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Inhalt

Abstract

We investigate production offshoring – the relocation of production activities to locations abroad – of European firms. The analysis employs data from the European Manufacturing Survey (EMS).

Offshoring activity is declining across most countries, sectors, and firm sizes between the periods 2004/06 and 2007/09. Regression analysis reveals that this decline is also significant after controlling for firm characteristics. Long-term data for Germany indicate that this decrease is part of a longer trend which already started in 2003.

Despite the general decrease in offshoring, far-shoring to Asia in general and to China in particular has increased. In contrast, near-shoring to EU member states in Middle and Eastern Europe (EU-12) became less attractive. The EU-12, however, is still the most important target region for offshoring activities of European firms.

The dominant motive for offshoring is the wish to reduce labour costs. Expected labour cost reductions explain offshoring to the EU-12, Asia and China in particular. Vicinity to customers and market expansion follow as a motive with a wide margin. However, in contrast to the EU-12, where the offshoring decision is solely dominated by potential labour cost savings, offshoring activities to Asia and China are also significantly related to market expansion motives.

1 Introduction

This paper investigates the relocation of production activities to locations abroad (referred to as offshoring in the text) in European manufacturing. We employ data from the European Manufacturing Survey (EMS), a large-scale survey on modernisation strategies in European manufacturing. The paper updates and complements a previous study (Dachs et al, 2006). We do not review the huge literature on offshoring and similar changes in global value chains – such a review is provided in Stehrer et al (2012).

At the end of the 1990s and the start of the new millennium, the reasons and consequences of the relocation of production capacities to foreign countries were discussed intensely in public and academic debates. This was due to the observation that many well-known European manufacturing companies made use of production offshoring strategies. The aim in most cases was to improve their cost position, in particular with investment in the new EU Member States, and partly also to support market penetration (Kinkel et al., 2007; Kinkel and Maloca, 2009). However, the risks and difficulties of transferring production in low-wage countries were frequently underestimated, resulting in medium-term adaptation strategies and sometimes even backshoring activities (Kinkel and Maloca, 2009). Nevertheless, for many years production relocations held a firm place in the standard repertoire of most popular cost reduction measures in European industry.

In the current Euro crisis the question comes up how manufacturing companies act in the offshoring arena in times of high economic uncertainty. The companies' behaviour in the light of the global economic crisis of 2008/2009 can act as reference for how industrial relocation strategies are influenced by external economic shocks. When looking at the offshoring intensity of the German manufacturing industry over a timeframe from 1995 to 2006 it can be shown that in times of economic difficulties, relocation activities have usually increased due to increased competitive pressure (Kinkel and Maloca, 2009).

The objective of the study is to analyse offshoring production activities across different types of European manufacturing industries. Thereby, we tackle the following **key questions**:

- What is the share of firms which have offshored production activities to foreign locations? Regarding size, sector affiliation and country, which types of firms are more likely to offshore?
- Has the propensity to offshore production activities changed in recent years? Has offshoring decreased or increased in the 2008/2009 economic recession?
- What are the preferred target countries for production offshoring? What are the motives for production relocations in these countries?
- How is offshoring related to firm characteristics, including firm performance, innovation and the characteristics of the production process?

The analysis is based on the European Manufacturing Surveys of 2006 and 2009. The remainder of the paper is organised as follows: Chapter 2 describes the data set in detail. Chapter 3 investigates the frequency of production offshoring across countries, company size and sectors. Chapter 4 deals with the target regions of production offshoring. Chapter 5 looks at the motives of this trend. Chapter 6 examines the characteristics of offshoring firms with multivariate analysis. Chapter 7 summarizes the results.

2 Database

The *European Manufacturing Survey* (EMS) investigates product, process, service and organisational innovation in the European manufacturing sectors (see Box 1 below).

This paper exploits evidence from the last EMS round conducted in the middle of 2009, covering companies' production offshoring activities from 2007 to the middle of 2009, thus covering the 2008/2009 economic crisis. These findings are compared with the results of the previous EMS round of 2006, which covers production offshoring activities from the middle of 2004 to the middle of 2006 and hence before the economic crisis.

In the context of this paper, offshoring firms are defined as firms which have moved parts of their production activities to affiliated or independent firms abroad. Hence, offshoring includes foreign direct investment, but also the import of goods previously produced domestically from contractors abroad.

Box 1: The European Manufacturing Survey

The European Manufacturing Survey (EMS) investigates technological and non-technological innovation in European industry. It focuses on fields such as technical modernisation of value adding processes, introduction of innovative organisational concepts including international offshoring and outsourcing of production and R&D activities and new business models for complementing the product portfolio with innovative services. In contrast to the Community Innovation Survey (CIS), EMS is more focused on technology diffusion and organisational innovation than on product innovation.

The questions on these indicators have been agreed upon in the EMS consortium and are surveyed in all the participating countries. Additionally, some countries ask questions on specific topics. The underlying idea of the question design is to have a common part of questions constantly over several survey rounds, to modify other common questions in the respective survey round corresponding to actual trends problems and topics and to thirdly give space for some country or project specific topics.

EMS is organized by a consortium of research institutes and universities co-ordinated by the Fraunhofer Institute for Systems and Innovation Research (ISI) and takes place every three years. In most countries, EMS is organized as a paper-based survey at company level. The persons contacted to fill in the questionnaires include the production manager or the CEO of the contacted manufacturing firms. For preparing multinational analyses the national data undergo a joint harmonisation procedure.

The latest survey EMS 2009 was carried out successfully in 13 countries and included information on more than 3,500 companies of the manufacturing sector.

Source: Fraunhofer ISI (2011)

The data set employed in this report was compiled from the Austrian, Croatian, German, Dutch, Slovenian, Spanish and Swiss EMS data sets collected in 2009 and in 2006. Danish and Finnish data are only available for the 2009 round, as the respective partners joined the EMS network after 2006.

The joined data will be analysed without applying any population weighting, which is often used to correct for different compositions of national samples. Weighting, however, may incur the danger of new biases which may be even more difficult to detect. Moreover, the regression results of chapter 9 largely confirm the descriptive results so that we are confident that unweighted data allows a by and large unbiased analysis.

This report focuses on actual trends and developments in production relocation activities of European manufacturing companies of the following industrial sectors: chemicals/chemical products (NACE 24), machinery & equipment (NACE 29), electrical & optical equipment (NACE 30-33), and transport equipment (NACE 34-35). Table 1 gibes an overview of the sample broken down by the sector, firm size, and country distribution for the EMS surveys 2006 and 2009.

Table 1 - Sample of surveyed firms, by firm size, country and sector, 2006 and 2009

		2006		2009
Firm size	N	%	N	%
Up to 49	435	29.9	476	33.4
50 to 249	669	46.1	663	46.5
250 and more	348	24.0	288	20.2
Sector	N	%	N	%
Chemicals/chemical products [(a)]	170	11.7	180	12.6
Machinery & equipment [(b)]	617	42.5	628	44.0
Electrical & optical equipment [(c)]	537	37.0	507	35.5
Transport equipment [(d)]	128	8.8	112	7.9
Country	N	%	N	%
Germany	847	58.3	635	44.5
Austria	89	6.1	102	7.2
Switzerland	299	20.6	303	21.2
Netherlands	89	6.1	116	8.1
Denmark			143	10.0
Croatia	40	2.8	24	1.7
Finland			42	2.9
Spain	56	3.9	32	2.2
Slovenia	32	2.2	30	2.1
Total	1452		1427	

Note: [(a)] NACE 24, [(b)] NACE 29, [(c)] NACE 30-33, [(d)] NACE 34-35.
Source: European Manufacturing Survey 2006, 2009

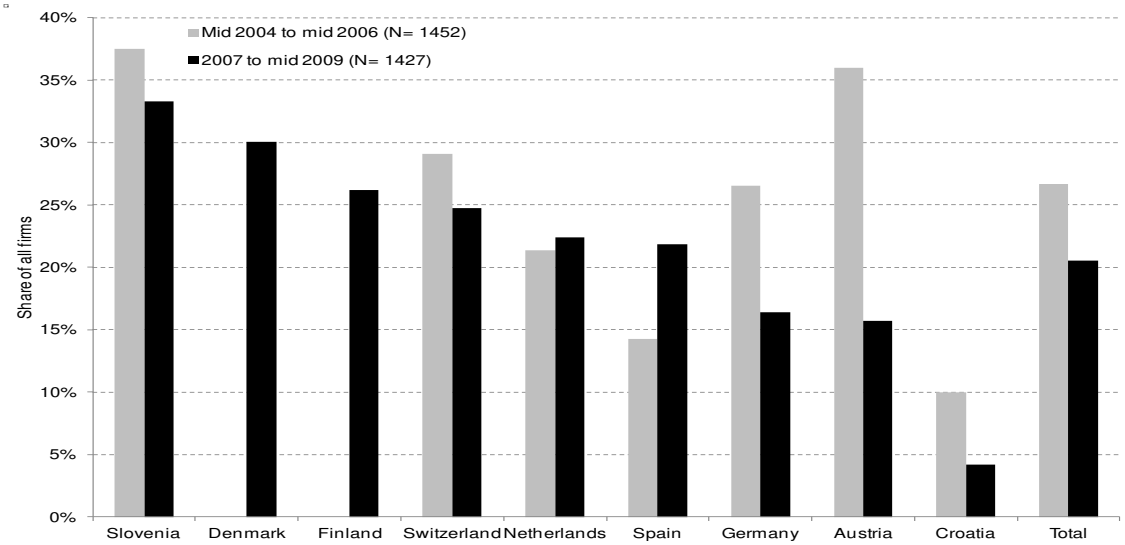
3 Production offshoring by country

The offshoring of production activities has been an important strategy for modernising production in all the surveyed countries. However, some differences as regards the degree of offshoring can be found (Figure 1). Slovenia and Denmark rank first and second with around one third of manufacturing companies that pursued production offshoring activities in the surveyed period from 2007 to the middle of 2009[1]. The Slovenian sample, however, is small and results may have been influenced by some very active firms. Finland and Switzerland are following in third and fourth place with 26 resp. 25% offshoring companies. Spain and the Netherlands take midfield ranks in European comparison with both countries having around 22% of manufacturing companies relocating production facilities abroad in the surveyed time-frame.

[1] SI, HR and ES show rather small absolute numbers of offshoring companies in the EMS samples of 2006 and 2009.

Germany and Austria are following with a clear distance. Firms with offshoring account for around 16% of all manufacturing companies between 2007 and the middle of 2009. Croatia is last in the ranking of the surveyed countries as regards production offshoring.

Figure 1 - Share of companies with production offshoring, by country



Source: European Manufacturing Survey 2006, 2009

Differences between countries in their offshoring level do not necessarily mirror their labour cost position. The group of countries with the highest offshoring propensity includes some countries with high hourly labour cost such as Denmark or Finland, but also Slovenia, a country with a moderate labour cost level. Vice versa, firms in some countries with high hourly labour costs such as Germany or Austria reveal low offshoring propensities between 2007 and the middle of 2009. These insights indicate that labour cost arbitrage is not the only factor when it comes to explain the different offshoring levels of European countries. Besides the absolute level of labour cost, labour cost dynamics in recent years could also be a decisive factor for firms' offshoring intensity, which might explain the high offshoring level of e.g. the Slovenian companies. Additionally, earlier experience with offshoring activities and their dynamics over time have to be accounted for when it comes to explain the actual offshoring intensity of the European manufacturing industry.

Overall, data suggests that the 2008/2009 economic crisis was associated with a decrease in offshoring activities in almost all surveyed countries. The total sample of all surveyed countries shows a decrease in production offshoring intensity from 27% in the period 2004/06 to 21% in the period 2007/2009 (Figure 1). European manufacturing companies seem to have maintained production at home and utilised capacities at their existing locations rather than looking for new offshoring ventures abroad.

The sharpest cutback can be observed in Austria (from 36 to 16%), followed by Germany (from 26 to 16%). Croatia's drop in its production relocation level is at 6 percentage points rather moderate, but coming from a previously low absolute level of 10% offshoring companies this equals a relative decline of around 60%.

Slovenia and Switzerland indicate a moderate decrease by 4 percentage points each. Denmark and Finland have only data for 2009. The Netherlands show a comparable production relocation level in both surveyed periods, as the low increase by 1 percentage point is statistically not significant.

Spain is the only country where production offshoring activities increased (from 14 to 22% of all manufacturing firms). This might be explained by a catching-up-strategy of Spanish

companies in emerging economies, e.g. in China and Asia. This will be explored in detail in Section 6, which focuses on the target regions of production offshoring.

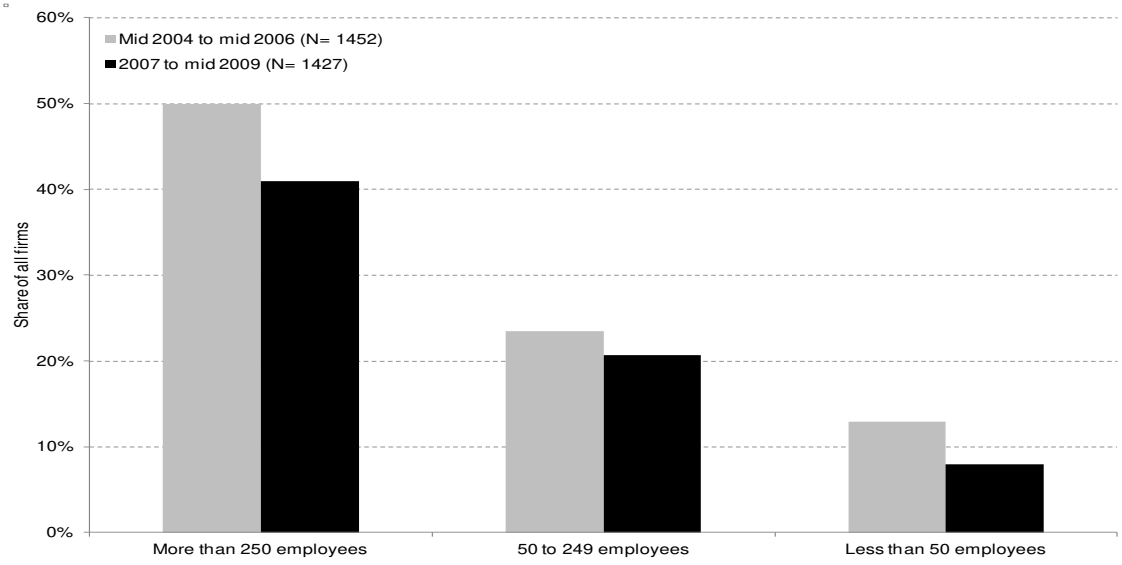
4 Production offshoring by company size

When looking at firms of different sizes, significant differences in the level of production relocations can be found (Figure 2). As it was to be expected, particularly larger firms with more than 250 employees have relocated parts of their production abroad (41%), whereas this ratio is significantly lower in medium-sized firms (50 to 249 employees: 21%) and small firms (49 and fewer employees: 8%).

The decrease in offshoring intensity which has been observed for the whole sample can be found across all company size categories. In companies with more than 250 employees the share of offshoring firms dropped by 9 percentage points in relation to 2 percentage points (50-249 employees) and 5 percentage points (fewer than 50 employees), respectively. In a relative perspective, the sharpest cutback can be observed in small companies with fewer than 50 employees, which sums up to a relative drop of 38% (from 13 to 8%) compared to the previous timeframe. This relative margin is lowest in medium-sized firms (50 to 249 employees) with a decline of 12% (from 24 to 21%).

The analysis therefore shows that the decline of production relocation activities in the course of the economic crisis is observable for firms of all sizes, with a slight tendency to be higher among small and large firms. In particular these companies seem to have been cautious to endanger sufficient capacity utilisations at their existing production sites in the course of the 2008/2009 economic crisis. In large companies this strategy can be explained by already existing offshore locations in different countries, offering opportunities to produce in low-wage countries or close to foreign customers in the main markets, when needed. In small companies their size restrictions might have been subcritical to split up production further in times of declining sales. Medium-sized companies seem to have a sandwich position in between, so that some of them were still seeking additional possibilities for low-cost- or in-market-production, even when global sales were significantly going down.

Figure 2 - Share of companies with production offshoring, by company size



Source: European Manufacturing Survey 2006, 2009

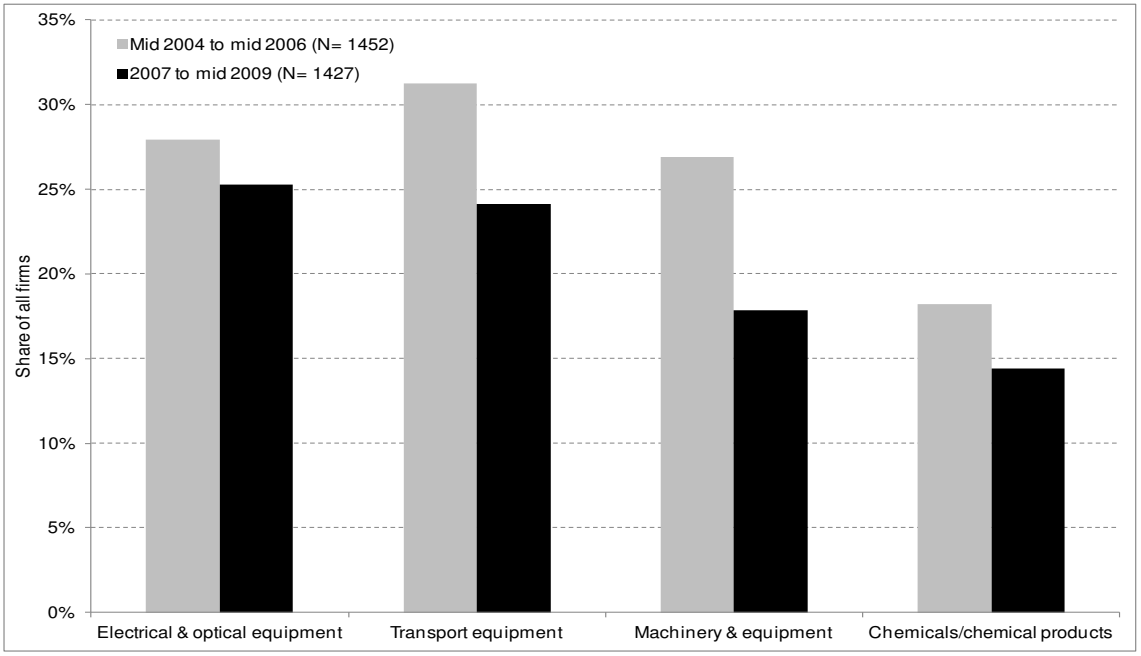
5 Production offshoring by industry

A differentiation by industry reveals sector-specific differences in relocation behaviour (Figure 3). Enterprises in the electrical and optical equipment industry (25%) and automotive and transport equipment manufacturers and their suppliers (24%) are particularly active in production relocations, ranking first and second. Machinery and equipment manufactures with 18% and the chemical industry with 14% tend to have a markedly lower propensity towards production relocation activities from 2007 to the middle of 2009. Reasons for the sector-specific offshoring levels are discussed in the following paragraphs, also looking on the dynamics over time.

Compared to the relocation level in the previous observation period from the middle of 2004 to the middle of 2006, particularly significant falls of around 9 resp. 7 percentage points can be observed in the machinery equipment and transport equipment industries. These dynamics equal high relative drops of 34 resp. 23% in these sectors compared to their previous offshoring levels. The strong decline in orders and sales in 2008/2009 seems to have a dampening effect on production relocations abroad, in particular among the mechanical engineering industry and automotive manufacturers including their suppliers.

In the chemical industry, the decline of companies' offshoring activities was rather moderate in absolute terms (minus 4 percentage points). But compared to the relatively low offshoring level in the previous period (18%) this still equals a relative drop of 21%. Due to the high capital-intensity, a high degree of process integration and low labour-intensity of its production processes, the chemical industry has traditionally been quite reserved to production relocation strategies. In the dawn of the 2008/2009 economic crisis, companies in the chemical sector seem to have been in particular focused on keeping and utilising their existing production capacities at their home bases.

Figure 3 - Share of companies with production offshoring, by sector



Source: European Manufacturing Survey 2006, 2009

By contrast, a relatively small decrease (3 percentage points) in the propensity to offshore can be observed in the electrical and optical industry. Here, competitive and cost pressures due to manufacturing processes characterized by medium-complex products, medium batch sizes and a relatively high labour intensity, along with strong foreign competition appear to be so

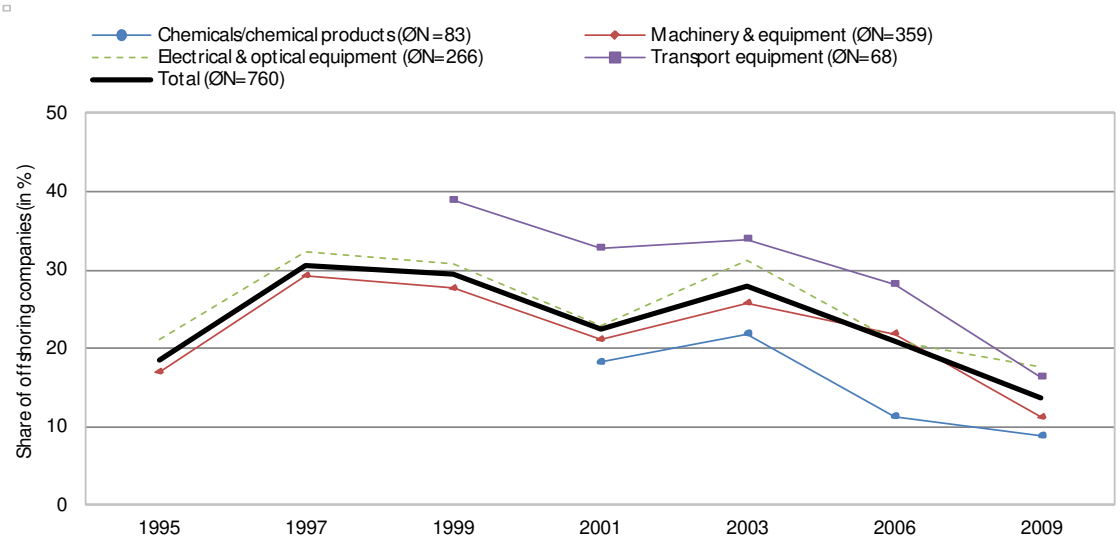
strong that, even with sales expectations significantly down, companies were still looking for saving potentials with production in low-wage countries.

Box 2: Changes in offshoring in the German manufacturing sector in the long run

The German data set of the European Manufacturing Survey (EMS) allows a detailed look on the development of offshoring since 1995. In each of the surveys in the respective years the surveyed companies were asked if they relocated production activities abroad in the recent two years, dating back from the year of the respective survey. Data for the two sectors machinery and equipment as well as electrical and optical equipment are available dating back to 1995. Data for the transport equipment sector is available since 1999. Data for manufacturers of chemicals and chemical products is available since 2001. The black line represents the average of all sectors surveyed in the respective period. The majority of observations are manufacturers of machinery or electrical and optical equipment. The average number of firms reporting offshoring over the surveyed period is reported in brackets in Figure 4.

Overall, offshoring developed largely in parallel in the four sectors. We observe a decline in the production offshoring propensity in all sectors since the end of the 1990s' with an interim peak in the survey period of 2003, which is due to then upcoming enlargement of the EU towards Middle and Eastern Europe. Since 2003, the share of offshoring firms in the surveyed sectors decreased from almost 30% to less than 15% in 2009. Within six years, the offshoring propensity of German manufacturing decreased by half.

Figure 4 –Trends in production offshoring in selected German manufacturing industries, 1995-2009



Source: German Manufacturing Survey 1995, '97, '99, 2001, '03, '06, '09, data unweighted.

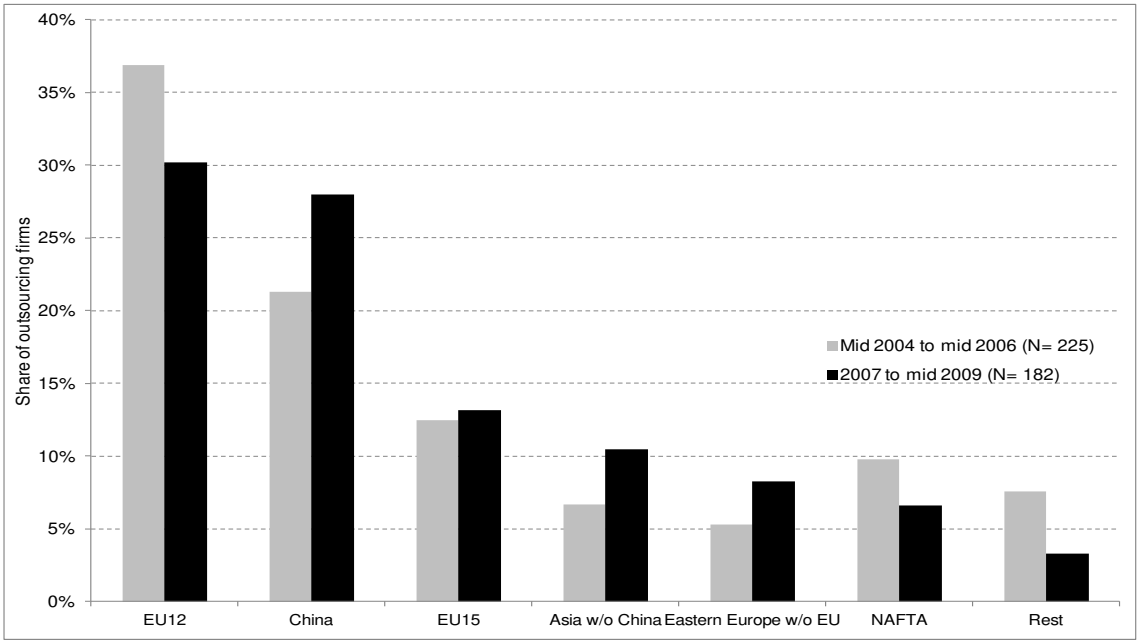
The driving force behind this development is economic growth. In times when Germany's economic growth was sluggish (end of the 1990s and after the re-unification from 2001 to 2003), offshoring was accelerating to utilize cost reduction potentials in low-wage countries. In times of high growth rates (the years 2000 and from 2004 to 2007), offshoring propensity decreased. The only significant exception to this pattern is the global economic crisis in 2008/2009, when German companies reduced their offshoring activities to realize better capacity utilization at their existing home plants.

There is also a stable ranking of sectors with respect to offshoring over time. Since 1999, the transport equipment sector constantly shows the highest offshoring intensity. Vice versa, manufacturers of chemicals and chemical products are over all surveyed periods most reluctant to offshoring. The only' exception from this parallel pattern is the electrical and optical equipment industry, which showed the lowest decline in offshoring intensity since 2006 and became the most offshoring intensive sector in 2009 for the first time – even if by only one percentage point ahead of the transport equipment sector. But over all surveyed years, the transport equipment sector can be regarded as the most offshoring intensive sector, followed by the electrical and optical equipment industry, the machinery and equipment industry, and finally the chemical industry.

6 Target regions of production offshoring

The Member States of the European Union which joined in the 2004 accession round (EU-12) are the preferred target region for production offshoring in the period from 2007 to the middle of 2009, accounting for 30 per cent of all valid answers from the surveyed offshoring companies (Figure 5). Compared to the previous period (between the middle of 2004 and the middle of 2006) this level dropped by 7 percentage points or 18 per cent in relative measures. When the number of offshoring firms is related to all surveyed firms including the non-offshoring firms (Figure 6), it becomes obvious that the share of all surveyed companies which offshored production activities to the EU-12 dropped sharply from 10 per cent of all companies to 6 per cent of all companies, a relative setback of 37 per cent. One of the reasons for these new EU Member States becoming less attractive could be the sharp rise in wages in some industrial regions of Poland, the Czech Republic, Hungary and Slovakia in the surveyed period from the middle of 2004 to the middle of 2009[2].

Figure 5 - Target regions of production offshoring



Note: The frequency of each location is related to all offshoring firms
Source: European Manufacturing Survey 2006, 2009

[2] In Germany, 33% of all companies which backshored once offshored production capacities to the German location between 2007 and the middle of 2009, named increased labour costs as a driving motive (Kinkel and Maloca, 2010).

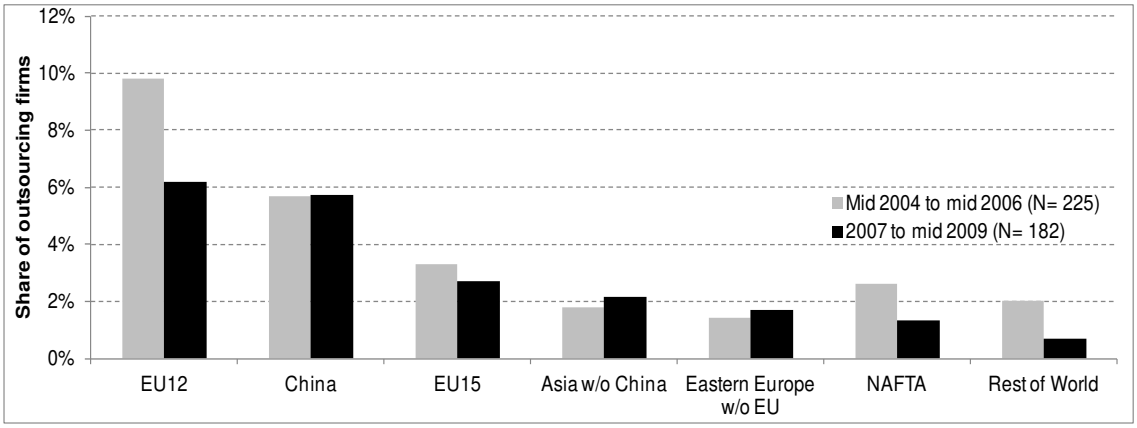
China is the second most attractive destination with 28% of all valid answers. In contrast to the EU-12, China has become significantly more attractive (+7 percentage points) compared to the previous period. Due to China's rising attractiveness, the total share of relocations targeted there at all surveyed companies stayed stable at 6%, despite the overall declining offshoring frequency.

It is notable that in particular small and medium-sized companies intensified offshoring to China (from 6 to 15% resp. from 20 to 33% of their offshoring activities), while offshoring of large firms with 250 and more employees to China remained stable at 27%. China is no longer an attractive relocation destination just for large companies, but increasingly also for SMEs.

Relocations to Member States of the European Union prior to 2004 (EU-15) remained stable at around 13% of all offshoring firms. The EU-15 countries are still the third most attractive region for relocations of European manufacturing companies.

Ranked fourth and fifth, the other Asian countries (10%) as well as Eastern Europe (without the EU Member States, 8%) both have become more attractive and showed an increase of 3 percentage points each. When the number of offshoring firms is related to all surveyed companies (incl. non-offshoring firms) it becomes obvious that these countries were the only ones with an absolute increase of inward relocation activities from the surveyed European companies, compared to the previous period (mid 2004 – mid 2006) before the economic recession.

Figure 6 - Target regions of production offshoring (incl. non-offshoring firms)



Note: The frequency of each location is related to all offshoring and non-offshoring firms
Source: European Manufacturing Survey 2006, 2009

Compared to the previous period, the NAFTA region and other regions around the world play a less important role. Relocations to NAFTA dropped by 3 percentage points to 7%, while other regions around the world dropped by 5 percentage points to 3%. The reduced attractiveness of the NAFTA countries in the dawn of the 2008/2009 economic crisis can be explained by the reduced sales particularly in the USA, which was hit first by the effects of the financial crisis on the 'real economy".

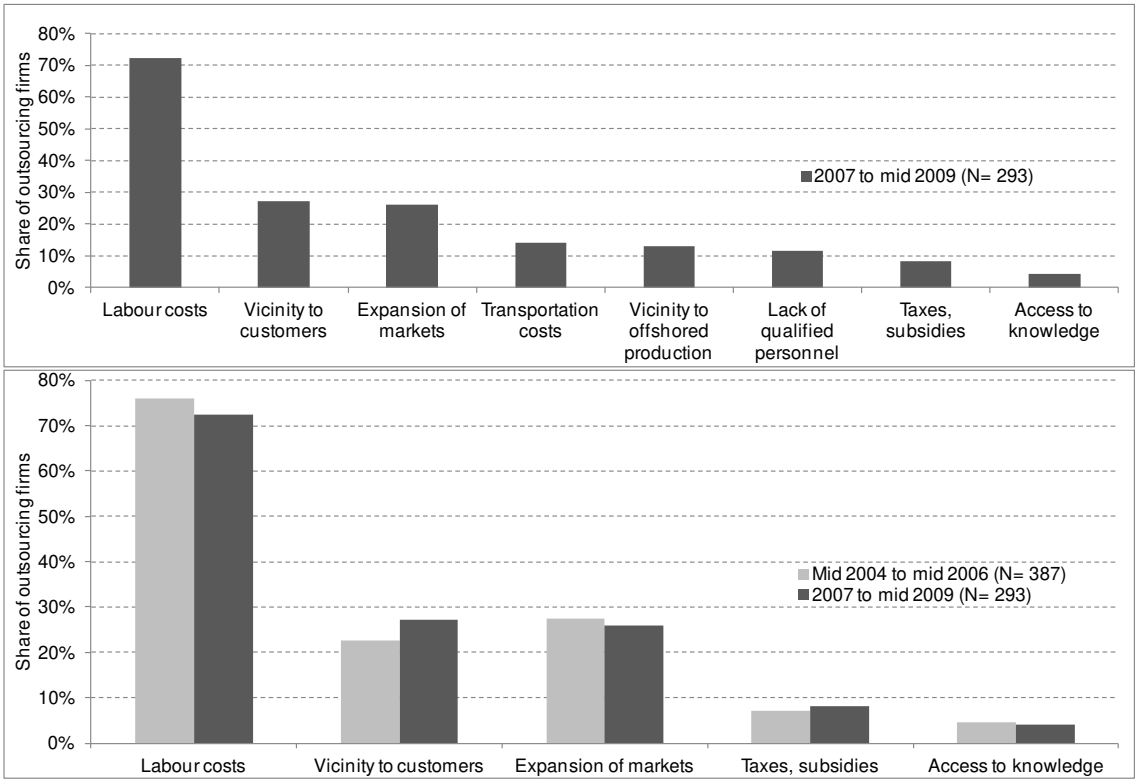
Overall, based on the increased relative importance of Asian countries and China as well as decreasing offshoring to the EU-12 countries, it can be concluded that companies more often prefer *Far-Shoring* to Asian countries and less often *Near-Shoring* to the closer EU-12 countries. As a result, *Intra-EU-27* production relocations were decreasing from a relative 49% to 43% of all target countries, whereas *Extra-EU-27 relocation* activities relatively gained from 51 to 57%. If the number of offshoring firms is related to all surveyed companies including the non-offshoring ones, the decline of the *Intra-EU-27* production relocations of 4 percentage points (from 13% [mid 2004 – mid 2006] to 9% [2007 – mid 2009] of all surveyed

companies) was twice as large as the decline of the *Extra-EU-27* relocations of 2 percentage points (from 14% [mid 2004 – mid 2006] to 12% [2007 – mid 2009] of all surveyed companies).

7 Main motives for production offshoring

Cost reduction is the dominant motive for relocating production activities abroad. Labour costs are stated as the most frequent factor triggering relocation activities by 72% of offshoring companies. Compared to the previous survey the importance of this motive decreased slightly, but not statistically significant, by 4 percentage points (Figure 7).

Figure 7 - Main motives for production offshoring



Note: Multiple answers allowed
Source: European Manufacturing Survey 2006, 2009

The least relevant motives for production offshoring are a better access to knowledge and taxes and subsidies in the target country. Hence, policy measures to attract production activities of foreign-owned firms with subsidies do not seem to be a very promising strategy. The high number of multiple answers as shown in Figure 7 indicates that in most cases it is not a single factor – despite the paramount importance of labour cost savings – but a whole bundle of motives that makes locations attractive.

In the second and third place for relocation motives with around 27% of nominations are customer and market oriented motives. Compared to the prior survey before 2007, the vicinity of the production location to key customers abroad gained in importance (4 percentage points), while the expansion of markets in the destination country stagnated. In this context it should be noted that the motive of vicinity to key customers reflects not only proactive strategies of the companies; suppliers are often requested directly by major customers with production sites abroad to produce close to them.

More or less equally important with around 13% of the answers are transportation costs, vicinity to already relocated production capacities and lack of qualified personnel at current

company locations. These three motives could not be measured in the previous survey. Transportation costs are particularly a motive for relocation when the customers in the destination country or in bridge markets are supplied directly by the foreign production site. For the offshoring mode of an 'extended workbench" with a high level of re-imports to the home country or to European markets, transportation costs might even be a negative factor.

The relevance of a lack of qualified personnel for production relocations abroad is also rather low. It appears that the worsening lack of qualified personnel in some qualifications in Europe did not yet have a dominant impact on production relocation decisions of manufacturing companies. But is has to be noticed that this appraisal was made in the dawn of the 2008/2009 economic crisis, when lack of qualified personnel was not the most pressing problem due to rapidly dropping sales. In times of better economic prosperity in Europe this factor might become (again) more relevant, due to the demographic change in many European countries.

Further motives like taxes, duties and subsidies (8%) and access to knowledge (4%) have seen a modest increase or decrease by 1 percentage point compared to the previous period and remain to have a minor impact on whether production is offshored or not. This is good news for European and national fiscal policy, as tax conditions do not seem to be a major driving factor for companies' production offshoring activities.

8 Specific advantages of offshoring destinations

The motives for production offshoring are closely related to the target countries of these activities. The relationship between motives and the decision to offshore to a particular destination may therefore help to understand the specific advantages of various offshoring locations. To identify and relate bundles of motives to the target countries, a Probit regression model is estimated, given as

$$Y^* = X'\beta + \varepsilon$$

where Y^* can be viewed as an indicator for whether the latent dependent variable Y – the probability to offshore - is positive

$$Y = 1_{\{Y^*>0\}} = \begin{cases} 1 \text{ if } Y^* > 0 \text{ i.e. } X'\beta + \varepsilon > 0 \\ 0 \qquad\qquad\qquad \text{otherwise} \end{cases}$$

with *X'* denoting the vector of binary explanatory variables and β being the parameter reflecting the marginal effect of a discrete change in the probability to offshore for the explanatory variables. ε is the error term, which is assumed to be of zero mean and with a standard deviation of σ^2.

This Probit model relates the motives for offshoring activities as explanatory variables *X'* at the firm level with the probability of production offshoring by target region *Y* reflecting the decision of firms to offshore to a specific target region in the periods from mid 2004 to mid 2006 and from 2007 to mid 2009. The possible reasons for production offshoring are labour costs, expansion of markets, vicinity to important customers, access to knowledge, taxes, levies, and subsidies, lack of qualified personnel, transportation costs, and vicinity to offshored production. Table 2 lists the significance levels and the resulting marginal effects of the independent variables (sample means)

The results show significant associations between destination countries and different motives. When companies strive for reducing *labour costs* via relocation of production activities abroad, the EU-12, China and other Asian countries are significantly preferred target regions. If the cost motive is present, the probability that a firm offshores production to the EU-12

increases by 27%. Offshoring to Eastern Europe, the EU-15 Member States and to countries from the Rest of the World (ROW) also shows a significant and positive correlation with the cost motive, but the coefficients are very small (below 0.03) so that the relationship is weak.

The main difference between Asian countries and the EU-12 with respect to the motives is that the labour cost motive is paired with market expansion motives in the case of Asian countries, but not in the case of the EU-12. The market expansion and the vicinity to customers motive increases the probability of offshoring to Asia by five and two percent, but decreases the probability of offshoring to the EU-12 and EU-15 countries.

The fact that the markets in the EU-12 and Eastern Europe can more easily be supplied with exports from the home country might account for the lack of market and customer incentives in these countries. In addition, the negative coefficient of the EU-12 countries for market expansion motives might be explained by their rapidly shrinking market perspectives in the dawn of the 2008/2009 economic crisis.

The EU-15 Member States additionally show a weak positive correlation with the reduction of transportation costs as driving offshoring motive, which in combination with even tight labour cost advantages of some EU-15 countries might sum up to an attractive *total cost* position for relocating production capacities there instead of serving these countries via exports.

The target locations Western Europe and North America are slightly more often than other countries named as sources for the access to new knowledge. This might serve as an indicator that technological competences for (basic) innovations and new product and process development (NPPD) are still predominantly located in Western Europe and North American company sites. On contrary, the negative (but not significant) coefficients of Asian and Chinese destinations might be triggered by the companies' sense that the access to and protection of knowledge in these countries is not easy to organize.

Table 1 - Probit regression results for destinations region by reasons for offshoring, 2006 and 2009

Production relocation: Reasons	Marginal effects													
	Asia		China only		EU15		EU12		North America		Eastern Europe		ROW	
Labour costs	0.150	***	0.114	***	0.026	***	0.268	***	-0.004	***	0.032	***	0.013	***
Expansion of markets	0.049	***	0.040	***	-0.012	*	-0.010	***	0.021	***	0.004		0.006	
Vicinity to important customers	0.020	**	0.012	**	0.000		-0.003		0.088	***	0.003		0.006	
Access to knowledge	-0.009		-0.010	*	0.054	**	0.001		0.023	**			0.029	**
Taxes, levies, subsidies	-0.007		-0.006		0.007		0.012		0.031	***	0.008		0.009	
Lack of qualified personnel	0.003		0.000		0.027		-0.002		0.005		0.010			
Transportation costs	0.027	*	0.009		0.065	**	-0.007		-0.003	*			0.015	*
Vicinity to offshored production	0.000		-0.002		0.001		0.002		0.019	**	0.000		0.000	

Note: (*) dF/dx is for discrete change of dummy variable from 0 to 1. The independent variables reflect the answers to the question "Has your firm offshored parts of production or parts of R&D to foreign locations resp. foreign companies or backshored them to your factory from abroad since 2007? How has this been organised? Please indicate the reasons." of the EMS 2006 and 2009. Difference in means of the independent variables are significantly diverse from zero, probability values of 10% (*), 5% (**) or 1% (***).
Source: European Manufacturing Survey 2006, 2009

9 Characteristics of offshoring firms

In the following, the characteristics of offshoring firms are further investigated using a multivariate analysis. This will help to understand better which firms offshore and which not. The analysis reports the strength of the relationship between the explanatory variables reflecting the characteristics of offshoring firms and the dependent variable, which is the firms' probability to offshore. The results show how a change in an individual explanatory variable triggers a change in the dependent variable. In particular, this analysis gives insight how innovation and technological product characteristics vary between offshoring and non-offshoring firm and in the relationship between offshoring and innovation as one important source for competitiveness of firms.

A Probit regression model is estimated to analyse the linkages between firm characteristics and the manufacturing firm's probability to offshore production activities. The aim of the Probit regression is to assess the relationship between specific firm characteristics as explanatory variables on the offshoring decision as dependent variable, allowing for a differentiation of offshoring firms from those not having offshored in the periods from 2003 to 2006 and from 2007 to 2009.

A Probit model is given as

$$Y^* = X'\beta + \varepsilon$$

where Y^* can be viewed as an indicator for whether the latent dependent variable Y – the probability to offshore - is positive

$$Y = 1_{\{Y^*>0\}} = \begin{cases} 1 \text{ if } Y^* > 0 \text{ i.e. } X'\beta + \varepsilon > 0 \\ 0 \qquad\qquad\qquad \text{otherwise} \end{cases}$$

with *X'* denoting the vector of binary explanatory variables and β being the parameter reflecting the marginal effect of a discrete change in the probability to offshore for the explanatory variables. ε is the error term, which is assumed to be of zero mean and with a standard deviation of σ^2. This Probit model relates firm characteristics on the offshoring decision as explanatory variables *X'* at the firm level with the dependent variable 'probability of offshoring production activities" *Y* reflecting the decision of this firm to offshore to a specific target region in the periods from 2003 to 2006 and from 2007 to 2009.

Previous results suggested that the decision to offshore depends on firm size, sectoral affiliation as well as its home country. We included these three variables as controls in the model. *Size* is measured by the log of the number of employees of the firm. Sector and home country are captured by dummy variables.

Additional explanatory variables include the revenue per employee (*revenue_empl*) to account for productivity (revenue per employee), *inno* which measures if the firm has introduced new products to the market, *inno_intens* which measures the turnover share of these new products, *export_intens* which is the share of exports on turnover. The degree complexity of the main product of the firm is captured by two variables*: simple_products* identifies all firms which produce simple products as opposed to products of medium or high complexity. Accordingly, m*edium_complexity* is one of all firms with medium complex products.

We also include *customize* which is one if the products are manufactured to the customer's specifications, and a variable that indicates whether the firm is a supplier to other firms or not (*supply*). A dummy variable (*y2009*) is introduced to control for the year, e.g. whether the

production activity was offshored from mid 2007 to mid 2009 or in the period before (2003 to 2006). Moreover, we introduce a variable for prior *offshoring experience* which is one if the firm has offshored before 2007. This variable is only available for the second observation period.

Table B1 in the appendix lists descriptions of the variables.

Table 2 presents the results. We estimated four equations. Equation (1) and (2) report results for the whole sample. The difference between (1) and (2) is the innovation variable. In (1), we employ a variable (*inno*) that measures if the firm has introduced a product innovation, in (2) the variable (*inno_intens*) measures the share of product innovations on turnover. Equation (3) and (4) include only the observations from the second period, since *offshoring experience* is not available for the first period.

We report marginal effects at the mean of the independent variables (sample means). The coefficients report the change in the probability to offshore in each explanatory, continuous variable and a discrete change in the probability to offshore for binary variables.

The results first confirm a positive relationship between *size* and offshoring holding all other factors constant. R*evenues per employee* (which may be regarded as a measure of labour productivity) is only significant for the first equation. Moreover, there is a positive and significant, although very small, relationship between *export intensity* and offshoring. These results are in line with the literature on foreign direct investment that stresses the fact that large and more productive firms choose to go abroad and points to complementarities between exports and FDI (Markusen 2002).

Innovation efforts of the firm are captured by *inno* and *inno_intens*. We found no significant association between offshoring and the two innovation variables.

Firms that produce simple products and medium complex products offshore more frequently than firms that produce complex products. In contrast, there is no difference between firms that are suppliers to other firms and firms that predominantly supply to final demand, which is surprising given the fact that suppliers may follow their customers abroad with production activities.

The results clearly show that there is a strong relationship between *sector affiliation* and the probability to offshore production abroad. Firms that belong to machinery and equipment, electrical and optical equipment and transport equipment industry reveal higher probabilities to offshore in equation (1) than those in the sector of chemicals and chemical products.

Being a Dutch, Danish/Finnish, or Swiss firm has a significant positive effect on offshoring as compared to being a German firm. Being an Austrian, Spanish, or either Slovenian/Croatian firm does not display a significant difference in the probability to offshore compared to a German firm all other variables equal.

Moreover, the regression confirms the descriptive result that the offshoring propensity decreased between the two periods. The dummy which identifies all observations from the period 2007 to mid 2009 is significantly negative after controlling for firm characteristics. This confirms that the decrease in offshoring propensity was not because the sample composition with respect to these firm characteristics has changed.

Table 2 - Probit regression on the probability of being an offshoring firm, 2006-2009

	(1)	(2)	(3)	(4)
size (log)	0.111	0.128	0.066	0.074
	(11.97)**	(11.27)**	(5.62)**	(5.08)**
revenue_empl (log)	0.043	0.037	-0.001	-0.009
	(2.28)*	(1.60)	(0.06)	(0.30)
export intensity	0.001	0.001	0.001	0.001
	(3.15)**	(2.13)*	(1.94)	(1.55)
inno	0.027		0.011	
	(1.05)		(0.33)	
inno_intens		-0.001		-0.001
		(1.04)		(1.38)
simple products	0.125	0.111	0.097	0.093
	(2.66)**	(1.87)	(1.59)	(1.18)
medium complexity	0.095	0.103	0.051	0.050
	(4.20)**	(3.69)**	(1.77)	(1.38)
customize	-0.017	-0.018	-0.031	-0.041
	(0.75)	(0.69)	(1.12)	(1.20)
supplier	0.031	0.039	0.068	0.069
	(1.19)	(1.25)	(1.90)	(1.51)
machinery	0.084	0.064	0.005	0.023
	(2.00)*	(1.28)	(0.10)	(0.38)
electrical and optical	0.141	0.123	0.078	0.090
	(3.24)**	(2.39)*	(1.56)	(1.44)
transport	0.138	0.131	0.014	0.048
	(2.34)*	(1.81)	(0.22)	(0.57)
Austria	0.065	0.051	-0.003	-0.060
	(1.42)	(0.94)	(0.05)	(0.91)
Switzerland	0.105	0.117	0.122	0.103
	(3.59)**	(3.25)**	(2.85)**	(1.88)
Netherlands	0.269	0.339	0.222	0.305
	(4.23)**	(4.10)**	(3.50)**	(3.65)**
Denmark & Finland	0.183	0.183	0.135	0.130
	(2.43)*	(2.11)*	(1.87)	(1.56)
Croatia & Slovenia	-0.050	-0.062	-0.029	-0.032
	(1.02)	(1.09)	(0.41)	(0.39)
Spain	0.006	-0.017	0.172	0.129
	(0.10)	(0.23)	(1.75)	(1.11)
y2009	-0.109	-0.120		
	(4.44)**	(4.05)**		
offshoring experience			0.420	0.410
			(11.45)**	(9.59)**
Observations	1746	1263	961	696

Note: (*) dF/dx is for discrete change of dummy variable from 0 to 1. Reference groups: [(a)] medium complexity, [(b)] medium batch, [(c)] basic programme with alternative, [(d)] chemicals and chemical products, [(e)] Germany. Difference in means of the independent variables are significantly diverse from zero, probability values of 10% (*), 5% (**) or 1% (***).

Source: European Manufacturing Survey 2006, 2009

The model presented above is extended in equations (3) and (4) with a variable that captures the firm's previous experience with offshoring production activities in the period 1999 to 2006. This variable is only available for observations in the period 2007 to mid 2009.

The results for this extended model indicate that previous offshoring experience explains offshoring today to a considerable degree: if a firm has offshored in the period 1999 to 2006, the probability of offshoring in the period 2007 to mid 2009 increases by more than 40%.

10 Summary and Conclusions

This paper investigated production offshoring – the movement of production activities to locations abroad – of European firms using a large firm-level data set. It covers the periods mid 2004 to mid 2006 and 2007 to mid 2009.

The data reveal a decline in offshoring activity between these two periods; the share of offshoring firms has decreased across most countries, sectors, and firm sizes. Regression analysis reveals that this decline is also significant after controlling for firm characteristics. In addition, long-term data for Germany show that this decrease is part of a larger trend which started already in 2003.

In the light of these results, fears of European policy that a continuing trend towards productions offshoring could hollow out the basis of European manufacturing seem unjustified. This hope is also fuelled by predictions that cost advantages of many overseas locations, in particular China and India, will disappear in the next five to ten years (BCG 2011). The economic crisis did not accelerate, but further slow down production offshoring. We interpret this as a sign that in times of economic crisis firms focus on the utilisation of their activities at home.

The main target regions for offshoring are the EU-12, China, the EU-15, and other Asian locations. Despite a general decrease in offshoring, *far-shoring* to Asia and China in particular has increased. In contrast, *near-shoring* to the EU-12 became less attractive. We interpret this as result of the on-going convergence process between EU-12 and EU-15 countries and shrinking labour cost differences. The EU-12, however, is still the most important target region for offshoring of European firms.

The dominant motive for production offshoring is the wish to reduce labour costs. Vicinity to customers and market expansion follow with a wide margin. Expected labour cost reductions explain offshoring to the EU-12, Asia and China in particular. However, in contrast to the EU-12, where the offshoring decision is solely dominated by potential labour cost savings, offshoring activities to Asia and China is also significantly related to customer and market expansion motives. This may explain the relative loss of attractiveness of the EU-12 compared to Asian countries. Markets in the EU-12 can easily been served by exports from the EU-15 or from existing capacities in these markets.

Offshoring firms are characterized by a larger firm size and less product complexity. Producers of electrical and optical equipment seem to have the highest incentives to look for cost saving potentials abroad, as they have a higher and hardly unchanged propensity to offshore production than firms of the other three sectors included. Previous experience with production offshoring considerable determines production offshoring today.

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13 Appendix

Table B1 Definition for variables used for the probit regression on the probability of being an offshoring firm, 2006-2009

Variable	Definition/Question in the EMS 2006/09	Code
Probability of being an *offshoring firm*	'Has your factory offshored parts of production to foreign locations resp. foreign companies or backshored them to your factory from abroad in the last two years?"	0: No, 1: Yes
Size	Logarithm of number of employees (excl. temporary agency workers) in 2005 or 2008	0 to 999999
Revenue_empl	Logarithm of annual turnover per employee in 2005/08	0 to 999999
Export_intens	Share of turnover from exports	0 to 100%
Inno	Is 1 if the firm has introduced new products to the market in the last two years	0: No, 1: Yes
Inno_intens	Share of turnover from products introduced to the market in the last two years	0 to 100%
Simple_products	Is 1 if the firm produces simple products opposed to complex products	Base case: complex products
Medium_complexity	Is 1 if the firm produces medium complex products opposed to complex and simple products	Base case: complex products
Customize	Is 1 if the firm produces according to customers specifications opposed to a standardized basic programme	0: No, 1: Yes
Supplier	Is 1 if the firm is an intermediate supplier to other firms	0: No, 1: Yes
Year 2009	Enterprise being surveyed by the EMS 2009	0: 2006, 1: 2009
offshoring experience	Is 1 if the firm has offshored parts of the production abroad between 1999 and 2006	0: No, 1: Yes

Source: European Manufacturing Survey 2006, 2009

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