppliers such as steel, which often comes from China. This is also limited by the oxidation of steel, as rust forms on this raw material over a long transport route from China to Germany (D2). In turn, this requires a firm to stay with its offshore location abroad, for example, in China to source and process steel locally.

With reference to literature, in the Delphi study with a panel of experts (e.g. academics, representatives from government bodies and consultants), MacCarthy & Atthirawong (2003) “noted that the ability to gain access to host raw materials may be equal to, or more important than, the ability to gain access to low costs when firms seek to manufacture internationally” (p. 801). This underlines the finding from this research (D2, table 32). In addition, by linking these findings back to the literature review in chapter 3.1.4.1 (table 7), the researcher also found that *customer proximity* has only been mentioned by MacCarthy & Atthirawong (2003).

Table 32: Findings to RQ1: Theme 4 ‘Drivers and barriers of reshoring and ES per case’ (Evidence 7)

Identifier	Quote
C1	And then, accordingly, investment support is really taken along, but also distances to the customer
D1	You've been promised by your customers [...] we'll give you the volumes you need, we'll give you more orders, we'll make more projects possible. The premise for this is a local production
D2	The raw material on the one hand, there are not many raw material producers left. So you are simply dependent on the contacts and accordingly it would not be possible to get good material to Germany. And the next thing is, the materials are raw, which means there is no surface on them, which can be shipped by sea, once there is rust on it, we can throw it away, we can't process it anymore. So we need the local supplier.
F2	Let me put it this way: customer proximity in terms of production is important, so you do not necessarily have to have the production site itself directly on site. That of course makes it easier. But what you do need is people on site who know the production process well, can think in production terms and are able to communicate this issue.
I1	R: What were you saying earlier about wanting to be closer to the customer? I guess that was one of the main or overarching motivators. I: For me personally, it was, yes, it was motivator and high driver, yes

Source: Own illustration

The fifth category derived from the interviews is (v) *regulations & environment*. When it comes to the associated drivers, these are concerned with environmental and legal conditions, safe and stable environments as well as government programs and subsidies. The barriers are

concerned with uncertain conditions in countries in Eastern Europe or strict ES regulations that have been introduced in low-wage countries. For instance, Engström et al. (2018) stressed that “strict environmental laws and regulations can be beneficial for manufacturers”, however, in this research it was found that AS do rather perceive it as a barrier (p. 193). What is interesting about these regulatory aspects is that they have been cited in particular by comparatively smaller firms (0.3-0.4 bn € revenue). A likely explanation is that these smaller firms in particular see a challenge in meeting regulatory requirements or stricter environmental conditions. It also shows that these firms are much more risk averse than the larger firms when it comes to the conditions for finding a stable region for their production (table 33).

Table 33: Findings to RQ1: Theme 4 ‘Drivers and barriers of reshoring and ES per case’ (Evidence 8)

Identifier	Quote
	But you have already looked: Where can I find a safe environment? Yes? Well, where they say/ We are reliable, yes? And on the other hand, it is also designed in such a way that you can manufacture quite well at these locations.
	But you also looked: Where are the actual environmental legal conditions?
C1	If you suddenly go to eastern Poland or to the group, to the Ukraine Yes? There you said: No. There the overall conditions are simply too uncertain. Yes? And that includes the environmental legislation. Yes? This is an experience that I believe many companies made relatively at the beginning of the first decade of the century, when they went to Eastern Europe, that suddenly very strict environmental standards were introduced, especially for foreign companies
E1	Well, it's government programs a pretty important topic in our industry.

Source: Own illustration

With regard to the overall objective of this research, the researcher was able to identify a sixth category (vi) *sustainability* as a potential driver and barrier to reshoring. Although it is not the primary aim of the thesis to examine the economic and social aspects of sustainability, this cannot be excluded. Focusing on ES takes into account the economic and social dimension to varying degrees in location decisions. In some cases, there are ES benefits for the firm, which are also of economic benefit. This is expressed in saving money through reduced transport costs, whereas in other cases there are additional costs to achieve ES benefits. Social benefits that accompany reshoring can be understood as offering jobs or qualifying new employees.

The participants stressed that achieving lower CO₂-emissions is one of the key drivers besides having access to energy systems and reliable energy supply. However, it must also be noted that four of the nine reshoring cases have only named CO₂-emissions and that drivers such as costs continue to dominate. This is specifically raised by D2, E1 and F1. G2 also points out that sustainability aspects in general are considered *a nice to have*, but not a top driver for reshoring. However, E1 also raised issues of *CO₂-taxes and -pricing*. This will be a major challenge for the firm and its suppliers in the coming years. In contrast to the remaining cases, this seems to be a more product-specific driver for packaging material suppliers, as this was not mentioned by anyone else.

The researcher has mentioned that the discussion about costs is still dominant. This continues to be the case with the discussion of potential barriers. Here, cases D, F and H again emphasise that the trade-off between lowest possible costs and a good environmental balance can be a barrier. F1 positions itself very clearly: “The driver for deciding this is profitability, not sustainability. Sustainability benefits in this case, but it is not the decisive factor”. Cases D, E and H also argue that customers will not pay for a higher level of sustainability, which stresses the debate about achieving the lowest possible costs for a product. “[...] But on the other hand, it is like this, paying more is not an option” (D1) and “[...] I believe that this is often the case with market trends, and it is a long way to go before our customers and their customers really appreciate this. Everyone wants it, but no one wants to pay for it” (E1). “[...] I find it really hard to believe that we can add five, eight, ten, three percent to the price and the customer pays for it and then passes it on to the end customer on a one-to-one basis” (H1).

Table 34: Findings to RQ1: Theme 4 ‘Drivers and barriers of reshoring and ES per case’ (Evidence 9)

Identifier	Quote
A1	I think, 20 years ago there was very little purpose on it. It’s gradually increased. So the point we are now, people are...parts of investments...someone looking at what is the CO ₂ impact in terms of moving production from Europe to China [...] the push that was already going towards ever more sustainable energy systems
D1	And of course we are also noticing that the issue of sustainability is becoming increasingly important to our customers. Now, especially due to the emergence of the CO ₂ balance in recent years, we are receiving more and more attention here
D2	[...] the issue of sustainability came up a bit. But I think that was third and fourth place there. First of all, it was the costs that simply exploded with global business.

E1	The topic of the CO ₂ -tax will also be a great challenge for us in the coming years. It will also be the biggest challenge for those who supply us with raw materials, and in this context, we are already reflecting on such decisions. But first of all, of course, they are very much driven purely by economic considerations
	Well, it's government programs a pretty important topic in our industry
F1	If I reshoring something, not only because it has a special effect, because it becomes cheaper or because the quality improves or because I can do it faster, but also because I can achieve something with it, right? Lower CO ₂ -emissions or, I don't know, jobs here at the site, shorter distances [...]
	The driver for deciding this is profitability, not sustainability. Sustainability benefits in this case, but it is not the decisive factor
G1	Currently only CO ₂ -measurement is an issue. Nothing else is of interest
G2	[...] we have now decided to manufacture the plastic sleeve in [location]. Yes, with regard to the sustainability aspect, that was not the main topic, but a "nice to have"

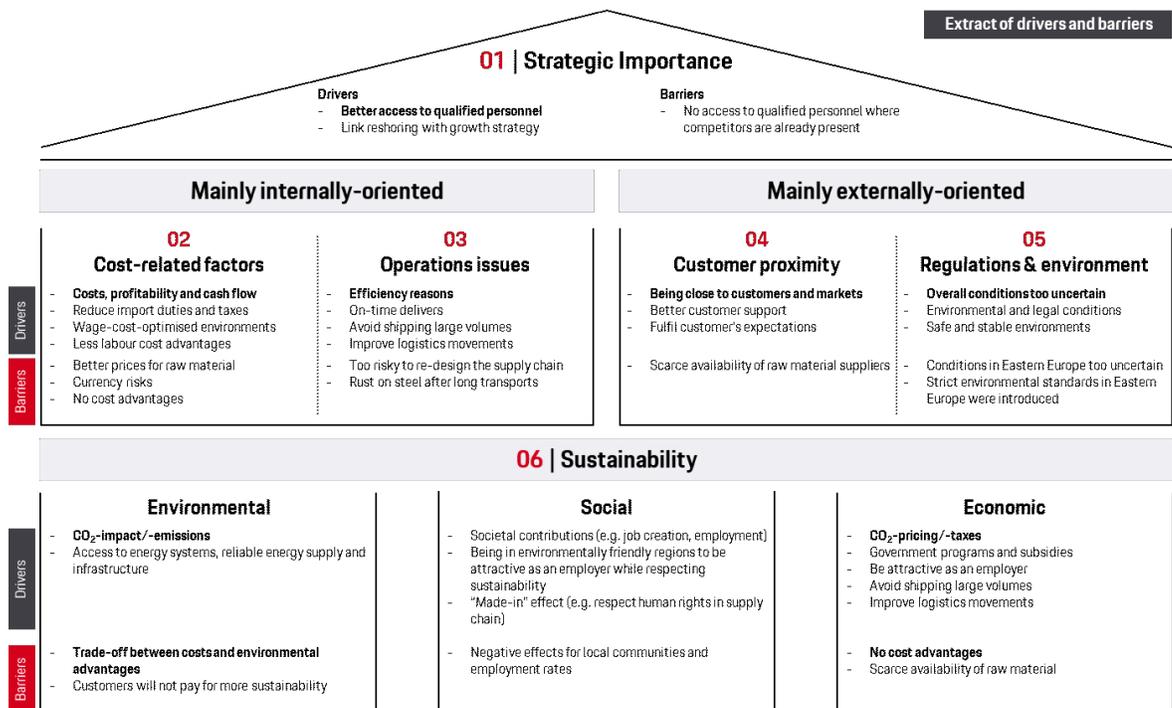
Source: Own illustration

With respect to the literature review, it became apparent that reducing CO₂-emissions is one of the main reshoring drivers in the category *sustainability*. This is also in line with Fratocchi & Di Stefano (2019), who identified the carbon footprint being the primary motivation for reshoring with regard to the ES dimension. In addition, Fratocchi & Di Stefano (2019) also stress further ES benefits “as a consequence of transport reduction and the adoption of clean sources of energy fuels” (p. 459), which were also explored as a driver in this thesis. Even though reshoring in itself leads to social benefits that were not explicitly mentioned (e.g. higher employment rate, better qualification), G1 particularly emphasised that job creation is a social driver.

In the literature review (cross-reference to section 3.1.4.1), the researcher also identified rather general drivers, such as greater attention to environmental impacts, a higher focus on sustainability, or a lower carbon footprint. The findings of this research in the AS sector are thus closely related to these drivers. Stronger environmental legislations were cited as a barrier, which were also mentioned by the cases in this study. Nevertheless, the findings on the drivers and barriers of reshoring have shown how ES is positioned and what role it plays compared to cost, operational issues or regulatory conditions.

As a result, the researcher has derived a theoretical model to categorise the drivers and barriers for reshoring and ES. With reference to the literature, Wiesmann et al. (2017) and Barbieri et al. (2018) expressed that a framework is needed to classify and elucidate the sheer variety of drivers and barriers. Consequently, this model does not only shed light on the interdependence between reshoring and ES, but helps to classify the drivers and barriers as well. The two dimensions *strategic importance* and *sustainability* form a bracket function in this model. Categories two to five represent the core of the model and have been differentiated to distinguish between those that are mainly internally- respectively externally-oriented. Following the TBL of sustainability, the researcher distinguished the drivers and barriers, which are applicable to the social and economic dimension of sustainability. The drivers or barriers highlighted in bold are those that have been mentioned frequently (figure 11).

Figure 11: Theoretical model to categorise drivers and barriers for reshoring and ES



Source: Own illustration

Conclusion

The categorisation of drivers and barriers has particularly helped to reveal the extent to which ES is a driving force for reshoring (Fratocchi & Di Stefano, 2019). Besides accessing green

energy systems and having reliable energy supply, reducing a firm's CO₂-emissions was found as a driver for reshoring, with costs still dominating. What also became apparent is the relationship between reducing CO₂-taxes and -pricing. This is perceived as an additional important driver, but more out of economic considerations and less as a contribution to sustainability. The importance of costs in terms of economic considerations in particular became clear in this study as one of the most important drivers and reasons for reshoring.

Other than that, it was found that firms in this sector need access to high-qualified employees to run their operations. On the one hand, already established competitors in a certain region can hinder a firm from reshoring because access to qualified employees may be limited. On the other hand, AS seeking to reshore are trying to increase market shares, exploit production capacity and enhance customer proximity. This can be viewed as a major conflict, which needs to be balanced in reshoring decisions. Furthermore, in contrast to Engström et al. (2018), this study also found strict environmental laws and regulations are perceived as a barrier. It was notable that both access to qualified employees and strict environmental laws and regulations were particularly mentioned by comparatively smaller firms (0.2-0.4 bn € revenue). It emerges that smaller AS in particular see a major challenge in relocating their manufacturing sites back to locations geographically closer to the customer where competitors are already present. This is accompanied by the challenge of achieving strict environmental targets or regulations.

Proposition 2: *The smaller a firm is (in terms of revenue), the higher the barrier to returning manufacturing sites geographically closer to the customer where (i) competitors make it difficult to access skilled employees and (ii) strict environmental targets have to be met.*

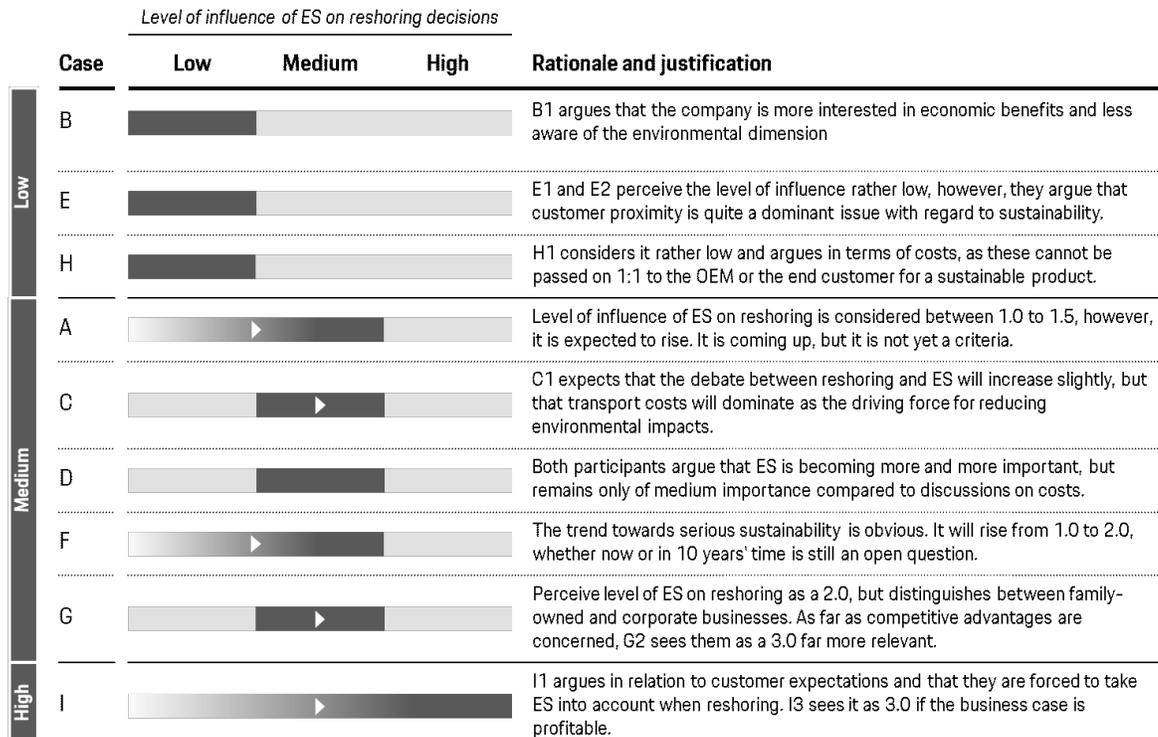
5.2.3 Level of influence of ES on reshoring decisions

Literature has shown that “scarce attention has been paid, until now, to the interdependences (if any) among sustainability issues and the firm's decision to backshore its manufacturing activities [...]” (Fratocchi & Di Stefano, 2019, p. 451). There is also a particular lack of research results on the interdependence between reshoring and ES in the automotive industry, which is considered as a major research gap. Rajeev et al. (2017) stress, “more focus on

industry-specific studies is required because problems addressing industries that are serious polluters, especially those in emerging countries, remains largely unaddressed” (p. 299). At the same time, the automotive industry is one of the least investigated sectors compared to the electronics industry followed by agricultural and food and logistics (Rajeev et al., 2017). The need to explore the influence ES has on reshoring decisions is thus a valuable research direction. Fratocchi & Di Stefano (2019) specifically stress to investigate both the environmental and social pillar of sustainability, “since these two issues may have different impacts on back-shoring decisions” (p. 468). Consequently, the purpose of this section is to illustrate the level of influence of ES on reshoring decisions.

The interviewees were asked to what extent they perceive the influence of ES on reshoring as low, medium or high and how they justify their choice. The summary of the findings shows that the level of influence is rated low by three cases, medium by five cases and high by one case. Figure 12 below compares the nine cases of reshoring, with an arrow on each bar indicating the trend in which the level of influence of ES on reshoring could develop in the next five years. First, this shows that the perception of ES is very heterogeneous among the individual reshoring cases and is due to different reasons, which will be explained in the upcoming section. In general, participants within the cases made no contradictory statements. The statements usually went in the same direction, even if the detailed responses of the participants naturally differed. This can be seen in the fact that one participant was more concerned with the topic of *costs* and the other with the factor of *competitive advantages*. Furthermore, it is also noticeable that no differentiation into the three level of influence (low, medium or high) based on the size of the firm can be done. The researcher therefore performs a detailed analysis of the findings by comparing the cases across and within each other.

Figure 12: Level of influence of ES on reshoring decisions in the next five years



Source: Own illustration

5.2.3.1 Low level of influence (cases B, E and H)

Participants in cases B, E and H were rather critical of ES' influence on reshoring and stressed that they tend to assume a low level of influence on such decisions. While case B emphasises that the social dimension will be of greater importance, case E emphasises that this will rather play a greater role in the textile industry (e.g. respecting human rights or avoiding child labour). In contrast, the issue of cost pressure dominates the automotive industry rather than the extent to which location decisions can be made based on sustainability aspects. It can thus be assumed that neither social nor environmental aspects of sustainability play a significant role and that much is concerned with costs.

H1 goes on to say that this industry is so dominated by cost pressure that it will not be possible to add x% to the price of a product if it is produced closer to the customer's factory. H1 also emphasises that it is being examined whether products can be produced closer to the customer, but that decisions are made based on costs rather than on the achievement of sustainability goals (table 35). This is also in line with Lechler et al. (2020).

Table 35: Findings to RQ1: Theme 5 'Level of influence of ES on reshoring decisions' (Evidence 1)

Identifier	Quote
B1	So, like I said, so far we haven't shifted anything back within my project. It hasn't been scheduled yet. I don't want to say that this can't happen in the future, because we are of course very international and...emm...about sustainability, that's something that accompanies us here. Again, I don't have any...there are of course certain sustainability issues that always surround you, but what I have for example is that you...emm...especially this social component...you have talked about the different pillars and...I think it will be very important that in the future
E2	To be honest, I am unsure whether the issue of sustainability will be so strong. I believe that the industry is also very much a part of it. I think, for example, if we now take clothing industry, textile industry, they may have to leave Vietnam, because there are more, yes, human-technical problems with child labour, or the supply chains are not quite right, so they may go back to Europe. But I believe that this is an industry that is so driven by cost pressure that it will not work.
H1	That is the crucial question. And, of course we ask ourselves this question, because it is difficult to answer. I personally, but perhaps I am too negative and biased because of my previous experience in the automotive industry, find it really hard to believe that we can add five, eight, ten, three percent to the price and the customer pays for it and then passes it on to the end customer on a one-to-one basis. Especially in the field of electric mobility, where the pressure on margins on the OEM side is already much greater than in the combustion engine world. So, I find it very difficult to believe that this is realistically the case.
	Okay, I should now/ because of the significantly lower volume, an investment no longer pays off", and then I look: "Okay, do I have free capacity somewhere else and will it pay off better in another location that is perhaps not in the region? Such considerations are of course already being made, but it is rare to deliberately move a local supply chain back and forth for sustainability reasons. So if they do, it is more in the spirit of forward-looking growth [...]

Source: Own illustration

Nevertheless, E1 emphasises that the proximity of manufacturing sites to the customer is important (time-to-market) and that ES must be considered in some way, but this cannot be done in isolation. The driver *time-to-market* in particular was already mentioned in section 5.2.2 in the category *operations issues* not only of case E, but also of cases B, D, G and I. This explains very well in the example of case E that despite a low perception of ES in reshoring decisions, the time-to-market factor is still very important. Furthermore, it can also be deduced from the statements that ES should be combined with other efficiency measures (e.g. optimise logistics, increase delivery capability). Nevertheless, it is clear from three interviews that the influence and perception of ES on reshoring is perceived as rather low (table 36).

Table 36: Findings to RQ1: Theme 5 ‘Level of influence of ES on reshoring decisions’ (Evidence 2)

Identifier	Quote
E1	But, of course I still believe that it is always relevant for companies to be located somewhere close to the countries where they produce and where they sell their products, because no matter what we realize, time to market is a huge issue in this context as well. This also has sustainability components with reduced stock levels. You have to be able to react more quickly, less preliminary products. I believe that it forms a combination, but I don't believe that it is possible in isolation. That is my thesis.

Source: Own illustration

5.2.3.2 Medium level of influence (cases A, C, D, F and G)

It can be stated that all cases that have expressed a medium level of influence still assume an increasing importance of ES on reshoring decisions. To underline this, table 37 provides a summary of the perceptions stated by these cases. More specifically, the main themes identified in this section are the following four:

- (i) Cost, price pressure and economic aspects
- (ii) Strategic relevance
- (iii) Customer expectations
- (iv) Competitiveness

The issue of competitiveness was also identified as one of the key factors. For this reason, it is specifically addressed in section 5.2.4. The breadth of issues, as can be seen from these four themes, is also consistent with findings by Di Mauro et al. (2018) and Stentoft et al. (2016) that reshoring is a very heterogeneous phenomenon with the cost driver being the most frequent one.

The rising trend of ES is clear to every firm involved in this study, even if opinions differ somewhat as to whether ES will enjoy greater relevance in the next two to three years or only in 10 years. While some argue that it will only slightly increase from medium to high (e.g. C1, F1), others clearly point out that the issue of sustainability is becoming gradually relevant on a short-term perspective already (e.g. D1, D2, F2). Only case A needs to be viewed critically, as A3 tends to assume that ES will have a rather small impact on reshoring decisions, whereas A1 and A2 argue that the impact will increase. A3 instead argues that it

will have greater relevance in procurement decisions and supply chain assessment than in location decisions. In addition, two important perspectives are also emphasised: on the one hand, F2 and D2 stress that they do not see ES as a compulsory task, but want to implement it pro-actively or voluntarily, even though it may be more expensive. On the other hand, D1 and D2 emphasise that customer expectations are also increasing and that topics such as the reduction of CO₂-emissions are important (table 37).

Table 37: Findings to RQ1: Theme 5 ‘Level of influence of ES on reshoring decisions’ (Evidence 3)

Identifier	Quote
A3	I think it's a one. I think it's not a big factor [...] I think in purchasing decisions when it comes to supply evaluation, it (environmental sustainability) will be much more important.
A1	So, short answer, yes, it will be a bit more important in my issues to produce for us but it could be much more important to evaluate our supply chain
A2	I would expect it to rise. That is clear.
C1	I think it has been coming up more and more over the last year. Maybe it's correct to say three to five but I would even say five to 10 years.
D1	I think it will increase slightly. But it will rather/ I still believe that especially in such an environment, where commodities are really produced in the supplier industry, the price pressure will continue to be very dominant.
D2	And of course we are also noticing that the issue of sustainability is becoming increasingly important to our customers. Now, especially due to the emergence of the CO ₂ -balance in recent years, we are receiving more and more attention here.
F1	But you can see that the customers are already thinking about it. That means shifting back to local-to-local. So for years now, we have been setting ourselves very high standards to make sure that we have as little energy consumption as possible, that the whole thing is sustainable, but then also sustainable in all three stages
F2	I would say today between one and two and in the next three to five years rather between two and three. People have always talked about it, but you can already tell, you said it before, and there are already one or two approaches to it. I believe that this topic is becoming more and more present. It will be increasing [...] and whether that is now in ten years, that is open to question, okay, but it is a one to a two. So in this respect we are now moving towards sustainability, which will be more expensive, but we also want a certain sustainability.
F2	So the trend is clearly there, okay, so I would say that twenty years ago nobody was interested, seriously, then it started, that it just got more and more interested [...] So from my point of view, the trend is clear, there is a trend towards serious sustainability.

Source: Own illustration

There was a consensus that increasing price pressure, cost and economic aspects will continue to be the dominant factor in the next five years. Even if all participants confirm that ES is perceived as an extremely important issue and is embedded in the firm's strategy, it is clear that suppliers in particular are affected by increasing cost pressure. The challenge is that suppliers must price their products in line with market conditions in order to operate profitably. Thinking purely in terms of cost optimisation, is a decisive factor to remain attractive for OEM's orders but it contradicts the idea of offering the most sustainable product possible (C1). F1 specifically points out that all their competitors trying to offer the lowest possible price and that is why this is a simply massively competitive market when ES-related objectives need to be ensured, too.

It has also been stressed by F2 that ES sometimes seems to be used as a cover (“window dressing”), so to speak, to position itself well, even if ultimately it is primarily a matter of purchasing products or parts at the lowest possible costs. There is criticism that ES is not taken seriously by OEMs and is only used as a sales argument, but that suppliers are nevertheless asked to implement effective measures with a long-lasting effect. In contrast, G1 argues that although discussions about costs and benefits of ES have often taken place, it has become clear that ES can very well be associated with more advantages than disadvantages. This is characterised by the fact that this firm took part in the German Sustainability Award and was named the most sustainable firm among participants from different industries. In general, however, the decision is made based on the price. This is also very closely related to the findings from the previous chapter, where the drivers and barriers of reshoring and ES were analysed (table 38).

Table 38: Findings to RQ1: Theme 5 ‘Level of influence of ES on reshoring decisions’ (Evidence 4)

Identifier	Quote
C1	I think it will increase slightly. But it will rather/ I still believe that especially in such an environment, where commodities are really produced in the supplier industry, the price pressure will continue to be very dominant [...] So also, in order to remain attractive as an employer
D1	But on the other hand it is like this, paying more is not an option
D2	[...] the issue of sustainability came up a bit. But I think that was third and fourth place there. First of all, it was the costs that simply exploded with global business.
F1	[...] Yes, because, let me put it this way, if you/ The topic CO2-neutral and sustainability, first of all it is not directly compatible with the absolute low cost idea

	And it's not only us who do that, unfortunately, of course, all our competitors do that as well, and that's why it's simply a massively competitive market
	I would say it's a question of price, as so often, okay? And the surcharge that you set for it is not big...the customers, they only ask you to do it, like this.
F2	Which also means, however, that the issue of sustainability is simply not yet taken seriously enough. So that is still far too much window dressing in general, okay? I think that people throughout, including management and everyone, including customers and so on, are saying: "We want this, and I seriously believe you do. But that has a price point, that has costs. And you are not prepared to bear these costs in the end, okay? And that's why it's always going to be such a shady mix up to now, unfortunately.
G1	And of course, in the beginning there was often the accusation that sustainability costs more than it brings. But in the course of time, we have certainly undergone a significant change, through various activities, in part also through tough arguments, that we were able to refute this argument and can now demonstrate that a credible sustainability management system can very well achieve competitive advantages and that there is no longer any suspicion that it costs more than it delivers. Instead, we are now convinced that it is more effective than it costs
G2	I believe - and I must refer to [G1] here - but I believe that this topic of sustainability and energy management is anchored there and that we also have the goals. The improvement of new plants only in this large context, the sustainability aspect is reduced to the economic aspect

Source: Own illustration

Regarding the importance of ES in relation to reshoring decision-making processes, it became clear that this has increased significantly in recent years. Everyone expects that the importance of ES on reshoring decisions will increase moderately. Reshoring is a phenomenon, which has been going on for a very long time and will continue to do so according to case A. Nevertheless, ES has not yet established itself as a decision criterion yet. Rather, it has become clear that ES must first be integrated into the strategy before using it as criterion for decisions. Especially with regard to the global business, complex supply chains of suppliers across the globe and price pressure, costs are currently more relevant in decisions than ES. An interesting finding from case F is that reshoring and ES have not only been considered as decision criteria, but are also discussed in terms of *changing mind-sets*. With a new, younger generation with a greater focus on sustainability, this debate will become even more important in the future (table 39).

Table 39: Findings to RQ1: Theme 5 ‘Level of influence of ES on reshoring decisions’ (Evidence 5)

Identifier	Quote
A3	<p>Because we have had it for many years in our procedures that we shall have this kind of decision support material which is understand the environmental impact of all strategic decisions. But in practice this hasn’t always materialised for all projects because of different reasons.</p> <p>I think that is something which is gradually happening but I’m confident that it is fully on the strategic agenda. Then, we need to make sure that we get it fully into the operational practice as well. This isn't happening overnight. It is, I think, a gradual evolution and maturity of the topic.</p> <p>But I think it’s not one of the top decision criteria in most cases. As I said, step one is to get it as part of the decision criteria at all which requires certain data and analysis and the KPIs and things like that.</p>
F1	<p>But I think that has something to do with generational change, with the people who can make decisions and therefore I believe that with the course of time this priority will change a bit. More priority will be given to nature, to the environment, to the issue of sustainability than we had twenty years ago and maybe even today.</p>

Source: Own illustration

The findings of the interviews also showed that perception is not only reduced to costs, but the competitiveness and the perception of a firm in the market are also related to this. Especially concerning the level of competitiveness of suppliers, the influence of ES on reshoring decisions was also rated much more important. In contrast to cases A, C, D and F, case G emphasises that a credible sustainability management system can very well achieve competitive advantages and does not necessarily have to cost more than it generates. In this case, however, there is one aspect to be highlighted, where case G is different from the others. G2 argues that especially in family-run firms, there is a greater focus on sustainability, even if it costs more. This can be attributed to the owner of the firm: if the owner is convinced of the idea of local manufacturing sites and also pays, for example, three percentage points more for it, the influence of sustainability on reshoring decisions is given a completely different meaning (table 40). Furthermore, G2 argues that he would rate the impact of ES on reshoring very high if it is purely a competitiveness issue (scale from one to three, where three means *very high*).

Table 40: Findings to RQ1: Theme 5 'Level of influence of ES on reshoring decisions' (Evidence 6)

Identifier	Quote
A2	<p>From an environmental impact that wouldn't probably be so good but from a cost side it could be beneficial. But I think right now the environmental impact and this thinking about local supply chains that is higher up on the strategic agenda. So, if that can be demonstrated I think it currently gives competitive advantage</p>
C1	<p>Well, in total, I think the overall answer is yes. It is also a partial advantage. In any case, this means that there is no after, there was no further disadvantage, but basically you have positioned yourself just as well as many other companies. And if you had not done so, you would have had a great disadvantage. I think the choice of locations where you went was very, very much appreciated by the customers.</p>
D2	<p>Daimler is also demanding that its suppliers be completely green for 2038, i.e. CO₂-neutral. And this of course puts pressure on all suppliers / Audi already has such a sustainability audit, what they are doing, which is an absolute hypocrisy for me at the moment, because in the end the cheapest supplier will get the contract later. And then you don't look to see whether the solar is on the roof or whether it works green, it's just cheap. So I see a big danger of sustainability and costs, and that is extremely critical at the moment.</p>
G1	<p>The Tier-1 is being looked at, yes. However, Tier-1 is often so large that OEMs cannot pull the big levers. It is simply broken down to us, so you have to do it. There is no discussion. So that is the disadvantage with us, we are at the end of the rat tail. So that means that everything else that can be somehow distributed and can be passed on in the chain, whether it is green electricity or costs, we cannot pass it on, because behind us the chain ends with the steelworks</p> <p>We identified the German Sustainability Award as the largest and most important of its kind in Europe. And very importantly: it was a cross-industry benchmark. It wasn't: "We're swimming in our own soup, we look at our two main competitors and say, of the three or of the two, we want to be the best. No, we want a cross-industry competition, and of course, in retrospect, that gave us a lot of tailwind, because we were able to show a sub-development, about the participation, about the top ten, top three and last year's victory, where a lot of things were thrown at you from outside</p>
	<p>R: How do you see this aspect in terms of competitive advantage? For example, if I now make myself more attractive by making my location - let's take a more extreme example - no longer in [place], in [place], in [place], wherever it is, but really in [place], and you obviously already have a better CO₂-footprint per se due to the shorter distance, which lies in between. Do you think that something like that will also have an effect on your competitive advantage in the future? If, for example, you get tenders from OEMs?</p> <p>I: So I say that's a three, yes.</p>
G2	<p>So of course it always depends on the type of company, whether there is an owner behind it. And if the owner is convinced that it is right to manufacture locally, even if I will be five percent more expensive later, but in return I do it well for the environment, for the region there, and I have other advantages that I cannot measure directly in euros when I have such a company owner, and he is the driving force behind it, then of course there is a three. And elsewhere, where it is driven strongly by economic considerations, it will remain a one</p> <p>Basically, I consider it very important that you can also generate competitive advantages beyond the economic or ecological and social aspects with shorter throughput times, or that we</p>

are in countries where the box has to say "Made in the USA" on it, so to speak. This aspect is sometimes more important.

Source: Own illustration

5.2.3.3 High level of influence (case I)

Concerning a high level of influence of ES on reshoring, there is only case I, which takes this position. In case I, however, there is the special feature that the firm has been actively pursuing the topic of ES for several years and pays a lot of attention to it. For example, the products of this firm have a recycled core from sustainable materials. Although it took a while for this to be accepted both internally (e.g. in research and development) and from the market (e.g. customers), it has now proven to be a profitable business model. It can be concluded that these positive experiences already contribute to a high perception of ES. The Sustainability Manager (I2) from this firm also points out that the management is committed to sustainability and that it is embedded in the corporate strategy.

Apart from the fact that the firm already has a sustainability strategy, I1 adds that this high perception of ES is also justified by the high transport and logistics volumes the firm has. The reduction of distances in logistics and transport by reshoring is advantageous from both an economic and an ES point of view: more than two million kilometres per year are avoided and internal efficiency measures have helped to reduce the number of rejects in case a product does not meet its quality standards. This can also be compared with case C, as C1 stresses that logistics and transport costs are of great importance, too, when deciding about reshoring. Even if the level of influence of case C is assessed as rather moderate and of case I as high, the focal points overlap, as in this case with logistics costs and efforts.

However, in line with cases A, C, D, F and G (medium level of influence), it is also clear from case I that much is concerned with cost issues. I3 explains: "When I say I have two options, and they are both more or less the same in terms of the business case, then I would say that the sustainability factor is already a three with increasing influence". If there are two reshoring options that result in the same business case, ES is always the first option. However, if ES is associated with high costs and has a rather negative impact in terms of profitability, the impact level would be rated with one. What certainly led to the ambitious

assessment of case I are four particularities where it differs from the remaining cases. First, it is important to stress the specificity of case I compared to all other cases as a family-run business. The company's owners generally attach great importance to sustainability, which means that it is placed on the firm's strategic agenda at an early stage.

Second, the firm is currently undergoing a transformation process, in which a new management team was brought into the firm. As part of this transformation process, sustainability was identified as the most important issue. As in the other cases, case I is similar in that ES is not seen as mere lip service, marketing or greenwashing. Nevertheless, the topic of ES as a driver for reshoring is accorded greater importance by the new team and is promoted accordingly to assess further reshoring options in the future.

Third, reshoring is accompanied by substantial lean management measures to shorten the value chain and lead times as well as to reduce complexity and interfaces. A unique selling point compared to the other reshoring cases is that the reshoring project is almost complete and has achieved corresponding success. I1's experience contributes to these successes in particular, as the interviewee has several years of experience in the area of operational excellence.

Fourth, compared to all other cases in case I, it became apparent that the revision of the production network is on the agenda for next year, as pointed out by I1. Not only CO₂-emissions are to be established as an evaluation criterion, but also criteria such as proximity to customers or transport kilometres are to be given greater consideration. This is happening against the background of rising customer expectations (table 41).

Table 41: Findings to RQ1: Theme 5 'Level of influence of ES on reshoring decisions' (Evidence 7)

Identifier	Quote
I1	Yes, exactly. I am definitely producing, I have to produce less in that sense because I have no rejects. And ultimately, this project alone, which I have mentioned or am involved in, will save us two million truck kilometres a year in Europe alone.
	That's why I simply run the project with fewer interfaces, shorter throughput times, a much more flexible supply change, especially now, even in times of Corona, it's actually a win-win situation for me or from my point of view.

Ultimately, environmental considerations have always played a relatively strong role

For example, our administration here at the site is also completely operated with a biogas plant. This is very, very high on our agenda, the topic of sustainability.

That's what the [Person] family [Person] has always attached great importance to environmental protection, because we are a family-run business. But that was simply driven by the fact that it was always in their personal interest.

The fact that we have a completely new management team as part of the transformation process has given the subject an extremely high profile.

I must say, however, that up to now the topic of, for example, I don't know, CO2 footprint or something like that, has not yet been included in the evaluation matrix. We will get to that. The OEMs are also increasingly demanding it.

We have been producing a sustainability report for several years now, and we have been paying more attention to the whole issue. It is a bit different within the divisions, but it is/ We also have divisions such as our *anonymised* Solutions Division, for example, which have really turned it into a business model. Our *anonymised* have a recycled core. It took a while for this to be accepted on the market and for it to be accepted internally.

I2

I have come to believe that there is a strategy behind it and that it is really being pushed by [Organisation]

Well, I do believe that the issue of sustainability is gaining more and more impact and is being taken into account more and more. Especially probably in large companies.

If I say I have an option that is green to the core, but costs you a lot of money, then I say one. Well, that's easy, in the end a company has to or should make a profit. That must be a factor in itself.

I3

The issue of sustainability is an aspect that is also taken into account here, and with the increasing importance of this topic it is also gaining in importance.

It is a top topic, a CEO topic. And not only from a marketing or greenwashing point of view, it has become a real competitive factor.

C1

And I think what certainly, what definitely will have an impact: It will be much more in the direction of transport costs. And also the impact that transport will have on the environment, which I believe will become stronger.

Source: Own illustration

Conclusion

With regard to the level of influence of ES on reshoring decisions, a large gap was found between the integration of ES into decision-making processes and the way reshoring processes are currently carried out. Although the participants attach a high importance to ES, this is not yet reflected in reshoring decision-making processes. On the contrary, these

processes tend to diverge and are not internally harmonised. Differentiating the cases into three categories (low, medium and high influence of ES on reshoring decisions), helped to gain an understanding of individual perceptions. Cases B, E and H do not see a high influence of ES due to rising cost pressure. A supplier's price increases cannot be justified by proximity to the OEM or by offering sustainable products. While customer proximity is crucial, cost and time-to-market are far more relevant than ES. A medium level of influence (cases A, C, D, F and G) is characterised by a rising perception of ES in location decisions, however, cost issues continue to dominate the decision. What differs is that these cases recognised the importance of ES for a firm's competitive advantage by integrating ES into the strategy and considering it as a location decision criterion. A high level of influence is perceived by case I because they seek to actively manage the production network, where CO₂-emissions, customer proximity and logistics are equally considered in the decision-making process. ES is an important driver of reshoring decisions and is considered important to evaluate further reshoring options. One specific characteristic of case I is that the firm is a family business, where ES is accorded greater importance by the owners. Sustainability has also been integrated in the strategy at an early stage. This leads to the following proposition:

Proposition 3: *Compared to public large corporations, family-run businesses attribute a higher importance to ES in location decisions for their competitive advantage, as economic aspects or stakeholder expectations drive them to a lesser extent.*

Proposition 4: *ES is not usually the primary driver of reshoring, as location decisions are generally cost-driven due to the importance of providing the best price offer and securing future orders. ES is considered merely as an additional factor to differentiate from the competition.*

5.2.4 Relevance of ES for competitive advantages when reshoring

The critical examination of the cases with regard to the perception of ES in reshoring has revealed that all participants mentioned *competitiveness* as a decisive factor. Therefore, a detailed analysis of the findings related to this factor is conducted in this section. With reference to the literature, there are numerous reasons to relocate a production site back to

developed countries, which is an important aspect to remain competitive (Stentoft, Mikkelsen, & Jensen, 2016). Access to innovation, infrastructure, qualified employees and the ability to react to sudden demand changes from a customer point of view are of utmost importance (Moradlou & Backhouse, 2016). Chen et al. (2014) add that “environmental and social issues have gained importance in recent years as organizations seek competitive advantage” (p. 154). The findings on the question of how local value creation or supply chains improve the competitive advantage of a firm have led to substantial insights. Data analysis resulted in four themes (i) *customers & expectations*, (ii) *infrastructure*, (iii) *made-in effect* and (iv) *pricing*, which are dealt with in sub-sections below.

In principle, it became clear from the interviews that each firm associates a high competitive advantage when local production is pursued and accompanied by ES-related measures. It also became clear that the strategic embedment and *CEO awareness* is a decisive factor in using reshoring and ES as a competitive advantage. At the same time, it is also important that the reshoring project is accompanied by effective measures that are associated with long-term positive effects (e.g. reduction of CO₂-emissions of the local production plant through higher energy efficiency and photovoltaic systems vs. financing of forest protection projects in South America).

The analysis also confirmed a high perception of ES when it comes to competitiveness, however, this relates to different parameters. For instance, while A2 argues that the environmental impact and the idea of local supply chains go hand in hand with competitive advantages, A3 of the same case rather emphasises that access to renewable energy is crucial. Furthermore, G2 emphasises the advantage of local production in order to be able to react more quickly as a firm to sudden fluctuations in demand or external influences. This does not work if a firm operates globally with a complex supply network. According to G2, this results in a particularly high competitive advantage and goes hand in hand with the findings of Moradlou & Backhouse (2016) and Ellram et al. (2013). They particularly address that reshoring enables a firm to respond faster to changing customer demands.

It also became clear that there are different views concerning the product portfolio. E2 explicitly emphasises that packaging material is made of renewable materials, which results

in a better competitive advantage for them. In contrast to E2, F1 is rather concerned about the product portfolio. The firm produces electronic products in a highly competitive market where it is rather difficult to gain a competitive advantage. This suggests that the product portfolio can also be an enabler or barrier to competitiveness (table 42).

Table 42: Findings to RQ1: Theme 6 'Relevance of ES for competitive advantages when reshoring' (Evidence 1)

Identifier	Quote
A2	The word trend is wrong but currently this is on-going in industry, so that can be a competitive advantage [...] But I think right now the environmental impact and this thinking about local supply chains that is higher up on the strategic agenda. So, if that can be demonstrated I think it currently gives competitive advantage.
C1	Well, in total, I think the overall answer is yes. I think in order to stay in the market [...] the efforts were also rewarded accordingly. And I think it has been an important part of being able to continue to exist there.
E1	So, where this topic is really credibly implemented and solutions are found, he also has here, can clearly gain a competitive advantage.
E2	Because we can work very well in a recycling system made of renewable raw materials. This means that our product is actually relatively sustainable compared to other products, which is where we have the advantage
F1	And it's not only us who do that, unfortunately, of course, all our competitors do that as well, and that's why it's simply a massively competitive market, these electronic articles, this whole world of automotive suppliers.
G1	Can a company really gain a competitive edge if it does it really well? I am convinced of that.
G2	What I noticed during the discussion was the competitive advantage I gain from manufacturing locally, where I can react quickly
I3	It is a top topic, a CEO topic. And not only from a marketing or greenwashing point of view, it has become a real competitive factor.

Source: Own illustration

Customers & expectations

Two important views must be considered: on the one hand, it became clear that fulfilling customer expectations is of utmost importance for AS. On the other hand, AS must continue to position itself well in the market in order to remain attractive OEMs and to secure future contracts. For illustration, Volkswagen (2019) provides clear requirements in relation to sustainable supply sources as well as energy- and carbon-optimised supply chains. Localisation of suppliers is also an effort from Volkswagen to reduce economic and geopolitical risks. In addition, Volkswagen is tying award decisions to sustainability criteria and does not award suppliers who fail to comply with regulations (e.g. use of renewable

energies, reduce CO₂-emissions, observe human rights, combat corruption). In case of Volkswagen, this affects more than 12,500 suppliers.

In this sense, C1 emphasised that the choice of location was both welcomed by the customer and helped the firm to remain active in the region. This expresses the positive outcomes associated with reshoring strategies. However, it also became apparent that the requirements for suppliers are only passed on by the OEMs along the supply chain. This indicates that the idea of positioning a firm well and securing future contracts is not necessarily a voluntary decision from the supplier, but rather an obligation to keep up with increasing requirements on ES. In addition, it is usually smaller suppliers (Tier 2-3), which are affected by this because they are at the end of the supply chain and have less negotiation power (D2). In contrast, H1 emphasises that as a large Tier-1 supplier with ~€12 billion revenue per year, they can leverage their competitive advantages through global presence and better financing options (table 43).

Table 43: Findings to RQ1: Theme 6 ‘Relevance of ES for competitive advantages when reshoring’ (Evidence 2)

Identifier	Quote
C1	I think the choice of locations where you went was very, very much appreciated by the customers.
D1	So just this topic Made in USA is of course wanted everywhere and everywhere gladly seen. Plays a high value. But on the other hand it is like this, paying more is not an option
D2	It is simply broken down to us, so you have to do it. There is no discussion. So that is the disadvantage with us, we are at the end of the rat tail.
E1	But I believe that this is often the case with market trends, and it is a long way to go before our customers and their customers really appreciate this. Everyone wants it, but no one wants to pay for it.
G1	And at Automotive, it is quite clear that we are experiencing massive pressure on the supply chains, especially from the large OEMs, VW, Audi, Mercedes and BMW
H1	I believe that we have an advantage over perhaps smaller market players who are now playing in the field of e-mobility, bracket to bracket, but who will have difficulties financing growth and global positioning because of their size.

Source: Own illustration

Infrastructure

The findings from the interviews revealed that achieving a strong competitive position in the market is not only about having access to qualified employees, infrastructure or innovation (Moradlou & Backhouse, 2016), but also to proper energy sources and recycling systems.

This finding also fills an extant research gap, which has been raised by Orzes & Sarkis (2019), if technological innovations (e.g. recycling systems) or access to environmentally sustainable resources (e.g. renewable energy) is considered in reshoring projects.

When asking for the extent to which a local production contributes to competitiveness, A3 stresses that firms also have to evaluate locations according to the grid factor. This includes the use of renewable energy or biogas and access to recycling systems. E2 goes on to say that especially for packaging materials, access to renewable energies is of utmost importance because the paper mills are extremely energy intensive. Furthermore, this does not only lead to better ES performance, but can also improve the pricing of products when electricity is produced for the firm’s self-consumption. F1 also sees the need for access to renewable energy to be an important part of a location decision, but this does not result in being cheaper, faster or better in terms of quality. However, this statement by F1 must be evaluated critically, as he/she has previously emphasised that the electronics industry in particular is a highly competitive market (table 44).

Table 44: Findings to RQ1: Theme 6 ‘Relevance of ES for competitive advantages when reshoring’ (Evidence 3)

Identifier	Quote
A3	It (a local supply chain) depends where you are in the world. But if we reshore it to a European country with a good grid factor for electricity, possibilities by biogas, that have good recycling systems for example incineration of the energy recovery stuff like this, more advanced countries when it comes to these issues, for sure.
	Access to renewable energy is important as the paper mills for packages are extremely energy intensive.
E2	Because I produce my own electricity, perhaps this will enable me to offer it more competitively and so on. And then we would have killed two birds with one stone, if we could implement something like that and say okay, yes, a plant is relatively green, at least as far as the electricity supply is concerned
F1	For example, what we are discussing right now is really this green power, yes, to use within the group [...] This is not a competitive advantage in quotation marks that it makes us cheaper, better or faster, but it is a switch factor where we say that for the future it is easy

Source: Own illustration

“Made-in” effect

The *"made-in" effect* is a theme that has already been mentioned in the literature by various authors (Orzes & Sarkis, 2009; Di Mauro et al., 2018; Srai & Ané, 2016; Canham &

Hamilton, 2013), to improve brand positioning through reshoring (e.g. Made in UK, Made in Germany). Consequently, it is not surprising that participants also mentioned this specific driver in the context of this data collection. It is notable that the "made-in" effect does not serve to strengthen brand positioning as proposed in the literature. Rather, A3 emphasises that the social dimension of sustainability resonates there when it comes to avoiding child labour in low-wage countries or paying workers fairly. The product label „Made in Sweden“ or „Made in Germany“ can guarantee this. At the same time, however, D1 criticises that it cannot lead to the supplier paying more if "Made in Germany" is demanded from the OEM. Only B1 emphasises that this effect does not have a high priority there. Possibly this can be justified by the fact that it concerns components in the vehicle (e.g. wetness detection in front wheels) that cannot be visibly perceived by both the OEM and the end customer (table 45).

Table 45: Findings to RQ1: Theme 6 'Relevance of ES for competitive advantages when reshoring' (Evidence 4)

Identifier	Quote
A3	I think if it says made in Sweden and not made in China on the end product, that that has an influence. I would expect so at least. But how it's been sourced, not sure that many customers would consider that at all actually. So long as we don't have conflict minerals and all this child labour that kind of issues but that's another topic
B1	Made in Germany doesn't count as much as it used to
D1	So just this topic Made in USA is of course wanted everywhere and everywhere gladly seen. Plays a high value. But on the other hand it is like this, paying more is not an option
G2	Basically, I consider it very important that you can also generate competitive advantages beyond the economic or ecological and social aspects with shorter throughput times, or that we are in countries where the box has to say "Made in the USA" on it

Source: Own illustration

In contrast, Diamantopoulos et al. (2011) claim that the strategic perspective of reshoring in terms of the “made-in” effect is gaining momentum. More recently, Di Mauro et al. (2018) stressed that the “made-in” effect is a frequent reshoring motivation for firms operating particularly in the textile, clothing, and leather or footwear industry. However, this research revealed that this effect does not have the same relevance for the AS sector. Rather, it became clear that it has a completely different meaning for AS.

Pricing

The discussion around the topic of competitiveness has also led to the theme *pricing* (price, cost pressure and economic aspects) being mentioned by cases D, E, G, H and I. This has

been analysed in detail in section 5.2.2 on the drivers and barriers of reshoring and ES and expresses the high importance of these topics for AS. In this context, the position of the OEM is strongly criticised that sustainable products, locations and local supply chains are demanded, but they are not willing to pay a premium for them (E1). In addition to delivery capability, quality and price, it thus became clear that ES aspects are now also demanded in tenders (G1). However, this is obviously not the case for every OEM. I1 and I2, on the other hand, say that the tenders are still strongly price-driven (table 46).

Table 46: Findings to RQ1: Theme 6 'Relevance of ES for competitive advantages when reshoring' (Evidence 5)

Identifier	Quote
D2	Officially? No. No. So officially I would say: Yes, of course, sustainability is very important and that is what we get sold. Unofficially, I would say that the price will still be the decisive factor as long as there is no pressure from everyone.
E1	Well, the topic is really extremely important for us in the industry. And we also notice that I think there is an extreme pressure. But I believe that this is often the case with market trends, and it is a long way to go before our customers and their customers really appreciate this. Everyone wants it, but no one wants to pay for it.
G1	[...] you can see that this is becoming increasingly important in tenders, that sustainability aspects and currently very, very strongly the emission targets are playing a role in addition to delivery capability, price and quality, and that you can see great advantages, that the market of competitors is becoming significantly smaller and that at the end of the day you can of course also push through other prices. "Okay, we'll do that. But if the trend is towards 15 per cent, there is no longer any benefit from an ecological approach or "We have a competitive advantage" because of short throughput times.
I1	Personally, I rather see the advantage in five years. I have to say this quite openly and honestly. But I also always see the new tenders that come in. And they are, it has to be said, extremely price-driven.
I2	Exactly, it's already beautiful and is gladly taken. But, priority one by far is still a price.

Source: Own illustration

The literature review has confirmed that locations decisions are an important part of a strategy. Especially deciding on the way back to high-wage countries is a crucial step for many firms in getting access to important resources (e.g. qualified employees, knowledge, innovation and infrastructure). In addition, competitiveness as a factor for reshoring and ES has so far only been treated very superficially and no substantial or in-depth academic findings on this are available in the automotive supply industry. However, it is important to pronounce that Chen et al. (2014) found environmental or social issues have become more

important when it comes to increasing competitiveness although this is not specifically related to the automotive industry. The aim of this section was therefore to investigate what influence reshoring and ES have to improve competitiveness and how it is being perceived. There are currently no case studies or substantial research results on this, especially for the automotive supply industry.

The researcher concludes that high importance is attached to increasing competitiveness in reshoring and ES. However, two different stages still have to be taken into account here: while OEMs already demand very high sustainability requirements (e.g. CO₂-target values in the supply chain), suppliers are for the most part still in the process of defining sustainability strategies, preparing for the implementation of reshoring projects or identifying ES-related measures. This is in line with Akhavan & Zvezdov (2019) and Lechler et al. (2020). Moreover, much of the discussion still revolves around price or costs rather than the actual contribution of effective ES-related measures. For example, this includes avoiding CO₂-emissions through less transport. This also correlates with the findings on the drivers and barriers of reshoring and ES, where cost-related aspects are also among the most frequently mentioned.

Conclusion

The issue of competitiveness covers four areas (*customers & expectations, infrastructure, made-in effect* and *pricing*). However, it appears that ES is not mentioned as a factor in creating competitive advantage, as it is not primarily aimed at reducing the firm's CO₂-emissions. This is being considered by *infrastructure* and the *made-in effect*. First, *infrastructure* aims to access environmentally sustainable resources such as renewable energy or technological innovations such as recycling systems. It is thus not only concerned with accessing qualified employees or urban infrastructure in terms of logistics. *Infrastructure* therefore deals with the environmental and economic dimension of sustainability alike. With regard to the *made-in effect*, AS make use of this approach to justify local manufacturing and it is thus rather directed towards social sustainability. It helps to position a supplier better vis-à-vis the OEM and to promote that products are manufactured locally where human rights, working conditions or compliance-related issues are considered.

It thus became apparent that sustainability in terms of the TBL plays an important role to establish competitive advantage. Nevertheless, since OEMs have high expectations with regard to CO₂-emissions and use this as a criterion for award decisions, achieving environmental targets can be more relevant than economic or social sustainability to strengthen competitiveness. On the one hand, CO₂-emissions are not only dependent on the location decision, but can also be considered independently of it (e.g. through sourcing, supply chain). On the other hand, it can be assumed that CO₂-emissions can be very high if manufacturing sites continue to be located abroad, supplier relationships extend across the entire world and supply chains become increasingly complex.

Beyond that, however, it should also be noted what ES means in the sense of higher competitiveness. This is particularly important, as there are divergent opinions within the cases. For instance, while A2 claims that local manufacturing sites and supply chains are relevant for achieving environmental goals, A3, in contrast, rather emphasises access to renewable energies. At the same time, E2 emphasises product-related characteristics, such as the use of sustainable packaging materials, which are not necessarily linked to a location decision. Overall, a much-differentiated picture emerges with regard to the assessment of competitiveness in terms of (environmental) sustainability. While some cases tend to take the firm perspective, other cases rather concentrate on the product.

With reference to the RBV theory, Di Mauro et al. (2018) argue that reshoring can also be encouraged by a firm's inability to exploit a host country's resources, which are required to establish competitive advantage. For instance, it emerges that AS tend to reverse previous offshoring decisions because they are not able to meet CO₂-targets or to collaborate with recycling providers, who are not available at offshore locations. It also shows that the "made-in" effect – as defined by Diamantopoulos et al. (2011) – does not apply to the AS sector. AS tend to use this effect to express that they preserve human rights or ensure fair working conditions. This is in contrast to Diamantopoulos et al. (2011) who argue that the made-in effect aims to strengthen brand positioning towards customers in B2C-markets such as fashion. More precisely, Robinson & Hsieh (2016) found that Burberry – an iconic British clothing brand – reshored its manufacturing activities back to the UK in order to strengthen brand positioning and the firm's focus on heritage. It emerges that location decisions of AS

can rather be explained by the inability of the firm to achieve its environmental or social targets with extant offshore locations.

Proposition 5: *To address sustainability across all three dimensions (TBL), automotive suppliers relocate their production sites to locations geographically closer to the customer to increase their competitive advantage.*

5.2.5 Success factors and lessons learned from reshoring

Literature has suggested that the importance of organisational learning from past offshoring and/or reshoring experiences is of high significance. Bals et al. (2016) have stressed “successful past implementation of such decisions provides a feedback loop into future-decision-making process” (p. 11). This is also in line with previous research from Gray et al. (2013) claiming that knowledge management is a critical element, especially when outsourced reshoring decisions are concerned. More recently, Gray et al. (2017) found that learning of previous experiences promotes a more effective location decision-making process. Kinkel (2012) adds “previous experience has a significant impact on recent production relocation activities [...]” (S. 710). Thus, Bals et al. (2016) suggested investigating the role of organisational learning on reshoring as this is interconnected with the implementation phase of the location decision.

Organisational Learning (OL) is an important theoretical framework underlying this research question. OL has gone through dramatic changes in the past years and has been first referenced to in 1963 by Cyert and March. OL is referred to “the study of the learning process of and within organizations [...]” (Easterby-Smith & Lyles, 2011, p. 3). The interviewees were asked on the level of success of the reshoring project, if the desired drivers were achieved and if there are any key lessons learned for future reshoring projects. Thus, the OL perspective is a quite valuable aspect to conduct an in-depth investigation on success factors and lessons learned of reshoring (cross-reference to Appendix 4).

The findings allowed the researcher to derive three important success factors: (i) *access to qualified and skilled employees*, (ii) *focus on the right strategy* and (iii) *understanding of*

environmental impacts. One of the main success factors in the context of reshoring projects raised was the former one *access to qualified and skilled employees*, which has been frequently mentioned across different cases (A1, C1, D1, F2 and I1). With reference to the identified drivers and barriers for reshoring and ES, the researcher found that *better access to qualified employees* is both one of the primary drivers and barriers in the category *strategic importance* (figure 11). Thus, it is no surprise that this is also mentioned as one of the success factors for reshoring. In particular, firms in the AS sector strive for qualified employees for two reasons. While one is rather directed towards a firm's operations to ensure that the plant works efficiently, the other one is related to a firm's attractiveness in the market and to win the right talents. It is notable that rather smaller AS (0.2 – 0.4 bn € revenue) have frequently mentioned these issues (C1, D1, F2). Thus, it is likely that larger firms in this industry are well known in the market from the perspective of a potential employee and thus do not need to mention this specifically. Following this reasoning, it also became apparent that bringing in external knowledge in terms of a top management position from an OEM is a measure carried out by AS. A likely explanation is that this person is well aware, for example, of the future sustainability requirements in the automotive industry and thus supports a supplier moving in this direction.

Similar to the driver *better access to qualified employees*, it was also important to look at the labour costs and the advantages related with it. It can be deduced that especially smaller suppliers with a relatively weak cost position must clearly weigh up the trade-off between qualified employees, who are able to understand and talk to the customer, and favourable wage cost, for example, in Eastern Europe (Poland, Hungary) in reshoring projects (C1, I1). It was found that it is quite a reshoring success factor to qualify current and new employees in the firm continuously (I1, I3). This also goes hand in hand with the findings from case A, where high-qualified employees are particularly important to keep production going (table 47).

Table 47: Findings to RQ1: Theme 7 'Success factors and lessons learned from reshoring' (Evidence 1)

Identifier	Quote
A1	[...] it has really emphasised the importance of having health and safety organisation and competent people across the world. And we have that, and this is one of the reasons to keep production going and to be able to manage these things effectively.

	I think that if you don't act as a company in a sensible and comprehensible way, but dismiss it, then I think you will not be able to win over certain talents [...]
C1	We had no illusions about it. And one knew relatively clearly that the wage cost advantage in the west of Poland, according to Wroclaw, is not so huge now, yes? On the other hand, we have built up a very, very stable, very good factory team there.
D1	This means that knowledge is not preserved, you have to rebuild it first, you have to hire colleagues for it and we also have the problem that the colleagues who started to build it up have knowledge in their individual areas, such as finance or sales, but nobody can really run a company.
	But what you do need is people on site who know the production process well, can think in production terms and are able to communicate this issue.
F2	And they must be close to the customer, or at least close to the people who talk to the customer. With increasing demands on technology and process reliability and other things, this is simply always a huge topic, which is also quite underestimated in this conversation with the customer. And finally, this makes it a bit easier for us, our new top management, one of whom was already a leader at [Organisation] and the other colleague also at Mercedes. They naturally bring this know-how to us. For them, it was already common practice and completely normal to think along these lines.
I1	And then, when I look at the Hungarian market here, which has an unemployment rate of two point X percent, it is incredibly difficult to get staff, incredibly difficult. In this respect, we have established a relatively good induction concept, at least in Europe. In other countries it has to get better. But in the end, all operators go through a training centre with us in three to four weeks, where they really learn the ropes, so to speak.
I3	For example. Or not even now, because the qualification is significantly higher. That's often a factor, too. I don't think it's a secret that we are already a benchmark in Germany, especially with our training system.

Source: Own illustration

The researcher found that (ii) *focus on the right strategy* is another success factor when it comes to location decisions. This is mainly characterised by two issues. First, when deciding on a location it is important for AS to evaluate if the firm is about to launch an entirely new location (greenfield) or to choose an existing plant (brownfield), which is likely to have considerable less ramp-up time to get the production started (D1). It is interesting that this finding is also in line with I3 who points to the importance that one must consider following both a brownfield approach and equipping the plant with qualified, experienced staff (table 48). However, it must be made clear that D1 in particular refers to the offshoring strategy of the firm and not to reshoring. Regardless of the offshoring strategy, it can be assumed that

the brownfield approach applies equally to reshoring, since the overarching goal is to ensure a firm’s production and on-time deliveries by having employees in place.

Table 48: Findings to RQ1: Theme 7 ‘Success factors and lessons learned from reshoring’ (Evidence 2)

Identifier	Quote
D1	The strategy should have been chosen differently, at the beginning the offshoring strategy. One should not have chosen a greenfield approach, but a brownfield approach. Because that's how you have the problem at the moment, of course, that you have to start from scratch.
I3	As a rule, you also go to locations or sites where you are already present. And not something that you build completely on a greenfield site and somehow pull up with completely inexperienced staff, but where you really say people already know what they are doing.

Source: Own illustration

Second, another strategy-related success factor is also in line with the requirement of having qualified and skilled people in place. It was found that both constantly observing market trends and listening to customers’ expectations are important aspects. It may be reasonable to decide on a location in terms of cost advantages, however, it is also important to consider specific market trends in the automotive industry (e.g. electric cars, autonomous driving) and to listen to the expectations of its customers. For instance, the car manufacturer Tesla is strongly committed to responsible sourcing of materials and requires its suppliers to provide evidence on sustainability practices in the supply chain (e.g. to determine the origin of raw materials) (Tesla, 2019). Thus, it is important to listen and understand the customer’s sustainability strategy, the expectations from an OEM’s suppliers and the products they are manufacturing globally or locally. Observing market trends, understanding sustainability requirements and listening to knowledgeable people (e.g. recruitment of managers from the OEM) is also expressed by case I (table 49).

Table 49: Findings to RQ1: Theme 7 ‘Success factors and lessons learned from reshoring’ (Evidence 3)

Identifier	Quote
I1	And that's why they are doing it massively. They [the new management team and recruitment of managers from OEM] know exactly what is going to happen in the next few years. And that's why I think it's great that we're starting early now. What does early mean, is always the question, what is early. But I would say that we should start well in advance to position ourselves accordingly.
I3	I think we could have saved ourselves many, many rounds of voting and argumentation, if we had really listened to the needs of the market at an earlier stage, or if we had taken this into

account, which are already clearly (...) or more strongly related to the topic of sustainability than I personally expected.

Source: Own illustration

The third success factor for reshoring is directed to understand the environmental impacts of the firm and its supply chain. It is important to understand both where a firm can influence the CO₂-footprint and which information is already available (table 50). This procedure is referred to a Life Cycle Assessment (LCA). “LCA is applied in various cases to: 1) identify the environmental hotspots in the studied system or/and 2) compare the environmental impacts of different alternatives that can be applied [...] to achieve the same function” (Dong, et al., 2018, p. 36). “LCA may thus facilitate a better informed decision process” (p. 33). In accordance with Dong et al. (2018), it is interesting that A3 mentions both the relevance of conducting an LCA and preparing the decision-making process. Even if this is only addressed by an individual case, it can be assumed that an LCA is nevertheless of high importance to identify CO₂-hotspots in the firm’s operations (e.g. production, energy) or across the supply chain (e.g. logistics).

Table 50: Findings to RQ1: Theme 7 ‘Success factors and lessons learned from reshoring’ (Evidence 4)

Identifier	Quote
A3	No, topic like that but more generally, it’s very important to understand your environmental footprint as a corporation including your supply chain. Of cour/, - and you have to understand who’s able to influence that footprint and what information they need for it. And really try and develop things for the decision makers that makes sense, that is not too complex as well to tailor your studies for the decision

Source: Own illustration

Conclusion

AS perceive (i) *access to qualified and skilled employees*, (ii) *focus on the right strategy* and (iii) *understanding of environmental impacts* as success factors when reshoring. These success factors are closely tied to the discussion of the drivers and barriers in section 5.2.2. Accordingly, it seems that there is a large overlap between the drivers and the success factors. It is also likely that the majority of firms have mainly been involved in offshoring in the past and that reshoring is a comparatively new phenomenon. It can therefore be assumed that the interviewees do not fully know the success factors and mix up success factors with drivers.

This may be because they have either not been in the firm long enough or have only accompanied the project selectively and are therefore not informed about all factors. With respect to section 5.2.2, the drivers have revealed that *qualified personnel*, *efficiency reasons*, *customer proximity*, *CO₂-impact* and *cost issues* are among the top drivers for reshoring. Particularly *efficiency reasons* and *customer proximity* as the ability to respond quickly to customer demands as well as to keep *costs* low appear to be the most important success factors and drivers when it comes to location decisions. Since access to qualified and skilled employees was mentioned as both a driver and a success factor, the following proposition can be derived:

Proposition 6: *Without the certainty that highly qualified and skilled employees are available at the future location close to the OEM, AS do not seek a reshoring location decision.*

5.3 RQ2: Integration of ES in reshoring decision-making processes

This section addresses the findings to research question two. Four themes were derived to explore the second research question (table 51). The researcher begins with the contextualisation of how reshoring and ES are embedded in the organisation and which responsibilities are associated with these roles. What follows is an investigation of the actual reshoring process and corresponding decision-making criteria. Lastly, the researcher derives the conceptual model for a holistic reshoring and ES decision-making process. Every theme in this section is being summarised with a conclusion and a proposition.

Table 51: Identified themes related to RQ2

Topics & research questions	No.	Themes	Sections
3. Integration of ES in reshoring decision-making	8	Embedment of reshoring and ES in the organisational structure	5.3.1
	9	Decision criteria for reshoring and ES	5.3.2
	10	Reshoring process and consideration of ES	5.3.3
	11	Conceptual model for a reshoring decision-making process	5.3.4

Source: Own illustration

5.3.1 Embedment of reshoring and ES in the organisational structure

In the course of the literature review, the researcher did not find any in-depth studies on how reshoring and ES are embedded in the organisational structure, although this is an important feature to understand the decision-making process. There is only some nascent research from Orzes & Sarkis (2019) claiming that the relationship between reshoring and ES is relatively unexplored. They call for an examination at all levels in the organisation of how firms consider ES when implementing reshoring. Consequently, the researcher seeks to explore the question of which departments are involved in the reshoring process, which roles and responsibilities they entail and how these functions interact with each other.

5.3.1.1 Organisational structure

This section is divided into two parts. First, the researcher explores the organisational structure of the cases. The aim is to investigate where in the organisation decisions are made

and which relevance is being attributed to reshoring and ES. Table 52 provides a detailed overview of the roles and responsibilities involved. By comparing the cases with each other, the researcher was able to summarise the responses according to the involved departments. Second, the researcher develops a framework to classify the findings from this study in a conceptual model. These findings contribute to the growing body of literature to understand reshoring decision-making.

Table 52: Involved parties and departments in reshoring decision-making process

Involved departments	A	B	C	D	E	F	G	H	I
1. Decision-making levels									
CEO, CFO, Managing Director		X	X		X	X	X		X
Strategic Plant Development							X		
Head of Business Unit			X				X	X	X
Production Director/ Group Manufacturing Director	X	X							
Sustainability Director	X								
2. Decision-support teams (direct functions)									
Logistics Manager			X				X		
Production Manager		X					X		
3. Decision-support teams (indirect functions)									
EHS Manager (Environment, Health & Safety)	X		X			X ⁶			
Investment & Finance	X								
Legal, Tax & Controlling							X		
Sales & Regional Sales Manager	X		X			X		X	
Sustainability Manager		X		X ¹		X ⁵	X ⁷	X	X ⁸
Operational Excellence Team		X				X	X		
Process Development Manager			X						
Energy Management				X ³	X				
Purchasing Manager						X	X		X ⁹
Works Council & CSR-Team (Corporate Social Responsibility)				X	X ²				
4. Regions									
Future Plant Manager			X						
Site Representatives				X		X			
5. Reshoring Project Management									
Relocation Coordinator	X								X
Group Project Team	X								
Centre of Excellence					X ⁴				

Source: Own illustration

1 Sustainability Manager is rather concerned with audit-relevant topics; 2 Sustainability is integrated in the Works Council & CSR-Team; 3 Energy Management is reflected in a so-called 'Centre of Excellence', which is a strategic unit comprising of process, quality or IT-knowhow; 4 'Centre of Excellence' is anchored on C-level; 5 Sustainability Manager is anchored

on C-level; 6 EHS Manager also takes care of sustainability; 7 Sustainability Manager is not part of the process, he is involved on demand; 8 Role of Sustainability Manager is envisaged, but not yet established; 9 Currently working on this role and to revise its job description (e.g. to extend its responsibility across the whole supply chain)

Involved departments

It is notable that each firm puts together its teams quite heterogeneously with functions ranging from the C-level through indirect and direct areas until the plant managers or site representatives itself. What can be concluded is that reshoring is a quite cross-functional topic and extends across the whole organisation. Regardless of the size of the firm or the reshoring project (e.g. from Korea to Spain), the teams are put together completely differently. While some firms have distributed this on quality on procurement only (case F), others such as case E have established a *Center of Excellence* or case G has a variety of functions involved (quality, procurement, logistics, legal, tax, supply chain, production, etc.). What can be derived from these observations is that these firms usually do not employ a dedicated employee (e.g. a Reshoring Manager) who is in charge of it (table 53).

Table 53: Findings to RQ2: Theme 8 ‘Embedment of reshoring and ES in the organisational structure’ (Evidence: 1)

Identifier	Quote
C1	Let's start with the hierarchies. So actually until the CEO and CFO. These projects always had both managing directors on the steering committee. So it was the CEO, the CFO. And were also regularly reported on in the advisory board. So that had a very high visibility, yes, and was an important part of it. And actually, the project team always included an experienced manager, and the project team was then composed of people from various areas. That is, from parts of the product or, I would say, process development to sales people, operational managers or, I would say, second tier in part. In other words, a deputy logistics manager from one location was responsible for the corresponding part of the project. Actually, as soon as you had him, the future plant manager was always given an important role in the project.
D2	It is suspended in the management and is broken down accordingly. This means that it is broken down into the individual areas, be it energy management, for example, or via the works council, if we now take the social component, via the human resources department.
E1	We have a CSR Council, where we have integrated the sustainability efforts we have, where we have integrated them, where managing is quasi part of the Council. Energy management is such that it reports to a so-called Center of Excellence. The Center of Excellence is a strategic unit [...] So location issues are of course in such a small company as we are, are absolutely then in my area of responsibility.
F2	The location strategy is, of course, a cross-group issue.
F1	R: What about sustainability? Is there an organizational unit or a Head of Sustainability? I: No therefore no. We have distributed this on our two shoulders: quality and procurement.

	And on top of that is my boss, the CEO of the [name of mother company anonymised], and next to him is a strategic buyer and a strategic operations person. And this strategic operations person is basically responsible for ensuring that the various production plants, that they fit together technologically, that they are correctly aligned for the future.
G2	R: Which other organisational units or colleagues are basically still involved? So production, logistics, procurement, sustainability team, can you say a little bit about who is involved? Legal and tax, controlling, purchasing. Purchasing is a major topic. The supply chains there, of course, when I talk about in-house production [...]. The purchasing department is very much involved in that. The business unit is a kind of merger of product management and development, which gives us input from the market where we need to act. Yes, law and taxes is a bigger issue at the beginning. But that fits in well, the ones you mentioned before are of course an integral part of it.
I3	That is rather the demand or a cross-cutting issue, yes

Source: Own illustration

It is also valuable to highlight that a significantly larger variance of indirect areas is involved in the reshoring and decision-making process. Surprisingly, the direct areas, such as production or logistics, which have to implement the reshoring project operationally, are comparatively less involved. There is only B1 who stresses that they have a Production Director involved. Following this reasoning, it can be deduced that there is possibly a significantly greater focus on the preparation of the decision and documents (e.g. business case calculation, scenario development, site selection), which is carried out by the indirect areas (A2). It is worth highlighting that some firms are still in the process of assigning tasks to new employees – whether present in the organisation or not – to cope with the increasing demands of reshoring and ES tasks (G2). Lastly, although nearly every firm claims that reshoring and ES are strategic topics and need to be managed by the C-Level, it is not always organised in such that decision-entitled managers are involved (table 54).

Table 54: Findings to RQ2: Theme 8 ‘Embedment of reshoring and ES in the organisational structure’ (Evidence: 2)

Identifier	Quote
A2	To give an example there, what we want to support with is then to understand what is the current impact with the current setup, let's say, with the current location. Then, we investigate if we change now to another location what of those processes from a lifecycle perspective will be impacted by that change and in what way and then we try and model that.
B1	[...] make sure that we have a solid decision support material so that these things are really taken into account that is a good achievement that it becomes part of the decision. [...] so that the very last decision can then be made by the management board or the corresponding production director with veto rights.

G2	We are currently undergoing a restructuring process in that there is one person responsible for strategic plant development. So that will be a new employee only from 1.1.21, who will only be responsible for the topic
I1	<p>So maybe the question in advance: is there already someone at [organisation] who is called Head of Sustainability?</p> <p>I: Yes, we are currently working on it, but we still have to wait for the concept, we have just completed a relatively large transformation at [Organisation] Automotive.</p>

Source: Own illustration

As far as the whole dimension of sustainability is concerned, it became apparent that this function is not that much represented yet as it is described by the participants. The composition of the functions involved in the reshoring process rather consists of ones such as logistics, finance, controlling or purchasing. This is also in line with the participants' statements that sustainability still plays a subordinate role and that the focus is more on economic considerations (e.g. price- and cost-related factors). For instance, there is only one firm with a Sustainability Director, who is allowed to make reshoring-related decisions. Although sustainability per se is considered an important topic, it is not yet anchored organisationally in any firm (I1, G2). Nevertheless, it must be emphasised that at least Sustainability Managers at middle management level are present in six of nine reshoring cases. It can be deduced that firms are more inclined to fill the operational role of a Sustainability Manager in the middle management first before filling a position on board level. Following this reasoning, firms are more interested in implementing ES-related tasks in terms of a team rather than having a decision-entitled manager. A C-level manager would also receive a higher salary and therefore have an impact on the cost structure. Furthermore, the works council or a CSR council in the organisational structure also reflect the importance of the social dimension of sustainability mentioned in the interviews (table 55).

Table 55: Findings to RQ2: Theme 8 'Embedment of reshoring and ES in the organisational structure' (Evidence: 3)

Identifier	Quote
I1	We have set up a strategy department and in this strategy department there is a separate group that only deals with CS. So, there it is definitely part of it. And we want to extend that to our suppliers as well. But you have to be honest, it's really in its infancy for us, so to speak. A structure has now been created.
A2	We have for many years had a very small sustainability staff, like a group sustainability function with just a few people with the responsibility to oversee targets and strategies but also with the ambition to fully integrate the actual work into the operations we want sustainability to be fully integrated in purchasing product development

Source: Own illustration

Decision-making levels

It was found that no studies are available with in-depth insights on reshoring decision-making and on which level in the firm these decisions are being made. Consequently, the interviewees were asked to contribute with information on how this is being reflected at AS. With the exception of cases A and H, there was a general consensus among the interviewees that reshoring decisions – regardless of the extent to which ES is taken into account – are made very high up in the organisation. This means that the top management board makes the location decisions and is in charge of reshoring. According to table 56, ES responsibilities or functions are usually not involved in the decision-making process. In cases A and H, location decisions are not made by the CEO, but by the Sustainability Director or the Department Head. This is one level below the CEO. This can possibly be attributed to the fact that these firms are relatively large AS (8 and 12 bn € revenue respectively). It can be assumed that the CEO of the company has given procuration to his subordinates in order to be able to make such location decisions one level below the C-level (e.g. Group Manufacturing Director; A3 or Regional Sales Manager; H1).

Table 56: Findings to RQ2: Theme 8 'Embedment of reshoring and ES in the organisational structure' (Evidence: 4)

Identifier	Quote
A3	And there are several cluster managers of course reporting to the group manufacturing director who have the ultimate decision.
A1	[...] when we take a decision to go to a particular direction there is obviously investment around that...and...that is approved in...when proposals are made...on a very high level
B1	And then you have to say that at the end of the day, top management sometimes also makes decisions that lie outside of these scorecards because they have another information horizon,

	so that the very last decision can then be made by the management board or the corresponding production director with veto rights.
C1	And this department provided the input for this selection and, I would say, for the evaluation. But that was then actually decided upon later by the management.
E1	So location issues are of course in such a small company as we are, are absolutely then in my area of responsibility.
F2	In other words, there is a responsible person in the group to get back to the question, yes, whenever we think of a topic, we quickly invent the appropriate responsibility. In two thirds of the cases this ends up with me
H1	So involved in the decision, that depends a little bit on it, but as a rule they are the regional sales manager. In principle, this is one level below management
I3	Well, these are decisions that are not aimed at short-term profit maximisation or anything else, but really intervene in the structure of my company and in the final analysis, this is done by the family [person] with the corresponding supervisory board members.

Source: Own illustration

5.3.1.2 Roles, responsibilities and positioning in the firm

In order to understand how the reshoring and sustainability departments – if there is one – are anchored in the organisation, the researcher investigated how they are positioned internally and which roles and responsibilities are associated with these departments. Although some attempts have been made to address the organisational issues of reshoring and ES, the literature review has shown that a complete picture of the extent is still lacking. Previous research typically only investigated the phenomenon of reshoring with regard to ES on a higher level. Research findings on roles, responsibilities or its position in the firm are still lacking. In the course of this section, the researcher initially explains the findings for reshoring and in the second step on ES.

Responsibilities and role in the firm for reshoring

After rigorous investigation, it was discovered that with the exception of cases G and I, in none of the cases studied for this thesis is a reshoring department set up as such that it deals exclusively with reshoring and is staffed with several employees. It is not possible to compare the cases simply with each other either as they have different roles and responsibilities assigned to reshoring. Moreover, each case is also in a different phase, as reflected in cases G and I. For instance, case G, on the one hand, has just accomplished an internal restructuring project and has recognised the need for a new function, which is called *Strategic Plant Development*. This position was filled on 01.01.2021 in order to meet the increasing tasks

that arise with reshoring. On the other hand, case I seems to be most advanced, as there is already a *Relocation Coordinator* in place, who is responsible to manage reshoring projects (table 57).

Table 57: Findings to RQ2: Theme 8 ‘Embedment of reshoring and ES in the organisational structure’ (Evidence: 5)

Identifier	Quote
G2	We are currently undergoing a restructuring process in that there is one person responsible for strategic plant development. So that will be a new employee only from 1.1.21, who will only be responsible for the topic
I1	That is why we have actually institutionalised this. We have relocation coordinators.

Source: Own illustration

By carefully examining the data across all cases, it was found that there are firm-specific job titles for the role of reshoring (e.g. Cluster Manager, Global Project Management or Strategic Operations) and different perceptions across the interviewees of the tasks associated with reshoring. This is applicable to all cases except G and I. Thus, the researcher found that these roles are concerned with a variety of tasks and that this differs across the cases. This ranges from rather broad global project management-related tasks to specific ones for a reshoring project. More specifically, this can be related to deciding which plants are selected to be repatriated (C1), building up reshoring models and potential scenarios (E2), ensuring that plants fit together technologically and that they are correctly aligned for the future (F1) or that capacities in the production network are homogeneously distributed (I1). In summary, however, it can be derived that every firm deals with reshoring in a different way. A likely explanation for this development is that these firms are still all different in terms of their structure or their roles and responsibilities per se even if they all belong to the AS sector. Another possible explanation is that all firms have made different reshoring experiences in the past, which have resulted in a different way to deal with it (table 58). Furthermore, it is also possible that reshoring decisions have required the involvement of different departments to a greater or lesser extent due to the different countries and shifts of manufacturing sites (from...to...), environmental factors or regional circumstances. This would explain why in some cases the CEO is personally responsible for this (E1) or why in other firms there is a separate department (A3, C1, F1, G2, I1).

Table 58: Findings to RQ2: Theme 8 'Embedment of reshoring and ES in the organisational structure' (Evidence: 6)

Identifier	Quote
A3	And where to produce, how to change the manufacturing footprint and so on is in that cluster manager's responsibility. And there are several cluster managers of course reporting to the group manufacturing director who have the ultimate decision
C1	So for offshoring and reshoring: yes. That we, we were basically building up an area called Global Project Management, where it was actually about managing large global projects
E1	So location issues are of course in such a small company as we are, are absolutely then in my area of responsibility (<i>interview with the CEO of the firm</i>)
F1	And this strategic operations person is basically responsible for ensuring that the various production plants, that they fit together technologically, that they are correctly aligned for the future
G2	We are currently undergoing a restructuring process in that there is one person responsible for strategic plant development. So that will be a new employee only from 1.1.21, who will only be responsible for the topic
I1	That is why we have actually institutionalised this. We have relocation coordinators. But yes, we do have colleagues there who are only concerned with this issue in order to ensure a relatively homogeneous capacity utilisation in the majority of the production network.

Source: Own illustration

One of the most important findings relates to reshoring being attached to the production and operations department. This became clear in nearly all cases insofar the CEO is not directly responsible for it. It is notable that ES is either not addressed at all by the participants or expressed that ES needs to be better integrated, for example, in purchasing, product development or the operations department. For instance, A3 specifically mentioned that the one responsible for EHS works closely together with the Cluster Manager on the reshoring project while A2 goes on to say that they have the ambition to integrate sustainability in the firm's operations. Besides case A, another exception is case B where B1 mentioned that there are different Sustainability Managers attached to the production and thus to a potential reshoring project, however, this is the only two cases where ES became apparent. In the remaining cases, ES integration is still in its infancy or addresses other issues such as to ensure supply chain stability or stability across the production sites (C1) (table 59).

Table 59: Findings to RQ2: Theme 8 'Embedment of reshoring and ES in the organisational structure' (Evidence: 7)

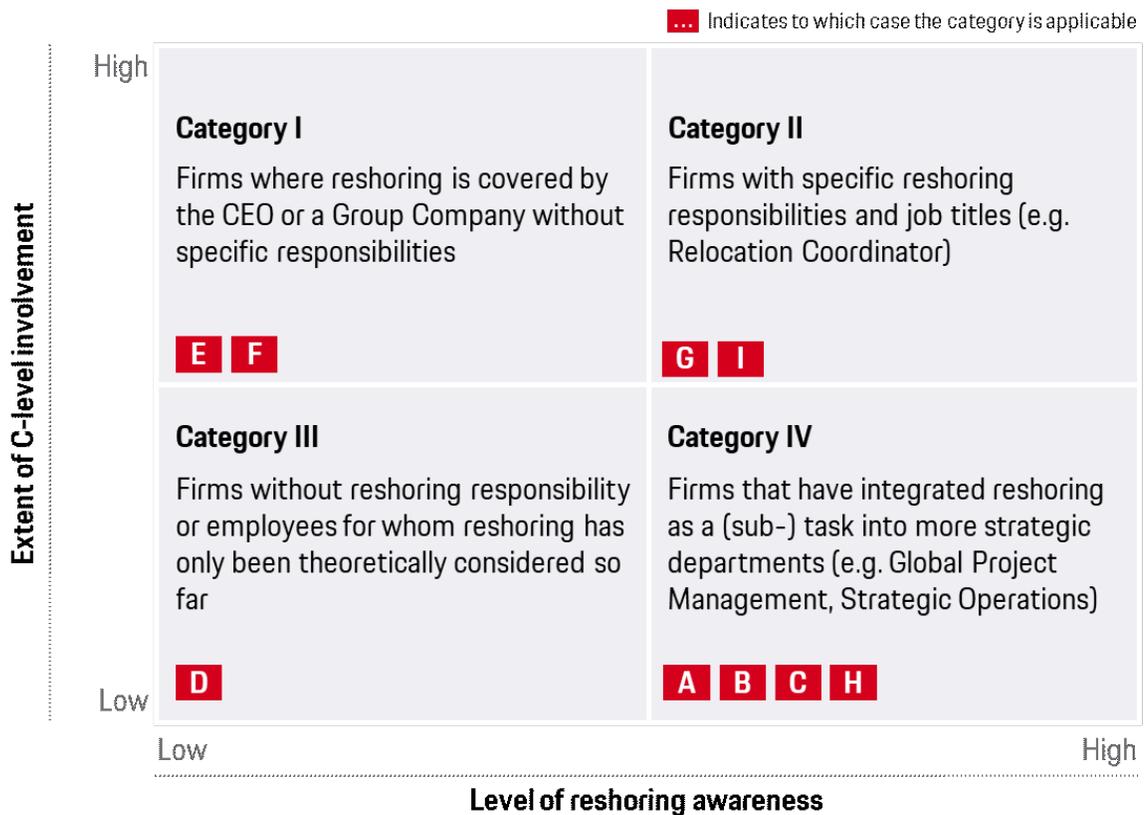
Identifier	Quote
A3	And there are several cluster managers of course reporting to the group manufacturing director who have the ultimate decision.
A2	[...] we have one big part of the organisation which manages the operations, basically all the manufacturing.

	[...] just a few people with the responsibility to oversee targets and strategies but also with the ambition to fully integrate the actual work into the operations we want sustainability to be fully integrated in purchasing product development, the operations
B1	There are different sustainability managers and there is an "Operational Excellence" department, which is also attached to the production
C1	[...] on the subject of environmental sustainability/ but that was, I would say, more about, as I said, the issue of stability of the supply chain/ as well as stability of the sites

Source: Own illustration

In conclusion, the researcher found that four types of firms can be distinguished and developed a conceptual model to classify the findings (figure 13):

Figure 13: Differentiation of cases how reshoring is treated internally



Source: Own illustration

For the majority of reshoring cases in this thesis, category (iv) is applicable, in which reshoring is rather considered as a (sub-) task or is established as part of an existing department. As far as this data is concerned, with the exception of case C, this category

includes firms that tend to have a comparatively larger revenue per year (€ 4.7-12 billion revenue). These firms are also characterised by a large organisation in terms of the variety of departments and the depth of issues they are exposed to. Because of the size of these firms, the involvement of the C-level is rather low. Executing the decision, for instance, is delegated to the Group Manufacturing Director, who is responsible for the coordination of the production network: “And where to produce, how to change the manufacturing footprint and so on is in that cluster manager’s responsibility. And there are several cluster managers of course reporting to the group manufacturing director who have the ultimate decision” (A3).

Responsibilities and role in the firm for ES

As far as the responsibilities and the role in the firm for ES is concerned, the researcher found that the firms examined for this thesis deal with ES quite differently. By carefully investigating the nine reshoring cases, the researcher was able to investigate the cases with regard to the role of ES and corresponding responsibilities in the firm. The result from the investigation suggests that three types of firms can be distinguished in terms of how ES is being anchored and positioned internally (figure 14).

Figure 14: Three-level classification of ES’s role and responsibilities in the firm

	A B G I	C E F H	D
	ES is well integrated and part of the decision	ES is not yet established, but first tasks are being carried out	ES is not considered yet in the organisational structure
Tasks with relevance for reshoring	<ul style="list-style-type: none"> Identify KPIs and targets in discussion with top management Understand the environmental impact a location has (e.g. CO₂-emissions) Conduct a lifecycle assessment to examine a firm’s or product’s CO₂-emissions Analyse internal processes with outsourcing potential Evaluate raw material sourcing and corresponding energy intensity Evaluate the location and transportation distances to tier 1-2 suppliers Examine the potential by switching to green energy and to equip all (new) plants with photovoltaics 	<ul style="list-style-type: none"> Understand local legislative requirements (e.g. which annual CO₂-targets are expected) Develop a future-proof sustainability strategy with regard to the manufacturing footprint Assess the opportunity to reduce CO₂-emissions while reshoring Consider CSR-issues (e.g. comply with human rights in the supply chain, ensure employment) 	<ul style="list-style-type: none"> Understand the expectations a customer has with regard to reshoring and ES
Tasks rather w/o relevance for reshoring	<ul style="list-style-type: none"> Investigate the potential to re-use materials (Circular Economy) Understand requirements for certification and audit-processes at new locations 	<ul style="list-style-type: none"> Optimise internal processes to avoid waste, act more efficient or make use of renewable materials at the new location 	<ul style="list-style-type: none"> Evaluate the impact reshoring has on the price of a product or on cost advantages
Results	Provide solid decision support material in terms of models and scenarios for the new manufacturing locations	Provide an initial evaluation of the impact the locational change has on ES	Become familiar with relocating a manufacturing site and the potential to make ES improvements

Source: Own illustration

The first type of firms have ES reflected in their organisational structure with a Sustainability Director or Head of Sustainability next to the C-level and a corresponding team. They specifically deal with ES questions and challenges and are responsible for preparing models and scenarios for the final location decision. This is applicable to cases A, B, G and I.

The second type of firms is applicable to another group of cases C, E, F and H where an *Environmental Team* is established. In contrast to the first type, the questions they are dealing with are rather related to assess legislative elements (e.g. local CO₂-requirements in a new region) or ensure stability in the supply chain or the production network. This means that the actual ES tasks tend not to be carried out and that other issues are associated with them. As far as this type is concerned, a reshoring decision would be done regardless of the input these teams provide. The tasks and the results these teams provide are still in its infancy. In addition, these teams extend across the whole firm and can be covered by the purchasing, quality or production department.

The third type expresses that ES is neither considered in the firm nor foreseen as a role in the organisational structure. As far as reshoring decisions are concerned, the C-level still makes location decisions regardless of ES impacts. Firms of this type are more concerned with the increasing demands of their customers, dealing with economic issues (e.g. cost and price pressure) and are usually smaller Tier-2/-3 suppliers at the end of the supply chain with weaker negotiation power. This finding also correlates with the results from the previous section shown in figure 13, where case D has no role for reshoring either and confirms that rising pressures from OEMs and other Tier-1 suppliers are dominating. Case D is also considered as Tier-2/-3 supplier and stresses that “it is simply broken down to us [...] that is the disadvantage with us, we are at the end of the rat tail” (table 60).

Table 60: Findings to RQ2: Theme 8 ‘Embedment of reshoring and ES in the organisational structure’ (Evidence: 8)

Identifier	Quote
D2	The difficulty is that we also have to price the product in line with the market, and that is where desire and reality end. That means we simply have to think in cost-optimised terms, and that does not necessarily mean the most sustainable supplier, but the supplier who offers sustainability plus a good price. There is a current topic, which I believe has also been in the media, that Daimler is also demanding that its suppliers be completely green for 2038, i.e. CO ₂ -neutral. And this of course puts pressure on all suppliers [...]

The Tier-1 is being looked at, yes. However, Tier-1 is often so large that OEMs cannot pull the big levers. It is simply broken down to us, so you have to do it. There is no discussion. So that is the disadvantage with us, we are at the end of the rat tail.

Source: Own illustration

Among cases A, D and E it became clear that compliance with certification and audit-processes is an important issue in the automotive industry. This is a strict requirement in the automotive industry as A3, D1 and E1 are referring to the IATF (International Automotive Task Force) and ISO (International Organisation for Standardisation) standards (table 61). According to the TÜV SÜD (2020), IATF specifies the requirements of quality systems (e.g. product safety, risk management, management of sub-suppliers), which also has implications on reshoring and ES decisions.

What still needs to be critically assessed, however, are the following three aspects. First, in line with cases A and B from the first group, case H would also need to be looked at again in more detail, as it is of a similar magnitude in terms of annual revenue compared to the other cases (case A: 8 bn €; case B: 4.7 bn €; case H: 12 bn €). One could assume that especially large AS (Tier-1) are exposed to enormous pressure from OEMs in terms of sustainability and have therefore already integrated ES into their corporate decisions. However, in case D (Tier-2/-3), the situation is that the OEM's pressure is passed along the value chain via the Tier-1 AS. It can be assumed that Tier-1 AS are exposed to the pressure of the OEM and Tier-2/-3 in turn to the pressure of the Tier-1 AS. However, in order to ensure the anonymity of the participant and the firm, the analysis will deliberately not go into greater depth.

Second, it must also be critically considered that the tasks mentioned in figure 14 with or without relevance for reshoring are not comprehensive. Since this thesis concentrates on the environmental dimension of sustainability, the social and economic aspects have not been entirely explored.

Third, looking more closely at the individual responsibilities, it became apparent that ES does not only deal with the issue of CO₂-emissions, but has a much broader scope. In this sense, the cross-functional part of sustainability and ES in particular becomes clear, that it is not only concerned with energy efficiency and CO₂-emissions, but also with the evaluation of

transport distances, legal effects in a certain country or the procurement of renewable raw materials (table 61). At the same time, this also highlights the range of issues and complexity associated with a reshoring decision.

Table 61: Findings to RQ2: Theme 8 'Embedment of reshoring and ES in the organisational structure' (Evidence: 9)

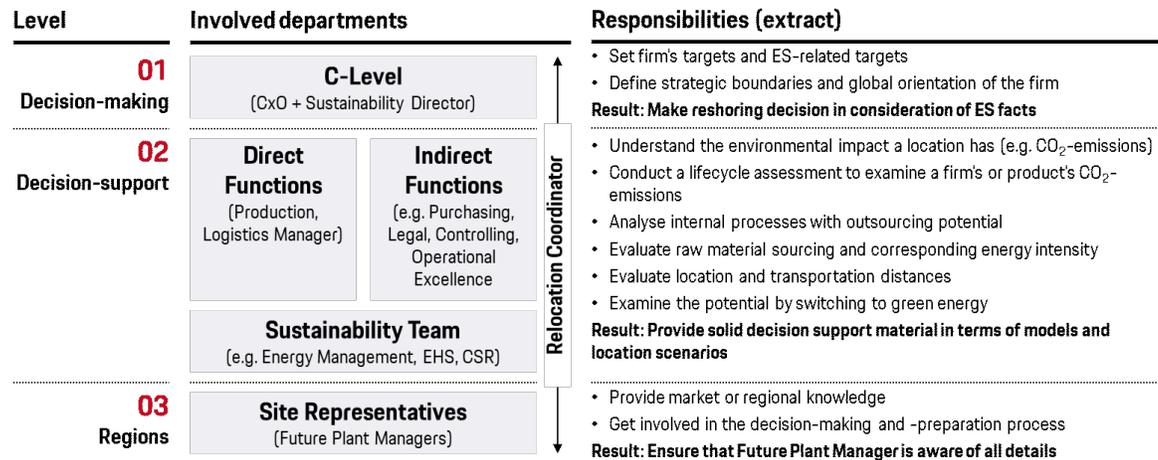
Identifier	Quote
A2	<p>We have for many years had a very small sustainability staff, like a group sustainability function with just a few people with the responsibility to oversee targets and strategies but also with the ambition to fully integrate the actual work into the operations.</p> <p>To give an example there, what we want to support with is then to understand what is the current impact with the current setup, let's say, with the current location. So, looking where is the customer? So basically taking a lifecycle approach to it. What is the customer application? Where is it used? How do we manufacture it? What are the processes we do in-house? What are the processes that are outsourced? What components do we buy? Where are the suppliers located? Where are the tier two suppliers to us located? We basically model that.</p> <p>I think, from my perspective if we as a step one just can make sure that we have a solid decision support material so that these things are really taken into account that is a good achievement that it becomes part of the decision.</p>
A3	<p>Yes. We have a sustainability director. But each cluster, I think every cluster has a EHS responsible and that person usually takes the question of environmental sustainability. Along with all the other EHS questions. And that is the person that would contact me to start working on a case, or get some facts, or have questions [...]</p> <p>Do we have a ISO 50001 certificate? ISO 14000 environmental certificates? Really hard facts. What is the company reporting in their annual report, what is the official data? Does it match this? Kind of the hard facts on that, and that they're audited as well.</p>
B1	<p>There are different sustainability managers and there is an "Operational Excellence" department, which is also attached to the production area</p> <p>Then there was an area that was more or less concerned with the environment, but then more with, I would say, the legislative elements.</p>
C1	<p>There is also a point like that or there was a point there where, on the subject of environmental sustainability/ but that was, I would say, more about, as I said, the issue of stability of the supply chain/ as well as stability of the sites that were chosen.</p> <p>[...] had no central role and therefore no central function really in the corporate hierarchy or in the corporate structure. For this reason, they did not have this area explicitly represented.</p>
D1	<p>For the topic of sustainability, we have, I'll call it that, named people who naturally deal with audit-relevant topics, which are correspondingly high in the automotive industry and especially through the introduction of IATF and ISO</p>
D2	<p>We have site representatives for them, who take care of the certification process accordingly</p> <p>So we don't have an individual person, I would say. So there is no such Head of Sustainability yet</p>

E1	Of course, we also have an energy management according to the ISO certifications. This means that these are topics that are always important to us, that also has promotional aspects and so on, but has been treated rather negatively in the past.
	Unfortunately we do not have that yet. We have a CSR Council, where we have integrated the sustainability efforts we have, where we have integrated them, where managing is quasi part of the Council.
F2	So in this respect we are now moving towards sustainability, which will be more expensive, but we also want a certain sustainability. For example, in one of our plants we have to cover the rest with our own electricity
	So what would be important in any case is that the applicable environmental guidelines are observed, that the corresponding environmental audits are also available.
G1	Well, the topic is present, for a long time it was dismissed to some extent, according to the motto: We are already doing a lot. Yes, we are certified according to ISO 50001 energy management. Yes, resource efficiency topics are played continuously
	And for us, this always means refinement, where you have to constantly look and see what material resources I need for my products and where can I leave out something that is actually completely unnecessary or oversized?
H1	So sustainability is now thinking more in this direction, naturally also ecologically with transport times, with less CO ₂ -emissions. We are now aligning our locations accordingly: We will no longer construct a new building without photovoltaics on the roof.

Source: Own illustration

In conclusion, with reference to the findings related to the question to what extent reshoring and ES are integrated in the organisational structure and how they are perceived among the participants, the researcher was able to derive a theoretical framework (figure 15). This framework suggests how reshoring and ES can be combined with each other. This integrative framework is based on a synthesis of the statements from all the cases the researcher has explored. The findings of all cases were taken into account (*best practices*), so to speak, in order to be able to depict as complete a picture as possible of the organisational structure for reshoring and ES. Thus, from an organisational perspective, this framework aims towards a common and equal consideration of reshoring and ES in the firm and across its manufacturing sites, which are selected to be brought back from their offshore locations. With respect to the findings from figure 13 and 14, it was discovered that all firms in this study positioned themselves quite differently with both reshoring and ES. The discussion leads to the development of the following theoretical framework:

Figure 15: Theoretical framework of the organisational structure for the decision-making process



Source: Own illustration

This theoretical framework extends across three levels and suggests that reshoring and ES must be attributed the same relevance. Concerning *Level 1: Decision-making*, the findings expressed that location decisions are not always made by the C-level, but also, for example, by the Group Manufacturing Director, although ES is not always a leading driver. The framework suggests that decisions are still being done by the C-level, however, the one responsible for sustainability in the firm must be part of the decision. With regard to *Level 2: Decision-support*, cases A, B, G and I revealed that much of the responsibilities are associated with preparing the location decision. Especially from an environmental perspective, there are many different issues to examine (e.g. LCA, CO₂-emissions, energy intensity, sourcing and origin of raw materials). In this sense, while the responsibilities for reshoring are being covered by the direct and indirect functions in the organisation, ES is rather a cross-functional topic. According to this framework, ES is thus perceived as an enabler or support function to prepare solid decision material and to work together with all functions quite closely. *Level 3: Regions* is closely related to the findings from cases C and D, where they have employed site representatives and thus involved the future plant manager already. Lastly, what became apparent from the analysis and the findings is that in most of the cases there is no department completely responsible for the reshoring project. Consequently, this framework proposes a Relocation Coordinator who is responsible for managing the reshoring project and the individual parties and ensuring that the decision is thoroughly and carefully prepared.

Conclusion

With respect to the embedment of reshoring and ES, the researcher was able to contribute to a research gap raised by Orzes & Sarkis (2019) calling for more research at all levels in the organisation. Findings of this section span three overarching topics: (i) *involved departments*, (ii) *decision-making levels* and (iii) *responsibilities and role in the firm*. As far as the *involved departments* are concerned, every firm puts together its teams quite differently. While reshoring and ES extend through the whole organisation, every firm puts different emphasis on the functions involved. While some primarily deal with operations, finance and sales to examine and prepare the location decision, others have functions involved, which are usually higher in the organisation (e.g. C-level, Strategic Plant Development). It is also quite a surprise that the majority of firms in this industry do not employ a reshoring manager or alike. It may therefore be that firms have either not yet recognised the need or do not have the right people to fill these positions. Due to the complex tasks associated with reshoring and the novelty of ES, it might cause uncertainties for firms in dealing with such decisions as well. Regarding the latter, it was also noted that some firms have a sustainability manager, but in most cases, this manager is not involved in the process or confronted with other issues (e.g. audits according to ISO standards). Accordingly, some firms may involve decision-entitled people directly, while others involve as many functions as possible to examine the location decision.

Second, concerning the *decision-making levels*, it was found that location decisions are anchored high up in the organisation and usually being carried out by the top management team. What must be considered critically, however, is the interdependence between reshoring and ES. While decisions are made at top management level, it often seems that the sustainability manager is not involved despite the rising importance of sustainability in this industry. What must be noted is that sustainability plays a subordinate role and that there is a lack of internal integration with other departments in the decision-making process.

Third, with regard to the *responsibilities of reshoring and ES as well as the role in the firm*, not all firms in this study have established yet reshoring departments and thus deal with reshoring differently. According to figure 13, it can be concluded that it is not necessary to have a dedicated reshoring department as the majority of cases from this study have

integrated reshoring as a (sub-) task into strategic departments such as Global Project Management. This would argue for a project-based approach with individuals providing continuity across reshoring processes. Ultimately, the decision whether to have a reshoring department also depends on the size of the firm.

This conclusion suggests that AS have not yet recognised the need to consider reshoring and ES together in their location decisions despite the rising expectations OEMs assign, for example, to reducing CO₂-emissions through reshoring. This leads to two observations: On the one hand, if there is no clear reshoring responsibility, a variety of different functions from the firm are involved in examining the location decision from different angles. On the other hand, even if most firms have a responsible sustainability manager who should be integrated in location decisions, this manager is not involved in the reshoring process or in the decision-making process.

Proposition 7: *The more automotive suppliers are confronted with the increasing need to consider ES in location decisions, the more sustainability responsibilities across different levels in the firm are involved in the decision-making process.*

5.3.2 Decision criteria for reshoring and ES

This section addresses *Theme 9: Decision criteria for reshoring and ES* as part of the second research question. What follows is a bottom-up analysis of the reshoring decision-making process by investigating the criteria being employed. Despite many studies and empirical-based investigations on reshoring and ES, the literature review has confirmed that little is known about decision-making criteria and -processes for reshoring in consideration of ES. “The decision-making and implementation process of reshoring (i.e. “how” firms decide to reshore and “how” they put that into practice) is a key aspect for a comprehensive study of the phenomenon [...]” (Barbieri et al., 2018, p. 92). In addition, Wiesmann et al. (2017) stressed that reshoring decision-making processes are still under-researched. By carefully investigating the underlying decision criteria, the researcher was able to develop a decision-criteria matrix for reshoring and ES (table 62).

By examining the responses from the interviews of all cases, the researcher was able to create an unstructured list of all decision criteria. This list was prioritised according to the cases who mentioned the respective criteria. Analogous to the structuring of drivers and barriers in the previous course of the thesis (section 5.2.2), the researcher was able to derive five categories. These categories may overlap with the drivers and barriers (table 26 and 27) as the category *cost-related factors*, for example, appears as both a driver and barrier as well as a decision criterion. However, it is even more evident from this that the dimension of costs is attributed an extremely high importance, as it constantly extends across the drivers and barriers as well as the decision criteria. This matrix comprises four categories, while there is another fifth category for ES (table 62).

Table 62: Decision-criteria for reshoring and ES

Decision-criteria for reshoring and ES	A	B	C	D	E	F	G	H	I
Reshoring									
1. Cost-related factors									
Costs and financial figures	X	X	X	X	X	X	X	X	X
Wage and labour costs	X	X	X	X	X	X	X	X	X
Logistics costs (incl. distance, CO ₂ , energy)	X	X			X	X		X	X
Qualifications and skill availability			X			X			
2. External and regional factors									
Legal and tax	X		X			X	X		
Compliance-based issues	X								
Local situation (e.g. political and economic stability, distance to customers, import duties, Brexit, trade wars)			X			X			
Infrastructure (space, resources, accessibility of own location)		X				X		X	
Access to innovation (e.g. recycling systems and use of renewable material)					X				X
3. Efficiency-driven factors									
Time-to-market (incl. customer proximity)					X	X		X	X
Market access and delivery time						X			X
Manufacturing processes	X								
4. Supply chain factors									
Reconfiguration of the supply chain	X					X			X
Type of product in the value chain (e.g. preliminary, semi-finished, finished)			X			X			
Origin and location of suppliers	X						X		X
Quality from suppliers (incl. availability of environmental-friendly suppliers)	X						X		X
ES									

5. ES						
CO ₂ -emissions (lifecycle assessment)	X	X	X	X	X	
Energy management at the sites	X	X		X	X	X
Material efficiency	X		X			
Access to green energy in a region	X		X	X	X	X

Source: Own illustration

In the pages that follow, the researcher examines the decision criteria for reshoring and ES in more detail by covering the following three categories: *interdependence between cost- and ES-related factors* (section 5.3.2.1), *consideration of ES as a decision criterion* (section 5.3.2.2) and *complexity of decision models* (section 5.3.2.3).

5.3.2.1 Interdependence between cost- and ES-related factors

First, the literature review confirmed that little is known about the decision criteria for reshoring and ES and that much refers to labour and cost-related advantages without taking into consideration ES (Chen et al., 2014). In line with the critical examination by Chen et al. (2014), the findings from this study also confirm that the economic dimension still strongly dominates reshoring decisions. Without exception, there was a consensus among all participants that *cost-related factors* are the most important criterion (table 62).

Case F, however, explicitly emphasised that the availability of qualified employees is the most important requirement when deciding on a location – even before cost – and that ES is rather perceived with medium importance. A further cross-case analysis of cases E, F and I revealed that opinions continue to diverge. Besides the whole category of costs, logistics, political and economic stability as well as the availability of environmental-friendly suppliers are mentioned as the most important criteria. Thus, it was found that economic factors dominate and ES is given second priority or is being considered implicitly. This is reflected in looking for environmental-friendly suppliers or in evaluating better logistics options with a lower CO₂-footprint. As far as ES is concerned, the aspect of logistics is an important criterion to consider because this usually accounts for a high share of CO₂-emissions (A3, F2, H1, I1, I3), which could be significantly reduced through reshoring (e.g. by eliminating airfreight and switching to road or rail transport). Browne (2005) emphasised “transport consumes about one-fifth of global primary energy and is responsible for similar amounts of

greenhouse gas emissions [...] the transport sector represents the fastest growing source of greenhouse gas emissions” (p. 643).

What is also interesting in this data is that case D has only mentioned cost- and ES-related factors as reshoring decision criteria. A possible explanation for this selection of decision criteria may be related to the maturity level of reshoring and ES in the organisation. Figures 13 and 14 have helped to classify the cases according to the extent to which reshoring and ES are organised internally. These classifications expressed that in case D there is neither a high awareness of reshoring in the firm nor is ES embedded in the organisation. On top of that, it can be assumed that D is a Tier-2/-3 AS and, thus, at the end of the value chain being confronted with rising cost and price pressure. According to D2's statement in table 63, it is clear that this means they have to pay particular attention to costs, but also to meeting the OEMs' sustainability targets (e.g. Daimler).

Table 63: Findings to RQ2: Theme 9 'Decision criteria for reshoring and ES' (Evidence: 1)

Identifier	Quote
A2	Of course, cost is very high up and all other operational decision criteria
	It is logistical, yeah, when it comes to logistics, it's CO ₂ kilometres, cost, energy used in our manufacturing.
A3	R: Would you also look on suppliers, which are environmental friendly? I: Yeah, for sure.
B1	But again, primarily driven by economic considerations
	That means we simply have to think in cost-optimised terms, and that does not necessarily mean the most sustainable supplier, but the supplier who offers sustainability plus a good price. There is a current topic, which I believe has also been in the media, that Daimler is also demanding that its suppliers be completely green for 2038, i.e. CO ₂ -neutral. And this of course puts pressure on all suppliers.
D2	The Tier-1 is being looked at, yes. However, Tier-1 is often so large that OEMs cannot pull the big levers. It is simply broken down to us, so you have to do it. There is no discussion. So that is the disadvantage with us, we are at the end of the rat tail.
E1	And then it is often the case that the initiative falls victim to the economic decision.
F2	[...] because I need certain cost advantages or because I want to have certain market proximity.
G1	[...] economies are in the form of labour costs, I suppose. Will be the // decisive factor
G2	That was purely a cost issue.
H1	We are now deciding, but not whether, yes/ So the choice of location will then actually be based more on economic criteria, which implicitly pay off in terms of sustainability, especially if the logistics costs are higher.

11	But as I said, I have to admit that in the pure evaluation, the financial figures were the main focus of my work. But what is then also an evaluation criterion, what is the distance to the customer, how many kilometres is it until then and so on.
	So yes, transport routes, delivery routes were a decision. This is also an ecological factor that has played its part. But of course, honestly, the first topic was economy.
13	The Footprint decisions or reshoring decisions, security of supply, supply routes, transport routes, once for cost reasons, once for service level, but also for ecological reasons were certainly decision criteria

Source: Own illustration

5.3.2.2 Consideration of ES as a decision criterion

Second, Barbieri et al. (2018) and Chen et al. (2014) criticised the fact that sustainability is generally associated with high relevance, but is not reflected as a decision criterion. However, as far as the literature reviews from Barbieri et al. (2018) and Chen et al. (2014) are concerned, the research was carried out between 2015 – 2017 and 1990 – 2011 respectively. Today, in contrast to the period in which the data of Barbieri et al. (2018) and Chen et al. (2014) were collected, awareness of sustainability is heightened. Moreover, the findings of this thesis add to the current debate that sustainability matters from an environmental perspective. With the four criteria mentioned in table 62 (CO₂-emissions, energy management, material efficiency and green energy), there is, however, only few criteria considered, but it confirms that ES is used in reshoring decisions even though this process is still evolving (A1, A2, A3, E1, G2). In addition, there are also other decision-making criteria contributing to sustainability (e.g. logistics, qualifications, origin and location of suppliers, compliance-based issues). As far as *logistics* are concerned, this particularly addresses the reduction of CO₂-emissions. With regard to *compliance-based issues*, social issues of sustainability such as human rights or fair working conditions are addressed.

Although ES has not yet been established as one of the top decision criteria yet or is used to the extent that decisions are made on this basis, it is already an important criterion for preparing models and scenarios and thus the location decisions (A1, A2, E1, G2). It became clear that besides cost-related factors, there is a variety of ES aspects being considered, too, such as to question product's CO₂-impact across its lifecycle (LCA), the processes carried out internally or outsourced or sourcing of material. Furthermore, it is notable that the economic (costs, wages) as well as the social dimension are addressed, too (table 64).

Table 64: Findings to RQ2: Theme 9 'Decision criteria for reshoring and ES' (Evidence: 2)

Identifier	Quote
A1	[...] it's a...it's primarily around, I think, CO ₂ impact. That's the main focus [...] compliance-based issues [...] legal requirements [...]
	Exactly how that is factored into the decision-making process is still kind of evolving, so there is not kind of an algorithm that says "look at this from a commercial point of view".
	I think this is because the environmental impact is one set of input for the decision, then there are other decision criteria as well
A2	To give an example there, what we want to support with is then to understand what is the current impact with the current setup, let's say, with the current location. So, looking where is the customer? So basically taking a lifecycle approach to it. What is the customer application? Where is it used? How do we manufacture it? What are the processes we do in-house? What are the processes that are outsourced? What components do we buy? Where are the suppliers located? Where are the tier two suppliers to us located?
	We look at the material flows [...] how much energy is used [...] where is that energy coming from [...] how much steel is used [...] energy intensive component suppliers
	But we will be asked what are the environmental impacts of this, what are the considerations in that. And then our input then is part of the overall kind of data which is used to make the decisions.
A3	Sometimes we use LCA [...] energy performance, material efficiency [...] have the quality we need [...] CO ₂ footprint for example is becoming much more, more and more high [...] when it comes to logistics, it's CO ₂ kilometres, cost, energy used in our manufacturing
E1	The topic of the CO ₂ tax will also be a great challenge for us in the coming years. It will also be the biggest challenge for those who supply us with raw materials, and in this context we are already reflecting on such decisions. But first of all, of course, they are very much driven purely by economic considerations.
G2	Afterwards in the argumentation for this decision, it was nevertheless brought forward. "I'm actually doing something good for my CO ₂ -footprint", and as an offside product, I take it from there and show it as a project success, but not as a driver.

Source: Own illustration

Furthermore, ES is also attributed high strategic importance. Since AS are required to fulfil sustainability-related targets from OEMs, the pressure is quite high, for example, to make CO₂-emissions, green electricity at locations or the reconfiguration of supply chains part of the decision. This is reflected in the statements from H1 and I1 who argue that it will not take another year until decisions are being made in consideration of ES and that it is very high on the agenda (table 65).

Table 65: Findings to RQ2: Theme 9 'Decision criteria for reshoring and ES' (Evidence: 3)

Identifier	Quote
A3	[...] when it comes to CO ₂ -emissions? This is not something that has been a big topic on the agenda these twelve years. But I would say the last two years it's really started to happen more and more that I get contacted.
	I don't think it will take another year before the first decisions are taken in this direction.
H1	Sustainability criteria are more involved than in the past, because customers explicitly ask for them.
I1	[...] CO ₂ -footprint or something like that, has not yet been included in the evaluation matrix. We will get to that. The OEMs are also increasingly demanding it. This is very, very high on our agenda, the topic of sustainability.

Source: Own illustration

5.3.2.3 Complexity of decision models

Third, Kinkel & Maloca (2009) claimed that firms do often rely on simple decision models without taking the dynamic development of an economy or market into account. At the same time, Chen et al. (2014) stressed that reshoring decision-making lacks the strategic long-term perspective where ES is an important part of it. However, the findings from this study point to the importance that even complex dimension, such as the need for SCR, political and economic stability or access to renewable energy at a new location are very well considered. Even though these firms have to work with assumptions for external parameters (e.g. exchange rates), they still try to incorporate these uncertainties into their decision criteria (table 66).

Table 66: Findings to RQ2: Theme 9 'Decision criteria for reshoring and ES' (Evidence: 4)

Identifier	Quote
A2	But it's basically a comparison between current situation and then the intended situation from an environmental impact perspective based on lifecycle assessment. The trick for us here is not to over complicate that part of it because we need to make quite a lot of assumptions and choices so that this material becomes relevant and usable for the decision makers.
C1	And there were, among other things, environmental aspects, legislative aspects of course, but also such things as economic stability, political stability, distance to the customers, own accessibility of the locations
H1	But when I look at it from an economic point of view, the advantage in labour costs is so much greater than the disadvantage in logistics costs. That again depends on the product. If it is large and heavy, it is a different matter. If it is small and easy to pack and distribute, it is a different matter again. But these considerations play a role here. And, as I said, sustainability is implicit in this, but not yet explicit.

13	[...] but I also have to somehow redesign the entire value chain with the corresponding uncertainties. This is already a decision factor that has to be taken into account.
	Well, these are decisions that are not aimed at short-term profit maximisation or anything else, but really intervene in the structure of my company and in the final analysis.

Source: Own illustration

In addition, it also became apparent in cases E and F that *efficiency-driven factors* in terms of time-to-market, customer proximity and market access are very important in assessing a firm's ability to bring a product fast to the market and to its customers. The most striking observation that emerges from the data is that E2 also highlights the potential of digitisation or automation to enhance delivery times. E2 points to the importance that there is an opportunity in achieving a higher process efficiency through digital solutions at reshored locations and that offshore site become obsolete. With reference to the exploration of the drivers and barriers of reshoring and ES in section 5.2.2, E2 mentioned that a higher level of automation is associated as a driver for reshoring. Consequently, in the long-term, this does not only result in delivering products faster and more efficient, but also leads, for example, to a better ES footprint (table 67).

Table 67: Findings to RQ2: Theme 9 'Decision criteria for reshoring and ES' (Evidence: 5)

Identifier	Quote
E2	In case of doubt, one of the most important decision criteria is time to market. Everyone wants to become significantly faster in everything they do and, yes, if you think of automotive suppliers or car manufacturers, who are already very fast
	I believe that the delivery time criterion may well become an important one, especially since digitisation can make process steps significantly simpler, automated and faster, so that location or foreign sites are perhaps no longer so important.
F2	[...] because I want to have certain market proximity

Source: Own illustration

The set of decision criteria in table 62 confirms that reshoring decisions are not only based on economic considerations, but on a variety of criteria comprising efficiency-, supply chain- and ES-related aspects. Although a high awareness is associated with cost-related parameters, location decisions are also being made according to strategic thoughts. AS consider the long-term perspective when deciding on a location. This finding is a valuable insight and contribution because it explains that reshoring decisions are not only considered

as a short-term reactive decision. On the one hand, this finding contradicts the claim from Gray et al. (2013) and Kinkel & Maloca (2009) who emphasise that reshoring can be seen as a correction of prior misjudgement. On the other hand, it confirms that firms concentrate on dynamic developments in economies or markets as well. Consequently, this research has also contributed to reveal that reshoring is not only concerned with short-term profit maximisation or even reactive decisions but is of strategic importance for the future global orientation of a firm, too (I3).

Conclusion

Discovering the role of ES among the criteria for the decision-making process in consideration of ES is one of the most important research avenues raised by Fratocchi & Di Stefano (2019), Barbieri et al. (2018) and Chen et al. (2014), which has been explored through this study. With regard to the interdependence between cost- and ES-related factors, it can be concluded that (labour) costs are the most important criteria for AS when deciding on a location. Despite the consensus that cost-related factors dominate the reshoring decision, the availability of qualified employees and locational factors (economic and political stability) are important, too. This is also in line with Chen et al. (2014). Some AS in this study are seeking for environmental-friendly Tier-2/-3 suppliers in a geographical closer location towards the customer, however, ES is still not among the most important ones. Even if ES is not one of the main decision-making factors, it was nevertheless observed that criteria such as CO₂-emissions, energy management or material efficiency play a role. It must also be emphasised that the criterion of logistics was mentioned by almost all cases and expresses that ES considerations are taken into account as well – even if the consideration of ES is currently still of secondary importance.

With regard to the complexity of the decision-making criteria, it can be seen that AS do not only consider criteria such as (labour) costs or logistics. On the contrary, complex criteria such as the political and economic stability of a market, infrastructures, tax aspects or the need for SCR are also considered. This is in contrast to Chen et al. (2014) and Kinkel & Maloca (2009) who stressed that reshoring decision-making relies on simple decision models. In addition, this section expressed the importance given to the proximity to OEMs.

This can be deduced from the time-to-market and market access criteria, which point to the importance of bringing a product faster to the OEM.

Proposition 8: *In contrast to offshoring decisions, which are primarily based on labour costs, reshoring decisions from automotive suppliers have become more complex over time and are thus related to other factors (e.g. access to qualified employees, political and economic stability, CO₂-emissions, logistics, tax aspects).*

5.3.3 Reshoring process and consideration of ES

A large and growing body of literature has investigated the phenomenon of reshoring. Among others, Barbieri et al. (2018) stressed that particularly decision-making and the implementation processes are comparatively less understood. In the study *Understanding Manufacturing Location Decision-Making: Rationales for Retaining Offshoring, Reshoring and Hybrid Approaches* from Theyel et al. (2018), the authors furthermore point out reshoring processes within firms are multifaceted, complex and consist of multiple stages with varying influencing parameters. More recently, Orzes & Sarkis (2019) call for a further investigation of how reshoring activities must be completed by understanding this process in detail. They also point out the role of ES remains even less understood. For this reason, the literature review has revealed an increasing awareness from scholars and practitioners alike to investigate these gaps. Therefore, before deriving a conceptual model of the reshoring decision-making process by integrating ES as a decision criterion, this section first aims for a careful investigation of the reshoring process itself.

First, in order to explore this research gap, the interviewees were asked to provide some details on how they deal with reshoring in practice in terms of the process or – if there is no process – to describe the tasks related to the location decision (cross-reference to Appendix 4). It was notable that almost no cases have a reshoring process established. This is even more surprising as six out of nine reshoring cases have dealt or are still dealing with a location decision. It is likely that the phenomenon of reshoring and the location decision is quite new in the AS sector and most firms deal with it based on previous offshore experience. While there is only C1 who argues that they have something like a *shifting process*, the rest of the

cases does not have one, however, they were still able to describe the tasks associated with their respective location decisions. Some firms call this process a *footprint activity* (A1), *shifting process* (C1) or *network design, coordination and configuration process* (I3).

Second, one unanticipated finding was that in some cases reshoring is not seen as a one-off activity but as a regular analysis of the production network carried out by, for example, business units, divisions or the operations department (I3). In the same vein, A1 states they are “looking at the overall trends, the global economic development”. On the one hand, this is in line with the previous argument from I3 that locations are being assessed on a regular basis. On the other hand, it suggests that they do not only evaluate current figures, but also take into account the possible strategic developments in the markets. Another possible explanation why cases A and I are conducting a regular analysis of their locations is that they have implemented reshoring projects and thus location decisions in the past already. This has probably led to managers considering the monitoring of trends and market developments as an important part of location decisions (table 68).

Table 68: Findings to RQ2: Theme 10 ‘Reshoring process and consideration of ES as a decision criterion’ (Evidence: 1)

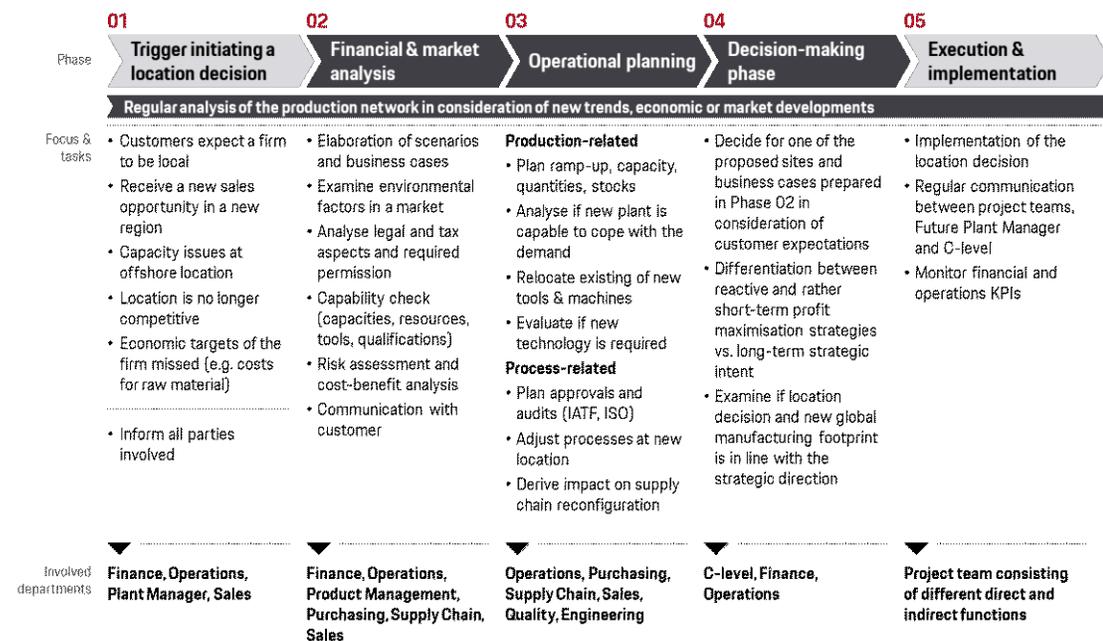
Identifier	Quote
A1	I think essentially it’s this footprint activity that I spoke about, which is a very strategic approach. [...] it’s looking at the overall trends, the global economic development where our business is going, the sectors, our strategy for different sectors and so on and then looking at our current footprint and balancing that then with what we see going forward
C1	Yes. There is. The, let me say, the shifting process [...]
F1	R: Is there such a shifting process in your company? I: No
G1	R: Is there an internal process for reshoring, for offshoring? If so, what would it look like? I: Not really, at least I am not aware of it
G2	R: Is there an operational reshoring or relocation process in [organisation]? I: No.
I3	So a reshoring process is not. A network, i.e. network design, network coordination and configuration process, which, where you really do regularly analyse your production network or the divisions, the business units for themselves, their production networks.

Source: Own illustration

Third, in accordance with the findings from this study and the activities for reshoring and ES raised during the interviews, the researcher was able to derive a reshoring process (figure 16). This research gap has been stressed by Orzes & Sarkis (2019) calling for further research on the reshoring implementation process and how should reshoring activities be completed. “Research is still needed to understand this process in greater detail [...] the role of environmental sustainability remains even less understood” (p. 482). Barbieri et al. (2018) go on to say reshoring implementation processes are comparatively less understood. Consequently, this research has provided some in-depth insights into how reshoring is being completed in the AS sector.

In consideration of the findings, this process consists of five phases: (i) *trigger initiating a location decision*, (ii) *financial & market analysis*, (iii) *operational planning*, (iv) *decision-making phase* and (v) *execution & implementation*. The tasks associated with reshoring and the departments involved with every phase are added to the respective category. Furthermore, the process takes into account the opinions from cases A and I that trends, economic situations and market developments need to be continuously analysed. This activity is not assigned to one of these phases but extends through the entire process model.

Figure 16: 5-Phase reshoring process



Source: Own illustration

The following section explains how the reshoring process in figure 16 can be used as a practical guide to facilitate firms with their location decision. The first phase examines the drivers, which cause that firms consider a change of a previously offshored location. It became apparent that there are different events that cause a firm to repatriate a manufacturing site (e.g. customer expectations, local sales opportunities or economic targets at the offshore location missed).

Phases two to four are considered as the main ones, where most of the work needs to be done to ensure that the management obtains a sufficient knowledge base to decide upon. For that reason, these phases are coloured in dark grey to differentiate them from the first and last phase. As far as the second and third phase are concerned, it became apparent that a financial and market analysis is required and that an operational plan needs to be elaborated. The main activities associated with phase two concentrate on scenario and business case development, the analysis of legal and tax requirements and the evaluation of risks, costs and benefits with the desired location. The activities for phase three can be distinguished into production- and process-related ones.

Regarding phase four of the reshoring process, the findings have revealed that the management team has to decide on three elements: decide for a location scenario, differentiate between short-term profit maximisation and long-term strategic intent and decide if the new location fits with the strategic direction. The fifth phase is basically concerned with the execution and implementation of the decision taken by the management team.

Conclusion

By concluding this section, these findings contribute to the manufacturing and reshoring literature in terms of the reshoring process, its implementation and the activities associated with it. A more fine-grained understanding of how firms manage locations decisions was developed, however, it is still a processual perspective of the location decision and does not yet take into account reshoring and ES decision criteria. Even if the participants in section 5.3.2 mentioned a variety of decision criteria for reshoring and ES, they are currently not reflected in the actual reshoring process. “This seems to indicate that the reshoring decision

involves high levels of complexity” (Boffelli et al., 2020, p. 10) and reveals that locations decisions and ES-related activities are not yet harmonised in the firm. This is also in line with previous findings from section 5.3.1, where it became apparent that the collaboration between both reshoring and ES is still lacking. More particularly, sustainability-related responsibilities are not always involved in the location decision and rather integrated on-demand (A1, A3, H1, F2, I1). Especially F2 stresses that the start of a site selection process has nothing to do with sustainability (table 69).

Table 69: Findings to RQ2: Theme 10 ‘Reshoring process and consideration of ES as a decision criterion’ (Evidence: 2)

Identifier	Quote
A3	This is not something that has been a big topic on the agenda these twelve years. But I would say the last two years it’s really started to happen more and more that I get contacted.
A1	[...] how that is factored into the decision-making process is still kind of evolving
F2	I would say that the start of a site selection process has almost nothing to do with sustainability
H1	Yes, one must honestly say. These are on-demand votes, and he is actually not involve
I1	CO ₂ -footprint or something like that, has not yet been included in the evaluation matrix. We will get to that

Source: Own illustration

It also emerges that AS do not have an operational reshoring process in place. Previous literature has also indicated that reshoring decision-making is not well-defined (Boffelli et al., 2020). It rather becomes apparent that the implementation of location decisions is made based on experience and is associated as a continuous flexible approach where market trends, competitors and economic developments are being monitored to manage uncertainties and risks a supplier may face (Verganti, 1999). Although case A mentions that reshoring is perceived as a strategic approach by looking pro-actively at overall trends or global economic developments, it appears that the remaining cases deal with reshoring rather reactive or on-demand. It thus emerges that the reshoring decision is characterised by reacting to external changes such as new market trends, new competitors or economic developments demanding a firm to change its manufacturing site.

Proposition 9: *When an automotive supplier faces changes in the external environment, such as new market trends, new competitors in the same region or economic fluctuations, it triggers the reshoring location decision as a reactive, rather than a proactive process.*

While the researcher was able to fill the research gap concerning the reshoring process, the integration of ES into the decision-making process is still lacking. Consequently, the next section of this thesis explores how a holistic conceptual model for reshoring can be developed by taking into consideration ES as a decision criterion.

5.3.4 Conceptual model for a holistic decision-making process

A large and growing body of literature has started to investigate the reshoring phenomenon. Much of the current literature on reshoring pays particular attention to decision-making processes and – if there is any – the interdependence between reshoring and ES decision criteria. Serious discussions about these two topics emerged since 2016 from Bals et al. (2016), Wiesmann et al. (2017), Gray et al. (2017), Barbieri et al. (2017, 2018), Theyel et al. (2018), Hartman et al. (2017) and Fracocchi & Di Stefano (2019). Earlier than this, there have been Arik (2013) and Chen et al. (2014) suggesting models for reshoring decisions and the integration of ES across the economic, environmental and social dimension (TBL). The extant decision-making models from the authors described in table 8 in the literature review serve as a broad guideline for the researcher and will be more “specified and backed-up by empirical evidence”. This was also raised as an important issue by Wiesmann et al. (2017, p. 37). Barbieri et al. (2018) also addressed the importance of the decision-making process as a key aspect for a comprehensive study of reshoring.

Little is known about the decision-making process in general and the interdependence with ES as a central decision criterion. Ambos et al. (2020) point out the “understanding of how managers take international location decisions is still scarce” (p. 210). On top of that, Theyel et al. (2018) stress “an updated understanding is needed how companies are making decisions about the location of their manufacturing” (p. 300). Moreover, it has been criticised that current decision-making models lack the long-term strategic perspective, do not examine a firm’s competitive position or the importance of access to markets or technology and that firms do not understand process complexities. In addition, no research has been found that explored the AS sector across these avenues in particular. Until recently, there has been no reliable findings on these research gaps, which in turn has motivated the researcher to start investigating these rich avenues. What follows is to investigate the findings from this study

(5.3.4.1) and to derive a conceptual model for a reshoring decision-making process (5.3.4.2) while linking the implications back to the literature.

5.3.4.1 Main findings concerning decision-making processes

All firms described the decision-making processes in quite different breadth. While cases A, C, E, H and I described the decision-making process in relative detail, the remaining cases only selectively address certain activities in the process. A2 in particular highlights which questions they are exposed to when preparing models and scenarios from an ES perspective (e.g. what are the CO₂-emissions across the product's lifecycle, how is it manufactured, what are the processes they do in-house, which value-adding activities are outsourced or where are the suppliers located). C1 goes on to say that primarily labour costs, the availability of qualified employees, the distance to customers and the environmental legal conditions were considered in the decision process. E1 rather points to the importance of ES-related investment decisions to equip new manufacturing sites with green electricity, better air conditioning or efficient heating systems. Lastly, while H1 emphasised that site selection is based on competitiveness and capacity, I3 highlights that the impact on SCR is a parameter that must not be underestimated (table 70). As in other parts of the thesis, too, this is another important reference to the third research question.

Table 70: Cross-case comparison of reshoring decision-making processes

Case	Decision-making process in place?	Consideration of ES?	Quote
A	Yes, but the maturity level differs across every case	Immature, but evolving	Exactly how that is factored into the decision-making process is still kind of evolving, so there is not kind of an algorithm (A1)
C			The consideration of where the locations were set up: they were already taken in a very structured way (C1)
E			[...] anything that is relevant to energy somewhere [...] let these be incorporated into our decision-making process accordingly (E1)
H			[...] so that internally we have actually defined the site selection relatively clearly for individual sites (H1)
I			But [<i>supply chain reconfiguration</i>] is actually also a topic that is consciously taken into account in the decision-making process (I3)

B			[...] top management sometimes also makes decisions that lie outside of these scorecards because they have another information horizon (B1)
F	No	No	We did not go into detail, because we actually came to this decision relatively quickly, and we would like to make a quicker and more entrepreneurial decision [...] I would say that the start of a site selection process has almost nothing to do with sustainability (F2)
G			Yes, very simple. Even there, often decisions and especially in top management decisions are actually only price-driven (G1)
D	No	No	<i>No response to the question in the interview</i>

Source: Own illustration

However, even though cases A, C, E, H and I claimed that a reshoring decision-making process was established, the expected details in terms of fundamental responses from participants were missing. Thus, it became clear that the maturity level and the focus of every reshoring decision-making process across the cases differs significantly. It also appears that even in some cases the decision-making process is entirely missing. Even though case C claims that decisions were made in a very structured way and based on a decision matrix, the details were hardly described. Especially by taking into account the reshoring projects per case that have either been completed, are still being implemented or are theoretically considered, it is surprising to note that relatively few details about the decision-making process are known. A likely explanation is that the reshoring projects in the past have been dynamically prepared, evaluated and decided according to the individual situation. However, a far more plausible explanation is that perhaps not so many projects have been carried out yet and – if they have – the projects are also associated with a duration of several years. Consequently, many of the participants in this study have probably not accompanied this entire process completely and have sometimes not been in the firm long enough to be able to follow all the steps.

Furthermore, it also became clear that the consideration of ES is either not done or is still immature. As far as the latter is concerned, the consideration of ES differs considerably in the individual cases, even if it is evolving. While case A follows a structured approach by analysing environmental impacts, creating models, scenarios and business cases and trying to become part of the reshoring decision-making process, the other cases rather chose focus

areas for their decisions, such as the use of green electricity, the impact of a future CO₂-tax or the possibility to reduce their logistics effort. This finding is also in line with previous discussions on the perception of reshoring and the role of ES and that economic considerations are still far more relevant than ES-related aspects. In comparison with case A, it is interesting to note that case E is also evaluating models where they map and price all parameters relevant for the decision. Thus, this seems to be a valuable insight from cases A and E to create models, scenarios and business cases for the location decision (table 71).

Table 71: Findings to RQ2: Theme 11 ‘Conceptual model for a holistic reshoring decision-making process’ (Evidence: 1)

Identifier	Quote
E1	The topic of the CO ₂ -tax will also be a great challenge for us in the coming years. And what we are not doing is to consider sustainable aspects in our decisions now.
E2	So, if we initiate such topics, then we first build models [...] where we try to map and price all the parameters that are relevant to our decisions.
F2	But of course I could also do something like with this energy story, solar cells or something like that, can I do something like that/ If I can get the electricity I need, things like that [...]
G1	Even there, often decisions and especially in top management decisions are actually only price-driven.

Source: Own illustration

The researcher also found that decisions are sometimes made consciously at the expense of, for example, CO₂-emissions in particular or ES influences in general. This shows that case A has dealt with reshoring decisions and its implications on CO₂-emissions more often and has gained experience from them. Furthermore, it is expressed that the decision not only brings unilateral effects in terms of CO₂-reduction, but also leads to costs being reduced and proximity to the customer being improved. *Lessons learned* were also mentioned as an important aspect by case C. These experiences were compiled and evaluated after the completion of each reshoring project. This led to the fact that the matrix could be expanded with the decision criteria of case C in order to be able to make the next decision as comprehensively as possible (table 72). This is also in line with Boffelli et al. (2020) who found that firms include *ex-post analysis* to assess the location decision after being completed.

Table 72: Findings to RQ2: Theme 11 ‘Conceptual model for a holistic reshoring decision-making process’ (Evidence: 2)

Identifier	Quote
A2	In some cases there may be a decision taken where we in the short term even may see an increase in CO ₂ -emissions. For example, if we move production to an area where we have difficulties sourcing renewable electricity moving from an area where we have a renewable electricity contract, the CO ₂ -emissions associated to that manufacturing will go up in the short term. But on the balance it may anyhow be a reasonable decision because we can reduce costs, we get closer to the customer and there can be other parameters in the right direction.
C1	This took place in a very, very structured way, also because once you started with the relocation, i.e. the classic relocation, to a low-wage country, to Slovakia with another country, with another commodity/ You already noticed that perhaps too few criteria were used. But then he noticed that it was difficult to achieve, that basically wages had risen massively, that you didn't get the right qualifications. And the location was retained and developed. The result was that a decision matrix was really put together.

Source: Own illustration

As far as the different stages for the decision-making process are concerned, it is worth highlighting that every firm follows different ones (figure 17). With the exception of cases A and C, which have four stages, cases E and H are following a five-stage decision-making process. It is quite interesting to note that in principle no two processes are alike. There are only individual activities that are not identically named, but are similar with the associated content. More specifically the *development of scenarios, models and business cases* as well as the *assessment of impacts and the evaluation of parameters* are activities that span multiple cases. This finding presented thus far supports the idea that these are important activities for a decision-making process, which can be derived from this thesis.

Figure 17: Comparison of decision-making processes

Cases	Stage 1	Stage 2	Stage 3	Stage 4	Stage 5
A	Receive customer's interest	Elaborate scenarios and business case	Perform impact assessment	Become part of the overall location decision	-
C	Choose country and region	Put together proper decision criteria	Execute the location decision	Derive lessons learned from the location decision	-
E	Build models and start "operationalisation"	Map, price and evaluate all parameters	Evaluate economic dimension ¹	Check synergies for other manufacturing sites	Present location strategy to advisory board
H	Identify sales opportunities	Create a reshoring concept ²	Check with customer's expectations	Suggest new site (if customer did not agree)	Present new concept and make the decision

¹ incl. put price equivalent to CO₂-emissions

² set sales prices, make site selection, evaluate capacity and competitiveness

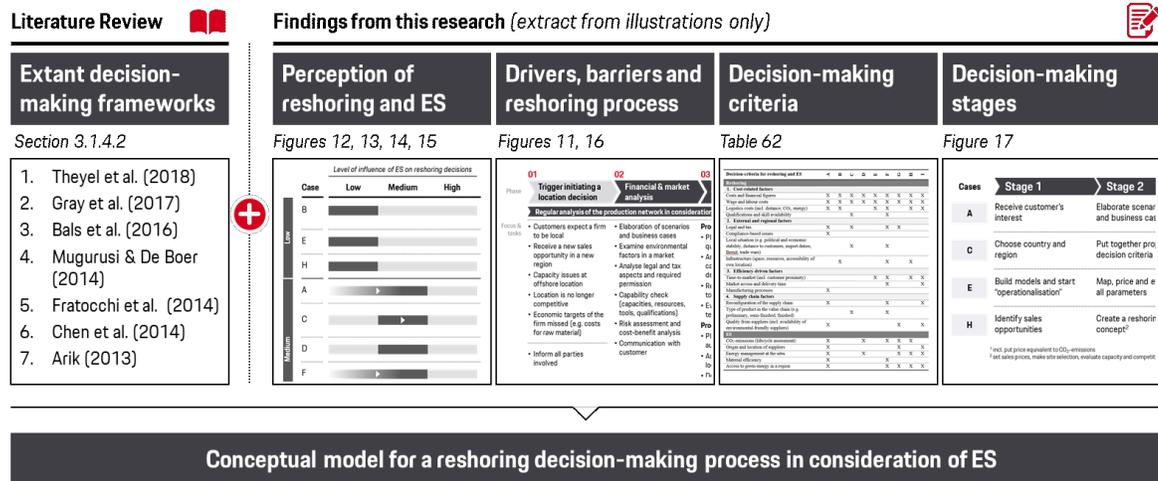
Source: Own illustration

The prevalence of different decision-making processes also expresses that reshoring decision-making is manifold and complex. This finding is consistent with those from Theyel et al. (2018) who point out that “processes within companies to make location decisions are multifaceted and complex” (p. 300). Boffelli et al. (2020) also stressed reshoring “is a decision usually characterized by high complexity [...]” (p. 4). However, it must also be critically emphasised that this process is only dealing with the individual stages, behind which in turn there can be different numbers and depth of activities as well as decision criteria. Even though the participants in this study mentioned the decision criteria according to which a location decision is made, a 1:1 relationship between the stages and the criteria is missing at this point. The researcher therefore builds on these findings to derive a theoretical or conceptual model in the next step.

5.3.4.2 Conceptual model for a reshoring decision-making process

The researcher now turns to the conceptualisation of the reshoring decision-making process. This conceptual model builds upon the previous findings on the perception of reshoring and ES, the reshoring process, the decision-making criteria and the decision-making stages (figure 18). It specifically aims to complement and strengthen extant theory-driven models and frameworks illustrated in section 3.1.4.2. It furthermore aims to address the proposed research gaps and to make a valuable contribution to the reshoring decision-making debate. The concluding conceptual model is depicted in figure 19 and will be explained in depth throughout this section.

Figure 18: Researcher's inductive process to derive a conceptual model for reshoring decision-making

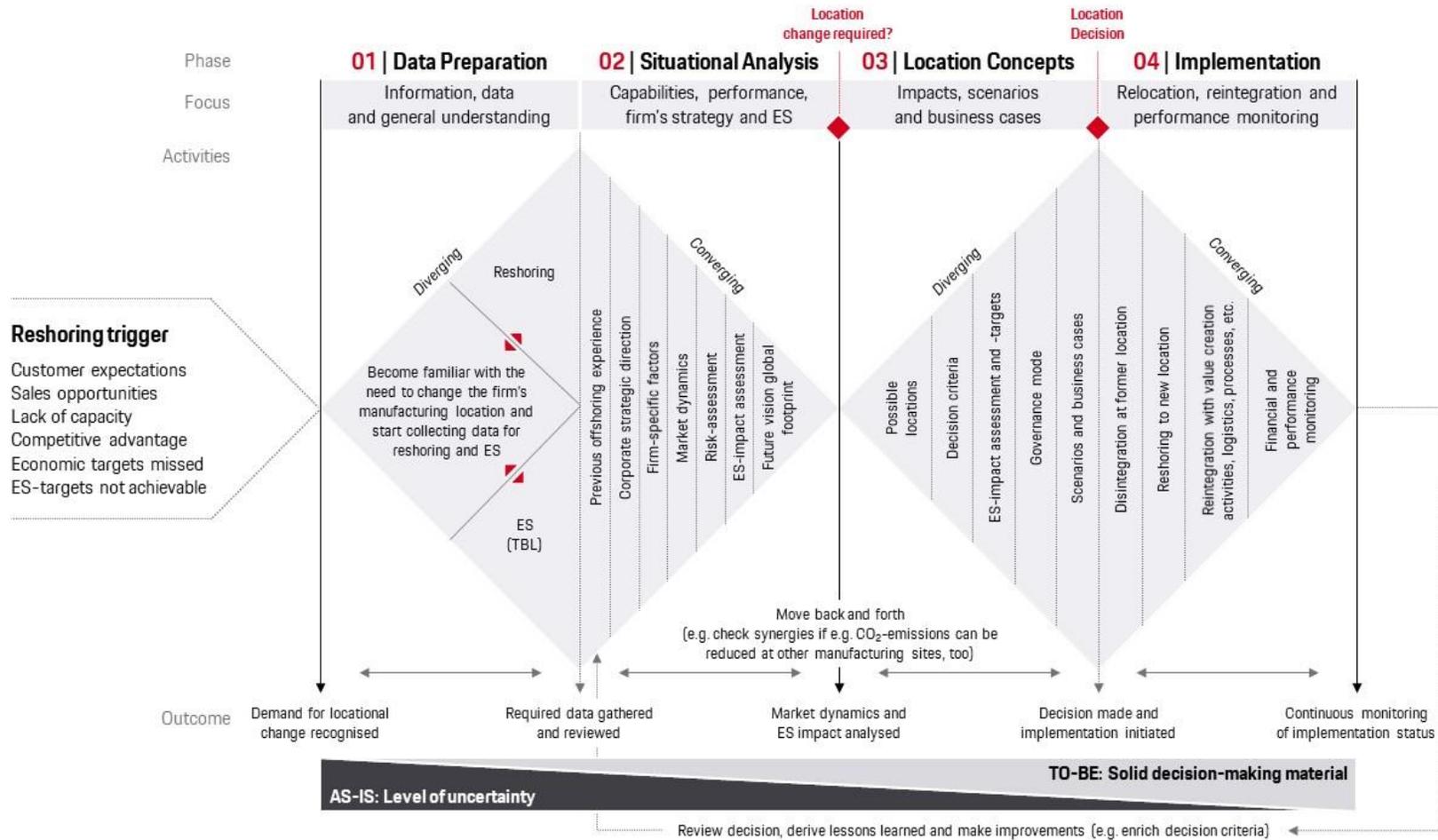


Source: Own illustration

General introduction to the conceptual model

The researcher proposes the conceptual framework, which synthesises different perspectives on reshoring and ES for the manufacturing location decision-making process. On the one hand, the model is constructed by deriving the findings from this research and by combining it with the main findings from the previous sections. On the other hand, it builds on extant reshoring decision-making frameworks from the literature (Gray et al., 2017; Bals et al., 2016; Mugurusi & de Boer, 2014; Fratocchi et al., 2014; Chen et al., 2014; Arik, 2013), which have been discussed in section 3.1.4.2. Starting point of this model is the respective trigger(s) initiating a change of the firm's global manufacturing footprint or a manufacturing site. According to this research, these may be customer expectations, new sales opportunities, lack of capacities at the current site or ES-targets, which are not achievable at the offshore location.

Figure 19: Conceptual model for the reshoring and ES decision-making process



Source: Own illustration

Furthermore, the model consists of four stages (*data preparation, situational analysis, location concepts and implementation*), which extent through a so-called *double diamond approach*. This approach originates from *Design Thinking*, which seeks solutions to complex problems by redefining the way in which they are understood and solved (Caulliraux et al., 2020). According to Peirce (1998), Design Thinking follows a third form of thinking besides deduction and induction – the abductive thinking. This is an important feature for this underlying conceptual model, as it requires the ones dealing with the location decision to go back and forth in the process, create new knowledge and hypotheses and link it with reality. The *double diamond approach* is one of the methodologies used in Design Thinking, which originally is constructed of four stages as well (*discovery, definition, development and implementation*) representing the cycles of divergence and convergence (Caulliraux et al., 2020).

In the course of this research, it became clear that most cases do not give equal importance to reshoring and ES, nor do they carry out their decisions in a structured way. It became apparent that cases A, C, E and H follow a structured reshoring process, however, every process is still different from each other (cross-reference to figure 17). On the one hand, case A, for example, waits for the customer to have demand in a certain region and thus reacts less strategically and more reactively. On the other hand, case H views reshoring more as a strategic process of proactively examining potential sales opportunities and then moving to them. It is thus apparent that not all cases have a clearly structured, strategic perspective behind them.

This model therefore integrates four stages, which first guide the one responsible for the decision with a structured process. Second, it also provides guidance for practitioners on where in the process the decision should be made. Third, every phase is characterised by divergent and convergent thinking. Fourth, it allows the user to go back and forth in every stage and to test, evaluate and refine, for example, the impact ES may has on reshoring decisions.

Trigger and Phase 1: Data preparation

According to this research, it became apparent that reshoring decisions for AS are initiated by, for example, customer expectations, new sales opportunities, capacity issues or economic targets. Although ES is not mentioned as one of the primary triggers, which initiate a location decision, however, the researcher decided to add this as well because of the rising importance of ES mentioned in figure 12. This can be explained by the fact that cases A, C, D, F, G and I generally see a medium to high level of influence of ES on location decisions and have indicated that it will increase in the future. In addition, although the objective of the thesis is to examine the ES perspective, social or economic impacts of sustainability were frequently mentioned, too. To complete the conceptual model, the researcher has therefore added TBL as a theoretical basis. This draws on Chen et al. (2014) stressing “models that provide balanced approaches with respect to content should be developed in order to properly organize the economic, environmental, and social perspectives, and indicate the interaction of these perspectives”, too (p. 161). The first phase *data preparation* of the conceptual model is thus aiming for the collection of the right information needed and becoming familiar with the need to change the firm’s manufacturing location. Complementing the findings of Chen et al. (2014), this first phase suggests starting to collect data for both reshoring and ES – on a TBL perspective – and to evaluate them on an integrated viewpoint throughout this model. MacCarthy & Atthirawong (2003) also emphasise that decision-makers should start gathering information.

This conceptual model sensitises scholars and practitioners that the current situation (as-is) is associated with high level of uncertainty. It does also justify that the first phase is of high importance to prepare the decision-making process as detailed and thoughtful as possible. This also links back to the literature where Theyel et al. (2018) stressed the “high level of uncertainty involved, these decisions are time and resource consuming and require firms to process large amounts of data” (p. 301).

Phase 2: Situational analysis

The second phase builds on findings from the literature review and is complemented by findings from this research. It consists of seven activities (e.g. previous offshoring experiences, corporate strategic direction or firm-specific factors). First, with reference to the

literature, Gray et al. (2017) suggest that location decision-making must consider previous offshoring experiences to avoid a reversal of the decision. This is also in line with case C (figure 17) who argues to derive lessons learned after the location decision. It can also be derived from the findings that reviewing the corporate strategic direction in terms of a firm's manufacturing footprint and its ES-targets are important. Cases C and H stressed that reshoring is a conscious strategic decision by entering a desired market, which thus needs to be reflected in the decision-making process. Chen et al. (2014) also go on to say that "the manufacturing strategy dimension of the industrial firm [...] is largely absent in the current literature on sustainability with relevance to facility location. Even though strategies for how to deal with sustainability are discussed in the literature, the corporate and business strategy perspective is missing" (p. 160).

Furthermore, Bals et al. (2016) point to the importance of analysing a firm's capabilities and performance. In this study, it also became clear that the firm's capabilities and resources in terms of qualified employees, know-how or infrastructure are one of the most important aspects (cases C and F). Besides costs, the high importance of infrastructure in dealing with location decisions is also emphasised by MacCarthy & Atthirawong (2003) especially concerning modes of transportation or the availability of utilities (e.g. water supply, waste treatment and energy supply).

In addition, the researcher found that market dynamics in terms of a home country's political and economic stability, the availability of environmental-friendly suppliers as well as access to affordable renewable energy, exchange rates or import duties are important as well. This also takes into account the competitive position in the market, which was discussed by Theyel et al. (2018) and raised as an important issue by cases A, C, E, F, G, H and I. In this context, Arik (2013) also suggested to make risk assessments part of reshoring decision-making. According to this research, risks relate to currency risks (case H), uncertainty associated with a SCR (case F) or the level of available knowledge in a certain region (case D). Most importantly, the researcher found that ES-impact assessment (LCA) is a crucial part of this phase. This is specifically addressed by case A who point to the importance that current environmental impacts need to be analysed early in the process and thus integrated into future scenarios and business cases. Once all seven activities have been prepared and analysed, it is

important to decide whether reshoring makes sense at all in terms, for example, of strategy, available resources, market-specific factors, or ES influences. If yes, this process continues with phase three.

Phase 3: Location concepts

The third phase primarily originates from findings derived out of this research. Bals et al. (2016) have integrated the *analysis of data and development of solutions* in their eight-step reshoring decision-making framework, however, it can be criticised that no distinction is made there between a detailed analysis and concept phase. A detailed explanation of the development of location concepts is largely absent in the literature. Thus, according to the findings, the researcher proposed five activities to be considered in this phase. First, as soon as the future vision of the global footprint is defined in the previous phase, the next step is to identify possible locations in a certain region of the home country. Second, the decision criteria explored in this research (section 5.3.2) have to be integrated and the selected locations need to be evaluated. Since “there are very few studies that have treated sustainability with facility location as a focus” (Chen et al., 2014, p. 160), it is important to consider both ES as a central decision criterion and to review the ES-impact assessment carried out in *phase 2: situational analysis*. This is even more significant because “reshoring for sustainability should be done with consideration and awareness” and it is currently not reflected in decision-making frameworks (Ashby, 2016, p. 85). This extends through the assessment of CO₂-emissions, the location of a firm’s suppliers, energy management, process-related issues (e.g. level of material efficiency) and access to green electricity at the home country. A special feature that applies to AS in particular is that the achievement of CO₂-objectives must also be discussed with the OEM. H1 and I1 argue that the pressure is quite high to consider ES-related targets and that it will not take another year until decisions are being made in consideration of ES. Third, the researcher proposed to choose the respective governance mode (in-house reshoring, reshoring for outsourcing, reshoring for insourcing or outsourced reshoring) as discussed in section 2.1.3. Fourthly, this results in the elaboration of scenarios and business cases that are used as a basis for decision-making by top management, as raised by cases A and E. “[...] decision makers should ensure that all factors are evaluated for each location alternatives” (MacCarthy & Atthirawong, 2003, p.

812). According to the second phase, these activities also lead to a decision as to which country the production site should be relocated to.

Phase 4: Implementation

As far as phase four *implementation* is concerned, there is a special feature in this model: the location decision is made between phases three and four. It is important to emphasise that the decision-making process does not end with the location decision, but that important activities still need to take place afterwards. These activities are essentially based on the findings of Bals et al. (2016) (e.g. disintegration at former location, reshoring to new location). However, in addition to the reshoring decision-making framework from Bals et al. (2016), the researcher also found that cases A and G integrate *Investment, Finance and Controlling* in the decision-making process. What can be derived from this finding is that they probably do not only carry out the scenario development and business calculation, but also perform a financial and performance monitoring of the decision as well. This also goes hand in hand with the start of the decision-making process, in which the *Investment, Finance and Controlling* departments pay attention, for example, to the fulfilment of economic objectives. At this point, it becomes clear that this department is integrated as a constant in the process. Nevertheless, this does not only apply to this department, but also to the achievement of sustainability goals. A location decision can be based on the failure to achieve environment-related objectives. The integration of the sustainability department into the decision-making process is therefore at least as important a prerequisite. Especially between phases two and three, it becomes apparent that the integration of this department is of particular importance to review the (negative or positive) effects a location decision has on ES-targets. Furthermore, it can also be evaluated to what extent positive results, such as the transition to renewable energies at the relocated site, can also be implemented at existing sites.

Conclusion

Each case provided a different view into the firm and expressed which priorities underlie the decision (e.g. elaborate scenario and business case, create reshoring concept or derive lessons learned). Consequently, the cross-case analysis allowed the researcher to get a deep understanding of the activities. Concerning the different priorities being set when making reshoring decisions, the researcher was able to find similarities across cases A, C, E and H.

For illustration, developing scenarios and business cases, deriving lessons learned and performing ES impacts assessments are important activities, which were discovered. However, figure 17 also expressed major differences with which activity the decision-making process is started. While case C starts to choose the country, case E rather starts with building models and scenarios or Case H with the identification of sales opportunities. In most of the cases, it emerges that decision-making activities overlap to some extent and are not well-defined. This seems to indicate that reshoring decision-making is complex in nature, which is in line with Gray et al. (2017). According to Verganti (1999), this leads firms to adopt a flexible approach when deciding on a location. According to behavioural decision-making literature, this finding is not surprising. “In fact, it provides evidence of the bounded rational feature of the reshoring decision-making being characterized by non-sequential phases and multiple routines and cycles” (Boffelli et al., 2020, p. 10).

Proposition 10: *Due to their complexity, location decisions cannot be made based on a rigid pattern. Automotive suppliers go through the phases (figure 19) in their location decision in multiple iteration loops, cycles and possibly in a different order (figure 17).*

5.4 RQ3: Influence of ES on the reconfiguration of supply chains

This section investigates the influence of ES on the reconfiguration of supply chains after reshoring. By coding the interviews, the researcher identified five themes to investigate this research question (table 73). First, the researcher investigates the extent of SCR after the location decision and explores if there are differences or similarities between the cases. Furthermore, the researcher examines the perception of ES when it comes to a reconfiguration of the supply chain. The researcher also seeks for particularities that need to be complemented in the conceptual model for reshoring decision-making, which has been elaborated in the previous section 5.3.4 (e.g. add further decision criteria). Product re-design because of SCR has been covered in the interviews and will be put into context with SCR. Lastly, the Covid-19 pandemic has shown that many firms are rethinking their global supply chains (Samson, 2020). Since the participants also mentioned this in the interviews, the researcher analyses the extent to which this also applies to AS. Every theme in this section is being summarised with a brief conclusion and a proposition.

Table 73: Identified themes related to RQ3

Topics & research questions	No.	Themes	Sections
4. Influence of ES on the reconfiguration of supply chains after reshoring	12	Extent of supply chain reconfiguration after reshoring	5.4.1
	13	Perception of ES when redesigning the supply chain	5.4.2
	14	Implications for reshoring decision-making processes	5.4.3
	15	Product re-design because of supply chain reconfiguration	5.4.4
	16	Implications of the Covid-19 pandemic on supply chains	5.4.5

Source: Own illustration

5.4.1 Extent of supply chain reconfiguration after reshoring

The literature review has revealed that firms start to carefully rethink their supply chain configuration (Orzes & Sarkis, 2019), put more emphasis on the issues around sustainability (Tate, 2014) while at the same time consider ethicality in the supply chain (Heikkilä et al., 2018). Investigating the relationship between reshoring, supply chain management and SCR

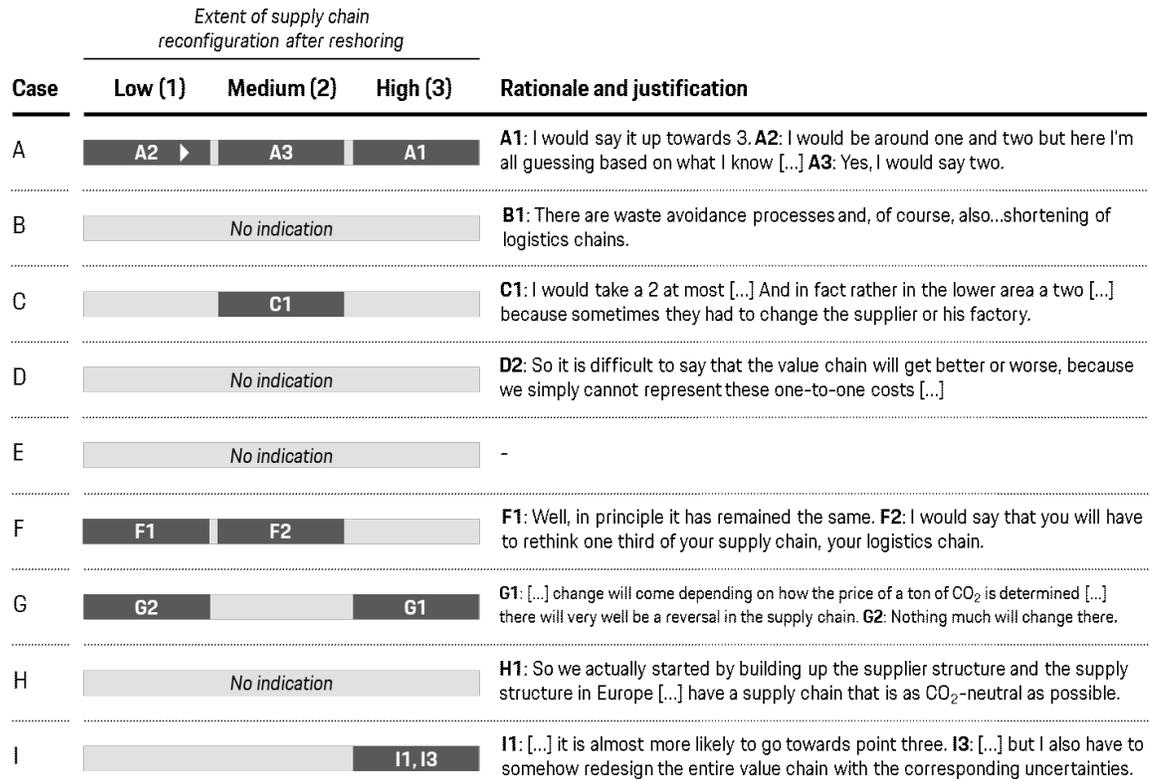
is one of the most important research gaps for the reshoring discussion (Orzes & Sarkis, 2019).

Findings from this research clearly expressed the importance of supply chain-related issues, too. For instance, this is reflected in a firm's ability to react faster to sudden changes from the customer, the evaluation of human rights in the supply chain and the improvement of ES (e.g. CO₂-emissions) resulting from less transportation. This finding is also in line with Engström et al. (2018) "It is however evident from the empirical findings that issues related to the supply chain's ability to meet customer demand create several drivers for all companies" (p. 197). Cases A and G have specifically emphasised that acting faster through local supply chains are important aspects for a firm's competitive advantage, too. As for the reshoring decision criteria explored in this research (table 62), supply chain-related factors have just been given their own category and thus express the importance in the reshoring decision.

Before moving on to the central issue of SCR after reshoring, it is important to make a cross-reference to the introduction of the reshoring cases from this study in table 20. In this table, every reshoring case is described in detail in terms of its stage (completed, in implementation or theoretically considered), the governance mode (e.g. in-house reshoring, reshoring for outsourcing) or the countries where the manufacturing site was relocated to. As far as the stage is concerned, it was found that three reshoring projects are completed (A, C, H), two are currently being implemented (G, I) and four are theoretically considered as a possible location decision for the firm (B, D, E, F). The distinction between these stages is an important requirement for this section as it forms an essential basis for the analysis of SCR after reshoring. In particular, this means that cases A, C, H, G and I are probably already confronted with SCR, because these firms have just completed reshoring or are in the process of completing it. Conversely, cases B, D, E and F are probably less affected, since they are still thinking about reshoring. Thus, this differentiation helps to gain a better understanding, which cases are affected from SCR. Besides gathering data for the stage of the respective reshoring case, the interviewees were also asked to indicate the extent to which the supply chain has been reconfigured. The following three-stage scale was used: 1 means *minor process-related reconfigurations*, 2 means *moderate adjustments in terms of e.g.*

management of logistics streams and 3 means total reconfiguration including the exchange/replacement of suppliers with new contractual agreements. The following figure 20 summarises the respondents' indications and presents the most important statements.

Figure 20: Extent of supply chain reconfiguration after reshoring



► The arrow indicates the trend in which the extent of supply chain reconfiguration could develop in the next five years

Source: Own illustration

In the previous course of the thesis, the researcher has already asked how strongly the participants would rate the influence of ES on reshoring decisions and why. In contrast to this interview question, it became apparent that fewer responses were provided concerning the influence a location decision has on the reconfiguration of a supply chain. This could be explained by the fact that only cases A, C and H have completed the location decision and thus might be able to indicate the extent to which the supply chain has been reconfigured. Surprisingly, although case H completed the reshoring project, H1 was not able to provide a response to this question. This is because H1 as a Department Head for a product unit is,

however, “involved in the strategic discussions about the production footprint” (H1), but is not in charge of SCR or related issues.

It is also notable that the responses differ greatly across the cases. More specifically, apart from cases B, D, E and H, which did not make any response at all, the other statements differ very clearly. In cases A, F and G, it is quite surprising that all respondents views varied on the extent to which the supply chain needs to be redesigned (figure 20). Similar to case H, this may also be related to the professional background of the participants, which does not specifically concentrate on supply chain-related issues. Concisely, case A involves Product and EHS Manager, case F CEO and Operations Manager and case G Sustainability Manager and the one in charge of the production network. Thus, they might did not feel comfortable in responding to this question due to lack of proper experience. Furthermore, every interviewee chose a different perspective to explain the expected degree of SCR. For illustration, on the one hand, G1 claims that the introduction of a CO₂-price has major implications for redesigning the supply chain. On the other hand, G2 argues from an operational perspective and emphasises that nothing will change in the supply chain (table 74).

Table 74: Findings to RQ3: Theme 12 ‘Extent of supply chain reconfiguration after reshoring’ (Evidence: 1)

Identifier	Quote
G1	I believe that there will be a change there as well. And that change will come depending on how the price of a ton of CO ₂ is determined [...] but it is my personal opinion that depending on how the pricing of the ton of CO ₂ develops, there will very well be a reversal in the supply chain, in the whole sourcing process [...]
G2	I am one hundred percent sure that this CO ₂ -pricing will have an increasingly strong influence. Nothing much will change there. So instead of me producing it on the injection moulding machine, packing it into the truck and driving to [location], they just spray it themselves on their own machines. So there is little pain

Source: Own illustration

However, as this thesis involved different functions dealing with either reshoring or ES, it is likely that not every one of them can describe the effects on the supply chain in detail. Regardless of which indication was made or the stage the reshoring project is currently facing, however, it can be stated that C1 (Director Operational Restructuring), F2 (Group

Director Operations), I1 (Director Operational Excellence Automotive) and I3 (Manager Connected Supply Chain) in particular were able to provide in-depth explanations of the implications on the supply chain. In addition, A2, A3, G1 and H1, whose cases are either completed or being implemented, mainly answered this question from an ES perspective. What follows is an in-depth investigation and explanation of the interviewees' meanings and opinions of SCR that have led to the findings illustrated in figure 20. By analysing the findings, the researcher identified four themes, which support the third research question in explaining the influences on SCR post reshoring: (i) *sourcing*, (ii) *quality*, (iii) *logistics* and (iv) *ES*. While section 5.4.1 mainly deals with these three themes, a separate section (5.4.2) is dedicated to the fourth theme (iv) *ES*. This is because of the main goal of this research to elucidate the importance of ES in connection with SCR.

Sourcing

As far as the contradictory statements in case A are concerned, it became apparent that the OEMs plays an important role. This is due to high expectations from the OEM having both the supplier close to them and reacting fast to sudden changes in the supply chain (e.g. just-in-time deliveries) (A1). The idea of *proximity* has also already occurred in section 5.2.2 when investigating the *drivers and barriers of reshoring and ES*. Thus, this has not only being raised by case A, but also links back to the findings in table 26, where cases C, D, E, F, G, H and I attached high importance to *customer proximity* and *OEM expectations*. A1 goes on to say “having a production in China running relied on component suppliers in Europe it does not....it is not a good set up in the long-term” (table 75).

The researcher also found that during or after reshoring, AS tend to have more European raw material suppliers and do not choose from the same supplier all the time, but from different ones throughout Europe (A2, A3, I3). This finding is in line with Pan (1989) who proposed multiple sourcing for improving the reliability of supply of critical materials. Buying from more than one supplier (e.g. Tier-2, -3) will protect a Tier-1 supplier in case of shortages. Although A2 disagrees, the statements overlap when it comes to sourcing materials that they distribute to different suppliers in the supply chain. Further possible explanations for these statements may be related to higher coordination efforts and higher costs associated with a global supply chain and risks resulting from the Covid-19 pandemic. Suppliers will

presumably try to maintain even greater control over their supply chain in the future in order to prevent delivery failures and to be able to react as quickly as possible.

As far as sourcing of raw materials is concerned, I3 confirms that the supplier base usually remains the same and that SCR is rather process-related (Pan, 1989). From a process-oriented perspective, the supply chain will be adapted in terms of, for example, logistics provider, but remains the same in its basic configuration. This implies the handling of different volumes, integrating new logistics provider or defining new material flows at the manufacturing site. This is also in line with C1 and I1 who point to the importance that it is rather impossible to change suppliers during series production, however, this cannot always be ensured. In individual situations, it may also be necessary to switch suppliers, which depends on the type of component or the availability of suppliers (A2, C1). This is most likely explained by the long time it takes to develop, qualify and certify a supplier or release and approve materials (A2, I1). “Due to the extremely complex structure of the development processes, the approval processes to be conducted worldwide (type approvals, general operating licenses), the supply chain [...] logistics and production processes” (VDA, 2020, p. 100), it is rather impossible to change a supplier in series production (table 75).

Table 75: Findings to RQ3: Theme 12 ‘Extent of supply chain reconfiguration after reshoring’ (Evidence: 2)

Identifier	Quote
A1	I would say it up towards 3. I mean, yeah...it is just very...especially for the automotive customers, just-in-time and all of that. Having a production in China running relied on component suppliers in Europe it does not...it is not a good set up in the long-term
A3	So, and if we supply a car manufacturer, they usually want a supplier close to them. So, we won't buy from the same supplier all the time but they are in Portugal, Spain, Europe, Czechoslovakia, Italy, Germany, with raw material from France or Germany
A2	[...] but I don't think I have seen any big changes in the supply chain when we do those relocations. If we look at the supply chain, many of the suppliers will remain but for some materials and some components, they may be switched. I think we try also to avoid that because of also other reasons qualifications and quality and these things
I3	We have a global purchasing organisation. Whether they let a Chinese PVC supplier deliver to Indonesia or to Germany [...] but it is the same supplier base. When I'm in reshoring projects and I talk about it, I have my forwarding or transport company base, my service provider base, whether they send five more trucks, which then go somewhere or not. In other words, it's more likely that the value chain will be adapted, but will remain the same in its basic configuration.
I1	So it is more or less impossible to change the supplier at an OEM during series production. It is then also fixed for the time until the facelift under the complete model cycle, which is defined for seven years.

C1	However, because the materials were released, they tried to keep the suppliers [...] If necessary, they may have sourced from another production site and organized the release accordingly [...] sometimes they had to change the supplier or his factory
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Source: Own illustration

Following this reasoning in terms of the Covid-19 pandemic and the implications arising from reshoring, the researcher found that suppliers are also questioning the origin of their raw materials (C1). This study revealed that it might be difficult when raw materials are being sourced from low-wage and developing countries in China or Africa. On the one hand, this is likely to be referred to the Covid-19 pandemic and thus to secure raw material deliveries (i.e. avoid supply shortage). On the other hand, this is an important aspect related to the social implications of sustainability (e.g. human rights, fair treatment, working conditions). Even though this research primarily focuses on the environmental dimension of sustainability, it is important to mention that social issues are regarded important as well. E2, on the other hand, claims that supply chains in the automotive industry are professionally organised and the Covid-19 pandemic has little impact on reshoring and SCR. Rather, sustainability is accorded greater importance when it comes to the stability of supply chains. Even though there is a contradictory statement from E2, it can presumably still be stated that sourcing will be more oriented towards local suppliers in the future. This would also support the findings of the previous discussion, where A3 and H1 particularly argued that they tend to have more local suppliers if they reshore manufacturing sites back to Europe (table 76).

Table 76: Findings to RQ3: Theme 12 'Extent of supply chain reconfiguration after reshoring' (Evidence: 3)

Identifier	Quote
A3	[...] if we produce something in Spain, we tend to have more European suppliers raw material comes from here and so on.
C1	If you really look at the topic in this way Risk Scanner. So where does something actually come from? And where does someone suddenly hang in the back where someone tells you: No. I'm sorry. Yes? I won't be able to deliver soon [...] And I think for two reasons: one is certainly Corona and I mean, that's a bit, hm (hesitant), it's completely relegated to the background, this whole Fridays for Future story. I don't think it will leave companies untouched.
E2	With automotive suppliers like these, there are the supply chains, they are so well coordinated that I can imagine that Corona will perhaps also have a little influence on reshoring, more than sustainability, because the supply chains were so severely interrupted
H1	So we actually started by building up the supplier structure and the supply structure in Europe.

Source: Own illustration

Quality

A further sub-topic, which could be derived from the theme *sourcing* are supplier qualification and quality-related aspects. The researcher discovered that SCR is sometimes avoided because of these aspects. It became apparent that AS associate a high risk with changing suppliers and then having to re-qualify them to meet the OEM's requirements (A2, A3, C1; table 77). According to the quality standards of the IATF (TÜV SÜD, 2020), this involves, for example, audits of product safety, risk management, warranty management, field failure tests, manufacturing process audits or product approval processes. This was also discussed in the previous section with regard to the *sourcing*. Changing suppliers within product development can have serious consequences (VDA, 2020). It can be derived from the findings that once a supplier has been released and a certain raw material approved, AS usually keep the suppliers. As discussed, this is not only because of the raw material suppliers itself, but also related to the employees working for this raw material suppliers. The level of qualification and the experience of the employees to work on a product constantly is of high importance for AS.

Table 77: Findings to RQ3: Theme 12 'Extent of supply chain reconfiguration after reshoring' (Evidence: 4)

Identifier	Quote
A2	I think we try also to avoid that because of also other reasons qualifications and quality and these things.
A3	[...] it's a risk changing suppliers from a quality perspective until we have developed that supplier.
C1	However, because the materials were released, they tried to keep the suppliers

Source: Own illustration

Logistics

Besides *sourcing* and *quality*, the third theme *logistics* also has major implications to consider for SCR. First, the study found that it is of high importance for AS to distinguish the type of product (e.g. finished vs. semi-finished). This is because the type of product may influence the choice of a carrier and is thus an important aspect to consider in the SCR decision. C1 particularly points out “because some of the inbound traffic was only slightly smaller or less than the outbound traffic. And, that means, they drive incredibly little weight with a huge volume”. Even if this is primarily dominated by economic considerations, it is important for in- and outbound cargo (C1, F1). This is also in line with the previous statement from I3

arguing that SCR rather deals with the handling of different logistics volumes. In addition, F2 goes on to say that they “have to rethink one third of the supply chain in terms of logistics” and confirms that logistics plays a major role in supply chain configuration. Even if F1 perceived the extent of SCR rather low, the interviewee also argues about logistics and points to the importance of costs and CO₂-emissions (table 78).

Reshoring is thus a chance to make supply chain less complex and to mitigate vulnerabilities in the supply chain. This is because local supplier networks rather rely on land transport via road or rail and are thus comparatively cheaper than transport via air or sea. Furthermore, these supply chains are thus less exposed to, for example, pandemics that affect air transport more. However, road and rail transport are also more susceptible to cargo theft, which OEMs and suppliers need to be aware of when redesigning the supply chain (McKinsey Global Institute, 2020).

Table 78: Findings to RQ3: Theme 12 ‘Extent of supply chain reconfiguration after reshoring’ (Evidence: 5)

Identifier	Quote
C1	And that was actually always an important selection point, because some of the inbound traffic was only slightly smaller or less than the outbound traffic. And, that means, they drive incredibly little weight with a huge volume.
F1	And that's why, today it's already like this with us, that we look very closely: What kind of product is this? What size is the product and how can we take the best routes? But I must also admit that it is still mainly the economic factor that drives us
I3	Well, I would say that it is less that the processes in the plant itself are changing a bit, that I have to handle different volumes
F2	And it was clear to us right from the start that if I didn't approach logistics intelligently, I would have infinite costs, but also infinite CO ₂ consumption somewhere

Source: Own illustration

Second, it was found that logistics and its implications on the supply chain were not just discussed after the location decision, but it was already an integral part of the decision-making process. The main goal is to keep the supply chain when reshoring as short and efficient as possible towards the customer following the idea “where must the manufacturing be relocated to maintain a reasonable, cost-efficient, competitive and fast supply?” (C1). This is an important finding, which is also linked to the reshoring stages (e.g. completed, in implementation). Since C1 mentioned that logistics and SCR were already discussed while

implementing the location decision, it would have an impact on cases G and I as well whose location decisions are still being carried out.

It also became apparent that both the distance and the uncertainties associated with logistics are of high importance. If the distance to another supplier is too long and the costs or investments are too high for the AS, one consequence would be to manufacture the parts or components themselves (make-or-buy decision) (table 79). This means changing the governance mode from *reshoring for outsourcing* to *reshoring for insourcing*. According to Wiesmann et al. (2017) “reshoring has a strong link to make/buy decisions [...]” (p. 38). Thus, certain events or situations – as expressed by Bals et al. (2016) – have implications for the decision-making process and can be viewed through the lens of TCE. This theory is widely used to evaluate make-or-buy decisions (Wiesmann et al., 2017) as well as to review the governance structure (McIvor, 2013).

Table 79: Findings to RQ3: Theme 12 ‘Extent of supply chain reconfiguration after reshoring’ (Evidence: 6)

Identifier	Quote
	What was certainly different as far as the supply chain is concerned is that by setting up the plants where they were closer to the customers, they kept the supply chain much shorter towards the customers.
C1	Yes, and to keep the // distances short. Part of what you did was: If you noticed that the distances were getting too long and the uncertainty was becoming too great, then you invested in this prefabrication. Yes? You make the foam blocks yourself. Well, I think personally, if distance alone were incumbent on me, I would make sure that I would increase my added value at the location

Source: Own illustration

Conclusion

As far as the extent of SCR in upstream operations is concerned, it is notable that this issue appears to be a phenomenon, which extends through all three dimensions of sustainability – environmental, social and economic. It became clear that with SCR, firms pursue to improve their efficiency (environmental, economic), evaluate human rights in the supply chain at Tier-2/-3 suppliers (social), reduce CO₂-emissions through less transportation (environmental, economic) and strengthen the competitive advantage in the market (economic). Furthermore,

supply chain-related issues are of major importance for AS to ensure stable supply and on-time deliveries to OEMs.

Even if it was found that SCR extends across all dimensions, it still emerges that the extent of SCR in every firm differs notably. On the one hand, this is due to the different perceptions and experiences every interviewee has made with SCR. On the other hand, the extent differs for each firm, as supply chains are structured differently. From a vertical perspective, this may include a different amount of upstream suppliers (e.g. Tier-2/-3), logistics service providers or value creation activities. From a horizontal perspective, there is a different amount of suppliers per Tier-1/-n level involved. In addition, spatial complexity corresponds to the geographic distance between an OEM and its AS (Bode & Wagner, 2015).

By comparing the cases across and within each other, it was found that SCR at AS is particularly characterised by the following four topics: *sourcing*, *logistics*, *quality* and *ES-aspects* in upstream operations. All four topics clearly expressed the complexity AS face when reconfiguring the supply chain. This starts with the search for local suppliers to reduce spatial complexity who meet the high-quality standards required by OEMs and do not need to be re-certified and extends to the evaluation of new logistics options. Not only does the deliverability and efficiency of a supply chain depend on this, but also a high proportion of total costs as well as CO₂-emissions. It thus emerges that SCR is a complex field as it involves many suppliers, logistics service provider and value creation activities across the globe (horizontal and vertical complexity). What was particularly notable is that sustainability-related aspects were mentioned in the context of sourcing and logistics as well. These aspects are directed towards the automotive supplier questioning the origin of its raw materials and if human rights or working conditions are ensured. Thus, social aspects such as ethicality in the supply chain are regarded important, which is also in line with Engström et al. (2018) and Heikkilä et al. (2018). In addition, the interdependence between logistics, costs and CO₂-emissions became apparent, which is directed towards environmental and economic sustainability. In sum, it requires AS to carry out a comprehensive assessment of various parameters particularly concerning sustainability.

Proposition 11: *As soon as a complex task like SCR is started (during or after the reshoring project), automotive suppliers take the improvement of sustainability-related issues along the three dimensions (environmental, social and economic) into account.*

5.4.2 Perception of ES when redesigning the supply chain

“Sustainability is becoming increasingly important in supply chains, particularly in those that function in highly competitive industries” (Flint & Golobic, 2009, p. 841). It has also become a competitive advantage when a firm has one or more competencies allowing it to create superior performance in contrast to its competitors. “One such competency that has received increasing attention in the literature is environmental sustainability” (Flint & Golobic, 2009, p. 842). Thus, Abbasi & Nilsson (2012) argue that sustainability must be integrated into supply chain management and not be treated as a theoretical concept. Particularly environmental and social issues must be “treated in the same way as revenues and costs are today. Otherwise, sustainability will only [...] be given lower priority [...]” (p. 527). For illustration, Porsche AG (2019) handles “sustainability on the same level as costs, quality, technological expertise and logistics within the award process” (p. 94), which consequently affects more than 7,500 suppliers. Exerting pressure on suppliers making sustainability an integral part of the award process, expresses the importance an OEM assigns to sustainability and the increasing pressure suppliers are exposed to.

When it comes to the perception of ES when conducting a reconfiguration of the supply chain, the researcher has found that ES is attributed rather a subordinate role. If ES is taken into account, it is rather indirectly through optimising transport routes and quantities in order to reduce CO₂-emissions (D2, F2). Even if it is currently only considered in the background, it can still be seen as a win-win situation. G1 also expressed that the majority of emissions in the supply chain result from logistics and transportation, which is actively being managed. A reason for considering ES in the supply chain, for example, is to avoid additional payments or costs that may arise in the future due to the introduction of a CO₂-price. “With increasing energy costs and additional costs for the emission of carbon through taxation and other policy instruments (e.g. the European Union Emission Trading System), economic motivation for energy and carbon efficiency goes up” (Böttcher & Müller, 2016, p. 1452). Although these

aspects are rather attributed to the economic dimension of sustainability, it is all the more important to consider ES in the supply chain. If the firm can no longer reduce the CO₂-emissions of its own manufacturing site (e.g. by switching from fossil fuels to green or renewable electricity) or through value creation activities (e.g. increasing the share of recyclable materials), the supply chain is the most important aspect in the entire supply network to focus on (G1).

In addition, the type of transport chosen (ship, rail or road) is not only an important aspect for the firm's cost structure, but also has an impact on CO₂-emissions (Browne, 2005). From this, it can be deduced that the reconfiguration of supply chains in this sector can be attributed to the change of means of transport, too (H1). However, cost of energy, CO₂-emissions or CO₂-prices (G1) as well as local production in Europe close to its customers (F2) are also perceived as important measures from an ES perspective. With respect to CO₂-emissions, it is likely that it will be used in the future as a means of exerting pressure to trigger the reconfiguration of a supply chain. However, the discussion about being cost-efficient, reacting fast and ensuring a high (product) quality is consistent with the findings discovered and explained in the previous chapters on the *perception of ES as a driver for reshoring*.

Table 80: Findings to RQ3: Theme 13 'Perception of ES when redesigning the supply chain' (Evidence: 1)

Identifier	Quote
D2	[...] the problem is that if the customer wants to have local-to-local, in most cases it is only a question of cost advantage [...] you put sustainability on the agenda, but of course he expects a cost advantage, because if he doesn't have to ship it by sea anymore, then it has to be cheaper. Indirectly, unfortunately only indirectly. So if I were to answer it so bluntly: Unfortunately not, okay? I have so much pressure on the supply chain that I can't play that into it, I have enough to do to keep the supply chain going and get it right.
F2	I reduce transport routes and such things, at least for the sake of sustainability. I produce in Germany, I get the PCBs [<i>Printed Circuit Board</i>] in Germany. Or we also have a plant in/ There is a plant in Belgium and a plant in Italy, which we work with at this point, but actually we secure our supply chain. And we have a little bit of sustainability on the side as well. So even if you somehow can't influence it from your own locations. You really do have a very, very long supply chain, some of it really global, and that's just unfortunately. The majority of the emissions are there, of course, and if I can influence it through energy costs, CO ₂ , or even the type of transport, and you might even have a CO ₂ -price tag, then I'm with you, then that will definitely be a factor, yes.
G1	

.....
 If possible, we do that. And we prove this, it is also written in our sustainability brochure. The current situation is that 53 percent of our products come from Germany, 31 percent from the EU and 11 percent from Asia. So we are trying to play that down accordingly, but it has different influencing factors, as I have just shown.

H1 Important to consider means of transport, also with regard to ES

Source: Own illustration

Moreover, an interesting finding was that CO₂-pricing and -taxes are perceived as important drivers to initiate a SCR. Since the findings on reshoring, ES and SCR in the context of this thesis have often revolved around the topic of costs, it stands to reason that the introduction of a CO₂-price is an important driver for SCR. This is likely because it affects the profitability of a firm. It can be assumed that this does not only affect the supply chain, but also the sourcing process (e.g. from which countries raw materials are being sourced from) or by whom products are being manufactured (e.g. reshoring for insourcing vs. reshoring for outsourcing) (table 81).

However, even if the introduction of a CO₂-price or -tax is beneficial for politics to make sure sustainability targets are fulfilled, it can be criticised that firms simply shift their production to low-wage or emerging countries with less regulations where CO₂-emissions are not regulated (G1). Notably, Sawhney & Rastogi (2015) found that polluting industries – such as the automotive industry – are moving manufacturing sites from Western home countries to locations with laxer environmental regulations. This effect is referred to as *carbon leakage*, as explained by Huang et al. (2020, p. 2). “The compliance costs and the associated uncertainty raise the risk of inducing producers to shift production capacity to a region in which carbon emission charges are absent or lower” (p. 1). A likely counter-argument to simply go into these countries, however, is the vulnerability of global supply chains, for example, in the context of the Covid-19 pandemic, and the time pressure exerted by OEMs.

Table 81: Findings to RQ3: Theme 13 ‘Perception of ES when redesigning the supply chain’ (Evidence: 2)

Identifier	Quote
E1	This means that I can actually only carry out CO ₂ -pricing that is appropriate to the cause. This means that we develop a system in our SAP system, so to speak, where CO ₂ is allocated to this cost unit depending on the use of a process stage, together with what I have in front as raw

.....

material and then with what I still have as freight, so to speak at the end, and then to determine a CO₂-equivalent for this product

G1 Before I answer that, I believe that there will be a change there as well. And that change will come depending on how the price of a ton of CO₂ is determined. If we are as lax as we are at the moment, where you can get a ton of CO₂ for 7.50 euros, then that is acceptable. But when it comes to dimensions that really hurt, I am absolutely convinced that no one will buy it from me internally, but it is my personal opinion that depending on how the pricing of the ton of CO₂ develops, there will very well be a reversal in the supply chain

[...] supply chains will become shorter again in the future.

On the one hand, of course, we are convinced - and I think we are in accord here - that supply chains will become shorter again in the future. At the same time, if I do things here or reach my limits, then I'll just go somewhere else where I can blow this out

Source: Own illustration

Conclusion

The researcher found that the perception of ES has rather a subordinate role in SCR. Although the reduction, for example, of CO₂-emissions is considered important, it rather results from the optimisation of transport routes or the choice of carrier. One particular reason why CO₂-emissions are taken into account in SCR is the potential penalty payments resulting from the introduction of a CO₂-price. Although the CO₂-price is more related to the economic dimension of sustainability, it is still important to mention as it can initiate a reconfiguration. It also became clear that the choice of transport mode is an important aspect for SCR and has an impact on both the environmental and the economic dimension of sustainability. In common with Abbasi & Nilsson (2012), this section has thus shown that sustainability is integrated in supply chain management, however, it does mainly address environmental and economic aspects. In connection with this question, the interviewees did not mention social issues, however, the previous section 5.4.1 has revealed that AS are, for example, questioning the origin of their raw materials. This is related, for example, to respect for human rights and fair working conditions. Following this discussion, it emerges that SCR revolves around logistics in particular. This is because the highest emissions are attributed to this sector (Browne, 2005).

Proposition 12: *With the introduction of a CO₂-price, particularly logistics and transportation are a key driver for the reconfiguration of supply chains to reduce CO₂-emissions.*

5.4.3 Implications for reshoring decision-making processes

Until recently, little is known about the relationship between reshoring, SCR and ES. These avenues are understood as foundational unexplored research gaps (Orzes & Sarkis, 2019). Furthermore, little attention has been paid to SCR and to the criteria, how it is being assessed. “A deeper understanding of the decision making processes required to effectively reconfigure supply chains when reshoring and/or insourcing can provide novel insights to researchers and managers alike” (Bals et al., 2016, p. 103). In addition, scarce attention has been paid to this research gap in the AS sector.

Following this reasoning, the researcher examined the cases according to the evaluation criteria used in an SCR. These criteria were identified by comparing the cases across and within each other. This comparison has allowed for deriving five categories (costs, operations, logistics, sourcing and ES). Table 82 below summarises these rich insights into the underlying criteria.

Table 82: Criteria to evaluate a supply chain reconfiguration in upstream operations

Supply chain reconfiguration evaluation criteria	A	B	C	D	E	F	G	H	I
Costs									
Economic and commercial aspects		X		X				X	
Costs of rejects/transport/scrap/indirect personnel									X
Investments									X
Operations									
Lead and throughput time									X
Control effort of the supply chain									X
Number of interfaces and complexity									X
Depth of value-creation activities				X					
Need for technological advancements									X
Logistics									
Means of transport							X		X
Sourcing									
Supplier qualification	X								
Risks and uncertainties (e.g. sourcing markets)				X				X	X
Location of suppliers								X	
Quality	X								
Product type (finished vs. semi-finished)				X		X			
Customer proximity and distance				X				X	X
ES-aspects									
CO ₂ -emissions	X					X	X	X	

CO ₂ -pricing and -taxes		X	X
Annual sustainability report	X		
Green electricity/renewable energy	X		X
Material efficiency	X		
Product declaration (e.g. ISO50001, 14000)	X		
Environmental certifications and audits	X		

Source: Own illustration

The findings of this study reveal that the criteria to evaluate a SCR when reshoring are rather heterogeneously distributed and show that every case puts different emphasis on this issue. It is thus also notable that not every case commented on the criteria to the same extent. This is exemplified by cases B, D and E where only *economic and commercial aspects* and *CO₂-pricing and -taxes* are mentioned as criteria to evaluate an SCR. In addition, it also becomes apparent that *sourcing* and *ES-aspects* are frequently reported and lead to the conclusion that these two categories are of particular importance.

First, the researcher found that SCR is consciously taken into account in the decision-making process, although every firm employs a different set of criteria to evaluate the consequences by changing the supply chain. Most importantly, it became apparent that SCR is a significant driver of complexity because it extends across the entire firm, has many interfaces, for example, to logistics providers or further suppliers and is associated with high costs and coordination efforts. In addition, if the supply chain becomes too complex or too long, it also entails significant uncertainties for the firm. One consequence of this could be that firms increase their own share of value creation and thus shorten the supply chain. It is thus likely that it is not only beneficial to reduce the distance, but also to increase a firm's value creation activities in the supply chain (i.e. reshoring for insourcing) and to become more efficient. In addition, it is possible that it has positive effects on ES targets, because the supply chain is shorter and less transportation is needed. Cases C and I have mainly raised these issues (table 83).

Table 83: Findings to RQ3: Theme 14 'Implications for reshoring decision-making processes' (Evidence: 1)

Identifier	Quote
C1	If distances were getting too long and the uncertainty was becoming too great, then you invested in prefabrication
I3	But // is actually also a topic that is consciously taken into account in the decision-making process, where are you going with your production, because of course that is also a driver of complexity. When I say that I not only have the production process itself and the qualified personnel that I have to have somewhere and build up for a relocation, but I also have to somehow redesign the entire value chain with the corresponding uncertainties. This is already a decision factor that has to be taken into account. Sometimes people still do this when I say that I don't have to go anywhere for economic reasons, or that offshoring is more of an issue. I just go to some low-cost country where I am not yet present, where I do not yet have a location, where I do not have a know-how carrier on site in any way, but then I am consciously involved in the decision making process, which has consequences for the project implementation.

Source: Own illustration

Second, in contrast to the reshoring decision-making criteria, economic and commercial considerations are relevant although they have been mentioned less. Since the sourcing-related criteria, such as risks and uncertainties, location of suppliers or product type, were mentioned more often from the interviewees, a likely explanation is that costs play a subordinate role in SCR and that it is primarily about securing the sourcing process. This is because (just-in-time) deliveries are one of the most important expectations OEMs have of their suppliers. However, H1 counters that commercial considerations are still important even though logistics in terms of the means of transport, CO₂-emissions, energy or the location of suppliers are of the same relevance. Another explanation why costs are rather in the background is that they are considered throughout the location decision anyway and are therefore not explicitly mentioned (I1) (table 84).

Table 84: Findings to RQ3: Theme 14 'Implications for reshoring decision-making processes' (Evidence: 2)

Identifier	Quote
H1	Yes, of course commercial considerations will play a role here. You can never ignore that. We are still a commercial enterprise. But I think these are the two main points you would certainly look at. And depending on what is produced there, and certainly also on the energy input, or especially when it comes to chemicals: what chemicals are used? Where do they come from? How are they handled? But that is actually already standard practice for us today.
I1	I always look at the lead time, look at the cost of rejects. And finally, what I also look at is how much control effort the supply chain requires. But the longer my value chain becomes, with more interfaces, the more overhead I need to manage it, the more scrap I have. So that means

that I have mainly looked at indirect personnel costs, transport costs, scrap costs and throughput time. So the things per se are in the foreground.

Source: Own illustration

Third, the consideration of ES in the decision-making process and its importance for supply chain reconfiguration is poorly understood (Orzes & Sarkis, 2019). Thus, in addition, to the previous findings on the reshoring decision-making criteria, the researcher explored further criteria, which are relevant to evaluate a SCR. Particularly the findings from cases A and I have created more transparency about the criteria as well as about the perception of ES in the assessment of the supply chain of AS. Besides the consideration of CO₂-emissions, it became clear in cases A, E, F, G and H that AS take further criteria such as the introduction of a CO₂-price, access to green electricity or the evaluation of product declarations (e.g. ISO50001, ISO14000) into consideration. Even if case E did not mention the introduction of a CO₂-price or -tax in the context of SCR, it can also be assumed that this is a future challenge and decision criteria for SCR. Furthermore, it is also important to link these findings back to the *logistics* category where it became clear that firms reduce transport routes and increase geographical proximity towards the customer for the sake of sustainability (F2, H1, table 85).

Moreover, the researcher found that it is not only concrete facts and figures that are used for the evaluation of SCR. Annual or sustainability reports of firms are also examined, for example to understand CO₂-emission values or the entire sustainability strategy of an OEM or a further Tier-2/-3 supplier (A3). A likely explanation is that AS not only aim to understand the ES perspective (e.g. CO₂-emissions), but can also better recognise social and economic aspects of the sustainability strategy (e.g. working conditions in the supply chain, board compensation based on environmental objectives). The social dimension has been particularly stressed by the interviewees (A1, A2, A3, E1, F1). These aspects cover, for instance, respecting human rights, avoiding child labour or ensuring fair payment. The commitment towards the social dimension of sustainability of an OEM or supplier is published in the form of an annual or sustainability report (Volkswagen AG, 2019; Porsche AG, 2019). This helps to understand the social commitment better as argued by A3 (table 85). The VDA (2020) also reported that the National Economic and Human Rights Action

Plan (NAP) aims to contribute to improving human rights situations and make globalisation more socially equitable in the automotive industry.

Table 85: Findings to RQ3: Theme 14 'Implications for reshoring decision-making processes' (Evidence: 3)

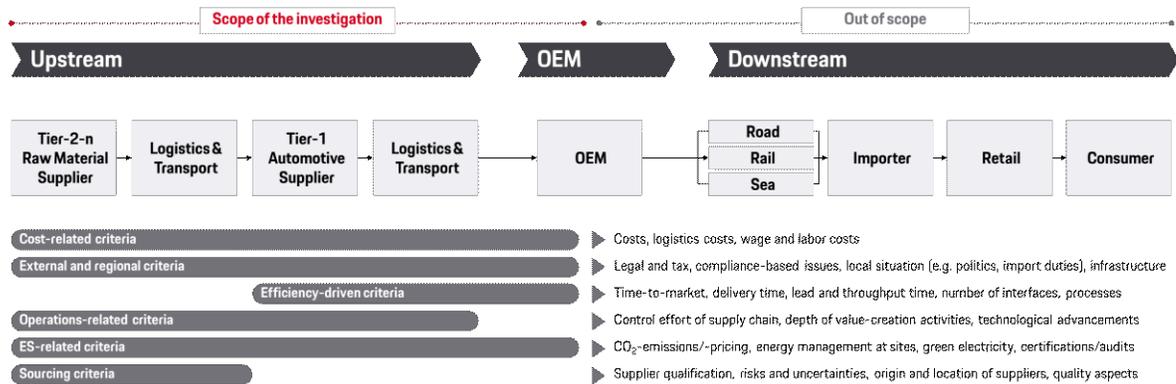
Identifier	Quote
A3	I think the first question should be do we have a product declaration when it comes to CO ₂ -emissions? Do we have a ISO 50001 certificate? ISO 14000 environmental certificates? What is the company reporting in their annual report, what is the official data? Does it match this? If we choose to look further, maybe we ask them about energy suppliers, if they have certificates for the CO ₂ emissions per kilowatt hour or mega joule or it could be about material efficiency to ask them how much material comes into your sites to produce a ring and how much does the product that comes out weigh, what is the net, Net, shape, co-efficiency [...] Generally, when it comes to sustainability topics, I think social sustainability will be more important.
A1	Of course, you should work to understand the environmental impacts of the decisions, but the social impact of closing production [...] can potentially be profoundly negative
A2	Actually I think one other area is also legislation and the impact that has on the supply chains. Because when we don't have harmonised global legislation in the environmental and also in the social area there will be different thresholds and basically different roles of the game in different countries which can make it sometimes unfair.
G1	[...] depending on how the pricing of the ton of CO ₂ develops, there will very well be a reversal in the supply chain [...]
E1	The topic of the CO ₂ -tax will also be a great challenge for us in the coming years. It will also be the biggest challenge for those who supply us with raw materials, and in this context we are already reflecting on such decisions.
	Actually, I think this is also a topic where we need to address socially.
F1	Yes that is interesting. I always notice that the environment and social issues go hand in hand.
F2	I reduce transport routes and such things, at least for the sake of sustainability.
H1	Well, we would probably insist that we have a supply chain that is as CO ₂ -neutral as possible, also with regard to the supply routes, so just take a look, is there a certain geographical proximity to our production plant?

Source: Own illustration

In conclusion, the discussion of the decision criteria with regard to the supply chain has provided further important insights. This is particularly important to shed light on the interaction between reshoring and SCR. It became clear that the ES-related aspects have become more important in SCR. It was recognised that it is often not only about ES, but that this topic is also dealt with subtly through the optimisation of logistics routes/means or customer proximity. Consequently, the researcher suggests that reshoring and SCR decision-making criteria should be matched in order to fully represent all criteria in this process.

The following figure 21 therefore schematically illustrates how the decision-making criteria for location decisions and the reconfiguration of supply chains complement each other. It is important to emphasise that the decision criteria for AS refer to the upstream processes starting with the raw material suppliers of the Tier-1 AS and ending with the OEM. As a result, figure 21 summarises the identified decision criteria from tables 62 and 82 and expresses where in the supply chain the criteria apply (e.g. raw material supplier, logistics & transport or Tier-1 AS).

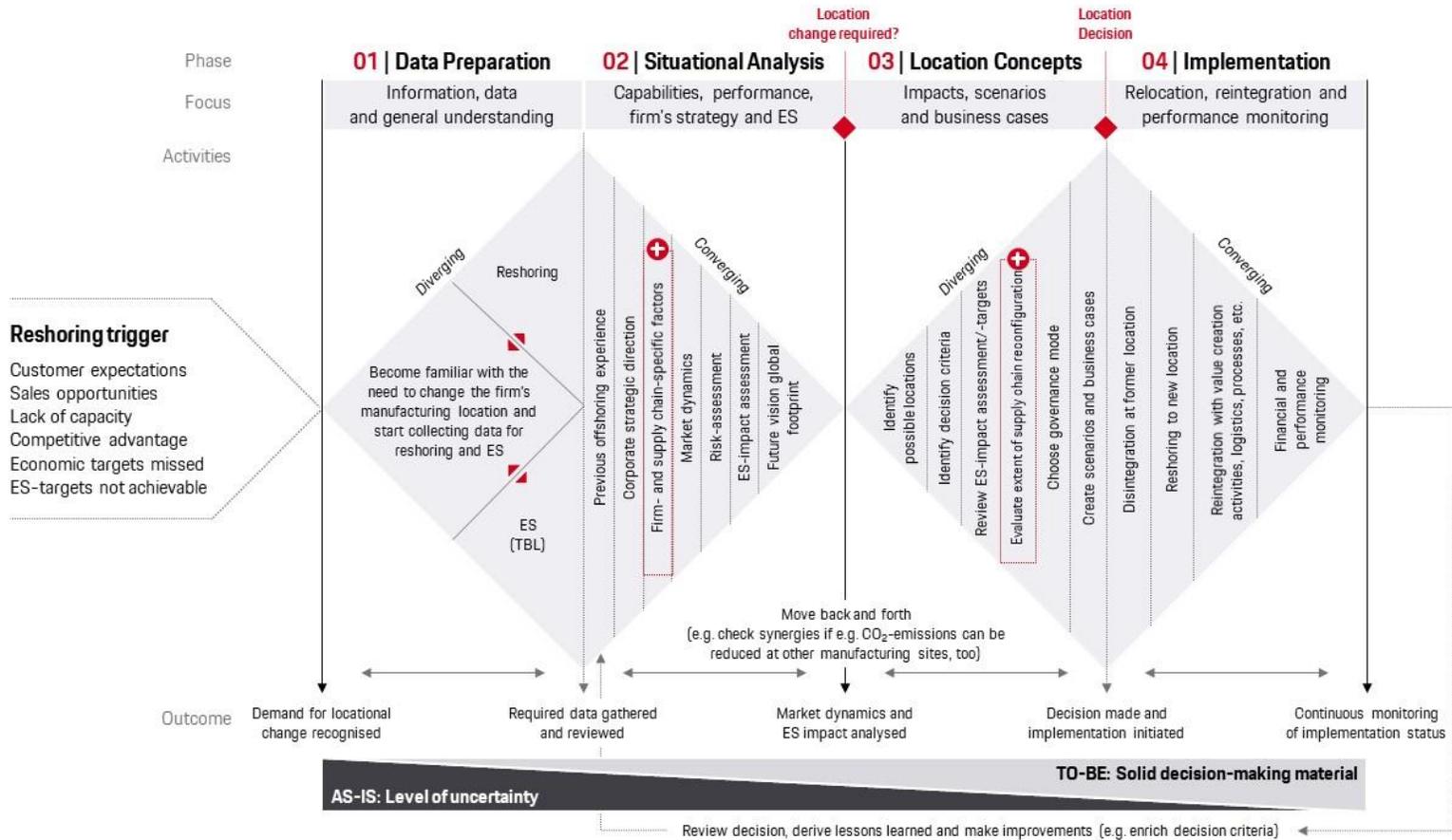
Figure 21: Decision criteria for reshoring and supply chain reconfiguration across the value chain



Source: Own illustration

Following the exploration of the decision criteria for reshoring and SCR alike, it is thus important to complement the conceptual model for the reshoring decision-making process as well (figure 19). This results in two important amendments: First, in the second phase *Situational Analysis* the researcher specified that it is not only about *firm-specific factors*, but also about *supply chain-specific factors*. Due to the variety of supply-chain specific decision criteria identified, it is important to start the analysis of the impact on the supply chain at an early stage as well. Second, in the third phase, *Location Concepts*, the researcher has added the activity *evaluate extent of SCR*, as this is an important aspect for the future location concept. Figure 22 below demonstrates the changes in the conceptual model, which are marked with both a red dashed frame and a plus symbol.

Figure 22: Adjusted conceptual model for the reshoring and ES decision-making process



Source: Own illustration

Conclusion

Investigating the process how the reconfiguration of a supply chain is being evaluated has resulted in substantial findings. First, *sourcing* and *ES-related aspects* in particular were mentioned more frequently than cost-related factors, however, cost considerations are still of high importance in SCR. Second, the researcher was able to identify further decision criteria, which are relevant to examine SCR. These criteria were thus added to the conceptual model for reshoring decision-making and have helped to enrich the model from a supply chain perspective. Third, it must be emphasised that some decision criteria such as CO₂-emissions, means of transport, location of suppliers or costs were already mentioned when exploring the reshoring decision criteria in section 5.3.2. Therefore, there can be an overlap of criteria. Nevertheless, additional criteria such as lead and throughput time, control effort of the supply chain, number of interfaces and complexity or the product type (finished vs. semi-finished) are important factors to evaluate a SCR. Fourth, concerning ES-related criteria, AS place special emphasis on the introduction of a CO₂-price, access to green electricity or the evaluation of product declarations. Especially the introduction of a CO₂-price can be considered very important because it may serve as a driver to shorten supply chains and to avoid CO₂-penalty payments. This discussion leads to the following proposition:

Proposition 13: *The CO₂-price takes on the most important role in SCR in terms of balancing the environmental and economic dimension for AS.*

5.4.4 Product re-design because of supply chain reconfiguration

Recently, a considerable amount of literature has been published on SCR (Orzes & Sarkis, 2019) and its interdependence to product and process development as this can have an impact on both innovation capability and time-to-market (Wan et al., 2019). The authors stress, “intense globalization processes have favoured the shift of many production activities to developing countries and the reconfiguration and repositioning of the operations” (p. 6). According to Wan et al. (2019), this is also a possible scenario, which has promoted reshoring in the past. Di Mauro et al. (2018) also point to the importance that a better competitive position emerges from offering higher quality products. In this study, the interviewees were

thus asked to explain if the reshoring strategy or SCR has resulted in a product re-design (e.g. by enhancing the quality or by offering a more competitive product portfolio).

A key finding is that product re-design does not emerge from reshoring or SCR in the AS sector. Much of the collaboration between OEMs and AS is concerned with the fulfilment of high standards and specifications to offer high quality products. Previous findings from this study (section 5.4.1) have also revealed that SCR is rather concerned with process-related changes and thus not with product-related ones. Severe product-related changes are more likely to be perceived as a barrier for the collaboration between OEMs and AS because of the high technical product specifications. For instance, developing and qualifying a new supplier to supply a different kind of raw material is too risky in terms of the validation costs (VDA, 2020). Thus, both reshoring and SCR do not lead to a re-design of the product due to costs, quality and time issues, as argued by C1, D2, F2 and I3. In the same vein, F1 confirms that reshoring and SCR do not result in product re-design, however, it must nevertheless be made clear that change requests during the product creation process from the OEM may occur. Concisely, the re-design of products is therefore not the result of reshoring, but is caused by customer demands and regular product development (table 86).

Table 86: Findings to RQ3: Theme 15 'Product re-design because of supply chain reconfiguration' (Evidence: 1)

Identifier	Quote
C1	No, the products have remained essentially the same there.
D2	Yes. I mean, on top of that - at least in the automotive industry, pharmaceutical industry, medicine, aviation - the standards and specifications are so tight that you would have to re-sample and that is not possible at all at such short notice.
F1	The fact that it has been relocated has not led to redesign. But certain change requests that the customer then had, i.e. for model updates a year later, led to another redesign. But that would have happened if it had remained in Asia. In other words, it wasn't the reshoring that tipped the scales in this case, but the customer's wishes.
F2	The problem is that especially in the automotive industry the validation costs are often simply too high, and that then becomes a huge problem. And I have to talk to the manufacturer and say: "Listen, I have the following seventy points, let's do a validation round". That takes half a year with a thermos and "knick-knacks", and then I make the product differently.
I3	So out of the Footprint decisions no. From the point of view of sustainability, from the point of view of cost efficiency through the use of recycling, for example, from the point of view of supply security, yes. But not from the point of view of the Footprint [...]

Source: Own illustration

The researcher noted that product re-design tends to result from customer expectations. This can be caused by certain country-specific requirements or even special customer requirements (e.g. a product's appearance, design, noises). In this respect, however, it can be argued that country-specific requirements are an important criterion for SCR (A1, A2). If a production site is relocated in a country where the customer ultimately wants to sell its products (e.g. vehicles), it may well be an implication that country-specific requirements become more relevant. This can be a decisive factor for firms in the automotive industry, for instance, to comply with CO₂-limits per car or to ensure the use of recyclable raw materials. On the one hand, E2 points to the importance that they were able to establish competitive advantage through using renewable raw materials and ensuring the recycling of materials. On the other hand, I1 stresses that high technical product specifications and requirements from the OEM prevent the supplier from using recyclable raw materials. According to the End-of-Life Vehicles Directive (ELV) from the European Commission (2013), a clear target of 95% recyclability per vehicle per year has been set. The aim is to adhere to a wide range of existing legislations for sustainable production as well as to reuse and recovery of raw materials (Appendix 12). This novelty is likely to lead to major changes in the technical specifications of the product, such as the transition from classic to sustainable raw materials or the modification of production processes. At the same time, this increases the pressure for suppliers to find solutions, which are both accepted by the OEM and technically feasible to ensure the recycling of products. Thus, it can be assumed that ensuring the recyclability of products indirectly leads to a re-design of products, where substitutes for sustainable or renewable raw materials are gradually introduced (E2, I1) or products are constantly refined. Particularly, the refinement of products not only leads to material cost being saved, but also to fewer transports being required, which in turn reduces CO₂-emissions (A3, G1). I3 even argues that the availability of recyclable raw materials is also a driver for reshoring if these are not available in locations abroad such as Vietnam (I3, table 87).

Table 87: Findings to RQ3: Theme 15 'Product re-design because of supply chain reconfiguration' (Evidence: 2)

Identifier	Quote
A1	We re-designed the products more from a customer perspective because there are certain...and depends on the industry. But, yeah, certain aspects or features that are really not that important in Europe, much more important in Asia. So, for example, the physically appearance of the products in Europe.

	So we have had to adapt our processes to that customer demand. Asian customers much more focused on the bearing noises. It is a really critical parameter for them, so we had to design things differently, re-tune our manufacturing process. In times of adapting for the suppliers, I do not really know. Probably we have had to do this to some extent, but I do not know to be honest.
A2	Not that I am aware of, I mean that the relocation led to a redesign of the product. Redesign of the product that is more linked to the customer side of the value chain rather than to the supply side of the value chain
C1	No, the products have remained essentially the same there. The products are also not insanely complicated.
E2	Because we can work very well in a recycling system made of renewable raw materials. This means that our product is actually relatively sustainable compared to other products, which is where we have the advantage.
G1	And for us, this always means refinement, where you have to constantly look and see what material resources I need for my products and where can I leave out something that is actually completely unnecessary or oversized? [...] but if I can save three truckloads a year, and every tenth company does that, then I've really gained a lot over the year, over the next ten to fifty years, and I've at least managed to make my products a little more sustainable [...]
A3	This particular product I don't think but there are certainly examples of design changes to avoid certain components completely or to say if there is a production step less that is needed to produce a shape for example, that kind of tweaks or even major redesigns. That happens quite often.
I1	But in the end this partly prevents the use of recycled material, because the surfaces have to be perfect. And that's why we have now changed over to a second step, that we have said, we understand, we have to keep it that way, we don't mess around, in German, but we think of products that have different requirements, where the specifications are such that we can use recycled materials perfectly again. And that is now the strategy we are pursuing. And that's why our new management team is strongly committed to this.
I3	The issue of sustainability comes strongly [...] where attention is really paid to increasing the proportion of recycled materials in our products, already in the design phase, to ensure material flows. I would also say that the recycling flows or the recycled material is then [...] a decision factor for the Footprint. So I can go to Vietnam if we stick to your example earlier. But if, for example, I don't get any profile sections for [<i>product anonymised</i>] and no industrial waste that can be extruded back into my profiles. Yes, then I'll be in Vietnam with low wages but without material, which doesn't help either.

Source: Own illustration

Improving the environmental performance of a product or increasing the efficiency of a firm's operations could lead to a product re-design. As far as the latter is concerned, it became clear that during reshoring and SCR certain design changes of a product occur. As a result, this is beneficial for sustainable production as long as certain components (i.e. less waste)

and thus production steps are avoided (A2, A3, H1, I3). It is surprising that H1 in particular perceives the influence of ES on reshoring decisions low (cross-reference to section 5.2.3).

At the same time, H1 sees a high interdependence between ES and product re-design. The researcher explored that the ES dimension is thus also associated as a driver to re-design a product. This is characterised by reducing the weight, moving certain value-creation activities to another location or increasing the recyclability of a product. This expresses that firms with energy-intensive resources and high value-added activities in particular are very deliberate in making the right decisions about how and where in the supply chain a part is produced. The example of H1 shows that this triggers both measures to reduce costs and considerations to improve the CO₂-footprint. Consequently, this affects the environmental and the economic dimension of sustainability alike (table 88).

Table 88: Findings to RQ3: Theme 15 'Product re-design because of supply chain reconfiguration' (Evidence: 3)

Identifier	Quote
A3	This particular product I don't think but there are certainly examples of design changes to avoid certain components completely or to say if there is a production step less that is needed to produce a shape for example, that kind of tweaks or even major redesigns. That happens quite often. Trying to improve performance, reduce weight, things like this, friction improvements, nice wheels, sometimes it could be things like recyclability. So, we avoid maybe some assembly techniques for different customers that requires that their products are easy to recycle. That can happen.
A2	Not in relation to relocation but other redesign projects to improve environmental performance but that is more than// from the customer side of things
H1	A manganese-phosphate plant of this kind is also quite large and energy-intensive, so we said: "Okay, we can solve this in another way", and if the customers get involved, then we took action at such an early stage that, for example, we moved to this new location where we have the production concept, so that we could eliminate this complete production step. And this is partly for reasons of sustainability.
I3	From the point of view of sustainability, from the point of view of cost efficiency through the use of recycling, for example [...] and also demanded, is there already a continuous revision and adjustment of the product portfolio

Source: Own illustration

Conclusion

This research provides an in-depth view on the need for product re-design because of SCR in the AS sector. According to Orzes & Sarkis (2019), Wan et al. (2019) and Di Mauro et al.

(2018), little academic findings on this avenue are available. They expressed the need for further research on the consequences from reshoring and SCR on product re-design. Thus, this research strongly contributes to this research avenue by exploring that product re-design does not primarily result from reshoring or SCR, but either from a customer's wishes or product improvements due to ES. Concerning both, it can be assumed that AS seek for competitive advantage while fulfilling the desired customer wishes or by improving a products performance with regard to ES. Concerning the latter, this is reflected in firm-specific design changes of a product, for example, to increase the recyclability, the usage of renewable materials in product development or the avoidance of unnecessary production steps to become more efficient. As mentioned earlier, especially firms in the automotive industry are required to ensure recyclability of vehicles and parts by 95% per year (European Commission, 2013). Consequently, there is strong external pressure from OEMs, institutions or policy makers on suppliers to re-design products to achieve these goals.

According to a study from Markley & Davis (2007), it specifically became clear "businesses will be challenged to create new strategies and it is likely that the basis for gaining competitive advantage [...] may be rooted increasingly in a set of emerging capabilities such as waste minimization, green product design, and technology cooperation in the developing world" (p. 765). The findings of this research can be linked to the study from Markley & Davis as well. For illustration, a number of leading US companies established competitive advantage by engaging with environmental performance-enhancing activities (e.g. decrease costs due to scrap and material losses, lowering material handling, increasing revenues by converting waste to by-products) (Markley & Davis, 2007). The focus on these issues may prove to be an effective strategy for establishing competitive advantage. However, it was found that reshoring is mainly focused on process-related changes and less on product-related changes. Thus, the following proposition emerges:

Proposition 14: *Due to the high technical product requirements of OEMs for their automotive suppliers, reshoring leads to processes that change, but not necessarily the products.*

5.4.5 Implications of the Covid-19 pandemic on supply chains

During the data collection phase, the interviewees were asked to talk about the influence of the Covid-19 pandemic on supply chains. The goal of the researcher was to understand how these severe supply chain disruptions are perceived especially due to their reliance on global suppliers and if it increases the trend towards local production. It is important to note that the interviews were conducted between July and November 2020 in the midst of the pandemic.

5.4.5.1 Main findings on the effect of the Covid-19 pandemic

Until recently, little is known about the short- and long-term effects of the Covid-19 pandemic, however, it is obvious that this pandemic will have dramatic consequences for national and global economies as well as on the structure and organisation of a firm's operations and supply chain (Samson, 2020). Barbieri et al. (2020) go on to say, "components of key industrial supply chain (e.g. automotive, chemicals) whose stoppage can dramatically hurt the GDP of an advanced economy" and thus highlight the relevance of the pandemic for the automotive industry (p. 131). Once the pandemic started to emerge in December 2019 in China, it had a severe impact on local automotive markets as factories temporarily closed. With more than 80% of the world's supply chain connected to China, these closures started to cause shortfalls for OEMs across the world (KPMG, 2020). Thus, there is a general consensus among analysts and institutions (e.g. The Economist Intelligence Unit, United Nations Conference on Trade and Development, World Economic Forum) that Covid-19 will undermine the current global value chain model of industrial firms in the long-term. "This likely reshaping of the supply chains will be driven by both managerial (i.e., firm-level) and political [...] factors" (Barbieri, et al., 2020, p. 131). There are numerous hazards of global operations published in literature for risk management of supply chains, however, the global turbulences of the Covid-19 pandemic are not yet covered and call for further investigation (Barbieri, et al., 2020).

As far as this research is concerned, there is also a consensus across cases A1, B1, C1, D2 and I2 that the Covid-19 pandemic has a strong influence on the reconfiguration of global supply chains, the availability of suppliers and the supply of raw material. With respect to the German automotive industry, the VDA (2020) also expressed that the pandemic "and the

rising protectionism, however, will lead to an attentive examination and possible also to diversification of the current supply chains” (p. 76). In contrast, E2 claims that supply chains particularly in the automotive industry are well organised, coordinated and structured, where Covid-19 might have little influence on it. E2 goes on to say that, sustainability will be much more relevant. However, the majority of cases argue that a lack or variability of demand and the availability of a second, third or fourth raw material supplier mainly cause disruption in the operations and supply chains. According to a study across several industries (e.g. automotive, chemicals, consumer goods) from MGI (2020), the “pandemic has led to a heightened sense of vulnerability [...] in May 2020, one-third of respondents cited demand variability and the difficulty of forecasting accurately as key issues” (p. 39). This is in line with the findings of this study.

Consequently, demand variability and lack of raw materials affect just-in-time deliveries from the Tier-1 supplier to the OEM, which was previously identified as one of the main goals. This also shows that the automotive industry in particular is continuing its production regardless of the pandemic and is dependent on material deliveries from its suppliers. However, it is also criticised by I2 that Covid-19 leads to a reconfiguration of supply chains in the automotive industry because of long delivery routes, but that this can also only be a short-term phenomenon. As a result, the topic of ES would move back into the background and cost and competitiveness would be pushed more strongly. In summary, it can be seen that the effects of the pandemic have certainly reached the automotive industry and suppliers, but that they are manifesting themselves to varying degrees (table 89).

Table 89: Findings to RQ3: Theme 16 ‘Implications of the Covid-19 pandemic on supply chains’ (Evidence: 1)

Identifier	Quote
A1	So, we have had disruption in our factories and we have stopped production in our factories, but not because of lack of components or materials. Mainly because of lack of demand.
C1	And I believe that this will have an effect that will really make you look: Can I secure my supply chain well. How can I, if I can somehow, actually detach myself from global chains?
D2	Last but not least, if you have several corona cases in your company and the company has to close down, then all you can say is, hopefully I have a second and third supplier that I can, I'll say, switch to. I don't have any more possibilities there.
E2	With automotive suppliers like these, there are the supply chains, they are so well coordinated that I can imagine that Corona will perhaps also have a little influence on reshoring, more than sustainability, because the supply chains were so severely interrupted

I2	Corona might change that a little bit now, slowly, because at one point or another we had a supply problem with these long delivery routes, for example from Asia and so on. But when it comes down to it, we still cart polymer around the world to get a good price. And thus to be able to offer competitively.
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Source: Own illustration

Following the exploration of the drivers and barriers for reshoring and ES, the researcher found that *environmental and legal conditions, safe and stable environments* as well as *government programs and subsidies* are important reshoring drivers (figure 11; category 5 “Regulations & Environment”). In particular, issues of political, social and economic stability in a country were not only raised as a driver for reshoring, but also as an important aspect for the implications of Covid-19 (C1, F2, table 90). If the political or economic stability in a country is uncertain, firms are not supported in pandemics and times of crisis and at the same time employees leave, it can be assumed that there will also be dramatic consequences for the entire supply chain. It can be deduced from this that an early relocation of sites including supplier relationships can be an effective measure to counteract another pandemic. Together with government programs and subsidies, similar to the Japanese government that has started to incentivise reshoring, this can be another driver for further location decisions (Barbieri, et al., 2020). In accordance with Barbieri et al. (2020), this may force firms to re-consider the current situation and revise the global footprint strategy either on firm- or on supply chain-level. Furthermore, the researcher proposes to add the threats of a global pandemic to the reshoring decision-making framework as a trigger, which could initiate a reshoring decision. This builds on previous findings from Barbieri et al. (2020) who claim “that Covid-19 can be associated with the role of a trigger for reshoring decisions. We can expect it to foster and accelerate decisions that have not been made yet” (p. 132).

Table 90: Findings to RQ3: Theme 16 ‘Implications of the Covid-19 pandemic on supply chains’ (Evidence: 2)

Identifier	Quote
C1	The fact that the supply system continued to function as a whole, but at some point, when the Polish border was practically closed, things got a bit short, it got even tighter. Yes? And they would still take a very, very, very good look at which countries they were going to. So they would like to have countries where they say: It will...the term political stability, political, social stability will take on new meaning.
F2	And then I would say that things like political stability and so on actually come afterwards [...]

Source: Own illustration

5.4.5.2 Social implications of sustainability

Both sustainability and the Covid-19 pandemic have particularly addressed the social dimension, which is related to, for example, respecting human rights, corruption, poverty, illiteracy and child mortality. However, economic and environmental considerations are also important to elucidate when referring to social implications (Lozano, 2008). These issues are relevant for firms, employees, stakeholders or the society because they increasingly expect firms to manage environmental and social issues alike. “Supply chain managers are in a particularly advantageous position to impact – positively or negatively – environmental and social performance, through for example supplier selection and supplier development, modal and carrier selection, vehicle routing, location decisions, and packaging choices” (Carter & Easton, 2011, pp. 46-47). The purpose of this concluding section is thus to elucidate the social implications arising from sustainability and the Covid-19 pandemic on SCR. For the purpose of clarity, the interview guide did not contain a question on the social aspects of both sustainability and the pandemic. As the researcher offered the interviewees the opportunity to mention other topics they considered important and which were not discussed during the interview, the social implications in particular were frequently mentioned.

This study revealed that opinions on the social implications differ greatly across all cases, however, it became clear that it is quite a relevant issue for the firm- and the supply chain-level. In terms of the frequency of issues raised, the supply chain-level dominates the debate of social implications. In particular, the researcher found it is mainly characterised by ensuring a responsible sourcing and supplier management and by maintaining fair working conditions for employees working at Tier-2/-3 suppliers at the end of the supply chain. For instance, F1 mentions the close relationship between environmental and social issues. If a company is able to improve its solvents used in any type of raw material, it does not only improve the odours for the employee, which could be harmful, but can also reduce the environmental impact. However, in contrast to F1, G1 points to the importance of the ability to make informed decisions. For instance, if a product’s quality, just-in-time deliveries and cost structures are competitive, an automotive supplier may not question the social aspects of a supply chain. When deciding on a location, it is therefore important to weigh up and critically question decision-making criteria, even if they indicate a positive development in

the operational or financial figures. A consequence of this can also be that social aspects should not be assessed only when they deviate from the goals that a firm has set for itself (e.g. if human rights are violated, being unfairly compensated or where child labour has occurred), but should be proactively managed. This also goes along with responses from A3, B1 and C1 that supply chain risk management is not yet mature (e.g. with regard to human rights, compliance or poor working conditions) (table 91).

Table 91: Findings to RQ3: Theme 16 ‘Implications of the Covid-19 pandemic on supply chains’ (Evidence: 3)

Identifier	Quote
F1	Yes that is interesting. I always notice that the environment and social issues go hand in hand. This means that they go straight in the direction of solvents, which may cause odours, which in turn leads to poor working conditions for employees. There is always a very close interaction between these issues. So, of course, environmental management systems do not only affect the environment, but also social factors, yes.
G1	Of course, they should go locally, but as long as the quality, the ability to deliver and the price are right, sometimes, of course, where you have a great dependence, you are inclined to judge certain aspects rather gently. Of course, it becomes stupid if child labour or any health and safety issues // are checked out at some point
A3	So long as we don’t have conflict minerals and all this child labour that kind of issues but that’s another topic
C1	And what they don't even have on their screens, which even now has a massive impact on their supply chain
B1	And when I read some reports that some batteries contain rare earths and that some children are digging them up in the mines and they collapse and so on, these are topics that really accompany you and also shape you personally in the way you live your responsibility professionally. Yes, so we offer different options as a supplier. First of all, there is the issue of social compatibility and compliance with human rights.

Source: Own illustration

In addition, the researcher found that there is also an interdependence between the “made-in” effect, the sourcing of raw materials and social implications. A3 particularly mentioned that it might have an influence on the customer if the product claims *Made in Sweden*, however, from an end customer perspective the sourcing process of raw materials is not evident and thus might not be relevant. A likely explanation is that the end customer cares less, but ultimately the OEM still needs to ensure that social differences are reduced or even avoided while bringing the product to market (table 92).

In addition, it was noted that harmonised global legislations are needed to act compliantly on social aspects in the supply chain. A likely explanation is that there are country-specific differences in compliance with, for example, fair labour conditions or human rights. These differences can make it difficult for both OEMs and suppliers to fulfil and monitor country-specific requirements with regard to, for example, paying minimum wages that may differ from region to region (Eurostat, 2020; Appendix 13).

Table 92: Findings to RQ3: Theme 16 ‘Implications of the Covid-19 pandemic on supply chains’ (Evidence: 4)

Identifier	Quote
A3	Generally, when it comes to sustainability topics, I think social sustainability will be more important. When it comes to our product and COVID-19, I’m not sure it will affect our business that much and the supply patterns as well. But I don’t think so. But hard to say at the moment, I don’t think so. I think if it says made in Sweden and not made in China on the end product, that has an influence. I would expect so at least. But how it’s been sourced, not sure that many customers would consider that at all actually
A2	Actually I think one other area is also legislation and the impact that has on the supply chains. Because when we don’t have harmonised global legislation in the environment and also in the social area there will be different thresholds and basically different roles of the game in different countries which can make it sometimes unfair.

Source: Own illustration

As far as the firm-level of AS is concerned, the researcher found that social aspects also apply to local communities and employment rates, however, this issue has only been raised by A1. For example, if an automotive supplier decides to move its production site back to its home country or to geographically closer ones with respect to the customer, this may have a positive impact for the local workforce, but it can be deeply negative for the people in the country the firm is leaving. This finding can also be linked back to the literature where Orzes & Sarkis (2019) stressed “the decision to reshore is not only that of the firm, but it could be a concern for the communities and locals. [...] Sometimes these elements are viewed as economically beneficial but may be detrimental to environmental and quality of life, or social, measures” (p. 482). In addition, according to Wiesmann et al. (2017), promoting local communities can also be perceived as a driver to reshore. The latter has shown that social aspects in terms of employment are rather seen beneficial for a firm and the home country. Nevertheless, the findings on this topic do not show a clear picture of whether AS tend to support local or offshore employment with their location decisions. Nevertheless, the

discussion contributes to the discussion of social aspects with regard to employment rates, but also with regard to human rights (table 93).

Table 93: Findings to RQ3: Theme 16 ‘Implications of the Covid-19 pandemic on supply chains’ (Evidence: 5)

Identifier	Quote
A1	of course, you should work to understand the environmental impacts of the decisions...but the social impact of closing production and reducing employment in Europe and then moving across to Asia, of course, it is positive for the workforce in Asia, but it can potentially be profoundly negative for individuals or the communities where it is leaving

Source: Own illustration

Conclusion

This section has revealed three important implications for AS. First, it became apparent that the pandemic had a strong influence on those firms. In particular, the supply of raw material and the availability of suppliers beyond one’s own capabilities are crucial to ensure on-time deliveries and to avoid shortages. Nevertheless, during the pandemic this was rather a short-term consequence of all suppliers and supply chains across the world.

Second, the researcher found that political and economic stability as well as safe and stable environments are not only associated as reshoring drivers, but also requirements to be assessed during a pandemic. In turn, these locational factors may force firms to think about their global footprint strategy continuously to prevent further supply chain disruptions. Therefore, it is important that this is an on-going process and is not only considered during reshoring. Furthermore, the risk of further pandemics in the future can also be considered as another trigger for the decision-making process.

Third, responsible sourcing, supplier management, fair working conditions or ethicality in the supply chain occurred as important social-related topics. Although these factors are only indirectly related to the pandemic, the aspects of sourcing and supplier management are important prerequisites for securing supply chains for the next pandemic. This is also in line with the VDA who particularly stress “the focus is also in building a sustainable supply chain. Here, ecological and social sustainability factors, ethical aspects, the CO₂ footprint, political risks [...] are identified” (VDA, 2020, p. 26).

It can probably be assumed that no one can already really assess the long-term effects of the pandemic. This critique would be in line with Sarkis (2021), who recently claimed “short-term environmental sustainability gains occur, while long-term effects are still uncertain and require research” (p. 63). The sample size of this research cannot provide a complete picture of all impacts. In addition, the size of the firms studied in this research differs across all cases. While there are five cases (C, D, E, F and G) with between 3 and 49 manufacturing sites worldwide, the remaining four cases are larger with >100 manufacturing sites. It can be assumed that the pandemic will hit smaller suppliers harder, while the larger ones will absorb the short-term negative consequences.

It emerges that AS are particularly affected from pandemics. The most critical impacts range from unstable supply chains to raw materials that can no longer be supplied by Tier-2/-3 suppliers. On the one hand, by relocating manufacturing sites back to geographically closer locations to the customer and thus securing the supply chain, AS have the opportunity to protect themselves against pandemics and to address social sustainability issues. On the other hand, depending on how many other sub-suppliers (Tier-2/-3) an AS has this can considerably increase the control effort of the supply chain. Especially the control effort was mentioned as an important driver for SCR in section 5.4.3.

Proposition 15: *As a short-term consequence, Tier-1 AS move their production sites closer to the OEM to avoid delivery failures and to be protected against future pandemics or similar major disruptive events.*

6 DISCUSSION AND CONCLUSION

This research aimed at investigating theoretically and empirically the relevance of ES and reshoring in the AS sector through a multiple case study. Drawing from an in-depth literature review on ES and reshoring and key theoretical perspectives (e.g. TCE, RBV), the researcher developed a holistic conceptual model for the reshoring decision-making process in consideration of ES (figure 22).

This final chapter will conclude the thesis in terms of a critical reflection of the research findings investigated in line with extant literature and theoretical perspectives. Furthermore, the researcher explains and justifies the contribution to management theory (section 6.2.1), the contribution to practice and policy (section 6.2.2) as well as the limitations and future research avenues (section 6.3).

6.1 Critical reflection and link to theory of the major research findings

According to Fook (2002), “the prime purpose of critical reflection is to unearth how we ourselves participate in discourses [...]” (p. 98). Consequently, critical reflection is about creating “conceptual space” (Rossiter, 2005, p. 1) and allows the researcher to free from “fixed and potentially restrictive ways of thinking, and may indicate avenues for change” (Fook, 1996, p. 199). Whilst critical reflection can be understood in a myriad of different ways, the main purpose of this section is to make meaning of the findings generated in this study in terms of a critical discourse. It thus links back to the literature review and draws on theoretical perspectives such as TCE, RBV or DC. These theories are widely used in extant literature to explain make-or-buy or location decisions (Wiesmann et al., 2017). Precisely because this study of reshoring and ES has revealed some novel insights in the AS sector, it is particularly important to elucidate the links between theory and practice. This section is therefore structured according to five themes, which are based on the main findings of this research that require a critical discourse (table 94).

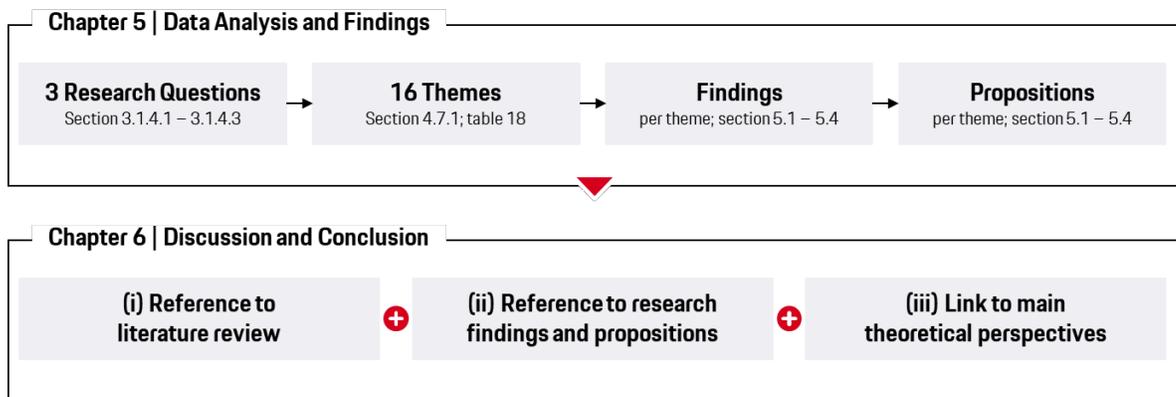
Table 94: Applied theoretical perspectives

Section	Theme	Transaction cost economics (TCE)	Resource-based view (RBV)	Natural resource-based view (N-RBV)	Dynamic capabilities theory (DC)
6.1.1	Reviewing the definition of reshoring	X	X		
6.1.2	Interdependence between cost and ES when reshoring	X			
6.1.3	Reshoring in the context of ES and competitive advantages		X	X	
6.1.4	Supply chain reconfiguration and the role of ES	X			
6.1.5	Product re-design in the context of ES		X	X	X

Source: Own illustration

The critical reflection of the five themes is as follows: (i) a reference to the literature review, (ii) a reference to the research findings and (iii) a link to main theoretical perspectives. The following figure 23 illustrates how Chapter 5 and 6 are interrelated with each other:

Figure 23: Relationship between Chapters 5 and 6



Source: Own illustration

6.1.1 Reviewing the definition of reshoring (TCE, RBV)

In general, Ellram et al. (2013) defined reshoring as moving manufacturing back to the parent company. Bals et al. (2013), Gray et al. (2013) and Tate (2014) furthermore emphasised that reshoring is about moving manufacturing sites from offshore to geographically closer locations. Compared to the definition from Ellram et al. (2013), this definition is broader and does not specifically indicate where the manufacturing site exactly moves. Geographically closer locations may refer to a firm's headquarter, other manufacturing sites in a country close to the headquarter or the customer (i.e. the OEM). Kinkel & Maloca (2009) and Fratocchi et al. (2016; 2014) use the term *back-shoring* and *back-reshoring* to explain that a firm moves its production back to the domestic country, however, there is also lack of clarity what domestic production exactly means. The sheer variety of definitions shows there is still no uniform definition for reshoring (Fratocchi & Di Stefano, 2019) and leaves a relatively large scope for interpretation.

The automotive industry is particularly characterised by producing “multiple vehicles in assembly plants that are distributed across different countries”, a growing role of suppliers in design and subassembly of components, geographical proximity, just-in-time deliveries, cost-efficient production (Schmitt & Van Biesebroeck, 2013, p. 477) and high quality requirements (Christopher, 2005). This industry is well suited to investigate customer proximity as it is one of the world's most competitive markets, involves >40 OEMs in Europe and a large supplier base (MacNeill & Chanaron, 2005; Appendix 11). The researcher showed that reshoring is rather driven by customer proximity, market access and efficiency of operations (e.g. time-to-market, on-time deliveries). Much more important: in accordance with Schmitt & Van Biesebroeck (2013), the firm's home country location (e.g. headquarter of the supplier) does not matter at all when reshoring. It is the geographical proximity to the customer's location (i.e. OEM), which is more relevant when moving manufacturing sites back from low-wage to high-wage countries or building entirely new sites. This is one of the key findings, which emerged from this research. Although the second part of the back-reshoring definition from Fratocchi et al. (2016) “[...] to serve the local, regional or global demands” is not part of many definitions of reshoring, it came out strongly in this research (cross-reference to section 2.1.3) (p. 100). Thus, as far as AS from this study are concerned,

reshoring of manufacturing sites happens regardless of the home country's location or headquarter and primarily aims to increase the proximity to the manufacturing sites of the OEM. "Proximity in this dimension is an important predictor of future contracts. One possible mechanism is the facilitation of knowledge exchange and the reduction of risk through trust. The nature of automobile production has always required some geographical proximity [...] the growing role of suppliers in design and subassembly of components requires frequent interactions between suppliers and carmakers" (Schmitt & Van Biesebroeck, 2013, p. 476). On top of that, reshoring in the automotive industry is more likely to be implemented by firms that pursue a customer-oriented strategy in a local market (Kinkel et al., 2020).

The critical discussion of the reshoring definition is being concluded by linking the findings back to theoretical perspectives. TCE and RBV – two of the most adopted theoretical lenses – have been applied to the outsourcing decision, but not as much to reshoring (Ellram, 2013). It has enhanced the understanding of reshoring in consideration of the nature of the automotive industry (i.e. proximity, quality, just-in-time deliveries and cost-efficient production). These theories thus allow the researcher to develop the definition of reshoring in the automotive industry further, where proximity, cost-efficiency and a strong competition prevail.

TCE is frequently applied for make-or-buy and location decisions because it provides insights into the cost of exercising ownership (Bals et al., 2016; Martínez & Merino, 2014). TCE argues "high and growing transaction and coordination costs can be used as arguments for explaining a change in location" (Lampón & González-Benito, 2019, p. 6269). Especially automotive firms are tied to profit-seeking behaviour (Pavlínek, 2020). According to this research, it emerges that AS seek to reduce their operating costs and improve delivery reliability by relocating a production site close to the OEM in high-cost countries. Likewise, this can be advantageous to increase a product's quality due to close collaboration with the OEM while lowering cost of rejects or material. Christopher (2005) and Duranton & Puga (2004) also point to the importance that geographical proximity to the OEM is beneficial because physical distance raises transaction costs (e.g. transportation, logistics, cost or difficulties in meeting delivery schedules). Particularly, the researcher found logistics and

transport to be drivers of both costs and CO₂-reduction when reshoring. This also became clear in an automotive-specific study from Pavlínek (2020) noting that locations decisions help firms to reduce transport and logistics costs.

RBV is another theory for explaining location decisions viewing “the firm as a bundle of assets and resources that, if employed in distinctive ways, can create competitive advantage”. It thus assists analysing a firm’s manufacturing capabilities, which links the decision with performance and competitive advantage (McIvor, 2013, p. 23). Consequently, establishing competitive advantage is crucial for AS when relocating or setting up new manufacturing sites close to the OEM. This is because a supplier may be not able to exploit a host country’s resources, which are required to achieve competitive advantage (Di Mauro et al., 2018; Canham & Hamilton, 2013). This competitive advantage is due to local production and supply chains, faster reaction to sudden changes and access to infrastructure (e.g. green energy, recycling systems). These points were highlighted in this study as crucial for establishing competitive advantage.

In consideration of these research findings and the theoretical perspectives, the critical reflection allows revising the existing definition of reshoring. Most notably, studying AS has revealed that the idea of bringing manufacturing sites back to the home country does not apply. It is rather concerned with the approach of bringing a supplier’s manufacturing sites closer to the OEM’s manufacturing sites regardless of the supplier’s home country. It also became apparent that this phenomenon is not always directed to close the offshoring location, but to follow the OEM’s manufacturing sites. In contrast to the conventional definition, it emerges that the term reshoring does not align well with the motivations for international reshoring in the AS sector. The common motivations for reshoring in the AS sector can rather be interpreted as follows: *A voluntary and conscious strategic location decision aimed at establishing competitive advantages and increasing geographic customer proximity to the OEM, regardless of the home country’s location (e.g. headquarters of a supplier). AS seek to relocate internal value-added activities to existing or new manufacturing sites while strengthening collaboration with the OEM (e.g. design and subassembly of components) and exploit competitive advantages (e.g. achieve ES targets, access to green energy and recycling*

systems, lower transportation cost). This could cause a ripple effect in the whole supply chain (upstream) forcing further Tier-2/-n AS to follow the Tier-1 AS.

Regardless of whether the term reshoring fits in the context of AS location decisions, the term will continue to be used in the rest of the chapter for consistency reasons.

6.1.2 Interdependence between cost and ES when reshoring (TCE)

Wan et al. (2019) and Di Mauro et al. (2018) have shown that political and economic changes caused firms to reconsider locations of previously offshored manufacturing sites. This is because location advantages in low-cost countries are diminishing and are not beneficial anymore. A growing awareness to evaluate the total cost of offshoring has further strengthened rethinking location decisions (Wan et al., 2019). Firms started to realise the advantages of bringing manufacturing back home. By regional manufacturing (i.e. only within Europe or in Asia), particularly the automotive industry offers opportunities for better collaboration between an OEM and its suppliers leading to greater customer proximity (McKinsey Global Institute, 2020). Especially the cost perspective was mentioned as one of the most important drivers for reshoring by Stentoft et al. (2016) and Fratocchi et al. (2016). This mainly refers to higher labour cost, operating and logistics cost, change of energy cost or eroding cost advantages in the host country.

According to the findings from this study, the importance of cost-related factors in the AS sector explain reshoring as the result of operating more efficient, with better access to qualified and skilled employees and reduced import duties and taxes. Benefits such as shorter routes (logistics), better lead times or less control effort were found to reduce costs when reshoring. Although this research revealed a clear consensus among the participants of cost being the dominant factor for location decisions, the importance of ES also became apparent in this discussion. Even if ES is not perceived as one of the main drivers for reshoring, it seems, however, that the reduction of CO₂-emissions can be interpreted as a cost-related strategy. This is not only reflected in the avoidance of a CO₂-price passed on by the OEM, but also in other areas such as to reduce logistics efforts. As a firm moves its production site closer to the customer, this research has shown that the primary goal is to improve time-to-

market, on-time deliveries and product quality. A secondary goal is to reduce CO₂-emissions in order to avoid a surcharge due to CO₂-prices. This shows that ES can certainly be taken into account in the cost discussion, but is perceived more indirectly as a response to rising costs or rising expectations from the OEM to reduce environmental impacts. Although there is a strong need for action to enhance environmental impacts, this is rather driven by costs. This is also triggered by the introduction of CO₂-prices or -taxes and helps to avoid surcharges, for example, if a component is no longer produced in Asia and is shipped back to Europe at comparatively high costs, logistics efforts and environmental impacts. This is in line with Stentoft et al. (2016) arguing for costs to be the most important driver even though it is not directly compatible with the idea of sustainability.

These findings can be viewed in light of TCE theory. Taking into consideration the relevance of costs and ES when reshoring, it emerges that AS look at the interdependence between both costs and ES from an economic perspective when making location decisions. This suggests, for example, with the introduction of a CO₂-price, AS examine their international (offshore) locations and thus seek to avoid CO₂-emissions by reducing logistics efforts as this is one of the main sources of CO₂-emissions (Browne, 2005). Hence, the location decision to bring manufacturing sites closer to the customer is affected by the cost of managing ownership in a distant location (Martínez & Merino, 2014).

However, “TCE argues that a firm’s make-or-buy decision is not only determined by the price of the purchased item but also its transaction costs”. TCE proposes a contractual relationship between a focal firm (OEM) and its suppliers (Meinlschmidt et al., 2018, p. 1891), which is given in this thesis. Especially the cost of monitoring, controlling and managing the contract, for example, with a logistics provider are referred to as transaction costs (McIvor & Bals, 2021). It emerges that these transaction costs influence the location decision and the governance mode when trying to reduce CO₂-emissions through logistics optimisation. Thus, in order to make the optimal location decision and to find the right governance mode of transactions, it became clear that the cases in this study compare potential benefits at the reshored location close to the OEM with the ones at the current offshored location. These benefits are aimed at close interaction with the OEM, faster time-to-market, on-time deliveries or access to infrastructure such as green electricity. Therefore,

TCE helps to explain the location decisions of the firms involved in this study and demonstrates the ability of TCE to make governance choices in line with ES (Meinlschmidt et al., 2018).

However, this does not only depend on a CO₂-price, but also on energy costs to enhance a firm's energy efficiency, to optimise ES impacts and to reduce costs. "Cost-efficiency motivations explain reshoring as the pursuit of lower [...] logistics costs, and/or more efficient co-ordination [...]" (Barbieri et al., 2017, p. 110). This is also in line with Ellram (2013) suggesting that firms do not only take into consideration cost aspects, but also – according to this research – efficiency-driven (e.g. time-to-market, on-time delivery), quality-driven (e.g. product quality) or ES-driven aspects (CO₂-emissions, reduction of logistics and transportation).

6.1.3 Reshoring in the context of ES and competitive advantage (RBV, N-RBV)

With regard to extant literature, Stentoft et al. (2016) stressed reshoring manufacturing sites back to developed countries is crucial to remain competitive. Accessing innovative technology, infrastructure or skilled employees are of utmost importance (Moradlou & Backhouse, 2016). Particularly the relevance of environmental and social sustainability has risen as firms seek competitive advantage (Chen et al., 2014).

The investigation across all cases has shown that every firm was or is still exposed to a location decision. The study revealed the strategic importance to enter or return to a desired market voluntarily. Costs, customer proximity and access, time-to-market and the ability to align production with customer expectations were among the most important factors mentioned in relation to reshoring in this industry. New sales opportunities or new customers in a certain region, for which a firm probably also has to set up completely new production facilities may drive location decisions, too. Although the cases in this study see a comparatively low influence of ES on location decisions, it is notable that competitive advantages are nevertheless associated with ES if combined with local production. This is due to different reasons such as the opportunity to establish local supply chains and thus to reduce CO₂-emissions, to improve a product's packaging through the use of renewable raw

materials or to have access to recycling systems for components. However, it must be stressed that although the respondents all see a high importance in terms of competitive advantage through ES, the reasons why it is an advantage are different in all cases.

Now the argument will be developed to consider how these findings interact with the RBV and N-RBV and how it might be extended (Lampón & González-Benito, 2019). This research has shown that competitive advantage is characterised by (i) customers & expectations, (ii) infrastructure, (iii) made-in effect (in terms of social issues) and (iv) pricing (cross-reference to section 5.2.4). The competitiveness of an AS may strongly depend on these indicators. However, it became clear that these factors primarily relate to the economic perspective (e.g. prices, efficiency, capacity or delivery). ES is only being looked through, for example, infrastructure (access to renewable energy, recycling systems) or – as far as the social dimension of sustainability is concerned – the made-in effect (justify local production and ensure fair working conditions). According to Di Mauro et al. (2018), reshoring in consideration of ES could be encouraged by the inability to exploit its competitive advantage at the offshore location. For instance, this could manifest itself in the lack of recycling solutions or insufficient access to renewable energies at offshore locations. This is where the N-RBV theory from Hart (1995) becomes relevant. Since AS look for recycling solutions for their products or access to renewable energy, it can be argued that this strategy facilitates environmentally sustainable activity, which is also related to increasing its competitive advantage. Following Hart's (1995) theory, it became clear that AS act in line with the N-RBV while focusing on pollution prevention (e.g. CO₂-emissions), product stewardship (e.g. to integrate ES into product development and increase the recyclability of a product) and sustainable development (e.g. to make use of low-impact technologies such as renewable energy).

This also allows for an extension of the RBV by taking into consideration the four identified themes: (i) customers & expectations, (ii) infrastructure, (iii) made-in effect and (iv) pricing. It helps to understand how a firm aims to establish its competitive position and to recognise the most important aspects when reshoring in consideration of ES. The findings complement the theory, for example, that access to renewable energy for the firm's own production facilities can lead to better pricing and thus to strengthen the competitive position. This is

consistent with Di Mauro et al.'s (2018) statement that a firm cannot use this advantage in its offshore location “and/or to properly exploit the host country’s resources in order to establish competitive advantage” (p. 109). The discussion also expresses that reshoring and ES decisions are not only about a firm’s capabilities, but also about where the firm is located (e.g. locally or globally, close to its customers). At this point, the social aspects must be mentioned as they are also of relevance in terms of fair working conditions, acting in accordance with human rights or sourcing of conflict raw materials. It can be argued that AS use reshoring as a means for differentiation through accessing superior services such as renewable energy or recycling systems locally (Foerstl et al., 2016). RBV theorists argue that firms build competitive advantage by establishing superior performance in processes, which are valued by customers (McIvor & Bals, 2021).

6.1.4 Supply chain reconfiguration and the role of ES (TCE)

According to Orzes & Sarkis (2019) and Tate (2014), it was found that firms start to rethink current supply chain configurations and to put more focus on sustainability. What comes with SCR is the consideration of ethicality in the supply chain (Heikkilä et al., 2018), which has resulted in an important research theme when investigating reshoring. Martins & Pato (2019) go on to say “supply chain sustainability has become one of the most dynamic and prolific decision management research fields. The incorporation of sustainability concerns into business practices is currently one of the most dynamic research issues in the area of supply chain management” (pp. 995, 997).

Research on the extent of SCR has revealed that much is concerned with operations, logistics, sourcing and ES-related aspects. As far as operations, logistics and sourcing is concerned, AS seek to improve costs and a supply chain’s efficiency by evaluating options to reduce control effort, number of interfaces, means of transport or customer proximity. From an ES perspective, SCR provides an opportunity to reduce CO₂-emissions while also taking into account CO₂-pricing and access to green/renewable electricity. Particularly the optimisation of logistics and thus the efficiency in the supply chain are important aspects found in this study. Reducing a firm’s logistics efforts also results in a better CO₂-footprint and less costs alike. Reshoring and SCR can lead to higher efficiency as well (Pearce, 2014). Concisely,

the optimisation of logistics results in a better cost position, which also leads to less CO₂-emissions. This is also plausible since it was investigated that the majority of CO₂-emissions generally appear with transportation and logistics services (Browne, 2005).

The findings from this research allow applying the TCE theory. Since SCR is related to sourcing, quality, logistics and ES or the proximity of a supply chain to its customers, much is concerned with the cost of exercising ownership in distant locations and the efficiency of a supply chain. Particularly, Grover & Malhotra (2003) stress that transaction costs must be investigated “in relation to efficiency and performance metrics within the supply chain” (p. 465). Since the researcher found that efficiency in the supply chain is important for AS (e.g. reduce number of interfaces, enhance proximity to the OEM, increase speed of response to last-minute changes), TCE offers a useful theoretical lens to explain SCR as AS aim to reduce transaction costs following the logic of TCE.

6.1.5 Product re-design in the context of ES (RBV, N-RBV, DC)

Concerning extant literature, the researcher noted an increasing awareness of the interdependence between reshoring, SCR and product development (Orzes & Sarkis, 2019), which can result in adapting a product’s technical configurations. In the context of reshoring, Di Mauro et al. (2018) were particularly emphasising the opportunity to improve a firm’s competitive position when offering higher quality products. This is due to better innovation capability or faster time-to-market while being closer to the customer with manufacturing sites (Wan et al., 2019).

While investigating product re-design (e.g. technical or design-related) it was found that it does not emerge from reshoring. On the contrary, product re-design in the AS sector is a result of on-going requests from the customer to meet their demands (Barney, 1991) and to meet ES-related objectives (European Commission, 2013). However, being close to the customer can help to re-design a product faster and to reduce transaction costs. Even though the literature has emphasised that reshoring, SCR and product changes are interrelated, it has been found that it does not apply to the automotive industry. It is rather about fulfilling customer demands and offering products meeting or exceeding the required standards (e.g.

specific material requirements). It also turned out to be related to the use of sustainable raw materials or compliance with recycling quotas, regardless of whether the parts or components are for electric vehicles or internal combustion engines. This is important to highlight as the firms in this thesis offer a wide range of products regardless of the vehicle technology (e.g. screws and fastening products, windows and frames, bearings, pistons, camshafts). This enables AS to gain a competitive advantage with the product that goes beyond the actual technical properties, regardless of the location of manufacturing sites.

With respect to existing theories in the context of product re-design, it was found that multiple researchers such as Lampón & Benito (2019), Barbieri et al. (2017) or Wiesmann et al. (2017) used RBV and DC theory to explain this relationship. Employing these theories helps to explain the re-design of products with the aim of achieving competitive advantages by meeting customer demands. The RBV deals with the search for competitive advantage and assumes that firms “invest their capital in areas where they possess key competencies and outsource all other (non-critical) activities”. However, according to Hart (1995), critiques revolve around the RBV as it “systematically ignores the constraints imposed by the biophysical (natural) environment” (p. 986). As a response, Hart (1995) established the natural-resource-based view (N-RBV), which takes into account rising environmental challenges of firms. “In the future it appears inevitable that strategy and competitive advantage will be rooted in capabilities that facilitate environmentally sustainable economic activity” (p. 990). On the one hand, the findings of this study are closely related to the RBV and N-RBV theories. A firm’s knowledge is used to deal with product re-design by ensuring, for example, the recyclability of a product (e.g. ELV from European Commission; Appendix 12), by using sustainable raw materials or by designing a product in a way to last longer. It allows the researcher to complement the N-RBV as the findings suggest that firms in the AS sector will re-design their products to reduce environmental impacts. According to the cases in this study, this seems to be particularly applicable to products associated with a high complexity.

On the other hand, DC theory closely links to the RBV, as it claims that a firm’s invisible assets are essential for creating a sustainable competitive advantage” (Wiesmann et al., 2017, p. 26). “[...] dynamic capabilities are a set of specific and identifiable processes such as

product development, strategic decision-making, and alliancing” (Eisenhardt & Martin, 2000, p. 1105). They are “best conceptualized as tools that manipulate resource configurations” such as products, processes or knowledge. Especially the strategic value of product development lies in the “ability to manipulate resources into value-creating strategies” (Eisenhardt & Martin, 2000, p. 1118). Together with RBV the theory suggests that firms enhance existing product configurations and thus to strengthen competitive advantage. It can be argued that AS re-design their products according to customer demands and to meet ES-related targets by creating value (Eisenhardt & Martin, 2000). DC also argues that value for competitive advantage is related to the product configuration itself and not to the capabilities of the firm. For the suppliers in this study, it means that it is not the firm's own knowledge that is decisive, but merely the adaptation of the product. Employing DC and RBV theory helps to explain product re-design that AS perform while strengthening competitive advantages.

6.2 Implications

This research leads to major academic and managerial implications concerning reshoring and ES. While the findings revealed some valuable and in-depth insights with regard to reshoring decision-making, the perception of ES and SCR, the following section aims to demonstrate the main implications for researchers, scholars, practitioners and policymakers. First, the researcher covers the implications and contributions for management theory. Second, the practical and managerial implications for reshoring decision-making as well as for firms in the AS sector are explained.

6.2.1 Contribution to management theory

As far as the academic implications are concerned, this study contributes to the research gaps identified from the literature for reshoring, ES and SCR in at least seven directions.

(i) Multiple case study in the automotive suppliers industry

Literature has shown that case study research in the automotive industry taking into account the relationship between reshoring and ES is lacking. Thus, this thesis makes a valuable contribution to fill this research gap. In addition, this thesis contributes to the discussion of

reshoring and ES by employing a qualitative study with multiple cases. Recent studies are particularly focusing on reshoring in certain countries or niche industries conducting investigations on the *what* and *why* (Akpınar, 2020; Pavlínek, 2020; Dachs et al., 2019; Wan et al., 2019; Engström et al., 2018; Ketokivi et al., 2017). This thesis serves an in-depth sectoral analysis focusing on the *how*, *why* and *which impact* of reshoring and ES. Notably, the literature review revealed a lack of case studies and academic insights especially in the automotive (suppliers) industry as well (Rajeev et al., 2017). While the *why* question is largely covered in the literature, this study provides a more nuanced understanding of the relevance of ES in this sector with regard to its perception among decision-entitled managers and CEOs. Moreover, the within and cross case analysis offers researchers and scholars some in-depth experiences about the motivations to relocate a manufacturing site, the relevant drivers and barriers beyond the cost discussion and the importance of reshoring and ES for the competitive advantage. The case-by-case analysis also sheds light on the decision criteria being considered in the decision-making process ranging through five categories (costs, external factors, efficiency, supply chain and ES).

(ii) Clear theory-based interpretation of reshoring and ES

This research contributes to main theoretical perspectives such as TCE or RBV in the reshoring debate. First, TCE is one of the theoretical perspectives with respect to location choices and make-or-buy decisions. According to Martinez-Mora & Merino (2014), this theory provides insights into the cost of exercising ownership in distant locations. With regard to the drivers and barriers of reshoring and ES, this research contributes to the TCE theory. This study found that reshoring aims to reduce the cost of a firm's operations through greater efficiency, shorter lead times or lower coordination with the offshore location. Rising costs can cause a firm to reshore its operations. Second, RBV deals with the question how a firm establishes competitive advantage. In consideration of the RBV, this study has shown that AS are not able to establish competitive advantages with offshore locations. For instance, this is because of complex supply chains, which are subject to social challenges (e.g. respect human rights and avoid child labour) or legislations demanding a firm to meet its environmental targets (e.g. CO₂-reduction).

(iii) Drivers and barriers of reshoring and ES

While Fratocchi & Di Stefano (2019) claim that a complete picture of the extent, drivers and barriers and the relationship between reshoring and ES is lacking, this study has contributed to this research gap by exploring the drivers and barriers in detail. More precisely, this study has resulted in identifying 31 drivers and 13 barriers for firms in the automotive industry, whereof seven appeared to be genuinely new, as they did not appear in table 7 in section 3.1.4.1. Three of them are also particularly related to ES drivers and barriers (driver: access to energy systems and reliable energy supply; barriers: trade-off between costs and environmental advantages, customers will not pay for a higher level of sustainability). Since Fratocchi & Di Stefano (2019) also stressed that the consideration of environmental and social sustainability as a driver for reshoring is still at generic level, the researcher developed a theoretical model to categorise the relevant drivers and barriers for reshoring and ES (figure 11). This model consists of six themes (strategic importance, cost-related factors, operations issues, customer proximity, regulations & environment, sustainability). In particular, the sixth theme *sustainability* distinguishes environmental, social and economic sustainability from a TBL perspective. As stressed by Fratocchi & Di Stefano (2019), this research has revealed the different drivers and barriers for social and economic sustainability, too.

With respect to the particularities of the AS sector, it was also demonstrated that the “made-in” effect has a different meaning. In contrast to Diamantopoulos et al. (2011), this research has shown that it is related to ensuring human rights in the supply chain. It is thus contradictory to the findings from Diamantopoulos et al. (2011) rather than serving to strengthen brand positioning.

(iv) Perception of ES when reshoring

As far as the perception of ES when reshoring is concerned, this research contributes to a variety of research gaps identified in the literature review. Fratocchi & Di Stefano (2019) expressed that the attention given to the impact of environmental and social sustainability issues has increased. Following this statement, Srari & Ané (2016) stressed that only CO₂-emissions were mentioned as a specific driver, which is associated with logistics improvements. In accordance with the drivers and barriers, this research has demonstrated that besides CO₂-emissions aspects such as CO₂-pricing, access to energy systems and

reliable green energy supply, “made-in” effect or environmentally friendly regions play a role. This does not affect environmental, but also social and economic sustainability.

Fratocchi & Di Stefano (2019) also argued that literature does not explain the extent to which ES is perceived as a driver or barrier. Little attention has been paid to the interdependence between reshoring and ES. This study revealed that the level of influence of ES on reshoring is not near to the top, however, six out nine cases confirmed it to rise in the next five years. Exploring the interdependence between reshoring and ES revealed that it is associated with establishing competitive advantage, fulfilling customer expectations or meeting the strategic objectives of the firm because sustainability is embedded in the strategy.

(v) Reshoring process and decision-making framework in consideration of ES

This study contributes to the reshoring decision-making debate. According to Barbieri et al. (2018), decision-making and implementation processes of reshoring (i.e. how firms decide to reshore and how they put that into practice) are a key aspect for a comprehensive study. They stressed that implementation processes of reshoring are comparatively less understood and that only limited contributions exist. Thus, this research offers a rich perspective of both the reshoring decision-making process as well as the implementation process. It sheds more light on the perspective how firms in the AS sector deal with reshoring and ES alike when making location decisions. The researcher has also explained how ES affects reshoring decisions. In addition, it became clear how reshoring and ES are treated internally in terms of the responsibilities and which cases have prioritised ES. A better understanding of the strategic imperative of reshoring and ES in the automotive industry has emerged.

Furthermore, Fratocchi & Di Stefano (2019) criticise that the interdependence among sustainability and a firm’s decision to reshore has not been addressed yet. This study clearly extends the understanding of applicable decision criterion for environmental, economic and social sustainability. The conceptual model for reshoring decision-making particularly highlights that the assessment of ES impacts is considered in two out of four phases: (ii) *Situational Analysis* and (iii) *Location Concepts*. Thus, this thesis also contributes to filling another research gap indicated by Chen et al. (2014) concerning the economic dimension and strategic long-term perspective. The conceptual model developed in this thesis integrates the

TBL (cross-reference to figure 22), the strategic perspective in phase one (ii) *Situational Analysis* as well as ES. The conceptual model is also a response to the research gap raised by Kinkel & Maloca (2009) that firms do often rely on simple decision models without taking into account dynamic developments of an economy or market. In accordance with Brown (2010) and Wiesmann et al. (2017), oversimplified models for decision-making are also a key source of failure. However, this research gap has been addressed. In the second phase (ii) *Situational Analysis*, it is important to consider market dynamics, for example, in terms of political and economic stability (e.g. exchange rates or import duties), the availability of environmental-friendly suppliers as well as access to affordable renewable energy.

(vi) Supply chain reconfiguration because of reshoring

The thesis contributes to a research gap raised by Bals et al. (2016). Since reshoring decision-making and SCR are largely unexplored, this study has revealed that ES has an influence on SCR. Even though opinions on this vary widely, it could be deduced that the reconfiguration spans four themes: (i) *sourcing*, (ii) *logistics*, (iii) *quality* and (iv) *ES*. For instance, with respect to sourcing, AS tend to choose local raw material suppliers after reshoring to shorten the supply chain, reduce complexity, and ensure supply of raw material. This can trigger a ripple effect along the value chain, meaning that other suppliers in the chain follow the Tier-1 AS. In line with this reasoning, ES is thus taken into account to optimise transport routes and reduce CO₂-emissions. In addition, changing means of transport, for example, from road to rail, may be another contribution from an environmental perspective. Moreover, CO₂-pricing and taxes are likely to initiate a reversal in the supply chain. These issues have a positive effect for both environmental and economic sustainability. This does also contribute to an extant research gap from Ashby (2016), who called for further research on the effects sustainability has on SCR.

Tate (2014) and Heikkilä et al. (2018) point to the importance that addressing sustainability must also meet ethicality of the supply chain, which is a dominant driver for re-examining location decisions. This study offers a richer perspective of the social aspects in the supply chain and that, for instance, AS are questioning the origin of their raw materials and starting to respect human rights, avoid child labour and ensure fair treatment and payment of workers

working abroad. Thus, this research contributes to the environmental and social debate of sustainability and confirms that both dimensions are considered.

(vii) Strategic imperative of local and sustainable supply chains

Furthermore, Ahi & Searcy (2013) stressed that sustainable supply chains must “meet stakeholder requirements and improve the profitability, competitiveness, and resilience of the organization over the short- and long-term” (p. 339). This also points to the importance of the Tier-1 and Tier-2 suppliers in this study, because they play a crucial role in enhancing and securing a sustainable supply chain (Wilhelm et al., 2016). This research has contributed to this gap by exploring that local supply chains are important to act faster (e.g. to sudden demand changes). This is also a result from the Covid-19 pandemic to reduce the vulnerability of global supply chains. Furthermore, it is of high relevance for competitive advantages, too. The main idea that AS are following is that supply chains are as fast, efficient and reliable as possible to meet customers’ expectations. Being competitive is also related to meeting social implications through local supply chains (e.g. human rights, fair treatment, working conditions). This particularly highlights the strategic imperative of local and sustainable supply chains in the automotive industry and makes clear that it is not only operational in nature.

6.2.2 Contribution to practice and policy

The study provides implications for practitioners specifically in the automotive industry charged with the responsibility to make location decisions in consideration of ES. Although a vast body of literature exists with regard to reshoring, no study has provided insights into the interdependence between reshoring, ES and SCR through a multiple case study in this industry.

The main implication for practitioners is that this study provides both a reshoring process (figure 16) and conceptual model for reshoring decision-making with a specific focus on ES and SCR (figure 22). As far as the conceptual model is concerned, it supports managers in making more informed location decisions by providing a clear structure along four phases. Each phase particularly demonstrates which activities are to be prioritised in the decision-

making process and thus provides practical guidance. Particularly, firm- and supply chain-specific factors, long-term strategic direction, ES impact assessment and scenario and business case development are among others the top activities to be considered. In the same vein, it is useful for practitioners to gain insights into the vast array of decision criteria underlying the reshoring decision. In addition, the decision criteria to evaluate a SCR provide practical guidance, too (figure 21). This helps managers to consider the need for SCR and to be fully aware of the complexity that comes along with a reconfiguration.

Managers can benefit from the transparency the researcher has gained with respect to the perception of ES when reshoring and its level of influence. The study supports managers to understand that ES has implications for customer proximity, time-to-market, just-in-time deliveries and their competitiveness. It is useful for practitioners to understand that AS associate a high competitive advantage with reshoring as long it is accompanied with ES-related measures. Managers should reflect on the fact that ES is perceived as an extremely important issue and is embedded in the firm's strategy, however, yet it is the cost pressure that AS are most concerned about.

The cross-case analysis provides guidance about the importance of drivers and barriers for reshoring and ES for AS. The vast array of 61 drivers and barriers along six categories (i) *strategy*, (ii) *costs*, (iii) *operations*, (iv) *customer proximity*, (v) *regulations & environment* and (vi) *sustainability (TBL)* assists managers to understand if some drivers or barriers are linked to their firm as well, which in turn might promote reshoring. Managers become aware that automotive-specific drivers and barriers such as the “made-in” effect and the risk to redesign the supply chain exist. The latter is concerned with the high requirements OEM’s have in terms of process stability or supplier and raw material selection when redesigning the supply chain during series production of a vehicle. From an economic and social sustainability point of view, this study makes managers aware of the fact that some drivers and barriers seek to pursue both reducing CO₂-emissions while optimising cost (economic) and contributing to employment or employee qualification (social).

It is also useful for practitioners to gain insights from the cross-case analysis on the extent to which reshoring and ES are being addressed internally. This study sheds light on the

departments involved in the location decision, helping managers to gain a better understanding of the extent of reshoring and ES in the organisation. The differentiation of cases how reshoring is treated internally has also helped to understand the extent of C-level involvement and the level of reshoring awareness. It became clear that four out of nine cases are in the bottom right corner (figure 13), i.e. firms that have integrated reshoring as a (sub) task into more strategic departments (e.g. Global Project Management, Strategic Operations).

The multiple case study offered some tangible insights into the extent of ES on SCR. AS generally pursue to improve their efficiency, evaluate human rights in the supply chain (social), reduce CO₂-emissions through less transportation (environmental, economic) and improve the competitive advantage in the market (economic). ES is taken into account, however, it is attributed rather a subordinate role and is thus being addressed through other measures, as explained above.

Exploring the implications of the Covid-19 pandemic fosters a better understanding that this crisis has a strong influence on both reshoring and SCR, the availability of suppliers and supply of raw material. However, the researcher points out that short- and long-term effect of the pandemic must be clearly weighed because of the novelty of the crisis. Nevertheless, analogous to the drivers and barriers, *environmental and legal conditions, safe and stable environments* as well as *government programs and subsidies* are important to consider from a managerial perspective, too. This study has thus also implications for policy makers. Offering government programs and subsidies to promote reshoring may be a measure to increase domestic or local manufacturing. It may help policy makers in identifying incentives especially for smaller firms with less financial options compared to larger ones. This might enhance local employment, improve employee qualifications and increase GDP (Di Mauro et al., 2018).

6.3 Limitations and future research avenues

This section covers the limitations of this study and highlights future research avenues for reshoring and ES. The research methodology was carefully selected, but limitations cannot be excluded. Furthermore, there are also content-specific limitations that could not be

examined in more detail. Accordingly, the first part of this section refers to four limitations that relate to the research methodology. Three further limitations are explained, which in turn are limited to the content of the thesis. Lastly, future research avenues will be highlighted.

Limitations in terms of research methodology

The first limitation concerns the generalisability of the findings investigated in this study. Despite different measures were considered to enhance reliability and validity, statistical generalisation of the findings to a broader population is not possible with qualitative methods (Di Mauro et al., 2018). The findings are generally bound to the perceptions of the 17 participants. Even if the participants were carefully selected, everybody still has a different level of experience in reshoring and/or ES and has thus contributed to this research to a different extent. Moreover, it was a major challenge to find participants, who are experienced in both reshoring and ES. Many of the desired participants approached before the data collection period refused to participate due to lack of knowledge. Furthermore, the researcher has also not admitted any participant who does not meet the prerequisites that have been defined in section 4.4.3. This is crucial in ensuring the quality of the interviewees and thus the findings of this study.

Second, some would criticise the sample size as relatively small and that the researcher is not able to achieve saturation. Moreover, justifying a sample size is a difficult process, which is not based on specific guidelines (Morse, 2000). However, since a sample size of 17 participants and nine cases was considered in this research, the researcher was able to capture a broad picture of the different AS. Nevertheless, the researcher makes no claim that saturation has been reached and that there is still a need for further research, for example, with Tier-2 and Tier-3 suppliers. Patton (2002) furthermore stresses, “there are no rules for sample size in qualitative inquiry” (p. 244). The size depends on factors such as “what you want to know” and “what will have credibility”.

The third limitation is concerned with interpretive bias, which affects the understanding and interpretation of findings. This may lead to questionable conclusions that may exceed evidence. In particular, “findings may be distorted at the stage of interpreting data [...]” (O'Connell et al., 2009, p. 394). Fontana & Frey (2005) particularly stress that it is almost

inevitable that the researcher transfers his beliefs, opinions or attitudes while analysing or interpreting data. Therefore, the researcher has chosen two measures to counteract this: On the one hand, the researcher provided the interviewees with the transcripts of the interview and asked for validation. On the other hand, the researcher read the transcripts in German and/or English several times to ensure that the statements were interpreted correctly, codes established and themes derived. This was done systematically with the help of NVivo 11 (Miles & Huberman, 1994) to avoid misinterpretations that differed from the participants' intention and opinion. However, due to the nature of qualitative research, it cannot be ruled out that misinterpretations are made.

Fourth, there is another limitation regarding the number of respondents per case. The aim of this research was to conduct a multiple case study analysis, which implies a within and cross case analysis. Analysing contradictory statements between the cases is an important feature of a multiple case study analysis to investigate a phenomenon from different perspectives. However, due to the high requirements on participant selection and the withdrawal of some interview partners, the researcher was unable to find a second interview partner in three out of nine cases. Moreover, in this context another limitation refers to the case study method itself because it does not develop testable generalisations, which is often criticised not to be scientific enough (Yin, 2014).

Content-specific limitations for reshoring and ES

Fifth, the study and data collection were conducted during the Covid-19 pandemic. It is likely that firms per se had a higher focus on cost-related factors (e.g. cost reduction, profitability, cash flow) and on those that increase a firm's ability to deliver products to the OEM on time. Consequently, it might be possible that the issue of ES was given less attention as a result.

Sixth, this study was primarily designed to take into account the relationship between reshoring and ES. The focus of this study was to investigate the role of environmental sustainability when it comes to location decisions. Particularly economic aspects such as costs cannot be excluded. Even if this research offered some additional findings with regard to the social dimension of sustainability, it is still limited in its coverage because the researcher has not specifically asked for it. Nevertheless, the researcher was able to identify

some measures, for example, with regard to SCR, which accounts for the social dimension alike.

Lastly, this research is still limited by the novelty of ES and sustainability in general. Sustainability challenges for firms of various kinds in relation to CO₂-limits (e.g. Paris Agreement) are increasing and many currently see only the tip of the iceberg. Both participants who are not primarily involved in sustainability and those who, according to their job description, are, for example, sustainability managers, have to deal with a variety of new issues (e.g. decarbonisation, circular economy, ethics in the supply chain). Therefore, it may well be that the experience with sustainability issues is not equally pronounced in all participants. Consequently, a similar study would be necessary once the sustainability issues have been cemented and it becomes clear which issues a firm is most likely to address. During the interviews, the researcher also noticed physical reactions in particular, which made it appear that the participants had to think for a long time about some questions.

Future research avenues

This study is a first step in analysing the interdependence between reshoring and ES specifically in the AS sector, taking into account extant research gaps such as the perception of ES, reshoring decision-making and SCR. With regard to the findings of this study, the propositions and the limitations, the researcher identified six areas, which deserve further research attention:

(i) Investigating the 'ripple effect' between OEM and Tier-n automotive suppliers

The thesis has revealed that customer proximity between an OEM and its Tier-1 AS is crucial. Customer proximity is important for AS to ensure on-time deliveries, cost-efficient production and a product's time-to-market while seeking for better competitive advantages. What this research has only partially explored, however, is the ripple effect that comes with reshoring of Tier-1 suppliers. There is therefore a need to investigate the extent to which this effect continues along the entire value chain up to raw material suppliers (upstream). It is valuable to investigate whether Tier 2-n AS also seek to reshore and follow the Tier-1 AS.

(ii) Testing of theory and propositions

The second research avenue concerns the development of the propositions, which have been derived per theme in chapter 5. These propositions deserve further research attention and can be tested in future studies. The majority of propositions are also suitable to conduct quantitative studies. For example, a valuable research direction could be to investigate the correlation between firm size (revenue) and barriers to bring production closer to the customer. Limited access to employees by already established competitors in the market is one of the barriers that has been explored. It is also valuable to test whether the introduction of a CO₂-price correlates with the optimisation of logistics. Another example is to test of whether product-related advancements, for instance, in terms of technical properties, not only have a positive impact on environmental factors, but also help to strengthen competitive advantages.

(iii) More case-based research in same/other industries and supply chain tiers

The researcher particularly emphasises the need for further case-based research and replication of the study in different industries and with different firm sizes. For instance, as far as Tier-2/-3 AS are concerned, the researcher suggests to investigate economic issues (e.g. cost and price pressure) compared to Tier-1 AS. In view of the further development of sustainability, it would be interesting to understand whether the perception in the automotive industry with regard to location decisions is changing. In accordance with Chen et al. (2014), it is thus valuable to investigate this from a TBL perspective and to explore how firms synthesise and weight all three dimensions. The researcher suggests that future research may employ surveys or quantitative approaches to validate the findings and test the propositions.

(iv) Testing and expansion of the conceptual model

Besides the need for more case-based research, the conceptual model reshoring decision-making (figure 22) developed in this thesis lends itself to further empirical testing in the same or other industries (e.g. other AS, aviation, consumer goods, agricultural) to enhance external validity of the findings. Future research may test and refine the model through further in-depth case studies. Empirical validation through survey data is another option for future research. Research questions surrounding the model are directed to investigate if the model is applicable to other firms in the same industry or other industries in general as well. If not,

what are the industry-specific differences? Which activities of the model apply and which do not? At what point is a decision made? The empirical testing of the model can also go deeper into the different activities, in terms of previous offshoring experiences, corporate strategy or sustainability.

(v) Social dimension with respect to supply chain reconfiguration

Since this thesis was designed to investigate ES in the context of reshoring, substantial and in-depth insights into the social dimension are still lacking. There is a strong need to elucidate the interdependence between the social dimension of the TBL and SCR (Chen et al., 2014). Although the researcher was able to show that some ES measures account for the social dimension (e.g. human rights, working conditions and ethical issues in the supply chain), there is still further research required to investigate this dimension. Kuhlman & Farrington (2010) also call for further research because the social pillar is interconnected with environmental and economic considerations and must be jointly evaluated.

(vi) Implications of the Covid-19 pandemic

This thesis has also focused on the impact of the Covid-19 pandemic, with particular reference to SCR. It was found that the impact on suppliers' ability to deliver raw materials is very high. However, this type of pandemic is a relatively new crisis and many are initially only responding to the short-term challenges. Further research is therefore needed to examine the long-term consequences of the pandemic in this industry and to what extent this leads to further reshoring projects or reconfiguration of supply chains.

6.4 My research journey

For the sake of clarification, this section is written in the first person since it is the nature of reflective writing to be essentially subjective. According to Rolfe (1997), “for any individual, their ‘unique’ body of knowledge can only be accessed by writing. This infers that there is something about the process(es) of writing that enables us to re-order everything we know into infinite combinations. Writing in the first person acknowledges the centrality of the writer [...] and cultivates a self-awareness and promotes an internal dialogue for analysing and understanding important issues [...]” (p. 448).

My strongest personal motivation and ambition of pursuing a DBA is to make a valuable contribution to a real-world business problem from my work environment that provides benefits to the firm I am working for or clients facing the same problem. Precisely because I have already been successful in business for many years, I was convinced to work independently on a new research question. Disruptive trends such as sustainability (e.g. reduction of CO₂-emissions) or reshoring (e.g. driven by the Covid-19 pandemic) have caught my attention quite early, where I was strongly interested in conducting a research project on.

At the same time, I was also looking for a new intellectual challenge by juggling research and my profession as a Senior Manager at Porsche Consulting. While having completed a preceding post gradual MBA degree in a part-time program, too, I wanted to gain further professional experience, broaden my academic skills and capabilities to grow as an individual. In addition, the DBA has provided a new challenge that goes beyond the practical knowledge I have learned during my previous studies or in projects – it has challenged me as a researcher while contributing to a new academic field.

The DBA program in connection with a regular profession was a challenge and demanded a high level of independent as well as intrinsic motivation to work five days per week in my job and every weekend on my research. This program also required tremendous organisational skills, which I have already demonstrated by successfully completing my part-time MBA program. I was always striving to work at the highest level and I am inquisitive about new methodical approaches and management practices. The DBA program in particular enabled me to do both, conduct research on a significant business-related problem and continue to work and grow within my current firm to enhance my professional appearance. In the long-term, my aspiration is either to grow with Porsche Consulting and become a Partner or leave the consulting business and bring my experiences to a medium-sized business. Another option is to become self-employed in the field of sustainability, where I can fully apply my extensive knowledge and expertise

While I have gained a much deeper understanding of research after graduating, I am convinced the greatest value is gained through practical research and gaining the confidence

and persistence to prove your work as valid. Graduating with a doctoral degree for me is at the highest level of professional and individual self-fulfilment. Accomplishing a research project has enabled me to discover different points of view, opinions and meanings people ascribe to a phenomenon and thus to evaluate diverging results. It has also challenged me during the past 3.5 years in mastering three projects – working for Porsche Consulting, accomplishing the DBA and maintaining relationships with my partner, my family and my friends.

6.5 Word count of the thesis

The following table presents the number of words per chapter. Due to the large number of chapters and subsections, the word count is only broken down to the second level (1.x):

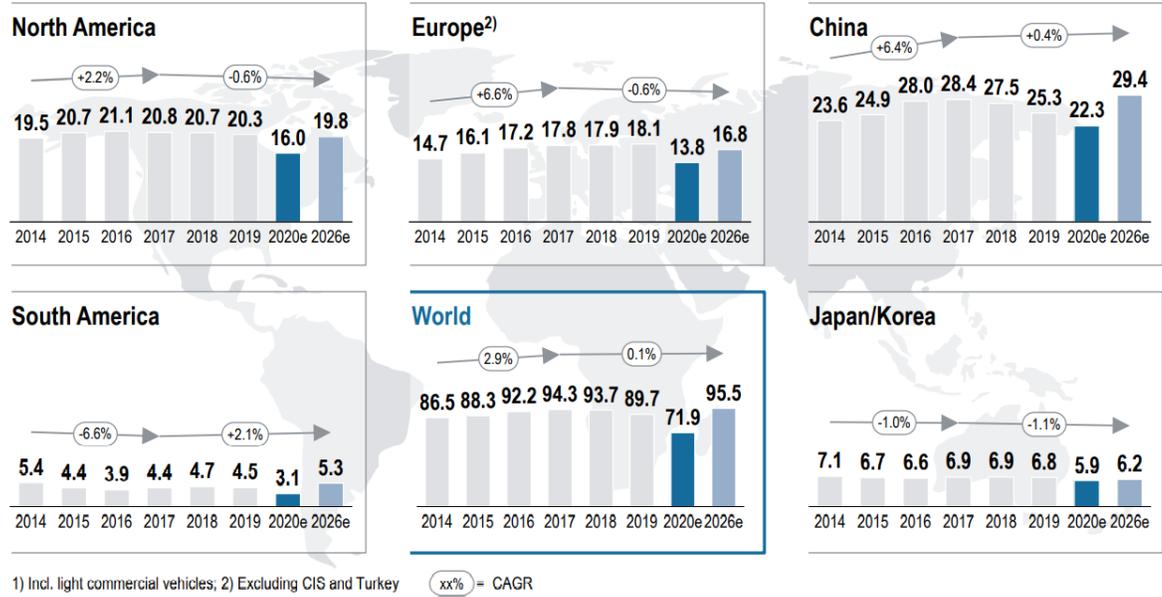
Table 95: Word count of the thesis per section

#	Chapter	Word count	Weighting
-	Abstract	315	0.40%
1	Introduction	3,097	3.92%
1.1	Background and rationale	883	
1.2	Purpose of the research	1,028	
1.3	Research questions	388	
1.4	Method of study	262	
1.5	Limitations and constraints	156	
1.6	Structure of the thesis	380	
2	Reshoring and environmental sustainability	8,312	10.51%
2.1	The reshoring phenomenon – from offshoring to reshoring	5,446	
2.2	Environmental sustainability	1,576	
2.3	Theoretical perspectives on reshoring and environmental sustainability	1,290	
2.4	Conclusion	309	
3	Literature review and current state of research	9,861	12.47%
3.1	Introduction & literature review	9,010	
3.2	Discussion and conclusion	851	
4	Research methodology and design	14,801	18.72%
4.1	Philosophical assumptions	3,285	
4.2	Methodological choice and design	1,283	
4.3	Multiple cases study as a research strategy	1,561	
4.4	Techniques and procedures for data collection	3,420	
4.5	Quality criteria	1,604	
4.6	Ethical considerations	1,525	
4.7	Objectives of data analysis	2,123	
5	Data analysis and findings	33,241	42.05%
5.1	Case description and contextualisation	1,852	
5.2	RQ1: Perception of reshoring as a driver for reshoring	11,002	
5.3	RQ2: Integration of ES in reshoring decision-making processes	10,937	
5.4	RQ3: Influence of ES on the reconfiguration of supply chains	9,450	
6	Discussion and conclusion	9,430	11.93%
6.1	Critical reflection and link to theory of the major research findings	4,317	
6.2	Implications	2,752	
6.3	Limitations and future research	1,799	
6.4	My research journey	562	
6.5	Word count of the thesis	31	
Total		79,057	

Source: Own illustration

APPENDIX 1: Global light vehicle sales volume

Global light vehicle sales volume by region (2014-2020 and outlook 2026 in m units)



Source: Lazard (2020)

APPENDIX 2: Overview of the interview questions

Anticipated duration: 30 to 45 minutes

Section 1: Background information (5')

- Understanding interviewee's educational and professional background
- Gathering demographic and numeric data for later evaluation
- Defining of reshoring case(s) as a basis for the interview

Section 2: Perception of ES as motivation or driver for reshoring (20')

- Understanding of organisational contexts and decision-making procedures (e.g. processes, roles and responsibilities, hierarchical levels)
- Investigating motivations, drivers and barriers of reshoring and ES
- Exploring ES principles in line with an organisation's objectives

Section 3: ES and reshoring decision-making (30')

- Investigating existing decision-making processes and assessing reshoring and ES on decision-making processes (e.g. in line with a firm's strategic objectives)
- Exploring how performance measurement is in line with ES targets

Section 4: Influence of ES on the reconfiguration of supply chains when reshoring (30')

- Investigating the reconfiguration of supply chains due to reshoring and ES
- Understanding which parts of a supply chain are significantly affected and which not
- Exploring how the environmental dimension is considered in supply chain reconfiguration
- Investigating the influence reshoring and ES has on strengthening competitive advantages because of local supply chains

Section 5: Summary and conclusion (5')

- Opportunity for further comments by the interviewee and to make recommendations for further discussion partners

APPENDIX 3: Guide for pilot interview

Topic: Environmental sustainability and reshoring in the automotive industry: A multiple cases study

Participants: Tim Becker, DBA Candidate (Interviewer)
Person First Name, Surname (Interviewee)

Date: yymmdd, duration (xx minutes), time (h:m am/pm)

Format: Semi-structured interviews

.....

Interview questions:

Section 1: Background information

1. Please provide the industry and the following numbers of the company you are working for: sites, revenue and employees.
2. Please describe your work experience with respect to previous professions, your current role in your company and your experience with reshoring and ES.
3. Please indicate your familiarity for both reshoring and ES on a scale of 1 to 3 (1 means 'rudimentary knowledge', 2 means 'good theoretical, but less practical experience' and 3 means 'profound theoretical and practical knowledge').
4. Is there any central responsibility for (i) offshoring/reshoring and (ii) sustainability in your company? If yes, in which department is the responsibility for each of these issues allocated? What is the person's role and responsibility?
5. If there is a case of reshoring in your organisation, please indicate the case(s), even if you have only considered reshoring (i) as a purely theoretical concept and have not yet dealt with it practically or (ii) if you have considered reshoring from a purchasing perspective by switching from an offshore to a local supplier.

#	Stage	From...	To...	What	Offshored	Reshored
1	Theoretically considered, practically engaged, implemented, stopped	Vietnam	Italy	Parts, components, services, functions	2013	2019
2	...	...	...	...	...	...
...

Section 2: Perception of environmental sustainability as a driver for reshoring (RQ1)

6. When and why did the concept of reshoring come up in your company?
7. What were the key drivers or motivations to reshore?
8. *[If interviewee has not mentioned ES as a driver, ask clarifying questions why he/she did not consider ES aspects; if the interviewee has mentioned ES as a driver]* Have you considered reshoring because ...
 - a. of increased awareness of environmental impact and focus on sustainability?
 - b. of establishing a local supply chain as transportation and logistics account for the majority of CO₂-emissions in the value chain?
 - c. of the limited availability of environmental sustainable suppliers?
 - d. of ES issues with the offshore supplier's production process in terms of pollution problems or not considering measures to improve, for example, CO₂-emissions?
 - e. of government policy on ES issues such as a CO₂ tax, sustainability rules or EU targets for the circular economy?
 - f. of changes in energy costs?
 - g. of the uncertainty, as the supplier is located in a region where environmental sustainability is more of a secondary objective?
 - h. developing a product brand and corporate reputation requires more local and sustainable sourcing and production?

- i. the strategy has shifted and more local production is required due to customer demand for sustainable products?
 - j. of meeting ES requirements of your company's top management or stakeholders (e.g. CO₂-emission targets)?
 - k. you remain attractive to end users or OEMs to secure future orders and contracts?
 - l. other drivers not mentioned in the previous list?
9. Where reshoring has been completed, have the drivers for reshoring been achieved in practice? Are there any key lessons for future strategies on reshoring?
10. How has the degree of importance for reshoring increased due to the growing debates and emerging demands on ES (1 means 'rather low', 2 means 'moderate rise' and 3 means 'substantial rise')?

Section 3: Consideration of environmental sustainability in reshoring decision-making (RQ2)

11. What does your reshoring process look like and how do you consider integrating ES aspects?
12. How does the current decision-making process look like and who (departments, job roles, hierarchy level) is involved at what stage in these decisions? Why?
13. What is the role that ES plays in deciding where to reshore compared to other factors such as low wages or better access to raw materials?
14. What is the decision criteria that you take into account beyond financial metrics? How do you specifically consider the environmental dimension?
15. How did you evaluate the decision with respect to reshoring and ES and what were the main aspects you looked at, for example, to assess that you were getting a better ES performance? Or do you rank and compare specific locational factors such as the cost of input goods, energy, knowledge, labour cost, access to markets, availability of suppliers, etc.?

16. How strong do you rate the level of influence of ES on strategic reshoring decisions in your firm on a scale from 1 to 3? (1 means 'weak influence', 2 means 'moderate influence' and 3 means 'strong influence')? Why? Do you expect it to rise or fall in the future?

Section 4: Influence of environmental sustainability on the reconfiguration of supply chains when reshoring (RQ3)

17. Which reshoring and ES cases have led to a reconfiguration of your supply chain and to what extent (1 means 'minor process-related reconfigurations', 2 means 'moderate adjustments in terms of, for example, management of logistics streams' and 3 means 'total reconfiguration including the exchange/replacement of suppliers with new contractual agreements')?
18. How was your supply chain designed before and after the reshoring process and which parts of it were mainly affected?
19. How do you consider ES aspects when you have the opportunity to reconfigure your supply chain?
20. What is the influence on your supply chains due to Covid-19 and what are the implications for ES?
21. What is the effect of a local supply chain on your competitive advantage? Which benefits do you see to improve your environmental performance? Why?
22. Did the implementation of a local supply chain require you to switch to suppliers that follow stricter sustainability practices? If yes, how did you manage the transition phase when switching from an offshore to a local supplier?
23. Due to your reshoring strategy, have you re-designed products to make the offshore supplier redundant or to develop an environmental-friendly product?

Section 5: Summary and conclusion

24. Is there any other issues concerning reshoring or ES that we have not discussed yet, but which are of major relevance for you?

25. Is there another employee in your company whom you would recommend for a further interview?

APPENDIX 4: Interview guide

Topic: Environmental sustainability and reshoring in the automotive industry: A multiple cases study

Participants: Tim Becker, DBA Candidate (Interviewer)
Person First Name, Surname (Interviewee)

Date: yymmdd, duration (xx minutes), time (h:m am/pm)

Format: Semi-structured interviews

.....

Interview questions:

Section 1: Background information

1. Please provide the industry and the following numbers of the company you are working for: sites, revenue, employees and tier-level in the supply chain.
2. Please describe your work experience with respect to previous professions, your current role in your company and your experience with reshoring and ES.
3. Please indicate your familiarity for both reshoring and ES on a scale of 1 to 3 (1 means 'rudimentary knowledge', 2 means 'good theoretical, but less practical experience' and 3 means 'profound theoretical and practical knowledge'). To what does your experience relate in each case?
4. Is there any central responsibility for (i) offshoring/reshoring and (ii) sustainability in your company? If yes, in which department is the responsibility for each of these issues allocated? What is the person's role and responsibility?
5. If there is a case of reshoring in your organisation, please indicate the case(s), even if you have only considered reshoring (i) as a purely theoretical concept and have not

yet dealt with it practically or (ii) if you have considered reshoring from a purchasing perspective by switching from an offshore to a local supplier.

Please also indicate the complexity of the product considered in your reshoring case (1 means “less complex, standardised and easy to replace”; 2 means “medium complexity with minor individualizations” and 3 means “highly customised with significant research and development efforts”).

#	Stage	From...	To...	What	Offshored	Reshored
1	Theoretically considered, practically engaged, implemented, stopped	Vietnam	Italy	Parts, components, services, functions	2013	2019
2	...	...	...	...	...	...
...

Section 2: Perception of environmental sustainability as a driver for reshoring (RQ1)

6. When did the concept of reshoring come up in your company?
7. What were the key drivers or motivations to reshore? Was reshoring a consequence of failing with the offshoring strategy? How do you see ES as a key driver?
8. *[If interviewee has not mentioned ES as a driver, ask clarifying questions why he/she did not consider ES aspects; if the interviewee has mentioned ES as a driver]* Have you considered reshoring because ...
 - a. of increased awareness of environmental impact and focus on sustainability?
 - b. of establishing a local supply chain as transportation and logistics account for the majority of CO₂-emissions in the value chain?
 - c. of the limited availability of environmental sustainable suppliers?
 - d. of ES issues with the offshore supplier’s production process in terms of pollution problems or not considering measures to improve, for example, CO₂-emissions?

- e. of government policy on ES issues such as a CO2 tax, sustainability rules or EU targets for the circular economy?
 - f. of changes in energy costs?
 - g. of the uncertainty, as the supplier is located in a region where environmental sustainability is more of a secondary objective?
 - h. developing a product brand and corporate reputation requires more local and sustainable sourcing and production?
 - i. the strategy has shifted and more local production is required due to customer demand for sustainable products?
 - j. of meeting ES requirements of your company's top management or stakeholders (e.g. CO₂-emission targets)?
 - k. you remain attractive to end users or OEMs to secure future orders and contracts?
 - l. other drivers not mentioned in the previous list?
9. Where reshoring has been completed, have the drivers for reshoring been achieved in practice? Are there any key lessons for future strategies on reshoring?
10. How has the degree of importance for reshoring increased due to the growing debates and emerging demands on ES? How do you expect it to be in the future (next 4-5 years)?

Section 3: Consideration of environmental sustainability in reshoring decision-making (RQ2)

11. If there is one, what does your operative reshoring process look like?
12. How does the current decision-making process look like and who (departments, job roles, hierarchy level) is involved at what stage in these decisions? Why?
13. What is the decision criteria that you take into account beyond financial metrics? How do you specifically consider the environmental dimension?

14. What is the role that ES plays in deciding where to reshore compared to other factors such as low wages or better access to raw materials?
15. How did you evaluate the decision with respect to reshoring and ES and what were the main aspects you looked at, for example, to assess that you were getting a better ES performance? Or do you rank and compare specific locational factors such as the cost of input goods, energy, knowledge, labour cost, access to markets, availability of suppliers, etc.?
16. How strong do you rate the level of influence of ES on strategic reshoring decisions in your firm on a scale from 1 to 3? (1 means 'weak influence', 2 means 'moderate influence' and 3 means 'strong influence')? Why? Do you expect it to rise or fall in the future?

Section 4: Influence of environmental sustainability on the reconfiguration of supply chains when reshoring (RQ3)

17. Which reshoring and ES cases have led to a reconfiguration of your supply chain and to what extent (1 means 'minor process-related reconfigurations', 2 means 'moderate adjustments in terms of, for example, management of logistics streams' and 3 means 'total reconfiguration including the exchange/replacement of suppliers with new contractual agreements')?
18. How was your supply chain designed before and after the reshoring process and which parts of it were mainly affected?
19. How do you consider ES aspects when you have the opportunity to reconfigure your supply chain?
20. Did the implementation of a local supply chain require you to switch to suppliers that follow stricter sustainability practices? If yes, how did you manage the transition phase when switching from an offshore to a local supplier?
21. Due to your reshoring strategy, have you re-designed products, for example, to make the offshore supplier redundant or to develop an environmental-friendly product?

22. What is the influence on your supply chains due to Covid-19 and what are the implications for ES?
23. What is the effect of a local supply chain on your competitive advantage? Why?
24. From a strategic point of view, how do you position yourself in the supply chain to remain attractive for your customers (OEMs)?

Section 5: Summary and conclusion

25. Is there any other issues concerning reshoring or ES that we have not discussed yet, but which are of major relevance for you?
26. Is there another employee in your company whom you would recommend for a further interview?

APPENDIX 5: Participant information sheet

Dear participant,

I am a doctoral student at the Sheffield Hallam University, United Kingdom, and I am working on a Doctor of Business Administration (DBA) degree. I am conducting an exploratory research project with the title: **Environmental sustainability and reshoring in the automotive industry: A multiple cases study** and would like to invite you to take part in my interviews.

The purpose of the thesis is to explore (i) the perception of environmental sustainability in the automotive industry in the context of reshoring, (ii) the consideration of environmental sustainability within decision-making frameworks and (iii) the influence of environmental sustainability and reshoring concerning the reconfiguration of supply chains.

I have decided to ask for your participation because both reshoring and environmental sustainability could be of high significance for your organisation. In addition, I decided to select you as a desired participant because you are a decision-entitled manager with relevant work experience in either the area of reshoring or environmental sustainability. You are required to talk about your experiences, practical issues, decision-making processes or your supply chains in consideration of reshoring and environmental sustainability.

Your participation as interviewee involves a one-time live recording of the interview and lasts between 45 to 60 minutes. No further interview is required. The interview takes place remotely via Skype for Business or Microsoft Teams. I will transcribe the interview after recording to analyse patterns and to identify themes according to the three research objectives mentioned in the previous paragraph. Your participation in this study is voluntary. A copy of the information provided here is yours to keep, along with the consent form if you do decide to take part. You can still decide to withdraw at any time without giving a reason, or you can decide not to answer a particular question. The data collection period of the study lasts approximately 3 months.

Your personal data is treated anonymously and the results from the interview are treated confidential. The coding system of the interviews does not contain any identifiers that can be

traced back to your identity. No one besides me as the researcher has access to the data generated in the interview. If necessary, anonymised data will only be exchanged between the researcher and the supervisor as long as it contributes to data analysis in the thesis. Data is not exchanged by sending files to the supervisors either, but only in verbal discussions. If data is requested by one of the supervisors, the data will only be shared if permission is given by the participants through informed consent.

After completion, all data will be stored in the Sheffield Hallam University Research Data Archive (SHURDA). Subject to SHURDA regulations, relevant research materials such as the transcriptions of the interviews will be kept for at least 5 years after completion of the research project. Although there is no obligation to destroy certain data, files that link the name of the participant to a specific code used in the thesis will be destroyed after 5 years. After the audio and video recordings, only the transcripts of the interviews remain to guarantee your anonymity. The recordings will be deleted. A copy of the written transcript is provided to you after the interview.

The study does not expose you to any risks that may affect your personal well-being and health. Even though your participation does not lead to any direct benefits to you, it could result in new, scientific knowledge, which is useful to both practitioners and other researchers. However, it may improve your understanding and broaden your horizon to the implications or interdependencies between reshoring and environmental sustainability for your industry.

You will receive a debriefing letter after completion of the interview where you will have the opportunity to ask clarifying questions. If you are interested, you may ask for a digital copy of the interview results.

Please do not hesitate to contact me in case of any questions (tim.b.becker@student.shu.ac.uk).

If you have any concerns about the study, at any point, please contact my supervisor at Sheffield Hallam University (Dr. Richard Breese, DBA, r.breese@shu.ac.uk).

Yours sincerely,

Tim Becker

The University undertakes research as part of its function for the community under its legal status. Data protection allows us to use personal data for research with appropriate safeguards in place under the legal basis of public tasks that are in the public interest. A full statement of your rights can be found at <https://www.shu.ac.uk/about-this-website/privacy-policy/privacy-notices/privacy-notice-for-research>. However, all University research is reviewed to ensure that participants are treated appropriately and their rights respected. This study was approved by UREC with Converis number ER19526334. Further information at <https://www.shu.ac.uk/research/ethics-integrity-and-practice>.

APPENDIX 6: Participant consent form

Title of research study: Environmental sustainability and reshoring in the automotive industry: A multiple cases study

Please answer the following questions by ticking the response that applies

- | | YES | NO |
|--|--------------------------|--------------------------|
| 1. I have read the cover letter for this study and have had details of the study explained to me. | <input type="checkbox"/> | <input type="checkbox"/> |
| 2. My questions about the study have been answered to my satisfaction and I understand that I may ask further questions at any point. | <input type="checkbox"/> | <input type="checkbox"/> |
| 3. I understand that I am free to withdraw from the study without giving a reason for my withdrawal or to decline to answer any particular questions in the study. I understand that there is no consequence to my future treatment by the researcher. | <input type="checkbox"/> | <input type="checkbox"/> |
| 4. I agree to provide information to the researchers under the conditions of confidentiality set out in the cover letter. | <input type="checkbox"/> | <input type="checkbox"/> |
| 5. I wish to participate in the study under the conditions set out in the cover letter. | <input type="checkbox"/> | <input type="checkbox"/> |
| 6. I consent to the information collected for the purposes of this research study, once anonymised (so that I cannot be identified), to be used for any other research purposes. | <input type="checkbox"/> | <input type="checkbox"/> |

Participant's Signature: _____ **Date:** _____

Participant's Name (Printed): _____

Contact details: _____

Researcher's Name (Printed): Tim Becker

Researcher's Signature: _____

Researcher's contact details:

Tim Becker

E-Mail Tim.B.Becker@student.shu.ac.uk

Please keep your copy of the consent form and the information sheet together.

APPENDIX 7: Participant debriefing form

Title of research study: Environmental sustainability and reshoring in the automotive industry: A multiple cases study

Name of researcher: Tim Becker

Dear participant,

Thank you very much for agreeing to take part in this study.

I invited people with professional experience in environmental sustainability and/or reshoring from the automotive industry (OEMs and suppliers). In this study, you were asked how you perceive environmental sustainability as a motivation or driver for reshoring, how it fits into decision-making schemes and what impact it has on the reconfiguration on supply chains. The results from this study will close a major research gap investigating the relationship of environmental sustainability and reshoring within the automotive industry. Second, I also hope to contribute to the role of decision-making schemes in the context of relocation production sites due to environmental sustainability requirements. Third, I expect that the results will also facilitate managers' understanding of the conditions that need to be met to implement a reshoring initiative.

If you would like further information about the study or would like to know about what my findings are when all the data have been collected and analysed then please contact me on

E-Mail Tim.B.Becker@student.shu.ac.uk

In addition, if you have any concerns about any aspect of the study, please do not hesitate to contact me, too. Unfortunately, I cannot provide you with your individual results.

Best regards

Tim Becker

APPENDIX 8: NVivo coding scheme

Codes and themes	Sources	References
Perception of reshoring and sustainability	16	88
Competitive advantage	15	33
Level of influence of sustainability on reshoring	11	23
Cost vs. sustainability	7	19
Barriers (reshoring and sustainability)	7	16
Sustainability driver	8	13
Reshoring decision-making (process)	11	39
Decision criteria	15	74
Reshoring driver	13	61
Reshoring process	8	20
Stages and (organisational) level	8	15
Strategy	4	12
Reshoring definition	5	8
Supply chain reconfiguration	9	28
Criteria when redesigning the supply chain	9	20
Low extent of supply chain reconfiguration	5	10
Perception of sustainability when redesigning the supply chain	8	9
Medium to high extent of supply chain reconfiguration	4	8
Origin of new suppliers after reshoring	1	3
Not being aware of the details	1	2
Reasons to avoid supply chain reconfiguration	2	2
Requirements for a supply chain reconfiguration	2	2
Organisational structure	14	27
Sustainability measures and responsibilities	11	33
Responsibility for sustainability issues	15	25
Responsible for decision-making	5	5
Responsibility for reshoring issues	5	5
Others	0	0
Success factors and lessons learned	11	19
Customer expectations	10	18
Product re-design	11	14
Social implications	7	11
Covid-19	7	8
Future research avenues	2	3
Requirements	2	2

The figures in the bold lines do not represent the total sum for the codes/themes below. These additional themes have also been assigned to the overarching codes.

APPENDIX 9: Sample interview transcript of I3

R: Researcher I: Interviewee

R: Then I would suggest we start with the first part on background information. What would interest me first of all, Doctor [Person], is your work experience at [Organisation] and also the experience you have gained in the past in the field of reshoring and sustainability. If you could say something about that in a nutshell.

I: With pleasure. Well, I have been with [Organisation] since 2018 in the role of team leader in a shared service on the topic of Connected Supply Chain. In other words, everything that concerns the digital or systemic interface to the customer, supplier or networking within a production network. And there as a shared service for our various business units, there as a sparring partner and driver for, yes, cross-divisional supply chain projects. Why do I officially say [Organisation] since 2018? Before that I was three years, three and a half years in my doctoral phase as an external consultant, at [Ort] University and Institute for Information Systems. Just three and a half years as a consultant at [Organisation]. And I was involved in initiating and setting up various projects, which I am now continuing to support full-time. So I have a slightly longer track record with the company than the actual company affiliation. Exactly. My experience with reshoring, environmental sustainability and reshoring itself is not a strategic direction for our company. But what [organisation] naturally does as a manufacturing company, as a globally manufacturing company, is to continuously adjust the Footprint from various aspects. Often the cost issue, of course, but sometimes also customer mails and quality issues, sometimes personnel or qualification issues, and I have already accompanied or managed various projects over the past few years on the topic of how to adjust our Footprint. Where in part, we will certainly come up with later in your interview questions, the topic of reshoring was also included as an aspect or as one, yes, measure for various reasons. And the topic, yes, sustainability is a big issue for [organisation] anyway. On the one hand, family businesses, where sustainability and yes, now not the next six months for profit optimisation, but really sustainable management is the order of the day. Or on the other hand where sustainability is lived as a corporate philosophy. And I don't think that's surprising either. Anyone who is in the plastics industry is also important in terms of

public image and how a company positions itself on the market to show that it uses resources responsibly. It is also important to increase recycling rates accordingly and to keep carbon footprints in mind when making business decisions. And this is not something that is propagated or pursued by the company [organisation] alone, but something that is clearly demanded and demanded by the customers. That is why, yes, that is the official experience since 2018 at [Organisation], before that the three years of consulting, consulting project. And yes, various Footprint optimisations, where reshoring decisions are part of this Footprint optimisation, or yes, sustainability, environmental sustainability as a corporate philosophy and, yes, competitive factor.

R: Wonderful. Thank you very much for the introduction. So there were definitely exactly the right keywords. I would suggest that we go through it in a really structured way when the questions come through. Then I wouldn't hook directly into the questions, but would also include the questions.

I: With pleasure.

R: But, in any case, the points were exactly right and they are also part of the conversation. Exactly, then I would briefly continue in the direction, i.e. how you would rate yourself on a scale of one to three, on the one hand for reshoring, on the other for sustainability. One, rather low level, no practical experience, you know a bit about theory, three, maximum level, theoretical and practical experience very well. How would you rate yourself in this respect?

I: Well, that's easy then, two at a time.

R: Okay, perfect. What does it look like when we now look at a reshoring case at the company [organisation], would there really be a practical case where they would say later in the conversation that we can refer to it? For example, we once thought about moving some location from Vietnam back to Europe? Or is that still in the conceptual phase of finding the right location?

I: There are actually concrete cases where, for instance, we did not discuss a complete location decision, as you have just said, for example, "we go back from Vietnam to Germany", but where in corresponding footprint decisions the decision is made explicitly to

bring partial volumes from a low-cost country back to a high-cost region or to Germany, for a variety of reasons and backgrounds. So there is a concrete, yes, we can refer to that.

R: Okay, perfect. Which countries would we be talking about? So from where to where would the example be?

I: We would speak once from Indonesia to Germany and once from Turkey to Germany.

R: Can you say when you outsourced to this location? So when did you outsource or relocate it there? That was probably a couple of years ago, I suppose?

I: I must admit, I have to pass. I cannot say that.

R: Okay, no problem. When did the concept of reshoring in general or the idea of reshoring in general come up? Did it come up in the context of the sustainability debate that people started to think about it? Or did it come about a long time ago, or many, many years before, because it was seen as having other advantages besides sustainability?

I: So the second. The issue of sustainability is an aspect that is also taken into account here, and with the increasing importance of this topic it is also gaining in importance. But it was not the decisive point or the trigger factor, and the discussions have been going on even before that.

R: Okay. So if I now look again at reshoring and sustainability, how is it hung up in your organisation? Well, I understood that I had spoken to Doctor [person], focus on relocation projects, Ms [person], clear focus on sustainability. How do you see that? So how are both issues positioned in your organisation?

I: (...) So the topic of reshoring or Footprint adjustment...an operations view and from an efficiency or cost perspective essentially. Sustainability as, yes, I call it the hygiene factor or accompanying factor that is also considered. But it also becomes an economic factor when customers say: "Okay, if you leave here and go somewhere else and increase your carbon footprint accordingly, you will lose us as customers. So of course these are also decision points that are taken into account. But let me say the whole issue: Where do I produce? Where can I maintain which quality level? Where can I ensure my service levels? This is more of an operations-driven issue. The issue of sustainability comes strongly or rather from the topic

of product portfolio, product development, where attention is really paid to increasing the proportion of recycled materials in our products, already in the design phase, to ensure material flows. I would also say that the recycling flows or the recycled material is then, accessibility is a decision factor for the Footprint. So I can go to Vietnam if we stick to your example earlier. But if, for example, I don't get any profile sections for *anonymised* and no industrial waste that can be extruded back into my profiles. Yes, then I'll be in Vietnam with low wages but without material, which doesn't help either. So here sustainability is more from the product perspective, market perspective, footprint, offshoring, reshoring, actually operations, efficiency, quality.

R: Does that mean that the whole issue of sustainability and the responsibilities also extend, so to speak, cost functionally across the entire organisation, if it has the product focus? And there is virtually no focus that is now, I don't know, sustainability in the area of operations or something like that? Or where is the intersection?

I: Rather the intersection, yes. So of course, when you make decisions in the operations area, when it comes to recycling, you have to meet recycling quotas. When it comes to energy self-sufficient plants, we have plants with their own wind turbines to supply themselves with electricity. Yes, these are always aspects of decision-making that are taken into account, but there is nothing to say that there is a person in charge or someone who looks at every major operations project, is that particularly sustainable? That is rather the demand or a cross-cutting issue, yes.

R: Yeah, okay. Copy that. What is your assessment of sustainability, i.e. how is it perceived by you or the management, i.e. the board of directors, management, management? So it is more of a top issue on the CEO agenda, so to speak? Is it more of a lip service: we have to do this for marketing reasons? What do you think, how is the topic perceived by management and co.

I: Well, honestly, I think a few years ago it was more of a marketing and lip service, but now I can answer that with conviction: It is a top topic, a CEO topic. And not only from a marketing or greenwashing point of view, it has become a real competitive factor. Especially in the plastics industry, where [organisation] is on the move. Even then, the next quarter is not planned in the short term, but in the medium to long term [Organisation] sees this as a

competitive factor, as a vital or important competitive factor. And this is lived, propagated and demanded by the management, the board of directors and yes, the owner family.

R: And probably also, you had mentioned it earlier, probably also in terms of customer expectations? Probably goes along with it, too, yes?

I: Definitely.

R: Okay.

I: So [organisation] is always in the majority of cases or in the majority of cases in a multi-level distribution, where we go to the trade, wholesalers, processors and relatively rarely to the end customer. Example *anonymised* profiles, example high pressure hoses, whatever. At the same time, however, the end customer's expectations of his suppliers, craftsmen, fabricators, who install a *anonymised* for him, for example, are more and more the same questions: Is this with recycled material? What will happen to this *anonymised* in twenty or thirty years' time, when I change the *anonymised* in my old building? And there is also the expectation of our customers to [Organisation] to have an answer then. The questions come from the end customer, and the [organisation] is asked by the previous sales levels.

R: Ah, okay, I see.

I: Accordingly, it is also, yes, it is a competitive factor that is becoming increasingly important.

R: How do you see this in the area of conflict in the direction of price versus sustainability? Well, at the moment I would assume that the dominant factor is still price, especially when it comes to competitive advantage. You said just the opposite in principle, sustainability is on the fast track. Do you think it has already passed it by or is it still to come?

I: I don't believe that this is a passing trend. [Organisation], we really are a vendor's tray, we do everything. But for now, [Organisation] and [Organisation] sees itself as a premium supplier. That means that [Organisation] will never gain or defend market shares in any way great by means of a price war. It has to be about better quality, it has to be about better service levels, and it has to be about a more convincing and better and more sustainable or transparent sustainability concept, if that is a customer demand. And then it is also true that you can talk

about, yes, an increased recycling rate, about the carbon footprint, about I don't know what, working conditions, fair wages. That is also a sustainability issue, not environmental, but it is also a sustainability issue. Which, in an overall argumentation, can also be asserted on the market in terms of price. Is not the only factor, and if we are then twice as expensive as the next competitor, it will not work either, that is clear. But that is something that can also be monetised.

R: Yes, I am with you there. So it is precisely social factors, as you have just said in terms of human rights, working conditions, etc., that cannot be ignored. This is not my primary focus now, but of course it is absolutely resonant. You have to take that into account, yes. If we now take the examples of Indonesia and Turkey, relocated back to, I think you said earlier, Europe, to be precise, to which country?

I: Germany, // Germany.

R: Germany, okay.

R: To Germany. From a real environmental perspective, what were the decision criteria you looked at? Well, I would assume that carbon footprint is one factor. Are there any other criteria that played a role in the decision?

I: Do I have to take a moment to reflect. So yes, transport routes, delivery routes were a decision. Well, just think of the topic of quality level, product quality or production quality in inverted commas around the corner, with corresponding recall rates, with corresponding, yes, reject rates, yes, waste rates, which we simply had there. It was certainly primarily an economic decision to say that I cannot afford to produce everything two or three times until a profile or a hose or something or tube is also in order. Quality ends up at the customer. But yes, if you take a step further with the products that are complained about and rightly so, something must happen. This is also an environmental factor that has played its part. But of course, honestly, the first topic was economy.

R: Yes, yes. In other words, if I want to ensure quality, so to speak, then I have to make sure that I have enough well qualified employees on site who can achieve this better quality? Which is not the case in Indonesia, for example? (...) Yes, okay.

I: For example. Or not even now, because the qualification is significantly higher. That's often a factor, too. I don't think it's a secret that we are already a benchmark in Germany, especially with our training system. But even in Asian countries, the issue of fluctuation is a very common one. So even if people know what they are doing and do it well, if they are away every quarter of a year and I have to re-teach them, mistakes are bound to happen during this training phase, I have exactly this effect, yes.

R: Precisely, yes.

I: Which, as a premium supplier, if I don't get by on price, but on quality and the promise of quality in particular, I simply cannot afford in the long term or cannot always afford.

R: What is the direction of the value chain? Did you have a look, for example, if I now have the opportunity to shorten my supply chain because I can produce in Germany, I'm right next door at the headquarters. That there are, so to speak, somewhat greener suppliers in the area, who in the best case scenario will be able to deliver with natural gas, hydrogen-powered trucks in the future, so that I can also reduce my CO2 emissions along the supply chain? Have these been criteria for you too?

I: (...) // In the ...

R: The maybe

I: Yes, you say.

R: Which may not have happened at present, but will happen in the future. So right now with natural gas, hydrogen, I don't think there is anything like that at the moment, especially when it comes to logistics, but which might play a role in the future, in the next five years.

I: So there really was no, at least not an official decision point that I was aware of and that was officially taken into account in this consideration. Of course, through our purchasing organisation, [organisation] has a global purchasing organisation, there is now also a separate company in Switzerland. It is clear that we have to look at this in the context of supplier evaluation and also take sustainability aspects into account in the context of supplier qualification. The Footprint decisions or reshoring decisions, security of supply, supply routes, transport routes, once for cost reasons, once for service level, but also for ecological

reasons were certainly decision criteria. The fact that I would have looked or that people looked, I now have a carrier or forwarding agent base here that is perhaps three years more likely to switch to a hydrogen or natural gas fleet than in Indonesia? Yes, I do not think so.

R: Yes, okay, yes I think so. What does it look like with, for example, energy costs, the availability of: I can work with green electricity here. So I can equip my manufacturing site with green electricity, so to speak, and build photovoltaic systems on the roof. Were these factors also taken into account in this decision? Or was that more of a given?

I: No, these are also decision points, whereby energy costs are included as indirect production costs, and are then also considered from an economic perspective. But it's also clear that in Germany a photovoltaic system on the roof or wind power systems are subsidised earlier and in a different way than in, I don't know, Indonesia, where the electricity itself is perhaps cheaper per kilowatt hour. Then these are certainly factors that are taken into account, and perhaps also in the back of my mind, where I say, okay, I have no economic disadvantage, but I do have an ecological advantage over what I call soft facts.

R: Yes. Yeah, okay.

I: But of course, the economy has to fit. I cannot afford to charge three times the price of electricity for energy-intensive production, yes.

R: Yes, yes that is true. Now I did not even ask it before. What is the status of the two reshoring initiatives, i.e. Indonesia and Turkey, at the moment? Have they already been completed, are they still in the process of relocation?

I: Relatively advanced in the relocation process, but in the relocation process and especially, yes, in the stabilisation phase. In other words, the relocation and stabilisation phase in the target plant has been completed now or in the target plants.

R: Yes. Can you say whether the top three factors - and I'm talking about the top three factors - are now being used to calculate CO₂, and if so, if it is being tracked, whether the first signs of success are already emerging? That you can see that emissions are already falling, for example, when I look at a production process? Or is it actually just too early? So the question aims to find out whether the desired success factors or desired are

I: Measuring.

R: Exactly, have results already been achieved? Yes.

I: It would actually be new to me or I don't know whether we are actively measuring this. But it's simple mathematics, if I manufacture the things in Germany and sell most of them to the European customer base, emissions simply have to fall. So I don't think we measure it, I would at least not know that we actively measure and track any emission values and emission differences from the Footprint decisions. But yes, it is a law of mathematics and logic that this must be so in itself.

R: Okay.

I: Yes.

R: In the current phase, can you say anything about what lessons learned or success factors there are for your reshoring initiatives? What went well? What went less well? What would perhaps be done differently in future initiatives?

I: Related to what? In terms of implementation, really, a relocation project, which essentially involves technical challenges, or in terms of decision-making?

R: No, rather in terms of decision-making actually.

I: Lessons Learned. (...) Actually rather and this is perhaps also from the history [organisation] than, yes, engineering companies or very technical companies, such projects are always approached very technically, very technically planned. In fact, they tend to be more in the direction of the market and the customer and market customer expectations, and more likely to catch up. And then also effects such as, yes, we support this, even if, for example, you come into the discussion with us in terms of price from a relocation, relocation back from Indonesia to Germany, but compensate for this to a certain extent via the carbon footprint. I think we could have saved ourselves many, many rounds of voting and argumentation, if we had really listened to the needs of the market at an earlier stage, or if we had taken this into account, which are already clearly (...) or more strongly related to the topic of sustainability than I personally expected. I'm not so close to the markets and the customers, I have to admit, but I was partly surprised by the vehemence with which such

points are then implemented and by the priority given to such points by major customers in particular, who can also exert a corresponding leverage in the direction of [organisation] //. Yes, with what priority this was then also set as a topic.

R: Yeah, okay. Do you have a concrete example? Where a major customer has said that I really expect this from you? So are we talking about CO2 again? Or are we really deeper into the turf or are we talking about certain product characteristics? When you say that they were more technical points?

I: Well, product properties are an on-going topic, although this is of course independent of where I manufacture the products. I can manufacture a product in Indonesia with a recycled core just as I can in Germany. Especially in footprint decisions, offshoring, reshoring projects, sorry, it was really the topic of transport routes, carbon footprint. That was already dominant, yes.

R: Yeah, okay. To what extent is there then a really structured relocation process and consciously in this sense also a decision-making process? So it followed the logic, I will say scenario one somehow or option one, we have never done it in the past and we are now intuitively crawling to it and try to run this decision or relocation process as structured as possible? Or did this decision-making and relocation process really, yes, follow a certain structure, a process that has already been established over the last few years? So is there already a reshoring process in your company that is established or is this only now following from it?

I: So a reshoring process is not. A network, i.e. network design, network coordination and configuration process, which, where you really do regularly analyse your production network or the divisions, the business units for themselves, their production networks. And then, yes, as a rule it is tackled quite actively when economic indicators are missed, when I get into trouble. And then there is actually already a standardised process where people say, OK, you have to do the math. On the one hand, quantitatively, what is the benefit of an offshoring or reshoring decision, enriched with qualitative factors. But there is actually a more or less structured process that you then go through, yes.

R: Okay, can you go a little bit more into detail, what roles or organisations are all involved? So besides supply chain, operations, production I suppose procurement, sustainability is probably one organisational unit that plays a role. Who is involved in this whole process? And perhaps also which hierarchical levels, so who makes the decision in the end?

I: (...) I mean, clearly, the clock or starting point is the person responsible for P&L. This is usually the one who notices, so something seems to be wrong in my network. I produce too expensively, I don't know what, I have customers jumping ship. This is the clock, P&L is usually the last member of the management team who is responsible for the business unit and then says: "Okay, guys, it doesn't work like that, we don't stand a chance against the competition. It is planned through Operations, together with the Finance departments. But it's also more likely to be at management level, where they say: rough concept, feasibility study, rough idea, from where to where it can go and what makes sense. On, yes, finance management for business units, operations management for specific business units with the corresponding, yes, specialist staff in the broadest sense, who simply provide the detailed analyses. Then, as you said, there is Operations, Applied Chain, the plants, and the technology, i.e. process engineering, is of course a major factor. If we also talk about qualification level, how complex are the processes, how complex is the equipment that is somehow relocated and has to be operated in the target plants. Of course, product management and sales are also involved. What would a corresponding footprint decision mean for the market and the customer? Yes, but it doesn't matter whether I'm offshore or offshore reshore, it's always the same departments that are involved and the decision is actually made or, yes, let's say prepared in the business units, with P&L responsibility, basically decided by the management. And then, and this is, yes, a peculiarity of a family business, in the final analysis, the family looks at it and the supervisory board, the board of directors, who then says/ Well, these are decisions that are not aimed at short-term profit maximisation or anything else, but really intervene in the structure of my company and in the final analysis, this is done by the family [person] with the corresponding supervisory board members.

R: Okay, great. Thank you very much for the explanation, yes. How would you assess the level of influence of sustainability on such reshoring decisions in the future? So to work with

a scale here, one rather weak influence, two moderate, three really strong influence? That it will also increase in the future? What is your assessment of this?

I: May I make a case distinction?

R: Sure.

I: So primarily, in the end the economy has to fit. When I say I have two options, and they are both more or less, so now, we don't need to talk about small change in such decisions, but they are more or less the same in terms of the business case, then I would say that the sustainability factor is already a three with increasing influence. If I say I have an option that is green to the core, but costs you a lot of money, then I say one. Well, that's easy, in the end a company has to or should make a profit. That must be a factor in itself. If that is the case, and it doesn't have to be the case that I, I don't know, optimise myself to the last decimal place, then sustainability really does have a great influence on [organisation], with a rising trend in my perception. Yes, but the economic efficiency must already be there.

R: Yes. Yeah, fair point. So I like the distinction. I also think it is something that has been crystallized very clearly in the last interviews, competitive advantage or even the importance will definitely increase in the future. But if it is no longer possible at the expense of or because of costs, or if profitability is possibly declining, then of course it makes no sense. Yes.

I: Yes.

R: Well, then I would dive into the last chapter again very briefly, if we are now moving towards the reconfiguration of value chains. As is well known, this has been the most complex or difficult topic to grasp in recent interviews. I would suggest that we simply give it a try. What I would like to know is to what extent did the Indonesian or Turkish reshoring case you mentioned lead to the value chain having to be completely reconfigured? In other words, we brought new logistics partners with us, we had to change the entire processes in our plant, and we may have had to bring in new partners as well. We had to look, where do we now get our raw materials from? Or has everything remained essentially the same? And all that was actually said was, now we no longer manufacture in Plant A in Indonesia, but are relocating it to Germany and the value chain remains the same? Can you say something about that?

I: Rather the second one indeed. (...) We have a global purchasing organisation. Whether they let a Chinese PVC supplier deliver to Indonesia or to Germany. Or that I say I'll use the French PVC supplier, who will then deliver my PVC to Germany and no longer the Chinese one to Indonesia, but is the same supplier base. And well, I'll probably put a tick in the box, I'm not a buyer now, but I'll probably put a tick in the box differently and make my annual contracts, and then adjust them the following year. Well, I would say that it is less that the processes in the plant itself are changing a bit, that I have to handle different volumes. That I have to define other material flows, yes. But even that is not something that is said to be turned completely inside out. As a rule, you also go to locations or sites where you are already present. And not something that you build completely on a greenfield site and somehow pull up with completely inexperienced staff, but where you really say people already know what they are doing. (...) Yes, these are little things like customer-specific packaging, which then has to be purchased, where I have to find a local supplier or whatever, some kind of handling, i.e. reels, pallets of some kind of stuff, yes. But that is rather small stuff. And then there is the distribution logistics. When I'm in reshoring projects and I talk about it, I have my forwarding or transport company base, my service provider base, whether they send five more trucks, which then go somewhere or not. In other words, it's more likely that the value chain will be adapted, but will remain the same in its basic configuration. But // is actually also a topic that is consciously taken into account in the decision-making process, where are you going with your production, because of course that is also a driver of complexity. When I say that I not only have the production process itself and the qualified personnel that I have to have somewhere and build up for a relocation, but I also have to somehow redesign the entire value chain with the corresponding uncertainties. This is already a decision factor that has to be taken into account. Sometimes people still do this when I say that I don't have to go anywhere for economic reasons, or that offshoring is more of an issue. I just go to some low-cost country where I am not yet present, where I do not yet have a location, where I do not have a know-how carrier on site in any way, but then I am consciously involved in the decision making process, which has consequences for the project implementation.

R: Yeah, okay. Fair point. It's interesting what you say. If the decision criteria you mentioned for the value-added chain go so far that you actually look at the criteria again right up to the plant location and say: "If I really do have three dominant competitors A, B, C in my

production environment, then of course I'll look at that too. Because if I'm looking for well-qualified employees, they may already be working for competitors A, B, C. Are these factors that have played a role again? Or are they?

I: Yes, absolutely. Absolutely.

R: Okay. And the plant you moved to, did that already exist or was it completely rebuilt?

I: There are both cases. Or do you now mean specifically in the case of reshoring?

R: Exactly, now right at the reshoring // example.

I: So, // okay. There were actually sites that [organisation] had already operated in Germany. Some of them were then expanded, some of them integrated into the existing infrastructure and some of them integrated the volumes. But at the location and with the corresponding, yes, organisational structure and infrastructure, [organisation] was already present on site. And then, so to speak, it simply saddled up what was integrated back from the low-cost countries with it.

R: Okay. Then I only have two final questions, Doctor [person]. One is about product re-design. Well, I heard earlier that it probably didn't matter, but I would still like to talk about it again. Because especially when it comes to changing the value chain. I heard earlier that it probably had little impact on the supply chain. But did it still have an impact on your product itself? That you said, now I might have to go to another supplier after all and thus have to re-design my product again? What about working with other materials, for example?

I: So out of the Footprint decisions no. From the point of view of sustainability, from the point of view of cost efficiency through the use of recycling, for example, from the point of view of supply security, yes. But not from the point of view of the Footprint, no, from the point of view of sustainability and how it is placed and lived by [the organisation] and also demanded, is there already a continuous revision and adjustment of the product portfolio // on the way?

R: Yes, yes. // Then also independent of reshoring. That is a continuous process behind it.

I: Yes.

R: Yeah, okay. Then again last question. I deliberately skipped it earlier because we were in discussion. How would you rate the product complexity? Well, maybe just to start with, if we were to talk about Indonesia and Turkey, for example, are we talking about the entire product range of [organisation] or about one really dominant product?

I: Not // about the complete // range, because we are divided into different and very, very heterogeneous business areas. It was actually profile area, i.e. in a profile production. And profiles can range from, to put somewhat polemically, can be a trained monkey to is so complex, you can't imagine what is in such a *anonymised* profile, for example, what is in it and how complicated such tools are. Yes, product complexity was already a range, I'd say. Because when we talk about the reshoring shares, we are actually talking about complex products with corresponding pricing and quality requirements in the market. We had the topic and the problems with the more complex products and not with the 08/15 profiles in inverted commas.

R: How would you, final question, just so I can compare it a bit better with the other interviews, how would you rate the complexity? Again, from one to three, so one rather complexity comparable to, even a screw can be complex, but I say consciously, a simple screw. And on level three we are talking about that, I will now take another example, a gearbox, a drive train. And two is something in between. So where, for example, would you place a profile on such a complexity scale? Put very simply?

I: A two with a tendency towards one. So the challenge now is not with a profile as with a gearbox with many components, assemblies, assembly requirements, also quality requirements. Sure, that's a different number. What makes profile extrusion complex is the issue of process manufacturing. I don't have a discrete production facility where I can see how my product is developing in terms of quantities. Instead, I have an extrusion line and that's all there is to it, so it has its own process engineering challenges. But if we now compare it with a drive train, with a gearbox, a two, direction one.

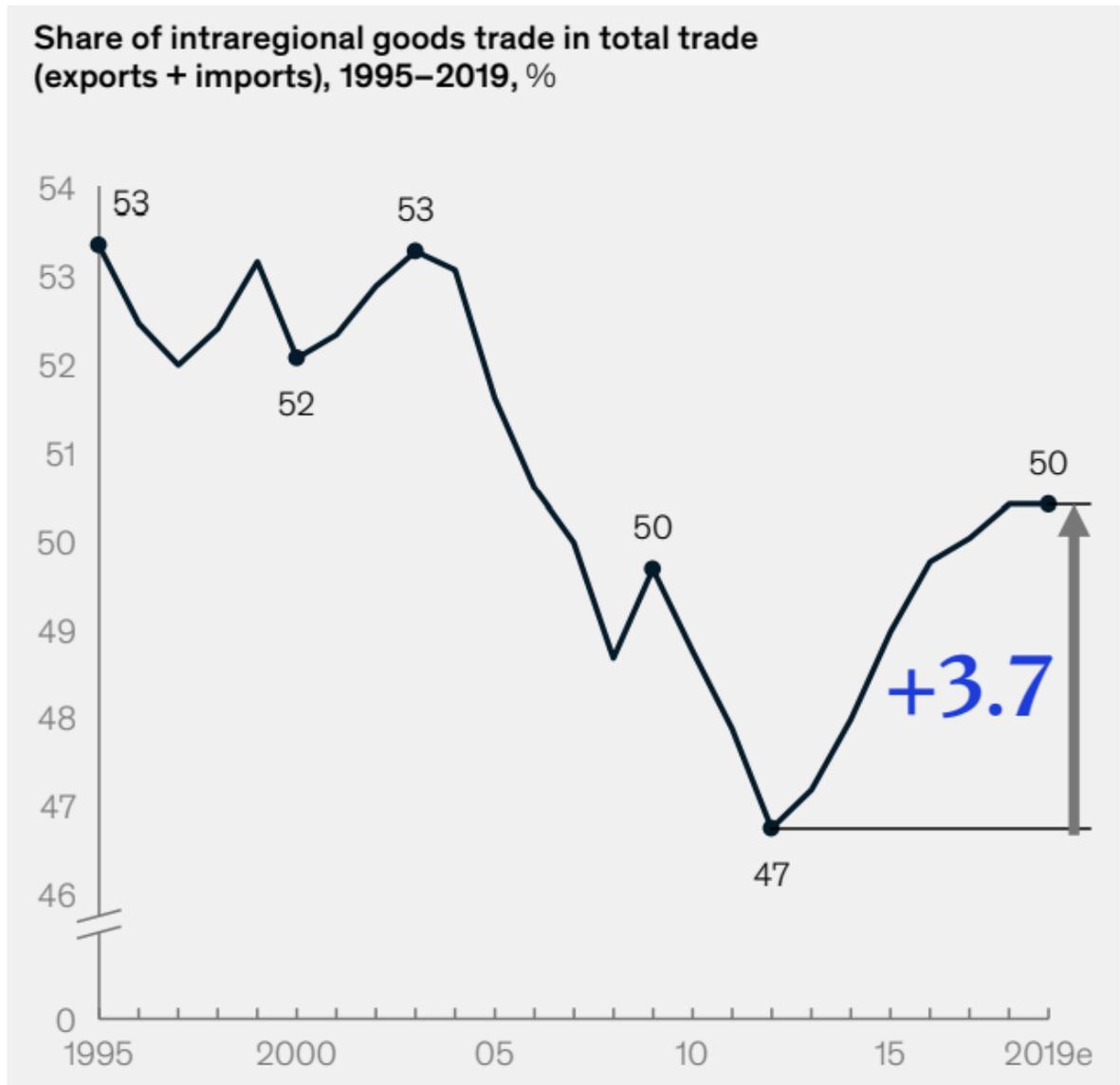
R: Okay, great. Thanks a lot. Good, then we are done with the official questions I had prepared. At the end I would like to give you the opportunity to tell me again if we have touched on any topics that were not covered enough, if you would like to go into them in

more detail or if I have not drilled again. Otherwise we would be done with the questions from my side.

I: No questions from my side either. Maybe, I don't know, is there a chance to somehow come up with, say, a kind of summary or something? Now it is of course interesting to see how other companies position themselves and how they assess the issue of sustainability in such decisions. So that would be charming, if you could get at something like that. Apart from that, no questions. But it was very interesting.

APPENDIX 10: Share of intraregional goods trade

“Since reaching a nadir in 2012, the share of trade occurring within the same region has begun to rebound. As the cost of labor increases in major offshoring centers, companies are realizing the advantages of bringing production closer to home, if not moving toward domestic production. Regional production networks offer the possibility of better collaboration between suppliers, greater proximity to customers, and reduced risk and cost of transportation”. (McKinsey Global Institute, 2020, p. 44).

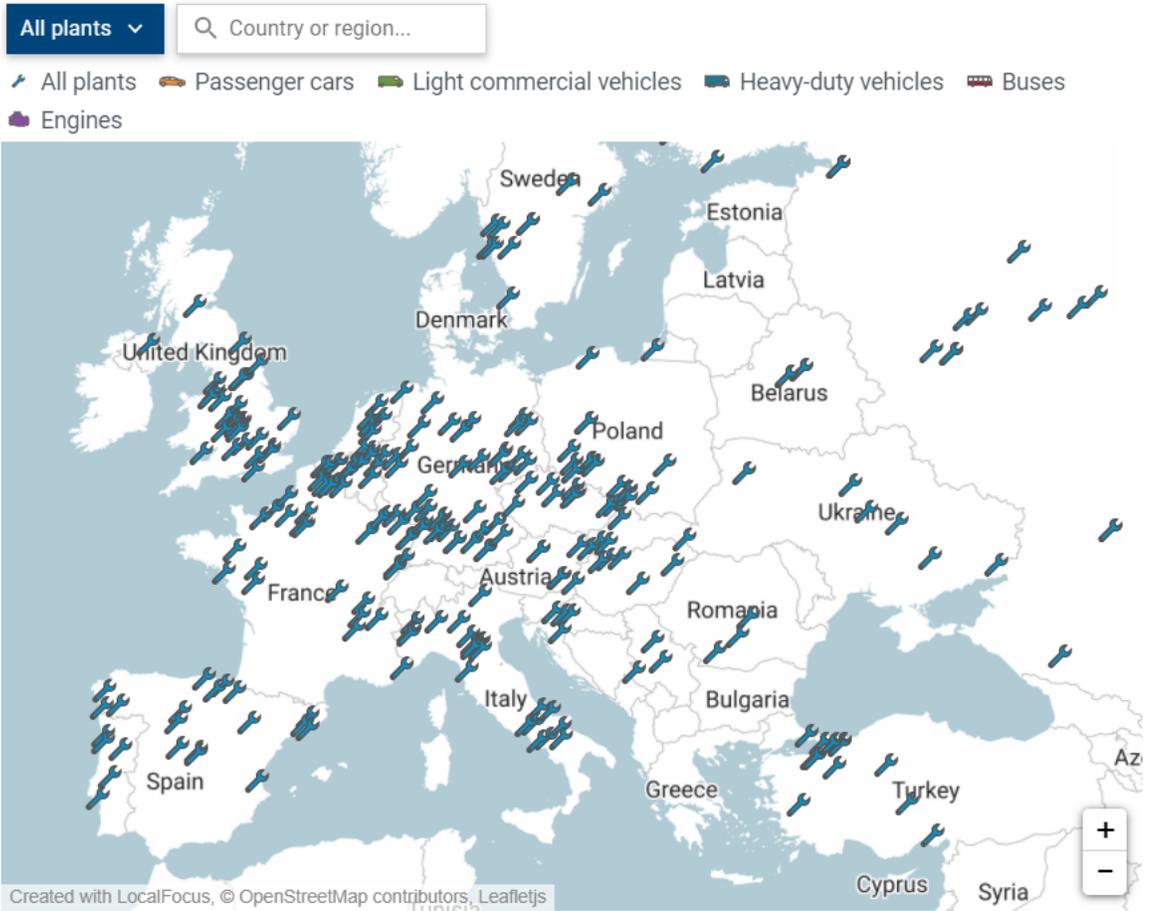


Source: ITC Trade Map, UN Comtrade, McKinsey Global Institute analysis

APPENDIX 11: Automobile assembly and production plants in Europe

Locations	Cars	Vans	Trucks	Buses	Engines	Total
Austria	1	-	2	-	2	5
Belgium	3	-	4	2	-	8
Croatia	2	-	2	-	-	3
Czech Republic	4	-	1	3	2	9
Finland	1	-	1	1	1	3
France	13	4	5	4	9	31
Germany	25	5	3	3	12	42
Hungary	4	-	-	1	2	6
Italy	11	4	2	1	8	23
Netherlands	4	1	3	2	1	10
Poland	3	2	2	4	6	16
Portugal	1	2	1	1	-	5
Romania	2	-	1	1	3	3
Slovakia	4	-	-	-	1	4
Slovenia	1	-	-	-	-	1
Spain	9	4	2	5	3	17
Sweden	3	-	2	3	5	10
EUROPEAN UNION	91	22	31	31	55	196
Belarus	2	-	2	1	-	4
Kazakhstan	3	5	5	4	-	7
Russia	16	2	8	6	5	31
Serbia	1	-	1	2	-	3
Turkey	5	7	5	7	3	17
Ukraine	4	1	2	2	-	6
United Kingdom	19	1	2	4	7	30
Uzbekistan	1	-	2	1	1	4
EUROPE	142	38	58	58	71	298

Source: <https://www.acea.be/statistics/tag/category/european-production-plants-map>



Source: <https://www.acea.be/statistics/tag/category/european-production-plants-map>

▼B

Article 7

Reuse and recovery

1. Member States shall take the necessary measures to encourage the reuse of components which are suitable for reuse, the recovery of components which cannot be reused and the giving of preference to recycling when environmentally viable, without prejudice to requirements regarding the safety of vehicles and environmental requirements such as air emissions and noise control.

2. Member States shall take the necessary measures to ensure that the following targets are attained by economic operators:

- (a) no later than 1 January 2006, for all end-of life vehicles, the reuse and recovery shall be increased to a minimum of 85 % by an average weight per vehicle and year. Within the same time limit the reuse and recycling shall be increased to a minimum of 80 % by an average weight per vehicle and year;

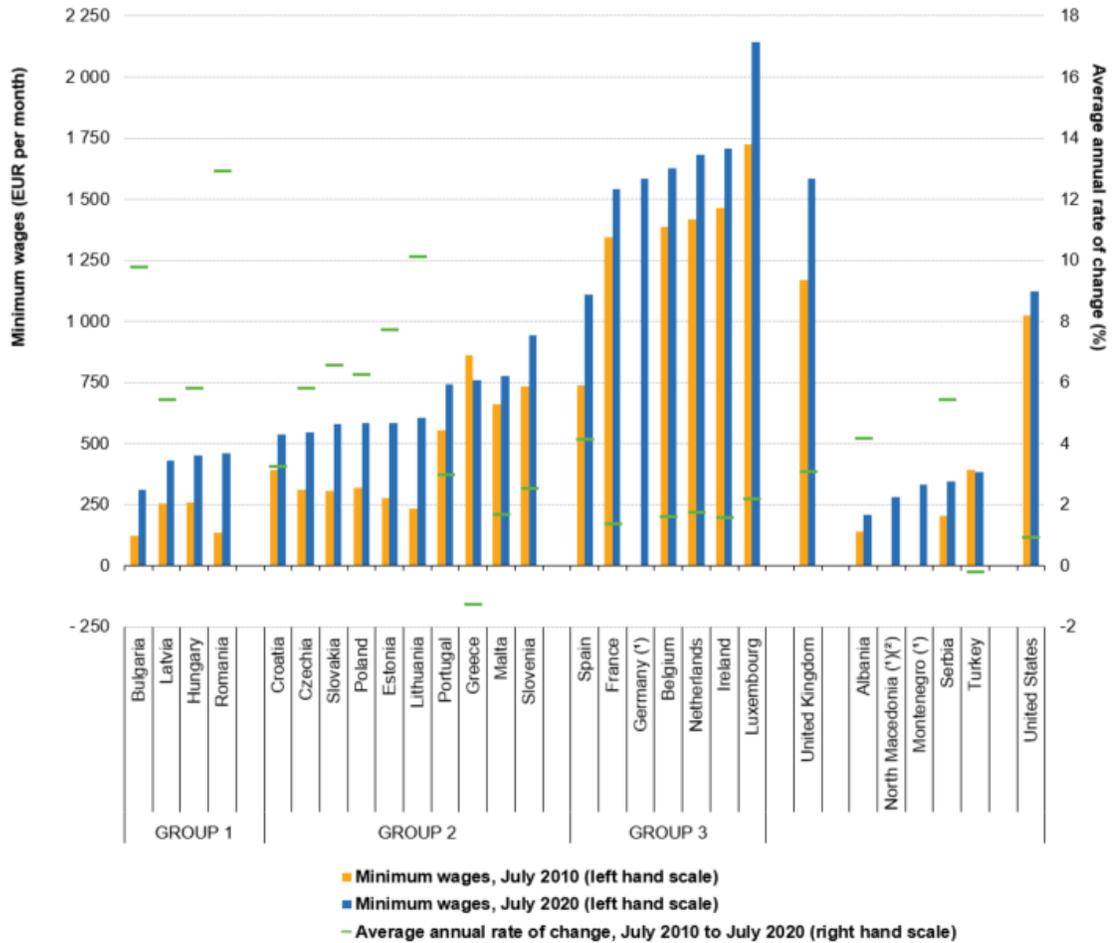
for vehicles produced before 1 January 1980, Member States may lay down lower targets, but not lower than 75 % for reuse and recovery and not lower than 70 % for reuse and recycling. Member States making use of this subparagraph shall inform the Commission and the other Member States of the reasons therefor;

- (b) no later than 1 January 2015, for all end-of life vehicles, the reuse and recovery shall be increased to a minimum of 95 % by an average weight per vehicle and year. Within the same time limit, the re-use and recycling shall be increased to a minimum of 85 % by an average weight per vehicle and year.

APPENDIX 13: Minimum wages in the EU Member States

Minimum wages, July 2010 and July 2020

(EUR per month and %)



Note: Denmark, Italy, Cyprus, Austria, Finland and Sweden: no national minimum wage.

(*) July 2010 and average annual rate of change not available.

(?) July 2018 instead of July 2020.

Source: Eurostat (online data code: earn_mw_cur)

eurostat

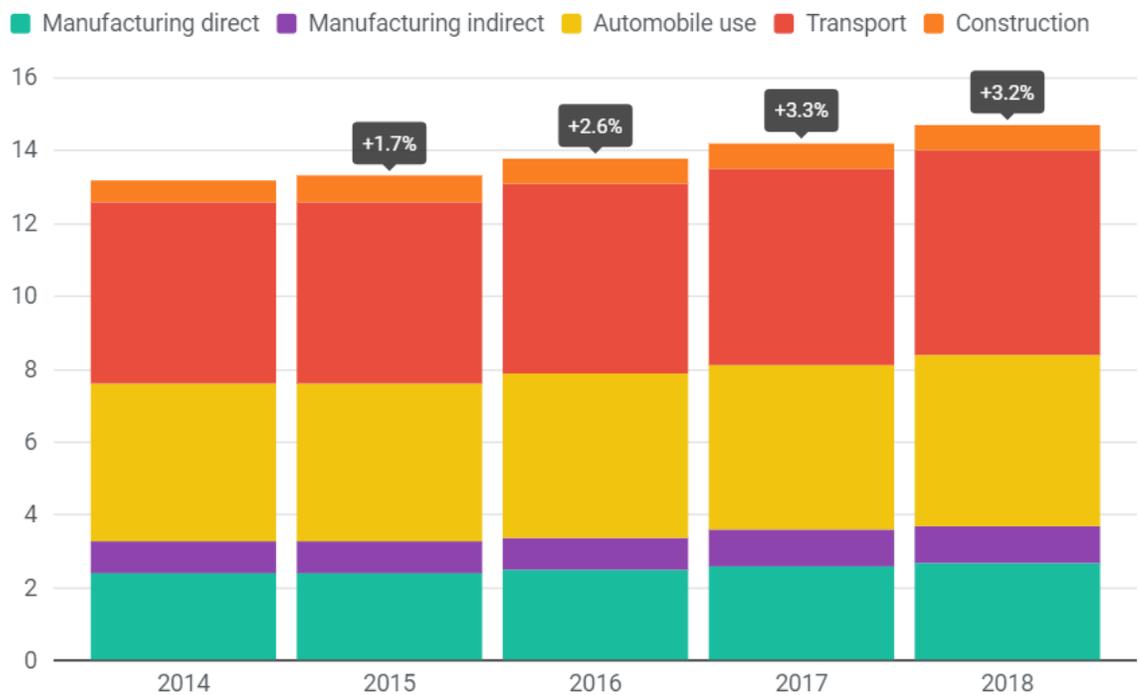
Source: Eurostat (2020)

APPENDIX 14: Employment in the EU automotive sector

“The automotive sector provides direct and indirect jobs to 14.6 million Europeans, representing 6.7% of total EU employment” (ACEA, 2021).

Employment in the EU automotive sector

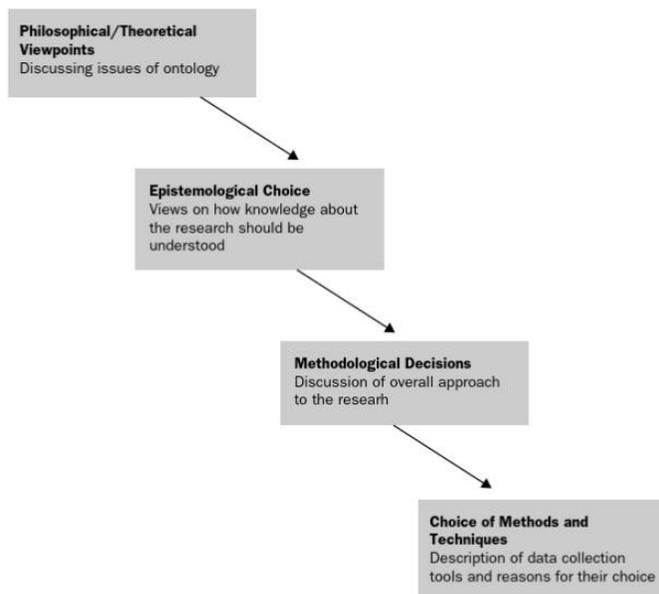
IN MILLION JOBS / 2014 – 2018



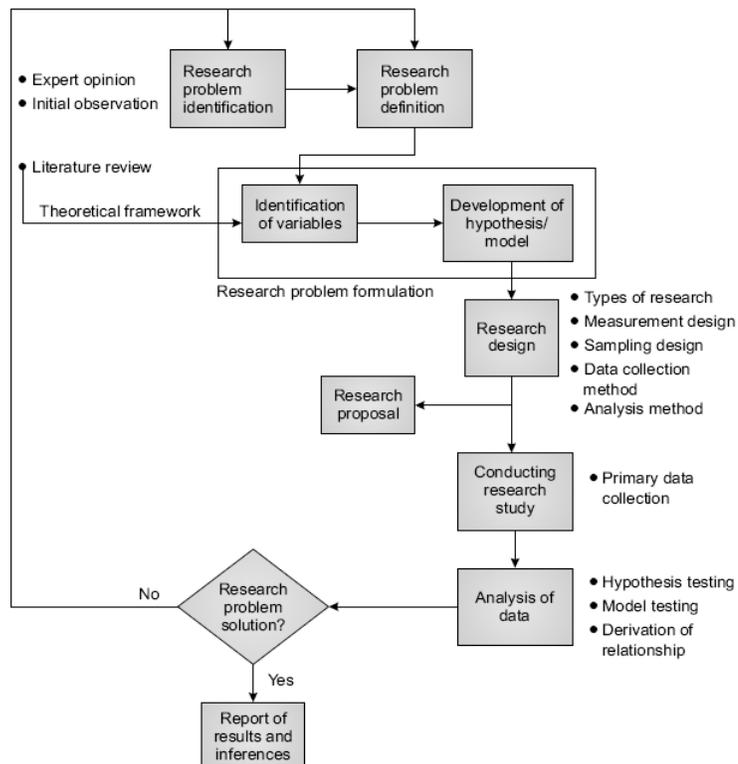
APPENDIX 15: Consolidation and comparison of literature (extract)

No.	Author(s)	Reshoring vs. ES	Year	Paper type/Methodology	Title	Journal	What	Why	Where	When	Who	Which impact	How
1	Sarkis, J.	Reshoring	2021	Conceptual paper	Supply chain sustainability: learning from the C	International Journal of Operations & Production Management	X						
2	Bals, Mohor	Reshoring	2021	Conceptual paper	A Multi-Theory Framework for Understanding International Business Review		X						X
3	Alpinar, M.	Reshoring	2020	Survey	The fit of competitive strategies and firm-specific competitiveness Review: An International Business		X	X					
4	Lund, H.B., Stelken, M.	Reshoring	2020	Case study research	Make at home or abroad? Manufacturing reshoring Geoforum		X	X					
5	Pavinek, P.	Reshoring	2020	Conceptual paper	Restructuring and internationalization of the E	Journal of Economic Geography	X						
6	Dados, B.; Kinnel, S.; Jäger, A.; Pabio, I.	Reshoring	2019	Conceptual paper	Backshoring of production activities in Europe	Journal of Purchasing & Supply Management	X					X	X
7	Lampón, J.F.; González-Benito, J.	Reshoring	2019	Conceptual paper	Backshoring and improved key manufacturing	International Journal of Production Research	X						
8	Wan, L.; Orzes, G.; Sartor, M.; Di Mauro, C.	Reshoring	2019	Conceptual paper	Entry modes in reshoring strategies: An empirical	Journal of Purchasing & Supply Management	X						
9	Wan, L.; Orzes, G.; Sartor, M.; Nassimbeni	Reshoring	2019	Conceptual paper	Reshoring: Does home country matter?	Journal of Purchasing & Supply Management	X						X
10	Barbieri, P.; Cabuschi, F.; Fracocchi, L.; Vi	Reshoring	2018	Literature review	What do we know about manufacturing reshoring?	Journal of Global Operations and Strategic Sourcing	X						
11	Di Mauro, C.; Fracocchi, L.; Orzes, G.; Sart	Reshoring	2018	Multiple case study	Offshoring and backshoring: A multiple case st	Journal of Purchasing & Supply Management	X						
12	Engström, G.; Söllander, K.; Hillerforth, P.	Reshoring	2018	Case study research	Reshoring drivers and barriers in the Swedish n	Journal of Global Operations and Strategic Sourcing	X						
13	Gappi, S.; Romani, S.; Baggio, R.P.	Reshoring	2018	Multiple case study	Reshoring from a demand-side perspective: Co	Journal of World Business	X					X	
14	Johansson, M.; Ohliger, J.	Reshoring	2018	Survey	Manufacturing relocation through offshoring or	Journal of Manufacturing Technology Management	X						
15	Pavinek, P.	Reshoring	2018	Survey	Global Production Networks: Foreign Direct In	Economic Geography	X						
16	Thegel, G.; Hofmann, K.; Gregory, M.	Reshoring	2018	Qualitative empirical analysis	Understanding Manufacturing Location Decis	Economic Development Quarterly	X						X
17	Vandhan, V.; Mulhall, R.; Byson, J.	Reshoring	2018	Qualitative empirical analysis	Repatriation or Reshoring of Manufacturing to	Growth and Change	X						
18	Albertoni, F.; Elia, S.; Massini, S.; Pisotelli	Reshoring	2017	Quantitative empirical analysis	The reshoring of business services: Reaction	Journal of World Business	X						
19	Baraldi, E.; Cabuschi, F.; Lindahl, O.; Frato	Reshoring	2017	Case study research (longitudinal)	A network perspective on the reshoring proces	Industrial Marketing Management	X						
20	Benstead, A.V.; Stevenson, M.; Herudiy, L.	Reshoring	2017	Case study research	Why and how do firms reshore? A contingency	Operations Management Research	X						X
21	Brandon-Jones, E.; Dutoord, M.; Quairi	Reshoring	2017	Survey	The impact of reshoring decisions on shareho	Journal of Operations Management	X						
22	Delis, A.; Duffield, N.; Temout, Y.	Reshoring	2017	Quantitative empirical analysis	The global recession and the shift to re-shorin	Journal of Business Research	X						X
23	Gay, J.V.; Esmonduran, G.; Rungtusanathan	Reshoring	2017	Case study research	Why in the world did they reshore? Examining	Journal of Operations Management	X						
24	Hartman, P.L.; Ogden, J.A.; Wirthlin, J.R.	Reshoring	2017	Case study research	Nearshoring, reshoring, and insourcing: Mov	Business Horizons	X						
25	Ketokivi, M.; Tuukilainen, V.; Seppälä, T.	Reshoring	2017	Case study research	Why locate manufacturing in a high-cost coun	Journal of Operations Management	X						X
26	Lampón, J.F.; Cabanelas, P.; Carballeira-O	Reshoring	2017	Quantitative empirical analysis	Responsiveness, the primary reason behind re	International Journal of Physical Distribution & Logistics	X						
27	Moradiou, H.; Babhouse, C.J.; Ranganath	Reshoring	2017	Survey	Distribution of manufacturing strategy decisio	International Journal of Production Research	X						X
28	Ohliger, J.; Feldmann, A.	Reshoring	2017	Research paper	Outsourcing/offshoring insights: going beyond	International Journal of Physical Distribution & Logistics	X						
29	Tate, W.; Bals, L.	Reshoring	2017	Survey	Impact of competitive strategy and cost-focu	The Journal of The Textile Institute	X						
30	Uluskan, M.; Jones, J.A.; Godfrey, A.B.	Reshoring	2017	Literature review	Drivers and barriers to reshoring: a literatur	European Business Review	X						
31	Wiesmann, B.; Shook, J.R.; Hillerforth, P.	Reshoring	2017	Quantitative empirical analysis	Integrated operational and financial hedging	European Journal of Operational Research	X						X
32	Zhao, L.; Huchtzmeier, A.	Reshoring	2017	Conceptual paper	Exploring the reshoring and insourcing decis	Operations Management Research	X						
33	Bals, L.; Kirchhoff, J.F.; Foerstl, K.	Reshoring	2016	Multiple case study	Direct and indirect value creation in offshored	International Journal of Physical Distribution & Logistics	X						X
34	Brandl, K.	Reshoring	2016	Conceptual paper	Reshoring and insourcing: drivers and future	International Journal of Physical Distribution & Logistics	X						X

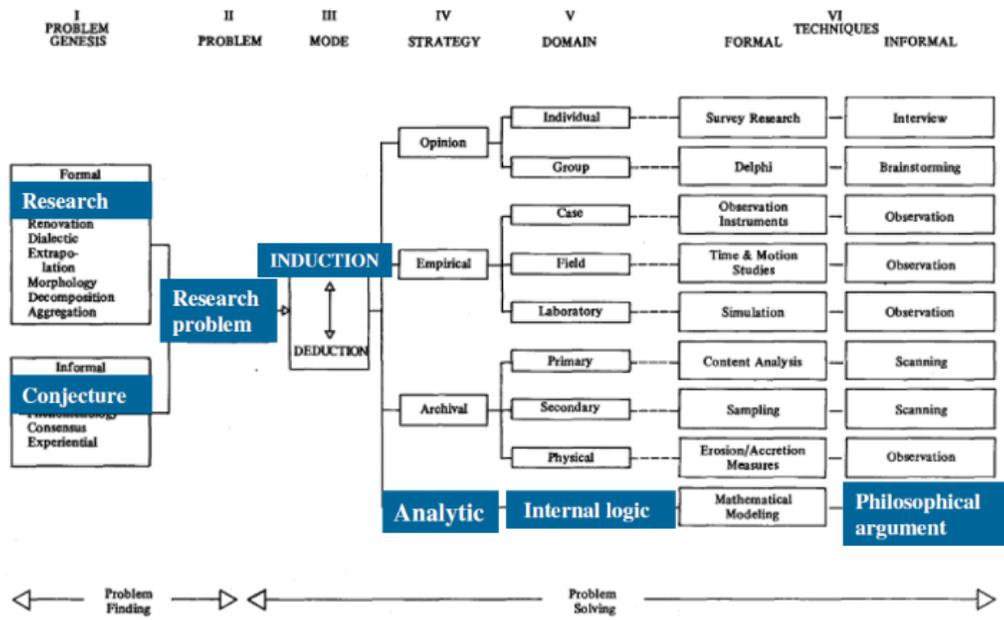
APPENDIX 16: Frameworks for research methodology



Source: Kuada & Kuada (2012)



Source: Krishnaswamy, Sivakumar, & Mathirajan (2009)



Source: Buckley, Buckley & Chiang (1976)

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