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Guest Editors: Levente Szász, Krisztina Demeter and Harry Boer

629 Editorial board
630 Guest editorial
637 Manufacturing relocation through offshoring and backshoring: the case of Sweden
Malin Johansson and Jan Olhager
658 Backshoring of production in the context of a small and open Nordic economy
Jussi Heikkilä, Miia Martinsuo and Sanna Nenonen
676 Managing reversed (global) outsourcing – the role of knowledge, technology and time
Bella Belerivana Nujen, Lise Lillebrygfjeld Halse, Rickard Damm and Hallgeir Gammelsæter
699 Developing closed loop supply chains for environmental sustainability: insights from a UK clothing case study
Alison Ashby

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Guest editorial

Global interactions – closing the loop
Introduction and background: global interactions

The papers in this special issue are all based on work presented at the 23rd International European Operations Management Association (EurOMA) conference held in Trondheim, Norway on June 17-June 22, 2016. The theme of the conference was “Interactions.” This set of papers deals with interactions in a global context. Three papers focus on backshoring of production activities previously offshored – closing the offshoring loop and its background, patterns and contextual influences, drivers, capability requirements and performance effects. One paper is concerned with developing closed loop supply chains (CLSC) for reasons of environmental sustainability, the importance of strategic resources, and shared vision and principles between the focal firm and its suppliers, and the need to integrate the design function and the end customer in the CLSC.

Globalization involves a great many things, ranging from global communication between the citizens of, what has become, a global village Marshall McLuhan predicted as early as the 1960s, to the omnipresence of multinational firms, their production, supply and demand networks. There is nothing new to global activity – moving across borders is as old as mankind (after all, we all stem from Africa), and countries in Asia (e.g. China) and Europe (Phoenicia, Greece, later Scandinavia, Portugal, and then Spain and, especially Britain) have sailed the seven seas for many centuries, in search for resources, markets, presence and power, or just out of pure curiosity.

In the last couple of decades, though, globalization became a crucially important topic on the industrial agenda. The most popular form is production offshoring. According to Brennan et al. (2015), the share of global production value added by G7 nations has dropped from 71 to 47 percent, which has been taken up by emerging countries through so-called captive offshoring and offshore-outsourcing. In captive offshoring, a company moves production activities abroad but keeps ownership. In offshore outsourcing, the activities moved abroad change ownership, to one or more suppliers.

Companies have many motives to go abroad. In the past, material and labor cost played a major role. Later, market access joined the set of offshoring drivers, together with proximity to suppliers and competitors. Today, companies even offshore R&D activities to get access to skills, knowledge and technology (e.g. Ferdows, 1997; MacCarthy and Atthirawong, 2003; Lewin et al., 2009; Nieto and Rodriguez, 2011; Da Silveira, 2014; Demeter, 2014).

While many companies still engage in offshoring, a new trend is emerging, so called reshoring, backshoring or nearshoring (Kinkel and Maloca, 2009; Kinkel, 2012; Ellram, 2013; Zhai et al., 2016; Fratocchi et al., 2014). Three of the four papers included in this special issue, Heikkilä et al., Johansson and Ollagier and Nuwen et al., investigate the backshoring (vs offshoring) phenomenon.

Sustainability is another hot topic in current theory and practice, and the focus of the fourth paper in this issue. Since the Brundtland report (WECD, 1987), stakeholder pressures on the socially, environmentally along with economically sustainable performance of

Following the invitation, ten papers were submitted for inclusion in this special issue. Each of them went through the usual JMTM double-blind review process, including multiple rounds of revisions. Eventually, four papers were accepted for publication. The authors thank all the authors who were willing to take up the challenge, even if some of them failed or gave up. Special thanks to the reviewers for the efforts they put in to helping the authors create this special issue.
industrial companies have steadily increased and led to the implementation of sustainable, i.e. environmental friendly, socially compatible and economically feasible, practices and products in their operations, production networks, and supply and demand chains. Implementing such practices in a plant or a company’s own production network is difficult enough – developing and getting them to work in the upstream and downstream supply chains is very complex. Due to philosophies such as “back to core business” (Andersson, 1990; Laing, 1990) and developments such as globalization, supply and demand chains today are highly fragmented and global. One of the principles of the lean philosophy is: “Why produce waste if you are going to throw it away?”, and elimination of waste (or muda) in the value-adding process is an important part of the lean toolbox (Ohno, 1988). Over time, the concept has developed form waste reduction in the “cradle-to-grave” process to zero waste in the “cradle-to-cradle” process. The benefits associated with this contemporary view on zero waste fully agree with the objectives of sustainability. Several ways of supporting zero waste have been proposed, ranging from design for ease of repair and disassembly, duration, recycling and reuse, minimization of packaging, and CLSC (cradle-to-cradle), the topic of Ashby’s contribution.

**Summary of the papers**

Global interaction is the pin linking the four papers in this special issue. The first three papers focus on offshoring and backshoring; the fourth paper on CLSCs. Both offshoring/backshoring and CLSCs are still riddled with questions, some of which are addressed in the four papers. They are summarized next. An overview of the main features of the papers (topic, geographical and industrial focus, methodological issues, and key findings) is provided in Table I.

Johansson and Olhager compare and contrast the offshoring and backshoring phenomena, and ask two questions: how is Swedish manufacturing affected by recent offshoring and backshoring? And how are offshoring and backshoring projects managed and what are the similarities and differences between the two directions? They investigate these questions using a sample of 343 Swedish firms, which offshored and/or backshored between 2010 and 2015. Their findings suggest that offshoring still dominates the globalization game. Swedish firms offshore labor-intensive production, and backshore complex production processes. The motives companies have to offshore or backshore are entirely different. While cost factors, in particular labor cost, dominate decision-making on offshoring, backshoring decisions are based on a multitude of factors, including quality, lead time, flexibility, access to skills and knowledge, access to technology, and proximity to R&D, which are all significantly more important for backshoring than for offshoring. These drivers, labor cost for offshoring, and product and process quality, delivery speed and reliability, and product mix and volume flexibility for backshoring are also the most important benefits achieved with moving production out of Sweden and back again.

Heikkilä *et al.* also compare and contrast offshoring and backshoring. They investigate the background, drivers, and patterns of offshoring and backshoring in a sample of 229 Finnish manufacturing firms. Using the same survey instrument as Johansson and Olhager, their research questions are: why and to what extent do Finnish manufacturing firms offshore and backshore their production? And how do the backshoring companies differ from other companies? They, too, find that the volume of offshoring is still bigger than that of backshoring. Like in Sweden, cost, in particular labor cost is the main motive driving offshoring. Flexibility, quality, lead time, logistics costs, proximity to R&D and product development, access to skills and knowledge, and time-to-market were the most important factors for bringing production back to Finland. The companies dominating the backshoring scene are relatively larger and technology intensive firms, with a corporate-wide strategy for guiding offshoring and backshoring decisions.
While Nujen et al. also focus on backshoring or, how they call it, reversed outsourcing or backsourcing, their particular interest is in the question how the internal process is and can be handled, after the decision has been made, with a special focus on in-house knowledge and technology requirements.

The research questions investigated in Nujen et al. are: how does reversed outsourcing influence in-house capabilities? And what factors influence the success of a reversed operation? As these, or similar, questions have not been explored previously, the authors opt for an explorative approach. Based on theoretical criteria, five Scandinavian case companies are selected. Two cases are digital network companies, the other three operating in the maritime industry. The authors prepared a detailed yet open interview guideline, which focused on the companies’ understanding of outbound and reversed global outsourcing, the drivers behind their decisions, and the role of knowledge, capability and technology in taking back and reintegrating previously offshored activities. The study was performed in 2015-2016. Entirely in line with the purpose of explorative research, Nujen et al. formulate propositions based on their analyses, which represent the contribution of their research, and are also quite useful to check a company’s readiness for reintegration. These propositions essentially refer to the importance of fit between the backsourced operation and the company’s needs.

Table I. Key features of the four papers

<table>
<thead>
<tr>
<th>Topic</th>
<th>Johansson and Ollager</th>
<th>Heikkilä et al.</th>
<th>Nujen et al.</th>
<th>Ashby</th>
</tr>
</thead>
<tbody>
<tr>
<td>Geographical focus</td>
<td>Sweden</td>
<td>Finland</td>
<td>Scandinavia</td>
<td>UK</td>
</tr>
<tr>
<td>Industrial focus</td>
<td>ISIC codes 10-33, more or less representative</td>
<td>ISIC codes 10-33, more or less representative</td>
<td>Telecommunication, maritime (offshore)</td>
<td>Textile</td>
</tr>
<tr>
<td>Methodology</td>
<td>Survey</td>
<td>Survey</td>
<td>Semi-structured interviews</td>
<td>Semi-structured interviews</td>
</tr>
<tr>
<td>Number of observations investigated</td>
<td>373 companies</td>
<td>229 companies</td>
<td>5 companies, 14 interviews</td>
<td>1 company, 9 interviews</td>
</tr>
<tr>
<td>Findings</td>
<td>Offshoring: cost is driver and benefit, for labor-intensive production, Backshoring: diverse drivers, especially access to knowledge, skills and technology, and proximity of R&amp;D, for complex production</td>
<td>Offshoring: cost is driver and benefit, for labor-intensive production, Backshoring: diverse drivers, for technology intensive firms, Backshoring companies are larger, have more plants and a corporate level location strategy, from high technology industries</td>
<td>Success depends on retained knowledge and management capabilities, both of which are negatively affected by the duration time of outsourcing, but complemented by the use of modern technology</td>
<td>Key importance of strategic resources and shared vision and principles between the focal firm and its suppliers; need to extend the CLSC model to integrate the design function and the end customer</td>
</tr>
</tbody>
</table>

While Nujen et al. also focus on backshoring or, how they call it, reversed outsourcing or backsourcing, their particular interest is in the question how the internal process is and can be handled, after the decision has been made, with a special focus on in-house knowledge and technology requirements.
capabilities: P1 and P2 suggest that knowledge about the operation and strong dynamic management capabilities have a positive effect on successful re-integration. P4 adds: the utilization of modern, i.e. contemporary, technology complements these factors. P3 proposes that the longer the backsourced operation has been performed externally, the more difficult it is to revive the requisite knowledge base (P1) and the capabilities (P2) necessary for re-integration.

Ashby’s paper reports her research on developing CLSCs for environmental sustainability. The research aims at developing a rich, multi-faceted analysis of environmental practices and challenges, and in particular understanding the role that suppliers have in the successful implementation and coordination of a CLSC. Using the natural resource-based view (e.g. Hart, 1995) as a theoretical lens, the paper investigates the following questions: how does a focal firm implement and develop a CLSC response to environmental sustainability? And how do supplier relationships and resources contribute to the focal firm achieving a CLSC response? CLSCs may provide an important mechanism to enhance environmental sustainability but have not been broadly researched or developed in practice. Consistent with this state-of-the-art-and-theory, the author developed an explorative single case study, evolving around a clothing firm, and operationalized using a detailed interview questionnaire. The study was performed in 2010-2012. The case study shows the key importance of strategic (physical, tacit as well as social) resources, and shared vision and principles between the focal firm and its suppliers, in order to progress from a more reactive pollution prevention strategy to a fully embedded CLSC response to environmental sustainability. Furthermore, the findings suggest the need to extend the current CLSC model to integrate the design function and the end customer. The design function ensures that appropriate environmental practices can be implemented, and customers represent a key stakeholder, which enable the reverse flows required to maximize value and minimize waste.

Similarities and differences between, and main lessons from, the papers
Johansson and Olhager and Heikkilä et al. use the same survey to discover offshoring and backshoring peculiarities in Finland and Sweden, respectively. Interestingly, albeit not altogether surprising, the findings for Swedish and Finnish industry are quite similar. Both countries are relatively small but highly developed economies with equally small home markets. They are highly developed knowledge societies in which there is less and less place for labor intensive production due to the high cost of labor. Both have an excellent educational system and, as a result, ditto access to R&D, innovation and knowledge. Previous findings on offshoring suggest that cost, the traditional motive for industrialized countries to move production to emerging countries, is still important. In the meantime, however, factors such as access to skills, knowledge and technology and access to the market and proximity to customers, suppliers and competitors have become ever more important offshoring drivers. Looking at the Swedish and Finnish experiences, we should modify this picture: for high labor-cost economies and knowledge societies, cost is still the dominant driver for production offshoring, while access to skills, knowledge, technology, and access to R&D keep complex, technology intensive production at home or bring them back home. The corollary of this issue is: how can less developed, especially the traditional low labor cost countries, break out of their labor cost trap, what strategies can be, or perhaps are already used to become and remain attractive for technology-intensive production and related activities?

In contrast to Heikkilä et al. and Johansson and Olhager, who focus on factors affecting the content of offshoring/backshoring (geographical), Nujen et al. provide insight into factors influencing the success of the actual backshoring process. As there is much more research on drivers of, benefits to be achieved with and factors affecting the
success of offshoring, Heikkilä et al. and Johansson and Olhager could use a large-scale method, survey-based research, to conduct their data collection and analyses. Process research is much more complex and, therefore, relatively rare, in change management, operations strategy and, also in offshoring. This justifies the Nujen et al.’s choice to opt for explorative case studies and, for that matter, Ashby’s study on CLSCs.

An important topic on the operations management (OM) research agenda is the development of theory. One notable contribution is Sousa and Voss (2008), who urge OM scholars to study the process of selection of OM best practices by organizations in more depth and use contingency theory, amongst others, for that purpose. They particularly address the association between fit, a central notion in contingency theory, and organizational effectiveness: “[…] organizations should use practices which are effective in their context (i.e. with adequate fit)” (p. 708). Fit is an important notion in all four papers. Both Heikkilä et al. and Johansson and Olhager emphasize the important relationship between type of production on the one hand, and the desirability of offshoring – of labor intensive production to low cost destinations, and keeping production at home, or bringing it back – of complex, technology-intensive production to a knowledge economy with excellent access to technology and R&D. Nujen et al. argue for the importance of organizational readiness for backshoring, in the form of an appropriate knowledge base, dynamic management capabilities, and use of contemporary technology. Ashby argues for the need to have a range of physical, tacit and social resources in place, as well as a shared vision and principles between the focal firm and its suppliers, in order to progress from a more reactive pollution prevention strategy to a fully embedded CLSC. Thus, the four papers, each in their own way and going beyond the individual plant, contribute to the further development of OM contingency theory.

Conclusion and further research
Of course, global interaction is much too broad a theme for one special issue, and four papers may actually raise more questions than they answer. The two survey-based papers need generalization to other geographical contexts, amongst others to determine whether the findings and explanations provided in these papers hold for companies located in different economies. Especially the links between labor-intensiveness and offshoring, and complex, technology-intensive production and backshoring, are important venues for further research. The two case-based papers propose contributions that need further development, testing and generalization in larger-scale studies in a greater variety of industrial and geographical contexts.

A second direction for further research is related to the notion of fit and the recognition of the nature of management theory. Contingency theory helps develop the normative, perhaps even prescriptive, insight that management theory is looking for. Performance effects are an important aspect of all management theory. In the set of papers included in this special issue, only Johansson and Olhager include performance aspects in their analyses.

Finally, JMTM had a special issue in 2017 (No. 3) on global operations based on selected papers of the EurOMA conference. Although the selection criteria were the same, the topics of papers in the current issue and the 2017 EurOMA special issue are quite different. While in the current issue offshoring, backshoring and CLSCs are in focus, in the 2017 issue material (Golini et al., 2017) and knowledge flows (Scherrer and Deflorin, 2017), the impact of product architecture on global operations network design (Pashaei and Olhager, 2017), and headquarter capabilities (Mykhaylenko et al., 2017) were in the forefront. Backshoring as a practice and an area of research was, however,
anticipated in the editorial for that special issue (Demeter, 2017). Its actual emergence confirms the infinite opportunities for research in global OM, in particular the need for developing theories and frameworks to structure the knowledge on the field.

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References


Further reading

Manufacturing relocation through offshoring and backshoring: the case of Sweden

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Abstract

Purpose – The purpose of this paper is to present recent empirical results concerning offshoring and backshoring of manufacturing from and to Sweden, to increase the understanding of manufacturing relocation in an international context. In particular, extent, geographies, type of production, drivers, and benefits of moving manufacturing in both directions are investigated.

Design/methodology/approach – The study is based on survey data from 373 manufacturing plants. The same set of questions is used for both offshoring and backshoring between 2010 and 2015, which allows similarities and differences in decision-making and results between the two relocation directions to be identified.

Findings – There are many significant differences between offshoring and backshoring projects. Labour cost is the dominating factor in offshoring, as driver and benefit, while backshoring is related to many drivers and benefits, such as quality, lead-time, flexibility, access to skills and knowledge, access to technology, and proximity to R&D. This is also reflected in the type of production that is relocated; labour-intensive production is offshored and complex production is backshored.

Research limitations/implications – Plants that have both offshored and backshored think and act differently than plants that have only offshored or backshored, which is why it is important to distinguish between these plant types in the context of manufacturing relocations.

Practical implications – The experience of Swedish manufacturing plants reported here can be used as a point of reference for internal manufacturing operations.

Originality/value – The survey design allows a unique comparison between offshoring and backshoring activity. Since Swedish firms in general have been quite active in rearranging their manufacturing footprint and have experience from movements in both directions, it is an appropriate geographical area to study in this context.

Keywords Operations management, Reshoring, Global manufacturing networks, Survey research, International manufacturing networks, Global operations, Rightshoring

Paper type Research paper

1. Introduction

Offshoring has been widely used during the past decades by firms in highly industrialised countries that have relocated their production to low-wage countries in e.g. Asia or Eastern Europe in order to find cost-effective manufacturing options. In general, offshoring refers to the activity of relocating value-adding activities across the national borders of the firm (Roza et al., 2011). According to recent research, however, many companies have failed to accurately weigh the costs against the benefits, and have encountered difficulties with, e.g. low quality, increased inventory, long lead-times or complications with communication and coordination (Leibl et al., 2011; Stanczyk et al., 2017). Global sourcing has often proved to be costlier than anticipated as the hidden costs of the offshoring operation may be substantial and hard to estimate (Platts and Song, 2010; Larsen et al., 2013). In addition, the nature of manufacturing is evolving and there are ongoing structural shifts in low-cost regions that are...
shaping the global manufacturing environment and forcing companies to handle a more complex set of factors when considering their manufacturing location decision (Strom and Levy, 2013). These circumstances have led some firms to reconsider their previous offshoring decision and bring manufacturing back to the home region, a phenomenon referred to as backshoring (Canham and Hamilton, 2013; Kinkel, 2014; Stentoft et al., 2016). While Wiesmann et al. (2017) found that the most commonly used term for the movement of once offshored manufacturing activities back to its previous location is reshoring, Albertoni et al. (2017) refer to reshoring as a generic change of location (could be further offshoring). In this research, we use the term backshoring to describe the movement of production activities all the way back to the country of origin.

The phenomenon of backshoring is not only of interest for practitioners, but has received increasing attention from policy makers in developed countries in the hope that it might help to create new job opportunities and restore the manufacturing industry in the home countries (Stentoft et al., 2016). Historically, manufacturing has been an important driver of economic growth. In advanced economies, however, manufacturing’s share of employment has weakened as a consequence of productivity improvements and global competition that has pushed firms to offshore their operations (Manyika et al., 2012). One such country is Sweden, where manufacturing has played an important role for economic growth and social welfare because of a historically strong trade balance. However, as a high-wage country, having a small home market, Sweden has suffered from the offshoring trend and is predicted to continue to lose manufacturing jobs to low-cost countries unless global competitiveness in manufacturing turns in Sweden’s favour (Alsén et al., 2013). Since Swedish firms in general have been quite active in rearranging their manufacturing footprint and have experience from both offshoring and backshoring, it is an appropriate geographical area to study in this context.

Although there is much current interest in manufacturing relocation in general and the phenomenon of backshoring in particular, a complete picture of the extent and drivers of the manufacturing location decision is still lacking (Fratocchi et al., 2014). Empirical evidence is starting to emerge but more research is needed on the drivers, effects, and likely evolution of the phenomenon (Brennan et al., 2015). Data for Sweden in particular are still scarce and the extent of offshoring vs backshoring activities has not yet been investigated, nor have the geographical aspects been investigated, i.e. to and from which regions manufacturing has been relocated. Hence, the first research question is:

**RQ1.** How is Swedish manufacturing affected by recent offshoring and backshoring?

Previous studies indicate that there are differences in how firms manage offshoring and backshoring in terms of drivers of the relocation decision, the type of production that is moved, and the expected outcomes (see, e.g. Canham and Hamilton, 2013; Kinkel and Zanker, 2013). Only Canham and Hamilton (2013) have performed a statistical comparison of the two relocation directions by analysing how the type of manufacturing system, capital intensity, export intensity, and R&D intensity affect offshoring and backshoring propensities. They found that manufacturing system type and R&D intensity significantly affected offshoring decisions, but found no significant relationship for backshoring. However, we have not been able to find studies that statistically analyse and compare the type of production, drivers, and benefits associated with offshoring and backshoring projects to contribute to the general understanding of manufacturing relocation. Hence, our second research question is:

**RQ2.** How are offshoring and backshoring projects managed and what are the similarities and differences between the two directions?

In order to address the research questions, we conduct a broad-scale survey of manufacturing relocation activities from and to Sweden. Because of the limited research on
backshoring, and especially its relationship with offshoring, we apply an explorative approach in order to improve the understanding of the phenomenon. We capture both offshoring and backshoring projects with the same set of questions and thereby provide both empirical evidence of the extent, geography, type of production, drivers, and benefits and an opportunity to perform a statistical comparative analysis between the two types of manufacturing relocation.

We first discuss the related literature. We then present the research design and methodology. The main section is concerned with the results from the survey. Finally, we provide implications for managers and researchers and discuss limitations and further research.

2. Related literature
Evolving supplier networks is one of the main trends in networked supply chain structures, as international networks are continuously contracting and expanding (Hameri and Hintsa, 2009). This has led to larger and highly specialised manufacturing networks around the globe. In this context, it is a challenging but important task to evaluate the strategic positions of plants in a manufacturing network since the geographical location of plants can have a significant impact on the profitability of a firm in the long term (Vos, 1991). The manufacturing location decision is part of the manufacturing firms’ business strategy and offshoring as well as backshoring of operations are two strategic options for manufacturing firms (Fratocchi et al., 2014).

A number of theories have been used, from both economics and international business literature, to explain why firms relocate their manufacturing. Two of the most common theories to explain offshoring decisions are the transaction cost economics (TCE) and the resource-based view (RBV), according to a literature review by Mihalache and Mihalache (2016). Both are concerned with the make-or-buy decision, but while TCE focusses on the cost perspective, RBV deals with the search for a competitive advantage (McIvor, 2013; Mihalache and Mihalache, 2016). Internalisation theory is another theory that has been widely used to explain the foreign activities of multinational enterprises (MNEs). It is linked both to TCE and to RBV as it focusses on the conditions under which the firm should perform the activity internally and which conditions call for outsourcing of production. It argues that every stage in the manufacturing process competes for limited resources in the form of knowledge or other intermediate products, and the MNE chooses to internalise activities when the market fails to provide the resources required or when it is economically more beneficial to perform activities internally (Rugman and Verbeke, 2008). However, these theories only provide part of the explanation for offshoring and backshoring since they focus on the ownership aspect (i.e. sourcing) rather than the location aspect (i.e. shoring). As implied by Gray et al. (2013), backshoring is essentially a location decision as it focusses on where the activities are performed rather than who is performing them.

The OLI framework (sometimes referred to the eclectic paradigm) has become one of the leading frameworks in international business research (Wiesmann et al., 2017). It builds upon the theory of internalisation (Rugman, 2010) and other partial theories in an attempt to synthesise the essential features in international economic involvement (Dunning, 2015). The OLI framework explains international manufacturing through three determinants that need to be realised for a firm to engage in international activities: ownership advantages (O), location advantages (L) and internalisation advantages (I) (Dunning, 1980, 1998). These three types of advantages are assumed to be unevenly spread across countries, industries, or enterprises. The interaction between them changes over time and thereby alters the optimal configuration of the MNE (Dunning, 2015). Dunning (1998) further categorised the L advantages into four groups of location factors that would explain in more detail what attracts firms to different regions: resource
seeking; market seeking; efficiency seeking; and strategic asset seeking advantages. The OLI framework essentially studies foreign direct investments and is thus appropriate for explaining offshoring activity. However, it has also been used to explain backshoring as it considers a manufacturing relocation to be a consequence of changes in the advantages and conditions that determine the optimal configuration of the MNE, something that could also motivate the need to bring manufacturing back (Ellram, 2013).

2.1 Offshoring

Offshoring, in particular from high-cost to low-cost destinations, has been practised by industry for at least the past 50 years. In the beginning, it was primarily manufacturing or assembly operations that were moved to foreign locations in order for the firm to cut production and labour costs and align their cost structures with their global competitors (Lewin and Peeters, 2006). Even though studies have shown that it is still more common to offshore simple than advanced tasks (Jensen and Pedersen, 2012), the nature of offshoring has changed in terms of task complexity. This development can be described as a learning-by-doing process as an offshoring firm goes through a number of stages, from cost minimising motives towards innovation seeking (Maskell et al., 2007). However, even though firms tend to continue offshoring with more advanced tasks they are careful not to offshore activities regarded as the core competence of the business (Lewin and Peeters, 2006). In fact, Linares-Navarro et al. (2014) showed that essential activities are most commonly offshored within the boundaries of the firm, while activities that are outsourced to external parties are often considered non-core. There is a relationship between the characteristics of the offshored activity and the drivers of the decision to relocate (Jensen and Pedersen, 2011), as offshoring of advanced tasks has been related to the search for skills and knowledge rather than cost savings.

It has been argued that offshoring would be dominated by large companies because of their often global networks, but research shows that SMEs are also active in relocating their activities even though their motives may be of another nature (Kinkel et al., 2007; Roza et al., 2011; Waehrens et al., 2015). Offshoring has however other implications for SMEs than for large firms as they have less experience and less advanced organisations in terms of, e.g. standardised processes and managerial capability (Waehrens et al., 2015). Offshoring of operations poses strategic challenges at the home plant, which implies a greater need to develop a strong concept of operations for the offshoring activity to be successful (Waehrens et al., 2015).

Theory suggests a number of motives for offshoring, such as cost seeking, resource seeking, innovation seeking, proximity to customers and suppliers, etc. (Roza et al., 2011; Ancarani et al., 2015). Schmeisser (2013) concluded that there is no single theory that fully explains how and why firms’ offshore value-adding activities and why there are differences in offshoring practices. Research on drivers of offshoring often takes on a multi-dimensional perspective that takes into account the interrelated trends in developed and emerging countries that affect the individual firms’ location strategies. Empirical studies, however, give similar results, pointing to cost as the major driver of offshoring (Lewin and Peeters, 2006; Kinkel et al., 2007; Lewin et al., 2009; da Silveira, 2014; Waehrens et al., 2015). From the perspective of the OLI framework, offshoring is then primarily related to efficiency-seeking location advantages. According to Kinkel and Maloca (2009), the OLI framework predicts that labour-intensive activities might be offshored while capital-intensive and skills-intensive activities may stay at home, when factor cost differences for capital are lower than for labour between countries. According to Contractor et al. (2010), offshoring for cost considerations will continue to dominate in the near future. However, as this strategy is easy to imitate by competitors, firms need to consider other aspects in order to remain competitive, such as innovation, flexibility and development (Lewin and Peeters, 2006; Waehrens et al., 2015).
There are a number of studies on performance outcomes of offshoring, but Mihalache and Mihalache (2016) found in their literature review that the results were quite inconsistent. They found studies reporting positive, negative or no association at all between offshoring and improved performance. According to Mykhayленko et al. (2015), this could be explained by the conditions and contexts around the manufacturing relocation that presumably determine the performance outcomes. They argue that many different set-ups could give the same results.

2.2 Backshoring vs offshoring
Offshoring of production activities has caused concern in developed countries because of fears that jobs will be lost to other regions and there have even been anti-offshoring campaigns from governments in countries like the USA, the UK and France (Khan and Lacity, 2012). Only a fraction of the jobs worldwide that potentially could be carried out at another location, however, is expected to be offshored, even in the future (Contractor et al., 2010). Offshoring is largely a balancing act between obtaining potential benefits and handling the risks associated with manufacturing relocation. Such risks include wage escalation, the importance of tacit knowledge, transaction costs, supply chain disruptions, competitive threats in terms of technology spill-overs, and regulations at the foreign locations (Contractor et al., 2010). In addition, the problems with offshoring, such as hidden costs, low quality, increased inventory, long lead-times or coordination issues (Platts and Song, 2010; Leibl et al., 2011; Larsen et al., 2013; Stanczyk et al., 2017) have spurred the phenomenon of backshoring that has emerged as a counter-reaction to offshoring. This search for the optimal balance in the global manufacturing network has sometimes been referred to as rightshoring (Tate, 2014; Bals et al., 2015).

Evidence of a possible backshoring trend is limited, although a number of survey studies have been conducted recently to collect empirical data as well as contrast backshoring with offshoring (Kinkel and Maloca, 2009; Kinkel, 2012; Canham and Hamilton, 2013; Dachs and Kinkel, 2013; Ellram et al., 2013; Kinkel and Zanker, 2013; Tate et al., 2014). A study of New Zealand firms showed that 44 per cent had offshored manufacturing since 2001, while only 7 per cent had backshored manufacturing during the same period (Canham and Hamilton, 2013). In the USA, incentives from governmental level have promoted backshoring and 40 per cent of the respondents in a US-based survey indicated that they perceive a trend that manufacturing is returning (Tate et al., 2014). Dachs and Kinkel (2013) used data from the European Manufacturing Survey (EMS) from 2007 to mid-2009 for eight European countries (Austria, Croatia, Denmark, Finland, Germany, the Netherlands, Slovenia, Spain and Switzerland). They noticed a considerable difference between the number of firms that have experienced offshoring (10-22 per cent) compared to backshoring (3-7 per cent) as well as differences between countries; Germany showed the lowest backshoring level with three per cent while Finland and Denmark showed the highest level of 7 per cent (Dachs and Kinkel, 2013). The only longitudinal data that are available regarding the extent of backshoring are the studies on the German manufacturing industry with data from the recurring EMS from 2006, 2009 and 2012 (Kinkel and Maloca, 2009; Kinkel, 2012; Kinkel and Zanker, 2013). Offshoring activities have been steadily decreasing during the period of measurement, while backshoring remains at a low level of around 2-3 per cent. Currently there is one backshoring company for every fourth offshoring company. A time-series analysis of production movements shows that the backshoring activity takes place within two to five years after the offshoring activity, indicating that backshoring can serve as a correction of a prior location misjudgement (Kinkel, 2014). In addition, the firm’s size, industry, home and host country characteristics as well as the strategy for relocation have all proven to have an influence on the duration of the offshore stay (Ancarani et al., 2015).

In general, survey results give a concurrent picture indicating that backshoring of manufacturing increases with firm size, even though SMEs have become more active in
recent studies. The most active firms can be found in high-tech industries such as motor vehicles and transport equipment (Dachs and Kinkel, 2013). The geographical regions most commonly involved in manufacturing relocation in the German studies are Eastern Europe (the 12 new EU member states), China and the rest of Asia, of which Eastern Europe appears to be the most attractive region for both offshoring and backshoring. There is also a considerable level of backshoring from Western Europe and the USA (Kinkel and Zanker, 2013). A study by Ellram et al. (2013) indicated that factors influencing regional attractiveness differ between geographical regions and that the manufacturing location decision is affected by different drivers as well as the perceived risk in each region.

Drivers of manufacturing backshoring have been summarised in a content-based literature review by Stentoft et al. (2016). They can be categorised based on: cost, quality, time and flexibility, access to skills and knowledge, risks, market, and other factors (such as core focus, government incentives and correction of a poor offshoring decision). Evidence from previous survey studies is clear in that the main reason for offshoring is to reduce labour cost, whereas backshoring is related to a variety of drivers of which the most important are quality issues at the foreign site, flexibility, delivery speed and access to skills and knowledge (Kinkel and Maloca, 2009; Kinkel, 2012; Canham and Hamilton, 2013). In the context of the OLI framework, firms that backshore manufacturing are thus moving from considering only efficiency-seeking advantages such as labour cost, to considering more strategic asset-seeking location advantages. Firms that to a larger extent consider strategic asset-seeking advantages could be predicted to move manufacturing from the offshore location where the initial attraction was cost, to for example the home country where skills-intensive activities such as R&D are often internalised as I advantages (Dunning, 2015).

A number of case studies have been conducted with the purpose of gaining deeper insights into the motivations and reasons for offshoring and backshoring of manufacturing (Hameri and Hintsa, 2009; Martinez-Mora and Merino, 2014; Pearce, 2014; Gylling et al., 2015; Ashby, 2016; Robinson and Hsieh, 2016). The common result is that they all highlight contextual factors and changes in the conditions that determine the optimal manufacturing location, such as exchange rates, relative price competitiveness between regions, transportation costs and market changes that put pressure on volume flexibility and short lead times. Backshoring is thus driven by many factors that could be considered temporary, which forces firms to be flexible and reassess the comparative costs and benefits in order to find the most profitable locations for manufacturing (Pearce, 2014; Tate et al., 2014).

2.3 Synthesis
The review of the literature related to manufacturing relocation shows that there is an emerging understanding of backshoring in relation to offshoring. There is, however, a lack of detail concerning the relationship between offshoring and backshoring. The extant literature that has empirically investigated backshoring has used the firm as the unit of analysis. Since larger firms relocate more manufacturing or more often, the results may be skewed. Therefore, a more detailed unit of analysis such as the plant (a firm may have multiple plants) and projects (a plant may have carried out multiple relocation projects to and from the plant) would be beneficial to get a fuller view of different aspects of manufacturing relocation. While extent, geography, type of production, and drivers have been explored in previous research, results on performance outcomes of offshoring are inconsistent (Mihalache and Mihalache, 2016) and no empirical results exist on benefits from survey studies. Consequently, we lack insights on benefits from backshoring projects and on comparisons between benefits from off- and backshoring. In addition, using projects as the unit of analysis would be appropriate for analysing benefits since it is most likely easier to relate benefits to specific projects – in each direction – than to overall manufacturing operations. Finally, the use of statistical
analyses to compare offshoring and backshoring is extremely rare; only Canham and Hamilton (2013) include a limited analysis contrasting offshoring and backshoring. These gaps are addressed in this research.

3. Research design and methodology
The purpose of this study is to present empirical evidence of manufacturing relocation in terms of offshoring and backshoring in Sweden, as formulated in RQ1. In particular, this study focuses on the extent and geographical regions involved in relocation projects to contribute to the understanding of manufacturing relocation. In addition, in line with RQ2, this study contributes a statistical analysis of offshoring and backshoring projects in terms of type of production, drivers, and benefits, to add new knowledge on how firms manage relocations in their quest for rightshoring. Figure 1 illustrates the research framework for this study.

The empirical data collection is based on an exploratory survey designed in accordance with general guidelines and recommendations on survey research; cf. e.g. Forza (2002). Exploratory survey research is used in the early stages of studying a phenomenon, when the objective is to become more familiar with a topic and to better understand and measure the concepts of interest (Malhotra and Grover, 1998). It is thus suitable for research on the phenomenon of backshoring, and especially the relationship (similarities and differences) between backshoring and offshoring, as this is still an under-researched area.

The questionnaire was pretested with both practitioners and researchers familiar with survey research in order to ensure high quality and accuracy of the constructs and questions. It was developed in English and then translated into Swedish. Both versions were available to the respondents. In the survey, the terms offshoring and backshoring were defined as follows: offshoring and backshoring refer to transferring manufacturing activities from one geographical location to another, either from Sweden to another country (offshoring) or bringing it back to Sweden (backshoring). The survey asks about relocation activities between 2010 and 2015. The survey questions are specified in the Appendix. Most items are perceptual with a five-point scale and the same set of questions is used for both backshoring and offshoring to be able to detect significant differences in any respect.

The unit of analysis in this study is the manufacturing relocation project. This is captured in the survey by questions related to “the latest, significant manufacturing relocation project” in each respective relocation direction (offshoring and backshoring).

The survey targeted all plants in Sweden with more than 50 employees in all manufacturing industry categories (SIC code 10-33). Plants with fewer than 50 employees were assumed to report very low levels of manufacturing relocation based on previous survey results (see, e.g. Kinkel, 2012; Canham and Hamilton, 2013), and were thus excluded.
Plant information and contact data were provided by Statistics Sweden (the Swedish Central Bureau of Statistics), and in total the target group included 1,637 plants, which thus constitute the population of manufacturing plants in Sweden with more than 50 employees within the industry codes 10-33. Plants with more than 100 employees were contacted by telephone before they received the survey by e-mail, while plants with under 100 employees received the survey via regular mail without any previous contact. Data were collected in September and October 2015, and after two reminders 373 usable responses were received. This is equivalent to a response rate of 22.8 per cent.

The survey respondents are production or plant managers or similar with an assumingly good knowledge of manufacturing relocation based on their experience; they have worked on average 13.8 years in production and operations management. Most respondents are production managers (47.1 per cent), followed by plant directors (30.6 per cent), global operations directors (9.4 per cent), and supply chain directors (5.6 per cent). The remaining 7.4 per cent have other positions.

Table I presents the respondent profile with respect to plant size and industry. In a few cases, the sample sub-group deviates more than 30 per cent from the expected proportion. Small plants are under-represented, which was anticipated since smaller plants are not expected to relocate manufacturing to the same extent as larger plants and therefore might refrain from responding to the survey. Plants with 101-250 employees as well as those with more than 500 employees are on the other hand over-represented. In particular, the larger plants have a response rate of 41.7 per cent, i.e. almost half the population in this size group. Two industries – electrical equipment and chemicals – are over-represented, while timber is under-represented. The overall view, however, is that the sample represents a good cross-section of the Swedish manufacturing industry.

We tested the sample for non-response bias by comparing differences between the first wave of respondents and the later returns, as suggested by, e.g. Armstrong and Overton (1977) and Lambert and Harrington (1990). This method assumes that late respondents, or respondents requiring reminders, are more like non-respondents. Only 2 out of 72 items showed significant differences between early and late respondents (significance level 0.05); these were labour costs and process quality for offshoring benefits. Non-response bias thus does not seem to pose a problem for this study.

<table>
<thead>
<tr>
<th>Number of employees at plant</th>
<th>Sample (n = 373) (%)</th>
<th>Population (n = 1,637) (%)</th>
<th>Sample/Population</th>
</tr>
</thead>
<tbody>
<tr>
<td>Less than 100</td>
<td>34.2</td>
<td>51.5</td>
<td>0.66</td>
</tr>
<tr>
<td>101-250</td>
<td>45.7</td>
<td>30.5</td>
<td>1.50</td>
</tr>
<tr>
<td>251-500</td>
<td>9.5</td>
<td>12.2</td>
<td>0.78</td>
</tr>
<tr>
<td>Over 500</td>
<td>10.6</td>
<td>5.8</td>
<td>1.83</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Industry (SIC code)</th>
<th>Sample (n = 373) (%)</th>
<th>Population (n = 1,637) (%)</th>
<th>Sample/Population</th>
</tr>
</thead>
<tbody>
<tr>
<td>Machinery and equipment (28)</td>
<td>17.4</td>
<td>13.6</td>
<td>1.28</td>
</tr>
<tr>
<td>Fabricated metal products (25)</td>
<td>10.7</td>
<td>12.2</td>
<td>0.88</td>
</tr>
<tr>
<td>Food (10)</td>
<td>7.5</td>
<td>10.3</td>
<td>0.73</td>
</tr>
<tr>
<td>Electrical equipment (27)</td>
<td>7.0</td>
<td>4.5</td>
<td>1.56</td>
</tr>
<tr>
<td>Paper (17)</td>
<td>6.2</td>
<td>5.4</td>
<td>1.15</td>
</tr>
<tr>
<td>Chemicals (20)</td>
<td>5.9</td>
<td>4.3</td>
<td>1.37</td>
</tr>
<tr>
<td>Rubber and plastics (22)</td>
<td>5.6</td>
<td>5.1</td>
<td>1.10</td>
</tr>
<tr>
<td>Motor vehicles (29)</td>
<td>5.4</td>
<td>6.8</td>
<td>0.79</td>
</tr>
<tr>
<td>Timber (16)</td>
<td>5.1</td>
<td>7.7</td>
<td>0.66</td>
</tr>
<tr>
<td>Computer, electronic and optical (26)</td>
<td>5.1</td>
<td>4.6</td>
<td>1.11</td>
</tr>
<tr>
<td>Other industries</td>
<td>24.1</td>
<td>25.5</td>
<td>0.95</td>
</tr>
</tbody>
</table>

Table I. Distribution of respondents with respect to plant size and industry.
4. Results

The results section addresses the two research questions. First, we address how offshoring and backshoring have affected Swedish manufacturing, i.e. RQ1. This part uses descriptive statistics concerning the extent of manufacturing relocation projects in both directions during the last five years and the geographical areas that have been involved in these projects. Then, we analyse and compare how offshoring and backshoring projects have been managed in terms of the type of production that has been relocated, drivers and benefits of individual relocation projects in both directions, using statistical analyses to identify significant differences, i.e. RQ2.

Some respondents have reported details of both offshoring and backshoring projects, while others have relocated manufacturing in only one direction during the last five years. Furthermore, some respondents can be characterised as having stayed at home, reporting no movement of manufacturing during this period. The respondents can consequently be grouped into four categories: “bi-directional movers” (both offshoring and backshoring), “offshorers” (only offshoring), “backshorers” (only backshoring) and “stay at home”. The distribution of the 373 respondents is as follows: 51 bi-directional movers (and for which we have data for both off- and backshoring projects), 82 offshorers, 48 backshorers, and 192 that have stayed at home. During the last five years, 35.7 per cent or 133 respondents (51 bi-directional movers + 82 offshorers out of the 373 survey responses) reported that they have offshored manufacturing, while 26.5 per cent or 99 respondents (51 bi-directional movers + 48 backshorers) have moved production back to Sweden. Consequently, we have access to detailed data on 133 offshoring and 99 backshoring projects.

This categorisation and the high number of projects for each category (minimum 48) allow us to do multiple statistical comparisons. First, we can compare offshoring with backshoring for plants that have moved manufacturing in only one direction to identify similarities and differences, i.e. offshorers vs backshorers. Second, we can compare offshoring with backshoring for the bi-directional movers to analyse how similarly or dissimilarly they manage relocations in the two directions. Third, we can compare the bi-directional movers with the offshorers concerning offshoring and the bi-directional movers with the backshorers concerning backshoring to analyse if the experience of manufacturing relocation in both directions affects how offshoring and/or backshoring are managed. The respondents that have reported no manufacturing relocation are excluded from further analysis.

4.1 Extent

The respondents were asked to indicate the total number of manufacturing relocation projects to and from their plant during the period from 2010 to 2015 both in the internal manufacturing network and to and from external suppliers or contract manufacturers. These movements are shown in Table II, reflecting that the ownership of the transferred production may or may not change (related to the make-buy decision, see, e.g. Linares-Navarro et al. (2014), Foerstl et al. (2016). The number of recent backshoring projects from internal plants is almost on a par with backshoring from external parties (i.e. “insourcing backshoring”), while offshoring is more extensively done to internal plants than to external parties (i.e. “outsourcing offshoring”). Plants thus move production internally to a larger extent than externally. Comparing the

<table>
<thead>
<tr>
<th></th>
<th>Offshoring</th>
<th>Backshoring</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Internal</td>
<td>316</td>
<td>137</td>
<td>453</td>
</tr>
<tr>
<td>External</td>
<td>193</td>
<td>149</td>
<td>342</td>
</tr>
<tr>
<td>Total</td>
<td>509</td>
<td>286</td>
<td>795</td>
</tr>
</tbody>
</table>
In order to be able to assess the size of the manufacturing relocation we asked the respondents to estimate the impact of offshoring and backshoring in terms of the change in number of employees at the plant (plus or minus percentage change). Based on the change in employment at the plant and the plant size (in terms of the number of employees), we calculated the size effects of movements in each direction. The average size effect for both offshoring and backshoring projects is equivalent to six full-time employees. Over the last five years, the average backshoring project is thus as large as the average offshoring project and the total effect of backshoring accounts for 56.2 per cent of the total effect of offshoring during this period – both in terms of the number of employees and the number of projects (cf. Table II; 286/509). Since the average offshoring and backshoring projects are more or less of the same magnitude, the number of projects is thus indicative of the impact of backshoring and offshoring on total employment. Overall, the results thus indicate that almost twice as much manufacturing has been moving away from Sweden than has returned over the last five years.

4.2 Geographical perspective on manufacturing relocations

The geographical perspective of relocations from and to a particular country provides an important contextual background for the understanding of other characteristics such as type of production, drivers and benefits. The respondents were asked to indicate the geographical region to which manufacturing was offshored or from where manufacturing was backshored, for each significant relocation project in the last five years. Figure 2 shows the percentage distribution of projects to or from each region. The main offshoring projects have been to Eastern Europe (36.8 per cent), Western Europe (19.6 per cent), and China (18.8 per cent). Particularly if the Nordic countries are included (6.0 per cent), we find that Europe dominates recent offshoring from Sweden, accounting for no less than 62.4 per cent. The same four regions top the list for backshoring, i.e. the regions from where Swedish plants have backshored manufacturing. The European dominance is even greater for
backshoring, accounting for no less than 75.8 per cent of the backshoring projects, while China accounts for 11.1 per cent. Together, these four regions account for 81.2 per cent of offshoring and 86.9 per cent of backshoring. Consequently, other regions such as India and “rest of Asia” account for relatively few relocations. In particular, there was not a single backshoring from India reported in this study, even though 3.0 per cent of the offshoring was done to India.

4.3 Type of production
The respondents were asked to indicate the type of production that had been relocated in terms of production volume, production complexity, labour intensity, and level of product standardisation along a five-point scale from “very low” (1) to “very high” (5) (see Appendix).
Table III presents the results of a two-tailed t-test for equality of means.
Table III shows that production that is backshored is of a significantly higher level of complexity than what is offshored. This indicates that the home plant considers itself as better equipped to handle complexity than offshore plants. This is particularly true at the plants that have experienced both offshoring and backshoring; they clearly emphasise that complex manufacturing is backshored. The reverse holds for labour intensity, i.e. that offshoring is significantly more labour-intensive than backshoring. This correlates well with the perception that labour costs are very high in Sweden, and if the labour differential is very large, the total manufacturing cost per item can be reduced if the corresponding items are offshored to regions with low labour costs. Neither product standardisation nor production volume indicates any significant differences between backshoring and offshoring.

4.4 Drivers
There were 21 potential drivers of manufacturing relocation listed in the survey. The respondents were asked to indicate the importance of each factor in the recent relocation decision along a five-point scale from “very low” (1) to “very high” (5) (see Appendix).
Table IV displays the results of a two-tailed t-test for equality of means. It is evident that the drivers for offshoring vs backshoring are significantly different. The only factor that is significantly more important for offshoring decisions is labour cost, while backshoring decisions are based on a multitude of factors. Quality, lead time, flexibility, access to skills and knowledge, access to technology, and proximity to R&D are all significantly more important for backshoring than for offshoring. Five of these are even significantly different at the plants that have relocated production in both directions, the exception being lead time. Production close to or in the market as well as time-to-market are also significantly more important in backshoring contexts when comparing the “backshorers” and the “offshorers”. However, the plants that have relocated production in both directions have a neutral view on these two factors.

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<table>
<thead>
<tr>
<th>Type of production</th>
<th>Only offshoring</th>
<th>Both off- and backshoring</th>
<th>Only backshoring</th>
</tr>
</thead>
<tbody>
<tr>
<td>Production complexity</td>
<td>3.10&lt;sup&gt;b&lt;/sup&gt;</td>
<td>3.10&lt;sup&gt;a&lt;/sup&gt;</td>
<td>3.76&lt;sup&gt;abc&lt;/sup&gt;</td>
</tr>
<tr>
<td>Product standardisation</td>
<td>3.38</td>
<td>3.11</td>
<td>3.11</td>
</tr>
<tr>
<td>Production volume</td>
<td>3.10</td>
<td>2.92</td>
<td>3.16</td>
</tr>
<tr>
<td>Labour intensity</td>
<td>3.55&lt;sup&gt;bd&lt;/sup&gt;</td>
<td>3.41&lt;sup&gt;f&lt;/sup&gt;</td>
<td>3.21&lt;sup&gt;d&lt;/sup&gt;</td>
</tr>
</tbody>
</table>

Notes: “Difference is significant at the 0.001 level; <sup>b</sup>difference is significant at the 0.01 level; <sup>cd</sup>difference is significant at the 0.05 level. Mean values and level of significant differences between groups by pairwise comparisons between columns for each item; column maximum in italic.
In general, there are few factors that are considered “important” or “very important” (a “4” or a “5” in the survey) when making decisions on offshoring. A score of three is a middle position that reflects the fact that the factor is neither important nor unimportant. Only two factors receive a higher average score than three for the offshorers: labour cost and other costs. The bi-directional movers rate four factors above three on average: labour cost, other costs, logistics cost and production close to or in the market. The overall message is that cost elements dominate decision-making on offshoring, and labour cost in particular. The corresponding number of factors for backshoring is nine and nine (i.e. the number of factors with an average above three for “backshorers” and “bi-directional movers”), see Table IV, indicating that backshoring is a much more multifaceted decision than offshoring.

We also analyse whether the plants that have relocated manufacturing in only one direction differ from the plants that have done both off- and backshoring, to understand if the latter group acts differently to those that have only moved manufacturing in one direction. Fundamentally, the results indicate that the plants with experience from relocations in both directions act similarly to plants that have only backshored (backshorers) for backshoring and similarly to plants that have only offshored (offshorers) for offshoring. There are only two significant differences concerning backshoring: production close to or in the market and time-to-market, which the “backshorers” regard as significantly more important. Concerning offshoring, production close to or in the market and logistics cost are both significantly less important for the “offshorers”.

In this context, it is interesting to note that the plants that have both off- and backshored manufacturing treat a number of factors in a more balanced way. For example, there is a gradual move of the scores for 6 out of 21 factors when moving from left to right in Table IV,

<table>
<thead>
<tr>
<th>Drivers of off- and backshoring</th>
<th>Only offshoring</th>
<th>Both off- and backshoring</th>
<th>Only backshoring</th>
</tr>
</thead>
<tbody>
<tr>
<td>Quality</td>
<td>2.89&lt;sup&gt;a,c&lt;/sup&gt;</td>
<td>2.75&lt;sup&gt;b,c&lt;/sup&gt;</td>
<td>3.63&lt;sup&gt;b,d&lt;/sup&gt;</td>
</tr>
<tr>
<td>Lead time</td>
<td>2.71&lt;sup&gt;a&lt;/sup&gt;</td>
<td>2.90&lt;sup&gt;e&lt;/sup&gt;</td>
<td>3.33&lt;sup&gt;f&lt;/sup&gt;</td>
</tr>
<tr>
<td>Flexibility</td>
<td>2.75&lt;sup&gt;a,d&lt;/sup&gt;</td>
<td>2.76&lt;sup&gt;b,c&lt;/sup&gt;</td>
<td>3.54&lt;sup&gt;b,d&lt;/sup&gt;</td>
</tr>
<tr>
<td>Access to skills and knowledge</td>
<td>2.64&lt;sup&gt;a,d&lt;/sup&gt;</td>
<td>2.65&lt;sup&gt;b,c&lt;/sup&gt;</td>
<td>3.52&lt;sup&gt;b,d&lt;/sup&gt;</td>
</tr>
<tr>
<td>Access to technology</td>
<td>2.42&lt;sup&gt;a,c&lt;/sup&gt;</td>
<td>2.64&lt;sup&gt;b,c&lt;/sup&gt;</td>
<td>3.23&lt;sup&gt;e&lt;/sup&gt;</td>
</tr>
<tr>
<td>Proximity to R&amp;D</td>
<td>2.00&lt;sup&gt;a,d&lt;/sup&gt;</td>
<td>1.98&lt;sup&gt;b,c&lt;/sup&gt;</td>
<td>3.13&lt;sup&gt;b,d&lt;/sup&gt;</td>
</tr>
<tr>
<td>Other cost</td>
<td>3.11</td>
<td>3.19</td>
<td>3.32</td>
</tr>
<tr>
<td>Production close to or in the market</td>
<td>2.58&lt;sup&gt;b,d&lt;/sup&gt;</td>
<td>3.06&lt;sup&gt;g&lt;/sup&gt;</td>
<td>2.60&lt;sup&gt;b&lt;/sup&gt;</td>
</tr>
<tr>
<td>Logistics cost</td>
<td>2.62&lt;sup&gt;e&lt;/sup&gt;</td>
<td>3.17&lt;sup&gt;e&lt;/sup&gt;</td>
<td>3.04&lt;sup&gt;f&lt;/sup&gt;</td>
</tr>
<tr>
<td>Focus on core areas</td>
<td>2.86</td>
<td>2.90</td>
<td>3.02</td>
</tr>
<tr>
<td>Time-to-market</td>
<td>2.08&lt;sup&gt;g&lt;/sup&gt;</td>
<td>2.11&lt;sup&gt;f&lt;/sup&gt;</td>
<td>2.31&lt;sup&gt;g&lt;/sup&gt;</td>
</tr>
<tr>
<td>Risk diversification</td>
<td>2.33</td>
<td>2.68</td>
<td>2.54</td>
</tr>
<tr>
<td>Access to raw materials</td>
<td>2.36</td>
<td>2.54</td>
<td>2.49</td>
</tr>
<tr>
<td>Avoid investments in new equip.</td>
<td>2.76</td>
<td>2.87</td>
<td>2.60</td>
</tr>
<tr>
<td>Changes in currency exchange rates</td>
<td>2.24</td>
<td>2.38</td>
<td>2.42</td>
</tr>
<tr>
<td>Shortage of qualified personnel</td>
<td>1.95</td>
<td>1.70</td>
<td>2.02</td>
</tr>
<tr>
<td>Labour cost</td>
<td>3.86&lt;sup&gt;a,d&lt;/sup&gt;</td>
<td>3.65&lt;sup&gt;b,c&lt;/sup&gt;</td>
<td>2.47&lt;sup&gt;b,d&lt;/sup&gt;</td>
</tr>
<tr>
<td>Requirement to move with customer</td>
<td>2.13</td>
<td>1.74</td>
<td>1.87</td>
</tr>
<tr>
<td>Country-specific conditions (e.g. subsidies, taxes, duties)</td>
<td>2.45</td>
<td>2.54&lt;sup&gt;g&lt;/sup&gt;</td>
<td>2.15</td>
</tr>
<tr>
<td>Follow industry practice</td>
<td>2.09</td>
<td>1.74</td>
<td>1.90</td>
</tr>
<tr>
<td>Trade barriers (e.g. customs, quotas, local content requirement)</td>
<td>2.30</td>
<td>2.37&lt;sup&gt;g&lt;/sup&gt;</td>
<td>2.08</td>
</tr>
</tbody>
</table>

**Table IV.** Drivers of off- and backshoring

Notes: <sup>a,b,c,d</sup>Difference is significant at the 0.001 level; <sup>e,f</sup>difference is significant at the 0.01 level; <sup>g,h</sup>difference is significant at the 0.05 level. Mean values and level of significant differences between groups by pairwise comparisons between columns for each item; column maximum in italic.
i.e. for lead time, flexibility, access to skills and knowledge, access to technology, time-to-market, and for labour cost (however in the other direction – from low to high). This means that the plants that have both off- and backshored typically take a middle position in their consideration of various factors when deciding on backshoring and offshoring, which can be interpreted as aiming at a balanced view of factors for manufacturing relocation decisions. They nonetheless rate a variety of factors significantly differently, i.e. five factors are significant drivers for backshoring decisions, while labour cost is the sole driver for offshoring.

4.5 Benefits

The respondents were asked to indicate to what degree the plant had benefitted from the manufacturing relocation, rating nine factors along a five-point Likert scale from "strongly disagree" (1) to "strongly agree" (5) (see Appendix). Table V shows the results of a two-tailed t-test for equality of means.

The results in Table V show that backshoring brings about many benefits concerning flexibility, quality, and deliveries, while offshoring leads to lower labour costs – but not necessarily lower logistics costs or other costs. Actually, “backshorers” exhibit significantly stronger benefits in terms of logistics costs and other costs than “offshorers”. In general, the benefits of backshoring projects seem to be substantial, since almost all mean values are well above three. This includes all aspects of flexibility, quality and delivery as well as logistics costs and other costs. The only factor that receives a lower value, around three, is labour costs. When we look at the benefits associated with offshoring projects, we see the reverse. Only labour costs have a mean value well above three, while all other benefit areas receive scores around three or below.

The plants that have moved production in both directions report significantly higher benefits for product quality, process quality, delivery speed and delivery reliability for backshoring, while labour cost is the only benefit associated with offshoring. Again, it is noticeable that the plants that have both off- and backshored have a more balanced view. There is a gradual move of factor means when moving from left to right in Table V for all factors except labour cost, i.e. for eight out of nine factors. Once again, this suggests that the plants that have both off- and backshored are aiming at a balanced distribution of production.

4.6 Comparing drivers and benefits

Comparing ex-ante drivers (see Table IV) and ex-post benefits (see Table V) associated with backshoring and offshoring, we find that these are strongly aligned for all types of plants. These results relate well to the OLI framework in that cost advantages are expected for

<table>
<thead>
<tr>
<th>Benefits</th>
<th>Only offshoring</th>
<th>Both off- and backshoring</th>
<th>Only backshoring</th>
</tr>
</thead>
<tbody>
<tr>
<td>Volume flexibility</td>
<td>3.01&lt;sup&gt;abg&lt;/sup&gt;</td>
<td>3.40&lt;sup&gt;f&lt;/sup&gt;</td>
<td>3.45&lt;sup&gt;abf&lt;/sup&gt;</td>
</tr>
<tr>
<td>Product quality</td>
<td>2.67&lt;sup&gt;ad&lt;/sup&gt;</td>
<td>2.80&lt;sup&gt;bc&lt;/sup&gt;</td>
<td>3.62&lt;sup&gt;bde&lt;/sup&gt;</td>
</tr>
<tr>
<td>Product mix flexibility</td>
<td>2.96&lt;sup&gt;ag&lt;/sup&gt;</td>
<td>3.02&lt;sup&gt;b&lt;/sup&gt;</td>
<td>3.37&lt;sup&gt;abg&lt;/sup&gt;</td>
</tr>
<tr>
<td>Delivery reliability</td>
<td>2.66&lt;sup&gt;ac&lt;/sup&gt;</td>
<td>2.82&lt;sup&gt;e&lt;/sup&gt;</td>
<td>3.52&lt;sup&gt;ae&lt;/sup&gt;</td>
</tr>
<tr>
<td>Process quality</td>
<td>2.54&lt;sup&gt;ad&lt;/sup&gt;</td>
<td>2.75&lt;sup&gt;bc&lt;/sup&gt;</td>
<td>3.62&lt;sup&gt;bde&lt;/sup&gt;</td>
</tr>
<tr>
<td>Delivery speed</td>
<td>2.60&lt;sup&gt;ac&lt;/sup&gt;</td>
<td>2.92&lt;sup&gt;bg&lt;/sup&gt;</td>
<td>3.50&lt;sup&gt;abg&lt;/sup&gt;</td>
</tr>
<tr>
<td>Logistics costs</td>
<td>2.77&lt;sup&gt;h&lt;/sup&gt;</td>
<td>2.98&lt;sup&gt;g&lt;/sup&gt;</td>
<td>3.28&lt;sup&gt;h&lt;/sup&gt;</td>
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<tr>
<td>Other costs</td>
<td>3.06&lt;sup&gt;h&lt;/sup&gt;</td>
<td>3.37&lt;sup&gt;f&lt;/sup&gt;</td>
<td>3.45&lt;sup&gt;e&lt;/sup&gt;</td>
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<tr>
<td>Labour costs</td>
<td>4.03&lt;sup&gt;ab&lt;/sup&gt;</td>
<td>3.67&lt;sup&gt;f&lt;/sup&gt;</td>
<td>2.76&lt;sup&gt;be&lt;/sup&gt;</td>
</tr>
</tbody>
</table>

Notes: <sup>a,b,c,d</sup>Difference is significant at the 0.001 level; <sup>e,f</sup>difference is significant at the 0.01 level; <sup>g</sup>difference is significant at the 0.05 level. Mean values and level of significant differences between groups by pairwise comparisons between columns for each item; column maximum in italic.

Table V. Benefits of off- and backshoring
offshoring from Sweden, while quality, lead-time, and flexibility advantages are expected for backshoring. Quality, lead-time and flexibility are key drivers for backshoring decisions and all aspects of these – product and process quality, delivery speed and reliability, and product mix and volume flexibility – are cited as significant benefits from backshoring. Labour cost is the main driver for offshoring and is cited as a significant benefit. However, the other two cost elements in this study – logistics costs and other costs – do not indicate the same type of alignment. While there were virtually no differences for these as drivers for off- and backshoring, the benefits in terms of logistics and other costs are significantly higher for backshoring than for offshoring. Thus, one cost element – labour cost – is the only factor that is significantly associated with offshoring, as driver and as benefit.

A combined view of drivers and benefits shows that there is a very clear division of factors. Many drivers and benefits are significantly different between off- and backshoring at the 0.001 level (see Tables IV and V, respectively for drivers and benefits): labour cost is significantly more relevant for offshoring, while quality, lead time/delivery, and flexibility are significantly more relevant for backshoring.

5. Discussion

5.1 Contributions

This paper contributes empirical evidence of the extent, type of production, drivers, and benefits of both offshoring and backshoring of Swedish manufacturing. First, the data on the extent of offshoring vs backshoring indicate that Swedish plants have been very active in relocating manufacturing. In particular, the ratio between the number of backshoring and offshoring projects indicates that about half as much manufacturing returns relative to what is offshored. The high proportion of backshoring relative to offshoring in Sweden is partly explained by the fact that offshoring projects are typically labour-intensive (which does not fit well with Swedish manufacturing), while backshoring projects concern complex production, which is better aligned with Swedish-based capabilities in R&D and technology development.

Second, our unique data set allows us to identify significant differences between offshoring and backshoring for type of production, drivers, and benefits. Offshoring is strongly associated with labour-intensive production, with labour cost as the sole driver and recognised as the sole benefit. These aspects are significantly higher for offshoring projects than for backshoring projects. Backshoring, on the other hand, is strongly associated with complex production and a variety of drivers and benefits, among others quality, lead-time and flexibility. All these aspects are of significantly higher importance for backshoring projects than for offshoring projects. In essence, this indicates that Swedish plants seem to be well equipped to take on complex tasks that require high competence levels in general.

Third, there is a strong association between drivers and benefits. The benefits reported from offshoring and backshoring activities echo the corresponding drivers, i.e. labour cost for offshoring and quality, delivery and flexibility for backshoring. It should be noted that: product as well as process quality; delivery speed and reliability; and product mix as well as volume flexibility were ranked significantly higher for backshoring than for offshoring. These results are also coherent with the type of production that is relocated, i.e. offshoring labour-intensive and backshoring complex production.

Fourth, we find that offshorers and backshorers think and act fundamentally differently when it comes to manufacturing relocation. In addition, the plants that have both offshored and backshored manufacturing in the last five years, i.e. the bi-directional movers, act as offshorers for offshoring and as backshorers for backshoring. This implies that they have made a distinct differentiation between what to offshore and what to backshore in order to improve performance, and that bi-directional movers consider two fundamentally different sets of location factors for the two relocation directions.
In summary, the first contribution relates to \textit{RQ1}, while the second, third, and fourth contributions relate to \textit{RQ2}. Both research questions are thus addressed.

5.2 \textit{Comparison with other studies}

Table VI presents a comparative summary of the results from this study with previous survey results from other geographical regions, i.e. from New Zealand (Canham and Hamilton, 2013), Europe (Dachs and Kinkel, 2013), and Germany (Kinkel and Zanker, 2013), that present comparable results to this study. These studies report on extent (in terms of the number of companies that offshore and backshore), type of production, and drivers. The present study adds new results on extent in terms of the number of projects in each direction and benefits from relocation, and provides tests of significant differences between offshoring and backshoring for type of production, drivers, and benefits.

The share of Swedish firms and plants that have offshored and/or backshored is considerably higher than in other countries; the only exception is offshoring from New Zealand. The proportion of backshoring relative to offshoring is much higher in Sweden – 74.2 per cent during the last five years (the corresponding numbers for the other countries or

<table>
<thead>
<tr>
<th>Location</th>
<th>New Zealand (Canham and Hamilton, 2013)</th>
<th>Europe (Dachs and Kinkel, 2013)</th>
<th>Germany (Kinkel and Zanker, 2013)</th>
<th>Sweden This study</th>
</tr>
</thead>
<tbody>
<tr>
<td>Source</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

\textbf{Extent}

\begin{tabular}{|l|c|c|c|c|}
\hline
                    & Offshoring & Backshoring & Back/Off & Extent \\
\hline
No. of companies   & 44.3\%     & 7.3\%       & 16.5\%   & 35.7\%       \\
\hline
No. of projects per plant &                   &             &           & 1.36          \\
\hline
Offshoring         & –          & –           & –        & 0.77          \\
Backshoring        & –          & –           & –        & 56.2\%        \\
\hline
\end{tabular}

\textbf{Type of production}

\begin{tabular}{|l|l|l|l|}
\hline
                   & Offshoring & Backshoring &             \\
\hline
Consumer goods and industrial goods & Clothing, Leather, – & Consumer goods & Chemicals, Textiles, – \\
\hline
\end{tabular}

\textbf{Drivers}

\begin{tabular}{|l|l|l|l|l|}
\hline
                   & Labour cost & Quality & Labour cost & Labour cost \\
Offshoring        & Labour cost & Quality & Flexibility & Quality \\
Backshoring       & Quality     & Flexibility & Lead time & Access to skills/knowledge \\
                   & “Made in NZ” & & & Access to technology Proximity to R&D \\
\hline
\end{tabular}

\textbf{Benefits}

\begin{tabular}{|l|l|l|}
\hline
                   & Labour cost & Flexibility & Quality \\
Offshoring        & –          & –           & Delivery \\
Backshoring       & –          & –           & –        \\
\hline
\end{tabular}

Table VI. Summary of main findings and comparison with previous survey studies.
regions range between 16.5 and 31.3 per cent). This is supported by the data on the number of projects and the effect on employment in Sweden, both amounting to 56.2 per cent for backshoring relative to offshoring. Sweden is thus closer to reaching an equilibrium between offshoring and backshoring than other countries – the net effect is nonetheless a reduction of manufacturing in Sweden. This figure is much higher than for any other country for which data are available, which indicates that Sweden is relevant as a manufacturing country, at least for complex production requiring R&D, technology, and skills and knowledge.

The drivers for offshoring decisions are consistent with previous research – labour cost is the sole dominating factor. Backshoring is more complex; this study confirms the basic factors quality, lead-time and flexibility. In addition, we find three other factors are just as important: access to skills and knowledge, access to technology, and proximity to R&D. All six factors are significantly more important for backshoring than for offshoring decisions. Canham and Hamilton (2013) also identify “Made in New Zealand” as a very important factor for bringing production back to New Zealand, strongly emphasising local production. The brand name “Made in Sweden” used to be strong internationally, but the role has been downplayed over the years. Instead, concepts like “Designed in Sweden” have appeared which signifies that local R&D may be considered more important than local production in the context of Sweden.

Finally, we note that while benefits have not been reported in the other studies, the results of this study indicate a strong association with the drivers for the relocation decisions – labour cost for offshoring projects and quality, lead-time and flexibility for backshoring projects.

6. Implications, limitations, and further research

6.1 Implications for managers

For practitioners, this research provides current empirical evidence and adds to the body of knowledge on how plants act concerning off- and backshoring. Practising managers can compare their perceptions and experience to our results on what other companies are actually doing. These results can serve as a benchmark (at least for highly industrialised countries) concerning what type of manufacturing to relocate, how much and how often. Labour cost is still regarded as the dominant (and the only significant) factor for making offshoring decisions, while factors related to quality, lead time and delivery act as drivers for backshoring in addition to access to technology, skills and knowledge as well as proximity to R&D. We also find that complex production is significantly more backshored than offshored, while the reverse holds for labour-intensive production. Complex production relates well with quality, flexibility, and delivery focus, while labour-intensive production relates well with a cost focus. The type of production and drivers thus correlate well. Drivers and benefits associated with offshoring and backshoring are also strongly aligned, indicating that intended advantages are realised through the manufacturing relocation in each direction. This is also verified by the plants that have moved production in both directions, i.e. they offshore for cost advantages and backshore for non-cost advantages. Since they have carried out a considerable number of offshoring as well as backshoring projects, it is clear that the rationale for moving production in one direction is very different from moving production in the other direction.

Overall, the results indicate that alignment between type of production and drivers is important to achieve the expected benefits. A coherent strategy for manufacturing relocation is therefore needed that makes a clear distinction between what should be offshored and what should be backshored.

6.2 Implications for researchers

For researchers, the study provides evidence of the statistically significant differences between offshoring and backshoring decision-making and experience, and shows that the
two directions of manufacturing relocation are managed in very different ways, even at plants that both offshore and backshore. The directions differ in terms of extent, geography, type of production, drivers and benefits. Our empirical findings are well aligned with the theoretical predictions of the OLI framework, considering the context of Sweden. From the Swedish perspective, it is reasonable to offshore labour-intensive production while complex production is kept at the domestic location, because of the relatively higher labour costs compared to other countries. We also find that for Swedish firms, offshoring relates to efficiency seeking (labour cost only), while backshoring relates to efficiency seeking (quality, flexibility) as well as strategic asset seeking (skills and knowledge). In addition, manufacturers want to be close to R&D activities, which are primarily internalised (i.e. the ‘I’ advantage) in the home country. Thus, our study supports the relevance of the OLI framework for backshoring, in addition to offshoring.

Two interesting features of this research are: the use of a similar set of questions for off- and backshoring, allowing us to contrast the factors for the two types of activity; and the distinction between “offshorers”, “backshorers”, and “bi-directional movers”, that provided additional insights into the phenomenon of offshoring vs backshoring. We find that plants that relocate production in both directions fundamentally act as “offshorers” for offshoring, and as “backshorers” for backshoring. However, the results also indicate that these plants are more moderate in their valuation of different drivers and thus have a more balanced view of manufacturing relocation, striving for rightshoring.

Since the average offshoring project affects equally many employees as the average backshoring project, the relative number of backshoring and offshoring projects is indicative of the total proportion of backshoring relative to offshoring (even in terms of employment). The number of projects can thus serve as an indicator of the total relationship between backshoring and offshoring in a particular country and can help to predict when the extent of backshoring may surpass that of offshoring. We strongly advocate the use of relocation projects as an indicator of extent rather than just counting the firms or plants that have experienced offshoring or backshoring, since larger plants relocate more than smaller plants.

6.3 Limitations and suggestions for further research
One limitation is the geographical focus on relocations to and from Sweden. It should be recognised that Sweden is a region characterised by high-cost manufacturing and limited market size, but good infrastructure in terms of skills and knowledge, technology and R&D facilities. The results that are comparable with Germany and New Zealand indicate similarities in terms of type of production and drivers, which indicates that our new findings concerning statistical differences between off- and backshoring based on significance tests as well as the findings on benefits would likely be applicable to these regions. We therefore believe that the results are relevant for highly industrialised countries and regions in general, with the possible exception of the very high proportion of backshoring projects relative to offshoring projects that may not be expected in other countries. At the same time, the figures indicate that it is indeed possible to attract manufacturing to a high-cost country. However, further studies are needed to investigate the specific circumstances that facilitate the return of Swedish manufacturing to better understand this phenomenon.

This research opens up a couple of avenues for further research. First, surveys that capture both off- and backshoring in other parts of the world, in order to get a wider understanding of the geographical aspects of relocation and the current state worldwide as well as to investigate the potential contingency effects of different geographical regions. Second, longitudinal survey studies, to capture the relative progression of offshoring vs backshoring activities as well as changes in type of production, drivers, and benefits. Third, it would be interesting to derive empirically driven bundles of drivers to understand how these are logically grouped based on actual data rather than conceptual expectations, and thereby better comprehend the
complexity of decision-making, e.g. concerning how many dimensions that need to be taken into account. Finally, in-depth case studies on decision-making processes and experiences for manufacturing relocation and strategies for manufacturing network restructuring, e.g. at plants that move manufacturing in both directions, to investigate how they use relocations towards rightshoring, to balance and optimise their manufacturing network.

References


Appendix. Survey questionnaire

Type of production (N.B. same set of questions for offshoring and backshoring)
What are the characteristics of the production that was moved? (1=Very low, 2=Low, 3=Neither high, nor low, 4=High, 5=Very high)

| T1. Production volume | T2. Production complexity | T3. Labour intensity | T4. Product standardisation (level of…)
|-----------------------|--------------------------|---------------------|---------------------

(Based on: Kinkel, 2012; Canham and Hamilton, 2013)

Drivers of relocation projects (N.B. same set of questions for offshoring and backshoring)
Please indicate the importance of the following factors in the decision to move production: (1=Very low, 2=Low, 3=Neither high, nor low, 4=High, 5=Very high)


(Based on: Kinkel, 2012; Canham and Hamilton, 2013; Tate et al., 2014; Ancarani et al., 2015)

Benefits of relocation projects (N.B. same set of questions for offshoring and backshoring)
Please consider if your company benefitted in the following areas from moving production: (1=Strongly disagree, 2=Somewhat disagree, 3=Neither agree nor disagree, 4=Somewhat agree, 5=Strongly agree)

|-----------------|------------------|---------------|------------------|------------------|-----------------|------------------|------------------|------------------|

(Based on: Authors)

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Backshoring of production in the context of a small and open Nordic economy

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Abstract

Purpose – The purpose of this paper is to investigate the extent, drivers, and conditions underlying backshoring in the Finnish manufacturing industry, comparing the results to the wider ongoing relocation of production in the international context.

Design/methodology/approach – The survey of 229 Finnish manufacturing firms reveals the background, drivers, and patterns of offshoring and backshoring.

Findings – Companies that had transferred their production back to Finland were more commonly in industries with relatively higher technology intensity and they were typically larger than the no-movement companies, and with a higher number of plants. They also reported more commonly having a corporate-wide strategy for guiding production location decisions.

Research limitations/implications – Backshoring activity in the small and open economy of Finland seems to be higher compared to earlier studies in larger countries. The findings suggest that there is a transformation in the manufacturing industries with some gradual replacement of labor-intensive and lower technology-intensive industries toward higher technology-intensive industries.

Practical implications – Moving production across national borders is one option in the strategies of firms to stay competitive. Companies must carefully consider the relevance of various decision-making drivers when determining strategies for their production networks.

Social implications – Manufacturing industries have traditionally been important for employment in the relatively small and open economies of the Nordic countries. From the social perspective, it is important to understand the ongoing transformation and its implications.

Keywords Production, Manufacturing, Manufacturing strategy

Paper type Research paper

1. Introduction

Manufacturing industries have a central role in economic growth through production and its interplay with wider business ecosystems. Therefore, it is necessary to understand the mechanisms leading to manufacturing companies’ production location decisions. This research paper describes the case of the Finnish manufacturing industry and the extent to which Finnish-based manufacturing companies move their production outside of Finland (offshoring) and bring their production back (backshoring).

The goal of this research is to enhance knowledge of the drivers and characteristics of backshoring, and its implications on the renewal of manufacturing industry in a small and open economy, such as Finland. The focus is on two main research questions:

RQ1. Why and to what extent do Finnish manufacturing firms offshore and backshore their production?

This research was conducted in collaboration with Professors Jan Olhager from the Lund University in Sweden and Jan Stentoft from the University of Southern Denmark. The research was part of the Innovation research program “Renewal of Manufacturing” jointly financed by Tekes – the Finnish Funding Agency for Innovation and the Swedish innovation agency VINNOVA. The authors acknowledge the financial support for this research, and the Nordic research partners for the fruitful cooperation.
RQ2. How do the backshoring companies differ from other companies?

The research was carried out as part of a three-country survey involving Denmark, Finland, and Sweden, of the trends and drivers of offshoring and backshoring of manufacturing. The particular focus in this paper is on the companies that have brought their production back to Finland during the period 2010-2015.

Extant literature has reported numerous reasons for moving manufacturing back to the developed economies from a previous location (Stentoft et al., 2016). Different drivers have been identified for backshoring, such as changing costs (Bailey and De Propris, 2014; Cho et al., 2014; Kinkel, 2012, 2014; Pearce, 2014; Martinez-Mora and Merino, 2014; Wu and Zhang, 2014), quality issues (Canham and Hamilton, 2013; Fratocchi et al., 2014, 2016; Gylling et al., 2015; Wiesmann et al., 2017), and time and flexibility issues (Arlbjørn and Mikkelsen, 2014; Fratocchi et al., 2014, 2016; Kinkel and Maloca, 2009; Stentoft et al., 2015). There are only a few studies available in which the backshoring phenomenon has been examined in the context of small countries (cf. Canham and Hamilton, 2013; Stentoft et al., 2015). Future research is recommended on backshoring to explore differences in backshoring practices with respect to industry comparisons, firm-size and country practices based on empirical data (Barbieri and Stentoft, 2016).

In this paper, we first review the related literature. Then, we present the research methodology and means of collecting data. The main section of the paper is concerned with the scope and drivers of offshoring and backshoring of the Finnish manufacturing industry and comparison of companies that have brought production back to Finland with those that have not done so. We conclude with implications for research and practice as well as discuss limitations and suggestions for further research.

2. Literature review

2.1 Manufacturing industry in the Nordic countries

Manufacturing firms’ competitiveness requires sufficiently concentrated clusters of resources – interconnected manufacturing firms, suppliers, service providers, and associated institutions that collaborate (Porter, 2000). The understanding used to be that proximity in geographic and various other institutional terms is good for accessing resources, building relationships, and achieving productivity and related benefits (Porter, 2000). Therefore, large countries with easy access domestically to markets, raw materials, and human resources, innovation capacity and economies of scale have dominated in the manufacturing landscape. However, globalization and internationalization of firms have changed this constellation, as the costs of transportation and information exchange have diminished dramatically, resulting in a changing configuration of production resources (Porter, 2000; Brennan et al., 2015). Resources and markets may thus be globally available to any firms, and at reasonable costs. Trends such as servitization, creation of new production systems, and sustainability and ethicality of the supply chains are driving changes in manufacturing networks, thereby potentially changing the competitive arena and generating new motives for the relocation of manufacturing (Brennan et al., 2015).

A lot of attention in research on the internationalization of manufacturing has been on large developed countries (e.g. Ellram et al., 2013; Gray et al., 2011; Kinkel and Maloca, 2009; Martinez-Mora and Merino, 2014; Pearce, 2014; Porter and Rivkin, 2012). This paper adopts the perspective of a small, developed country, specifically in the Nordic region. Such context has been covered only to a limited extent in previous relocation research (e.g. Arlbjørn and Mikkelsen, 2014; Gylling et al., 2015; Stentoft et al., 2015). In Nordic countries, the main markets and demand for manufactured goods are often located at a distance. Labor costs tend to be relatively high, labor rules and laws are relatively inflexible, and these factors have encouraged manufacturing firms to establish new capacity in the emerging markets,
where also the labor costs are lower. This has resulted in job losses in the home countries (Alsén et al., 2013). With high-technology manufacturing, also the access to specialized raw materials and components, and manual labor has required locational considerations (Groth and Winther, 2013).

These issues have driven manufacturing firms and industries to consider their international presence actively. Although Nordic countries (Denmark, Finland, Norway, Sweden) have been considered as active in their cluster-based economic development initiatives (Porter, 2000) and they are praised for their access to talented workforce (Alsén et al., 2013), the economic success of the small Nordic countries is heavily dependent on exports (Alsén et al., 2013). Therefore, manufacturing industries have been an important source of economic wealth. The decline in the manufacturing sector has caused significant concerns for the welfare of these economies.

The share of the manufacturing sector in the Nordic countries’ gross national product (GNP) has declined in recent decades, following the same trend as in other developed economies. In Finland, for example, the highest manufacturing share of GNP was reached in 1974, when it accounted for 32 percent of GNP. In the early 2000s the share fluctuated between 25 and 28 percent, but fell to 20 percent in 2009 as a result of the global financial crisis that started in 2008. The share has remained the same since then, and the other sectors have not been able to compensate for the loss of this contribution to GNP (Finland’s Ministry of Employment and the Economy (FMEE), 2014).

Employment in manufacturing industries has also been in decline. In 2007, the manufacturing sector in Finland employed directly 397,000 people. The reduction in the manufacturing workforce between 2007 and 2016 was 90,000 people, i.e. 23 percent, resulting in 307,000 people directly employed in the manufacturing industry in 2016. Over the long term, however, Nordic manufacturing output has continued to grow, primarily because of investments in automation and the shift toward more technology-intensive and knowledge-intensive sectors.

Offshoring and job losses have mostly affected the labor-intensive industries, such as furniture, textiles, and electrical components. Much of production in these industries has moved to lower cost countries and emerging markets. For example, Swedish computing and electrical component manufacturers employed virtually all their workers domestically in 2000. A decade later, 22 percent of their employees were in low-cost countries. In addition, a large number of workers were employed offshore by contract manufacturers. In the textile and clothing industries, the share of employment in low-cost countries rose from 8 to 42 percent. The labor force of Swedish machinery and equipment companies in low-cost countries rose from 15 percent in 1998-2000 to 34 percent in 2008-2010 (Alsén et al., 2013).

In the changing global business environment, the Nordic manufacturing companies are increasingly shifting the focus of their investments outside their home bases. From 2000 to 2006, 81 percent of capital expenditure by Finnish manufacturing companies was invested within the Nordic region. From 2007 to 2011 that dropped to 67 percent. Finnish capital investments have been moving to the rest of Western Europe and to the developing economies, including Russia, Eastern Europe, Asia, and South America (FMEE, 2014).

The decreased industrial value-added is the most significant challenge that the manufacturing sector in Finland is presently facing. The Finnish electronics industry lost about EUR9 billion of its value-added during the period 2009-2015. In the wood and paper industry the loss has been about EUR1.5 billion and the metal processing industry has also been severely affected. The causes are slightly different across the three industries. In the electronics industry the loss of value-added could be explained by the collapse and eventual divestment of Nokia’s mobile terminals business to Microsoft. The loss in the paper industry was caused by the global decrease in the demand for printed media, with
the resulting overcapacity and the need to close factories in the Nordic countries. In metal processing there was a combination of factors behind the loss of industrial value-added: lower demand for investment goods, increased competition from the emerging markets, lowered prices for metal products, and loss of competitiveness because of increasing cost levels (FMEE, 2014). With these background factors, the dependency of Nordic economies on manufacturing competitiveness makes it necessary to understand the premises for successful backshoring.

2.2 Offshoring and backshoring of manufacturing

Much research has been published on offshoring and outsourcing. Companies choose these actions for several reasons, for example, to obtain cost advantages and proximity to customers (Kakabadse and Kakabadse, 2002; Kinkel and Maloca, 2009). More recently research has focused on the reverse movement, that is, moving manufacturing back to its original location, known as backshoring (Kinkel, 2014), reshoring (Gray et al., 2013; Ellram et al., 2013; Tate, 2014), or re-insourcing (Drauz, 2014).

Stentoft et al. (2016) made a content-based literature review analyzing the research so far on the backshoring of manufacturing. The specific reasons for moving manufacturing back to manufacturing companies’ home countries can be related to six distinct aspects: cost; quality; time and flexibility; access to skills and knowledge; risks; and other factors (such as incentives, core focus, shrinking market, and rectification of an erroneous decision), see Table I for literature references.

Backshoring operations have been studied in various country contexts, and the target and source countries have been considered. Kinkel (2012) conducted a survey with almost 1,500 German firms among various industries and firm sizes. Besides covering the motives of offshoring and backshoring and changes in these after the economic crisis, the findings showed that the German manufacturing firms had most frequently offshored to Eastern European countries, China, and other Asian countries, and that this activity has changed (less to Eastern Europe and more to Asia) after the economic crisis. Backshoring has similarly been most active from Eastern Europe and China. Kinkel also reported a decline in offshoring activities after the economic crisis of 2008.

There have been some backshoring studies focusing on certain types of businesses, or certain countries only. For example, Zhai et al. (2016) focused on manufacturing firms that had backshored from China to the USA, using a document-based study of 139 backshoring cases. They covered a variety of industries. Robinson and Hsieh (2016) used a qualitative interview-based study and focused on the manufacturing of luxury clothing, specifically Burberry and its supply partners, and the backshoring of manufacturing to the UK. Gylling et al. (2015) report an illustrative single case from Finland on first the offshoring and eventually the backshoring of bicycle manufacturing. Bals et al. (2016) studied reshoring decision making using documentary data from Germany and the USA, and propose various new research avenues, for example, those concerning the varying home country conditions and how these give rise to differentiation in backshoring patterns and decision-making.

In the context of small countries, i.e. Denmark, Finland, and New Zealand, the following factors favoring backshoring are specifically addressed in the existing research:

- quality not at an acceptable level in the source country (Arlbjørn and Mikkelsen, 2014; Canham and Hamilton, 2013; Gylling et al., 2015; Stentoft et al., 2015);
- delivery lead time (Arlbjørn and Mikkelsen, 2014; Stentoft et al., 2015), demand volatility and supply chain resilience (Gylling et al., 2015; Stentoft et al., 2015);
- proximity to R&D resources, and utilization of new technologies and automation (Arlbjørn and Mikkelsen, 2014; Stentoft et al., 2015);
<table>
<thead>
<tr>
<th>Drivers</th>
<th>Specific issues</th>
<th>References</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Higher-than-expected coordination efforts and transaction costs</td>
<td>Kinkel (2012, 2014), Kinkel and Maloca (2009, Gray et al. (2013); Gylling et al. (2015)</td>
</tr>
<tr>
<td></td>
<td>Miscalculation of actual cost</td>
<td>Gylling et al. (2015); Kinkel (2014), Kinkel and Maloca (2009), Martinez-Mora and Merino (2014), Tate et al. (2014)</td>
</tr>
<tr>
<td></td>
<td>Changes in energy costs</td>
<td>Pearce (2014), Tate (2014), Tate et al. (2014)</td>
</tr>
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<td></td>
<td>Productivity differences between locations</td>
<td>Pearce (2014)</td>
</tr>
<tr>
<td>Quality</td>
<td>Need for small production runs</td>
<td>Canham and Hamilton (2013), Gylling et al. (2015)</td>
</tr>
<tr>
<td></td>
<td>Customer perceived quality</td>
<td>Canham and Hamilton (2013), Fratocchi et al. (2016)</td>
</tr>
<tr>
<td></td>
<td>Product quality</td>
<td>Canham and Hamilton (2013), Fratocchi et al. (2016, Stentoft et al. (2015), Tate et al. (2014), Zhai et al. (2016)</td>
</tr>
<tr>
<td></td>
<td>Process quality</td>
<td>Kinkel and Maloca (2009)</td>
</tr>
<tr>
<td></td>
<td>Co-location between manufacturing and R&amp;D, innovation, services or development of system solutions to maximize quality</td>
<td>Bailey and De Propris (2014), Fratocchi et al. (2016)</td>
</tr>
<tr>
<td></td>
<td>Co-location between marketing and production for good time-to-customer</td>
<td>Fratocchi et al. (2016)</td>
</tr>
<tr>
<td></td>
<td>Utilization of new technologies and automation</td>
<td>Arlbjørn and Mikkelsen (2014), Stentoft et al. (2015), Tate et al. (2014)</td>
</tr>
<tr>
<td>Other specific drivers</td>
<td>The risk of losing know-how or intellectual property</td>
<td>Kinkel (2014), Moser (2013), Tate (2014), Tate et al. (2014)</td>
</tr>
</tbody>
</table>

Table I. Summary of previous research on the drivers of backshoring (continued)
volatility in the currency exchange rates (Gylling et al., 2015)), market-related factors, such as loyalty and/or patriotism, value of “Made in X” and staying close to customers (Canham and Hamilton, 2013); and

- increased focus on core activities at the focal manufacturing firm (Arlbjørn and Mikkelsen, 2014; Canham and Hamilton, 2013; Stentoft et al., 2015).

There is some indication that company size is relevant in the decisions to both offshore and backshore manufacturing. Earlier research shows that bigger companies are more active in offshoring than small or medium sized firms, but there is no difference in backshoring (Kinkel, 2012). Srai and Ane (2016) conducted a qualitative survey of 94 companies that had backshored manufacturing to France and the UK. They did not specifically address the impact of size, but their sample included a fairly large proportion of medium-sized and small firms, indicating that SMEs may also be active in backshoring. A broad range of industries have been studied when analyzing offshoring and backshoring (Brennan et al., 2015; Kinkel, 2012; Massini et al., 2010).

There are only a few systematic comparative studies available of the extent and drivers of offshoring and backshoring trends in small and open, export-dependent economies. Also, there are only few studies available in which the research data come from the level of company decision makers; the trends in manufacturing employment and investments have rather been observed through macroeconomic numbers. Simultaneous analysis of offshoring and backshoring using the same set of survey questions has also not been done before. This study seeks to contribute by addressing these gaps with empirical data collected among firms in the Finnish manufacturing industry.

### 3. Research design and approach

#### 3.1 Design of the questionnaire survey

This paper is based on survey research carried out in Fall 2015 on the extent and characteristics of manufacturing companies’ production offshoring and backshoring activities in Denmark, Finland, and Sweden. The survey design is based on the earlier research on relocation of manufacturing in Germany, the USA, Spain, and Denmark; cf. Kinkel (2014), Tate (2014), Martinez-Mora and Merino (2014), and Stentoft et al. (2015). The questionnaire consists of five sections focusing on: first, a company’s manufacturing network characteristics; second and third, the extent and perceived drivers, benefits and performance of recent offshoring and backshoring decisions; fourth, decision-making and performance related to production relocations; and fifth the company and respondent background.

The questionnaire was jointly developed by researchers in Denmark, Finland, and Sweden. The original survey questionnaire was developed in English and then translated into the local language versions, i.e. Danish, Finnish, and Swedish. Each respondent was given an option to answer either in English or their native local language. The questionnaires were piloted with

<table>
<thead>
<tr>
<th>Drivers</th>
<th>Specific issues</th>
<th>References</th>
</tr>
</thead>
<tbody>
<tr>
<td>Risks for the customer</td>
<td>perception of the brand value</td>
<td>Robinson and Hsieh (2016), Wiesmann et al. (2017)</td>
</tr>
<tr>
<td>Volatility in currency exchange rates</td>
<td></td>
<td>Bailey and De Propris (2014), Gylling et al. (2015), Moser (2013), Tate et al. (2014)</td>
</tr>
<tr>
<td>Government incentives</td>
<td>favoring a certain location</td>
<td>Moser (2013), Pearce (2014), Tate et al. (2014)</td>
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</table>

Table I.
test respondents including both researchers not directly involved with the project and practitioners representative of the targeted respondent group. Some items were modified as a result of piloting. For example, as a result of the feedback from practitioners, it was emphasized that the responses concerning offshoring and backshoring decisions concerned the most recent significant and permanent movements of production either abroad or back home. This is an important distinction from the continuous allocation of production among an international plant network, which is a common practice for large international manufacturing companies in certain industries.

This paper focuses on three aspects of the production relocation questionnaire: the extent of offshoring and backshoring; the drivers of offshoring and backshoring; and comparison of backshoring companies with the “only offshoring” and “no-movement” companies in light of company characteristics and activities. Offshoring and backshoring refer to transferring production permanently from one geographic location to another location, either from Finland to another country (offshoring) or bringing it back to Finland (backshoring). Backshoring does not necessarily mean that the same production had been earlier moved abroad. In both offshoring and backshoring the ownership of the transferred production may or may not change. The survey covered production location movements during the preceding five years. The most recent significant relocation instances, both offshore and back, were studied more specifically in cases when the company had implemented these production relocations. Further, both company-level and the focal plant level aspects of offshoring and backshoring were studied. Company refers here either to the entire company or to a specific business area in case of a multi-business corporation.

### 3.2 Sample and respondents

The targeted companies included all the manufacturing companies with more than 50 employees in all the manufacturing industry categories (ISIC codes 10-33). In Finland, 949 companies belonged to the target group in 2015. All the companies in the target group were contacted by telephone to identify the person responsible for production and operations. The companies’ manufacturing contact persons were contacted to ascertain their willingness to participate in the survey. Of the 949 companies 434 were willing to receive the survey, after which an electronic link was sent to the questionnaire. Three reminders were e-mailed to the contact persons to increase the response rate. The number of manufacturing companies finally submitting the completed survey was 242, and of these 13 did not fulfill the criterion of having over 50 employees. Therefore, the final number of acceptable survey responses was 229, corresponding to a 24 percent response rate.

The respondent sample is compared to the total population of manufacturing companies in Tables II-IV in terms of number of employees in the company, industry, and ownership. The respondent sample is somewhat biased toward large companies (over 500 employees) ($\chi^2(3) = 86.546; p < 0.001$) and one industry is clearly over-represented, namely the machinery industry and equipment (ISIC code 28), even though otherwise the distribution

<table>
<thead>
<tr>
<th>Distribution across company size</th>
<th>Total population (%)</th>
<th>Respondents (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>51-100 employees</td>
<td>49.0</td>
<td>31.7</td>
</tr>
<tr>
<td>101-250 employees</td>
<td>31.4</td>
<td>31.7</td>
</tr>
<tr>
<td>251-500 employees</td>
<td>11.1</td>
<td>11.9</td>
</tr>
<tr>
<td>Over 500 employees</td>
<td>8.5</td>
<td>24.7</td>
</tr>
<tr>
<td>Total</td>
<td>100.0</td>
<td>100.0</td>
</tr>
</tbody>
</table>

**Table II.**

Survey respondents in terms of company size

**Note:** Comparison of the respondent sample to the total industry population of Finnish manufacturing firms in terms of company size (number of employees)
follows the population distribution \(\chi^2(20) = 14.371; p = 0.811\). The distribution of ownership in the sample matches with that in the population \(\chi^2(1) = 0.125; p = 0.757\).

Of the survey respondents 84 percent were production managers, plant directors or managers, global operations directors or managers, and supply chain directors or managers. Other responsibilities of the respondents included, e.g. chief executive officers, chief financial officers, chief procurement officer, quality and development manager, and chief technology officer. The average work experience of the respondents in production and operations management tasks was 15.5 years and in their respective current job positions 6.5 years. Therefore, we can conclude that the respondents had in-depth experience and knowledge to answer the questions in the survey questionnaire concerning their company’s manufacturing network, strategy and performance, and the recent offshoring and backshoring decisions.
3.3 Questionnaire instrument and variables

The first aspect of this paper, the extent of production movements, was approached by asking if companies had permanently offshored and/or backshored their production during the last five years (yes/no alternatives). Further, the main market areas of the latest significant production transfer and the geographical areas to/from which this production was moved were charted. The following classification of geographical areas was utilized: Nordic countries, other areas in Western Europe, Eastern Europe, North America, Latin America, China, India, Asia (excluding China and India) and other areas (Africa, Middle East and Australia). Expectations regarding production movements in the company during the next two years were elicited using a five-point scale (not at all, small extent, moderate extent, large extent, very large extent) with an additional “not applicable” option. The distributions of the survey responses are presented in Section 4.1.

The second aspect of production relocation in this paper included questions about the company strategies and production relocation drivers. Regarding the strategies, the respondents were asked if their company had a corporate-wide relocation strategy guiding offshoring and backshoring decisions, and if strategies for the focal plant and corporate-wide manufacturing had been created (yes/no). Drivers of the latest significant production location movement were elicited by exploring 21 aspects defined as factors contributing to relocation decisions in the earlier research literature (e.g. Kinkel and Maloca, 2009; Stentoft et al., 2015; Tate et al., 2014). These drivers are presented in Figure 2 in Section 4.2. The impact of the drivers on the recent significant production relocation decision was charted for both offshoring and backshoring using a five-point scale (very low, low, neither high nor low, high, very high) with an additional “not applicable” option.

For the third aspect, being a comparison of backshoring companies with other companies, some background aspects of the companies were ascertained. First, company size was measured in terms of the number of employees in the focal plant and at the company level, as well as in terms of the number of own production plants in the company’s manufacturing network. The classifications of 1-50, 51-100, 101-250, 251-500 and over 500 employees were used in the focal plant review; the first of these groups was discarded when studying the company level. The number of plants was determined by a classification of one, two, three to five, six to ten and over ten plants. All these questions had also a “not applicable” alternative. The industries of the responding companies were classified according to the Eurostat (2016) codes into four categories according to technological intensity (high technology, medium-high technology, medium-low technology and low technology). The distribution of the companies according to the number of employees in a company and the industries and their technological intensity are presented in Tables II and III, respectively.

3.4 Data analysis

The data were analyzed in order to study the extent of production movements, drivers of these movements, and characteristic of companies that have backshored production. The extent of production relocations was analyzed through a descriptive analysis of response frequencies (n or %). The importance of offshoring and backshoring drivers were reviewed by descriptive statistics and compared using Mann-Whitney U-test. The differences in importance of drivers between large and small companies as well as high and low technological-intensity companies was analyzed also by Mann-Whitney U-test. For these analyses the company size (number of employees) and technology intensity was classified as binary variables due to the limited number of respondents particularly in the group of backshoring companies (250 employees at maximum and more than 250 employees; low/medium-low technology intensity and high/medium-high technology intensity).

Further, the characteristics of companies that reported having brought their production back to Finland were compared with the groups of “only offshoring” and “no movement” companies.
The focus was on three aspects known to affect production relocations: industry (technology intensity), company size (number of employees in the company and the focal plant; number of production plants), and existence of a strategy guiding production relocations. The objective was to understand if the backshoring companies together formed a group with some specific characteristics. The descriptive results are presented in terms of category frequencies (n or percent) or scale averages. In addition to the descriptive inspection, multinominal logistics regression was used to identify the characteristic of the backshoring companies.

4. Results

4.1 Extent of production relocations

We first examined the extent of offshoring and backshoring to understand the status of location movements among the respondents. The survey results showed that a considerable amount of production had been transferred across national borders in both directions: 78 out of the total 229 companies (34 percent) had realized some production movements during the last six years (2010-2015). However, more production was moving away from Finland than coming back. Out of the total 229 respondent companies 59 (26 percent) reported having permanently moved production to other countries during the last five years and 30 companies (13 percent) reported having moved production to Finland. Out of the 78 companies that had moved production abroad or back, 11 companies (5 percent of all respondent companies) reported having engaged in both offshoring and backshoring during the time period analyzed. In total, 151 companies (66 percent) reported having neither offshored nor backshored production during the past five years.

Most of the selected 59 latest significant offshoring movements were made to Eastern Europe or Western Europe including the Nordic countries. The next typical location of production offshoring was China. The most recent significant backshoring cases of bringing production to Finland were mostly from Western Europe or another Nordic country, Eastern Europe or China. The detailed percentages and comparison between offshoring and backshoring locations are presented in Figure 1.

Out of the 59 companies that had offshored their production during the reviewed period, 32 (54 percent) had made three or more production moves. Only one move was made by 15 (25 percent) of the offshoring companies. The production was moved to both own company’s plant outside of Finland (79 percent of the companies) and to another company’s plant (54 percent of the companies, some companies had made simultaneous moves to both own and another company’s plants). Backshoring was more infrequent, thus only six (20 percent) out of the 30 backshoring companies had moved production back to Finland three or more times. About 40 percent of the companies had moved production back only one time. Production was moved back quite as commonly from own company’s plant abroad (67 percent of the companies) than from an external supplier or contract manufacturer (64 percent of the companies).

![Figure 1. Comparison of offshoring and backshoring movements regarding the geographical areas](image)
4.2 Drivers for offshoring and backshoring

According to the survey responses, the most important reasons for offshoring from Finland were labor, logistics, and other (not labor and logistics) costs. The only factors that had a statistically significantly higher rating for offshoring compared to backshoring were labor costs \((U = 335.0; p < 0.001)\) and trade barriers \((U = 455.0; p < 0.05)\). In turn, flexibility, quality, lead time, and logistics costs were the most important factors when bringing production back to Finland. Out of these flexibility and quality had higher ratings compared with offshoring \((U = 434.5; p < 0.001\) and \(U = 515.5; p < 0.01\), respectively). Other drivers rated more significant among backshoring companies than offshoring were proximity to R&D and product development \((U = 430.5; p < 0.001)\), access to skills and knowledge \((U = 485.5; p < 0.01)\) and time-to-market (bringing new products to market faster) \((U = 486.0; p < 0.01)\). Figure 2 shows the reported importance of factors for making the company’s latest significant offshoring and backshoring decisions.

We conclude that offshoring decisions of Finnish manufacturing firms are dominated by labor costs, whereas drivers of backshoring decisions are clearly more numerous, including both operative factors (flexibility, quality) and factors related to knowledge and capabilities (access to skills and knowledge, proximity to R&D and product development, and time-to-market).

![Figure 2. Importance of factors in offshoring and backshoring decisions](image)

**Notes:** Averages of all responses, \(n=59\) offshoring/30 backshoring. ***\(p<0.001\); **\(0.001 \leq p < 0.010\), *\(0.010 \leq p \leq 0.50\)
4.3 Companies bringing production back to Finland

*Technological intensity of industry.* The group of 30 companies that reported having brought production back to Finland was analyzed to compare them with the group of only offshoring and no movement companies. Companies having implemented backshoring could be found in 11 out of the 20 ISIC manufacturing industry categories. The highest number of backshoring companies was in the machinery and equipment industry (ten companies, ISIC code 28), fabricated metal products (four companies, code 25), electrical equipment (three, code 27), computer, electronic and optical products (three, code 26), and chemicals industry (three, code 20). The companies that had transferred their production back to Finland were more commonly in industries with higher technology intensity than those companies that had only offshored their production or not realized production movements. The distributions of companies according to their industry’s technology intensity in the groups of backshoring, only-offshoring and no-movement companies are compared in Table V.

*Company size.* Companies in the groups of backshoring, only-offshoring, and no-movement were compared in terms of the number of employees in the company and the number of production plants. Backshoring companies had more commonly a higher number of employees (40 percent had more than 500 employees) than the no-movement companies (22 percent had more than 500 employees) but the highest share of large companies was among only-offshoring companies (49 percent had more than 500 employees). Companies having implemented backshoring to Finland had a higher number of production plants than the only-offshoring and no-movement companies. One-third (ten) of the backshoring companies had over ten production plants, compared to about ten percent of the other companies.

*Strategies.* In total, 96 companies (42 percent) of all the 229 participating companies reported having a corporate-wide strategy for guiding offshoring and backshoring decisions. As Table V shows, a larger share of the backshoring companies (77 percent) reported having a corporate-wide strategy for guiding offshoring and backshoring decisions than did only-offshoring (65 percent) and no-movement companies (29 percent).

<table>
<thead>
<tr>
<th>Technology intensity of the industry</th>
<th>Backshoring companies (n = 30) (%)</th>
<th>Only-offshoring companies (n = 48) (%)</th>
<th>No-movement companies (n = 151) (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>High/medium-high</td>
<td>70.0</td>
<td>56.3</td>
<td>40.4</td>
</tr>
<tr>
<td>Medium-low/low</td>
<td>30.0</td>
<td>43.8</td>
<td>59.6</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Number of employees in the company</th>
<th>Backshoring companies (n = 30) (%)</th>
<th>Only-offshoring companies (n = 48) (%)</th>
<th>No-movement companies (n = 151) (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>51-100 employees</td>
<td>20.0</td>
<td>14.9</td>
<td>39.3</td>
</tr>
<tr>
<td>101-250 employees</td>
<td>26.7</td>
<td>25.5</td>
<td>34.7</td>
</tr>
<tr>
<td>251-500 employees</td>
<td>13.3</td>
<td>10.6</td>
<td>12.0</td>
</tr>
<tr>
<td>Over 500 employees</td>
<td>40.0</td>
<td>48.9</td>
<td>14.0</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Number of production plants</th>
<th>Backshoring companies (n = 30) (%)</th>
<th>Only-offshoring companies (n = 48) (%)</th>
<th>No-movement companies (n = 151) (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1 plant</td>
<td>23.3</td>
<td>14.9</td>
<td>45.3</td>
</tr>
<tr>
<td>2 plants</td>
<td>10.0</td>
<td>17.0</td>
<td>21.3</td>
</tr>
<tr>
<td>3-5 plants</td>
<td>23.3</td>
<td>36.2</td>
<td>20.7</td>
</tr>
<tr>
<td>6-10 plants</td>
<td>10.0</td>
<td>19.1</td>
<td>4.7</td>
</tr>
<tr>
<td>over 10 plants</td>
<td>33.3</td>
<td>12.8</td>
<td>8.0</td>
</tr>
<tr>
<td>Company has a corporate-wide strategy for guiding offshoring and backshoring decisions</td>
<td>76.7</td>
<td>64.6</td>
<td>28.6</td>
</tr>
<tr>
<td>Finnish privately owned company</td>
<td>66.7</td>
<td>72.9</td>
<td>77.5</td>
</tr>
</tbody>
</table>

*Table V.* Characteristics of the backshoring companies vs only-offshoring and no-movement companies.
Ownership. The share of Finnish privately owned companies was slightly lower among companies that had moved production back to Finland (67 percent) compared with the companies that had only offshored their production (73 percent) or that had not made any production movements (77 percent) (Table V).

Table VI shows correlations between the variables included in the multinominal regression analysis of the company characteristics on production movements. The ownership variable was omitted from the final regression model, thus inclusion of it did not improve the model. Table VII presents the results of the regression analysis. The results suggest that companies that have not made production movements are more likely from industries with low or medium-low technology intensity when compared with backshoring companies (coeff. = 1.636, \( p < 0.010, \text{OR} = 5.133 \)). This relation was not found as statistically significant when comparing the groups of only-offshoring and

<table>
<thead>
<tr>
<th>(1) Production movement types</th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
</tr>
</thead>
<tbody>
<tr>
<td>Technology intensity</td>
<td>0.20***</td>
<td>0.28***</td>
<td>0.30</td>
<td>0.589***</td>
</tr>
<tr>
<td>Number of employees in the company</td>
<td>0.20***</td>
<td>0.28***</td>
<td>0.30</td>
<td>0.589***</td>
</tr>
<tr>
<td>Number of manufacturing plants</td>
<td>0.30***</td>
<td>0.28***</td>
<td>0.30</td>
<td>0.589***</td>
</tr>
<tr>
<td>Corporate-wide strategy for guiding offshoring and backshoring decisions</td>
<td>0.38***</td>
<td>0.00</td>
<td>0.29***</td>
<td>0.29***</td>
</tr>
</tbody>
</table>

Table VI. Pairwise correlations

<table>
<thead>
<tr>
<th>Only-offshoring (n = 46)</th>
<th>Coefficient (SE)</th>
<th>OR (95% CI)</th>
<th>No-movement (n = 145)</th>
<th>Coefficient (SE)</th>
<th>OR (95% CI)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Technology intensity</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Low/medium low</td>
<td>0.75 (0.55)</td>
<td>2.12 (0.73/6.19)</td>
<td>1.64** (0.51)</td>
<td>5.13 (1.90/13.85)</td>
<td></td>
</tr>
<tr>
<td>High/medium high</td>
<td>0</td>
<td>0</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Number of employees in the company</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>51-100 employees</td>
<td>-1.77 (1.00)</td>
<td>0.17 (0.02/1.21)</td>
<td>-0.49 (0.93)</td>
<td>0.61 (0.10/3.80)</td>
<td></td>
</tr>
<tr>
<td>101-250 employees</td>
<td>-1.43 (0.81)</td>
<td>0.24 (0.05/1.18)</td>
<td>-0.27 (0.79)</td>
<td>0.77 (0.16/3.38)</td>
<td></td>
</tr>
<tr>
<td>251-500 employees</td>
<td>-1.71 (0.97)</td>
<td>0.18 (0.03/1.22)</td>
<td>-0.48 (0.91)</td>
<td>0.62 (0.10/3.66)</td>
<td></td>
</tr>
<tr>
<td>Over 500 employees</td>
<td>0</td>
<td>0</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Number of manufacturing plants</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1 plant</td>
<td>1.87 (1.07)</td>
<td>6.47 (0.80/52.24)</td>
<td>1.94* (0.94)</td>
<td>6.95 (1.09/44.21)</td>
<td></td>
</tr>
<tr>
<td>2 plants</td>
<td>2.93** (1.11)</td>
<td>18.79 (2.13/165.98)</td>
<td>2.37* (1.03)</td>
<td>10.68 (1.43/79.83)</td>
<td></td>
</tr>
<tr>
<td>3-5 plants</td>
<td>2.29** (0.88)</td>
<td>9.84 (1.75/55.27)</td>
<td>1.09 (0.84)</td>
<td>2.99 (0.58/15.39)</td>
<td></td>
</tr>
<tr>
<td>6-10 plants</td>
<td>1.96* (0.91)</td>
<td>7.08 (1.20/41.92)</td>
<td>0.37 (0.95)</td>
<td>1.44 (0.22/9.34)</td>
<td></td>
</tr>
<tr>
<td>Over 10 plants</td>
<td>0</td>
<td>0</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Corporate-wide strategy for guiding offshoring and backshoring decisions</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>No</td>
<td>0.76 (0.59)</td>
<td>2.14 (0.68/6.76)</td>
<td>2.15*** (0.53)</td>
<td>8.61 (3.04/24.4)</td>
<td></td>
</tr>
<tr>
<td>Yes</td>
<td>0</td>
<td>0</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Table VII. Multinominal logistic regression on production movements

Notes: *\( p < 0.05; **p < 0.01; ***p < 0.001 \)
backshoring companies. Further, the company size measured as the number of employees in
the company was not statistically significantly related to the decisions of only-offshoring or
no-movement groups when they were compared with the backshoring companies. However,
significant relationships were found when reviewing the number of manufacturing plants.
When compared with the backshoring companies, the companies that had not made
production movements more often had one to two plants (coeff. = 1.93/2.37, p < 0.050,
OR = 6.95/10.68), but among companies that have only offshored production, two to ten
plants were more typical (coeff. = 1.96-2.93, p < 0.010, OR = 7.08-18.79). In addition,
a strategy guiding offshoring and backshoring decisions was found to have a relation with
production movements. The companies that had not moved their production had less
commonly a strategy guiding their production movements compared with the backshoring
companies (coeff. = 2.15, p < 0.001, OR = 8.61). The model classified 71.5 percent of
the cases correctly (93 percent of the no-movement companies, 28 percent of the
only-offshoring companies and 33 percent of the backshoring companies).

5. Discussion

5.1 Extent of production movements
A considerable amount of production has been transferred across national borders of Finland
in both directions. The results show that about one-third (34 percent) of the manufacturing
companies have been active in transferring production both offshore and back. More
production has been moving away from Finland than coming back; for every company that
backshored its production there were 2.3 companies offshoring production (companies having
done both offshoring and backshoring have been removed from this ratio). This means that
backshoring accounts for 43 percent of offshoring. Surveys that have captured similar type of
data have been carried out in New Zealand (Canham and Hamilton, 2013), Europe (a mix
of European countries; Dachs and Kinkel, 2013), Germany (Kinkel and Maloca, 2009;
Kinkel and Zanker, 2013; Kinkel, 2012, 2014), and the USA (Tate et al., 2014).

The ratio between backshoring and offshoring in Finland seems to be higher compared
to what has been reported in earlier studies in other countries. Research in Germany shows
that the amount of production backshoring to Germany during the period 2006-2012 was
10-35 percent of offshoring activities (Kinkel, 2014). In the mix of European countries
studied by Dachs and Kinkel (2013), the ratio between offshoring and backshoring was
about 30-35 percent, and in New Zealand the ratio was 16 percent according to the data
collected between 2001 and 2011. In the USA, 21 percent of the US manufacturers said that
they were moving manufacturing back or planning to do so (Brennan et al., 2015).
The numbers between countries are not directly comparable because they have been
collected at different times and using different survey tools. However, they can be taken as
indicative of the similarities or differences across the countries.

Our findings, thereby, indicate that the patterns of backshoring in a small and open Nordic
economy, such as Finland, might differ from those of other countries. The literature review
portrayed Nordic manufacturing industries as key sources of economic wealth for the
countries, with distant markets and labor systems as challenges to their competitiveness.
Where companies have sought for cost advantages in their manufacturing through
internationalization and offshoring, also a contrary trend can be found but in a smaller scale.
The discovered extent of backshoring in the case of Finland suggests that companies’
manufacturing strategies are evolving and priorities might be changing over time.

5.2 Drivers of offshoring and backshoring
The decision-making drivers differed for offshoring and backshoring in several aspects.
According to the survey respondents the dominant reason for offshoring from Finland was
labor costs which is well aligned with earlier research (e.g. Kakabadse and Kakabadse, 2002; Kinkel and Maloca, 2009; Kinkel, 2012). In turn, drivers of backshoring decisions are clearly more numerous, including both operative factors such as flexibility and quality (e.g. Bailey and De Propris, 2014; Canham and Hamilton, 2013; Fratocchi et al., 2014; Gylling et al., 2015; Kinkel, 2012; Moser, 2013; Martinez-Mora and Merino, 2014; Zhai et al., 2016; Wu and Zhang, 2014; Wiesmann et al., 2017) and factors related to knowledge and capabilities, specifically access to skills and knowledge, proximity to R&D and product development, and time-to-market (Arlbjørn and Mikkelsen, 2014; Bailey and De Propris, 2014; Kinkel, 2014; Pearce, 2014; Tate, 2014; Stentoft et al., 2015).

5.3 Conditions underlying backshoring
Companies having implemented backshoring can be found in all industries. However, the companies that had transferred their production back to Finland were more commonly in industries with high or medium-high technology intensity than those companies that had not backshored production. This finding, combined with the finding that factors related to knowledge and capabilities were important backshoring drivers, signals that utilization of new technologies might be a factor bringing production to a Nordic location such as Finland. This finding still needs to be interpreted with caution but it is in line with the earlier findings by, e.g. Arlbjørn and Mikkelsen (2014), Stentoft et al. (2015) and could offer a motive to guide small Nordic countries to invest in technology innovations as a means to drive manufacturing innovations locally.

Backshoring companies in this study were more commonly companies with a higher number of production plants than the only-offshoring and no-movement companies. Contrary to some earlier studies, the size of the company in terms of the number of employees was not found significantly different for companies that had been active in moving production when compared with the no-movers (cf. Kinkel, 2012). Having a high number of production plants suggests that backshoring companies did not necessarily transfer production to close the plant at the location from which production was moved. Instead, this observation suggests that companies assign specific roles to their plants and allocate production to the plants according to these roles (Ferdows, 1997; Brennan et al., 2015).

The backshoring companies reported more commonly having a corporate-wide strategy for guiding offshoring and backshoring decisions than did no-movement companies (cf. Feldmann and Olhager, 2013). This suggests a difference in sustainable decision-making practices between manufacturing firms that are active in moving production vs those that remain passive. Firms that move their production seem to more often have a strategy process guiding their decisions, whereas firms that are more passive do not have explicit manufacturing strategies.

6. Conclusions
6.1 Research contributions
This research makes a contribution to previous research in three ways. First, the backshoring activity in the small and open economies of the Nordic countries, illustrated here by the example of the Finnish manufacturing industry, seems to be higher compared to earlier studies in larger countries. Second, manufacturing companies in the industries with high and medium-high technology intensity are backshoring their production more commonly than companies in the industries with lower technology intensity. The finding suggests that there is potentially an on-going transformation in the manufacturing industry of Finland, with the downsizing of the more labor-intensive and lower technology-intensive industries to be replaced to some extent by the higher technology-intensive industries. Third, manufacturing companies in all size groups can backshore their production, but backshoring activity is higher among the companies with higher number of plants than the activity among the no-movement companies.
6.2 Limitations and proposals for further research

This survey study has limitations that need to be considered when assessing validity of the results. The questionnaire was designed in an international team and the earlier literature was used, likewise well-established measures and scales, to enable comparability with former offshoring and backshoring studies. Significant effort was made to achieve a high response rate and to clean up the data. However, the sample of 229 Finnish manufacturing companies and the small number of offshoring and backshoring cases among the respondents impeded the use of some advanced statistical techniques within the single-country sample. Data are biased toward larger firms (compared to the population). Also, there is over-representation in the data of one industry compared to the population, i.e. machinery industry and equipment (ISIC code 28). These biases limit the generalizability of the findings.

In this study, a company’s technology intensity was measured by its sectoral affiliation instead of using a company-level indicator like R&D intensity. It might be that some companies in sectors like machinery and equipment are acting with a high technology intensity and some others in the same sector with a much lower technology intensity. This limitation is acknowledged and needs to be considered in the interpretation of the results.

6.3 Managerial implications and future research

The findings suggest that moving production across national borders is one option of the manufacturing firms to stay internationally competitive. The drivers of offshoring and backshoring differ, and they are different across industries and company characteristics. Companies must prepare their plant location strategies in line with the requirements set by their context and be proactive in preparing strategies for plant relocations. The relevance of several factors, such as cost, quality, flexibility, and access to knowledge and technology, need to be carefully considered when defining location-specific plant roles in the production networks.

Besides the international studies to test the antecedents and consequences of offshoring and backshoring decisions, this study has pointed out the role of manufacturing strategies in connection with location movements. Further research is needed to explain the background factors of potential successes and failures in location choices. Finally, there is need for more comparative studies exploring both offshoring and backshoring in different countries at the same time with the same methodology. This would be the only way to verify if the economic conditions, e.g. the size of the domestic markets, do influence the production relocation activities.

References


Further reading


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Managing reversed (global) outsourcing – the role of knowledge, technology and time

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Abstract

Purpose – Against the recent trend toward reversed global outsourcing, the purpose of this paper is to provide insights on how the internal process can be handled once the decision on reverse outsourcing has been made. The authors focus in particular on in-house knowledge and technology requirements.

Design/methodology/approach – To explore the topic at hand, the researchers conducted in-depth semi-structured interviews with five companies operating in two different industry sectors.

Findings – Reversed outsourcing accentuates challenges relating to retained knowledge. When embarking on reversed outsourcing, companies need to acknowledge the effort to revive and renew capabilities in order to perform technical operations and advanced manufacturing production.

Research limitations/implications – The research is based on case studies in a Scandinavian context. Further empirical research from other high-cost locations is needed to validate the findings.

Originality/value – Explorative qualitative research is scarce in the emergent literature on reversed outsourcing. The paper provides practical and theoretical insights into how to handle diminishing knowledge in companies that are re-evaluating their sourcing strategies. It adds a knowledge dimension within the emergent literature. A framework for key success factors and propositions is also provided.

Keywords Knowledge transfer, Outsourcing, Manufacturing strategy, Capabilities, Technology implementation, Reversed outsourcing, Backshoring

Paper type Research paper

1. Introduction

Pushed by increased global competition, a large number of western companies have relocated their activities to low-cost countries in Eastern Europe and Asia during the past few decades, referred to as global outsourcing. Global outsourcing aims to profit from efficiency advantages at low-cost locations and to position businesses in emerging markets, while assuming that it is possible to disperse parts of manufacturing and service operations (e.g. from raw material to a finished product), production work and R&D departments independently of the location context (Gereffi et al., 2001).

Recently, attention has shifted toward whether low-cost locations provide sufficient value creation and competitive advantages. Businesses have experienced that global outsourcing frequently increases risks concerning lead time, delivery precision, quality, coordination and loss of competence, which may erode capabilities in organizations and whole nations (Kotabe and Mol, 2009). Moreover, salary increases in traditionally low-wage countries have spurred reconsiderations of global outsourcing strategies (Bals et al., 2015;
Kinkel and Maloca, 2009; Tate, 2014). Macro-level dynamics also play a role. Some of the largest economies in the world are moving toward more protectionist policies. Notably, US President Donald Trump actively promoted the slogan “Make America Great Again” during his election campaign, in accord with the former President Obama administration’s strategy referred to as “Made in America” (The White House, 2014). The European Commission has advocated the “For a European Industrial Renaissance” initiative, encouraging industries to tap into a reversed shift as well as supporting its member countries to develop policies aimed at boosting operations, manufacturing and job creation in their own regions through e.g. backshoring initiatives (European Commission, 2012).

Despite growing attention toward the movement of activities back to their original location, there is a conspicuous absence of empirical studies of this phenomenon (Arlbjørn and Mikkelsen, 2014). In particular, there is a lack of studies addressing how businesses may (re-)build the knowledge and capabilities required to bring back activities to high-cost countries. Within the Scandinavian context, the number of cases is relatively few. This may reflect high wage levels, which represent a strong barrier to reverse operations from low-cost locations. However, advanced manufacturing, facilitated by 3D printing and robotics, has been emphasized as an important enabler for bringing manufacturing and operations back to western countries (Moradlou and Backhouse, 2016). Lack of studies on how new technologies will sustain manufacturing in western countries calls for empirical research that would shed light on possible obstacles and opportunities related to reversed outsourcing, since most of the extant studies are of a conceptual nature, posing potential research gaps (Stentoft et al., 2016; Wiesmann et al., 2017).

Against this background, the present work explores challenges that businesses meet when embarking on reversed outsourcing in a Scandinavian context. The study focuses on the knowledge aspects of this strategy, encompassing re-integration of existing and new capabilities. In relation to this, the study aims at identifying what factors are critical to the success of the reversed operation.

The paper is organized as follows. The next section establishes the theoretical approach to reversed outsourcing strategies, where knowledge, absorptive capacity and dynamic capability aspects are discussed. Thereafter, we give a brief presentation of research methodology used in the study. In Sections 4 and 5, cases and findings are presented. In Section 6, we tentatively suggest an emergent framework for successful reversed outsourcing. The final section highlights the contribution of the paper to the research field.

2. From cost to knowledge

Literature on transaction cost economics (TCE) and the resource-based view (RBV) of the firm has dominated the global outsourcing literature. Williamson (1981) claimed that sourcing decisions are made with respect to cost reduction in “make or buy” considerations and the importance of asset specificity and its governance. RBV, on the other hand, accentuates the strategic importance of tangible and intangible resources that are at the organization’s disposal. Like TCE, RBV has seen intangible resources as strategic assets that should be organized in markets or organizations according to their costs and benefits (Barney, 1991; Barney and Arikan, 2001; Coase, 1937). The implicit problem with these theories is not the arguments themselves, but the understanding and valuation of intangible assets, all of which are issues critical to sourcing decisions. Literature on global outsourcing builds on these theories, and has developed along two tangents: one that focuses on knowledge acquisition and innovation through outsourcing and offshoring, and another that points out the need to maintain in-house knowledge and capabilities to innovate incrementally.

Recently, authors have pointed out that companies outsource to achieve both cost advantages and access to external knowledge (Kinkel, 2012; Manning et al., 2008; Narula and
Michel, 2009), as well as superior skills at other locations (Pedersen et al., 2001; Mudambi, 2008; Oshri et al., 2015). This has led to a development of patterns of geographically dispersed activities (Mudambi and Venzin, 2010). In this respect, a shortage of highly skilled domestic workers is seen as a critical factor (Oshri et al., 2015). For example, Jensen (2009) provides empirical research on Danish businesses that outsourced their service operations to low-cost locations in search of superior resources in IT and engineering. Hence, value creation is conceptually de-coupled from the home location, while the new context is presumed to possess the appropriate skills and the right type of knowledge base (Doh, 2005; MacKinnon, 2012).

Mudambi (2008) argues that the “source of value has been shifting from tangible assets to intangible assets” (p. 699). However, this shift does not unanimously point in the direction of dispersed sourcing. Another stream of research emphasizes the importance of knowledge development in face-to-face interactions and socialization to explain accumulation of new and extant knowledge for business success (Asheim and Gertler, 2005, Halse and Bjarnar, 2014). It is argued that “to achieve scale economies in R&D, geographical proximity at a single location, preferably within a regionally or nationally concentrated knowledge cluster, is preferred because it provides a fertile ground for efficiency, specialization and opportunities for in-depth problem-solving in innovation” (Kotabe et al., 2007, p. 260). In order to be able to acquire (external) knowledge and use it in a productive manner, organizations must maintain a critical mass of knowledge and competence in-house (Cohen and Levinthal, 1990).

From this approach it follows that global outsourcing threatens to disaggregate existing value chains and disrupt informal social networks, structures and processes that play a critical role in an organization’s system of creating, integrating and sharing knowledge (cf. March, 1991). There is an apparent risk that organizations outsource processes and operations that are critical to their competitive advantage and that, over time, knowledge and capabilities that affect the ability to create new products and services are lost (McIvor, 2013). Moreover, outsourcing may also undermine engineering infrastructures and manufacturing competencies, causing deskilling and a decline of specific industrial knowledge, all of which could have serious implications to regional or national upstream and downstream supply chains. Pisano and Shih (2012) argue that the USA is in the process of losing its critical mass of skills, knowledge and infrastructure needed to manufacture many of the cutting-edge products it has invented.

Global outsourcing strategies are to a large extent being re-conceptualized as a matter of how to deal with intangibles. In this view, global outsourcing builds on the transition of inter-organizational knowledge to extend and expand the company’s internal knowledge base (Doh, 2005; Gulati, 1999). Accordingly, knowledge is the centerpiece in theories on corporate globalization processes (Petersen et al., 2001). However, most research concerning the management of intangibles is restricted to internal company knowledge processes, such as knowledge creation (Grant, 1996a; Nonaka, 1994). Thus, management of intangibles is a dynamic capability “which reconfigures and realigns the knowledge capacities. It refers to a firm’s ability to successfully manage its knowledge base over time” (Lichtenhaler and Lichtenhaler, 2009, p. 1316). This reasoning is closely related to Cohen and Levinthal’s (1990) concept of absorptive capacity, which argues that the utilization of external knowledge within an organization’s boundaries should not be neglected. That being said, literature covering global outsourcing is primarily focused on the process of external knowledge acquisition, neglecting the internal aspects or opportunities of knowledge usage (Nujen and Halse, 2017). How these challenges are addressed has impact on the success of businesses, regions and whole nations (Aron and Singh, 2005; Kotabe et al., 2008, 2012; Larsen et al., 2013). Adding to this is the diffusion of new technologies that rapidly diminish competitive advantages between early adopters (usually businesses at high-cost locations) and those lagging behind.

The dichotomized views of knowledge acquisition and exploration in relation to global outsourcing presented above pinpoint several knowledge-related challenges that lend themselves to further investigation in relation to how a reversed decision affects an organization.
2.1 From shore back to local
In an attempt to re-integrate globalized functions/operations, several relocation strategies have emerged, and analogous concepts have appeared in the literature on sourcing: reshoring, back-reshoring, in-house reshoring, nearshoring and captive backshoring (Bals et al., 2015; Ellram et al., 2013; Fratocchi et al., 2016; Gray et al., 2013; Kinkel and Maloca, 2009; Oshri et al., 2015; Stentoft et al., 2016; Tate, 2014). All of these terms incorporate a reverse action of functions/operations back to the original service and manufacturing location or to a neighboring country. According to Gray et al. (2013), these actions are foremost emphasized as location decisions. In particular, the term reshoring is defined as moving outsourced operations from a current location to a new one, independent of the ownership structure (Bals et al., 2015).

A feature of the reshoring definition worth noting is that it also seems to be closely related to decisions concerning switching suppliers, with the important difference that the (external) supplier no longer belongs to an offshore location. Likewise can be argued for a nearshoring strategy, defined by Ellram (2013), as an action to locate manufacturing plants and service centers within the company’s own region. Alternatively, it can be understood as bringing previously offshored operations to a foreign country close to the home country (Fratocchi et al., 2014), e.g. what Canada and Mexico are to the USA (Tate, 2014). In a similar vein, back-reshoring is defined as a voluntary business strategy concerning the home country’s partial or total relocation of production, to serve local, regional or global demands (Fratocchi et al., 2014). Authors emphasize a reversed action of an earlier (globalized) activity and explicitly include a dimension of partial re-integration. As can be seen, the main characteristic in these definitions is a shift from offshore back to local and/or regional locations.

In this study, the reversed global outsourcing strategy of interest primarily concerns the phenomenon of backsourcing, also referred to as backshoring, defined as a process of bringing once (globally) outsourced value-creating operations back to the home country or within the organization’s own boundaries (Dachs et al., 2006; Kinkel et al., 2008; Holz, 2009; Kinkel and Maloca, 2009; Lacity et al., 2009). Our choice of highlighting the organizational boundaries, and not merely treating the process as a location decision, is based on the premise that intangible processes are strongly rooted in internal knowledge bases, which implies that ownership and organizational boundaries are of significant importance. In order to minimize the risk of excluding other researchers’ valuable observations on this phenomenon, we prefer to stay with the term reversed outsourcing in our paper.

Even though companies might not articulate it as such, reversed outsourcing strategies may be a reaction to changes in both external and internal knowledge requirements. According to Stentoft et al. (2016), companies consider reversed outsourcing because of concerns associated with diminishing competencies resulting from spatial de-coupling of, for example, R&D and manufacturing. However, it may not be as “easy” as presumed to return an outsourced function back to its origin (Nujen and Halse, 2017). Re-integrated activities are often reframed to include new routines or processes (Oshri et al., 2015), requiring the right type of knowledge (Bhagwatwar et al., 2011). The required knowledge has often dissipated because of downsizing, which often comes as a result of outsourcing (Kotabe et al., 2008, 2012; Pisano and Shih, 2012).

Challenges associated with dissipated competencies and potential knowledge gaps concern the ability to change operating principles and transform firm assets (Teece, 2007). The issue at hand is to bring back functions/operations from an external context and integrate this knowledge into an organization’s current systems and processes, while at the same time utilizing new technologies (Kogut and Zander, 1992). This highlights the need for dynamic capabilities, which according to Teece et al. (1997) embody “the firm’s ability to integrate, build and reconfigure internal and external competence to address rapidly changing environments” (p. 516). Reversed outsourcing underlines the importance of
management involvement while moving beyond traditional transaction cost arguments (Santos and Eisenhardt, 2005). The acknowledgment of diminishing competence within the in-house environment is therefore a hugely important task for organizations and their managers. They need to find out what kind of knowledge of strategic importance might be required and retrieve this knowledge to facilitate sharing across organization units (Pedersen et al., 2001).

Accordingly, businesses need to extend existing capabilities both backward and forward in supply chains to develop new types of knowledge (Grant, 1996a, b). In other words, the revival of prior capabilities must go hand in hand with the development of new knowledge.

3. Methodological approach
While previous studies have mainly focused on drivers and motivation factors for embarking on reversed outsourcing (Stentoft et al., 2016), little attention has been devoted to how such strategic changes are handled after the decision has been made. Specifically, there is a lack of studies addressing potential obstacles and opportunities during a re-integration operation.

Given the novelty of the phenomenon under investigation, we opted for a qualitative and explorative approach. It is acknowledged that qualitative case studies are useful to advance understanding of under-researched phenomena (Yin, 2009) and when aiming to extend emergent theory (Eisenhardt, 1989). Bals et al. (2016) highlight the need for further theory development within the extant body of knowledge on reversed outsourcing. The authors propose several different future research paths, advocating an integration of theoretical perspectives referred to in our theory section. Hence, we need a deeper understanding of this phenomenon, and actions carried out in a reversed transition need to be analyzed in depth. In this study, we aim to capture micro-level actions affecting internal strategic changes on firm level, that is, individual action(s) explaining firm-level outcome (Foss et al., 2010). Five companies were theoretically selected for the study.

The goal of theoretical sampling is to select four to ten cases that are likely to replicate or extend emergent theory (Eisenhardt, 1989). Our cases meet the theoretical sampling requirements of companies that have changed from one sourcing direction to another and have employed changes regarding existing in-house operations and capabilities. Further inclusion criteria met: headquarters were in high-cost locations, firms had embarked on a reversed strategy and researchers were given access to decision makers and managers engaged with the reversed operation. This generated a deep insight of the phenomenon under investigation from first-hand sources (Yin, 2009). In total, 14 in-depth semi-structured interviews were conducted with managers and strategic personnel at five companies located in Scandinavia.

Table I provides an overview of the respondents. On average, the interviews lasted between 60 and 90 min. Interviews were conducted in person by either one or two of the authors and, with respondents’ approval, were recorded and transcribed. Additional data were retrieved from the internet and company websites. This provided information about the companies’ official global operations. Case descriptions were then iterated between the three authors (the last author joined the study at a later stage) to identify and arrive at a consensus understanding of patterns in the data. Complementary insights can add value to the data and enhance confidence in findings (Eisenhardt, 1989). The research team compromised a novice researcher, a practitioner with more than 15 years of operational and strategic experience within the telecom industry, and two experienced researchers who have worked with similar topics. We analyzed each interview several times, searching for quotes and full or partial sentences that were related to the keywords or sub-terms. When identified, quotes were highlighted and drawn to a matching theme (Yin, 2009). Appendix 1 shows the interview guide and Figure A1 provides an example of how the themes emerged in the analysis.
We posit that the “how and what” questions are concerned with what is happening after companies embark on a reversed strategy and the motivation behind it. To extract meaning from actions, our questions aimed at exploring the involved managers’ understanding and experiences of knowledge search, sharing and development against the background; reversed outsourcing. Consequently, the questions focused on how firms actually handled the new sourcing decision after it had been made, and how they connected the re-integrated functions/operations with existing in-house resources and new technology.

This is not a comparative study. Instead, the explorative design seeks to broaden the understanding of an emergent field by studying actions made on the micro level (Foss et al., 2010, Johnson et al., 2003) in diverse firms. It is research for “which existing theory seems inadequate” (Eisenhardt, 1989, pp. 548-549).

We acknowledge the limitation posed by the fact that interviewing more informants from each company would have increased the reliability of the study. While recognizing this, we believe that the study is a step forward to building a preliminary understanding of the main features of reversed operations within an organization.

Two of the companies in this study (Alpha and Beta) operate within the broader digital network and service provider field, whereas the remaining companies (Gamma, Delta and Kappa) are part of an offshore industry cluster. Even though the companies operate in different sectors, all perform both manufacturing and operation activities, which was

<table>
<thead>
<tr>
<th>Company</th>
<th>Sectors</th>
<th>Participant</th>
<th>Host location</th>
<th>Reasons for sourcing out</th>
<th>Reversed in-house after x years</th>
<th>Reasons for reversed outsourcing</th>
<th>Re-integration operation</th>
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<tbody>
<tr>
<td>Alpha</td>
<td>Telecom</td>
<td>Head of PDU</td>
<td>USA</td>
<td>Cost competence</td>
<td>&lt;1</td>
<td>Contract failure</td>
<td>Backward engineering</td>
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<td></td>
<td></td>
<td>Head of digital media</td>
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<td>Mistrust</td>
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<td>Beta</td>
<td>Telecom</td>
<td>CTO</td>
<td>Baltics</td>
<td>Cost Reach a wider market</td>
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<td>Dependency risk</td>
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<td>Head of innovation</td>
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<td>High management involvement</td>
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<td>Gamma</td>
<td>Offshore</td>
<td>CEO SC director</td>
<td>Baltics</td>
<td>Cost</td>
<td>&lt;10</td>
<td>Competing for a new contract</td>
<td>Modularization</td>
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<td>Lead time</td>
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<td>2 board members</td>
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<td>Robotics</td>
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<td>Co-locate on site</td>
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<tr>
<td>Delta</td>
<td>Offshore/aquaculture/furniture</td>
<td>CEO Purchasing manager</td>
<td>China</td>
<td>Cost</td>
<td>&lt;15</td>
<td>Coincidence</td>
<td>Automation knowledge</td>
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<td>Portugal</td>
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<td>Closer to customer</td>
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<tr>
<td>Kappa</td>
<td>Offshore</td>
<td>CEO</td>
<td>East Europe</td>
<td>Cost Capacity</td>
<td>&gt;15</td>
<td>Deliberate changes in strategy</td>
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<td>2 middle managers</td>
<td>Russia</td>
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Notes: "Former head of digital media (2005-2015) interviewed after ended contract; "purchasing manager in the customer organization"
important to nuance because this meets important conditions that are embedded in knowledge flows and contextual boundaries. What is worth noting is that we are not referring to all divisions of these companies.

4. Cases
4.1 The digital network companies: Alpha and Beta

Case Alpha. Alpha is a technology and service vendor in the telecommunications field. Its products serve nearly 40 percent of global mobile telephone traffic. The company has transformed and substantially downsized its production in recent years. Most of its remaining production operations have been moved to and/or sourced at low-cost locations. Its corporate strategy is to focus on R&D capabilities within software development.

Alpha has a global sourcing strategy, encompassing outsourcing at the home location, captive centers at foreign locations and offshore outsourcing models, where independent third-party suppliers perform operations at both high-cost and low-cost locations. The company reports that most of these sourcing strategies have reached realistic outcomes. However, it has also faced some challenges, usually related to quality and efficiency in product development.

In 2015, Alpha ended up in a problematic situation with one of its third-party US suppliers. The decision to outsource was based on a pure cost reduction business case. Product management erroneously considered the product to be a commodity, not considering its critical and unique aspects. One reason for the misjudgment is that the R&D department was bypassed in the decision process:

The product management department spends a lot of time on presenting products in sales and customer meetings. Consequently, less time is spent with engineers at the R&D department, which subsequently results in product managers who really do not know how to “build things”, and therefore lack important insight into specific functions, and finally become less and less sophisticated as purchasers (i.e. the buyer of third-party). They are missing to bring along the whole chain, and consequently stop possessing real knowledge of their product (Head of digital media).

It turned out that the US supplier did not have appropriate competencies when it came to these specific telecom products. According to the head of Product Development Unit (PDU):

[…] product managers thought that this company possessed better competencies than us to develop the product and chose to create a new business model with the US supplier in lead (Head of PDU).

To cope with these issues, Alpha’s product managers had to support the external supplier with in-house R&D resources. Less than a year into the contract, Alpha decided to bring back the function in-house due to lack of progress with filling critical competence gaps. However, Alpha had already diluted its in-house capabilities after transferring production to the external supplier. This was perceived as a worst-case scenario, where Alpha faced a dependency issue:

First we had to share our knowledge on how to produce telecom products […] now they have this expertise and are competing with us. They hold a trump card, knowing that they are now the only ones who have this expertise […] To resolve this, we now have to pay them a huge amount in order to be able to take back this part of the product in-house (Head of PDU).

Filling knowledge and capability gaps takes time, especially if you are uncertain about exactly what you are lacking. To come up with a way of “knowing what they needed to know,” Alpha initiated a knowledge re-integration process through “backward engineering,” trying to understand how much capacity and what kind of skills and competencies the company now lacked. Alpha also needed to find out if the source code developed by the supplier could be applied in their own infrastructure:

Sometimes it is not enough to hold source code competence. The process also requires other skills […] these solutions are quite complex so you must have a wider perspective on things (Head of digital media).
The managers in charge of the reversed strategy were simultaneously tasked with a restructuring of the entire R&D operation at the home location, and managed to assemble a team who had worked with closely related products. With these resources, Alpha created a home location R&D department, something very unusual for this particular organization.

The message from the head of PDU is that:

> When outsourcing failures occur, this creates an awareness about what one has left within one’s own organization.

**Case Beta.** Beta is one of the dominant telecom service providers in Scandinavia and the Baltics. It employs around 21,000 people. Beta operates with a global sourcing strategy, providing a comprehensive range of telecommunication and fixed network services. In 2005, Beta, which had completely vertically integrated activities in the Baltics, decided to spin out a division of the company in the domain of civil works and maintenance. The new entity was to be a fully owned subsidiary with approximately 300 employees and was to provide services for both the mother organization and potential clients.

However, in 2010, civil works and maintenance were no longer considered a competitive differentiator and preparations were made to completely spin out the captive venture. This could however put the operator at risk of losing key technical competence. Furthermore, the mother organization could potentially end up as the only external buyer for these unique competence resources.

To solve this problem, Beta decided to re-integrate its network equipment maintenance activities, which were most business-critical. This involved carving out key resources and re-integrating them back in to the mother organization before any further separation was made. Approximately 50 employees were re-integrated:

> […] because of market regulations, we decided that it would be too risky to sell off this knowledge or competence (CTO).

The re-integrated employees belonged to a specialized workforce, trained on very specific equipment. Furthermore, due to regulatory reasons, operators were required to settle within 30 km from the geographically dispersed equipment they serviced. This came at a high cost, since the personnel were idle most of the time, only monitoring the equipment, while still receiving a full salary. Beta was, however, willing to pay this price:

> Instead of becoming dependent on suppliers or, even worse, competitors, we need to protect and share this knowledge within our organization before it gets lost (CTO).

Beta created a knowledge re-integration program for rebuilding competence and knowledge transfer. Ten managers were responsible for workshops. It was important to create a forum where the re-integrated employees could air their potential concerns regarding their working conditions:

> […] questions such as, first you outsourced me, now you are taking me back, where are you going to send me next? were brought up […] what we understood quite quickly was that these guys were looking for stability. It was important for the implementation process to communicate an understandable and clear group message, in person, and not just sending a standard email […] (CTO).

Since the function had not been part of the mother organization for many years, and because of the necessity of keeping this competence available 24/7, Beta decided to initiate a very costly and time-consuming knowledge-sharing program that encompassed the entire organization:

> “[…] technical experts tend to keep unique knowledge they do not want to share […] so a main challenge is to change this culture. We had to explain to the guys that the industry is changing […] that we do not wish to have one expert on each side who is responsible for only one part of the
operation or one technology [...] so they need to understand that they also need to expand their knowledge and combine it with other resources (CTO).

Knowledge rebuilding aimed at creating a more stable foundation, with several employees developing a wider competence base. For every equipment site, there should exist a parallel worker who could step in whenever needed. For this to work, Beta had to significantly adapt their processes:

[...] an externality of this change in processes was to become better prepared for a more modern way of working than before (Head of innovation).

Beta’s reversed outsourcing experience can be summed up in the following statement:

The most difficult part when choosing to embark on a reversed sourcing strategy is communication [...] to be able to create credibility among the re-integrated personnel, as well as to build up a common understanding with your chief financial officer and the CEO. We had to make heavy investments in training costs, but it is actually not about us spending more money, instead it is about investing smart for the future (CTO).

Beta’s decision to embark on this new sourcing direction had a deliberate knowledge re-integration purpose. The process was very time consuming but the corporation managed to revive previously existing knowledge within its own boundaries. Hence, Beta managed to preserve knowledge it did not even consider as core, yet understood the importance of not letting it erode.

4.2 The offshore-cluster companies: Gamma, Delta and Kappa

Gamma, Delta and Kappa are all companies operating within the maritime industry at a high-cost location. Gamma is one of the largest shipbuilding companies in its home country, with a workforce of approximately 700, and delivers specialized vessels worldwide based on a one-of-a-kind production. Delta provides innovative products and processes for the offshore sector as well as for the marine, aquaculture and furniture industries, and employs about 40 people. Kappa is a sub-supplier of large winches and fairleads mainly to shipyards, ship-owners and oil companies. Its workforce is roughly 160 people.

Gamma operates with a sourcing approach that encompasses third-party independent suppliers and a captive joint-venture center, most of them in the Baltics. Delta’s choice of strategy has primarily focused on offshoring to China and Portugal, whereas Kappa has predominantly outsourced to Eastern Europe and Russia.

Throughout the 1990s, many of the companies in the cluster initiated outsourcing activities, starting with labor-intensive steel production and welding work, followed by engineering and design. The impetus for outsourcing was the difficulty of competing with low-cost locations, which later developed into a bandwagon effect. Gamma was the last company in the cluster to embark on this strategy.

Recently, Gamma and Delta have both tapped into reversed strategies, while Kappa is actively preparing to embark on one.

Case Gamma. In 2012, Gamma was competing for a big vessel contract with an unusually short delivery time. The situation prompted a strategic shift toward reversed outsourcing, since it became apparent that the company had difficulties in meeting lead time requirements with the current production line. Therefore, instead of constructing complete hulls through a third party, using traditional assembling processes, they brought back critical parts and started to modularize these, which had been the norm before their global outsourcing journey. The modularization process was accomplished by heavy investments in automation technologies and robotics. Thus, by returning to the old way of working, Gamma also saw the need to revive previously important competencies. Despite the focus on
high value added technology, management realized the vital importance of future knowledge accumulation at the home location:

[…] the longer an activity is out, the faster you will lose in-house competence (CEO).

Due to the relatively short time-span between outsourcing and subsequent repatriation, Gamma had retained parts of their organizational capabilities. This was perceived as an enabler for the reversed operation:

[…] the fact that we still had construction knowledge within the organization was crucial for this operation (SC director).

Access to new technology did not make construction knowledge obsolete:

The knowledge we are talking about is not to be able to read an instruction, or punch in a program to a machine. What is more important is the knowledge of how to do something without an instruction, and it is these activities we need to combine […] (HR director).

This awareness led Gamma to encourage knowledge sharing through learning by doing, and to run programs that promoted experience-based collective action between its departments. Through the process, management realized that in-house production competence is key when developing new techniques, which motivated them to expand their reversed strategy.

It is important to bear in mind that the impetus for Gamma’s action was not a deliberate analytic process, although over time it has developed into a decision of significant strategic importance as to how and where they choose to continue with their future manufacturing activities. Thus far, the company has had great success with its reversed strategy, not only from an economic point of view. Bringing back manufacturing operations has also initiated other innovation processes.

The underlying message from Gamma’s supply chain director is that more attention should be directed to knowledge as a key strategic resource:

In our industry, you will never be good enough to design a product if you do not have the knowledge of how to produce it […] (SC director).

Case Delta. Like Gamma, Delta’s decision to change their sourcing direction came about by coincidence. The company had developed a new type of machine within the framework of an EU innovation project, but the results were considered a failure at the time. However, an unexpected opportunity in the market for large molding parts turned out to be the perfect application for the machine.

Delta’s traditional molding operations had been outsourced since the mid-1990s due to high labor costs. Now, Delta faced a challenge of skill scarcity. The new machine was high-tech and knowledge of its functionality and operations was restricted to a few people at the home location. To overcome this problem, Delta decided to bring back the production of particular parts. Fortunately, much of the staff had been retained and could regain the required competence and capacity.

However, to bring back the actual assembly work was demanding, since the product design had been changed to include new advanced technologies:

[…] what we saw in our organization is that the competence of shop-floor workers and its technology stops developing the day you start sourcing out (CEO).

The goal of the reversed operation was an attempt to re-integrate the common knowledge of how these products worked:

What is very interesting to reflect upon is how knowledge itself can be perceived as a commodity and measurable anywhere. That one assumes that e.g. an engineering hour in one country has the
same content in a different country [...] We see that this is not always true, not within our industry at least (CEO).

This experience led to a deeper insight that the required knowledge was embedded in the workforce, and that it needed to be revived for new knowledge to be developed. To address this matter, Delta chose to re-establish the links between R&D and production by co-locating them on-site.

Through this experience, Delta realized that competitors and suppliers in the international market were not necessarily more competitive than they were. Because of the enabling technology being a differentiator, in combination with their employees' knowledge, Delta chose to produce these large molding products at home.

The strategic decision to reverse production was triggered by a former customer's request at the home location, where Delta saw an opportunity for crossover innovation using the new machine. This became a win-win situation for both companies. Delta was able to avoid a loss of a heavy R&D investment, and the customer achieved operational advantages, such as higher flexibility in order-changes and shorter supply chains. Moreover, communication was improved, since language and culture differences became less of an issue. It is intriguing that Delta's reversed strategy also helped its customer to retrieve production from an offshore location.

The reversed outsourcing strategy developed into a value-added activity for Delta:

When we are bringing back production in-house, it allows us to achieve a greater value creation through customers at the home location and within other markets, and this gives a greater response from our side to proceed with reversed strategies (CEO).

**Case Kappa.** In the past couple of years, Kappa has prepared a strategic shift toward reversed outsourcing. Learning from other regional firms, Kappa has chosen a technology-focused strategy. Today, the technological approach is what underpins all their outsourcing, insourcing and reversed decisions. According to the CEO, their approach is analyzed on the scale: “Technically too simple, too complex or technically suitable.” The goal is to re-integrate production and design processes, but only those specific processes that fit their cutting-edge technology. The strategy is to always invest in adjacent technology. Combining this reasoning with the economic situation, they have discovered that in-house production is more beneficial than initially predicted, which has acted as a trigger for their reversed focus.

When initially investing in robotics in 2004, Kappa lacked robotics competence. One middle manager explained: “Most of us believed that now that the robot was installed, it would manage itself in a way [...].” However, after working with the robot for six months it turned out that the supplier had delivered a robot that was unsuitable for the way Kappa's production was set up:

[...] when you do not have enough knowledge, you cannot set the right requirements or ask the suppliers the right questions, so then one ends up with a delivery made on their premises [...].

This insight pushed the company to implement a new knowledge platform that incorporated a higher technological level. Against this background, Kappa made changes in their workforce training and upskilling efforts:

If you do not recruit or invest [...] you might end up with not having any permanent employees who have the knowledge required when the market situation or production processes are changing [...] insourcing only represents “borrowed” competence and leaves as soon as the contract is over [...] you are sending away knowledge in a way [...] (CEO).

Consequently, Kappa minimized the use of insourced personnel for their new robot development. What is worth noting is that most of Kappa’s workforce lacks higher technical
education, while holding hands-on experience. Hence, tacit knowledge, developed through social interaction and practical work, is still a foundation for the company.

Efforts to build internal competence were significant. In 2011, Kappa bought their second robot, and in just three weeks managed to have a successful integration between the robot and the production line:

This time it was totally different, since now we could set the demands ourselves, we knew how a robot worked, how our processes reacted to robotics and what it potentially could advance into doing […] (Middle manager).

Twelve years after their first robot investment, now planning for their fourth, Kappa has not yet decided on a specific process or product to bring back. Yet, its top management continues to aspire toward implementing reversed outsourcing through knowledge renewal, focusing on technological developments.

5. Findings
Our cases demonstrate that when companies fail to target critical capabilities abroad, as was the case for Alpha, a shift toward an internal search for assets occurs, leading decision makers to pursue reversed outsourcing as a new strategy. Likewise, when embarking on a reversed strategy, e.g., to mitigate against a dependency risk, which was a prominent factor for Beta and later also for Alpha, a reinforcement of internal capabilities and capacity emerges.

Such interventions demonstrate the importance of management involvement, elucidating the need for dynamic capabilities in order for the firm to change, evolve and transform the concerned resources (Teece, 2007). This is also true for capabilities that already exist but that have not yet been located and codified in an adequate manner, since capabilities are “powerless” if not embodied in the firm’s theory of business (Prahalad and Hamel, 1990).

Likewise, when handling challenges associated with existing knowledge gaps following, e.g., the introduction of new advanced technology, firms may need to change their operating principles completely, as was the case in Kappa. Consequently, the introduction of new technology is accomplished by combining various independent knowledge dimensions, aiming to make that knowledge inherent within the firm (Grant, 1996a, b).

Cohen and Levinthal (1990) argue that a firm’s absorptive capacity is related to the amount of overlap within its knowledge base. Such an overlap can be brought about through knowledge sharing initiatives, which all remaining cases have embraced. For instance, when Beta decided to sell off their captive center, they needed to rebuild firm-level capabilities to prevent a dependency risk. These types of actions often require that certain employees with particular know-how and experience are hired and socialized through diverse knowledge-sharing programs, an approach Beta chose when deciding to re-integrate 50 employees back in-house.

In line with the RBV approach, a reversed strategy also concerns firm capabilities and resources, on which to control, develop and nurture (Barney, 1991; Barney and Arikan, 2001). Moreover, Alpha, Beta and Delta have all emphasized the vital importance of face-to-face interaction when they chose to co-locate their re-integrated functions on-site. For Delta, this was done through re-establishing links between the R&D department and production, whereas for Alpha it meant gathering dispersed employees within the firm. These actions seem to have a repairing effect on internal knowledge as well as a mitigating effect against negative consequences caused by the so-called de-linking problem (cf. Stentoft et al., 2016; Kotabe et al., 2007).

Hence, once knowledge and capability aspects are introduced within the context of sourcing, we observe that firms’ behavior changes (Argyres, 1996; Grant, 1996a; Teece, 2007).
Our case analysis suggests that reversed outsourcing leads to an awareness of lost or missing capabilities, both within and beyond the boundaries of the firm, leading to a stronger focus on the firm’s dynamic capabilities. Reversed outsourcing reinforces internal knowledge sharing, which can result in better operations and competitive advantages. It leads to a reconfiguration of internal resources, strengthening potential fragmentation of an organization’s knowledge base, which in turn might represent a means to mitigate against the possible erosion of (previous) existing knowledge.

6. Toward a framework for successful reversed outsourcing strategy

The five cases presented provide insights on both opportunities and challenges associated with reversed outsourcing. Based on these insights, a conceptual framework is proposed to delineate factors that influence the success of reversed outsourcing. Four factors, namely the duration of outsourcing, a relevant knowledge base, management capabilities and technology utilization, are proposed as critical to successful re-integration operations.

Figure 1 presents the framework for and the explication of the relationships between focal variables.

6.1 Length of outsourcing duration

Our findings from the case studies suggest that after relocating production and service operations to external suppliers, companies rarely maintain the same activities within their own boundaries. Consequently, over time, knowledge and capabilities that influence the ability to create new products and services vanish (cf. McIvor, 2013). Extended duration of outsourcing essentially breaks the trajectory of capability development within a firm. This is consistent with the concept of path dependency, such that knowledge and capabilities embraced at a certain time are decisive for the future strategies a company can embark on (Halse, 2017; Prahalad and Hamel, 1990).

A striking example of how impactful time frames are within outsourcing can be found in Kappa. Although they had been preparing for reversed outsourcing for a decade or so, it was still difficult for the company to pinpoint the operations suitable for their current processes. The outsourced operations were misaligned with Kappa’s original processes, thereby obstructing the revival of previous knowledge and subsequently the re-integration efforts. The case further illustrates that it is very demanding, if not impossible, to restore or revive production knowledge required for previously outsourced operations (Kinkel, 2014).

Another consequence of the time frame that emerged in several of the interviews was the transition from outsourcing to reversed outsourcing. The handling of the reversed operation was perceived as very time consuming, especially if one is uncertain about what exact
knowledge the re-integrated operation is lacking, as is illustrated in Alpha through their backward-engineering process. Furthermore, the rebuilding programs/arenas also turned out to be time consuming. Hence, the duration of outsourcing greatly influences the balance of focus between a knowledge-centric integration process vs one being management heavy. The longer the duration, the less likely the firm is to have enough existing knowledge to absorb previously sourced out functions/operations. Taken together, findings across the five cases suggest that the development of a knowledge base and management capabilities required for handling a successful re-integration is largely affected by the duration of outsourcing. Hence, the following proposition is suggested:

**P1.** The longer an operation is performed by external actors, the more difficult it is to revive (a) the requisite knowledge base and (b) the capabilities necessary for re-integration.

### 6.2 The impact of knowledge base

The second key factor relates to fundamental organizational characteristics, incorporating both tacit and explicit knowledge. A set of barriers and enabling factors appears to influence the utilization of these knowledge elements. In all cases, a relevant knowledge base, i.e. adequate knowledge concerning the outsourced operations being reversed, represented a critical factor. Thus, successful re-integration depends not only on an existing knowledge base, but also on absorptive capacity at the receiving end (Cohen and Levinthal, 1990). The strategic management field highlights a non-existing organizational knowledge base as an obstacle to strategic goals (cf. Kotabe et al., 2008; Grant, 1996a, b). Organizations need a critical mass of in-house knowledge and competence in order to capitalize on external, or new, knowledge in a productive manner (Cohen and Levinthal, 1990), as evident in both Gamma and Delta, who were not affected by significant downsizing processes. Instead, they both stress that the reversed operation would not have been successful without existing in-house competence. This proved to be important also in Beta, since it relied on the “people” re-integration to mitigate against fragmentation of its knowledge base. Beta understood the importance of not letting important knowledge dissipate.

A relevant knowledge base enables renewal of previous knowledge by combining it with new skills. In Kappa, in particular, we saw that its ability to absorb new knowledge depended on the existing organizational knowledge base. Kappa managed to create new technological capabilities, albeit not efficiently implemented, which hampered or at least slowed down their reversed implementation strategy. Its management did not grant enough attention to its common in-house knowledge base. Instead, it tried to “automate” itself out of an outsourcing situation.

Considering the findings from the five cases and insights from extant literature, the following proposition is suggested:

**P2.** A relevant integrated knowledge base concerning the sourced out operations has a positive effect on re-integration, which in turn leads to successful handling of reversed outsourcing.

### 6.3 The impact of management capabilities

The critical role of management capabilities is reflected in the extant literature on reversed outsourcing. For example, Bhagwatwar et al. (2011) assert that a re-integration process relies on managers’ abilities to handle both knowledge and organizational changes. This is what a new sourcing direction often demands. Hence, management capabilities should gravitate toward ensuring that strategies are implemented, leveraging assets and resources and building new capabilities (Teece et al., 1997; Teece, 2007). In our study, the role of management’s ability to locate the “right” competence and initiate the creation of
knowledge-sharing programs emerged as a significant factor influencing re-integration. For instance, with Beta, we saw high management involvement not only with respect to uncovering required knowledge, which it found to be embodied in the 50 re-integrated employees but also with respect to communication skills. Its management emphasized the need to build in more absorptive capacity in the remaining workforce. This is a question of managerial capability, that is, the ability to adapt to changing circumstances, which is also one of the most critical long-term success factors (Teece et al., 1997). Similar findings were noted in Gamma and Delta, while with Alpha we saw that when managers lacked sufficient production knowledge, incorrect decisions were easily made.

The success of handling a reversed outsourcing operation depends as much on managerial capabilities as on the relevant knowledge base, which often is a result of previous management decisions. Unless managers fully understand how resources such as knowledge and capabilities interact, either as enablers or as barriers for their re-integration efforts, reversed outsourcing becomes difficult to handle. Consistent with extant literature, our findings suggest that:

\[ P3. \] The stronger and more dynamic the management capabilities, the more effective the re-integration efforts are likely to be.

6.4 Moderation role of technology utilization
Technology as an enabler has gained significant attention within emergent literature on reversed outsourcing as a means to decrease the cost of wages in high-cost locations (Arbjoern and Mikkelsen, 2014) and with respect to lead time and quality aspects (Gylling et al., 2015; Nujen et al., 2015). However, these studies do not stress the transformation of new technology into new competencies, which our findings suggest is critical for successful reversed outsourcing, especially in cases were technology is a key motivating factor.

Consistent with the literature, technology utilization is seen as a necessity for long-term viability of manufacturing operations at high-cost locations. Thus, investments in technology/robotics have little value unless complemented with employee upskilling programs. Take the example of Delta, where we learned that production line technology stops developing the day a company embarks on outsourcing. It is crucial to ensure continuity in knowledge development, especially when competencies are about to dissipate. However, the balance between re-integrated “old” knowledge and the creation of new capabilities is difficult to manage. In Kappa, the technology factor had a negative effect on the re-integration process, and the reversed outsourcing strategy had to be put on hold. Kappa heavily invested in new technology and upskilling after realizing that the duration of the outsourced work had already deemed much of the knowledge in the organization obsolete. Focusing on in-house capabilities may therefore outweigh technology as a main driver for reversed outsourcing. Thus, as the velocity of new technology increases and businesses are repositioning themselves in high-cost countries, their ability to build and sustain capabilities will be crucial.

In sum, findings from our five cases suggest that technology utilization has a moderate effect on the knowledge base as well as on management capabilities. The following proposition is put forward:

\[ P4. \] The utilization of modern technologies complements (a) existing knowledge base and (b) management capabilities.

7. Conclusions
This study has explored how firms are handling re-integration work during a reversed outsourcing transition. Based on five cases, the study finds that successful re-integration
relies on a balance of two main factors. First, the retained knowledge base in the organization, and second, the capabilities displayed by management in the firm. These two factors are heavily influenced by how the firm utilizes technology, which either acts as a moderator to knowledge (re-)building efforts, or contributes as an integral part of the re-integration work and thereby becomes a differentiator for success.

Additionally, the duration of global outsourcing influences decisions regarding which strategy to embark, in knowledge rebuilding and development. Notably, reversed outsourcing seems, at least in part, to lead to preventing the ongoing erosion of firms’ capabilities. However, under certain circumstances, especially with regard to technology and lack of absorptive capacity at the receiving end (Cohen and Levinthal, 1990), interaction with the new sourcing strategy may disrupt the important balance between an adequate knowledge base and the capabilities displayed.

That said, reversed outsourcing has been shown to contribute to actualizing the important work of not letting in-house capabilities erode. In two of the cases, a risk of future erosion of firm capabilities was prevented by raising awareness about potential dependencies of specific knowledge, while in two additional cases the re-integration work has led to a desire toward repatriating additional functions with the help of new technology. The success of a reversed outsourcing transition is based on the understanding of knowledge issues, emphasizing a strong need to foster and nurture knowledge-building efforts at the focal firm, especially in an era where intangible assets are the new target in global sourcing strategies (cf. Mudambi, 2008).

7.1 Implications
The study has shown that reversed outsourcing decisions all too often are dealt with ex post. Several detailed case descriptions were presented to support researchers and practitioners in conceptualizing potential obstacles associated with reversed outsourcing. The study offers a preliminary framework of determinants of re-integration success derived from the cases and theory. This framework can guide researchers on the critical aspects of knowledge and management efforts needed in a reversed operation. The four propositions (P1-P4) can also be applied as an informative checklist for organizational readiness before embarking on a reversed outsourcing strategy, or to reduce potential obstacles during the reversed transition entry phase. Hence, it is essential to acknowledge that decision makers on a strategic level can over/underrate their organizational readiness by misjudging firm-level capabilities when sourcing decisions are being made. This study provides managers, in particular, with a broad view of how a reversed transition can be handled, the potential obstacles they may encounter and what mitigation efforts may be required.

7.2 Contribution
Accordingly, our study aims to make several contributions. First, we address a research gap regarding the impact of the way reversed outsourcing is handled, based on empirical qualitative research. This is an important contribution, as previous research has predominantly offered “gap-spotting” studies (Alvesson and Sandberg, 2013), where considerable interest was directed to the drivers and motivation factors for this phenomenon. Second, we offer four propositions explaining a successful re-integration operation. Third, we contribute to the emergent field of reversed (global) outsourcing by incorporating the theoretical perspective of absorptive capacity (Cohen and Levinthal, 1990) and the dynamic capability view (Teece et al., 1997; Teece, 2007), which is in line with the theoretical avenues proposed by researchers within the field (cf. Bals et al., 2016). Finally, the findings of this study contribute to the broader research on global sourcing, since much research within this context marginalizes the activities, managerial or otherwise, that happen in firms (Johnson et al., 2003).
7.3 Limitations and future research

Our study is based on managers’ recall, which might represent some inherent limitations. However, by including Beta in our study, we managed to capture the handling of an ongoing reversed outsourcing transition, something that can contribute to reducing such limitations. Second, the focus on micro-level actions within the firms implies that other important facets are left obscure, such as how industry- and country-specific aspects might influence managers’ choice of actions. However, by presenting the changing forces on a macro level as a background in our introduction, the study provides a general understanding of additional aspects underpinning the new focus toward reversed outsourcing on the firm level. For example, lack of competence within distinctive fields in a high-cost country due to global sourcing creates issues for firms operating in such environments (Roos and Kennedy, 2014). Third, this study is restricted to five case companies in a Scandinavian context, which represents some methodological limitations that may restrict the validity of the findings. Finally, our study only represents one side of the table when closing down captive centers and repatriating a function/operation back in-house. This is important to highlight, since such an approach might fail to pinpoint important obstacles or enabling criteria during the re-integration work. Therefore, we recognize that a study that incorporates a dyadic relationship would provide richer data on how the management of re-integration could be handled during a reversed outsourcing transition. We encourage future research to address these concerns.

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Appendix 1

Semi-structured interview guideline

Authors note: we portray typical prompts that we applied when needed. However, we sought to begin with open questions and let respondents speak freely. Additional questions were added when insufficient information was given, and follow-up questions were addressed if relevant in the specific setting.

Introduction
We would like to talk about how reversed outsourcing, also referred to as backshoring, reshoring and backsubourcing, has been handled within your org/department. Please think about the opportunities that emerged through this transition as well as potential obstacles and how these were handled by you and later unfold within the firm. We have a desire to focus on perspectives concerning knowledge, capabilities and technology, since there is a larger amount of research focusing on traditional economic aspects such as production cost, labor cost, currency, tax, as well as on lead time and quality aspects.

General
(1) What is your understanding of global outsourcing and the reversed form of it? How is it defined or understood by you/your organization?
(2) Please explain the background of this particular case of reversed sourcing decision. Did you have any thoughts of switching suppliers, instead of reversing back in-house? What was/is your role in this project?

Drivers/decision behind
(1) What are your motives or drivers for BS? (e.g. costs, technology, changes in the environment, proximity, product characteristics, problems with the supplier(s), etc.). Please try to connect this to knowledge and competence aspects if possible.
(2) Was this a function/production previously produced/handled in-house before they were decided to be sourced out? Who produced it at that time and where (within the boundaries of the firm i.e. captive, joint venture or third part) and for how long?
(3) Please describe in detail (if you can) how the new strategy unfolds itself and what happened. Did you have any preplanned guide for how to embrace or evaluate a situation, which includes repatriating an activity/function/service? Was there an action plan agreed upon? How did you recon the requirements needed and among whom could you find it? (different departments/functions/locations).

Knowledge/capability/technology
(1) What role did the involved employees and managers play?
(2) Was there raised any resistance in general among the employees (both new/old)? How did the employees respond to the technology introduction (robotics)?
(3) Was/are the employees’ skills in accordance with the re-integrated function?
(4) In accordance with the introduction of technology/robotics?
(5) How did the interaction between you occur, how did you communicate? (meetings, programs, teams, arenas etc.).
(6) Can you outline the re-integration process in general and if possible highlight hinders and solutions? Please elaborate on the actions made and how it was done.
(7) To what extent was these actions/decisions as a whole or as partial influenced by earlier experience, (on an individual/firm basis)? Please elaborate.
(8) What was the most important factor for you to be able to carry out your “plan”?

(9) What perception or understanding did you have regarding the internal knowledge? How did you locate it, developed it and how did you come to decide what and whom was going to be involved? Which knowledge/competence criteria are the most important and why?

(10) Can you define or explain what your core knowledge base is? (or should be/desired).

(11) Were there any specific tools or register that you could use to locate/indicate/where and how to search for the resources needed?

(12) What was the outcome of this situation/transition? How important has this change in sourcing direction been for your company? (financially, technologically and with regard to more intangible resources). Please elaborate.

(13) What has been the greatest difficulty in carrying out (parts of your) function in-house again?

(14) What has been the main advantages in carrying out (part of your) activities in-house again?
## INITIAL THEME

### REASONS FOR SOURCING OUT

- "The expectation for sourcing this out, was to avoid making a new R&D investment ourselves [...]"
- "What happened here is that, or actually it was a "sample-shot" the product managers took a decision about build or buy, aiming to get rid of the governance aspects [...] so it would only be something we were going to buy [...]"
- "The product management department had a blind faith in this company, after all, it was an American company, so they just had to be good at software development [...]"

### REASONS FOR REVERSING

- "During this journey then, it turned out that they did not know how to do this. So our R&D staff had to sit down and train theirs [...]"
- "My concern is that we might not really have enough knowledge about this anymore, except from what we have tried to learn them [...]"
- " [...] at the same time we understood that we needed them, the engineers, inside to help us build this competence again"
- " [...] we chose to focus on this, this strategy one can call it, or were trying to bypass a dependency situation"

## FOCUS INCREASE

### RESULT/OUTPUT OF OUTSOURCING

- "When looking back in the mirror, the decision to source out, it should never have been made, because it was wrong. And much was because the third part's competence was insufficient, it was a miss from our side [...]"
- "My experience is that it is a "blind man leading another blind man" and that it is this that is the problem. One is lacking real knowledge about the product and its functions [...] which makes it difficult to make the right sourcing decision"

### UNDERSTANDING OF SHARE, REVIVE, REBUILD AND RETAIN IN-HOUSE CAPABILITIES/KNOWLEDGE

- ".[...] to accomplish a competence transfer during downsizing is not directly easy to achieve"
- "[...] since this worked out so badly, we did not dare to get rid of some of the staff as planned"
- "We needed to come up with an idea of how to take this back and what competence or skills we could use [...]"
- "[...] We had to restructure our entire R&D operations, search for our brightest minds when it came to this particular function of the product, among 3,000 engineers"
- "[...] the key thing is that you need to reasonably explain why this is necessary, why they need to move, combine or collaborate and share this knowledge here and now [...]"

### MANAGERS (DESIRE) ACTIONS

- "I think it is important that we maintain 1-3 teams ourselves on bigger product and development work in-house, to be able to really understand how to buy later from external outsourcing providers, or for that matter also from partners"
- "[...] as a manager, I have to learn things everyday, but I do not if I am placed at a distant place. One have to understand how things are connected. For example, a system architect and an encoder should sit together, as well as product developers and managers should sit together [...] this leads to more efficiency"
- "[...] since this worked out so badly, we did not dare to get rid of some of the staff as planned"
- "My experience is that it is a "blind man leading another blind man" and that it is this that is the problem. One is lacking real knowledge about the products and its functions [...] which makes it difficult to make the right sourcing decision"
- "[...] at the same time we understood that we needed them, the engineers, inside to help us build this competence again"
- "[...] we chose to focus on this, this strategy one can call it, or were trying to bypass a dependency situation"

\*Note: Identification of key factors that may affect managers' understanding and firm-level knowledge*
Developing closed loop supply chains for environmental sustainability
Insights from a UK clothing case study

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Abstract
Purpose – Forward and reverse supply chains form a “closed loop” when managed in a coordinated way and this “cradle to cradle” responsibility has strong relevance to addressing environmental sustainability in global supply chains. The extensive outsourcing of manufacturing has created highly fragmented supply chains, which is strongly evidenced within the UK clothing industry, and it presents major environmental challenges, particularly around waste and resource use. The purpose of this paper is to investigate how a closed loop supply chain (CLSC) can be successfully developed to address environmental sustainability. Design/methodology/approach – The natural resource-based view (NRBV) acknowledges the importance of a firm’s tangible and intangible resources, as well as socially complex relationships, and provides three path-dependent strategies for achieving environmentally based competitive advantage. Via an in-depth case study of the UK-based clothing firm, the NRBV is employed as a framework for understanding the processes that a focal firm needs to engage in to develop a CLSC, and the contribution that is made by its resources and supplier relationships.
Findings – The findings illustrate the key importance of strategic resources and shared vision and principles between the focal firm and its suppliers, in order to progress from a more reactive pollution prevention strategy to a fully embedded CLSC response to environmental sustainability. The case study highlights the need to extend the current CLSC model to integrate the design function and end customer; the design function ensures that appropriate environmental practices can be implemented, and customers represent a key stakeholder as they enable the reverse flows required to maximise value and minimise waste.
Originality/value – The NRBV and its three path-dependent strategies are an established framework for understanding environmentally based competitive advantage, but has not previously been explicitly employed to investigate CLSCs. This research, therefore, provides valuable insight into the applicability of this model in the supply chain field, and the key role of tangible and intangible resources and socially complex supplier relationships in developing and achieving a CLSC.

Keywords Sustainable production, Environmental sustainability, Environment, Closed loop supply chains, Green operations, Buyer-supplier relationships, Natural resource-based view of the firm (NRBV), Supplier relationships

Paper type Research paper

Introduction
Globalisation and economic trends have created highly complex supply chains (Varma et al., 2006), and there has been a significant shift to firms outsourcing non-core activities to overseas suppliers (Darnall et al., 2008). This has been especially evident in the UK clothing industry, where cost pressures, competition and quota removal have forced firms to source the manufacturing function, and focus on customer-facing and design activities (Allwood et al., 2006). It is also an industry that has received a significant negative press regarding its environmental impacts, particularly in relation to the responsible use of natural resources and chemicals, and the waste and pollution it generates (Fletcher and Grose, 2012). It, therefore, represents a highly appropriate focus for this paper, as successfully addressing such major environmental issues in this complex industry has implications for global supply chain practice.

Waste and emissions caused by production processes throughout the global supply chain are major sources of environmental problems, and a focus on pollution prevention is
seen as one of the most immediate ways to tackle these issues (Min and Galle, 1997). Resource reduction through recycling, reuse and waste elimination extends this responsibility further (Carter and Ellram, 1998), and can lead to cost savings and enhanced competitiveness (Rao and Holt, 2005). Developing the right kind of supply chain can be a key to addressing the environmental sustainability, with firms recognising the systemic and strategic implications of managing the numerous flows in the supply chain (Defee et al., 2009). Firms, which apply a systems approach, can facilitate the adoption and diffusion of environmentally focused practices (Florida, 1996), and move towards a closed loop supply chain (CLSC). Forward and reverse supply chains form a “closed loop” when managed in a coordinated way (Kleindorfer et al., 2005), and a “cradle to cradle” responsibility, which acknowledges all stages in a product’s lifecycle, is increasingly considered a competitive necessity (Das and Posinasetti, 2015; Elia and Gnoni, 2015).

CLSC research has evolved from a focus on remanufacturing in the 1990s; remanufacturing is a key closed loop practice as it replaces worn, broken or obsolete parts from a product (Pun, 2006), and contributes to reducing a company’s environmental burden (Jena and Sarmah, 2014). As a result of diminishing lifecycles, the commoditisation of products, and decreasing profit margins closed loops have become increasingly important in industrial practice for the systematic management of resources and waste. It represents a rich and significant area for research development, with integrative methodological approaches required to provide practical insights and solutions to the design, control, and operation of CLSCs (Guide and Van Wassenhove, 2009). There is an acknowledged need to move to more practical and values-based views of CLSCs, with academics becoming familiar with industry practice and the challenges it creates (Guide and Van Wassenhove, 2009). Through an in-depth case study of a focal firm, the goal of this paper is to apply a theoretical lens that enables a rich, multi-faceted analysis of environmental practices and challenges in a specific industry, and to understand the role that suppliers have in the successful implementation and coordination of a CLSC.

The theoretical framework of the natural resource-based view (NRBV) of the firm, which evolved from the RBV in response to environmental sustainability is employed. It recognises the importance of tangible and intangible resources at the firm and supply chain levels, and presents three path-dependent strategies that progress from pollution prevention to sustainability. It offers significant potential to understand the development of CLSCs, and how supplier relationships and the resources they generate contribute to a value and values-driven supply chain. The paper reviews relevant environmental sustainability and CLSC literature in relation to the NRBV, and then presents a case study of a UK clothing SME, which has strong environmental principles and a CLSC ethos. The findings are discussed and provide valuable insight into the development of a CLSC against the NRBV framework, and the role that strategic resources and supplier relationships play in its achievement. The paper, therefore, contributes to both CLSC research and practice; its use of the NRBV allows a more holistic understanding of how environmental sustainability integrates with intangible, embedded social components, such as trust and principles, and provides practitioners an appropriate structure for decision making on the design, implementation and management of a CLSC. Suggestions for future research directions are also made.

Literature review
A set of search criteria related to environmental sustainability and CLSCs was applied to identify the most relevant papers for review; as well as using these specific search terms the keywords/phrases of green supply chains, environmental supply chains, environmental responsibility and sustainable/responsible supply chains were employed. The search was limited to journals produced in English; for quality purposes searches were limited to journals rated from 2* to 4* in the ABS journal rankings (2016). The search databases used
were Science Direct, EBSCO and Emerald Fulltext, and as each search was completed the abstracts were reviewed to ensure the relevance of the results. Recognising the interdisciplinary nature of the subject areas, and the fact that environmental sustainability and CLSCs are still evolving concepts, it was subsequently deemed important to include certain journals that fell outside this scope, to ensure that the most current and relevant research in the field was included.

CLSCs
Every product generated, transported, used and discarded within a supply chain has some degree of impact on the environment, and is a function of the material and energy consumed, and wastes released in its lifecycle (Tsoulfas and Pappis, 2006). Increasing environmental consciousness across multiple industries together with stricter legislation (Neto et al., 2010) has made product disposal a critical issue for firms (Jena and Sarmah, 2014). Recovery and recycling are practical and value-maximising alternatives to landfill disposal (Guide and Van Wassenhove, 2009), and there is growing recognition that with increased global consumption of goods, the quantity and availability of raw materials will deplete significantly (Kumar and Putnam, 2008), so resources need to be used (and reused). To manage the environmental performance of a supply chain, all stages need to be addressed (Tsoulfas and Pappis, 2006), as any activity may have a negative impact. Environmental issues cannot be managed in isolation from other supply chain activities (Vachon and Klassen, 2008), and companies must design, produce, distribute, and dispose of products in a way that minimises the associated environmental impacts (O’Brien, 1999).

Closed loops consider all stages of the supply chain, and are defined as the “design, control, and operation of a system to maximise value creation over the entire lifecycle of a product with dynamic recovery of value from different types and volumes of returns over time” (Guide and Van Wassenhove, 2009, p. 10). The CLSC, as illustrated in Figure 1, recovers added value by reusing products and/or their components (Guide and Van Wassenhove, 2009). It is characterised by the firm’s active involvement in the recovery process in order to extend a product’s life or manage final disposal (Klassen and Johnson in New and Westbrook, 2004). The key goal is to keep all materials within the lifecycle and minimise any flow into the external environment (Sarkis, 1995). The CLSC concept is, therefore, of key importance in addressing the key environmental concerns of waste and hazardous materials through pollution prevention activities, as well as generating economic value through extending product life and enabling the reuse, remanufacturing and recycling of products (Blumberg, 2005).

A key way to improve environmental sustainability within the CLSC is to lengthen the life of materials and products, and recycling can generate additional revenue streams while

![Figure 1. Closed loop supply chain (CLSC)](Image)
also reducing the level and cost of waste disposal (Sarkis et al., 2010). By incorporating repair, reuse and remanufacturing as well as recycling the CLSC model reduces waste, and makes efficient and effective use of resources at all stages (Das and Posinasetti, 2015). Closed loops increasingly represent a critical activity for firms, with economic and environmental impacts pushing the need to integrate forward and reverse product flows, rather than just “greening” individual production processes. (Elia and Gnoni, 2015). The CLSC is becoming a preferred model for more progressive companies due to its potential for value recovery, positive response to environmental sustainability and growing consumer awareness of environmental issues (Das and Posinasetti, 2015). There are specific environmental concepts and practices that form an explicit part of or actively contribute to achieving the CLSC, as illustrated in Figure 1, and they are evaluated and discussed in the following sections. However, it is recognised that most current environmental activity is in pollution prevention rather than fully coordinated supply chains, and despite its recognised importance in addressing sustainability the CLSC is still far from being an industry norm.

**CLSC environmental concepts and practices**

*Design for the environment (DfE) and design for remanufacturing (DfRem)*

The design function is a key to the CLSC, as it sits at the start of the supply chain and enables specific environmental practices to be implemented and achieved effectively. DfE systematically considers design performance with respect to environmental objectives over the full product and process life cycle (Masclé and Zhao, 2008). It enables firms to address the environment (Preuss, 2005b), and develop recoverable products which are durable, reusable, harmlessly recoverable and environmentally compatible in disposal (Tsoulfas and Pappis, 2006). Three key DfE objectives are maximisation of profit over a product’s life span, maximisation of the number of parts reused, and minimisation of landfill waste (Masclé and Zhao, 2008). Difficulties associated with DfE are designers’ unfamiliarity with the process and lack of integration with other design tools (Albino et al., 2009), which lead to issues in coordinating the process with manufacturing. It is an emerging tool, which requires refinement to be effective and depends on material availability and the technical capability of the supply chain (Preuss, 2005b).

The DfRem aims to enhance remanufacturability, and requires the design function to actively consider each remanufacturing step, and how the design of the product will affect them (Hatcher et al., 2011). It can be seen as a part of the concurrent engineering process, but research also indicates that DfRem is actually a collection of many tasks or considerations whose prioritisation will differ depending on the processing needs of the product (Sundin and Bras, 2005). Specific product properties may have a positive or negative effect upon particular remanufacturing process steps, such as disassembly or cleaning, and improving remanufacturing efficiency through design may make it a more viable and lucrative product end-of-life strategy (Hatcher et al., 2011). Further dimensions of integrating environmental concern in the design stage which contribute to “closing the loop” include design for recycling and design for disassembly (Gupta, 1995). These complementary approaches allow for more efficient and profitable reuse/disposal of product components (Kumar and Putnam, 2008).

*Product stewardship*

The concept of product stewardship incorporates these design-related responses to the environment, and explicitly considers the environmental impact of products from the purchase of raw materials to how the product is disposed at the end of life, and aims to reduce the environmental burden of products (Wong et al., 2012). It is representative of a cradle to grave (or cradle) responsibility for the lifecycle of a product (Angell and Klassen, 1999), and
is focused on “product-based green supply” (Seuring, 2008). The goal of product stewardship is to keep all materials within the lifecycle and minimise any flow into the external environment (Sarkis, 1995). It therefore considers the environmental impact in of a product in its design, packaging, and materials used, and promotes the recycling, remanufacturing and reuse of materials/components, and using recyclable parts (Wong et al., 2012).

Product stewardship extends the environmental perspective to the entire value chain to include internal and external stakeholders, such as R&D, designers and suppliers, and is therefore crucial to the integration and coordination required in the CLSC. Examples include redesigning products and processes, which further emphasises the key role of the design function, using renewable resources and working with suppliers to prevent pollution (Rusinko, 2007). It represents one of three capability-based strategies that form the NRBV of the firm, and progresses a firm from reactive pollution prevention activities to a more proactive and integrated response to environmental sustainability.

Reverse logistics (RL)

Traditional logistics manages the supply of goods from the producer to the end consumer (Lippman, 2001), while RL relates to products returned by the customer to the focal firm. In line with the presented CLSC model, it has the purpose of recovering and potentially generating value (Blumberg, 2005) or properly disposing of products (Lippman, 2001), and is a “process whereby companies can become more environmentally efficient through recycling, reusing and reducing the amount of materials used” (Carter and Ellram, 1998, p. 85). RL provides the maximum utilisation of used products, where every output is returned to natural systems or becomes an input for manufacturing another product (Tsoulfas and Pappis, 2006). Products, parts, subassemblies and materials represent growing values and economic opportunities at the end of the supply chain (Blumberg, 2005), and the holistic nature of reverse distribution actively aims to reduce resources in the forward system so that fewer materials flow back, reuse and remanufacturing is possible and recycling facilitated (Carter and Ellram, 1998). RL is, therefore, the function that allows the supply chain loop to be closed, and enables the implementation of the environment-focused activities of recycling, reuse, remanufacturing and repair.

Recycling, reuse, remanufacturing and repair

Waste products and emissions can be recycled as a raw material for use in the same or different production process; processed to be reused; and used for a different useful application. Reclaimed material can also be sold to another company (Gupta, 1995). Recycling and remanufacturing work in parallel, with the major distinction between material recovery (recycling) and added value recovery (remanufacturing) (Kenne et al., 2012). Recycling requires disassembly of the waste or returned product, separation of parts and material reprocessing, and denotes material recovery without conserving any of the original product’s features (Field and Sroufe, 2007). Remanufacturing replaces worn, broken or obsolete parts from a product, with the aim of returning it to new or better than new condition (Pun, 2006). Both approaches can benefit firms economically as costs will be lower than using “virgin” materials; environmental consequences are generally higher for the initial processing of virgin material, as well as regulations and associated costs (Field and Sroufe, 2007).

Remanufacturing not only helps in reducing a company’s environmental burden, but can also reduce production costs (Jena and Sarmah, 2014). It is the process of returning a used product to at least original equipment manufacturer original performance, and includes sorting, inspection, disassembly, cleaning, reprocessing and reassembly, and the replacement of parts which cannot be brought back to original quality (Hatcher et al., 2011). It is an important aspect of CLSCs because it extends products’ lives and integrates back into the production chain used components that would otherwise have entered landfill (Sundin et al., 2009; Hatcher et al., 2011).
By providing remanufactured products to customers, companies can provide the same level of service using fewer resources, thereby reduce the resource intensity and increase the eco-efficiency of product systems (Kerr and Ryan, 2001).

Reuse represents a form of recycling where the recycled product retains all the properties of the original (Sarkis, 1995), and makes use of good components from retired assemblies, while repair brings damaged components back to a functional condition (Kumar and Putnam, 2008). Repair activities are a growing area, and a repair network can itself be considered as a closed loop with products flowing between the manufacturer and its customers (Kusumastuti et al., 2008). It is less represented in the current CLSC literature, but is a key way to reduce disposal until a product’s true end of life.

Managing supplier relationships in the CLSC
A key challenge in the CLSC “is not just how to manage irregular reverse flows, but how to obtain them in the first place” (Seitz and Peattie, 2004). This highlights the importance of RL to closed loops and the practical issues associated with incentivising and enabling products to be returned to source; these issues are exaggerated by the complex and global nature of today’s supply chains. It also indicates the importance of managing both supplier and consumer relationships to ensure the CLSC operates effectively. Research to understand global supply chains is progressively moving away from conventional economic, technological and tangible mechanisms towards more relational, inter-organisational approaches (Filbeam et al., 2012), which focus on the interaction between actors in a supply network and how they cooperate, stimulate and influence each other (van Bommel, 2011).

Transactional relationships focus on increasing the number of suppliers or frequently switching suppliers to economise costs, whereas relational approaches focus on the sharing of information (Power, 2005; Preuss, 2005b). Spekman et al. (1998) consider cooperation as the threshold level of supply chain interaction where firms exchange some essential information and engage some suppliers in long-term relationships, while coordination workflow and information are exchanged to allow more seamless linkages. Collaboration represents the optimum level and occurs when two or more independent firms work in partnership to plan and execute supply chain operations (Nyaga et al., 2010). Collaborative relationships are characterised by information sharing, a long-term approach and mutual advantage (Preuss, 2005a) with joint efforts creating value that cannot be achieved independently (Nyaga et al., 2010). They require the development of trust and commitment between buyers and suppliers (Attaran and Attaran, 2007), with trust seen as a prerequisite to success (Varma et al., 2006). Individual relationships and close-knit social relations (van Bommel, 2011) can nurture trust and informal networks.

Supply chain research and practice tends to focus on tangible processes, and this extends to addressing environmental sustainability (Ashby et al., 2012). There is little in the current literature that explicitly recognises the importance of relationships in developing CLSCs (Jena and Sarmah, 2014), and to address this research gap there is a need to apply theoretical frameworks that can fully address both the tangible and intangible dimensions of CLSCs (Ostlin et al., 2008). This paper therefore employs the NRBV as it incorporates different dimensions of environmental responsibility, and recognises the role of tangible and intangible resources in achieving sustainability. There is increasing awareness of the importance of resources which develop from relationships with suppliers and network structures. The relational view of supply chains (van Bommel, 2011) emphasises the benefits of common resources that partners cannot generate independently; relational resources stem from the focal firm’s network ties and their emergence is viewed as a context and path-dependent process. As these resources are difficult to imitate, they can form a significant basis for sustainable competitive advantage, and can generate extensive value for interconnected...
organisations (Barrutia and Echebarria, 2015). Trust is considered a key relational resource and its prominence in current sustainability research stresses its highly beneficial effects in relational contexts (Simpson and Power, 2005; Barrutia and Echebarria, 2015).

The NRBV
The RBV suggests that firms are able to create and sustain competitive advantages through the collection and integration of strategic resources that are rare, valuable, inimitable, and non-substitutable (Barney and Hesterley, 2008). It has become important in OM and supply chain research as it can be used to deconstruct the sources of competitive advantage both internally and across cooperative partnerships, and therefore provides a unique means of supply chain analysis. Each supply chain activity requires particular resources and capabilities, but it is important, and more challenging, to integrate the existing capabilities across the supply chain, and leverage them effectively (Hitt et al., 2015). Firms that are able to build their supply chain capabilities can use them to gain competitive advantages (Barney, 2012), and create socially complex resources through on-going interactions with their supplier network.

The NRBV (Hart, 1995) is an evolution of the resource-based view (RBV) of the firm, which entails that resources and capabilities that are valuable, rare, and inimitable determine the competitive position of firms with environmental considerations (Barney, 1991). A firm can achieve superior performance if it has the capability to exploit as well as preserve natural resources in its operating environment, and firms embracing the product-related environmental practices detailed above and utilising them intensively in their operations and supply chain stand a higher chance for preserving the natural resources in their environment (Wong et al., 2012). The socially complex capability of environmentally focused firms is developed where partner firms are engaged in coordinated organisational actions; such capability allows firms to access the resources of their suppliers, and the inherent complexity in supplier coordination and collaboration are difficult to imitate (Wong et al., 2012).

The NRBV recognises the key role of tacit and socially complex resources as well as cultural embeddedness, shared visions and strong moral leadership in addressing the environment, and building on these principles firms need to develop environmentally sustainable capabilities to remain competitive. Hart (1995) proposes three interconnected strategies: pollution prevention, product stewardship and sustainability. In Table I, the three strategies are interconnected through path-dependency and embeddedness, and offer a framework for understanding how to coordinate the different CLSC components documented in the literature. They follow a sequence beginning with pollution prevention through to sustainability, and each strategy builds on the prior capability. The pollution prevention strategy links to the core capability of continuous improvement (CI); most research to date has focused on the application of this strategic capability, and how to prevent pollution in a cost-effective way through the minimisation of waste and emissions (Mena et al., 2014). While it is a better response to environmental issues than pollution control, it is still considered reactive in nature (Vachon and Klassen, 2006).

<table>
<thead>
<tr>
<th>Strategic capability</th>
<th>Environmental driving force</th>
<th>Key resource</th>
<th>Competitive advantage</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pollution prevention</td>
<td>Minimise emissions and waste</td>
<td>Continuous improvement</td>
<td>Lower costs</td>
</tr>
<tr>
<td>Product stewardship</td>
<td>Minimise lifecycle cost of products</td>
<td>Stakeholder integration</td>
<td>Pre-empt competitors</td>
</tr>
<tr>
<td>Sustainability</td>
<td>Minimise environmental burden of firm growth and development</td>
<td>Shared vision</td>
<td>Future position</td>
</tr>
</tbody>
</table>

Source: Hart (1995)
Following the NRBV framework the focal firm then extends from internal pollution prevention practices towards cooperation with external stakeholders, including suppliers. The core capability of the product stewardship strategy is the integration of stakeholders’ environmental interests, and requires information exchange and collaboration on environmental impact reduction (Grekova et al., 2014), emphasising the need for relational resources (Barrutia and Echebarria, 2015), and inter-organisational relationships which generate socially complex resources (Mena et al., 2014). Research is beginning to address the concept of product stewardship, and improved relationships across supply networks can lead to improved and more proactive environmental outcomes. Firms depend on suppliers to provide environmentally friendly materials, and closer relationships can lead to greater supplier involvement in environmental initiatives, such as recycling and reuse (Mena et al., 2014).

Table I indicates the importance of shared vision as a key resource for moving from reactive environmental approaches, illustrated by pollution prevention to the proactive, future-focused and value-seeking responses to sustainability advocated in CLSC research. The NRBV aligns with currently documented responses to environmental responsibility in supply chains, from a short-term, transactional approach where specific processes are simply “greened” (Ashby et al., 2012), to taking a product lifecycle view, through to a long-term and proactive commitment to minimise the firm’s environmental burden as it grows and develops (New and Westbrook, 2004). This final position aligns directly with the CLSC concept, as to succeed it needs to take full account of the environment throughout the firm (Das and Posinasetti, 2015; Elia and Gnioni, 2015), and requires a proactive, networked supply chain, but it is currently under-developed within the field and represents a key research gap.

The embeddedness of environmental principles in a firm’s culture and supply chain can represent an inimitable resource (Barney et al., 2001), and the NRBV’s emphasis on shared vision as the key resource for a sustainability strategy offers potential for understanding how supplier relationships contribute to the achievement of a CLSC. Supply chain collaboration can be a source of sustained competitive advantage because it grows historically and involves socially complex interactions (Mena et al., 2014), and the need for a shared vision to achieve sustainability implies the collaborative involvement of suppliers. The research on the NRBV capabilities of product stewardship and sustainability is nascent, and this paper aims to address this key gap through a focus on the role of suppliers in progressing from one strategy to another, and the resulting impact on the development of the CLSC. The literature review has indicated that pollution prevention and product stewardship are key, but potentially isolated components of the CLSC, while a sustainability strategy can represent a complete closed loop response.

The research framework
The NRBV provides an appropriate structure for understanding the different CLSC practices that have been presented and discussed in the literature review, to include the potential sequence or priority of their implementation, the nature and extent of their interaction, and how this, then, combines to achieving the fully coordinated CLSC, as illustrated in Figure 1. Its implicit recognition of strategic resources, both tangible and intangible, and the need for stakeholder integration to achieve specific strategic capabilities enables the role of supplier relationships to be evaluated as the CLSC develops. Figure 2 presents the research framework that will be applied to address the following research questions:

RQ1. How does a focal firm implement and develop a CLSC response to environmental sustainability?

RQ2. How do supplier relationships and resources contribute to the focal firm achieving a CLSC response?
The framework consolidates the key environmental and resource-based concepts presented in the literature review; it is used to analyse a firm’s progress from each NRBV strategic capability, and how it can use this path-dependent approach to achieve a fully coordinated CLSC. The role of different forms of resources associated with the NRBV is used to evaluate the contribution made by the firm and its supplier relationships in achieving each stage.

**Research methodology**

The clothing industry has been heavily researched in relation to global supply chains and therefore has an important contribution to make to the developing CLSC research field. It can be seen as an extreme case for managing environmental sustainability due to frequent shifts in product portfolio and its internationally organised product chains that substantially influence and extend the stages where environmental impacts can occur. Production processes in the clothing supply chain make intense use of chemical products and natural resources, creating emissions and waste and generating a high environmental impact (Fletcher, 2008). There is also a "throwaway" attitude to clothing, due to increased purchase frequency and substantial pricing reductions (Birtwistle and Moore, 2007), which has resulted in an increased rate of garment disposal (Allwood et al., 2006), a key consideration within the CLSC.

Given its complexity and global nature translating the CLSC model into supply chains is a key challenge for the UK clothing industry, but there are signs that reuse and recycling are becoming sources of added value in supply chains (Fletcher, 2008). Recycling and reuse are proactive responses and have a positive impact on a product’s lifecycle as well as addressing resource availability, especially important as virgin resources become scarcer (Sarkis et al., 2010). The literature has indicated the importance of collaborative relationships in the CLSC, but the UK clothing industry has traditionally been highly transactional in nature, and focused on achieving lowest unit cost, primarily through sourcing from developing countries where labour is cheaper, even if this has negative environmental and social implications (Bruce et al., 2004). The industry therefore has specific relevance for this research study as it enables insight and understanding of how the focal firm can progress from an established and ingrained transactional model to one that enables a coordinated, collaborative and environmentally sustainable supply chain.

The presented case study is representative of exemplar UK clothing firms who operate responsibly and have owner managers with strong environmental principles (Tilley, 1999).
Such case study observations are well suited to relatively new research topics, especially where the phenomena are poorly understood; in-depth qualitative case studies are deeply embedded in rich empirical descriptions, and typically address “how” and “why” questions (Eisenhardt and Graebner, 2007). The methodology is particularly strong in theory building and appropriate to researching a dynamic, evolving phenomenon such as CLSCs (Eisenhardt and Graebner, 2007). Case studies offer high validity with practitioners (Karlsson, 2009) and the strategy provides powerful tools for capturing both the hard and soft elements of an organisation (Voss et al., 2002). While a single case offers limited generalisability, it can richly describe the existence of a phenomenon (Siggelkow, 2007), and provide the opportunity to develop a deep understanding of its nature and complexity in a specific setting (Barratt and Barratt, 2011).

Data collection and analysis

The main instrumentation for the data collection was the semi-structured interview (Miles and Huberman, 1994) with the key informants being the firm owner and the supply chain manager. An interview protocol was provided (Appendix 1) and a set of standard questions established that were adapted in response to any new or interesting facets that arose during the interview process (Reuter et al., 2010). Six visits were conducted over a 15-month period, as illustrated in Table II, and two interviews had already been conducted with the firm a year previously. On-site interviews were also conducted with a key UK supplier and their Japan supplier. For purposes of internal validity, evidence was obtained from multiple sources: field notes were recorded during each visit, and written supporting data obtained including company accounts, marketing material and policies (Poba-Nzaou et al., 2014). The secondary data collection extended beyond the interview period (Table II), and together with the interview transcripts this data formed a clear narrative for the case (Yin, 2009).

Qualitative data are full, earthy, holistic and real, but because the context is part of the study there will always be many variables and a high volume of rich data (Yin, 2009). Cross-interview analysis allowed common patterns to be identified (Reuter et al., 2010), and a coding scheme (Charmaz, 2006; Strauss and Corbin, 2008) was implemented to relate interview content to specific themes. It involved the systematic and iterative review of each transcript and the extraction of recurrent data, which was then assigned to an initial theme. The analysis process was guided by the reviewed literature, but new recurrent themes were also identified – see Appendix 2 for the themes that resulted from the analysis and coding process.

Supporting information was used to verify, triangulate and enhance the data analysis (Karlsson, 2009), and the longitudinal nature of the study enabled the development of the focal firm’s supply chain to be evaluated over a specific period of time. There is a recognised

<table>
<thead>
<tr>
<th>Date</th>
<th>Duration</th>
<th>Interviewee</th>
<th>Location</th>
</tr>
</thead>
<tbody>
<tr>
<td>13 April 2010</td>
<td>41 mins</td>
<td>Firm owner</td>
<td>Head office, Cornwall</td>
</tr>
<tr>
<td>13 April 2010</td>
<td>38 mins</td>
<td>Supply chain manager</td>
<td>Head office, Cornwall</td>
</tr>
<tr>
<td>14 January 2011</td>
<td>48 mins</td>
<td>Firm owner</td>
<td>Head office, Cornwall</td>
</tr>
<tr>
<td>10 March 2011</td>
<td>1 hour 21 mins</td>
<td>Design director</td>
<td>Head office, Cornwall</td>
</tr>
<tr>
<td>23 June 2011</td>
<td>59 mins</td>
<td>Supply chain manager</td>
<td>Head office, Cornwall</td>
</tr>
<tr>
<td>18 October 2011</td>
<td>45 mins</td>
<td>Japan supplier – UK manager</td>
<td>Head office, London</td>
</tr>
<tr>
<td>18 November 2011</td>
<td>1 hour 15 mins</td>
<td>UK supplier - owner</td>
<td>Supplier premises, Devon</td>
</tr>
<tr>
<td>30 November 2011</td>
<td>27 mins</td>
<td>Firm owner</td>
<td>Head office, Cornwall</td>
</tr>
<tr>
<td>6 March 2012</td>
<td>34 mins</td>
<td>Supply chain manager</td>
<td>Head office, Cornwall</td>
</tr>
</tbody>
</table>

Table II. Interview details
lack of longitudinal studies in the supply chain literature, which typically looks at networks at a point in time rather than as a dynamic cycle (Pilbeam et al., 2012). There is also recognition that the roles and responsibilities of a focal firm’s suppliers can change over time and as relationships evolve (Slepniov et al., 2010), which is key to this paper in understanding the importance of socially complex resources in achieving CLSCs. The longitudinal study was conducted over a total period of just over two years, which was sufficient time to build a rapport with the focal firm and interviewees, and to observe key developments in the firm’s CLSC and its relationships with suppliers (Aloni et al., 2015; Done et al., 2011; Eltantawy et al., 2015).

The case study is a surfing lifestyle brand-based in the South West of the UK, and since being established in 2005 it has grown in both size and turnover, as shown in Table III. It has three explicit points of commitment – people, product and planet. It specialises in making a select range of performance clothing from recycled or natural fibres, and at the heart of the company ethos is a desire to make the best technical apparel with minimal environmental impact, backed by a sustainable design philosophy.

It will not manufacture products that cause more of a problem than they solve, and strives to communicate the firm’s honesty and trustworthiness to its suppliers, as well as its customers. The firm has a strong and distinctive brand identity that directly aligns with its environmental principles, and a loyal customer base; it aims to tell a story about its products and “hope that our honesty comes out in our marketing and people will learn to trust that” (Owner). The firm sources environmentally responsible materials, processes and suppliers, and as illustrated in Table III, all products are designed in-house, along with all customer-facing activities.

Research findings

Principles

Coming from a marine science and surfing background, the owner has emotional connections to the environment, which inform the principles that are applied to the firm and its supply chain. Strong beliefs and values are likely to be associated with a founder (Pedersen, 2009), with business not just seen as an income stream, but as a vehicle for change (Rodgers, 2010). This highlights the importance of embeddedness, which directly relates to an organisation’s principles and culture; the studied firm was established on the specific principles of people, product and planet, and these commitments permeate their supply chain.

They aim to work with suppliers that share their principles, as this makes it easier to make the appropriate environmental decisions. This was reflected in the supplier interviews; the Japan supplier is the industry leader in recycled polyester and was established to address the environmental issues associated with this oil-based fibre, while the UK supplier

<table>
<thead>
<tr>
<th>Established</th>
<th>2005</th>
</tr>
</thead>
<tbody>
<tr>
<td>Turnover 2011/2012</td>
<td>£668,000</td>
</tr>
<tr>
<td>Turnover 2014/2015</td>
<td>£1.48 M</td>
</tr>
<tr>
<td>No. of employees 2015</td>
<td>30</td>
</tr>
<tr>
<td>Accreditation</td>
<td>Global organic textile standard (GOTS)</td>
</tr>
<tr>
<td>Sales mechanisms</td>
<td>Independent retailers, own retail outlets, online sales</td>
</tr>
<tr>
<td>Supplier locations</td>
<td>Australia, China, Japan, Portugal, Italy, UK</td>
</tr>
<tr>
<td>Core products</td>
<td>Knitted base layers, waterproofs, insulation</td>
</tr>
<tr>
<td>In-house activities</td>
<td>Product design, marketing, warehousing and despatch, customer service, product repair</td>
</tr>
</tbody>
</table>

Table III. Key company information
has a shared commitment to localised supply of natural resources. The latter relationship indicates how their principles have evolved to inform a desire for more local supply chains, as a mechanism to support UK/European producers and their local community; reduce environmental impacts associated with global transport, and provide more supply chain visibility. The firm also extends beyond traditional supply chain boundaries to align with customers that share their values; loyalty to the firm’s brand identity supports a strong supply chain and is a key factor to closing the loop as it incentivizes RL. This theme reflects both the stakeholder integration and shared vision dimensions of the NRBV (Table I), and indicates how fundamental shared principles are as a foundation to a coordinated CLSC.

**Pollution prevention**

The studied firm has always looked to minimise the environmental impact of the products they design and produce in their supply chain. They engage in environmentally responsible manufacturing processes, which require working with suppliers that can meet these standards, and actively maximise the use of their materials and components to ensure that minimal waste is generated and stays within the supply chain. An example of this is the use of fabric offcuts from the production of their clothing products to create a range of bags, and also as a source of material for the repair of returned products.

The longitudinal analysis indicates that this approach has always been integral to how they operate their business and supply chain rather than a distinct strategy for environmental sustainability. This is in contrast to the reviewed literature, which suggests internal pollution prevention activities such as waste management are the dominant response to the environment in industry practice. This finding also challenges the path-dependent nature of the NRBV framework where firms engage in pollution prevention as a starting point for environmental sustainability.

**Product design**

The design process starts at the fibre stage and the firm flexes creative control through to how the finished product can be maintained, repaired, reused, recycled, and disposed. It is in full control of the design function and applies a DfE approach; for the principle of planet this translates into sourcing and developing raw materials derived from recycled, animal friendly, or easily renewable origins; this includes recycled polyester (an oil-based fibre) and Merino wool, which is a specific technical requirement for its core base layers. These decisions enable them to create a product which is durable, repeatedly usable, harmlessly recoverable and environmentally compatible in disposal (Tsollias and Pappis, 2006).

The firm is directly engaged with the raw material purchasing stage and this extends to developing their own performance fabrics; they explicitly look to improve their products, working collaboratively with their key suppliers to develop the most environmentally responsible materials. This innovative use of physical capital, i.e. materials, and the harnessing of the tacit skills and expertise of its supply chain partners creates a “distinctive visibility” and competitive advantage that cannot be easily replicated by competitors. The reviewed literature emphasised the role of the design function in the CLSC in enabling key practices such as recycling and remanufacturing, and it clearly underpins the firm’s strong product stewardship approach.

**Product stewardship**

The firm’s product principle translates into how it addresses each stage of a product’s manufacture and disposal. It believes that clothing firms have a responsibility for a product along its entire lifecycle; this translates into their explicit “cradle to cradle” approach which enables their customers to return garments for repair, reuse and recycling. They consider
that garments should be kept and maintained for as long as possible, and product design and manufacture need to contribute to this. The firm applies a strong focus on product performance and longevity that aligns with their environmental principles, and also represents a key component of the CLSC:

We want to go back to making the kind of jacket your dad still has after 30 years […] We don’t want that cycle where you get rid of stuff quickly. We want people to keep our stuff for a long time (Owner).

Their aim is to minimise their environmental burden, in line with the third strategic capability of the NRBV, and also educate the consumer to do the same, so they provide care and disposal information via the products themselves and online channels. They innovate wherever possible throughout their supply chain, and “have a thirst for knowledge to improve our garments”; this suggests a drive for CI in all aspects of the supply chain, rather than just pollution prevention as presented in the NRBV framework. For them environmental sustainability is about change, adaptability and survival, and its active engagement with suppliers, customers and community evidence the stakeholder integration required by the NRBV to achieve a product stewardship capability.

Closing the loop
The firm applies the CLSC model as illustrated in Figure 3; it incorporates all key clothing supply chain stages, but also explicitly recognises the design function and the consumer’s role in closing the loop, stages that are excluded in the current CLSC model presented in Figure 1. While recycling and reuse close the manufacturing loop, the design function is a key to make responsible and sustainable decisions before the process begins, and enabling effective closed loop practices such as recycling. The consumer’s role is multi-faceted as they are responsible for the product use, its care and disposal; responsible product disposal is recognised as often the biggest contribution that can be made to environmental sustainability (Das and Posinasetti, 2015), but is the aspect over which firms typically have the least control.

The longitudinal analysis indicated that the firm has always aimed to solve the challenge of product disposal within its supply chain, and it actively addresses the issue through its repair and return service, which has been available since it was established. The materials and components of returned products which are at the end of their use can be recycled back into raw materials; recycled fibre represents a low-impact alternative to other sources, with reduced energy and resource consumption as well as chemical consumption if it is not over-dyed (Fletcher, 2008). The findings show that the studied firm has always produced their outerwear from recycled polyester, for both performance and environmental purposes, working with the leading industry fibre supplier; based in Japan they developed the closed
loop technology that enables 100 per cent polyester garments, materials or components to be recycled into fibre.

While only polyester products can currently be returned to the Japan supplier for recycling into fibre, the firm offers a repair service for their entire product range, which forms its own closed loop within the supply chain (Kusumastuti et al., 2008). The repair service is performed in-house and aligns with the firm’s belief in product longevity through ensuring the longest possible life for their garments, but also offers a mechanism for gaining insight into their products’ performance and durability in the field, which, in turn, enhances and develops their product stewardship approach. The literature review highlighted that this CLSC practice is currently underrepresented in both research and practice, but represents a highly relevant component of product stewardship. This finding reflects how the firm has successfully integrated a key stakeholder into the supply chain, and the positive impact that customer loyalty and shared principles has in closing the loop.

Relationships and resources
The firm has always acknowledged the importance of good relationships and explicitly recognises the need for the relational resource of trust in their supplier relationships: “It’s not a case of relying on them, but trusting them. It’s about having really good relationships with whoever we’re working with, that there’s transparency and we understand what is required from each other” (supply chain manager). The NRBV emphasises the need for shared principles and visions with key stakeholders to progress from pollution prevention to a future-facing sustainability strategy. The firm’s embedded and active engagement with its suppliers, customers and community indicates that it has always been well positioned to reach this stage of the NRBV, and that suppliers are key in fully achieving a CLSC through supporting and connecting each stage.

The long-term perspective that the firm applies brings additional benefits, with some of their suppliers willing to accept lower profit margins because they trust, believe and share in the firm’s sustainability vision. The shared commitment is also evidenced in supplier flexibility and reciprocity with a desire to provide solutions and solve problems for the firm. “I know they haven’t made any money on a certain product because of the amount of development and delivery costs [...] they don’t whinge about it because they see it as a long-term relationship” (Owner). This further emphasises the role of trust and reciprocity as socially complex resources, and illustrates the strategic benefits of collaborative relationships. The UK supplier interview also presented the related relational theme of “brotherhood”, indicating that despite the growth in outsourcing to overseas suppliers there is a strong textile heritage and passion in the UK industry that can harnessed and developed in the CLSC.

While they currently source key materials from overseas suppliers (Table III) the longitudinal analysis revealed there has always been a desire for the supply chain to be closer to home, to more fully respond to their environmental commitments, and minimise their environmental burden. A key example is the innovative and inimitable Merino wool initiative; in 2008, the firm identified a UK farmer with the necessary connections, knowledge and expertise, which could combine with its own technical and design skills, and then embarked on a very long-term collaborative partnership. The farmer located the only remaining breed of sheep in the UK that could produce the required high quality of wool, and developed a breeding programme to establish production-level numbers, a stage that was achieved during the longitudinal study. It highlights how the firm continuously strives to make their products and what they do better, further illustrating that CI is not limited to pollution prevention, and how they collaboratively engage their suppliers in the process to harness both physical and tacit resources.
Discussion
This paper has provided unique and rich insight into the environmental principles, practices, strategic resources and relationships of an exemplar UK clothing firm, and how these different dimensions have informed and developed their CLSC as a response to environmental sustainability. The application of the NRBV research framework (Figure 3) has shown that the case study’s supply chain relies strongly on supplier collaboration and embedded environmental principles, and it has always taken a proactive, product stewardship-based approach to environmental sustainability. The UK clothing industry is a very relevant area for study, often representing an extreme example of poor environmental and social responsibility, and has historically operated highly transactional and poorly coordinated supply chains. This exemplar case study illustrates that these barriers and challenges can be addressed in the clothing industry through the implementation of coordinated environmental practices and collaborative supplier relationships, and has implications for CLSC design and practice in similarly complex and cost-driven industries and where environmental sustainability is of growing importance:

**RQ1.** How does a focal firm implement and develop a CLSC response to environmental sustainability?

The reviewed literature highlighted the growing imperative for addressing the environment in supply chains, and presented the recognised mechanisms to do so (Das and Posinasetti, 2015) to include emissions reduction, waste management, recycling, reuse and remanufacturing. The CLSC is of key importance to environmental sustainability as it aims to integrate these activities to minimise environmental impact and maximise value creation (Guide and Van Wassenhove, 2009), and the NRBV provides a three-stage framework for understanding how a focal firm can progress from internal pollution prevention activities to a sustainability strategy. The findings indicate that the studied clothing firm’s key motivations for implementing a CLSC came from the founder’s strong environmental principles and people, product and planet sustainability vision. Clearly, well-communicated environmental commitments therefore translated into a strong and embedded organisational culture and brand identity that helped to prevent any significant compromises in developing their CLSC.

As illustrated in the literature, DfE represents a key starting point for developing a CLSC as it ensures that environmental responsibility is built into the product itself, and subsequently encourages the right decisions and practices to address environmental sustainability within the clothing supply chain. It is not explicitly incorporated in the current CLSC model, but as the case study has indicated it has a vital role in achieving a product stewardship strategy, and ensuring the effective implementation of the documented recycling practices; without this product design consideration, the extent of the firm’s response to environmental issues will be constrained. The case study firm applies many of the key environmental practices outlined in the literature review, including the innovative use of waste materials to create new clothing products, use of recycled materials in product design and manufacture, and the repair, reuse and recycling of returned products. It reflects its strong and continued product stewardship approach, and its strong environmental principles underpin this, but the findings also show the importance of engaging and integrating key stakeholders to achieve a CLSC. Suppliers could be considered the most important stakeholder, and the case study evidence how effectively the firm has integrated them, but it also indicates the key role of customers in ensuring that clothing products are returned into the loop for recycling, reuse and repair.

The NRBV provides three path-dependent strategies to guide a firm’s progress from pollution prevention to sustainability, and there is evidence of alignment between these strategies and the studied firm’s supply chain practices. However, the findings suggest that...
these strategies are not necessarily as sequential as indicated in the current model, and challenges the role and relevance of pollution prevention as an explicit stage in the CLSC. Pollution prevention, through its minimisation of waste and use of “green” production processes are a core component of the case study’s product stewardship approach, and the findings have also indicated that the CI resource associated with pollution prevention applies to all aspects of the firm’s CLSC. This therefore suggests that there are aspects of the three strategies that can develop concurrently and that pollution prevention is not necessarily the most appropriate starting point for developing a CLSC, as it is more reactive in nature and the extent of its impact on environmental sustainability is constrained:

**RQ2. How do supplier relationships and different resources contribute to the focal firm achieving a CLSC response?**

The presented findings illustrate the importance of strong, long-term, and trustful supplier relationships in achieving sustainability principles and commitments, as articulated in the reviewed literature (Ostlin et al., 2008). A collaborative rather than the more transactional approach typically associated with clothing supply chains means that different supply chain stages are coordinated efficiently and effectively, and appropriate environmental practices developed and implemented. Information, tacit skills, expertise and understanding are also shared, contributing to the firm’s strategic resources, and the trust and shared principles with suppliers translates into flexibility and reciprocity that supports their commitment to CI in all aspects, and the ability to dynamically evolve the supply chain. These relationships, in turn, contribute to the socially complex resources that a firm can harness in its supply chain, and provide the sustainable competitive advantage advocated by the NRBV.

Table IV summarises the firm’s physical, tacit and socially complex resources, resources that have enabled the firm to be proactive and value seeking in its supply chain decisions. These resources have been integral to its product stewardship philosophy, initially in enabling the right materials, products and processes to be developed, and then ensuring that tacit skills and expertise can develop overtime and that a sustainability culture and strategy is embedded in the CLSC. Further emphasising the importance of the design function for CLSCs, the firm has been involved in product development from the start, and this has evolved into the creation of proprietary performance fabrics. This control of a key supply chain stage develops strategic resources; the fabrics they have developed are core to their brand and product performance, and difficult for competitors to replicate, while the Merino-quality wool collaboration represents a very rare, valuable and inimitable resource. This is due to the limited availability of the material, but also the more tacit shared skills, vision and commitment of the supply partner.

The firm currently has control of 95 per cent of their textiles, garment development and manufacturing. This level of control and visibility has enabled them to ask important questions in line with their points of commitment, and illuminate all areas of the supply chain. Its strong, trustful, collaborative and often personal supplier relationships allow them to track their tangible environmental achievements and share information and visibility of

<table>
<thead>
<tr>
<th>Physical resources</th>
<th>Tacit resources</th>
<th>Socially complex resources</th>
</tr>
</thead>
<tbody>
<tr>
<td>Raw materials</td>
<td>Skills and expertise</td>
<td>Personal relationships/friendship</td>
</tr>
<tr>
<td>Own performance fabrics</td>
<td>Brand identity/story/loyalty</td>
<td>Shared vision and principles</td>
</tr>
<tr>
<td>Innovative developments</td>
<td>Principles</td>
<td>Trust and commitment</td>
</tr>
<tr>
<td>Product longevity</td>
<td>Reputation</td>
<td>Supply chain culture</td>
</tr>
<tr>
<td>Product recycling and repair</td>
<td>Firm culture</td>
<td></td>
</tr>
</tbody>
</table>

**Table IV.** Case study firm’s strategic resources
the whole supply chain with its customers; as the findings have illustrated these represent key stakeholders and should be integrated into the CLSC. The studied firm does have strong connections with its customer base, but could more fully harness them to achieve the same level of control it has within the design and manufacturing functions, and therefore ensure a reliable and manageable flow of returned products. This could be achieved by developing their business model to become a service rather than product provider, engaging in contractual relationships with their customers that would require on-going monitoring and modification of the product (Sundin and Bras, 2005).

Shared environmental principles between firm and supplier, and also customers, make product stewardship possible in the immediate term, but more importantly it is this strong foundation and the relationships that evolve as a result that enable them to progress further; the extent to which a shared vision and commitment becomes embedded over time ensures that a sustainability strategy and fully coordinated CLSC can be achieved.

Conclusion, limitations and future research
This paper builds on CLSC research that is taking a more integrated approach to understanding environmental principles, value creation and relationships in global supply chains (Miemczyk et al., 2016), and applies an NRBV framework to the UK clothing industry where environmental sustainability is of critical importance. CLSCs are recognised as a significantly important mechanism to address environmental sustainability (Crandall, 2006), but have not been broadly researched or developed to date (Kumar and Putnam, 2008). There is an acknowledged need for practitioner tools in the field (Das and Posinasetti, 2015), and the global and complex nature of the clothing industry strongly reflects the key challenges of CLSC implementation. The “greening” of products and processes is a dominant metaphor in current research and practice (Vachon and Klassen, 2006), but this focus on pollution prevention limits the CLSC response, and lacks the embeddedness required for achieving a sustainability strategy. Pollution prevention is a reactive approach to environmental sustainability, but the case study has shown that it does not have to be the initial response to environmental sustainability, and more importantly that CLSCs are not just the tangible implementation of environmentally responsible practices.

The paper illustrates the applicability of the NRBV framework for developing CLSC research from this dominant practice-based response to a much-needed holistic perspective, that more fully integrates environmental and social considerations in the supply chain (Ashby et al, 2012), and highlights the role of tacit resources, shared principles/visions, and socially complex relationships in enabling sustainability principles to be embedded. As demonstrated by the studied firm this embeddedness and a long-term, perspective means the environment is incorporated into every supply chain stage, from design to disposal, and enables the most appropriate CLSC decisions to be made. The findings evidence that the CLSC requires strong environmental foundations, but that it is also a dynamic and evolving entity; the longitudinal analysis revealed the firm’s progressive change from its Japan polyester supplier to one in Europe, and how its embedded and shared principles minimised its impact on the supply chain.

The findings indicated a need to extend the CLSC model to explicitly integrate the design function and the end customer, as these will ensure that appropriate environmental activities can be implemented effectively. The studied firm’s strong and committed focus on product design and performance provides practitioners with a more appropriate starting point for the CLSC, as it ensures that the environment is “built in” to the product and subsequent supply chain stages, rather than just implementing pollution prevention activities. This product stewardship approach ensures that practitioners recognise the importance of integrating key stakeholders in the CLSC, and how these relationships can develop to help minimise the environmental burden of the supply chain. The case study
illustrates that it is more straightforward to take control of the design function, but that a successful strategy will rely on developing connections with the end customer. A strong brand, product identity and shared principles will form the foundation of these connections, and could enable more functional sales mechanisms such as a customer contract based on service (Sundin and Bras, 2005). This would enable the focal firm to monitor and develop product performance and ensure the maximum possible return of products.

The path-dependent process proposed by the NRBV, while aligned to the CLSC model is not necessarily the most effective approach, and for researchers this offers the opportunity to develop the NRBV framework further within the CLSC field, and in multi-disciplinary and integrative methodological directions (Ashby et al., 2012). Conceptually this requires a less linear framework where pollution prevention is not considered strategic, as in the NRBV, but rather the operational norm. This would remove the cost dimension, recognised as skewing sustainability responses (Seuring, 2008), and emphasise tacit and socially complex resources. Strategies would then evolve from strong organisational principles rather than progression along a specific path, providing an individualised, embedded and proactive response to environmental sustainability. There is therefore a need to apply multiple theoretical lenses that can fully capture the organisational, intangible resources and relational aspects of this framework; institutional, (social) network, stakeholder and social capital theories offer this potential, but while employed in sustainability research they are typically used independent of each other.

The limitations of the paper are through its focus on a single case study, albeit one that has strong environmental principles that have driven its commitment to and development of a CLSC. The findings offer unique insights into the successful implementation of a CLSC, and the role played by strategic resources and stakeholder relationships, but they are not representative of the average clothing firm and therefore not generalisable to the clothing industry as a whole. There is therefore a need for multiple case studies of firms in the process of developing a CLSC to address environmental sustainability; to improve the generalisability of the findings CLSC practice in other firms and industries should be evaluated against the NRBV to develop a more dynamically interactive model than is currently presented.

References


Developing CLSCs
Further reading


## Appendix 1

<table>
<thead>
<tr>
<th>Context area</th>
<th>Level</th>
<th>Questions</th>
<th>Field procedures/sources of information</th>
</tr>
</thead>
<tbody>
<tr>
<td>Company ethos</td>
<td>Organisation</td>
<td>What is your background? (each interviewee)</td>
<td>Interviews</td>
</tr>
<tr>
<td></td>
<td></td>
<td>What are the firm’s sustainability principles?</td>
<td>Company literature</td>
</tr>
<tr>
<td></td>
<td></td>
<td>How are these communicated?</td>
<td></td>
</tr>
<tr>
<td>Design</td>
<td>Product</td>
<td>Who is involved with the design of your products and why?</td>
<td>Interviews</td>
</tr>
<tr>
<td></td>
<td></td>
<td>How are design requirements communicated to the supply chain?</td>
<td>Product specs/brochures</td>
</tr>
<tr>
<td>Raw materials</td>
<td>Product</td>
<td>What raw materials do you use and why?</td>
<td>Interviews</td>
</tr>
<tr>
<td>Supplier relationships</td>
<td>Organisation/suppliers</td>
<td>How do you manage your supplier relationships?</td>
<td>Interviews with firm and its suppliers where feasible</td>
</tr>
<tr>
<td></td>
<td></td>
<td>How long have you been working with each supplier?</td>
<td></td>
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<tr>
<td></td>
<td></td>
<td>Do you have policies/codes of practice in place with your suppliers and if so how do you ensure they are achieved?</td>
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<tr>
<td></td>
<td></td>
<td>How important are your supply chain relationships to achieving your business and sustainability goals?</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>How frequently do you change or source new suppliers?</td>
<td></td>
</tr>
<tr>
<td>Communication</td>
<td>Organisation/suppliers</td>
<td>How do you communicate with your suppliers?</td>
<td>Interviews</td>
</tr>
<tr>
<td></td>
<td></td>
<td>How frequently?</td>
<td>Marketing material</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Who has direct communication with your suppliers and why?</td>
<td>Direct observation</td>
</tr>
<tr>
<td>Decision making</td>
<td>Organisation</td>
<td>Who is involved in business decisions and why?</td>
<td>Interviews</td>
</tr>
<tr>
<td></td>
<td></td>
<td>How do you align your decisions with your firm ethos/principles?</td>
<td></td>
</tr>
<tr>
<td>End of life</td>
<td>Process</td>
<td>Do you have any mechanisms to allow customers to return products to you for repair/reuse/recycling?</td>
<td>Interviews</td>
</tr>
<tr>
<td>Company performance</td>
<td>Organisation</td>
<td>How many staff do you employ?</td>
<td>Annual reports/financial data</td>
</tr>
<tr>
<td></td>
<td></td>
<td>What is your annual turnover?</td>
<td></td>
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<tr>
<td></td>
<td></td>
<td>Are you profitable?</td>
<td></td>
</tr>
</tbody>
</table>

Table AI. Interview protocol
Appendix 2

Cross-interview themes

<table>
<thead>
<tr>
<th>SME characteristics</th>
<th>Home-originated business</th>
</tr>
</thead>
<tbody>
<tr>
<td>Supply chain practice</td>
<td>High eco literacy</td>
</tr>
<tr>
<td></td>
<td>SCM understanding</td>
</tr>
<tr>
<td></td>
<td>High levels of measurement (2)</td>
</tr>
<tr>
<td>Supply chain configuration</td>
<td>Unique processes</td>
</tr>
<tr>
<td></td>
<td>European manufacturing</td>
</tr>
<tr>
<td></td>
<td>Creation of new industry/supply chain</td>
</tr>
<tr>
<td></td>
<td>UK produced, processed and manufactured (1)</td>
</tr>
<tr>
<td></td>
<td>Local not necessarily ethical (1)</td>
</tr>
<tr>
<td>Supply chain relationships</td>
<td>Personal relationships</td>
</tr>
<tr>
<td></td>
<td>Trust and transparency</td>
</tr>
<tr>
<td></td>
<td>Innovation, adaptability, evolution</td>
</tr>
<tr>
<td></td>
<td>Posterity and heritage (1)</td>
</tr>
<tr>
<td>Supply chain boundaries</td>
<td>Product lifecycle</td>
</tr>
<tr>
<td></td>
<td>Closed loops (2)</td>
</tr>
<tr>
<td>Product</td>
<td>Longevity</td>
</tr>
<tr>
<td></td>
<td>Functionality</td>
</tr>
<tr>
<td>Principles</td>
<td>Customer informs product development</td>
</tr>
<tr>
<td></td>
<td>Integrity and honesty</td>
</tr>
<tr>
<td></td>
<td>Product, planet, people</td>
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<tr>
<td></td>
<td>Telling a story</td>
</tr>
<tr>
<td></td>
<td>No compromise on quality (1)</td>
</tr>
<tr>
<td></td>
<td>Cannot hurry nature (1)</td>
</tr>
<tr>
<td></td>
<td>Preservation (1)</td>
</tr>
<tr>
<td>Financial/operational</td>
<td>Commerciality</td>
</tr>
<tr>
<td></td>
<td>Buyer priorities – price over expertise (2)</td>
</tr>
<tr>
<td></td>
<td>High street uncaring and unaware (2)</td>
</tr>
<tr>
<td>Social responsibility</td>
<td>Local charity</td>
</tr>
<tr>
<td></td>
<td>Local community</td>
</tr>
<tr>
<td></td>
<td>Textile brotherhood (1)</td>
</tr>
</tbody>
</table>

Table AII. Themes from analysis and coding process

Notes: 1 = UK supplier; 2 = Japan supplier

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Volume 29 Number 4 2018

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Guest Editors: Levente Szász, Krisztina Demeter and Harry Boer

629 Editorial board
630 Guest editorial
637 Manufacturing relocation through offshoring and backshoring: the case of Sweden
Malin Johansson and Jan Olhager
658 Backshoring of production in the context of a small and open Nordic economy
Jussi Heikkilä, Miia Martinsuo and Sanna Nenonen
676 Managing reversed (global) outsourcing – the role of knowledge, technology
and time
Bella Belerivana Nujen, Lise Lillebrygfield Halse, Rickard Damm and Hallgeir Gammelsæter
699 Developing closed loop supply chains for environmental sustainability: insights from
a UK clothing case study
Alison Ashby


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