Changing patterns of production relocation and backshoring activities in the course of the economic crisis

Abstract

Relocation of production activities to emerging countries in Asia and Eastern Europe has become more and more important in recent years. However, *backshoring* activities of once offshored manufacturing capacities are relevant phenomena, too. Particularly cost-driven relocation activities show a tendency to "fail" and are relatively inflexible to changing environmental conditions.

We use data from 1,484 German manufacturing companies to analyse changing patterns in firms' production relocation and backshoring behaviour, using structured probit analyses. We find that relocation activities declined significantly, whereas the level of backshoring activities has remained stable. Since the emergence of the economic crisis, particularly companies following a price leadership strategy are engaging in production relocation. Export-intensive companies tend currently towards more backshoring and (re-)concentrating of their production capacities. They valuate the benefits of higher capacity utilization and a superior relation of variable costs to fix costs higher than the option of producing partly at low-wage locations.

1 Introduction

Recent studies show that the relevance of the vertical relocation mode to establish international production activities in low-wage countries in Asia and Eastern Europe has grown in the 1990s and in the first years of the 21st century (e.g. Barba Navaretti and Falzoni, 2004; Brainard and Riker, 1997; Egger and Egger, 2003; Mucchielle and Saucier, 1997; Pennings and Sleuwaegen, 2000). Whereas in the past predominantly multinational enterprises (MNEs) have been active in this arena (e.g. Ayal and Zif, 1979; Buckley and Casson, 1976; Caves, 1982), today production relocation as a replacement mode of operating foreign direct investment (FDI) is becoming an increasingly interesting option for firms of all sizes (Mucchielli and Saucier, 1997; Pennings and Sleuwaegen, 1997). Due to the long term impact on the competitiveness of the company, offshoring decisions are key aspects of strategic enterprise positioning (Dunning, 1988; Ferdows, 1997; Hill et al., 1990; MacCarthy and Atthirawong, 2003) and play a crucial role for the competitiveness and the labour market of the regional and national economy (Porter, 1990, 1998).

Empirical studies often fail to take into account that production relocation does not necessarily have to be an irrevocable process. *Backshoring* activities of once offshored

manufacturing capacities are quite common phenomena (Kinkel and Maloca, 2009). Reasons for failures in international management, resulting in backshoring operations from foreign locations back to the domestic location, stem from lack of knowledge about the foreign destination and from lack of systematic location planning (Anderson et al., 1998; Truijens, 1992). Thus backshoring of manufacturing capacities might be a quantifiable phenomenon, but reliable data is not yet diffused in academic discussion.

Against the background of the actual economic crisis comes up the question if these patterns and trends are going to continue or if the extent and drivers for production relocation and backshoring activities has been significantly affected. This paper focuses on the change of patterns of production relocation and backshoring activities by comparing evidence of firms which have been active before 2007 with companies being active in the period from 2007 to mid 2009. The latter period was at least on one half influenced by the global economic downturn, hitting parts of the German industry heavily in 2008 and 2009. The research hypotheses will be tested with German data from the European Manufacturing Survey (EMS), a survey on the introduction of advanced production technologies and organisational concepts in European manufacturing industry. The German data set of the 2009 survey round includes 1,484 answers of companies of all manufacturing industries. Methodically we employ a structured set of probit analyses to identify the significant determinants and differences between production relocation and backshoring activities before and within the crisis.

The paper is organised as follows. Section 2 gives an overview on the relevant literature regarding relevance, driving factors and changing patterns of production relocation and backshoring and shapes hypotheses to be tested. Section 3 presents our data and the methodology used. Section 4 presents our results, a short overview on the relevance and the motives of production relocation and backshoring in the German manufacturing industry and the changing patterns detected in descriptive analyses and in the structured set of probit analyses. In section 5 we discuss the findings and draw conclusions for enterprise strategies and future research.

2 Literature review and hypotheses on trends and drivers of production relocation and backshoring

The movement of production activities from the home base of manufacturing companies to foreign locations has been researched theoretically and empirically for quite a while (e.g. Dunning, 1980, 1988; Stopford and Wells, 1976; Vernon, 1966, 1979). However, most studies so far have analyzed the determinants and motives of foreign direct investment (FDI) without clearly distinguishing between horizontal expansion investments and vertical relocation decisions (Pennings and Sleuwaegen, 2000). Some

more recent studies show that in particular the relevance of the vertical relocation of production activities to low-wage countries has grown in the 1990s and in the first years of the 21st century (e.g. Barba Navaretti and Falzoni, 2004; Brainard and Riker, 1997; Egger and Egger, 2003; Mucchielle and Saucier, 1997; Pennings and Sleuwaegen, 2000). Today, besides MNEs, more and more SMEs are offshoring production activities abroad to utilise the competitive advantages of a more intense international labour division (e. g. Anderson et al., 1998; Fillis, 2001; Urata and Kawai, 2000). The establishment of the European Common Market and the joining of the new Member States (EU 10 resp. EU 12) have accelerated the dynamics of this development (Egger and Egger 2006; Kinkel et al., 2007; UNCTAD 2005 and 2007).

The obstacles to the internationalization of companies have also been comprehensively investigated. The capital and financing requirements for foreign projects, overcoming bureaucratic hurdles abroad, as well as lack of know-how, capacity and competent personnel for cross-border management are acknowledged barriers (Fillis, 2001; Baird et al., 1994). Firms which tend traditionally to be more anchored in their region, frequently have only little or even no experience with internationalization beyond classical export business. For these *traditionals*, which are in many cases SMEs; the relocation or creation of additional capacity abroad presents a new strategic dimension (Lu and Beamish, 2006, 2001; Fernandez and Nieto, 2006, 2005). They need to integrate international management into the existing company management and decision-makers in these companies have to extend their well-known sphere of activity beyond the country borders (Mathews and Zander, 2007; Crick, 2007; Gallo and Sveen, 1991). This can entail the risk of misjudgements and wrong decisions, particularly if in SMEs new strategic decisions in favour of involvement abroad have to be prepared and realized relying on the existing resources and competences (Lu and Beamish, 2006).

The problems of established firms that want to be increasingly present in cross-border business become particularly clear, if they fail abroad. Inexperienced traditional enterprises can run into problems with their involvements abroad, which "drain away" their international investments (sunk costs) and can even lead to the termination of the internationalization (for the time being) and capacities being transferred back to their home country location (Kinkel et al. 2007; Schulz, 2007; Schulte, 2002). This phenomenon, known as *backshoring* or *backsourcing,* is made public only in the rarest cases and is also not statistically captured. This phenomenon can also be described from the view of *divestment* of foreign production locations (Benito, 2005). Alike studies on relocation activities (Pennings and Sleuwaegen, 2000), research on divestment and closure of foreign units (Belderbos and Zou, 2009; Benito, 1997, 2005; Li, 1995, Mata and Portugal, 2000) is relatively scarce and calls for more knowledge about its drivers and effects (Benito, 2005; Boddewyn, 1979).

Production relocation as “the move of a manufacturing process from one place to another” (Mucchielle and Saucier, 1997) can be defined in terms of spatial and ownership boundaries (e.g. Dossani and Kenney, 2003; Jahns et al., 2006; Olsen, 2006). Backshoring and insourcing activities can be categorised using the same dimensions, as they are also location or make-or-buy decisions on the part of companies. In terms of spatial dimension we differentiate between relocation or backshoring activities within the country (national or onshore) or to or from foreign locations (international or offshore/backshore). Changes in ownership which are caused by these transactions can be differentiated according to whether production capacities are transferred to or from locations of the own company (internal or captive mode) or whether they are transferred to or from external suppliers (external or out-/insourcing mode). In the following, *relocation of production capacities will be defined as relocation to or from own locations abroad (captive relocation or captive backshoring) as well as to or from foreign suppliers (offshore outsourcing or offshore insourcing).*

According to co-evolutionary approaches (e.g. Hutzschenreuter et al. 2007; Manning et al., 2008), institutional and environmental factors and particularly external shocks like a worldwide economic crisis, are affecting companies’ FDI and relocation strategies significantly. The 2009 World Investment Report has conclusively shown that the actual global economic crisis led to a severe reduction in global FDI flows (UNCTAD, 2009). However, the fall of FDI inflows hit most emerging economies later and not that hard than most developed countries. Thus, it is not clear whether the economic crisis affected relocation activities to emerging economies negatively or not. One argument for a reduction of production relocation activities in the course of the economic crisis goes back to transaction cost theory, predicting that the degree of vertical and spatial integration tends to rise with higher uncertainty of economic activity (Williamson, 1985, 1991). Empirical studies of firm relocation behaviour have shown that uncertainty has a negative impact on the probability of relocation (Pennings and Sleuwaegen, 2000). From a real options perspective (Li and Ruman, 2007; Belderbos and Zou, 2009), a company can benefit from waiting with relocation in uncertain times. This argument may also be used for divestment or backshoring decisions. “The greater the uncertainty of future growth and cost development of a location, the higher the value of the flexibility of “switching” betwenn options and the less likely a foreign affiliate will be divested (Belderbos and Zou, 2009). Thus, we propose the following two opposing hypotheses regarding the development of the extent of production relocation and backshoring activities in the course of the economic crisis:

H 1: The share of production relocating companies has declined in the course of the global economic crisis

H 2: The share of production backshoring companies has declined in the course of the global economic crisis

Motives for production relocation and backshoring

Different theories and analytical frameworks try to explain why firms produce internationally: Internalization theory (e.g. Buckley and Casson, 1976; Caves; 1982), international product cycle theory (e.g. Vernon 1966, 1979), the eclectic paradigm of Dunning (1980, 1988), stage theory of internationalization (e.g. Johanson and Vahlne, 1977, 1990) or resource-based theory (e.g. Chang, 1995; Delios and Beamish, 1999) are well established in IB literature. According to the OLI-framework of ownership, internationalisation and location advantages, the four main types of FDI are resource seeking, market seeking, efficiency seeking and strategic asset seeking (Dunning, 1988, 1998). Empirical studies examined different push and pull factors as the main drivers of international production activities. Reduction of labour costs, access to new markets, vicinity to key customers, access to new knowledge and the search for superior tax incentives and subsidies are among the most important motives (e. g. Dunning 1980, 1988; Ferdows, 1997; Kinkel et al. 2007; MacCarthy and Atthirawong, 2003).

For decisions to relocate production activities abroad, particularly location advantages of labour costs in low-wage countries are a pivotal factor. But also access to foreign markets and vicinity to key customers, for suppliers often as a more “passive” specification “following the customer”, are decisive motives for the offshore relocation of production activities (e.g. Kinkel et al. 2007; Kinkel and Maloca, 2009). In an economically challenging environment it can be assumed that local labour cost advantages are still an important driver for production relocation, as cost control becomes all the more important. Recent studies have also shown that in economically prosperous times more expansion investments for market opening are being carried out, whereas in times of economic downturn expansion investments are declining (UNCTAD, 2009) and market seeking relocation activities increasingly serve as a “substitute access option” as no additional capacities have to be built up (Kinkel and Maloca, 2009). Therefore, we propose the following hypothesis regarding the development of the motives for production relocation activities in the course of the economic crisis:

H 3: In the course of the global economic crisis, both labour cost reduction motives and market or customer seeking motives are gaining importance for production relocation activities.

Prior studies have also conclusively shown that relocations activities of companies located in developed European countries towards the twelve new Eastern European member states are primarily cost-driven (e.g. Mucchielle and Saucier, 1997; Pennings

and Sleuwaegen, 2000). For relocation activities targeted to Asian countries and specifically China, market seeking motives play an almost equally important role than the search for lower labour costs (e.g. Kinkel et al., 2007). As most low-wage Eastern European countries (EEC) are suffering much harder and longer from the consequences of the economic crisis than the emerging economies in Asia, particularly China, companies might target their market seeking relocation activities, which are assumed to gain further importance (see H 3), significantly more often to the once again growing Asian emerging economies. Thus we propose:

H 4: Production relocation activities to Asian countries and specifically China are gaining relative importance in comparison to relocations to the new Eastern European member states

For manufacturing companies' *backshoring* activities, the barriers to internationalisation are important antecedents. The capital and financing requirements for foreign projects, overcoming bureaucratic hurdles abroad, as well as lack of know-how, capacity and competent personnel for cross-border management are commonly acknowledged barriers (Fillis, 2001; Baird et al., 1994). These barriers to internationalisation, which in many cases bear a special significance for SMEs, are usually not further discussed. It was argued that an organisation's unfamiliarity with the process of internationalisation can be cured by learning or imitation (e.g. Henisz and Delios, 2001). Overcoming the internationalisation hurdles by step-for-step learning effects was thus for a long time assumed to be a self-reinforcing process (Alon, 2004; Hohenthal 2001, Eriksson et al., 2000; Gankema et al., 2000). The phenomenon of backshoring, however, shows that the assumption that existing internationalisation obstacles will and can be easily overcome is not a matter of course.

According to transaction cost theory, high and growing transaction and coordination costs might also be a strong argument for (re-)concentrating production capacities in one local setting via *insourcing or backshoring* activities (e.g. Williamson, 1985, 1991). Long physical and "mental" distances and possible opportunistic behaviour of the foreign production site or foreign supplier might make it very costly to negotiate, monitor and enforce all necessary trans-border supply and coordination activities. This includes also quality insurance processes to secure the needed quality level of products and processes, which are not easy to transfer in a foreign cultural setting, particularly when the parent company had long-lasting experiences and learning processes with advanced quality management methods. Empirical studies have shown that quality problems are always amongst the most important reasons for production backshoring activities, as also high coordination costs and problems with the flexibility and ability to supply of the foreign location (Kinkel et al., 2007; Kinkel and Maloca 2009; Schulte, 2002).

A sufficient ability of the foreign location to flexibly supply its local customers or trans-border locations of its parent company's supply chain will be easier to fulfill in times of economic downturn, when global sales are decreasing. Problems to achieve a satisfactory product and process quality at the foreign location are assumed to be independent from global economic developments, as trans-border support and learning processes are a crucial key. Thus, we propose:

H 5: In the course of the global economic crisis, the flexibility and ability to supply loses significance as motive for backshoring production activities, whereas quality problems at the foreign production site remain highly important.

Previous experiences and path dependency

Besides the motives of relocation decisions intended by the companies' responsible managers, path dependency is also a recognized factor for offshoring practises (e.g. Hutzschenreuter et al., 2007). As most companies "manage" the process of internationalisation by experimental learning or imitation (Henisz and Delios, 2001; Johanson and Vahlne, 1977), location decisions are influenced by existing interpersonal links and organisational routines rather than by systematically collected research (Ellis, 2000; Nelson, 1991; Nelson and Winter, 1982; Zollo and Winter, 2002). Relocation decisions are thus significantly shaped by past experiences on how to initiate and manage such processes. Some authors describe the relocation process as an adoption process, starting with rather simple or standardised activities and progressively leading – by learning and doing – to relocation of increasingly advanced activities (Lewin and Peeters, 2006; Maskell et al., 2007). Therefore, it can be argued that firms with past experiences in production relocation or backshoring activities are more likely to take up such activities again than firms with no past experience in this specific arena.

H 6a: Previous experiences with production relocation activities will have a significantly positive impact on the probability of current production relocation activities.

H 6b: Previous experiences with production backshoring activities will have a significantly positive impact on the probability of current backshoring activities.

3 Data and methodology

Our analysis will use the German dataset from the European Manufacturing Survey (EMS), a survey on the diffusion of advanced production technologies and organisational concepts in European manufacturing industry. The written survey set has been carried out by the Fraunhofer Institute for Systems and Innovation Research (ISI) every two years since 1995. It is the only dataset in all Europe which regularly enquires about

the trends towards relocation as well as backsourcing of production and R&D activities in manufacturing industry. The current German dataset of 2009 includes 1,484 observations of German firms of all manufacturing industries.

Table 1: Company size and sector distribution of the sample

	Database	
Company Size	n	%
up to 99 employees	934	62,9%
100 to 499 employees	437	29,4%
500 and more employees	113	7,6%
Industrial sector		
Manufacture of food products, beverages and tobacco	123	8,3%
Manufacture of textiles, textile products, leather and leather products	44	3,0%
Manufacture of wood and wood products	32	2,2%
Manufacture of pulp, paper and paper products; publishing and printing	80	5,4%
Manufacture of chemicals, chemical products and man-made fibres	77	5,2%
Manufacture of rubber and plastic products	130	8,8%
Manufacture of other non-metallic mineral products	81	5,5%
Manufacture of basic metals and fabricated metal products	302	20,3%
Manufacture of machinery and equipment n.e.c.	286	19,3%
Manufacture of electrical machinery and apparatus n.e.c.	70	4,7%
Manufacture of office machinery, computers and communication equipment	45	3,0%
Manufacture of medical, precision and optical instruments etc.	106	7,2%
Manufacture of vehicles and transport equipment	53	3,5%
Manufacture of furniture; manufacturing n.e.c.; Recycling	63	4,1%
Industrial sector group		
Input goods	750	50,7%
Investment goods	450	30,3%
Consumer goods	284	19,0%
Total manufacturing industry	**1484**	**100,0%**

The distribution of the sample (table 1) represents very well the population as regards company size and industrial sectors. Small companies are slightly underrepresented in the sample whereas large companies tend to be slightly overrepresented. Therefore, the discrepancies between the sample and the population have been compensated with weighting factors. The weighting factors have been calculated using criteria to "company size", "industrial sector" and "Western or Eastern regions of Germany" as only these factors are available for the parent population. On the whole, the database can be regarded as a representative cross-section of the above mentioned core sectors of the German manufacturing industries.

To analyse the *determinants* of production relocation and backshoring activities before and in the course of the global economic crisis, we employed a structured econometric

probit analysis each with three different models. Model 1 describes the determinants of production relocation/ backshoring activities in a timeframe of 1999 to 2006, which was all before the emergence of the actual economic crisis. Model 2a describes the determinants of production relocation/ backshoring activities from 2007 to mid 2009, which was at least on one half influenced by the actual economic crisis and hit large parts of the German industry heavily in 2008 and 2009. In Model 2b we include, again for the recent timeframe from 2007 to mid 2009, additionally a dummy variable of past experiences (1999-2006) with production relocation or backshoring activities to control for path dependency effects. In all models, the influence of different firm level determinants *X* on the probability to relocate or backshore production activities is estimated with a probit model, where the relocation *OFFS,* respectively the backshoring decision, is the dependent variable:

$$\mathrm{P}(OFFS_i = 1) = \Phi(X_i)$$

Φ is the cumulative normal density function. *X* contains a specific set of firm-specific determinants we control for (size, industrial sector, region in Germany, product development mode, product complexity, batch size, competitive strategy, supplier company or not, percentage of lowly qualified personnel, export quota, percentage of labour costs at turnover).

We proxy the *size* of the parent company using the natural logarithm of the number of employees, which we expect to have a positive impact on the probability of production relocation. Large companies are significantly more often multinational companies, have more plants and have more often already gathered experiences with cross border production and relocation activities (e.g. Dunning 1980, 1988; Pennings and Sleuwaegen, 2000; Rugman and Hodgetts 2000). They have also better financial and personnel capacities to plan, finance and absorb the costs of the relocation investment (Caves, 1982; Fillis, 2001; Pennings and Sleuwaegen, 2000). Also, divestment and *backshoring* activities are expected to be positively related to the size of the parent firm, since larger firms tend to possess more potentially closable production locations (e.g. Haynes et al., 2003) and find it easier to decide for withdrawal, as they might give less weight to individual affiliates than smaller firms (e.g. Belderbos and Zou, 2009; Li, 1995). However, large firms have also more financial and management resources and are thus in a stronger position to deal with temporarily poorly performing foreign sites to resist divestment or backshoring (e.g. Couke and Sleuwaegen, 2008; Park and Park, 2000). The smaller the firm, the more resources – relatively seen – must be spent on international projects in order to lead to long-term success (Andersson 2000; Brush et al., 2002). The probit analysis also controls for a *regional dummy* within Germany (Western or Eastern part) and for different *industry dummies*. In the probit models for estimating

the backshoring probability we reduce sectoral dummys to three main industrial sector groups (input, investment and consumer goods), as a finer sliced differentiation does not improve the quality of the models.

We control for the *p mode* (customer specific product development or developing products for a standardised product programme), assuming a negative impact of customer-specific patterns on the probability of relocation activities, as cost advantages and transaction potentials of offshoring activities can be most easily found in more standardised R&D, production and service processes (e.g. Doh et al., 2009; Pennings and Sleuwaegen, 2000; Vernon, 1966, 1979; Williamson, 1985). The model also proxies for the *product complexity* and the manufactured *batch sizes* of the parent company. We assume a positive correlation of batch size and relocation propensity, as product lifecycle theory predicts that more standardised production processes with higher economies of scale are more often targets of relocation strategies (Vernon 1966, 1979).

The probit models proxy for the primary *competitive strategy* of the parent firm and the dummy variable whether it is a *supplier company* or not. It is expected that companies focusing on a price leadership strategy are more frequently active in production relocation activities, as the labour cost advantages of low-wage countries contribute directly to their most important competitive factor (e.g. Benito, 2005). It is also assumed that supplier companies are more frequently relocating production activities, as they are sometimes confronted with the requests of some key customers to follow their investments and build up a local supply base in close proximity to them (e.g. Kinkel et al., 2007). These requests add further relocation considerations and pressure to the otherwise also proactive location decisions of supplier companies.

We test for the *labour cost intensity* (percentage of labour costs at turnover) and the *percentage of lowly qualified personnel* of the parent company, which we both expect to have a positive impact on the propensity of production relocation. IB theory predicts that units in the home country will specialize on more skill-intensive and capital-intensive activities like highly automated production or flexible, ‘customized’ manufacturing, while foreign affiliates located in low-wage countries exploit factor price advantages of their host countries (e.g. Dunning, 1980, 1988; Vernon, 1966, 1979). The comparative location advantage of a high-wage country as Germany relies strongly on the skills of qualified personnel to efficiently use and further optimise capital-intensive production technologies (e.g. Kinkel and Maloca, 2009; Pennings and Sleuwaegen, 2000). Thus, location advantages of low-wage countries and the propensity to offshore production activities might be highest for firms performing rather simple tasks with an above-average share of labour costs and low-skilled workers doing manual work.

Our probit analyses also test for the *export quota* of the parent company, assuming that export-intensive companies are more active in production relocation. This is in line with theoretical expectations of experience- or learning-based stage models of international production (e.g. Johanson and Vahlne, 1977). It is predicted that companies internationalise like "rings in water" (O'Grady and Lane, 1996; Nordström and Vahlne, 1994; Johanson and Vahlne, 1990). They start with export activities in culturally and physically "close" countries whose traditions and history appear known, before serving and later investing in more "distant" markets.

4 Results

Relevance of production relocation and backshoring activities

According to our data of 1,484 German firms covering all manufacturing sectors, only 9 per cent of the companies relocated parts of their production activities abroad in the recent period from 2007 to the middle of 2009 (table 2). Compared to the 15 per cent of companies which have been active in the last surveyed two years timeframe before the emergence of the economic crisis (mid 2004 to mid 2006), there has been a significant decline of relative 40 per cent in the share of relocating companies.

The scale of the current economic crisis is seemingly causing companies to maintain production at their existing locations rather than look for further potential cost savings in low-wage countries. The information on currently planned production relocations (7 per cent of enterprises) also confirms the current caution of German manufacturing companies. Thus, hypothesis H 1 is supported.

At the same time the analysis of the development of *backshoring activities* of previously outsourced production capacity shows a stable picture. The rate of *backshoring companies* in the manufacturing sector since mid 2004 has been fairly constant or even slightly rising from around 2.4 per cent (mid 2004 to mid 2006) to currently 2.8 per cent, which when extrapolated is around 570 companies per year. *Therefore for every third relocating company there is currently one backshoring company.* The current repatriation plans of enterprises to utilise domestic production capacity also suggest a further stabilisation of this level, rejecting hypothesis H 2.

As it was expected, particularly larger firms with more than 500 employees have relocated parts of their production abroad (46 percent), whereas this ratio is significantly lower in medium sized firms (100 to 499 employees: 22 percent) and small firms (20 to 99 employees: 10 percent). The analysis also shows that the decline of production re-

location activities in the course of the economic crisis is observable for all sizes, with a slight tendency to be higher in smaller firms.

Table 2: Share of companies with production relocation and backshoring activities

Production relocating/ backshoring companies	Relocation 2007 to mid 2009	Relocation mid 2004 to mid 2006	Backshoring 2007 to mid 2009	Backshoring mid 2004 to mid 2006
20-99 employees	5 %	10 %	1,6 %	1,3 %
100-499 employees	16 %	22 %	5,2 %	4,4 %
500 and more employees	38 %	46 %	9,3 %	10,5 %
Manufacture of electrical equipment and electronics (NACE 30-32)	23 %	26 %	3 %	3 %
Manufacture of vehicles and transport equipment (NACE 34, 35)	20 %	31 %	6 %	9 %
Manufacture of textiles, textile and leather products (NACE 17-19)	16 %	25 %	4 %	2 %
Manufacture of machinery and equipment n.e.c. (NACE 29)	11 %	22 %	3 %	4 %
Manufacture of medical, precision and optical instruments (NACE 33)	10 %	14 %	0 %	0 %
Manufacture of chemicals and chemical products (NACE 24)	9 %	11 %	3 %	4 %
Manufacture of basic metals and fabricated metal products (NACE 27, 28)	8 %	11 %	3 %	2 %
Manufacture of rubber and plastic products (NACE 25)	8 %	18 %	5 %	5 %
Other sectors (NACE 20, 23, 26, 36, 37)	4 %	13 %	1 %	2 %
Manufacture of food products, beverages and tobacco (NACE 15, 16)	3 %	2 %	2 %	1 %
Manufacture of pulp, paper and paper products; publishing and printing (NACE 21, 22)	1 %	8 %	2 %	0 %
All companies	9 %	15%	2,8 %	2,4 %

A similar distribution pattern is seen across the size categories for *backshoring* activities to the German production locations. The *backshoring* level diminishes from the largest to the smallest size category, from 10.5 per cent to 1.3 per cent. Here it is obvious that, compared to the prior period (mid 2004 to mid 2006), large companies are slightly reducing backshoring activities, whereas slightly more small and medium sized enterprises (SMEs) have become active.

Differentiation by industry reveals sector-specific differences in relocation behaviour. Particularly active in production relocations are enterprises in the electrical industry (23

per cent), automotive manufacturers and their suppliers (20 per cent) and the textile and clothing industry (16 per cent). The broad mid-table area includes manufacturers of machinery and equipment, manufacturers of medical, precision and optical instruments, of chemical products, metal products and rubber and plastic products. Rather resistant to relocation are the food industry and the paper and printing industry which are more strongly characterised by local customer markets. Compared to the relocation level in the previous observation period, particularly significant falls of around 10 percentage points are seen in the automotive and machinery industries, with the manufacturers of rubber and plastic products and in the textile and clothing industry. By contrast a relatively small fall in the propensity to relocate, starting from a very high level, can be observed in the electrical industry.

With the *backshoring* activities there are less sector-specific differences compared to the previous observation period. Only among automotive manufacturers and their suppliers can a more significant fall be observed, falling by 3 percentage points to 6 per cent. However, the automotive industry still shows the highest level of *backshoring* activities, closely followed by the manufacturers of rubber and plastic products. This indicates that the automotive industry is still looking for opportunities to reduce global capacity due to structural reasons.

Motives and target/ source countries of production relocation and backshoring

Reducing labour costs is still the dominating single motive for relocating production abroad (table 3). Three quarters of relocating enterprises state this as a decisive reason for their relocation decision. This is followed in places two and three, each with just under 30 per cent of the nominations, by the proximity of the production location to key customers abroad and market access in the destination country. Improved conditions relating to taxes, duties and subsidies were stated by only around one in ten relocating enterprises as an important reason. The relevance of access to new knowledge, technologies or clusters abroad for production relocations is even lower. Compared with the prior period (mid 2004 to mid 2006), only the relocation motive of proximity to key customers has gained measurably in importance by 8 percentage points since the last survey in the middle of 2006. Overall, hypothesis H 3 has thus to be rejected. The global economic downturn seems to have no significant effect on the relative importance of different motives for production relocation.

Table 3: Main motives for relocation of production activities

Main motives for production relocation decisions	Production relocation 2007 to mid 2009	Production relocation mid 2004 to mid 2006
Labour costs	77 %	80 %
Vicinity to key customers	29 %	21 %
Access to new markets	28 %	27 %
Taxes, levies, subsidies	12 %	11 %
Access to new knowledge/ technologies/ clusters	2 %	4 %

The analysis of the most important *backshoring* reasons shows that quality problems are the most frequent reason, stated by around 7 in 10 *backshoring* enterprises (table 4). This motive has slightly gained in importance compared to the prior survey before the middle of 2006. In second place for *backshoring* reasons with 43 per cent nominations are critical losses in the flexibility and delivery capability of enterprises. These losses may be based both on problems with their own production sites and flexible access to local supplier networks. As assumed, this backshoring motive has significantly lost in importance since the emergence of the global crisis, providing support for hypothesis H 5.

Table 4: Main motives for backshoring of production activities

Main motives for production backshoring decisions	Production backshoring 2007 to mid 2009	Production backshoring mid 2004 to mid 2006
Quality	68 %	61 %
Flexibility/ Ability to deliver on time	43 %	**72 %**
Labour costs	**33 %**	16 %
Coordination and monitoring costs	20 %	16 %
Availability/ Fluctuation of qualified personnel	**19 %**	9 %

In place three as reason for backshoring follow labour costs abroad, which have more than doubled in importance since the last surveyed period (mid 2004 to mid 2006). This indicates an unexpected increase in wage dynamics in the destination countries. As some enterprises seem to have made their location comparisons statically or underestimated local development dynamics, some of the originally promising relocation calculations now no longer appear to be advantageous. The underestimated level of coordination and control costs is an important backshoring reason for one in five enterprises, as also the availability and fluctuation of qualified personnel at the foreign location. The

latter has more than doubled in relevance since the last survey, indicating that this factor is a becoming more important reason in relation to the lack of qualified personnel in Germany as a reason for production relocations abroad.

In line with the relevance of cost motives, the new EU member states are still the preferred *target region* for production relocations (table 5). 40 per cent of relocating enterprises were active between 2007 and the middle of 2009 in these countries. However, the new EU states have become noticeably less attractive as a relocation destination compared to the prior survey period (mid 2004 to mid 2006), when the level of relocations to these countries was 15 percentage points higher. On the other hand also most backshoring activities, one in every two, are from the new EU member states. The rise in this value by 12 percentage points since the last survey period is further proof that these Central and Eastern European countries are becoming less attractive as production locations for German enterprises. At the same time production relocations to the rest of Eastern Europe are stagnating, while backshoring activities from here, which were not measurable in 2006, are becoming increasingly relevant (9 per cent). One of the reasons for them becoming less attractive could be the sharp rise in wages in some regions of Poland, the Czech Republic, Hungary and Slovakia, which has gained greatly in importance as a motive for repatriation (see table 4).

China is the second most attractive relocation region with 27 per cent of production relocation activities. China has therefore gained 8 percentage points since the last survey period. It is notable that China is no longer an attractive relocation destination for just larger enterprises, but is also an attractive relocation destination, and at a similar level, for small and medium-sized enterprises. On the other hand 16 per cent of backshoring is now coming from China, which is for the first time a notable share. Here in particular small and medium-sized enterprises are active which, due to their physical and cultural distance, find it difficult to get the frequently occurring quality problems under control, particularly in economical challenging times where they are in parallel requested to solve other important problems.

The remaining Asian countries have also become notably more attractive for production relocations since the last survey period (up 7 percentage points) and are currently the third most attractive region (16 per cent). Together with the increased importance of China and the new EU countries becoming less attractive, it can be concluded that when companies relocate due to cost considerations and sometimes also market seeking reasons today, they more often prefer the further away Asian countries with their attractive mix of low wages and their – early after the global economic downturn – once again growing market perspectives over the closer new EU countries, where market

perspectives are still relatively pessimistic and wage levels have noticeably increased in recent years. This picture provides support for hypothesis H 4.

Table 5: Target and source countries for production relocation and backshoring activities

Target countries for production relocation activities	Relocation 2007 to mid 2009	Relocation mid 2004 to mid 2006
New Eastern European Union member states (EU 12)	40 %	**55 %**
China	**27 %**	19 %
Asia (besides China)	**16 %**	9 %
Other (than EU 12) Eastern European countries	12 %	12 %
"Old" European Union member states (EU 12)	10 %	13 %
North-America	9 %	4 %
Latin-America	3 %	4 %
Source countries for production backshoring activities	Backshoring 2007 to mid 2009	Backshoring mid 2004 to mid 2006
New Eastern European Union member states (EU 12)	**51 %**	39 %
China	**16 %**	2 %
North-America	**14 %**	3 %
Other (than EU 12) Eastern European countries	**9 %**	0 %
"Old" European Union member states (EU 12)	9 %	**30 %**
Asia (besides China)	7 %	13 %
Latin-America	0 %	2 %

The fifth and sixth most attractive relocation regions are the old EU countries and North America. North America is up by 5 percentage points since the last survey, with the devaluation of the dollar in the meantime making favourable production and sourcing strategies possible in this important target market for many German enterprises. At the same time though backshoring from North America has also gained in importance, up by 11 percentage points to now 14 per cent. This might be attributable to the very early downturn in the USA in the wake of the global economic crisis. Up until the crisis the USA had been the most important sales market for many German producers.

Determinants of production relocation and backshoring activities

To identify the relevant determinants that influence the probability of a firm to relocate or backshore production activities and the changing patterns due to the economic crisis, we calculated three probit estimations each for the relocation and backshoring propensity using robust standard errors. Table 6 displays the results of the probit regressions where we report the coefficient and significance levels. The models are all statistically significant and show a Pseudo R^2 of between 0.1279 and 0.3679 (Table 6), which is satisfactory to quite good. Due to missings in the multiplicity of the considered variables, the originally 1,484 observations have been reduced to between 649 and 877 cases featuring all the considered variables.

Change of production relocation patterns

The results for the *relocation propensity* show that in all three models the size of the company is significantly and positively related to the probability to relocate production activities. This has been theoretically and empirically expected and fits to the results of the descriptive analysis (table 2). Companies which are engaged in customer-specific product development are – as expected – less active in production relocation, but only before the occurrence of the economic crisis (table 6, model 1). As assumed, companies focusing on a price leadership strategy are in all three models significantly more often active in production relocation activities than companies focusing on a differentiation strategy. It was also expected that companies with a higher percentage of lowly qualified personnel show a higher probability to relocate production activities. If we include in model 2b, for the recent timeframe from 2007 to mid 2009, a dummy variable to control for past experiences (1999-2006) with production relocation activities, we find also expected results. Previous experiences have a significant and positive impact on recent production relocation activities, providing support to hypothesis H 6a.

Table 6: Probit regressions of firm-level determinants for the probability to relocate or backshore production activities

Probit regression	**Model 1 (1999 - 2006)**			**Model 2a (2007 - mid 2009)**			**Model 2b (2007 - mid 2009)**		
	Number of obs = 857			Number of obs = 877			Number of obs = 856		
	LR chi2 = 107.63			LR chi2 = 109.73			LR chi2 = 224.11		
Dependent Variable: Manufacturing relocation	Prob > chi2 = 0.0000			Prob > chi2 = 0.0000			Prob > chi2 = 0.0000		
	Pseudo R2 = 0.1620			Pseudo R2 = 0.1787			Pseudo R2 = 0.3679		
	Coef.	**P>|z|**	**Sig.**	**Coef.**	**P>|z|**	**Sig.**	**Coef.**	**P>|z|**	**Sig.**
Number of employees (log)	.2799004	0.000	***	.3463877	0.000	***	.287878	0.000	***
Manufacture of textiles, textile and leather products (NACE 17-19)	.6899503	0.024	**	.4855741	0.155		-.0192239	0.964	
Manufacture of chemical, rubber and plastic products (NACE 24, 25)	-.439865	0.077	*	-.004427	0.985		.2222287	0.391	
Manufacture of machinery and equipment n.e.c. (NACE 29)	.1534522	0.449		.2479049	0.261		.202381	0.424	
Manufacture of electrical equipment and electronics (NACE 30-32)	.6043569	0.006	***	.5705234	0.016	**	.3190881	0.239	
Manufacture of medical, precision and optical instruments (NACE 33)	-.1901559	0.487		.4604244	0.070	*	.6824451	0.015	**
Manufacture of vehicles and vehicle equipment (NACE 34)	.3740309	0.240		.2867371	0.416		.1316715	0.735	
Other sectors (NACE 15, 16, 20-23, 26, 35-37)	-.1448635	0.464		-.2684756	0.231		-.3152887	0.225	
German Region (Western part)	.2085257	0.256		.209449	0.290		.1348622	0.535	
Customer specific product development	-.268572	0.036	**	-.1971693	0.142		-.1180243	0.445	
Manufacture complex products	-.0251201	0.883		-.1863638	0.310		-.2770651	0.182	
Manufacture large batch size	-.1387695	0.336		-.1292497	0.386		-.1302742	0.447	
Strategy: price leadership	.3044445	0.051	*	.4791297	0.003	***	.3887965	0.031	**
Supplier company	.1676915	0.198		.0206305	0.879		-.0026261	0.987	
Percentage lowly qualified personnel	.0050016	0.053	*	.0079791	0.003	***	.0076577	0.013	**
Export quota	.0080403	0.001	***	.0076103	0.004	***	.0042712	0.158	
Percentage personnel costs at turnover	.0044772	0.414		.0060024	0.299		.0037012	0.584	
Manufacturing relocation (1999 - 2006)							1.662.467	0.000	***
_constant	-3.186.632	0.000	***	-3.782.313	0.000	***	-3.643.383	0.000	***
Significance level: *** = p < 0.01; ** = p < 0.05; * = p < 0.1									

Probit regression	**Model 1 (1999 - 2006)**			**Model 2a (2007 - mid 2009)**			**Model 2b (2007 - mid 2009)**		
	Number of obs = 657			Number of obs = 855			Number of obs = 649		
	LR chi2 = 29.60			LR chi2 = 33.85			LR chi2 = 63.73		
Dependent Variable: Manufacturing backshoring	Prob > chi2 = 0.0000			Prob > chi2 = 0.0007			Prob > chi2 = 0.0000		
	Pseudo R2 = 0.1279			Pseudo R2 = 0.1337			Pseudo R2 = 0.2838		
	Coef.	**P>|z|**	**Sig.**	**Coef.**	**P>|z|**	**Sig.**	**Coef.**	**P>|z|**	**Sig.**
Number of employees (log)	.1090626	0.210		.1185753	0.139		.1093678	0.233	
Manufacture input goods	.3235253	0.283		.0819411	0.757		-.0010721	0.997	
Manufacture investment goods	-.042124	0.900		-.1596723	0.592		-.2054277	0.548	
German Region (Western part)	.4610998	0.179		-.0792019	0.751		-.3243926	0.303	
Customer specific product development	-.3949398	0.053	*	-.3492765	0.075	*	-.2790405	0.229	
Manufacture complex products	.0731	0.760		.2829002	0.208		.1781161	0.520	
Manufacture large batch size	-.0439138	0.850		-.0505523	0.822		-.1145035	0.660	
Strategy: price leadership	.3197586	0.153		.2476799	0.273		.0762008	0.789	
Supplier company	.5767919	0.006	***	.2822877	0.150		.0333086	0.885	
Percentage lowly qualified personnel	.0010371	0.800		.0010956	0.779		-.0018214	0.711	
Export quota	.0057322	0.144		.0133115	0.000	***	.0136782	0.002	***
Percentage personnel costs at turnover	-.0164505	0.061	*	-.002381	0.772		.0047635	0.620	
Manufacturing backshoring (1999 - 2006)					0.000	***	1.723.891	0.000	***
_constant	-2.853.239	0.000	***	-2.926.258	0.000	***	-2.746.132	0.000	***
Significance level: *** = p < 0.01; ** = p < 0.05; * = p < 0.1									

The inclusion of past experience (1999-2006) with production relocation activities improves significantly the quality of the model, increasing the Pseudo R^2 from 0.1787 (model 2a) to 0.3679 (model 2b). This leads to two conclusions: Firstly, past experience with relocation really matters for recent activities in this arena, whereas the relevance of export experience vanishes in model 2b as a significant explanation factor (unlike in model 1 and 2a). Secondly, the insertion of past experience with production relocation has also a *methodical surplus*. It significantly sharpens the differences between the models of firm-level determinants before and after 2007. Variables which have been similar in explanation power and significance become insignificant (e.g. export quota) after adding past experience with the dependent variable "production relocation" in the probit model. As significant factors in model 2b remain a stronger focus of production relocating firms on a price leadership strategy and a stronger bias towards companies with a higher percentage of lowly qualified personnel. *Change of production backshoring patterns*

The results for the *backshoring propensity* show in all three models no significant correlation of the size of the company and the probability to backshore production activities. This fits to the theoretical and empirical expectations described in the section 3 that the *size* of the parent company and the backshoring propensity can be correlated positively (e.g. Haynes et al., Belderbos and Zou, 2009; Li, 1995) or negatively (e.g. Belderbos and Zou, 2009; Couke and Sleuwaegen, 2008; Park and Park, 2000). According to model 1, companies which are engaged in customer-specific product development have been less active and supplier companies have been more active in production backshoring before the occurrence of the economic crisis. We will come back to these results in our discussions.

In the two models estimating the backshoring propensity after the emergence of the economic crisis (models 2a and 2b), the export quota of the parent company is significantly and positively related to the probability to backshore production activities. The assumption that export-intensive companies tend towards (re-)concentrating their production capacities in their parent site and serving foreign markets via export modes in economically tense times is further supported by the fact that the "export quota" remains as a highly significant explanation factor in model 2b, where past experience with production backshoring activities is included. The insertion of the dummy variable to control for past experiences (1999-2006) with production backshoring activities shows the expected significant and positive impact, providing support to hypothesis H 6b. The Pseudo R^2 improves significantly from 0.1337 (model 2a) to 0.2838 (model 2b). Once again, the insertion of past experience significantly sharpens the differences between the models before and within the economic crisis. The variables "customer-specific product development" and "supplier company", which have been similar in ex-

planation power in model 1 and 2a or lost significance with the emergence of the economic downturn, become insignificant after adding past experience to the model.

5 Discussion and conclusions

Consistent with the recent cutback of global FDI flows (UNCTAD, 2009), we found a significant decline of production relocation activities of German manufacturing companies in the course of the global crisis, compared to a (relatively) 40 percent higher level before the crisis. These findings are in line with arguments of transaction cost theory, predicting that with a higher uncertainty of the economic environment the degree of organisational and spatial separation tends to decrease (Williamson, 1985, 1991). In the current economic crisis companies primarily seem to be trying to utilize their capacities at existing locations to realise a reasonable relation of variable costs to fix costs. At the same time the level of backshoring activities has remained stable, so that *for every third relocating company there is now one backshoring company*. This result clearly shows that, in the current times of high uncertainty and a tough business environment, it seems to be more important for German manufacturing firms to concentrate their activities at their parent site than to “hold an option” for foreign production.

Reducing labour costs is still the dominating single motive for relocating production abroad, followed by a clear margin by the proximity to key customers abroad and access to foreign markets. Overall, the global economic downturn seems to have no significant effect on the relative importance of different motives for production relocation. The picture for the evolution of the backshoring motives is different. The main reason for backshoring production activities is quality problems at the foreign location. Critical losses in the flexibility and delivery capability follow at second rank of backshoring motives, but have significantly lost in importance since the emergence of the economic crisis. This shows that a sufficient ability of the foreign location to flexibly supply its local customers or the trans-border locations of its parent company’s supply chain seem to be easier to fulfill in times of economic downturn, when global sales are decreasing. Conversely, quality problems have slightly gained in importance compared to before 2007, indicating that in economically tense times companies – and in particular SMEs – are more reluctant to “invest” the necessary resources for support and learning processes (e.g. Henisz and Delios, 2001; Gankema et al., 2000) in quality management.

The new EU member states seem to have become less attractive recently. Production relocations to these countries have fallen noticeably, while backshoring from them has increased. China and the rest of Asia on the other hand have continued to grow as relocation destinations, although backshoring activities from here are now a measurable phenomenon as well. This pattern can be explained firstly by the high wage dy-

namics in some Eastern European countries (EEC) over the last few years. This factor has become more relevant for backshoring decisions from these countries, which are primarily low-wage destinations for companies in developed European countries (e.g. Mucchielle and Saucier, 1997; Pennings and Sleuwaegen, 2000). Secondly, most low-wage Eastern European countries (EEC) are suffering much harder and longer from the consequences of the economic crisis than the emerging economies in Asia, particularly China. Thus, companies seem to have targeted relocation activities, which are not only following cost reduction rationales but also market seeking considerations, more often to the once again growing Asian emerging economies.

The results of our structured probit analyses uncover further insights in changing patterns of production relocation and backshoring strategies by comparing firm-level determinants before and in the course of the crisis. The results of the probit anylyses indicate that since the beginning of the economic crisis particularly companies with a primary focus on price competition and a high share of lowly qualified workers at their parent site were engaging in production relocation. Whereas in economically more prosperous times many other companies seem to have “experimented” with relocation activities, it can be observed that in challenging times rather companies which assume to get a direct contribution of labour cost advantages in low-wage countries to their competitive position are engaging in this arena. The probit models also show that past experience with production relocations and thus path dependency matters (e.g. Eriksson et al., 2000; Hutzschenreuter et al., 2007). This suggests that particularly in economically uncertain times, companies seem to fall back to once already practiced and well-rehearsed behavioural patterns and strategies, using existing interpersonal links and organisational routines (Ellis, 2000; Nelson, 1991; Nelson and Winter, 1982; Zollo and Winter, 2002). They seem to be more reluctant to new approaches with subjectively higher associated risks and to experimental learning of more advanced relocation modes.

Regarding the *change of backshoring patterns* it becomes obvious that companies which are engaged in customer-specific product development have been less active in production backshoring before the emergence of the global economic downturn. This suggests that if a company has been successful in establishing customer-specific interfaces in product development and production processes to their local customers abroad, these valuable ties serve as an impediment for divesting or backshoring foreign production capacities. However, in economically uncertain times with lower local sales and sometimes subcritical masses, these ties might be capped in order to (re-)concentrate these interfaces in one location (e.g. Williamson, 1985, 1991). Supplier companies have also been more active in production backshoring before the occurrence of the economic crisis. This might reflect that supplier companies are sometimes

confronted with the requests of some key customers to follow their investments and thus are forced to build up foreign production capacities (e.g. Kinkel et al., 2007). With the emergence of the economic crisis many of the large, multinational customer companies reduced their activity level in FDI (UNCTAD, 2009), leading to a lower pressure on supplier firms to follow them. The export quota of the parent company is significantly and positively related to the probability to backshore production activities. This result indicates that in times of decreasing global growth and foreign sales, export-intensive companies tend towards (re-)concentrating their production capacities in their parent site and serving some foreign markets (again) via export modes. They valuate the benefits of higher capacity utilization and a superior relation of variable costs to fix costs at their home base higher than the option of producing partly at low-wage locations with lower variable costs, but overall higher fix cost burdens.

Our findings illustrate the high impact of environmental factors such as global or local economic developments, but also developments of wages, education or (political) risks, on companies' offshoring decisions (e.g. Doh et al., 2009; Dunning, 1998; Manning et al., 2008). Therefore, it would be helpful to systemically integrate possible scenarios on the future development of influencing environmental factors and their potential impact on IB strategies and offshoring decisions in future research frameworks. Nowadays, it should be perceived already in the run-up to establishing a production unit abroad, that internationalization is always subject to dynamic developments at different locations which can strategically necessitate backshoring after a certain time. Dynamic considerations in the decision-making process of relocation activities, using scenario-based decision-making tools (Kinkel and Maloca, 2008), are urgently advised. Also, the deduction of future "trends" and new paradigms in IB and offshoring research should always be mirrored in the light of possibly changing (or even trend reversing) environmental and economic conditions. This would help academics and practitioners to develop a sound understanding and "feeling" of the described phenomenon and its interrelation with and sensitivity to significant changes of the relevant environment.

Complementary to skills in using methods which support truly dynamic location decisions, companies should, according to our insights, endeavour to develop the following international business competences (Knight and Kim, 2009), if they want to establish themselves abroad in the long term: the competence to maintain flexibility and the ability to deliver at home and abroad, to introduce a joint quality standard at home and abroad, to anticipate and cope with the arising coordination and communication costs. Also, abilities should be developed to render strategic international management so flexible that the firms can confront the growing dynamics of internationalization and react in a timely fashion with adaptable (backshoring-) strategies. First approaches to

systematically build up these competences are as yet in the development phase (Basly, 2007; Kinkel, 2004; Knight, 2001; Knight and Kim, 2009).

Further research is needed in this field. Comparative studies of diverging relocation and backshoring patterns according to countries, branches (e.g. “old” and “new” economy), MNEs vs. SMEs or from various target regions and markets do not exist yet. This seems urgently required, as national and international locations today must be constantly checked as to their positioning in the global value-added chains. In a time in which flexibility and mobility are becoming more and more crucial for all kind of companies, particularly since the emergence of the global economic crisis, location decision-making must also be arranged along flexible and modifiable lines. Fitting this awareness into the strategic structure of internationally active enterprises is one of the new core tasks in international management.

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