

Measuring Reshoring Trends in the EU and the US

Authors

Steffen Kinkel

Rahimaniah Titis Dewanti

Peter Zimmermann

Rosemary Coates



The Reshoring Institute is a contributing member of Makers Europe

MAKERS

Deliverable 4.1

Measuring reshoring trends in the EU and the US

Task 4.2 Conceptualise drivers and dynamics of reshoring and onshoring trends

Task 4.3 Explore EUROSTAT and national databases to map reshoring and onshoring trends

Coordinated by Karlsruhe University of Applied Sciences

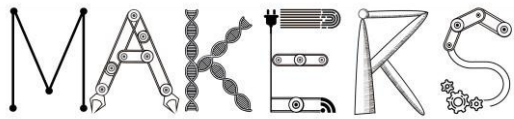
Authors:

Steffen Kinkel, ILIN Institute for Learning and Innovation in Networks, Karlsruhe University of Applied Sciences, steffen.kinkel@hs-karlsruhe.de

Rahimaniah Titis Dewanti, ILIN Institute for Learning and Innovation in Networks, Karlsruhe University of Applied Sciences, rahimaniah_titis.dewanti@hs-karlsruhe.de

Peter Zimmermann, ILIN Institute for Learning and Innovation in Networks, Karlsruhe University of Applied Sciences, peter.zimmermann@hs-karlsruhe.de

Rosemary Coates, Reshoring Institutes, University of San Diego, US, RCoates@ReshoringInstitute.org



List of Contents

1. Introduction: Paper content and structure	2
2. Definition of reshoring and some theory	2
3. Surveying reshoring in the EU.....	5
3.1 Eurostat survey data on international sourcing.....	5
3.2 Survey results across several EU member states	12
3.3 Survey results on single country level	17
3.4 Comparison and discussion of survey results and approaches	22
4. Measuring the interrelation between reshoring and the use of Industry 4.0 technologies	24
5. Measuring reshoring in the US	27
5.1 Data of the Reshoring Initiative	29
5.2 Data of the Reshoring Institute	32
5.3 Conclusions on US reshoring and comparison with EU patterns	35
6. Measuring Reshoring with Trade data and Input-Output-Tables.....	36
6.1 Trade data	36
6.2 Input-Output-Tables.....	38
7. MAKERS conclusions and avenues for further research.....	43
8. References.....	49

1. INTRODUCTION: PAPER CONTENT AND STRUCTURE

Policy makers and academics are increasingly aware of the so called reshoring or backshoring of once offshored manufacturing capacities back to the home country (Kinkel, 2012). The current debate on re-industrialisation (Pisano and Shih, 2009, 2012) in the US and Europe is to some extent based on expectations that reshoring activities of manufacturing companies might help to restore industrial competitiveness in high-wage countries. It is fuelled by the assumption that cost advantages of important low-wage countries, in particular China, may be gradually eroded by higher wage increases in the next five to ten years (BCG 2011). Other reasons for back-shoring operations stem from lack of knowledge about the foreign destination and from lack of systematic location planning (Kinkel, 2012; Kinkel and Maloca 2009). However, empirical evidence on reshoring and foreign divestments is relatively scarce and calls for more knowledge about its drivers, effects, and about its likely evolution (Fratocchi et al., 2016, 2014; Kinkel, 2014).

In this paper, we first define reshoring and its different forms and describe it briefly from the lenses of the most relevant theories (section 2). In the following, we analyse and compare different surveys that measure reshoring activities in the EU and single European countries (section 3) and outline some evidence how reshoring relates to the use of Industry 4.0 technologies in manufacturing (section 4). In section 5 we analyse existing approaches that measure reshoring activities in the US and compare the results with European evidence. Section 6 looks at trade data and Input-Output-Tables as suitable approaches to measure offshoring and reshoring tendencies. Finally, we draw conclusions on the reshoring evidence in Europe and the US and the potentials and limitations of the existing approaches to measure the reshoring phenomenon (section 7).

2. DEFINITION OF RESHORING AND SOME THEORY

Reshoring or backshoring is the decision to relocate manufacturing activities back to the home country of the parent company (Kinkel & Maloca, 2009; Arlbjørn & Mikkelsen, 2014; Fratocchi et al., 2014; Foerstl et al., 2016). Reshoring or backshoring can originate from and be relocated to wholly owned production sites of the company (captive mode) as well as from foreign suppliers or to home-based suppliers (outsourced mode), thus covering different ownership modes of manufacturing in the offshore and home country. In this context, Gray et al. (2013) distinguish four different reshoring options (see Figure 1): (a) in-house reshoring, when a company is relocating manufacturing activities being performed in wholly owned offshore facilities back to wholly owned facilities in the home country; (b) reshoring for outsourcing, when a company is relocating manufacturing activities being performed in wholly owned offshore facilities back to home-based suppliers; (c) reshoring for insourcing,

when a company is relocating manufacturing activities being performed by offshore suppliers back to wholly owned facilities in the home country; and (d) outsourced reshoring, when a company is relocating manufacturing activities being performed by offshore suppliers back to home-based suppliers. The authors characterize all these different options basically as location decisions.

Figure 1: Reshoring options

		To: Onshore	
		In-House	Outsourced
From: Offshore	In-House	In-House Reshoring	Reshoring for Outsourcing
	Outsourced	Reshoring for Insourcing	Outsourced Reshoring

Source: Gray et al. (2013)

There is no explicit theory of reshoring or backshoring. The literature explains reshoring in the framework of existing theories of the multinational firm, as a reverse or subsequent decision of a previous offshoring decision (Bals, et al., 2013; Ellram et al., 2013; Gray et al., 2013; Tate, 2014; Foerstl et al., 2016). To put it simply, reshoring takes place when the trade-offs between cost advantages, market and knowledge seeking, transaction costs and maintaining control are not advantageous for the firm anymore.

Through the lens of *internalisation theory* (Buckley and Casson, 1976; Casson, 2013; Rugman, 2010) and Dunning's "eclectic paradigm" (Dunning, 1980, 1988), reshoring is a result of changes in the ownership, location and/or internalization advantages from international production, or a consequence of a wrong assessment of these advantages (Ellram et al., 2013, Fratocchi et al., 2016). International expansion of multinational firms was fueled by labor arbitrage, a substantial lowering of import barriers for intermediate goods, lower cost of cargo transport, and the rapid development of ICTs which supported transborder communication and coordination (Dicken, 2014). Factors that contributed to a wrong assessment of location, internalization or ownership advantages include rising labor costs in foreign locations and narrowing wage differentials, transport costs and long lead-times in transport, currency fluctuations, the cost for obsolete materials ordered according to a long-term and incorrect forecast, unforeseen coordination cost such as additional travelling expenses, or a loss of intellectual property to foreign competitors or suppliers (Handfield, 1994; Kinkel & Maloca, 2009; Holweg et al., 2011; Nassimbeni,

2006). Case studies have shown that some managers have offshored manufacturing activities based on simple comparisons of easily measurable costs, in particular labor costs (Kinkel & Maloca, 2009).

The *resource-based view* (RBV) of the firm (Wernerfelt, 1984; Prahalad & Hamel, 1990) can also be applied to explain reshoring strategies. Firms can develop organisational processes and routines that cannot be acquired over markets, enabling them to use resources and develop capabilities more efficiently and effectively (Barney, 1991; Teece et al., 1997, 2002). Reshoring decisions thus may result from the limited abilities of companies to sufficiently develop and maintain such critical capabilities in foreign locations, or to exploit the host country's resources in order to create competitive advantage for the multinational company as a whole (Canham & Hamilton, 2013). Here, advanced production technologies also come into play. Some organisations are able to adopt manufacturing processes to develop unique and barely imitable competences at specific locations and to exploit these resources in a specific and more effective way (Broedner et al., 2009; Grant, 1991).

Transaction cost theory (TCT) can also help to understand reshoring. High and growing transaction and coordination costs can be strong arguments for re-concentrating manufacturing activities via reshoring. TCT points to various reasons for a wrong assessment of the 'hidden' costs of offshoring. *Bounded rationality* and possible contingencies in transactions across companies and countries may lead to inaccuracy of the projected cost and performance of manufacturing offshoring decisions (Pisano, 1990; Pisano & Shih, 2009; Lewin et al., 2009; Cabral et al., 2013) to higher than expected costs, poorer than expected quality, and higher than expected efforts for the management of transborder activities (Fredriksson & Jonsson, 2009; Tate et al., 2009). Biases in decision making such as the "bandwagon effect" (Abrahamson & Rosenkopf, 1993), aiming at imitating competitor behavior and 'following the herd', can also be explained by bounded rationality (Barthélemy, 2003).

The *level of uncertainty* is also influencing companies' offshoring and reshoring decisions. Foerstl et al. (2016) differentiate between environmental uncertainty, supply chain complexity, and task uncertainty as possible drivers for reshoring decisions. *Environmental uncertainty* encompasses the perceived degree of volatility and unpredictability of a foreign market, including unforeseen cost increases, quality and flexibility issues, raw material shortages, or currency fluctuations (Ellram et al., 2013; Gray et al., 2013; Tate, 2014). *Supply chain complexity* includes vertical complexity, horizontal complexity, geographic dispersion and length of the supply chain (Choi & Hong, 2002). It can lead to excessive coordination and monitoring efforts, rising transportation cost or high amounts of working capital in safety stock (Lewin et al., 2009; Tate et al., 2011; Ritter & Sternfels, 2004). *Task uncertainty* is another factor influencing offshoring and reshoring decisions. Here, to some extent

uncertain potentials of technological innovations in manufacturing processes, e.g. by an intensified use of Industry 4.0, come also into play. A higher Industry 4.0 adoption might enable more flexible, autonomous and less labor intensive production modes, giving advantages to reshoring decisions over low-wage manufacturing activities (Handley & Benton Jr., 2013; Lasi et al., 2014). *Asset specificity* is also closely linked to the implementation of new product or production technologies, e.g. Industry 4.0 technologies. It involves specific durable investments such as technology or knowledge and skills that are required to realise efficient processes and transactions. A high degree of asset specificity appears to be most critical for the integration of manufacturing activities and their control under unified governance (Williamson, 1985), in particular in cases of high product or process complexity (McIvor, 2009). The higher and more specific investments in advanced production technology are, the higher the possibility to integrate the specific manufacturing operations at one focal plant, favoring rather reshoring than additional offshoring activities.

3. SURVEYING RESHORING IN THE EU

3.1 Eurostat survey data on international sourcing

Eurostat has twice collected international business function sourcing data. The two so-called “ad-hoc surveys” were carried out on a voluntary basis by the National Statistical Institutes (NSIs) of 12 European countries in 2007 and 15 countries in 2012. **The 2007 survey covers the period 2001–2006 (6 years), the 2012 survey the period 2009–2011 (3 years).** The international sourcing statistics cover NACE Rev.1.1 (Statistical Classification of Economic Activities in the European Community) sections C to I and K, that are basically non-financial market activities. The data refers to enterprises with 100 or more persons employed. The focus was on these larger enterprises, as these were considered to be the key drivers of international sourcing.

The 2007 international sourcing survey covers the following 11 countries: the Czech Republic, Denmark, Germany, Ireland, Italy, the Netherlands, Portugal, Slovenia, Finland, Sweden, and the United Kingdom.

The 2012 international sourcing survey covers the following 15 countries: Belgium, Bulgaria, Denmark, Estonia, Ireland, France, Latvia, Lithuania, the Netherlands, Portugal, Romania, Slovakia, Finland, Sweden, and Norway.

The surveys cover the following **business functions**:

- *Core business function*: Production of final goods or services intended for the market/for third parties carried out by the enterprise and yielding income.

- *Support business functions* that are carried out in order to permit or facilitate production of goods or services intended for the market/for third parties:
 - *Distribution and logistics*
 - *Marketing, sales and after sales services*
 - *ICT services*
 - *Administrative and management functions*
 - *Engineering and related technical services*, incl. technical testing and design
 - *Research & Development*

The number of participating enterprises per country for the two survey rounds is depicted in Table 1, also differentiating between all NACE sectors covered and the manufacturing industry. As shown, the data set of the 2012 survey round consists of around 40,000 enterprises (including 14,000 from the manufacturing industry) from the 15 participating countries, whereas the 2007 data set covers around 54,000 enterprises (including 25,000 from the manufacturing industry) from 11 participating countries. This is due to the fact that in the 2007 survey round some large EU countries participated that did not in the 2012 round (e.g. Germany, Italy, UK, Czech Republic), whereas in the 2012 survey round more smaller countries joined (e.g. Belgium, Bulgaria, Estonia, Latvia, Lithuania, Romania, Slovakia, Norway). The number of participating enterprises is rather stable and similar in the seven countries that participated in both survey rounds (Denmark, Ireland, the Netherlands, Portugal, Finland, Sweden, and Norway), in all NACE sectors as well as in manufacturing.

Table 1: Participating countries and enterprises in the two international sourcing survey rounds of 2012 and 2007

	2012 survey		2007 survey	
Country	Total (all NACE)	Manufacturing	Total (all NACE)	Manufacturing
Belgium	2,216	868		
Bulgaria	2,256	1,009		
Czech Republic			4,329	2,438
Denmark	1,244	411	1,385	589
Estonia	514	223		
Germany			19,080	9,685
Ireland	1,257	336	1,285	413
France	13,543	4,224		
Italy			9,538	4,836
Latvia	600	184		
Lithuania	945	333		
Netherlands	4,560	1,170	4,633	1,400
Portugal	2,496	960	2,540	1,142
Romania	4,445	2,021		
Slovenia			766	437
Slovakia	1,277	655		
Finland	1,198	472	1,270	575
Sweden	2,332	818	2,262	972
United Kingdom			7,174	2,288
Norway	1,431	351		
All countries	40,314	14,035	54,262	24,775

Source: Eurostat, own representation

The main results of the 2007 and 2012 surveys on international sourcing activities of European companies can be very shortly summarised as follows (Alajääskö, 2009; Rikama et al., 2013):

- The highest share of international sourcing is found in small, open economies with high labour costs. Denmark and Finland lead the field with 25% and 21% enterprises performing international sourcing (2009-2011). In the 2007 round, international sourcing was also common among Irish, UK, and Slovenian enterprises.
- Sourcing is mainly driven by manufacturing enterprises. In many countries, around two-thirds of all enterprises sourcing internationally are in the manufacturing sector.
- Enterprises are more frequently sourcing support functions internationally than core functions. Exceptions are France, Ireland, Italy, Sweden and the UK, where more core business than support functions are sourced. From 2009-2011, ICT is the support function that was most frequently outsourced internationally (before, it was 'distribution and logistics' and 'marketing and (after) sales'). Due to their

digital character, ICT services can be conducted relatively easily from any location. This trend is supported by the increase in the use of cloud computing.

- The number of enterprises sourcing knowledge intensive support functions is growing. Around 15% to 20% of enterprises carrying out international sourcing are moving R&D and engineering functions abroad. However, over half (53%) of the international sourcing of R&D and engineering functions is being moved to other EU Member States.
- Proximity is a major factor in sourcing, with domestic sourcing being more prominent than international sourcing and with international sourcing mainly taking place within Europe. Yet, China and India have both become important locations for business function outsourcing. China is strong in attracting core business functions in manufacturing, whereas India is strong in supplying support services globally.
- The main reason for enterprises to move functions abroad is to cut labour and other costs. This is particularly important for enterprises in high labour costs countries, such as the Nordic countries.
- Direct employment consequences are limited but their cumulative and indirect effects should not be underestimated.

Only the 2012 international sourcing survey round covers data on reshoring activities of European enterprises. They are differentiated in so called “backsourcing” and “international relocation” activities. In the respective questionnaire to the participating enterprises, they are defined as follows:

1. **International backsourcing** is the movement of functions by your enterprise back into your home country, which your enterprise has previously moved out of the country.
2. **International relocation** other than backsourcing is the movement of functions by your enterprise into your home country from abroad, which have been carried out for your enterprise abroad but have not previously been moved out of your home country by your enterprise.

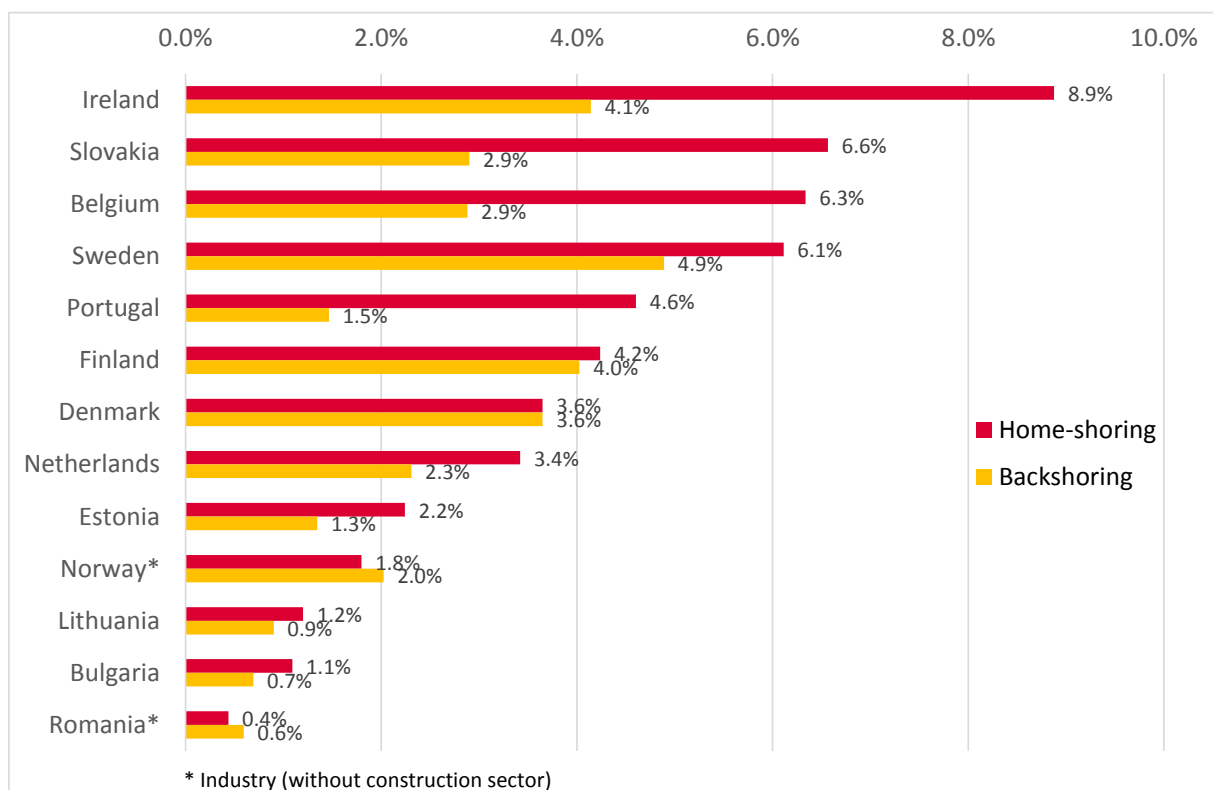
For both modes surveyed, the following additional clarification is made: “The functions have been moved from your affiliates abroad or from enterprises within or outside of your enterprise group abroad. They have been moved to your enterprise or to enterprises within or outside of your enterprise group in in your home country.”

Consequently, **both modes** can be understood as **reshoring activities** and cover all four fields of Gray’s taxonomy displayed in Figure 1 (in-house reshoring, reshoring for outsourcing, reshoring for insourcing, outsourced reshoring). They differ by the fact that in the first mode the respective enterprise has offshored (or outsourced) the activity out of the home country itself, whereas in second mode the activity has been

performed abroad without being offshored (or outsourced) by the enterprise itself before. Therefore, “international backshoring” can also be characterized as “backshoring” and international relocation as “home-shoring”, as described in the MAKERS deliverable 4.2 (Pegoraro et al., 2017).

In Figure 2, the results on home-shoring and backshoring activities of enterprises from the manufacturing industry are displayed. The highest share of home-shoring is found in Ireland, where almost 9% of manufacturing enterprises were performing home-shoring activities between 2009 and 2011. Home-shoring is also above-average in Slovakia, Belgium and Sweden, with shares of 65 to 7% of all manufacturing enterprises. Backshoring is particularly frequent in Sweden, Ireland, Finland and Denmark, with shares of between 3.5% and 5% of manufacturing enterprises being active. Low shares are displayed for Romania, Bulgaria and Lithuania, which are clearly below average in home-shoring and backshoring activities of manufacturing enterprises.

Figure 2: Share of enterprises (manufacturing industry) that home-shored or backshored activities in 2009-2011 (%)



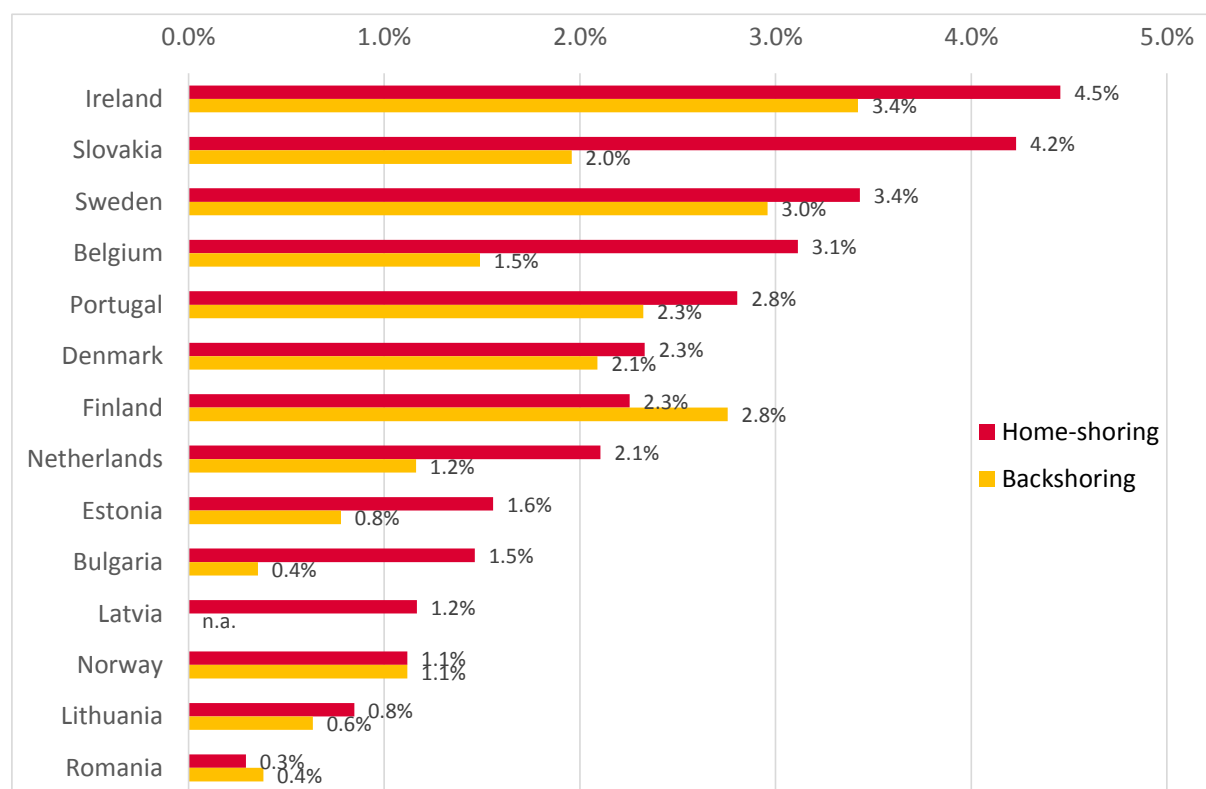
Source: Eurostat, own calculations and representation

Figure 3 displays the home-shoring and backshoring activities of enterprises from all NACE sectors covered. Again, Ireland shows the highest share of home-shoring enterprises at all enterprises (4.5%), followed by Slovakia, Sweden and Belgium.

Backshoring shares are highest in Ireland, Sweden and Finland with around 3% to 3.5% of all enterprises performing such activities. Also, the countries with low home-shoring and backshoring shares are for all sectors similar to the manufacturing sector, in particular Romania and Lithuania.

Overall, reshoring (i.e. home-shoring and backshoring) activities have been in particular performed by enterprises from small, open economies with high labour costs – as also international sourcing activities (Rikama et al., 2013). Furthermore, reshoring levels in the manufacturing industry are higher than in the other NACE sectors covered, as it is also the case in international sourcing activities. This shows that reshoring activities are closely related to international sourcing and offshoring activities, as reshoring can only take place from where previous activities have been set up.

Figure 3: Share of enterprises (total NACE) that home-shored or backshored activities in 2009-2011 (%)



Source: Eurostat, own calculations and representation

Against this background it is remarkable that home-shoring levels are higher than backshoring levels over all covered countries, meaning that in most cases the foreign functions have not been moved out of the home country (offshored or outsourced) by the respective enterprise itself. Here, two different ways are possible:

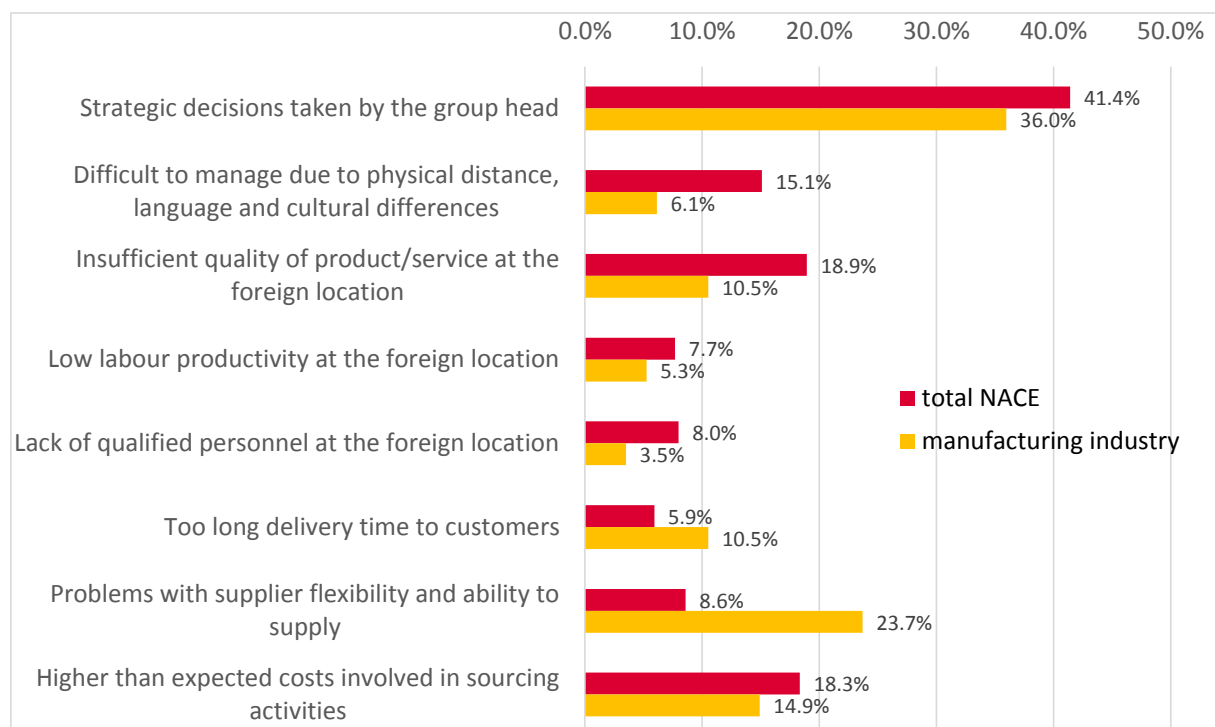
1. The enterprise has built up additional capacities or acquired (parts of) a company in some foreign country, without moving existing activities from the home country there, and home-shored (some of) these capacities at a later time.
2. The enterprise is part (subsidiary) of a foreign parent company and reshored some activities from other countries (maybe also the home country of the parent company) to the country where the enterprise (subsidiary) has its seat.

The first option is assumed to be the more frequent one and seems to be a common path of reshoring. Thus, it needs to be taken into account that reshoring activities do not necessarily follow an own previous offshoring or outsourcing activity of the respective enterprise, but also expansion capacities can be reshored at a later time.

Motivation factors for backshoring activities

The Eurostat survey on international sourcing also covers some motivational factors for backshoring. However, motivations for home-shoring are not covered, so the motivational factors are only related to the backshoring mode.

Figure 4: Motivation factors for backshoring (2009-2011)



Source: Eurostat, own calculations and representation

As shown in Figure 4, the most frequent motive is strategic decisions that are taken by the group head of the enterprise, named by around 40% of the backshoring enterprises. It is followed by insufficient quality at the foreign location and higher than

expected costs involved in sourcing activities, named by 18% to 19% of the backshoring enterprises. In the manufacturing industry, in particular problems with supplier flexibility and ability supply with 24% and long delivery time to customers with 11% seem to be significantly more important than in total NACE businesses. Vice versa, insufficient quality and difficult to manage distances and cultural differences are more important for other businesses than the manufacturing industry.

A further differentiation of the most important motives by the participating countries is difficult, as numbers off backshoring enterprises are rather small and statistical evidence does remain limited. Overall, the most striking result is the dominant importance of strategic group head decisions for backshoring activities. Here, one major **limitation** of the Eurostat survey 2012 comes into play, as it mainly covers small European countries. In such small countries, subsidiaries of companies from larger foreign countries play a more important role for the overall economy than in larger countries like Germany, France or the UK. It can be assumed that in those large EU countries the population of national enterprises is higher and thus strategic group head decisions might play a more limited role than in the covered small economies. This needs to be taken into account when interpreting the results on reshoring activities from the Eurostat survey.

Overall, the **main limitations** if the Eurostat survey(s) on international sourcing regarding the analysis of reshoring activities in Europe are:

- The previously mentioned lack of large countries in the survey round 2012, which limits the results basically to small European economies,
- the lack of comparability to the survey round of 2007, as reshoring (i.e. backshoring and home-shoring) has only been surveyed in 2012 and only seven smaller countries have participated in both survey rounds (Denmark, Ireland, the Netherlands, Portugal, Finland, Sweden, and Norway),
- no differentiation of reshoring activities in core and support business functions is possible in the dataset provided by Eurostat, due to the low number of answering reshoring companies in the participating countries.

3.2 Survey results across several EU member states

Most of the research on reshoring is still based on case studies or individual reshoring decisions announced in the media. Some studies have been based on secondary data collected from media reports on individual companies' reshoring decisions, coupled with additional information (e.g. annual reports, balance sheets, websites) on the respective companies (OECD, 2015; Uni-CLUB MoRe reshoring dataset). However, "quantitative evidence on reshoring is still fragmented and often of anecdotal nature" (OECD, 2015, p. 10). This makes it difficult to assess the

magnitude of the phenomenon and analyse the main drivers and characteristics of the underlying processes (Frattochi et al., 2014; Kinkel, 2014).

The OECD claims in its 2015 position paper that reshoring is a sensitive activity that companies prefer not to disclose in great detail, as offshoring also is. But companies might not be so cautious to speak publicly about reshoring, as they might create rather positive publicity compared to offshoring, which is often loaded with political pressures (OECD, 2015). However, from their longtime experience in researching the phenomenon of reshoring, the authors of this report have evidence that there is also a substantial downward bias in reporting on reshoring decisions, maybe even larger than in offshoring decisions, as companies really do not want to talk about changes in their internationalization strategies and the potential errors or misjudgements that caused the strategy change (Kinkel and Maloca, 2009).

Dachs and Zanker (2014) present recent results on European companies' backshoring activities based on data from the European manufacturing survey (EMS)¹. The data covers the period between 2010 and mid-2012 for 11 available countries (Austria, Switzerland, Germany, Denmark, Spain, France, Hungary, Portugal, Netherlands, Sweden and Slovenia). It shows that **around 4% of all companies in the survey sample have moved production activities to their home country**. In the same time period, there are more than three offshoring companies for every backshoring company.

Backshoring is most frequent among medium-sized companies. The propensity for backshoring is below 1.5% in small companies with less than 50 employees, increases to 9% in companies with 150–249 employees and decreases to around 7% for companies with 250 and more employees. In a sectoral perspective, the share of backshoring companies is lowest in low-technology industries such as the manufacturing of clothing, food and beverages, wood products, glass or bricks. Advantages of offshoring locations seem to be largest in these sectors. In contrast, backshoring is most frequent in high-technology industries. Here, the electrical equipment and computer industry stand out.

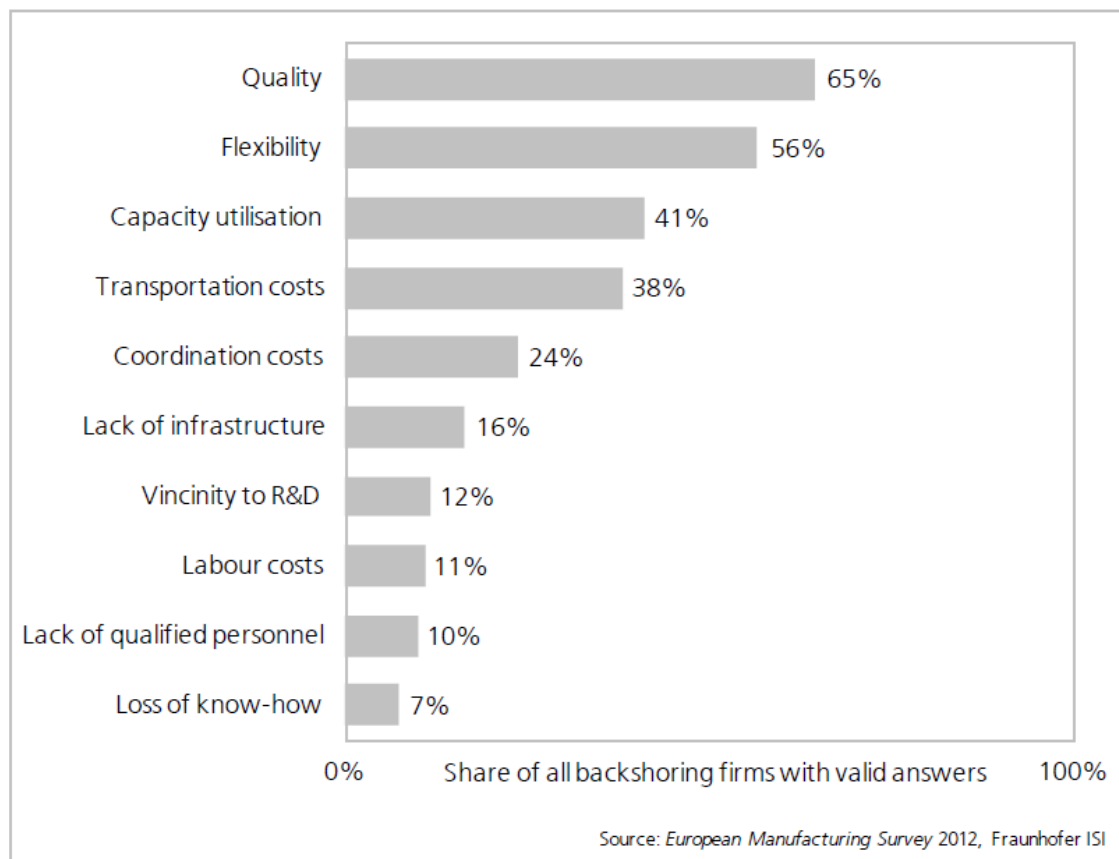
Other EU countries (Western as well as Eastern Europe) represent almost two-thirds of the **source countries for backshoring** by EU companies. In particular China and India have become more important as source countries for backshoring over time,

¹ The European Manufacturing Survey investigates technological and non-technological innovation in European industry. In contrast to the Community Innovation Survey, it is more focused on technology diffusion and organisational innovation (including offshoring, outsourcing, and reshoring). The survey is organised by a consortium of research institutes and universities, coordinated by the Fraunhofer Institute for Systems and Innovation Research ISI, and takes place every three years. More than 3,500 firms in 13 EU countries participated in the last available survey in 2012.

accounting for more than 20% of all backshoring activities. This follows the increased offshoring by EU companies to these countries in the years before.

The **most important reasons for backshoring** are quality issues, reported by almost two thirds of the surveyed companies, and the loss of flexibility, to respond quickly to dynamic changes in market demand or needs of customers, for more than half of the backshoring companies (see Figure 5). Innovation related factors like the loss of know-how or the vicinity of production to R&D are less important for the backshoring activities of EU companies, as also rising labour costs or lack of qualified personnel in the foreign target countries.

Figure 5: Reasons for the backshoring of production activities, 2010 – Mid-2012



The study concludes that from today's perspective, given that there are three offshoring companies for every backshoring company, it seems unlikely that backshoring will be a main driver of a 'manufacturing renaissance' in Europe (Dachs and Zanker, 2014). As the backshoring propensity is highest in high-technology industries such as electrical equipment or computers and industries with strong supplier relations like the automotive industry, this may suggest that Europe's competitive advantages as an industrial location lies in these industries. EU countries may be able to gain future backshoring momentum by increasing efforts in training,

innovation, and new production processes, as e.g. Industry 4.0, to be able to further increase production flexibility and quality, which proved to be the main drivers of backshoring activities of European manufacturing companies.

Fratocchi et al. (2016) provide evidence on motivations of manufacturing reshoring, based on a sample of 377 reshoring cases belonging to 322 companies. US and EU companies are almost equally represented in the sample (47% and 51%). Data were collected by the *Uni-CLUB MoRe Reshoring Research Group*² from 2011 to the beginning of 2014 through a keyword search in secondary data of the major international and national business-related newspapers, magazines and reports (e.g., Wall Street Journal, Financial Times, The Economist, Time, Bloomberg, Business Week, Spiegel online, and Il Sole 24 Ore), white papers of major consulting companies (e.g. Boston Consulting Group, McKinsey, Accenture and internet search. With respect to US companies, data collected by the Reshoring Initiative (www.reshorennow.org) was also integrated. Results show that 59% of the **reshoring activities originate** from China and 13% from other Asian countries, 12% from Eastern European countries, 8% from Western European countries, and 5% from Central and South America. China as a source country of reshoring is much more important for US companies (75%) than for EU companies (44%), whereas Eastern Europe and Western Europe are mainly relevant for EU companies (23% and 13%) and almost negligible for US companies (0.5% and 3%). The most frequently mentioned **reshoring motivations** were logistics costs (22%), delivery time (18%), labor cost gap reduction (18%), Made in effect (18%), poor quality of offshored production (17%), and total costs of sourcing (11%). All other of the identified 26 distinct reshoring motivations were mentioned in less than 10% of the reshoring cases. On the other hand, some factors as e.g. the loss of know-how in the host country or other manufacturing costs as e.g. energy costs seem to be less relevant than in the related literature. Overall, factors of the external environment (in 70% of the cases) appeared to be more relevant for reshoring decisions than internal factors (44%). The authors conclude that both efficiency-driven as well as customer value-driven motivations for reshoring are important and should be integrated into sustainable ex ante evaluation schemes for offshoring initiatives.

An empirical study by Ancarani et al. (2015) provides evidence on reshoring activities and the duration of prior foreign manufacturing ventures. The analysis is also based on secondary data from the *Uni Club MoRe*, covering 249 reshoring cases from 2011 to the beginning of 2014. The database consists of 131 US and 109 EU cases. 90% of the US cases were **reshoring from Asia**, compared to 61% of the EU cases, whereas 26% of the EU cases moved back from Eastern Europe, which was no

² The Uni-CLUB MoRe Reshoring Research Group is a team of management engineering scholars with an active interest in tracking reshoring activities belonging to four Italian universities (Bologna, Catania, L'Aquila, Udine). The group was established in 2009.

factor for US reshoring at all. Total costs were the most important **reshoring motivation** for both US (38%) and EU (36%) reshoring companies. Also quality issues were similarly important for both US (21%) and EU (17%) companies. However, delivery delays (21% vs. 12%) and proximity to customers (13% vs. 2%) were significantly more important for US companies, whereas the Made-in effect was a motivation especially for EU companies (13% vs. 20%). Regarding the **duration of the prior offshore experience**, the paper shows that 75% of the companies have reshored within 10 years when performing an offshore outsourcing mode, whereas this drops to about 50% for firms with a captive offshoring strategy. In more detail, the results show that

- companies from the electronics and automotive sectors return earlier than other industries, as they are characterised by high product specialisation and customization, high levels of outsourcing and strong final producers (OEMs),
- small and medium sized enterprises (SMEs) return earlier than large firms, as they are more prone to strategic mistakes in the ex-ante evaluation of offshore initiatives (Kinkel and Maloca, 2009) and exhibit higher vulnerability to environmental changes, due to shortages of internal resources (information, capital, managerial experience),
- the duration of offshore ventures in China and other Asian countries is significantly lower than in other countries, due to the rapid deterioration of locational cost advantages over the past years, and due to cultural differences in language, business approaches, political systems, or the coordination of work,
- quality issues significantly decreases the duration abroad, as strategic assets seeking is becoming key in explaining relocations,
- reshoring due to “made-in” motivations is also associated with shorter durations offshore, but only for EU companies, which overall exhibit a shorter offshore duration than US companies.

Ancarani et al. (2017) provide more recent evidence from the *European Monitor of Reshoring (EMR)*, a collaboration between EU Eurofound and a Consortium of Italian Universities (Bologna, Catania, L'Aquila, and Udine) in order to identify and analyse evidence on reshoring to the EU. It uses secondary sources, mainly based on a broad media screening of more than 7,500 press releases, major daily newspapers, local papers, trade journals, broadcaster websites, news agencies, etc., employing a structured keyword search. The screening started in January 2016 and covered 93 backshoring cases until May 2017. UK, Italy and France account for 66% of the collected cases, whereas Germany and Spain each represent only 5% of the sample. The **main source countries** of backshoring activities were by far Western European countries (36%) and China (34%), followed clearly behind by Eastern European countries (10%), India (7%) and the USA (6%). The high proportion of reshoring from

Western Europe seems to be motivated by exploitation of untapped capacity at home or reorganisation of home-based production sites. The **main motivations for backshoring** are related to business restructuring, that includes global reorganization (38%), economic crisis (20%) and untapped capacity at home (17%), followed by flexibility related factors like delivery time (26%) and proximity to customers (25%), quality related factors like "Made in" effect (24%) and poor quality of offshored production (20%), and the automation of production processes (22%) and other product/process innovations (22%) at the home base.

Wan et al. (2017) provide evidence on reshoring entry modes based on a more recent sample of the *Uni Club MoRe* dataset, consisting of 678 cross-industry and cross-country reshoring projects. Data were collected from 2011 to 2016 through a keyword search in secondary data of the major international and national business-related newspapers, magazines and reports (e.g., Wall Street Journal, Financial Times, The Economist, Time, Bloomberg, Business Week, Spiegel online, and Il Sole 24 Ore). Results show that **entry modes of reshoring decisions** are affected by past experiences and thus not independent from the entry modes of the previous offshoring decisions. An "insourcing entry mode" is almost always replicated in future relocations, whereas an "outsourcing offshore entry mode" has been changed in half of the cases towards an "insourcing reshore entry mode". Companies belonging to clothing industry are more likely to select outsourced reshoring whereas government incentives are significantly and positively related to the insourcing mode of reshoring.

3.3 Survey results on single country level

Germany

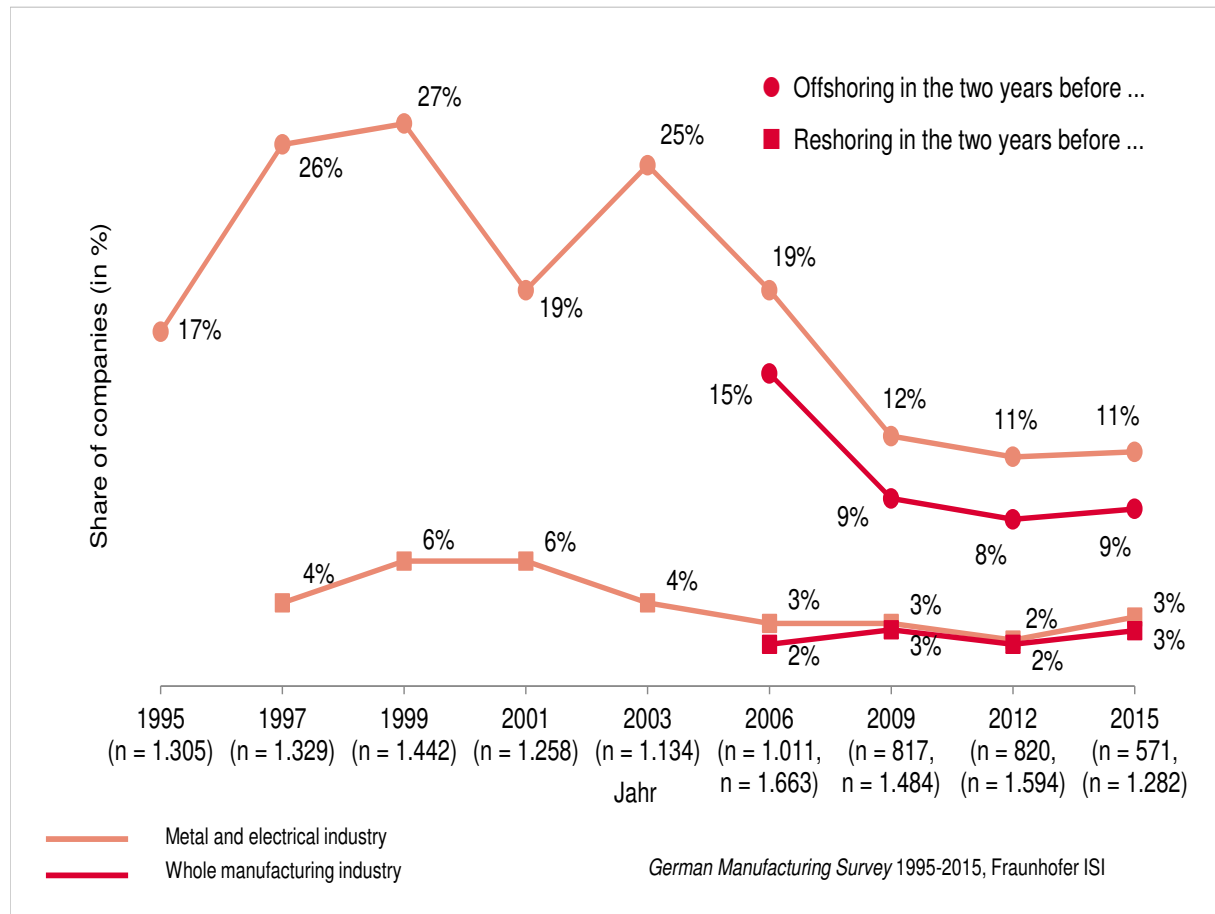
The only longitudinal data on offshoring and backshoring activities is available for the German manufacturing industry. The German Manufacturing Survey is part of the European Manufacturing Survey (EMS), coordinated by the Fraunhofer Institute for Systems and Innovation Research ISI, and includes around 1,150 to 1,650 answers of German manufacturing companies in each survey round from 1997 to 2015 (1997, 1999, 2001, 2003, 2006, 2009, 2012, 2015). The distribution of the sample is representative of the basic population of all German manufacturing companies. German evidence on reshoring might be indicative of trends in other developed and high-wage countries with strong capabilities in medium-high-tech manufacturing and opportunities for innovations for global markets, e.g. in automotive, machinery and equipment, electrical machinery, chemical industries (Brennan et al., 2015).

According to the most recent data from the survey round of 2015, backshoring of production capacities has slightly risen compared to the 2012 survey results. **From 2013 to mid-2015, about 3% of the German manufacturing companies have shored parts of their foreign production capacities back to Germany.** This does

not necessarily mean that a foreign site had to be closed, as also partial capacities may have been transferred back. At the same time, production offshoring activities abroad continued to stay on a low level. Only 9% of German manufacturing companies have offshored parts of their production abroad from 2013 to mid-2015. This value is only barely higher than the 8% at the last survey in 2012, which represented the lowest level ever measured since the start of the survey in the mid-1990s (Figure 6). Thereby the declining trend of the past 12 years has not yet reversed. Less and less German companies reduce domestic production capacities in favor of foreign locations.

Hence, **there is currently one backshoring company on every three offshoring companies**. A share of about 3 percent backshoring companies is certainly not a big trend. However, it is a relevant phenomenon. When extrapolated to the entire German manufacturing sector, absolute numbers account actually for around 500 to 550 German companies performing backshoring activities per year. Further time-series analysis of panel data shows that every fourth to sixth offshoring activity is countered by a backshoring activity within two to five years (Kinkel, 2014). Approximately 20 percent of German companies' backshoring decisions can be characterized as mid-term to long-term reactions to changing local environments, whereas 80 percent can still be characterized as short- to mid-term corrections of prior location misjudgements (Kinkel, 2014; Kinkel and Maloca, 2009).

Figure 6: German manufacturing companies' offshoring and backshoring activities over time



The **main source countries** of German companies' backshoring activities were the Western European EU 15 countries (32%), followed by other (than China) Asian countries (23%), North America (16%), China (13%), and the Middle and Eastern European EU 13 countries (10%). In the previous surveys of 2012, 2009 and 2006, the EU 13/12/10 have been much more important for German companies' backshoring activities, accounting for around 50% of the backshoring cases in each round. The **most important reasons for backshoring activities** of German manufacturing companies are the lack of flexibility (56%) at the offshoring location or in the resulting supply chain and a low quality (52%) of the goods produced. Both reasons are relevant for more than half of all backshoring decisions and remained virtually unchanged since the last survey. The reduced flexibility and delivery capability may be due to problems and distances in the own supply chain between the sites as well as limited access to local supplier networks abroad. Quality issues stem from underestimated efforts to ensure the desired product and process quality in countries with a different mentality and culture, as well as internal quality assurance efforts. On the other hand, innovation-relevant factors such as the risk of loss of know-how at the foreign location (6%), the proximity to domestic R&D (5%) or the availability or fluctuation of skilled workers at the foreign site (0%) play a minor role for reshoring decisions of German manufacturing companies.

DACH countries

Dachs et al. (2017) provide evidence on backshoring activities in the so called **DACH countries (Germany, Austria and Switzerland)**, based on the European Manufacturing Survey (EMS) 2015. The data set includes responses of 2,120 manufacturing companies (1,236 from Germany, 135 from Austria, 749 from Switzerland) with at least 20 employees. Overall, **3.8% of all companies in the sample performed backshoring activities during 2013-14**. The **most important reasons** for backshoring are the lack of flexibility and delivery issues (52%) at the offshoring location or in the resulting supply chain and a low quality (45%) of the goods produced, followed by unemployed capacities in the home country (42%). All other factors follow clearly behind, with transportation and coordination cost (each around 20%) on ranks four and five). High labour costs or innovation related factors like proximity to R&D activities or a perceived loss of know-how are the least relevant reasons for backshoring activities, each named by less than 10% of the surveyed backshoring companies.

France

Fel and Griette (2016) conducted an online survey of 215 buyers and purchasing managers from companies located in France (87%) and Western Europe (13%). They find that 75% of the responding companies were sourcing in China, mainly to search for low prices (90%). Among the companies sourcing in China, 48% have actually near-reshored all, or part, of their Chinese supplies over the past few years, and 10% plan to do so soon. Near-reshoring is most common in the textile (80%) and retail industry (75%) and almost non-existent in the computer industry. 30% of the near-reshoring companies – or **14% of all companies sourcing in China – were backshoring to France**, all others to other Western and Eastern European countries (incl. Turkey). Most of the near-reshoring is relatively new, as 96% of the responding companies started **during the past 5 years** and 39% in the past year (2015) alone. The **duration of the offshoring strategy before reshoring was relatively short**, reaching more than 10 years in only 20% of the cases and 5 years or less in 35% of the cases. The **main motives for reshoring** were changes in business conditions with China (54%, e.g. higher wage costs and the fall of the Euro against the US Dollar), followed by changes in the companies' strategies (30%, e.g. moving upmarket, upgrading, lean management, CSR policy), seeking to bring design and production closer together (40%) and correction of mistakes in their ex ante judgment of the initial offshoring operations (15%). Most of the reshored products were mid-range products (60%), followed by high-end (25%) and low-end products (15%).

UK

Bailey and De Propriis (2014) discussed the evidence on backshoring to the United Kingdom that is available from a variety of surveys. E.g., a survey by Business Birmingham (2013) indicated that one-third of UK manufacturers were considering to source more domestically. A survey of manufacturing firms in the Midlands of the UK (Bailey and De Propriis/ SGH Martineau, 2013) displayed that **around 16%** of the 80 responding companies **were actually undertaking reshoring** and 5% actively considering it. A half of the companies have brought back operations from BRIC (Brazil, Russia, India and China) countries, one third from Asia, and over one fifth from Europe. The **most important drivers for reshoring** were transport costs (62% of respondents) and quality issues (62%), followed by supply-chain resilience (39%), exchange rate shifts (31%), rising wages overseas (31%), the need for rapid turnaround (31%) and the need to offer a service alongside manufacturing (31%). However, Bailey and De Propriis (2014) also identified **key barriers for further backshoring** to the UK like energy costs, regulation, access to finance, skills gaps, etc..

Recently, Li et al. (2017) provided results of a survey of all UK-based manufacturers. Of the responding companies, 262 have no missing values and thus were eligible for analysis. The analysis distinguishes between *direct reshoring*, which refers to the physical backshoring of previously offshored manufacturing activities back to the UK, and *indirect reshoring*, that is “to keep or increase manufacturing activities in the UK instead of moving them abroad after a serious consideration of foreign locations” (Li et al., 2017, p. 5). Results show that **13% of the responding companies have directly reshored (backshored) manufacturing activities back to the UK within the past 8 years (since 2008)**, whereas “indirect reshoring” has been significantly more common among UK manufacturers, being performed by 52% of the surveyed companies. The analysis also provides some evidence that offshoring companies show a better cost performance in manufacturing, whereas reshoring (indirect or direct) companies are better in terms of flexibility and delivery time.

Nordic countries

Heikkilä (2017) provides a comprehensive study on “Relocation of Nordic Manufacturing” in the so called **Nordic countries Denmark, Finland and Sweden**. (Heikkilä, 2017). The research was conducted within the *ROaMING research project* by the Tampere University of Technology (TUT), Lund University and the University of Southern Denmark during 2015-17. They carried out a large survey on offshoring and backshoring activities **during 2010-15**, containing responses of 847 manufacturing companies (373 from Sweden, 229 from Finland, 245 from Denmark).

This rich data set allows for differentiating backshoring patterns and motives over the three countries covered. **Overall, 19%** (n=160) of the surveyed companies answered that they have **performed backshoring activities** during 2010-15, with the highest backshoring propensity observed in Sweden (27%), followed by Finland (13%) and Denmark (13%) with a quite similar frequency. The most active industries in backshoring were basic metals (36%), electrical equipment (33%) and the chemical industry (30%), whereas the timber industry is the most reluctant to backshoring (9%). The **main source countries** of backshoring activities were other Nordic (26%) and Western European countries (31%), followed by Eastern European countries (17%), China (13%), and other Asian countries (9%). The **most important drivers for backshoring activities** are quality (scoring 3.82 on a 5 point Likert scale), followed by flexibility (3.73), lead time (3.56), access to skills and knowledge (3.48), access to technology (3.24), other cost (3.21), logistics cost (3.12) and proximity to R&D and product development (3.10). All other factors scored below the scale median of 3.0. Labor cost is the most important factor for offshoring decisions (3.93), but not for backshoring (2.43). Overall, in particular quality related, flexibility and time related, innovation and knowledge related and to some extent (logistic) cost related factors matter for backshoring decisions of Nordic manufacturing companies.

3.4 Comparison and discussion of survey results and approaches

Overall, the following conclusions can be drawn when analysing the patterns of European companies' reshoring activities:

- **Source countries for reshoring** by European companies are in particular other Western and Eastern European countries. China has emerged as the most important single source country of European manufacturing companies' backshoring activities, and also India has become more important over time.
- The **most important reasons for backshoring** activities of European manufacturing companies are quality issues, loss of flexibility and delivery time, logistics costs, the "Made in" reputation effect, the reduction of labor cost gaps, and total costs of sourcing. Innovation-related factors like the loss of know-how or the vicinity of production to R&D are less important for the backshoring activities of European companies, as also some other manufacturing costs as e.g. energy costs.
- In Europe, the **average share of companies active in reshoring at all manufacturing companies** is around 4%, varying significantly from around 1% in Eastern European countries like Romania or Bulgaria over 3% in large industrial countries like Germany, 10% in small Western economies like Belgium, 13% in Ireland or Nordic countries like Denmark or Finland, up to around 15% in France and the UK or even 27% in Sweden.

- However, it is very **difficult to compare these figures** on the shares of companies active in reshoring, **as they cover different time-frames** over which the reshoring activities have extended, ranging from 2 years in the case of Germany and the DACH countries over 3 years in the case of the 2012 Eurostat survey, 5 years in the case of France, 6 years in the case of the Nordic countries up to 8 years in the case of the UK.
- One approach to make these results more comparable could be to adjust the figures to a commonly defined time-frame of e.g. two years³. The resulting **“adjusted” shares of companies active in reshoring** for the European countries covered with specific surveys is displayed in Table 2. Accordingly, reshoring levels seem to be highest in Sweden and Ireland (around 9% each), followed by Belgium, Slovakia and France (around 6% each). Many countries are not significantly differentiating from a 4% level that seems to be common for quite a number of Western European countries (e.g. Denmark, Finland, Portugal, Netherlands, UK, Germany). Only some small Eastern European countries as Lithuania, Bulgaria or Romania show significantly lower reshoring levels of around 1% of their manufacturing companies.

Table 2: “Adjusted” shares of companies active in reshoring for selected European countries

Country	Share of companies active in reshoring	Time-frame (years covered)	“Adjusted” share of companies active in reshoring over a 2 years period
Sweden	27.0%	6	9.0%
Ireland	13.0%	3	8.7%
Belgium	9.5%	3	6.3%
Slovakia	9.0%	3	6.0%
France	14.0%	5	5.6%
Denmark	13.0%	6	4.3%
Finland	13.0%	6	4.3%
DACH	4.0%	2	4.0%
Portugal	6.0%	3	4.0%
Netherlands	6.0%	3	4.0%
Selected European countries (EMS survey)	4.0%	2	4.0%
UK	13.0%	8	3.3%
Germany	3.0%	2	3.0%
Estonia	3.5%	3	2.3%
Lithuania	2.0%	3	1.3%
Bulgaria	2.0%	3	1.3%
Romania	1.0%	3	0.7%

³ Longer time-frames could be simply divided by a specific factor to get adjusted to 2 years, e.g. divided by 3 in the case of a 6 years time-frame.

- However, also the “adjusted” shares of companies active in reshoring need to be cautiously compared between different European countries and interpreted with care. One reason is that the “adjustment” to a time-frame of 2 years by a simple division can be problematic, as companies may have reshored more than once over a longer period of time and therefore the real ratio tends to be underestimated by the simple division. Also, company managers may be more reminiscent of recent events than those completed some time ago.
- Another issue is **different points in time** when the different surveys were conducted, as reshoring decisions are heavily influenced by factors of the external environment and these are changing quite significantly over time (e.g. wages, economic and political conditions, etc.).

4. MEASURING THE INTERRELATION BETWEEN RESHORING AND THE USE OF INDUSTRY 4.0 TECHNOLOGIES

A recent study by Kinkel and Jäger (2017) investigates the relationship between backshoring of production activities and the use of digitization technologies in manufacturing, also known as Industry 4.0 (I4.0). The analysis is based on German data of the European Manufacturing Survey (EMS), covering 1,282 German manufacturing companies. The selected sample is representative for the whole German manufacturing industry.

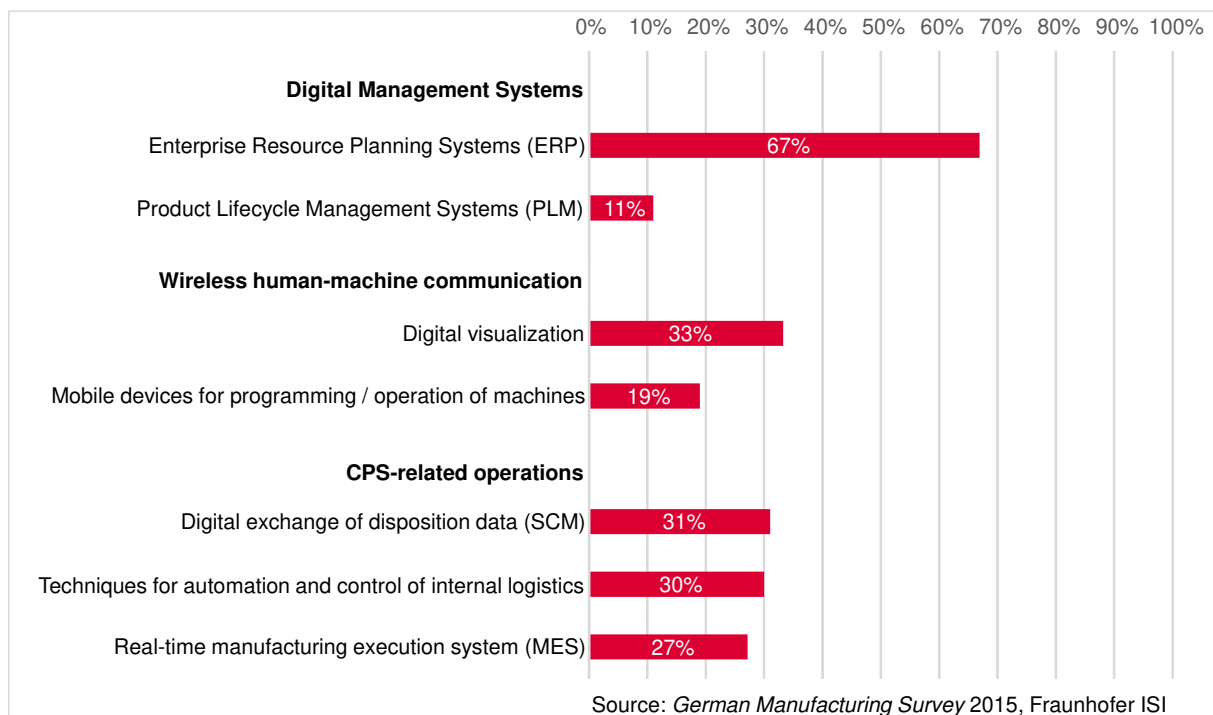
The study analyzed the use of **eight different digitization technologies** that can be understood as enabling technologies for digital networked production according to the model of Industry 4.0. These were assigned to the following **three technology fields**:

- *Digital management systems* comprise two basic technologies for the management of IT-related processes of production and product development:
 - Software system for production planning and control (ERP)
 - Product Lifecycle Management systems (PLM)
- *Wireless human-machine communication* encompasses two workplace-supporting IT implementations:
 - Digital visualization in the workplace
 - Mobile / wireless devices for the programming and operation of systems
- *Cyber-Physical-Systems* encompass production-integrated enabler technologies for industry 4.0:
 - Digital exchange of disposition data with suppliers or customers (SCM)

- Techniques for automation and control of internal logistics
- Real-time manufacturing execution system (MES)

The share of German manufacturing companies already using these digitization technologies in their manufacturing processes is displayed in the following Figure 7:

Figure 7: Use of Industry 4.0 enabling technologies in the German manufacturing industry



Source: Kinkel and Jäger (2017)

In a second step, an Industry 4.0 readiness index (*iready*) is constructed as follows:

Level 0 (non-user) if the company has not yet introduced any technology from the three technology fields

Level 1 (beginner) if the company has introduced at least one technology from one of the three different technology fields

Level 2 (active user) if the company has introduced technologies from at least two of the three different technology fields.

Level 3 (advanced user) if the company has introduced at least one technology from all three different technology fields.

As the reshoring activities are surveyed for the years from 2013 to 2014, only the

introduction of digitization technologies before 2013 is considered. As the descriptive analysis shows, 33% of the German manufacturing industry did not use any of the selected digitization technologies before 2013 (level 0). So, a relevant number of German companies are still at the very beginning of the road towards industry 4.0. The group of companies which introduced at least one technology in one of the technology fields before 2013 (level 1) includes 21 per cent of the companies. 25% of the companies belong to level 2 and another 21% to level 3. The level 3 "advanced users" are at least already set up in such a way that they have already gained experience with today's enabling technologies in all three technology fields relevant to Industry 4.0. However, this group is relatively small.

A **logistic regression model** has been employed to explain the likelihood of a German manufacturing company to have been active in **backshoring** manufacturing operations during 2013-14. The model is significant and shows satisfactory model quality (Table 3).

Table 3: Logit model for the backshoring propensity of German manufacturing companies

Cox & Snell: 0,055 Nagelkerkes: 0,230		Regression coefficient B	Sig.
Step 1	Ln #employees	,072	,673
	sec99_other manufacturing	-,038	,974
	sec24_metal & metal components	-,093	,938
	sec26_Data processing equipment, electronic and optical products	,691	,561
	sec27_electrical equipment	,439	,724
	sec28_machinery & equipment	-1,023	,415
	medium batch size	,329	,593
	large batch size	-,152	,850
	medium complex products	-,383	,532
	complex products	-,248	,730
	supplier company	-1,485	,004
	main competition factor: price/cost	,574	,310
	Ln import quota of inputs	-,143	,468
	Ln export quota of inputs	1,101	,004
	Ln share of unskilled workers	,137	,439
	I40-enabling-use-til-2013_level1	1,884	,095
	I40-enabling-use-til-2013_level2	1,932	,076
	I40-enabling-use-til-2013_level3	2,618	,016
	Constant	-8,946	,000

Source: Kinkel and Jäger (2017)

The results show that supplier companies show a significant lower backshoring propensity than manufacturers of end products (OEMs). This can be explained by

close ties with customer companies at the foreign location, which often have to be supplied flexibly from short distance, so that proximity to the customer is advantageous. In addition, the backshoring propensity increases with the export rate of the companies. For German companies that rely on an export model, the quality and flexibility of their production are decisive factors, which are also the most important motives for backshoring activities. In addition, the label "Made in Germany" is often helpful for these companies in order to successfully sell their premium products abroad.

The results also display a **significant positive correlation** between the use of **digitization technologies** in manufacturing and the **backshoring propensity** of German manufacturing companies. "Advanced users" (level 3), which introduced at least one technology from each of the three technology fields before 2013, have significantly more often shifted foreign production activities back to the German location as "non-users" (level 0) of digitization technologies. According to the estimation model, "advanced users" of digitization technologies display on average a **10-times higher backshoring propensity** (approx. 5%) than "non-users" of digitalization digitization (approx. 0.5%). Also "beginners" (level 1) and "active users" (level 2) are showing a higher backshoring propensity than "non-users" (level 0), albeit at a lower 10% level of significance.

Two arguments can be used to explain this correlation: First, the use of digitization technologies can lead to **increased automation** and productivity at the German production site, so that the labor cost ratio becomes lower, labour arbitrage in low-wage countries less appealing and economies of scale at the remaining factory sites in developed countries more important. Second, the use of digitization technologies can be used to **increase the flexibility and ability for customized production** in small batches with very low marginal cost, which allows the efficient and timely serving of individual customer requirements and offers incentives for companies to bring back or hold the production close to their European customers (→ local value chains). **According to both arguments, the intensive use of digitalization technologies can significantly contribute to more attractive production conditions with increased added value at the German location.**

5. MEASURING RESHORING IN THE US

The debate on reshoring in the US was largely stimulated by the 2011 report "Made in America Again" of the Boston Consulting Group (BCG, 2011). This report and some related follow-up work (BCG, 2012) estimated that US manufacturing could create 2.5 to 5 million manufacturing and related services jobs by 2020.

Largely due to the deteriorating cost competitiveness of China, it is argued that several US industries might be close to a “tipping point” (BCG, 2012) after which more and more companies will backshore manufacturing activities to the US. The reports provide very detailed calculations of total landed costs and results of a survey of around 200 US companies. They display that in 2013 more than half (54%) of the surveyed executives were planning or considering reshoring activities, compared to 37% in 2012. Also harder evidence showed the rising relevance of reshoring, as more than 20% of the surveyed executives in 2013 were actively engaged in backshoring or about to backshore manufacturing in the near future, compared to less than half of it in 2012. Based on this it is predicted that such reshoring of activities from low cost countries will contribute to the future revival of US manufacturing.

This arrival of a “manufacturing renaissance” in the US was questioned by other studies (e.g. Nager and Atkinson, 2015; Goldman Sachs, 2013; Morgan Stanley, 2013). A.T. Kearney (2014) has also taken a more sceptical look on reshoring to the US. Based on an analysis of 700+ reshoring cases that have been announced in the years 2010-14, it is argued that the growth in reshoring activities seems to have slowed down. As at the same time many US companies are still offshoring activities abroad, the impact of reshoring on aggregate indicators like production and jobs may be doubted.

The collected reshoring cases are covering several sectors (A.T. Kearney, 2014). They include sectors where reshoring was rather expected, as e.g. in appliances and electrical equipment (15%), transportation equipment (15%) or computers and electronics (10%), but also sectors that many thought would never return to the US, such as apparel and textiles (12%).

The most frequent reasons for reshoring of US companies (see Table 4) are delivery time (30%), quality issues (30%) and several cost categories as freight costs, wages or energy costs. In total, cost-related reshoring motivations sum up to around 70% of the mentions. Innovation-related reasons are to a lesser extent featured in the top 10 reasons. Interestingly, “Made in USA” has become increasingly important over the years, moving further up in the ranking. However, it still needs to be seen if US customers are really willing to pay the extra cost that most products with the “Made in USA” label are associated with (A.T. Kearney, 2014).

Table 4: Reasons for reshoring of US companies from A.T. Kearney’s Reshoring Database

	Mentions
Delivery time improvement	30%
Quality improvement	29%
Image/Brand (prefer U.S.)	20%
Freight Cost Improvement	20%
Wage Cost Improvement	20%
Total Cost of ownership	17%
Energy Cost Improvement	14%
Government Incentives	14%
Innovation/Product Differentiation improvement	13%
Higher productivity	13%

Source: A.T. Kearney (2014, p. 4)

5.1 Data of the Reshoring Initiative

Another “believer” and source of (positive) evidence on reshoring in the United States is the Reshoring Initiative. The **Reshoring Initiative** is a non-profit organization that was founded by Harry Moser in 2010. It has the goal to bring manufacturing jobs back to the U.S. in order to strengthen the US economy. In order to reach this goal it encourages companies to produce and source local. It offers a web-based tool to enable US companies to estimate the “real” total cost of ownership of offshoring activities. Additionally, it offers a library of articles about US reshoring cases on the initiative’s webpage www.reshorennow.org. Based on this library, the Reshoring Initiative has described reshoring trends of the past years in several articles.

According to Moser (2013), the published cases are representing a wide range of industries (see Table 5). 23% of the cases are manufacturers of electrical equipment, appliances & components, 18% of transportation equipment, 13% of computer and electronics and 11% of machinery. But also low-tech industries like plastics and rubber, fabricated metal parts, furniture, food and beverages or clothing and textiles are represented with different reshoring activities.

Table 5: Industries represented in the cases listed by the Reshoring Initiative

Industry	Number of cases	Share
Electrical equipment, appliances & components	46	23.1%
Transportation equipment	34	17.1%
Computer and electronics	25	12.6%
Machinery	21	10.6%
Miscellaneous	19	9.5%
Plastics and rubber	16	8.0%
Fabricated metal parts	16	8.0%
Furniture	12	6.0%
Clothing and textiles	4	2.0%
Food and beverage	4	2.0%
Primary metals	2	1.0%
Total cases	199	100.0%

Source: Own illustration according to Moser (2013), Reshoring Library as of 3/2013

An overview (see Table 6) provided by Moser (2013) shows that most reshoring cases come back from China (61%), followed by other Asian countries (Japan, India, Taiwan, Malaysia, Philippines; together 17%), Mexico (12%) and others (9%). The dominance of China is not surprising, since the previous manufacturing offshoring trend of US companies definitely pointed to China as the main target country.

Table 6: Source countries of reshoring cases of US companies in 2012

US reshoring source country	Number of cases	Share
China	105	61.4%
Mexico	21	12.3%
Japan	12	7.0%
India	8	4.7%
Taiwan	5	2.9%
Canada, Spain	3 each	1.8%
Germany, Malaysia, Philippines	2 each	1.2%
Brazil, El Salvador, Indonesia, Hungary, Singapore, UK, Venezuela, Guatemala	1 each	0.6%
Total	171	100%

Source: Own illustration according to Moser (2013), Reshoring Library as of 3/2013

As of October 2013, this library contained 425 articles and was analysed by some students in a specific working paper (Hartmann et al., 2014). The sample of reshoring cases collected in the library contained 147 different companies in total. 18 cases were excluded because they do not have their head office in the US. Another 11 cases were excluded because they refer to reshoring of service activities and the paper concentrated on reshoring of manufacturing activities. Others were excluded because what was labelled as “reshoring” was only a decision to produce a new product or to ramp up production capacity in the US. Finally, 81 firms were left for the analysis.

Table 7: Reasons for reshoring of US companies

Reasons for reshoring (n = 66)	Number of cases	Share
Time to market/Transportation time	27	40.9%
Quality issues	26	39.4%
Transportation costs	19	28.8%
Costs of control	18	27.3%
Proximity to Customers	17	25.8%
(Cost) Efficiency	16	24.2%
Labour costs	16	24.2%
Proximity to R&D	12	18.2%
Tied-up capital/ high stocks	10	15.2%
Intellectual Property	6	9.1%
Made in USA	6	9.1%
Reputation for Quality	6	9.1%
Supply chain coordination	6	9.1%
Job creation/ help US economy	5	7.6%
Legal Institutions/Political strategy	4	6.1%
US subventions/policies	4	6.1%
Currency appreciation	3	4.5%
Delivery problems in foreign countries	2	3.0%
Tariffs	2	3.0%
Material costs	1	1.5%
US energy costs	1	1.5%
Total cases	66	
<i>Thereof related to ...</i>		
<i>Flexibility, time to customers</i>	<i>62</i>	
<i>Quality, image</i>	<i>38</i>	
<i>Costs</i>	<i>76</i>	
<i>Innovation related</i>	<i>18</i>	
<i>Policy related</i>	<i>13</i>	

Source: Own illustration according to Hartmann et al (2014), *Reshoring Library* as of 3/2013

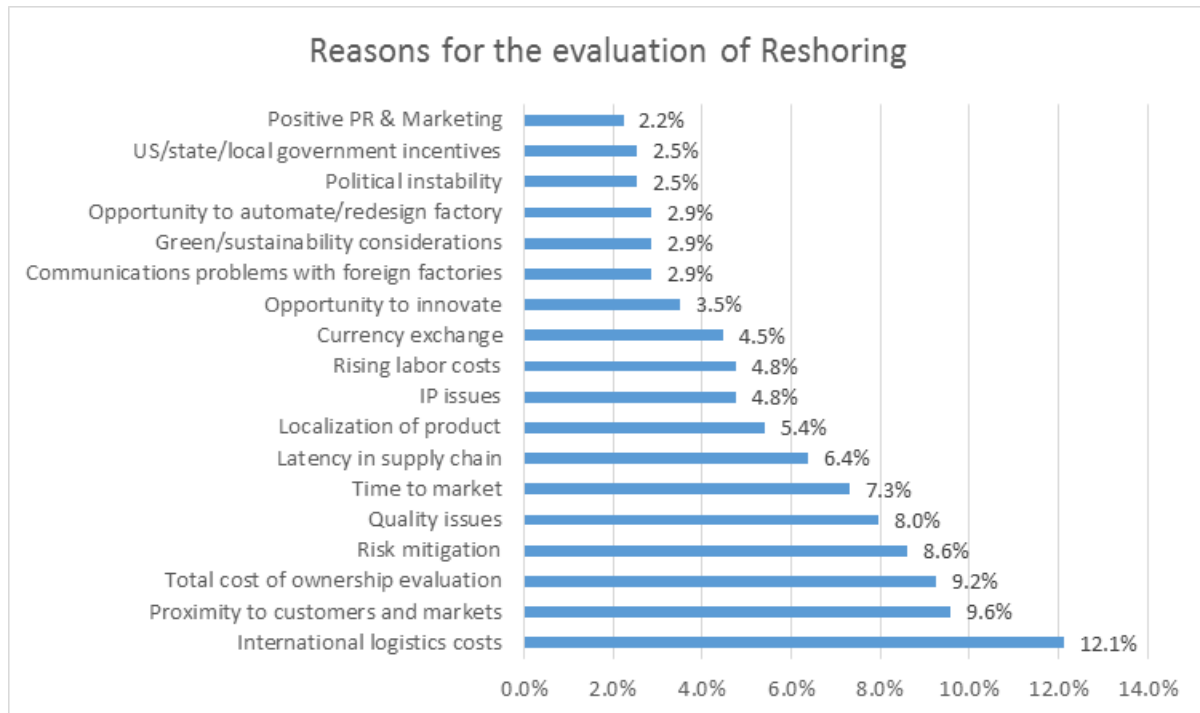
As Table 7 shows, the seven main reasons for reshoring activities of US companies were the following: Time-to-market/Transportation time (mentioned by 41% of the reshoring companies), quality issues (39%), transportation costs (29%), costs of control (27%), proximity to customers (26%), (cost-) efficiency (24%), and labor costs (24%). If put together, cost-related motives (orange color) are most frequently reported, followed by motives related to flexibility and delivery time to customers (green color), motives related to quality and image (blue color), innovation related (green color) and policy related (white color) reasons. This shows the higher focus of US companies on cost, compared to European companies, whereas flexibility and quality issues seem to be equally important.

5.2 Data of the Reshoring Institute

The most recent evidence on US reshoring activities is provided by the 2016 online survey of global operations conducted by the Reshoring Institute and the University of San Diego. It is intended for manufacturers in the USA that are reshoring now, considering it, or planning to open new manufacturing facilities in the US. The online survey consisted of 15 questions, was conducted from August to October 2016 and had 65 participants. 80% of the participants state that their company's headquarter is located in the USA.

The results show that the main reason for the evaluation of reshoring options are international logistic costs (see Figure 8). This is consistent, realizing that the share of logistics costs in total costs is considerable. A 2008 study for Germany displays 16% for commercial and 7% for industrial enterprises [1]. Considering that about 45% of the logistics costs in Europe 2016 were transportation expenses, this fits well to the second most important reason that is proximity to customers and markets [2]. In addition to transport cost reduction, other studies show companies can have significant benefits of locations closer to customers and markets. They gain visibility, get a clearer view of the market and are able to respond faster to customers' needs and requirements [3]. Referring to costs, also TCO evaluations (9%) and rising labor costs (5%) are among the top ten reasons for evaluating reshoring. Besides costs, flexibility (time to market and proximity to customers) and quality related reasons seem to be in particular important. The social and political factors seem to be of lesser importance for the companies to evaluate reshoring options. For example, government incentives, even though they are directly relevant for cost considerations, are only mentioned in 2.5% of the responses.

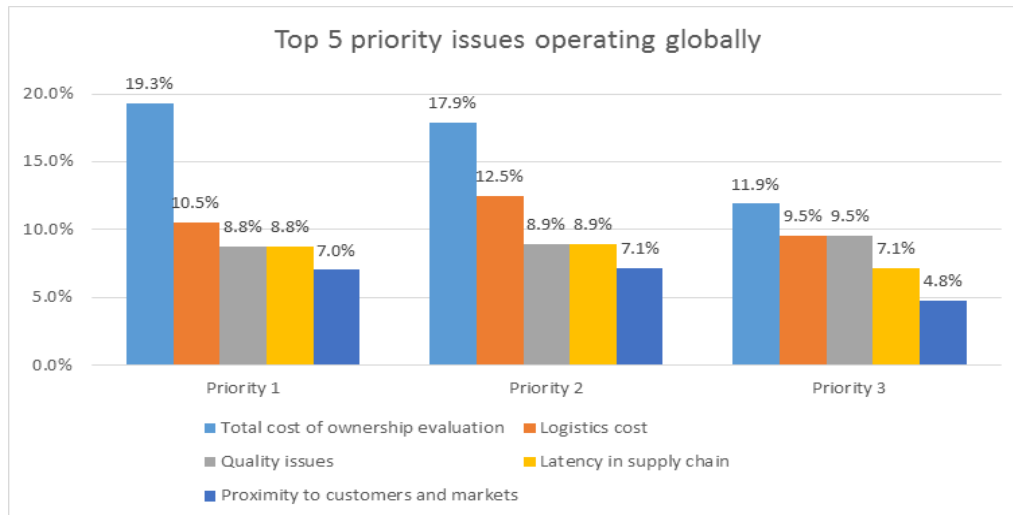
Figure 8: Reasons for the evaluation of reshoring (multiple answers possible, n=51)



Source: Reshoring Institute, 2016 online survey of global operations

These findings raise the question if the reasons for the evaluation of reshoring correlate with the issues companies are facing when they operate globally. As shown in Figure 9, the top five reasons for the evaluation of reshoring are also the top five issues for companies operating globally. Yet, TCO evaluations are described as more important issues in global operations than as reasons for considering reshoring options. On the other hand, logistics costs and the proximity to customers and markets are rated less as an global operation issue but more important as a reason for reshoring. However, companies that own global production sites have slightly different priorities. The top priority issues for them are TCO evaluations with 17% followed by logistics costs with 14%. This implies that logistics costs are a more important factor for globally producing firms. On the second priority level, they rate in particular quality issues (21%) as bigger problems than companies without global production sites. Thus, issues with TCO, logistic costs and quality seem to be specific challenges for international production operations.

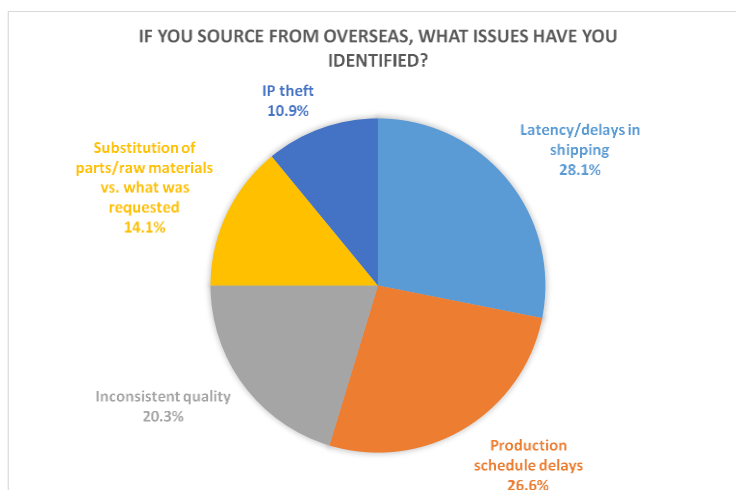
Figure 9: Top 5 priority issues operating globally (n=58)



Source: Reshoring Institute, 2016 online survey of global operations

For companies sourcing overseas, delays in general are the biggest issue (see Figure 10), whether it concerns shipping (28%) or production (27%). Another issue already mentioned by the companies operating globally relates to the quality that is inconsistent (20%) or does not meet the requested requirements (14%). Another problem often described in the media is the theft of intellectual property, which seems to be of lesser importance for global sourcing operations (11%) – while it was more among the top ten reasons for considering reshoring options.

Figure 10: Issues sourcing overseas (n=50)

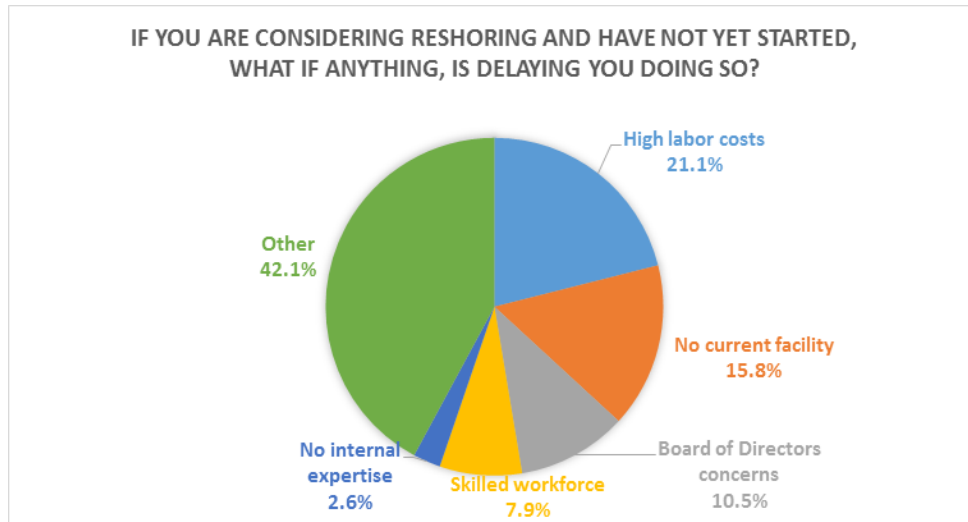


Source: Reshoring Institute, 2016 online survey of global operations

If a companies are considering a concrete reshoring activity, but have not started yet, it is interesting to see what factors are impeding the reshoring project. The answers given by the companies to this question are widely spread. High labor costs at the home country (here the USA) are with 21% of the mentions the main concern of the companies, followed by missing facilities with 16%. A lack of skilled workforce at home or internal expertise are minor concerns of the surveyed companies. Other

mentioned impeding factors are high transition and capital costs, limited or missing availability of supply and suppliers or other company priorities.

Figure 11: Factors delaying reshoring activities (n=38)



Source: Reshoring Institute, 2016 online survey of global operations

5.3 Conclusions on US reshoring and comparison with EU patterns

Overall, the following conclusions can be drawn when analysing the patterns of US companies' reshoring activities and comparing them with the results on EU companies from section 3:

- Reshoring seems to be a more **common phenomenon** in the US than in most European countries. In 2013, more than half of the executives surveyed by BCG were planning or considering reshoring activities. In Europe, the **average share of companies active in reshoring** at all manufacturing companies, "**adjusted**" to a comparable time-frame of 2 years of activity, is overall around 4%, varying significantly from around 1% in Eastern European countries like Romania or Bulgaria over 3% in large industrial countries like Germany or the UK, 4% in Nordic countries like Denmark or Finland, around 6% in Belgium or France up to 9% in Sweden and Ireland. However, it is very difficult to compare these figures, as they origin from different time-frames (from 2 to 8 years) and, in the case of US surveys, even include companies that are only considering reshoring activities or invest in (new) manufacturing capacities in the US instead in some offshore country. Thus, comparisons of reshoring levels between different countries need to be interpreted with care.
- Source countries for reshoring** by US companies are especially China and other Asian countries, while for European companies also Western and in particular Eastern European countries are included. However, China and India

have also become more important as source countries for European companies' backshoring activities over time.

- Different costs factors, like total cost of ownership (TCO), transportation costs, rising labor costs, or costs of control, represent the most important **motivations for reshoring** of US companies. Overall, the narrowing cost levels between emerging and developed countries seems to be more important for US companies than for European companies. Contrariwise, quality issues and losses of flexibility and delivery time seem to be relatively more important for European companies, albeit they are also among the most important reasons for US companies' reshoring activities. Also, the exploitation of the "made in" reputation effect is a significant driver for reshoring activities that seems to be more important for European than for US manufacturers.

In addition, Fraticchi et al. (2015) draw some conclusions by using the *Uni-CLUB MoRe dataset* to analyse the differences in reshoring between Europe and US companies:

- Backshoring seems to be a more common phenomenon than nearshoring, particularly in the US, with 10 times more backshoring cases than nearshoring cases in the US, and seven times more in Europe.
- Reshoring in Europe goes back to the 1990s and even the 1980s, whereas it is much more recent in the US.
- Backshoring occurs across a broad range of manufacturing industries from low-tech (clothing and footwear in Europe and furniture in the United States) to high-tech (e.g. electronics, electrical appliances, automotive), whereas nearshoring seems to be more concentrated, especially in the European textiles and clothing industry.

6. MEASURING RESHORING WITH TRADE DATA AND INPUT-OUTPUT-TABLES

6.1 Trade data

As reshoring is not yet captured in official statistics, economic data can only be used indirectly to analyse the extent of reshoring on a wider economy level (OECD, 2015). One possible indicator is the "share of imports at domestic demand". Increasing backshoring should be reflected in a larger share of domestic production and a lower share of imports at domestic demand. Data shows for example (OECD, 2015, p. 14-15):

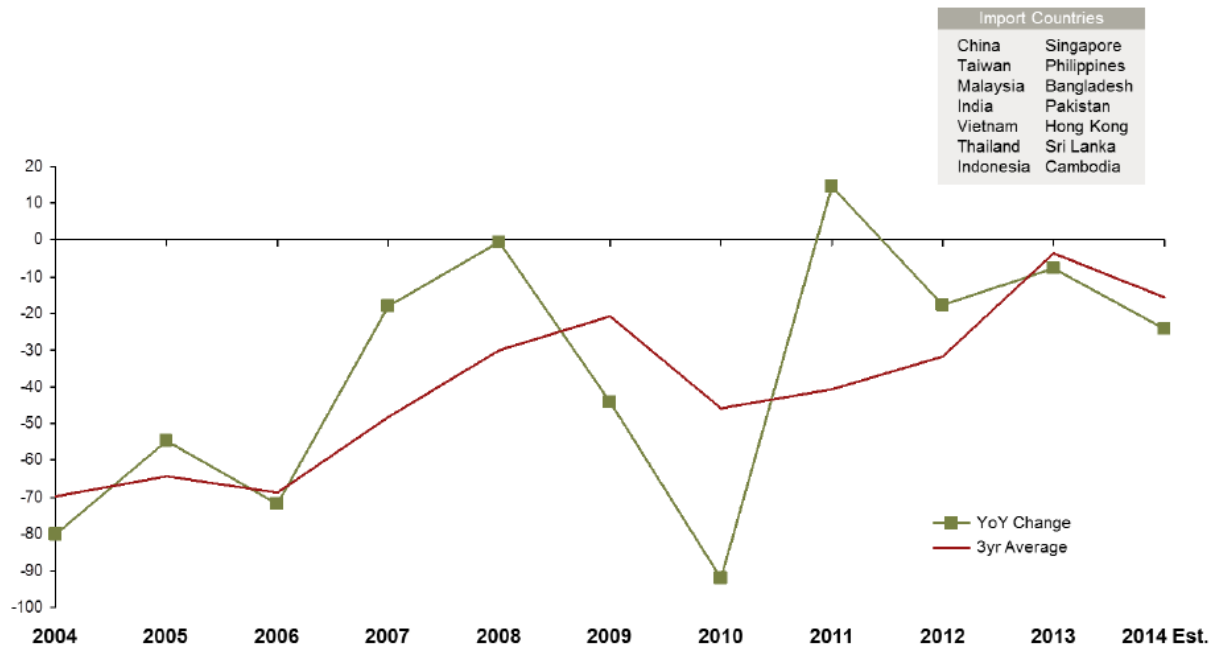
- In most countries, the growth in the share of imports at domestic demand has slowed down in recent years, but not necessarily reversed towards a decrease.

- In some countries like e.g. Japan, Germany or the United Kingdom, the share of imports at domestic demand has indeed decreased in the most recent years covered by the data (2013-2014).
- Imports from the Asian region (Japan and Korea excluded) still show in most countries an upward trend, despite the rising labour costs in China, maybe with shift of production to other countries in the region.
- In the US, the share of Mexican imports has increased by almost 50% in the past 10 years, which may be an indication of nearshoring activities by US companies to Mexico.
- Western European countries (e.g. Germany, France, Italy) show until recently a growing share of imports from Eastern Europe and thus no signs of backshoring from these countries; only the UK shows a decline in the most recent years 2013-2014, albeit after having more than doubled the share of imports from Eastern Europe since 2015.

The authors of the OECD study point out that such evidence needs careful interpretation, since factors like the technical specialization and changing competitiveness of countries or the macro-economic development might be more important to explain the depicted trends than reshoring itself (OECD, 2015).

For estimating the reshoring extent in the US economy, A.T. Kearney has built a Reshoring Index that is also based on “share of imports at domestic demand”, labelled as Manufacturing Import Ratio (MIR) in their report (A.T. Kearney, 2014). This MIR grew from 7.7 percent in 2004 to 10.5 percent in 2010, indicating a significant amount of production offshoring from U.S. to foreign countries over that time period. Since then, the pace has slowed down and has stabilized at around 10.5 percent (2010-2013). The resulting Reshoring Index tracks the year-over-year change in the “share of imports at domestic demand”, measured in percentage basis points. Positive values can be interpreted as net reshoring, negative values as net offshoring. The results show (see Figure 12) a positive trend of Reshoring Index from 2004 to 2013, however turning positive only once in 2011. The growth of offshoring and importing of goods thus seems to have slowed down, maybe partly attributed to reshoring, but still offshoring seems to be slightly stronger than reshoring tendencies.

Figure 13: A.T. Kearney Reshoring Index – Year-over-Year Change in the U.S. Manufacturing Import Ratio (Basis Points, 2004 – 2014 Est.)



Source: A.T. Kearney, 2014, p. 8

Note: 2014 data are not yet available beyond Q2, so the full year YoY change is estimated based on 2013 Q1-Q2 vs. 2014 Q1-Q2 change

One major **limitation of the measure “share of imports at domestic demand”** is the assumption that all of an import’s value was added in the exporting country (e.g. Sturgeon, 2013; Timmer et al., 2016). However, due to today’s fragmented global value chains (GVC) it is difficult to estimate what share of an imported product’s value is added in the exporting country and what “made in X” really means. In this context, flows of intermediate goods can provide hints about the structure and development of GVCs (e.g. Feenstra, 1998; Sturgeon, 2013; Timmer et al., 2016).

6.2 Input-Output-Tables

Since some years there are several efforts to link information on intermediate inputs and domestic value added by sector with data on international trade in goods and services to create a large world input-output table (WIOT). A WIOT is based on a “set of national input-output tables that are connected with each other by bilateral international trade flows” (Timmer et al., 2016, p. 17). National IOTs are regularly published by national statistical offices. However WIOTs are not, as they require integration of statistics across different countries. Figure 14 provides a simple, generic two-country excerpt of a WIOT (Sturgeon, 2013).

Figure 14: A simple, generic two-country excerpt of a WIOT

		Intermediate use		Final Use		Total use
		Country 1	Country 2	Country 1	Country 2	
		1 ... N	1 ... N			
Supply	Country 1 1 : N	1's use of its own inputs	2's use of inputs from 1	1's use of its own final goods	2's use of final goods from 1	1's total output
	Country 2 1 : N	1's use of inputs from 2	2's use of its own inputs	1's use of final goods from 2	2's use of its own final goods	2's total output
	Value added	1's value added	2's value added			
	Total supply	1's total output	2's total output			

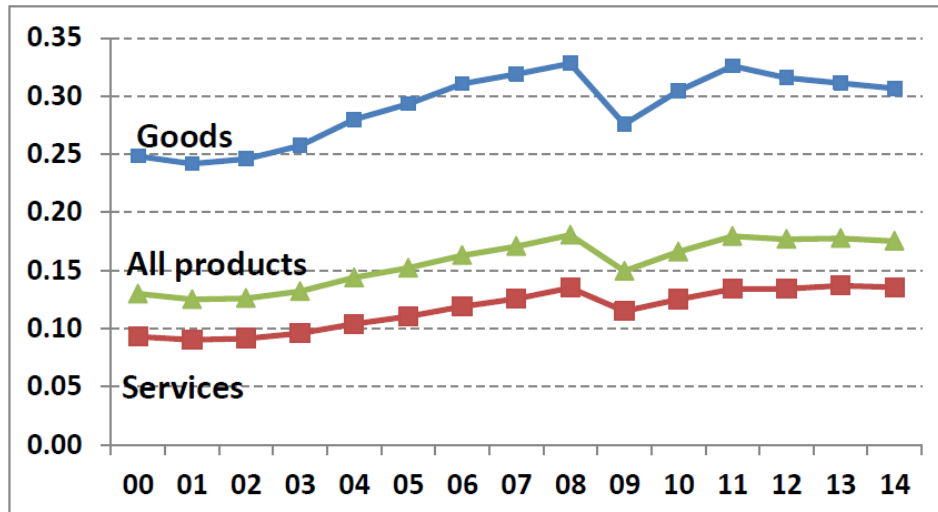
Source: Powers (2012)

The World Input-Output Database (WIOD) is a public use dataset first launched in April 2012, based on a large-scale EU Framework Program (FP7) project. The newest 2016 release (Timmer et al., 2016) provides WIOTs for 2000 to 2014 and covers forty-three countries, including all 28 members of the European Union and 15 other important economies: Australia, Brazil, Canada, China, India, Indonesia, Japan, Mexico, Norway, Russia, South Korea, Switzerland, Taiwan, Turkey and the United States. In total, these countries cover more than 85% of world GDP. The 2016 WIOD release covers the overall economy and includes data on 56 sectors at the 2-digit ISIC revision 4 level (Timmer et al., 2016).

Timmer et al. (2016) provide a **novel indicator of international production fragmentation**, called “**global import intensity**” (GII) of production. It encompasses all imports, intermediate goods as well as intermediate services, needed in any stage of the production of a final good or service, not only in the last stage of production, but also in earlier stages of production. It differs from traditional indicators of vertical specialization, e.g. “share of foreign value added in exports”, as (1) it measures the import intensity of final output and not only of exports, and (2) it includes imports at all stages of a global value chain (GVC), enabling to analyze the structures and characteristics of global value chains as a whole (Timmer et al., 2016).

The findings show a rapid international fragmentation of worldwide goods production, increasing from 25 dollar cent of imports per dollar of worldwide final goods output in 2000 to 33 dollar cent in 2008 (Timmer et al., 2016, p. 4f.). This was followed by a dramatic collapse of international fragmentation in 2009 and a gradual recovery until 2011 (see Figure 15). Since then, international fragmentation seems to have slightly reverted, **indicating some reshoring tendencies in global value chains**.

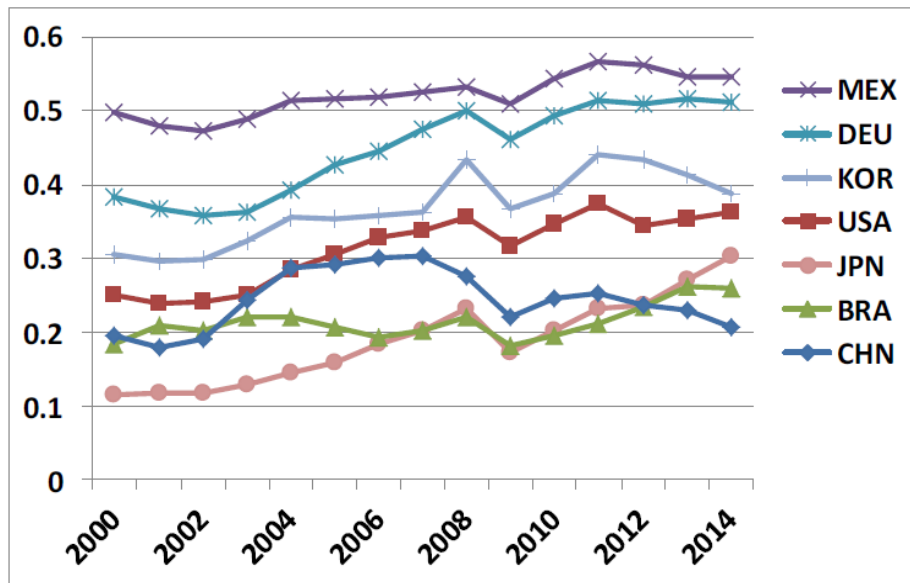
Figure 15: International fragmentation of production of final goods and services



Note: ratio of GVC imports to the output of the final products. GVC imports include imports by the country in which the last stage of production took place, as well as by all other countries involved in earlier stages of production. Goods refer to production of agricultural, mining and manufacturing final goods (836 in total). Services refer to production of all other final products in the economy (1,628). Global import intensities of production for products have been weighted by final output.

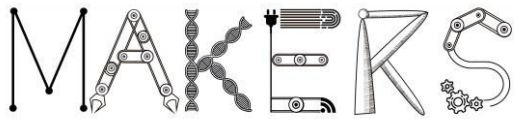
Changes in the import intensity of world GDP can stem from more or less internationally fragmented production processes, or from final demand shifts to goods and services that are more or less import intensive. The contribution of international fragmentation can be found by keeping global final demand for each product fixed, the contribution of shifts in the structure of final demand by keeping GIIs constant (Timmer et al., 2016). It can be shown that roughly half of the import intensity increase during 2000-08 was due to international production fragmentation, as well as to demand shifts. Since 2011, both the fragmentation effect as well as the demand shift effect have turned negative, each driving down the import intensity of world GDP by around 0.5 log points (Timmer et al., 2016). Thus, around half of decrease of the import of world GDP was due to **international de-fragmentation of production**, providing a **clear indication for some forms of reshoring**.

Figure 16: Global import intensity (GII) of car manufacturing



Notes: Imports needed in all stages of production of final output from WIOD industry 20 (Manufacture of motor vehicles, trailers and semi-trailers). Imports in \$ per \$ final output. Countries refer to the location of final stage of production (Mexico, Germany, South Korea, USA, Japan, Brazil, and China). Source: Timmer et al., 2016

Timmer et al. (2016) also provide some GII analysis of specific final goods in selected countries, e.g. the GII related to the production of final motor vehicles (“cars”) in Mexico, Germany, South Korea, USA, Japan, Brazil, and China. The results show that international fragmentation processes were strong in car manufacturing during 2000-08 and stalled during the crisis in all selected countries (see Figure 16). Since 2011, patterns vary. China shows a clear de-fragmentation trend, as according to legal requirements more and more intermediates of car production are produced within China itself (Timmer et al., 2016). But also South Korea and Mexico show de-fragmentation tendencies and Germany at least a halt in further fragmentation. Only for cars finalized in Japan, Brazil and the US (since 2012), a recent pattern of an ongoing international fragmentation of production can be shown. This can serve as an evidence that for specific final products production, some countries seem to show **patterns of international de-fragmentation – and thus reshoring** –, whereas other countries show at the same time patterns of international fragmentation – and thus further offshoring and outsourcing. Consequently, de-fragmentation and reshoring patterns seem to be no global phenomenon in specific industries or products, but are also **influenced by countries changing technological specialization and competitiveness** in specific fields. Against this background it would be interesting to analyze the GII patterns and developments of some other final products typical for some of the EU countries specialization profile (e.g. machinery and equipment, textiles and clothing, pharmaceuticals, etc.). MAKERS plans to do so in the following months.



Despite the progress world input-output tables (WIOTs) represent for the possibilities of statistical analysis of offshoring and reshoring, outsourcing and insourcing patterns, they have some severe **limitations** (Sturgeon et al., 2013):

- Lack of detail, timeliness, and accuracy that arises from estimation procedures and cross-border harmonization. Usually, it takes up to 4 years before a new edition of input-output tables (national or global) is provided.
- As companies engaged in international trade source significantly more intermediate inputs from abroad than other companies, it would be helpful to be able to distinguish between exporting and non-exporting and importing and non-importing companies in each industry covered, e.g. on the NACE 2 digit level.

7. MAKERS CONCLUSIONS AND AVENUES FOR FURTHER RESEARCH

This report analyses and compares the most important *surveys* on manufacturing companies' reshoring activities in the EU (Eurostat survey on international sourcing, European Manufacturing Survey (EMS), Uni-CLUB MoRe reshoring dataset, ROaMING research project) and in the US (the Reshoring Initiative, the Reshoring Institute) and draws conclusions on surveys as an adequate instrument to measure the reshoring phenomenon. In addition, the possibilities and limitations of trade data and input-output tables (WIOTs) for the statistical analysis and measurement of offshoring and reshoring, outsourcing and insourcing patterns are analysed and critically assessed.

From the critical analysis of the survey data of European and US companies' reshoring activities, the following conclusions on detected patterns and shortcoming of the measurement can be drawn:

- Reshoring seems to be a more **common phenomenon** in the US than in most European countries. In 2013, more than half of the executives surveyed by BCG were planning or considering reshoring activities. In Europe, the **average share of companies active in reshoring** at all manufacturing companies, "**adjusted**" to a comparable time-frame of 2 years of activity, is overall around 4%. This share varies significantly from around 1% in Eastern European countries like Romania or Bulgaria over 3% in large industrial countries like Germany or the UK, 4% in Nordic countries like Denmark or Finland, around 6% in Belgium or France up to 9% in Sweden and Ireland.
- However, it is very **difficult to compare these figures**, as they origin from different time-frames (from 2 to 8 years) and, in the case of US surveys, even include companies that are only considering reshoring activities or invest in (new) manufacturing capacities in the US instead in some offshore country.
- Also the "adjusted" shares of companies active in reshoring need to be cautiously compared between different European countries and interpreted with care. One reason is that the "**adjustment**" to a time-frame of 2 years by a simple division can be problematic, as companies may have reshored more than once over a longer period of time and therefore the real ratio tends to be underestimated by the simple division. Also, company managers may be more reminiscent of recent events than those completed some time ago.
- Another issue is **different points in time** when the different surveys were conducted, as reshoring decisions are heavily influenced by factors of the external environment and these are changing quite significantly over time (e.g. wages, economic and political conditions, etc.). Thus, **comparisons of reshoring levels between different countries need to be interpreted with great care.**

- **Source countries for reshoring** by US companies are especially China and other Asian countries, while for European companies also Western and in particular Eastern European countries are included. However, China has emerged as the most important single source country of European manufacturing companies' backshoring activities, and also India has become more important over time.
- Different **costs factors**, like total cost of ownership (TCO), transportation costs, rising labor costs, or costs of control, represent the most important **motivations for reshoring of US companies**. Overall, the narrowing cost levels between emerging and developed countries seems to be more important for US companies than for European companies. Contrariwise, **quality issues and losses of flexibility and delivery time seem to be relatively more important for European companies**, albeit they are also among the most important reasons for US companies' reshoring activities. Also, the exploitation of the "made in" reputation effect is a significant driver for reshoring activities that seems to be more important for European than for US manufacturers.
- Backshoring seems to be a more common phenomenon than nearshoring, particularly in the US, with 10 times more backshoring cases than nearshoring cases in the US, and seven times more in Europe. However, some **surveys to not clearly distinguish between different modes of reshoring** or cover different modes than other surveys⁴, making cross-country comparisons at least difficult or even impossible.

Overall, the survey results suggest that it seems not very likely that reshoring initiatives of manufacturing companies will be a major lever to restore industrial work in many high-wage countries. It is not easy, in some cases impossible, to restore product and process competences outsourced some years ago. In many cases it might be easier to build up capabilities for the next generation products or production technology.

Here, the new digitization technologies for a smart, vertically and horizontally integrated production, also known as Industry 4.0, carry promising potentials: Results of a recent study in the German manufacturing industry (Kinkel and Jäger, 2017) display a **significant positive correlation** between the **use of digitization technologies** in manufacturing (or Industry 4.0 enabling technologies) and the **backshoring propensity** of German manufacturing companies. **Two arguments**

⁴ E.g. *backshoring and home-shoring* in the Eurostat survey on international sourcing, *backshoring and backsourcing* in the European Manufacturing Survey (EMS), *backshoring and nearshoring* in the Uni-CLUB MoRe reshoring dataset, or *direct and indirect reshoring* in the UK and the US, with the latter defined as "keep or increase manufacturing activities in the UK/US instead of moving them abroad after a serious consideration of foreign locations" (Li et al., 2017, p. 5).

can be used to explain this correlation: First, the use of digitization technologies can lead to **increased automation** and productivity at the German production site, so that the labor cost ratio becomes lower, labour arbitrage in low-wage countries less appealing and economies of scale at the remaining factory sites in developed countries more important. Second, the use of digitization technologies can be used to **increase the flexibility and ability for customized production** in small batches with very low marginal cost, which allows the efficient and timely serving of individual customer requirements and offers incentives for companies to bring back or hold the production close to their European customers (→ local value chains). According to both arguments, the **intensive use of digitalization technologies in manufacturing (Industry 4.0 enabling technologies) can significantly contribute to more attractive production conditions with increased added value at the German location.**

Against the background of some severe gaps and shortcomings of surveys on reshoring activities, we see the following **approaches to improve the available survey instruments**:

- In the reshoring surveys available, respondents were asked about sourcing events that occurred during a specific time period, e.g. the past 2 years or 5 years. This approach has different shortcomings, as already mentioned above. Survey results covering different time-frames are difficult to compare, even when “adjusted” to a common time-frame, as companies may have reshored more than once over a longer period of time and company managers may be more reminiscent of recent events than those of some years ago. The surveys may have also been conducted at different points in time, making comparisons difficult because the external environment may have significantly changed. Therefore, **quantitative European panel data** on companies’ reshoring activities, conducted yearly or every two years, could be an appropriate approach (e.g. Sturgeon, 2013) to support reliable analysis and (cross-country) comparison of specific reshoring patterns and trends.
- In the reshoring surveys available, respondents only provided responses whether their company had reshored during a specific time period (yes or no), without judging the magnitude of the reshored activities. Thus, future reshoring surveys in Europe should also **collect quantitative information on the value of the reshored business** (e.g. Sturgeon, 2013).
- The reshoring surveys available do not always clearly distinguish between different modes of reshoring (e.g. backshoring, home-shoring, nearshoring, back sourcing, direct and indirect reshoring) or cover different modes, making cross-country comparisons difficult. Thus, it is suggested to **distinguish** in future surveys between **four forms of reshoring**, as proposed in the MAKERS deliverable 4.2 (Pegoraro et al., 2017):

- Backshoring, that is the move of an activity previously offshored to a foreign location back to the home economy,
- Nearshoring, that is the move of an activity previously offshored to a foreign location to an the economy near the home economy,
- Home-shoring, that is the move of an activity from a foreign location – but NOT previously offshored to this foreign location by the company itself – back to the home economy,
- Hop-shoring, that is the move of an activity previously offshored to a foreign location to another foreign economy,

The surveying of all of these four forms should include internal, captive modes as well as external, outsourced modes, covering all four reshoring options (In-In, In-Out, Out-In, Out-Out, see also Figure 1) proposed by Gray et al (2013).

Some studies use trade data to measure offshoring and reshoring tendencies. One popular indicator is the “share of imports at domestic demand”, which should be decreasing if backshoring is increasing. Existing results show for example that the share of imports at domestic demand has indeed decreased in some countries (e.g. Japan, Germany, UK) in recent years. The Reshoring Index of A.T. Kearney is also based on the “share of imports at domestic demand”, indicating that the growth of offshoring and importing goods built by the US economy has indeed slowed down, but offshoring activities still tend to be slightly stronger than reshoring tendencies.

One major **limitation of this indicator** is the assumption that all of an import’s value was added in the exporting country, however in today’s fragmented global value chains (GVC) this assumption might be rather naïve (e.g. Sturgeon, 2013; Timmer et al., 2016). Therefore, since some years world input-output tables (WIOT) are created and used for measuring offshoring and reshoring intensities of countries and industries.

Based on a **novel indicator**, called “**global import intensity**” (GII), that encompasses all imports and intermediate goods needed in any stage for the production of a final good, some interesting results on **international production fragmentation** are provided (Timmer et al., 2016). It has been shown that after a period of rapid international fragmentation of worldwide goods production during 2000-08, there was a dramatic collapse in 2009 and a gradual recovery until 2011, and since then a slight decline in international fragmentation, **indicating some reshoring tendencies in global value chains**.

A more detailed and specific look at **car manufacturing** displays recent (since 2011) **international de-fragmentation – and thus reshoring – tendencies** for cars finalized in South Korea and Mexico, and Germany shows at least a halt in further

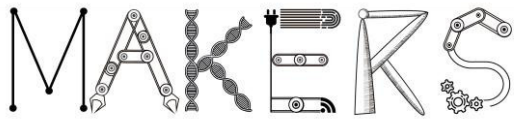
fragmentation, whereas in Japan, Brazil and the US an ongoing international fragmentation of production can be shown. Consequently, de-fragmentation and reshoring patterns seem to be no global phenomenon, but are influenced by countries changing technological specialization and competitiveness in specific industries. Thus, the **MAKERS project plans to analyze GII patterns of some other final products typical for selected EU countries** specialization profiles (e.g. machinery and equipment, textiles and clothing, pharmaceuticals, etc.) in the following months.

Despite the progress world input-output tables (WIOTs) represent for the possibilities of statistical analysis of offshoring and reshoring patterns, they still have some severe **limitations** (Sturgeon et al., 2013):

- Lack of detail, timeliness, and accuracy that arises from estimation procedures and cross-border harmonization. Usually, it takes up to 4 years before a new edition of input-output tables (national or global) is provided.
- As companies engaged in international trade source significantly more intermediate inputs from abroad than other companies, it would be helpful to be able to distinguish between exporting and non-exporting and importing and non-importing companies in each industry covered, e.g. on the NACE 2 digit level.

As these limitations clearly restrict the possibilities of a timely analysis of the reshoring trends and drivers in the EU, it is suggested to accompany the creation and analysis of suitable WIOTs by an additional, **quantitative European panel survey**, conducted yearly or every two years as suggested above, to develop systematic and up-to-date information on European companies' reshoring activities. With such a data base it would be possible to get answers or indications for important questions as e.g.: How are dynamics and motives of backshoring activities evolving over different countries over time? How do companies learn from offshoring failures and backshoring experience, and how does it influence future location decisions? Does supply chain complexity influence offshoring and backshoring modes and how?

Overall, the collected results so far suggest that companies are continuing to internationalize their activities, but with greater sensitivity to critical factors than in the past. The advantages of cost-based offshoring activities to low-wage countries seem to diminish more and more, while market related expansion investments in emerging markets, to get closer to the local customers and serve their needs in time, might gain further significance. At the same time, partly because of the new potentials of Industry 4.0 and smart digitized manufacturing technologies, companies are increasing their focus on **utilizing the strengths and potentials of their home base in high-wage countries** in Europe. Therefore, we might envisage the beginning of a **new strategic imperative of re-localized manufacturing** (Brennan et al., 2015; Kinkel, 2014) in important markets, with a strong focus on regional concentration and



D4.1 Measuring reshoring trends in the EU and the US

specialization of the necessary engineering and manufacturing competences. Complete solution providing capabilities will be installed in all relevant markets, bidding farewell to further slicing value chains over locations with least-cost advantages, which has led to very complex, multi-stage global supply chains that often comprise many different players and locations. Such global chains are also vulnerable to damages in one of their links, endangering the reliability and responsiveness of the whole chain, which is a crucial condition for the success of companies in today's global economy.

8. REFERENCES

- A.T. Kearney. (2014): The Truth About Reshoring: Not What It's Cracked Up to be!
- Abrahamson, E., & Rosenkopf, L. (1993): Institutional and competitive bandwagons: Using mathematical modeling as a tool to explore innovation diffusion. *The Academy of Management Review*, 18: 487–517.
- Alajääskö, P. (2009): Features of International Sourcing in Europe in 2001-2006. Statistics in focus 73/2009, Eurostat.
- Ancarani, A.; Di Mauro, C.; Fratocchi, L.; Orzes, G.; Sartor, M. (2015): Prior to reshoring: A duration analysis of foreign manufacturing ventures. *International Journal of Production Economics* 169 (2015), pp. 141-155.
- Ancarani, A.; Barbieri, P.; Di Mauro, C.; Fratocchi, L.; Mascali, F.; Nassimbeni, G.; Orzes, G.; Sartor, M. (2017): Manufacturing Reshoring: evidence from the European Monitor of Reshoring. Paper presented on the MAKERS Workshop “Reshoring and Industry 4.0”, Karlsruhe, May 3rd 2017.
- Arlbjørn, J. & Mikkelsen, O. (2014): Backshoring manufacturing: notes on an important but under-researched theme, *Journal of Purchasing & Supply Management*, 20 (1): 60-62.
- Bailey, D.; De Propriis, L. (2014): Manufacturing reshoring and its limits: the UK automotive case. *Cambridge Journal of Regional Economic Sociology* 7 (3), pp. 379-395.
- Bailey, D., De Propriis, L./SGH Martineau (2013): *Report: Bringing Manufacturing Back*. Birmingham: SGH Martinueau.
- Bals, L., Jensen, P. D. Ø., Larsen, M. M., & Pedersen, T. (2013): Exploring Layers of Complexity in Offshoring Research and Practice. In T. Pedersen, L. Bals, P. D. Ørberg Jensen, & Møller Larsen M. (Eds.), *The Offshoring Challenge: Strategic Design and Innovation for Tomorrow's Organization*: 1–18, London: Springer.
- Barney, J. (1991): “Firm resources and sustained competitive advantage”, *Journal of Management*, Vol. 17 No. 1, pp. 99–120.
- Barthelemy, J. (2001): “The hidden costs of IT outsourcing”, *Sloan Management Review* Vol. 42 No. 3, pp. 60–69.
- BCG (2011): Made in America, Again. Why manufacturing will return to the U.S. Available at: <http://www.bcg.com/documents/file84471.pdf>, accessed: 18.12.2013.

- BCG (2012): *Made in America, Again: U.S. Manufacturing Nears the Tipping Point.*, The Boston Consulting Group, 2012.
- Brennan, L., Ferdows, K., Godsell, J., Golini, R., Keegan, R., Kinkel, S., Srai, J.S., et al. (2015): “Manufacturing in the world: Where next?”, *International Journal of Operations & Production Management*, Vol. 35 No. 9, pp. 1253–1274.
- Broedner, P., Kinkel, S. and Lay, G. (2009): “Productivity effects of outsourcing: New Evidence on the Strategic Importance of Vertical Integration Decisions”, *International Journal of Operations & Production Management*, Vol. 29 No. 2, pp. 127–150.
- Buckley, P. J., & Casson, M. (1976): *The future of multinational enterprise*. London: Macmillan.
- Business Birmingham (2013): *Jobs Boost Expected as British Manufacturers Source More UK Components*. Birmingham: Business Birmingham.
- Cabral, S., Quelin, B., & Maia, W. (2013): Outsourcing failure and reintegration: the influence of contractual and external factors. *Long Range Planning*, 47(6): 1-14.
- Canham, S. & Hamilton, R.T. (2013): SME internationalisation: offshoring, ‘backshoring’, or staying at home in New Zealand. *Strategic Outsourcing: An International Journal*, 6(3): 277-291.
- Casson, M. (2013): Economic analysis of international supply chains: an internalization perspective. *Journal of Supply Chain Management*, 49(2): 8-13.
- Choi, T.Y. & Hong, Y. (2002): Unveiling the structure of supply networks: Case studies in Honda, Acura, and DaimlerChrysler. *Journal of Operations Management*, 20(5): 469-493.
- Dachs, B., & C. Zanker, C. (2014): Backshoring of Production Activities in European Manufacturing. *European Manufacturing Survey (EMS) Bulletin* No. 3, Karlsruhe.
- Dachs, B.; Kinkel, S.; Jäger, A. (2017): Bringing it all back home? Backshoring of manufacturing activities and the diffusion of Industry 4.0. Proceedings of the 24th International Annual EurOMA Conference, Edinburgh, Scotland, July 3rd-5th 2017
- Dicken, P. (2014): *Global shift: Mapping the changing contours of the world economy*. London: Sage Publications.
- Dunning, J.H. (1980): Towards an eclectic theory of international production: some empirical tests. *Journal of International Business Studies*, 11(1): 9–31.

- Dunning, J.H. (1988): The eclectic paradigm of international production: a restatement and some possible extensions. *Journal of International Business Studies* 19(1): 1–31.
- Ellram, L.M., Tate, W.L. & Petersen, K.J. (2013): Offshoring and reshoring: an update on the manufacturing location decision, *Journal of Supply Chain Management*, 49(2): 14-22.
- Feenstra, R. (1998): “Integration of trade and disintegration of production in the global economy”, *Journal of Economic Perspectives*, 12(4), 31-50.
- Fel, F. and Griette, E. (2016): Determinants for French firms’ reshoring decisions: A proposed typology. Proceedings of the 23rd International Annual EurOMA Conference, Trondheim, Norway, June 19th-21st 2016
- Foerstl, K., Kirchoff, J.F., & Bals, L. (2016): Reshoring and Insourcing: Drivers and Future Research Directions, *International Journal of Physical Distribution and Logistics Management*, 46(5): 492-515.
- Fratocchi, L., Ancarani, A. Barbieri, P., Di Mauro, C., Nassimbeni, G., Sartor, M., Vignoli, M., & Zanoni, A. (2016): Motivations of manufacturing reshoring: an interpretative framework. *International Journal of Physical Distribution & Logistics Management*, 46(2): 98 – 127
- Fratocchi, L., A. Ancari, P. Barbieri, C. Di Mauro, A. Troiano, M. Vgnoli and A. Zanoni (2015): Manufacturing Back- and Near-Reshoring: A Comparison of European and North American Evidence in J. Stentoft, G. Vastag and A. Paula (eds), ‘*Research in the Decision Sciences for Innovations in Global Supply Chain Networks: Best Papers from the 2014 Annual Conference*’
- Fratocchi, L., C. Di Mauro, P. Barbieri, G. Nassimbeni, & Zanoni A. (2014): When manufacturing moves back: Concepts and questions. *Journal of Purchasing and Supply Management*, 20(1): 54-59.
- Fredriksson, A. & Jonsson, P. (2009): Assessing consequences of low-cost sourcing in China. *International Journal of Physical Distribution & Logistics Management*, 39(3): 227-249.
- Goldman Sachs (2013): The US Manufacturing Renaissance: Fact or Fiction?, *US Economics Analyst*, Issue No. 13/12.
- Grant, R.M. (1991): The resource-based theory of competitive advantage: implications for strategy formulation, *California Management Review*, 33: 114-135.

- Gray, J.V., Skowronski, K., Esenduran, G. & Rungtusanatham, M. (2013): The reshoring phenomenon: what supply chain academics ought to know and should do. *Journal of Supply Chain Management*, 49(2): 27-33.
- Handfield, R.B. (1994): US global sourcing: patterns of development. *International Journal of Operations & Production Management*, 14(6): 40–51.
- Handley, S.M. & Benton Jr., W.C. (2013): The influence of task- and location-specific complexity on the control and coordination costs in global outsourcing relationships. *Journal of Operations Management*, 31(3): 109-128.
- Hartmann, A.K.; Penteker, L.; Prokott, F. (2014): Patterns of Reshoring to the U.S.. Paper presented at the University of Hohenheim, Faculty of Business, Economics and Social Sciences, Lecture on “International Offshoring und Outsourcing”.
- Heikkilä, J. (ed., 2017): Relocation of Nordic Manufacturing. Tampere University of Technology.
- Holweg, M., Reichhart, A., & Hong, E. (2011): On risk and cost in global sourcing“, *International Journal of Production Economics*, 131: 333–341
- Kinkel, S. and Jäger, A. (2017): Auslandsverlagerungen, Rückverlagerungen und Digitalisierungsverhalten in der deutschen Industrie. Trends und Auswirkungen für den Produktionsstandort Deutschland. Hochschule Karlsruhe – Technik und Wirtschaft.
- Kinkel, S. & Maloca, S. (2009): Drivers and antecedents of manufacturing offshoring and backshoring – a German perspective. *Journal of Purchasing & Supply Management*, 15(3): 154-165.
- Kinkel, S. (2012): Trends in production relocation and back-shoring activities – changing patterns in the course of the global economic crisis. *International Journal of Operations & Production Management*, 32(6): 696-720.
- Kinkel, S. (2014): Future and impact of backshoring – some conclusions from 15 years of research on German practices. *Journal of Purchasing & Supply Management*, 20(1): 63-65.
- Lasi H., Fettke, P., Kemper H.G., Feld T., & Hoffmann, M. (2014): Industry 4.0. *Business and Information Systems Engineering*, 6(4): 239-242.
- Lewin, A. Y., Massini, S. & Peeters, C. (2009): Why Are Companies Offshoring Innovation? The Emerging Global Race for Talent. *Journal of International Business Studies*, 40(6): 901-925.

- Li, D.; Godsell, J.; Karatzas, A. (2017): The current state of manufacturing reshoring in the UK. Proceedings of the 24th International Annual EurOMA Conference, Edinburgh, Scotland, July 3rd-5th 2017
- McIvor, R. (2009): How the transaction cost and resource-based theories of the firm inform outsourcing evaluation. *Journal of Operations Management*, 27(1): 45-63.
- Morgan Stanley (2013): US Manufacturing Renaissance: Is It a Masterpiece or a (Head) Fake? *Morgan Stanley Blue Paper*, April 29, 2013.
- Moser, H. (2013): Reshoring Initiative. Presentation at the CTMA. Available at: http://ctma.com/wp-content/uploads/Reshoring-Initiative-Presentation-H_Moser-Sept-18-2013-CTMA.pdf (accessed 22.12.2017).
- Nager, A. and R.D. Atkinson (2015): The Myth of America's Manufacturing Renaissance: The Real State of U.S. Manufacturing, *The Information Technology and Innovation Foundation*, Jan. 12, 2015.
- Nassimbeni, G. (2006): International sourcing: empirical evidence from a sample of Italian firms. *International Journal of Production Economics* 103(2): 694–706.
- OECD (2015): RESHORING: MYTH OR REALITY? Structural Change and the Next Production Revolution. DSTI/IND (2015) 8, Paris.
- Pegoraro, D.; De Propriis, L.; Bailey, D. (2017): Paper on reshoring trends and drivers of shorter value chains. MAKERS Deliverable 4.2, Birmingham Business School, The University of Birmingham.
- Pisano, G.P. (1990): The R&D boundaries of the firm: An empirical analysis", *Administrative Science Quarterly*, 35(1): 153-176.
- Pisano, G.P. & Shih, W.C. (2009): Restoring American competitiveness. *Harvard Business Review*, 87(7/8): 2-14.
- Pisano, G.P. and Shih, W.C. (2012): Producing Prosperity: Why America Needs a Manufacturing Renaissance, Harvard Business Review Press, Boston, MA
- Prahalad, C.K., Hamel, G. (1990): The core competence of the corporation. *Harvard Business Review*, May/June: 79-91.
- Rikama, S.; Nielsen, M.E.; Nielsen, P.B.; Alajääskö, P.; Roodhuijzen, A. (2013): International sourcing of business functions. Statistics Explained, Eurostat.
- Ritter, R. & Sternfels, R. (2004): When offshore manufacturing doesn't make sense. *The McKinsey Quarterly*, 4: 124-127.
- Rugman, A.M. (2010): Reconciling internalization theory and the eclectic paradigm. *Multinational Business Review*, 18(2): 1-12.

- Sturgeon, T.J. (2013): Global Value Chains and Economic Globalization – Towards a New Measurement Framework. Industrial Performance Center, Massachusetts Institute of Technology.
- Tate, W.L., Dooley, K. J. & Ellram, L. M. (2011): Transaction Cost and Institutional Drivers of Supplier Adoption of Environmental Practices, *Journal of Business Logistics*, 32(1): 6-16.
- Tate, W.L., Ellram, L., Bals, L., & Hartmann, E. (2009): Offshore outsourcing of services: An evolutionary perspective. *International Journal of Production Economics*, 120(2): 512-524.
- Tate, W.L. (2014): Offshoring and reshoring: U.S. insights and research challenges. *Journal of Purchasing and Supply Management*, 20(1): 66-68.
- Teece, D.J., Pisano, G. and Shuen, A. (1997): “Dynamic capabilities and strategic management”, *Strategic Management Journal*, Vol. 18 No. 7, pp. 509–533.
- Teece, D.J., Pisano, G. and Shuen, A. (2002): “Dynamic capabilities and strategic management”, in Dosi, G., Nelson, R.R. and Winter, S.G. (Eds.), *The Nature and Dynamics of Organizational Capabilities*, Oxford University Press, New York.
- Timmer, M. P., Los, B., Stehrer, R. & De Vries, G. J. (2016): An Anatomy of the Global Trade Slowdown based on the WIOD 2016 Release. *GGDC Research Memorandum 162*, Groningen.
- Wan, L.; Orzes, G.; Sartor, M.; Di Mauro, C.; Nassimbeni, G. (2017): Entry modes in reshoring strategies: An empirical analysis. Proceedings of the 24th International Annual EurOMA Conference, Edinburgh, Scotland, July 3rd-5th 2017
- Wernerfelt, B. (1984): “A resource-based view of the firm”, *Strategic Management Journal*, Vol. 5 No. 2, pp. 171–180.
- Williamson, O.E. (1985): *The Economic Institutions of Capitalism*. New York: Free Press.

MAKERS - Smart Manufacturing for EU growth and prosperity is a project funded by the Horizon 2020 Research and Innovation Staff Exchange Programme under the Marie Skłodowska-Curie Actions - Grant agreement number 691192.



Ca' Foscari
University
of Venice



Hochschule Karlsruhe
Technik und Wirtschaft
UNIVERSITY OF APPLIED SCIENCES

