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PRODUCTIVITY IMPACTS OF OFFSHORING AND OUTSOURCING: A REVIEW

Karsten Bjerring Olsen

Abstract

Despite the attention that offshore outsourcing currently demands in the public media, there is little empirical evidence on its economic impact. As a consequence of rising fears of job losses associated with the phenomenon, most existing research on the subject is primarily concerned with addressing related labour market issues. The impacts on productivity, however, have received only little attention. This paper surveys the empirical literature on offshore outsourcing and its productivity effects. Due to the small number of existing studies, the survey also includes research that may serve as indirect evidence of the phenomenon's link to productivity, such as its effect on skill upgrading. The most apparent conclusion drawn from the review is that there appears to be no clear patterns as to how offshore outsourcing affects productivity, and that much depends on both sector and firm-specific characteristics. There are some indications, however, that positive productivity effects from foreign material sourcing depends on the degree to which firms are already globally engaged, but also that such engagements generally could be close to their optimum level in developed economies. There is little existing research on offshoring of services, but it appears that its productivity enhancing effects generally are small in manufacturing plants while being of a somewhat greater magnitude for firms in the services sector.

L'IMPACT DES DÉLOCALISATIONS SUR LA PRODUCTIVITÉ : VUE D'ENSEMBLE

Karsten Bjerring Olsen

Resumé

Malgré l'intérêt que les délocalisations à l'étranger suscitent dans les médias, on dispose de peu d'éléments empiriques sur leur impact économique. Le phénomène de délocalisation faisant craindre de plus en plus des pertes d'emplois, la plupart des études qui y sont consacrées s'attachent essentiellement aux aspects qui ont trait au marché du travail, l'impact sur la productivité ne retenant guère l'attention. On commentera dans ce document les recherches empiriques sur les délocalisations à l'étranger et leur impact en termes de productivité. Vu le petit nombre d'études disponibles, on prendra également en compte les travaux qui éclairent indirectement le lien avec la productivité, notamment du point de vue de l'amélioration des qualifications. La conclusion la plus nette qui ressort de ce panorama est la suivante : il ne se dégage aucun profil clair quant à la façon dont la délocalisation à l'étranger influe sur la productivité, les caractéristiques du secteur et de l'entreprise jouant à cet égard un grand rôle. Certains éléments montrent néanmoins que l'impact positif que peut avoir la délocalisation matérielle à l'étranger est fonction du degré d'implication mondiale de l'entreprise, cette implication pouvant en général être proche de l'optimum dans les économies développées. Les recherches sont peu nombreuses sur la délocalisation des services ; il apparaît néanmoins que les gains de productivité dont la délocalisation s'accompagne dans le secteur manufacturier sont généralement faibles, alors qu'ils sont un peu plus nets dans le secteur des services.

PRODUCTIVITY IMPACTS OF OFFSHORING AND OUTSOURCING: A REVIEW

1. Introduction

Contracting out business activities to foreign providers, or what has come to be called "offshoring", has been undertaken for decades. As such, offshoring is not as recent a phenomenon as the impression one may draw from its current attention in the public media.[1] The phenomenon, however, appears to have entered into a new stage with offshoring of services becoming increasingly important. This change in structure has been underway for some time, and is generally attributed to the interplay between three factors: technological advances, economic and competitive pressures to reduce costs and improve productivity, and institutional developments favouring trade liberalisation.

Advances in technology have reduced transportation costs considerably, but more importantly, the development and rapid dissemination of information technologies have had enormous economic impacts through the transformation of work processes, organisational structures as well as on how we communicate. Large parts of the economy have become digitized which has enabled business activities to be conducted in entirely new ways, as well as across large distances. This has opened possibilities of trade in a variety of services that were traditionally non-tradable, and caused a growth potential in offshoring activities facilitated by the opening of markets at both global and national levels.

Offshoring in services emerged already in the late 1980s and early 1990s with the contracting out of tasks related to customer services, but has since moved on to a broader range of activities including engineering, software development and other tasks requiring high-skilled human capital. Due to the significant size of the services sector in the Western economies, and the increasing broad range of tasks exhibiting offshoring potential, the number of jobs which could potentially be affected through this channel is substantial.[2] As a result, the subject has become increasingly politically charged.

The potential negative impact of offshoring on wages and employment, and the consequential reactions from the public in the debate, is probably the main reason why most research on the phenomenon and its economic impacts has focussed on concerns related to labour markets. However, proponents of offshoring continue to argue that the phenomenon has long term economic benefits, and that it eventually will increase living standards in OECD countries through positive productivity effects and reductions in factor costs. Yet, little rigorous research on offshoring and its impacts on productivity or firm performance

1. Illustrations of media focus often refer to an increase in newspaper articles on the subject. While unable to obtain such figures, a Google search for "outsourcing", "offshoring" and "offshore outsourcing" at the start of this paper (1 May 2005), and at its completion (end October, 2005) is illustrative. Hits at the beginning numbered 13, 1, and 0.5 million for "outsourcing", "offshoring" and "offshore outsourcing", respectively and 75, 3 and 2 million at the completion.

2. A recent study estimated the occupations potentially affected by offshoring (in 2003) to be around 19.2% of total employment in the EU15, 18.1% in the United States, and 18.6% in Canada. In Korea, the share was slightly lower, at 13%. It should be noted that these numbers may represent an "upper limit" as not all jobs in these occupations would necessarily be offshored (OECD, 2004).

has been conducted. It is the purpose of this paper to give an overview of existing research on offshore outsourcing and its impact on productivity.

The paper consists of seven sections. The following section outlines the issue and discusses the importance of empirical inquiry as regards the productivity effects of outsourcing. Section three briefly outlines the theoretical links between outsourcing and productivity, while section four focuses on some of the empirical methodologies employed in analysing the issue. Section five presents a range of existing empirical evidence while section six follows with a discussion of a more general nature. Section seven provides the reader with a summary.

2. Offshoring, outsourcing and offshore outsourcing

There are countless reports on the magnitude and growth of offshoring. The most famous of these studies is probably an estimate by Forrester.[3] While there is no need in the context of this paper to summarise the different estimates here, the vast number of studies on offshoring themselves appear to indicate a significant increase in the degree of internationalisation.

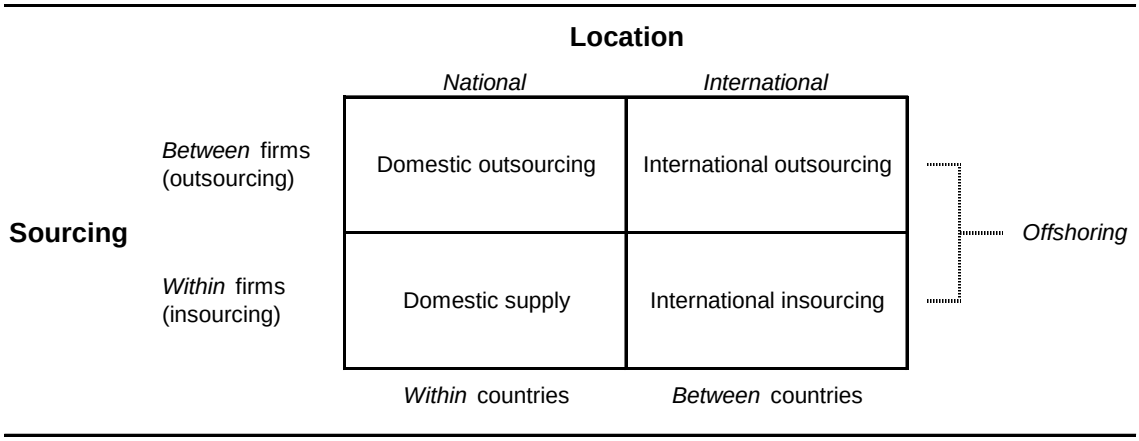
Despite the many accounts on the subject, it is difficult to get a clear picture of the impact of offshore outsourcing on the economy. First of all, as the public debate on the subject has evolved, the terminology being used has become increasingly blurred. Secondly, ideological considerations have increasingly entered the debate. And lastly, yet probably most importantly, the lack of hard evidence of the impact of offshoring has allowed the debate to continue without the merit of a strong information base. Addressing this lack of empirical evidence is one objective of this paper and of the OECD work on globalisation more generally.

The term “offshoring” is often associated with “outsourcing” but neither implies the other. Whereas outsourcing refers to the relocation of jobs and processes to external providers regardless of the provider’s location, offshoring refers to the relocation of jobs and processes to any foreign country without distinguishing whether the provider is external or affiliated with the firm. Outsourcing may therefore include job relocations both within and between countries, whereas offshoring refers only to international relocations. The term offshore outsourcing therefore only covers the relocation of jobs or processes to an external and internationally located provider.[4]

3. Forrester, an independent technology research company, estimates that by the year 2015, approximately 3.3 million jobs in the United States would be lost due to offshoring. See Kierkegaard (2003) for a discussion on this estimate.

4. The key to determining what process is being considered lies in knowing what is internally provided, and what is externally provided. However, this has become increasingly difficult due to a variety of complex organisational forms. Mergers, strategic alliances, and public-private partnerships, for instance, have blurred the border between internal/external, and a number of business strategy terms related to such enterprise restructuring have only complicated the picture. Moreover, many companies have developed contracting strategies that are even more complex.

Figure 1. **An illustrative matrix of insourcing, outsourcing and offshoring**



Some commentators have criticized the term "offshoring" due to its lack of meaning in especially the European context, but even in the United States, where "offshoring" prevalently is understood as the relocation of jobs to countries such as India and China, other terms have emerged, for instance "nearshoring" in dealing with offshoring from the United States to *e.g.* Canada and Mexico. As a result, terms such as "global", "international" or "cross-border" outsourcing have therefore been suggested. Nevertheless, for the sake of simplicity this paper will make use of "offshore outsourcing", "offshoring" and "outsourcing" as described above. Moreover, it should be noted that the term will refer to both manufacturing and services inputs, unless otherwise stated.

2.1. Contextualising the phenomenon

To balance the many forecasts of job losses quoted in the public media, analysts of offshoring, be it economists, consultant companies or international organisations, often relate projected job losses to general employment changes when evaluating the overall consequences. For example, many studies compare to US employment turnover, where the annual amount of job destruction alone is estimated to be between 7 and 8 million jobs – a number that dwarfs even the largest forecasts of job-losses linked to offshoring. Slaughter (2004) draws attention to a less quoted figure, namely the increase in US employment due to international insourcing from foreign countries which grew from 2.6 million jobs in 1987 to 5.4 million in 2002. Also, contrary to many beliefs, Kirkegaard (2003) notes that between 1999 and 2002 the majority of job losses in the category "occupations at risk of offshoring" did not happen in services but in the manufacturing industries. Moreover, these were generally low-wage jobs, with services employment in the same occupational category increasing.

For the United States it is also commonly noted that the large increase in manufacturing productivity growth, and not offshoring, has been the main reason for both the decrease in manufacturing employment and the "jobless recovery" (see *i.e.* Mann, 2003; Kirkegaard, 2003; Drezner, 2004; Schultze, 2004). Other explanatory factors with more significance than offshoring are mentioned by other authors including weak domestic demand and the overvaluation of the dollar (*i.e.* Baily and Lawrence, 2005).[5] A related explanation suggests that the rate of job creation following the recent recession has been unusually slow compared with job destruction due to an ongoing structural transformation of the economy (Groshen and

5. For Japan, the increase in overseas employment linked to international outsourcing accelerated in the late 1980s; this coincided with a sharp appreciation of the Yen.

Potter, 2003). Attention has also been drawn to the US net surplus in services trade (Amity and Wei, 2004*c*), and to a finding that United States imports of business, professional and technical services have remained constant between 1997 and 2003 (Schultze, 2004). There are countless other contextualising examples, but the main message seems to be that, fundamentally, offshoring is primarily a trade phenomenon qualitatively similar to conventional trade (Bhagwati *et al.*, 2004).

Another set of arguments related to offshoring refer to the potential long term benefits of the phenomenon. For instance, the large amount of relatively high-quality jobs created in less developed countries due to offshoring may provide these countries with substantial economic benefits. They can build a stronger economic base, increase domestic consumption, and therefore foster imports from developed nations. Moreover, offshoring may also enhance living conditions in OECD countries as the increased productivity and cost reductions stemming from this process will eventually lower product prices and drive up real wages. In addition, there may be economic benefits from reemployment of those who lose their job to offshoring, as these people may eventually move into more rewarding occupations, although temporary adjustment costs of this transition will be incurred (OECD, 2005). The latter argument obviously assumes the existence of suitable and rewarding reemployment possibilities and is often rationalised by drawing on historical analogies.

3. Theoretical perspectives of outsourcing

To compete in increasingly competitive economic environments, decisions to offshore company activities are essentially driven by factors related to costs of production, distribution and productivity. From the perspective of the firm offshoring is therefore seen as a part of its business strategy. For instance, if offshoring enables a firm to relocate its relatively inefficient production processes to external providers with cheaper and perhaps more efficient production capabilities, the firm can turn its focus to areas where it has a comparative advantage and expand output, or engage in new business activities. Offshoring of tasks with high complexity levels or of core activities, on the other hand, remains less attractive because of security issues such as the potential lack of control over the processes.[6]

The theoretical literature on the firm's decision to produce in-house or outsource through market contracts is extensive and dates back to Coase (1937) and his theory of the firm. Recently, however, the attention on the foreign aspects of the phenomenon has grown (see *i.e.* Antràs and Helpman, 2004; Antràs *et al*., 2005, and Grossman and Helpman, 2002). The majority of this work has most commonly focused on either transaction cost theory, or, in particular, the principal-agent framework.

- *Agency theory*: According to this theory bounded rationality and self-serving behaviour or opportunism of a firm's employees can imply productivity losses. As such, conflicting goals and interests between the firm and its employees may pose a problem to the firm. To reduce inefficiencies stemming from this source the firm can outsource its activities to an external provider and control the output or effort of the provider through an outcome based contract.

- *Transaction cost theory*: According to this theory, outsourcing is only desirable as long as the costs of related asset specific investments, contractual incompleteness and search efforts are lower than the expected cost advantage. In the case of outsourcing it is often linked to specialization, *i.e.* to management theories focusing on the firm's core competences.

Outsourcing could also have productivity enhancing effects at a more aggregate level if offshoring would lead to the creation of new firms, and the destruction of old ones (Antràs *et al.*, 2005). This process is often associated with Schumpeter's theory of creative destruction, and numerous empirical studies have

6. For related empirical evidence see Baker and Hubbard (2003), Masten (1984), and Ono and Stango (2005).

provided support for its positive impacts on productivity (Bartelsman *et al.*, 2003).[7] Other relevant theories have examined the potential for productivity enhancing effects due to knowledge spill-over as well as firms' abilities to focus on core competences by outsourcing relatively inefficient activities.

4. Empirical literature and methodology

4.1. Outline of existing research

Given the amount of attention that offshore outsourcing demands in the public media surprisingly little rigorous empirical research has been done on its economic impacts. The main focus of the studies that exist deals primarily with labour market issues, which remains true even as research on the subject is expanding. Direct investigations of outsourcing and its impact on firm productivity are relatively few in number. Under reasonable assumptions, however, one may draw important indirect linkages between productivity and skill intensity, and since this subject is a common theme in the empirical literature on outsourcing and its labour market impacts, some of the results from these studies will also be discussed in this paper.

Whether the empirical literature on offshoring concerns productivity or issues related to labour markets, most studies only cover manufacturing industries. Moreover, many studies focus only on the relocation of manufacturing processes ignoring the relocation of services. Because of the increasing importance of services offshoring, especially within the services sector itself, it is unfortunate that insights regarding productivity effects of the phenomenon primarily have to be drawn from evidence for manufacturing industries. Most studies are micro oriented and the productivity impacts on manufacturing establishments are therefore the main focus of analysis. To compensate for a lack of information on services, a brief overview of different offshoring surveys will be covered. Due to these limitations, the survey in this paper can give only a fragmented picture of the subject. This, however, reflects the state of the available evidence, which is still more limited than desirable.

4.2. Methodology

The impact of outsourcing on productivity is commonly analysed by estimating labour productivity through a production function framework. Other, but less frequently used approaches include the estimation of total factor productivity (TFP), TFP growth breakdowns and ANOVA analysis.

The standard approach used to study outsourcing's impact on productivity, especially at the level of the firm, is to estimate a production function given by

$$Y_{i,t} = A_{i,t} F(K_{i,t}, L_{i,t})$$

where Y refers either to output or value added, A is the technology factor, K is capital, and L is labour. The subscript i refers to either industry or firm depending on the type of data used, whereas t refers to time. The functional form is usually assumed to be a Cobb-Douglas function. In this case, dropping the time subscript, taking logs and subtracting l (where $l_i = \ln L_i$, etc.) from both sides yields the following basic expression for the labour productivity level

$$y_i - l_i = a_i + \beta_1 (k_i - l_i) + \beta_2 l_i$$

7. Empirical estimates for this factor are also avialable for Portugal (Carreira and Teixeira, 2003), Slovenia, (Loecker and Konings, 2004), Finland (Maliranta, 2003), Estonia (Masso, Eamets, and Philips, 2004), and New Zealand (McMillan, 2004).

It is common to let outsourcing take effect through the technology factor of the production function. This basically means that outsourcing may alter the firm's underlying production technology by allowing it to shift the intercept of the log-linear production function. As such, the base regression equation takes the following form

$$y_i - l_i = \beta_0 + \beta_1(k_i - l_i) + \beta_2 l_i + \beta_3 x_i^m + \beta_4 x_i^s + \varepsilon_i$$

where *x* refers to the measure of outsourcing, and *m* and *s* indicate material and services outsourcing respectively. The remaining production technology factors are picked up by the constant β_0 and the error term ε_i. In cases where the growth rate of labour productivity is estimated (*i.e.* by first-differencing the base equation above), the outsourcing variable is often included as a firm-specific effect which implies that the terms stay as they are. For completeness, the base regression equation then becomes the following

$$\Delta(y_i - l_i) = \alpha_0 + \alpha_1 \Delta(k_i - l_i) + \alpha_2 \Delta l_i + \alpha_3 x_i^m + \alpha_4 x_i^s + u_i$$

For industry level estimation, however, the outsourcing variables are most often also included as changes. The effects of outsourcing on productivity levels and growth are thus determined by the level of significance of the estimated coefficients on *x*.

This estimation method is likely to be faced with some constraints. Problems of endogeneity can be expected since the results might be driven by unobserved covariates that are correlated with both productivity and outsourcing. For example, plants with a high productivity level may also be more skill-intensive and for that reason more likely to engage in outsourcing of low-skill intensive processes in order to focus on core competences. This may leave the regression estimates biased and inconsistent. A way of reducing such concerns is to use lagged variables of the outsourcing variable or IV estimation, which is widely used in the literature. Moreover, looking at growth rates by first-differencing is known to exacerbate potential problems of measurement errors in the data (Griliches and Hausman, 1986).

The analytical framework used for productivity breakdowns is based on a consolidation framework initiated by Leontief (1967). Services inputs into manufacturing, for example, are reduced into their constituent elements of labour, capital, and goods inputs. The change in TFP growth in manufacturing can then be broken down into effects stemming from the purchases of services and from the rate of material productivity growth in the industry itself (see *i.e.* ten Raa and Wolff, 2001). If the estimated increase in the rate of TFP growth computed with the consolidated measure is smaller than the increase in the rate of TFP growth computed with the direct coefficients, then this could indicate a positive productivity effect of services outsourcing on the manufacturing industry.

ANOVA analysis, or analysis of variance, is essentially a generalisation of the *t*-test allowing one to look for differences in data over multiple groups. In connection with productivity and outsourcing it is used to look at differences in labour productivity over different levels of outsourcing intensities. This method is not commonly used in the literature.

Insights into the link between outsourcing and productivity may also be derived from indirect analysis, *i.e.* research that does not deliberately seek to establish a relationship between offshore outsourcing and productivity, but that nevertheless may give insights into how these variables could be linked. For example, analysis of the impact of firm characteristics on the decision to outsource could be valuable. Kimura (2002) and Tomiura (2004), for example, both estimate the determinants of outsourcing decisions and include productivity as one of their explanatory variables. Their analysis framework, however, indicates that the causality between outsourcing and productivity is not as clear cut as is often argued, and that investigating the link between outsourcing and productivity is not without problems.

Other useful insights can be obtained by addressing how outsourcing affects the skill intensity in industries and establishments. Such studies exist for the United States (Feenstra and Hanson, 1999), the United Kingdom (Hijzen, 2003; and Hijzen, Görg and Hine, 2003), the European Union (Egger and Egger, 2001a), Germany and Italy (Helg and Tajoli, 2004), France (Strauss-Kahn, 2002), and Japan (Head and Ries, 2002). Skill intensity is often measured as the costs of high-skilled labour relative to the total wage bill. Thus, assuming that the marginal product of high-skilled workers is higher than that of low-skilled workers, a positive effect of outsourcing on a firm's skill-intensity would, *ceteris paribus*, also indicate a positive productivity change.

4.3. Measures of outsourcing

A common measure of offshore outsourcing used in the literature is derived, to a greater or lesser extent, from that provided by Feenstra and Hanson (1996a, 1996b, 1999). They estimate offshore outsourcing as the share of imported intermediate inputs over total costs, which for each industry *i* can be written as

$$Outsourcing_i = \sum_j \left(\frac{X_i^j}{Y_i} \right) \left(\frac{M_j}{C_j} \right)$$

where X_i^j is input purchases of good *j* by industry *i*, Y_i is total non-energy input used by industry *i*, M_j is import of good *j*, and C_j is the consumption of good *j*. Based on this measure they calculate a "narrow" measure of outsourcing by restricting attention to those inputs that are purchased from the same industry as that in which the good is being produced (using 2-digit SIC industry codes). They also employ a second measure which they call "differential outsourcing". This is simply calculated as the difference between their total outsourcing estimate and narrow outsourcing.

While especially the narrow measure defined by Feenstra and Hanson is widely used, and is in line with the WTO mode 1 definition of international outsourcing, there is no consensus that it is the most appropriate measure. Girma and Görg (2004), for example, argue that it is too wide, especially for analyses at the establishment level. Instead they prefer a measure suggested by Abraham and Taylor (1996) which includes only the contracting out of machine maintenance services, engineering and drafting services, accounting services, computer services, and janitorial services. Egger and Egger (2001*a*) and Helg and Tajoli (2004) also use a narrower measure restricting offshore outsourcing to outward processing. This measure includes only the intermediate exports for processing that are re-imported. Others like Görg *et al.* (2004) and Criscuolo and Leaver (2005) have more direct data on intermediate inputs, including *e.g.* raw materials and components, and services inputs as well as the proportion of these sourced abroad. A discussion on the measurement issues associated with offshoring is given in OECD (2005*a*), albeit with a focus on related labour relocations.

5. Empirical evidence

5.1. Productivity effects at the industry level

As early as the 1960s, Baumol (1967) argued that one of the major reasons for the growth of the services sector could be linked to services outsourcing in the manufacturing industries (see also Fixler and Siegel, 1999; ten Raa and Wolff, 2001). The fact that manufacturing industries to an increasing extent could outsource their less efficient service activities, and focus on their core competences, led to significant productivity gains in the industry, and increased the already existing productivity gap between the manufacturing industry and the service sector – a phenomenon that was later called "Baumol's disease".

Not all services sectors, however, are affected similarly by ICT services sometimes noted as an example of a sector that may contribute to improved productivity growth, *i.e.* see Wölfl (2003, 2005) for an overview.

For data covering the 1980s, Siegel and Griliches (1992) investigated if outsourcing of services by manufacturing industries led to an overstatement of manufacturing productivity. However, when examining the acceleration of manufacturing TFP and outsourcing of services they found only a weak link. While replicating these results, a later study by ten Raa and Wolff (2001) also provided indirect evidence supporting the theory of Baumol's disease. Their findings suggest that manufacturing industries had been especially successful in outsourcing relatively inefficient services over 1987-1996, but that increasing services inputs observed alongside with the TFP growth recovery over 1977-1987 could stem from both outsourcing and a general substitution of service activities for material inputs.

Fixler and Siegel (1999) provide some insights into outsourcing and its productivity impact on the services sector. Their empirical evidence suggests that outsourcing led to short-run reductions in services sector productivity, but that productivity improvements can be expected, especially for business services, once outsourcing of services by manufacturing firms will subside relative to production capacity in the services sector. They also argue that productivity in the services sector will increase as outsourcing by service firms increases, although they provide no direct evidence of this.

Over the second half of the 1990s, the United States experienced a strong economic expansion and an increase in productivity growth. There is little dispute that this was primarily driven by large IT investments facilitated by falling hardware prices, and the transformation of economic activities that these investments brought. Mann (2003) argues that although technical change is the most important driver of IT hardware price declines, international trade and the globalisation of IT hardware production also played a major role. More specifically, she estimates that over 1995 to 2002, the international fragmentation of IT hardware manufacturing led to a price decrease between 10% and 30% of IT hardware. This translated into a higher productivity growth of 0.3 percentage points per year corresponding to an accumulated USD 230 billion in additional GDP. Moreover, IT capital deepening and IT diffusion are now fuelling an increasing demand for IT services and software, which has allowed new business areas and economic activities to emerge. Mann argues that as offshoring in IT services and software production increases, prices will fall considerably in these areas too, which in turn will foster further productivity increases as the economy adopts a higher degree of pervasive computing. Moreover, since the price elasticity of IT services' demand is higher than that of IT hardware demand, the potential increase in productivity could even be greater than it was in the 1990s.

That offshoring leads to such beneficial outcomes is also the view of the McKinsey Global Institute (MGI) (2003) which looked at savings incurred by offshoring customer services to India, and the overall economic benefits enjoyed by the United States from such investments. Acknowledging that direct labour cost savings can exaggerate the potential benefits of offshoring, and including related costs such as increased communication and travel expenses in their estimates, they predict a reduced cost base of between 45% and 55%. If the process design of the company is re-engineered at the same time, they envision additional savings bringing the cost base down to 30-35%.[8]

MGI also estimates a base saving of USD 0.58 per corporate dollar invested in offshoring, and a directly related benefit to the US economy of USD 0.09 per dollar due to additional exports to India and profits transfers by India-based US providers. Estimating additional benefits of USD 0.45 to 0.47 stemming from re-employment of workers who lost their job in the process, they estimate an overall economic benefit to the United States of between USD 1.12 and USD 1.14 per corporate dollar spent

8. The methodology of these estimates is not explained by the McKinsey Global Institute which leaves the measures open to criticism.

(updated with 2005 figures the benefit is estimated between USD 1.14 and USD 1.17). Benefits to the Indian economy are estimated at USD 0.33 per dollar, leaving the global economic benefit between USD 1.45 and USD 1.47.[9]

According to more recent research by MGI (2004, 2005) the economic benefits of offshoring in the United States are not the same as those in Europe. In Germany (MGI, 2004), for instance, it is estimated that the economic benefits are only USD 0.80 per corporate dollar spent on offshoring. This result is largely driven by lower company savings stemming from the fact that the major German offshore location is Eastern Europe, and not India where wages are much lower. The economic benefit from re-employment is also considered lower due to lower flexibility of the labour market in Germany. France is estimated to be in a similar situation as Germany but with a slightly higher return of USD 0.86 to the economy per corporate dollar spent on offshoring (MGI, 2005).

Investigations of offshoring such as those by Mann (2003) and McKinsey Global Institute (2003, 2004 and 2005) are useful for getting a clearer picture of the issue, but can lack credibility due to their underlying estimation methodologies. The US return to corporate offshore investments of about 13% as estimated by MGI, for example, depends crucially on a significant benefit resulting from re-employment of labour. While the argument that re-employment is important for reaping economic benefit of offshoring is noteworthy, the actual estimates could be questionable – especially in the light of a recent BLS study which found that in the period 1979-1999 31% of those who lost a job due to trade were not fully re-employed. Besides, while only 36% of the displaced workers were able to find a new job with matching or higher wages, 55% were at best working for 85% of their former wages, and 25% were working for 70% or less of their former wage. Also, a recent study by the OECD (2005*b*) finds that labour adjustment costs in both the United States and Europe appear to be higher in the industries that are faced with the most intense international competition. Here, long-term unemployment and losses due to early labour market retirement following displacement are important issues in Europe. In the United States, on the other hand, a significant part of the losses accrue to wage losses following the post-displacement job – a finding that supports the BLS findings.

Other concerns regarding the MGI estimates are raised in Bivens (2005). First, the 13% US return rate to offshoring is based on proprietary data on firms that have already engaged in offshoring activities. This leaves room for a potential bias due to self-selection. Second, MGI does not account for the financing element of the increased imports that offshoring consequently will cause. And last, but not least, widespread offshoring activities could increase foreign productivity in sectors where offshoring countries are net exporters, which could result in a loss of income through negative impacts on the terms of trade (*i.e.* higher prices for imports relative to prices for exports).[10] This argument has also been advanced by Samuelson (2004), but is downplayed by Bhagwati *et al.* (2004) by pointing to historical comparisons. Similar concerns were raised by Europe in the 1950s about growth in the United States, and in the 1970s by the United States about growth in Japan.

Concerning Mann's study Bivens notes that although offshoring of IT services has increased, software prices have fallen more slowly since 2000 than during the previous 20 years, which contradicts Mann's argument. Moreover, the immediate effect of increased software investments might not be as significant to the economy as hardware investments due to a slower depreciation rate of software relative to hardware. Basing the argument that offshoring of IT services can contribute to productivity growth in the

9. See footnote 8.

10. Other arguments concern the fact that MGI estimates cost savings to be higher than re-employment benefits. This essentially implies a static redistribution of income from workers to companies per corporate dollar spent on offshoring. Workers may recoup some of their loss as consumers through dynamic effects such as lower prices, but this aspect of offshoring remains largely unknown.

US economy on data from the hardware industry could be questioned. Even if this were the case, there could be further problems. For instance, following Mann's own estimates and assumptions, Bivens attempts to re-estimate the productivity impact stemming from a 20% reduction in IT hardware prices. He finds than in order to arrive at Mann's estimate of 0.3 percentage points in the yearly contribution to productivity growth from this source requires a capital share of IT hardware in the US economy about five times greater than the generally accepted estimates.

One of the first papers to engage in a more detailed analysis of offshore outsourcing and its impact on productivity was by Egger and Egger (2001*b*, published in Economic Inquiry 2005). They studied the impact of outsourcing on the productivity levels of low-skilled workers using data on 22 manufacturing industries (2-digit NACE) in 12 EU countries over the period 1992-1997. Using the narrow definition of foreign outsourcing and estimating a production function with CES properties, they found that in the short run[11], a one percentage increase in the outsourcing intensity would lead to a 0.18% decrease in labour productivity of low-skilled workers. In the long run, which was estimated by excluding specific effects from the regression, this effect was reversed to a 0.53% increase.

This effect is to some extent supported by Siegel and Griliches (1991). They use data for 4-digit US manufacturing industries and find a negative correlation between productivity growth and the change in the share of imported materials although this turns out to be insignificant. The negative short run effect could also be biased downward due to data measurement errors for capital services (measured by capital stocks) and labour inputs (measured by employment headcounts). While the former leads to a downward bias of the capital coefficient, the latter omits the volume and quality of the hours worked. These are well-known problems and apply to most empirical research in this area (see Siegel and Griliches, 1991). Moreover, the estimation framework used by Egger and Egger differs from what is commonly used, and their results are therefore not directly comparable with most other research.

The difference between negative productivity effects in the short run, and positive effects in the long run, could possibly be explained by short run rigidities, and could, at least in the context of 12 European countries, be associated with rigid labour markets. For instance, if production is shifted abroad, then for a given level of employment, labour productivity must fall.

In contrast to Egger and Egger (2001*b*), Amiti and Wei (2004*b*) focus on general labour productivity and not the productivity of the low-skilled, and analyse the impact of offshoring on growth instead of levels. Using data for 96 US manufacturing industries (2-digit data from the Bureau of Labor Statistics), their analysis takes form through a more standard framework as they apply a Cobb-Douglas production function. Offshore outsourcing of materials is distinguished from that of services, which includes inputs from telecommunications, insurance, finance, business and computing and information services. The sample runs over the period 1992 to 2001[12], and as a separate analysis Amity and Wei also look at how offshoring affects changes in labour demand. The measure of outsourcing is similar to the broad measure used by Feenstra and Hanson (1999).

Amity and Wei (2004*b*) find that there is no clear effect on productivity from material offshore outsourcing, but that there are large positive effects from offshore outsourcing in services. Depending on the model specification, an increase of one percentage point in services outsourcing intensity leads to an increase in labour productivity from 0.43 to 0.57 percentage points.[13] It should be noted that in a more

11. This was estimated by including time-, industry-, and country-specific effects in the regression equation.

12. To calculate outsourcing for the year 2001, the input/output coefficients from the year 2000 are used.

13. GMM estimates carried out to reflect concerns about endogeneity gave almost identical results as OLS, and inclusion of lagged dependent variables plus industry fixed effects did not change the signs.

recent study which addresses the potential endogeneity issues raised earlier, Amity and Wei (2006) find that material offshoring in fact does have a significantly positive, yet small, productivity impact.

A significant contribution from the paper by Amiti and Wei (2004*b*) is that they investigate effects of outsourcing over both the aggregated sample of 96 manufacturing industries as described above, but also at a more disaggregated level (450 industries). This proves to be an important distinction for changes in labour demand, although this approach can unfortunately not be applied to labour productivity due to lack of data.

Most studies of productivity impacts of offshoring at the aggregate level have focused on large countries or economic regions such as the United States or the European Union. Compared with smaller countries, however, these tend to be less open in terms of trade flows, and the effects of offshoring may therefore also be less revealing – in particular if the data period covered by the analysis is short. Recognising this, Egger *et al.* (2001) analyse the productivity impacts of offshoring in Austria using data for 18 manufacturing industries (2-digit NACE) over 1990-1998. They use a measure of offshoring similar to the narrow measure employed by Feenstra and Hanson (1999) but are unable to directly distinguish industry sourcing by the country of origin. As sourcing to the Eastern European countries is particularly important in the Austrian context, they assume that shares of intermediate imports by country of origin are equal for all industries.

To establish the impact of offshoring on productivity Egger *et al.* (2001) follow the approach applied by Feenstra and Hanson (1999). That is, they examine the change in TFP (measured as a Tornqvist index)[14] due to offshoring to Eastern European countries and control for interaction effects with offshoring in low-skilled as well as capital intensive industries.[15] Controls include productivity effects stemming from R&D expenditures, general import and export openness with Eastern countries measured as the import and export ratios of gross production, as well as time-specific and industry fixed effects. Egger *et al.* find that offshoring has a positive and significant effect on TFP and that this effect seems to be more pronounced with respect to offshoring in capital intensive industries relative to low-skilled intensive industries. They estimate that 0.2 percentage points of the 0.9% average increase in Austrian TFP can be attributed to offshoring. They also found that offshoring to other OECD countries had a significant negative effect on TFP, although the authors do not discuss this effect.

5.2. Productivity effects at the level of the firm

Aggregate data contribute to the understanding of international outsourcing and its impact on productivity. However, given the large heterogeneity in firm behaviour with respect to outsourcing, investigations at a more detailed level can provide further insights.

5.2.1. Outsourcing and its impact on productivity

Some of the earliest attempts to estimate the effects of fragmentation on plant productivity using micro-data include Görzig and Stephan (2002), and Girma and Görg (2002, 2004). However, while both studies focus directly on outsourcing as an explanatory factor of productivity, neither of them make the distinction between domestic and international outsourcing.

14. The Tornqvist Index is a weighted geometric average of the quantity relatives using arithmetic averages of the value shares in the two periods as weights. It has been shown than when the phenomenon being analysed (*i.e.* TFP) can be represented as a homogeneous translog production function, then the change in TFP can be represented by a Tornqvist index.

15. Dummies are coded as 1 if low-skilled and capital intensities are higher than the sample averages.

Görzig and Stephan (2002) examine a panel data set of about 43 000 German manufacturing companies over the period 1992-2000. They estimate firm performance measured by both the returns per employee, which could be interpreted as productivity, and the return on sales.[16] Three different measures of outsourcing are employed, and are all related to internal labour cost. The first is "material inputs" which reflects make-or-buy decisions by the firms and therefore resembles material outsourcing to external suppliers. The second is "external contract work" meant to reflect subcontracting, and the third is "other costs not related to production" capturing outsourcing of services.[17] The authors estimate both a between-firm specification, where all observations are averaged for each firm, and a within-firm specification, where they control for unobserved heterogeneity and exclude all time-invariant variables. The former model is interpreted as the long-run model, whereas the latter is interpreted as the short-run model.

Generally, Görzig and Stephan find a positive and significant effect of all three measures of outsourcing on firm performance, measured as returns per employee. This effect is strongest for material outsourcing, but negative for services in the short run. Moreover, they find that increased subcontracting and outsourcing of services reduces firm profitability, whereas firms engaged in material outsourcing tend to do better than those that do not outsource. Based on this they conclude that, on average, the level of subcontracting and outsourcing of services that firms have engaged in is above the optimal level. Despite the significance of these results, it should be noted that most of the variation in performance across firms can be attributed to firm-specific characteristics, and therefore remains unexplained.

Girma and Görg (2002, 2004) address the impact of outsourcing on both labour productivity and TFP for three separate UK manufacturing industries over the period 1982-1992. They use plant-level data[18], including larger establishments with more than 100 employees, in the chemical, electronic, mechanical and instrument engineering industries. Using the standard framework outlined in the methodology section they analyse how both productivity levels and growth are affected by outsourcing, although they do not distinguish between the domestic and international direction of the activity. Outsourcing is measured as the cost of industrial services received by an establishment relative to the total wage bill, where industrial services include machine maintenance services and engineering and drafting services only.[19] Thus, compared to other studies, Girma and Görg apply a more narrow measure.

The impact of outsourcing on productivity levels is positive and significant for plants in the chemical and engineering industries, and about three times stronger in the latter. The effect of outsourcing in the electronics sector is negative but insignificant. Girma and Görg also include an interaction term for outsourcing and plant ownership and find that the productivity effect is more pronounced in case of foreign ownership, especially for plants in the engineering sector. There are no clear results regarding outsourcing's impact on the growth of labour productivity, although there appears to be a correlation in foreign owned plants in the engineering sector. Regarding the analysis of TFP, the sectoral pattern of effects on labour productivity is repeated. This implies that there is a positive productivity effect of outsourcing to plants in the chemicals and engineering sectors, but not in the electronics sector, and the effect for plants in engineering is stronger than that for chemicals. The only exception is that the effects of

16. Both measures make use of the gross operating surplus (GOS). The first is GOS divided by employment, the second is GOS divided by gross production.

17. The measure "other costs not related to production" may overestimate actual outsourcing of services since it includes some costs not related to outsourcing activities.

18. Around 80% of their sample is plant level data. The remaining 20% is data collected at the level of the firm.

19. Non-industrial services are not included.

outsourcing generally are even stronger in engineering as well as positively and significantly correlated with the growth in TFP. Foreign ownership strengthens the effects of outsourcing on TFP.[20]

5.2.2. Offshore outsourcing and its impact on productivity

Using data for larger electronics firms (employment larger than 20) in the Republic of Ireland over the period 1990-1995[21], Görg and Hanley (2003*b*) estimate the effect of outsourcing on both the level and growth in labour productivity. The data includes a total of 652 establishments covering 12 sub-sectors of the electronics industry and includes services such as software development, software production, telecommunications and IT services. Outsourcing is measured as the ratio of imported inputs over total inputs, and apart from looking specifically at offshore outsourcing they also distinguish between outsourcing of materials and services. Services are defined as "other direct and indirect costs" excluding materials, wages, rent interest payments and depreciation. In their analysis they apply the standard estimation framework outlined in the methodology. To account for possible productivity convergence when estimating productivity growth, the set of explanatory variables includes lagged labour productivity.

Görg and Hanley find no clear productivity impact of offshore outsourcing in either materials or services – unless the sample is split into sub-sectors of plants operating either upstream or downstream. In this case, services outsourcing has a large positive and significant impact on both the level and growth in labour productivity for plants operating in downstream sectors. A one percentage point increase in outsourcing is associated with an increase of labour productivity of 0.99 and 0.55 percentage points for levels and growth rates, respectively. For plants operating in the upstream sectors of the electronic industry, on the other hand, the effect is negative, albeit insignificant. There is no effect of foreign material outsourcing in either of the two sub-sector classifications.

Using the same data as above, Görg and Hanley (2005) extend their study of offshore outsourcing in the Irish electronics sector and its productivity impacts. In this study, however, they focus on TFP instead of labour productivity and control for differences in export intensities across plants. To do this they introduce a dummy that takes the value 1 if the plant's export intensity is higher than the median. Since they also code for plant-specific effects, the export intensity dummy captures productivity effects for plants moving from low-export to high-export intensity. Time effects are also included, but they do not distinguish between upstream and downstream operations as in Görg and Hanley (2003*b*). The dependent variable is plant-specific TFP levels.

Looking at offshore outsourcing of materials and services combined, Görg and Hanley (2005) find a positive and significant effect on TFP. When distinguishing between offshoring of services and materials, however, materials are found to have a positive and significant productivity impact while the coefficient on services is positive but insignificant. These effects are robust across different model specifications. There is no significant productivity impact from the export intensity dummy.

20. Based on their estimates, Girma and Görg also calculate "back-of-the-envelope" contributions of the change in both labour productivity and TFP resulting from actual changes in outsourcing intensity as implied by their model. These are then related to the actual changes in productivity. For domestic plants in the chemical sector, they find that outsourcing contributed 4.7% to the growth in labour productivity and foreign plants 2.4%. In the engineering sector, the corresponding contributions were larger with 14.7% and 6.8%, respectively. For growth in TFP in chemical plants the contribution from domestic plants was 1.1% and 0% for foreign plants, whereas the contribution to TFP in engineering was 24.4% for domestic plants and 0% for foreign plants.

21. The manufacturing of electronics in the Irish economy was a rapidly expanding sector over this period, and has witnessed a significant fragmentation of production over the past decades (Ruane and Görg, 2001).

Prior to the two studies mentioned above, Görg and Hanley (2003*a*) conducted another but closely related study. This was based on the same data source, but addressed the question whether or not outsourcing increased plant profitability. In the study they find evidence of a causality going from outsourcing to profitability; they also find that outsourcing of services lowers plant profitability. The effect on profitability from outsourcing of materials was positive but insignificant. Reversing the regression, they found that material outsourcing was positively and significantly related to profitability, whereas services outsourcing was negatively related, but insignificant. It should be mentioned, however, that no plant specific effects were estimated, which potentially could bias the results. Moreover, they did not distinguish between national and international outsourcing.

Görg, Hanley and Strobl (2004) extended on Görg and Hanley (2003*a*, 2003*b*) by investigating the effects of offshore outsourcing on plant productivity over a longer time period (1990-1998), and by using data covering all manufacturing industries. Again, outsourcing of services is distinguished from material outsourcing, and productivity effects are estimated for productivity levels only following the standard framework. The only notable difference from Görg and Hanley (2003*b*) besides larger data coverage is a slight change in the outsourcing variable which here is measured as the ratio of imported inputs over the plant's total wage bill, and not total inputs. The measures of material and services inputs did not change.

Just as in Görg and Hanley (2003*b*), Görg, Hanley and Strobl (2004) generally find that there is no productivity effect from services outsourcing. Despite the similarity in estimation frameworks between the two studies, however, the effect from material outsourcing is both positive and significant, and they estimate that an increase in material outsourcing by one percentage point leads to a 1.2% increase in labour productivity. When allowing different production functions according to plant ownership (foreign or national) and trade activity (domestic or international, based on the exporting status of the plant), offshore outsourcing of materials is found to have an impact on plant productivity of a similar magnitude for both foreign and nationally owned exporting plants. The effect for non-exporting plants, regardless of ownership, was insignificant. Thus, only plants oriented toward the international market seem to benefit from offshore outsourcing of materials. Taking into account the international character and ownership of plants did not result in any impact on productivity from offshore outsourcing in services.

Focusing entirely on offshoring of services, Criscuolo and Leaver (2005) study the phenomenon's effect on total factor productivity in about 37 000 UK establishments over 2000-2003. The data is compiled using three different sources and includes explicit values of the plants' imported and exported services.[22] While the measure of offshored services does not distinguish between different service activities one of the data sources contains partial information on services expenditures coding for 39 different activities provided the value of the transaction is GBP 10 000 or above.

Criscuolo and Leaver (2005) estimate a production function using a somewhat more generalised version of the standard approach. The offshoring variable, which corresponds to the value of services offshored relative to the total services purchased by the plant, still takes effect through the technology factor, but the production function is specified in terms of deviations from the industry mean (measured on a 4-digit level). Controls include different firm characteristics including indicators on whether or not the firm is part of a multinational enterprise coding for ownership, *e.g.* the United Kingdom, the United States, and "other". Firms that export services are also accounted for, and the regression includes specific effects for sectors (4 digit level), regional location and time. Using fixed effects GMM estimation the study finds that offshoring of services generally has a positive and significant effect on plant productivity. However, when separating the sample into manufacturing and services firms, offshoring only has a positive significant productivity effect in the latter group. This result supports most other research done with

22. Imports and exports of "all transactions with individuals, enterprises and other organisations domiciled in a country rather than the UK".

respect to manufacturing plants. For the plants in the services sector, a 10% increase in offshoring is associated with a 0.68% increase in TFP.

Criscuolo and Leaver also look at the productivity impacts of offshoring considering their ownership form and global engagement. Here, combining data on manufacturing and services plants, they find indications that offshoring is associated with positive and significant productivity effects for domestically owned firms (but not for those foreign owned), for firms that are not a part of a multinational enterprise (but not for those that are), and for firms that export (but not for exporters). These results could suggest diminishing productivity returns to offshoring, as plants that are already globally engaged may have little more to gain.

Calabrese and Erbetta (2004) analysed the effects of outsourcing on firm performance in the Italian automotive suppliers sector over the period 1998-2001. Their sample includes 465 plants from the Piedmont region in Italy. Contrary to most other empirical studies using micro-data, their methodology is based on "static" ANOVA analysis of firm performance according to firm categories depending on the degree of outsourcing. They also apply a "dynamic" ANOVA analysis looking at changes in the outsourcing categories between 1998 and 2001. Three measures of outsourcing all expressed relative to total operation costs were used. The first relates to material outsourcing, the second to services outsourcing, and the third is an integration variable measuring costs of personnel, depreciation and amortisation.

Labour productivity in the Italian automotive industry has generally been in decline over the period, yet Calabrese and Erbetta find that material outsourcing seems to have lessened the decline significantly. This indicates a positive effect on labour productivity from material outsourcing. The effects from outsourcing of services, however, are less clear. Unfortunately, there is also no distinction between domestic and international outsourcing, and generally the evidence presented in the paper remains somewhat limited.

Mazzola and Bruni (2000) analysed the success of 160 small Italian firms over the period 1979-1992. Based on firm performance with respect to sales, employment and productivity, they constructed a binary variable representing an observable indicator of a latent success variable. Using a probit model this variable was then related to on a range of different indicators related to organisational structure, financial conditions, market structure as well as sectoral variables. Following this approach they found that firms that are subcontracting work processes have significantly higher probabilities of success relative to other firms. As the research objective of the study is not primarily concerned with outsourcing, it should be noted that the subcontracting variable was only entered as a simple dummy.

In an effort to analyse determinants of different offshoring types, Lui and Tung (2004) also consider the effects from offshoring on firm productivity. The authors consider outward FDI and export outsourcing as opposed to import outsourcing which is the focus of most other studies. In this setting, export outsourcing refers to the non-affiliate offshore production of company exports. The data covers 1 336 exporting manufacturing companies in Chinese Taipei, and includes different firm characteristics obtained from two different sources dating from 2000 and 2001. Productivity relates to labour and is measured as the sales per employee relative to the weighted industry average.

Labour productivity is linked in regression analysis to both export outsourcing and FDI dummies including controls for a variety of different company characteristics. Company size, R&D expenditures, and export related activities are all accounted for as is the direction of FDI, whether foreign affiliates operate in upstream or downstream markets, and their age. Liu and Tung find that FDI generally is associated with a negative productivity impact, although it is positive when directed towards the United States. Effects from FDI towards China are negative and significant. Export outsourcing, on the

other hand, is found to have a positive and significant impact on both levels and growth in labour productivity. Linking the decision to engage in export outsourcing to lagged labour productivity, including various controls, shows a positive and significant effect. It thus seems that more productive firms are engaged in export outsourcing to a greater extent than less productive firms, and that by doing so they increase their productivity even further.

5.2.3. Foreign direct investment

Foreign direct investment may be associated directly with offshoring in the form of international insourcing. For this to be the case, however, the FDI must be accompanied by domestic employment reductions following the halt of production processes carried out by the foreign affiliate. This can be hard to identify, and the literature that deals with FDI and its impact on firm productivity and profitability seldom accounts for these. The results may therefore not reflect productivity effects that stem only from offshoring.

5.3. Indirect evidence

5.3.1. Determinants of outsourcing

Another perspective on outsourcing and its productivity effects may be obtained by looking directly at the determinants of outsourcing.

Girma and Görg (2004), who estimated the productivity effect of outsourcing in the chemical, engineering, and electronic manufacturing industries in the United Kingdom (as discussed above), also estimated the determinants of outsourcing. Focusing on plant characteristics, they found that high wages were positively related to outsourcing. As they argue, this could suggest that cost-savings are important in the firm's decision to outsource. It could also indicate, however, a specialisation process by skill intensive plants in which they are outsourcing their relatively low-skill intensive processes.

Kimura (2002) focused specifically on the determinants of subcontracting and used survey data covering 3 723 large Japanese manufacturers of machinery for the year 1994 and their foreign affiliates (all firms have more than 50 employees). Although the definition of subcontracting used in the survey is unclear, it appears to include both materials and services, with no distinction between the two, and involves some form of long-term contractual relationship between the partnering firms. Also, there is no distinction between domestic and foreign subcontracting. By using a logit specification to estimate the probability of using sub-contracting, Kimura finds no significant effect from operating surplus over sales, and firm performance therefore does not seem to be related to subcontracting.

This finding is in contrast with Tomiura (2004) who investigates determinants of outsourcing using a slightly more recent and much larger sample. The data is from 1998 and covers 118 300 Japanese firms of all sizes whose main activity is manufacturing.[23] Tomiura is able to distinguish between domestic and foreign directed activities, but looks only at material outsourcing. As with Kimura's sample, there is no distinction between unaffiliated contracts and contracts with own subsidiaries, and he therefore measures offshoring which includes both international in- and outsourcing. Tomiura finds that more productive firms tend to be more active in offshoring, and similarly that firms with more labour-intensive production tend to offshore more. Other factors positively related to offshoring are computer usage intensity, highly skilled employees, and R&D expenditure per employee. This finding is consistent with labour cost saving strategies and an increased focus on core competencies. Alternatively, it could suggest that higher

23. For instance, if a firm's main activity changes from manufacturing to wholesale, as has been the case for many manufacturers of clothing due to outsourcing, it is no longer in the sample.

technological capabilities are required when engaging in offshoring activities, which would support the theoretical arguments of Bartel *et al*. (2005) and, to some extent, Freund and Weinhold (2002).

With the same objective of analysing the linkage between international fragmentation decisions and productivity, in a later study Tomiura (2005) uses the same data as above but distinguishes firms according to three international activity categories; *i)* offshore outsourcing, *ii)* foreign affiliate ownership (or FDI), and *iii)* exporting. A fourth "domestic" category includes all remaining firms not engaged in any of the first three categories. The vast majority of the firms (more than 90%) belong to this group, whereas only 1% of firms are engaged in all international activities simultaneously.

Tomiura (2005) employs four different measures for productivity; *i)* labour productivity, *ii)* an approximation of TFP[24], *iii)* the firm's market share in the home country, and *iv)* the firm size in terms of output. He then relates productivity to a set of firm-specific dummy variables representing the four different international activity categories and all combinations thereof. Controls include industry-specific dummies and a dummy for FDI directed towards Asia. This exercise results in an interesting mix of productivity effects stemming from different globalisation modes. Firms relying only on exports in their international engagement tend to be among the least productive in the group of globalising firms. Moreover, while firms engaged in offshore outsourcing are not more productive than exporting firms in terms of labour productivity, they are so in terms of TFP. This reflects the fact that outsourcers tend to be relatively labour intensive companies. As regards FDI, firms that invest in Asia tend to be more productive than both domestic and exporting firms, but less productive than firms directing their investments to the rest of the world. Finally, firms engaged in more than one, or several, globalisation modes simultaneously tend to be among the most productive companies regardless of the productivity measure.

5.3.2. Offshoring and labour market issues

Valuable insights in the link between offshore outsourcing and productivity may also be drawn from research studying the phenomenon's impact on labour markets. In this regard, the effect on skill-intensity is of particular interest since a higher skill-intensity may be associated with higher labour productivity, under some reasonable assumptions.[25] In this connection, however, one must be careful with interpretation as the skill-intensity is most commonly proxied by the non-production workers' share of the total wage bill.

Evidence from aggregated data

Feenstra and Hanson (1999), who base their research on Leamer (1998), provide an important study of offshore outsourcing and its impact on the labour market. The methodology they apply has been the foundation for many later studies. They investigate the impact of offshore outsourcing on the skill-intensity of US manufacturing industries over 1979-1990 and find that international outsourcing has a positive and significant effect on the increase in the non-production workers' wage share.

Hijzen, Görg and Hine (2003) provide evidence that offshore outsourcing accounts for about half the increase in the skilled cost share relative to the total wage bill in UK manufacturing industries. The estimates are based on a sample covering 53 industries over 1982-1998, and the measure of outsourcing is analogous to that used by Feenstra and Hanson (1999). There is no distinction between services and

24. This approximation is defined by adjusting labour productivity for different capital-labour ratios.

25. Assuming that the marginal product of high-skilled labour is larger than that of low-skilled labour, a positive effect from offshore outsourcing on a firm's skill-intensity could indicate a positive effect on labour productivity of the firm.

material outsourcing, but the skill level is estimated by using SOC codes instead of relying on manual/non-manual indications.

Focusing on offshore outsourcing measured as outward processing, Egger and Egger (2001) look at the change in skill ratios in manufacturing industries over 1995-1997 in the European Union. They find that the growth rate in high-skilled labour relative to low-skilled labour was about 1.8%, and that outsourcing could explain about 4% of this change. For import-competing industries, however, outsourcing could account for about 18% of the change. The impact of outward processing must be considered a somewhat moderate or conservative measure of offshore outsourcing. This is because the measure only includes international trade for reasons of processing, meaning goods temporarily exported from the EU to be processed abroad and re-imported into the EU. Hence, not all intermediate imports are included.

The impact of international fragmentation on ratios of skilled to unskilled labour has been investigated for the German and Italian economies by Helg and Tajoli (2004). They use a narrow measure of offshore outsourcing similar to Egger and Egger (2001) above, namely industry trade flow from outward processing to non-EU countries (relative to industry output). Data on outward processing was derived from Eurostat, and employment data from the respective countries' national statistics on 20 manufacturing industries in Germany and 13 in Italy (2-digit ISIC, rev. 3). Changes in skill-composition are coded using broad occupation data (managers and white-collar employees vs. labourers and apprentices).

Helg and Tajoli (2004) link the ratio of managers and white-collar workers to labourers and apprentices on outward processing. They control for industry output, capital intensity, an R&D index and the skilled/unskilled wage ratio, and include industry-specific and time effects. By doing so, they find a consistent positive and significant impact of outward processing on skill-composition in Italy. In Germany, the effect is negative but insignificant. There are indications that capital and skills are substitutes in Italy, while complementary in Germany. Also, as Germany has been involved in outward processing for a longer period than Italy, the data period may simply be too short to reveal a skill-composition effect in Germany. This could also indicate diminishing returns to offshore outsourcing in the manufacturing sector.

Strauss-Kahn (2002) analyses the employment inequality in France using disaggregated industry data for the 1977-1996 period (60 manufacturing sectors). Offshore outsourcing is coded as a narrow measure defined as the share of imported industry inputs embodied in production, from the same industry. Strauss-Kahn finds that offshore outsourcing has a significant negative effect on the share of unskilled employment, and that such activities account for 11% to 15% of the within-industry shifts towards skilled employment over 1977-1985, and for 25% over 1985-1993. The main effect however, stems from skill-biased technological progress, which is consistent with the findings of Feenstra and Hanson (1999).

Evidence from disaggregated data

Head and Ries (2002) use data for approximately 1 000 Japanese multinational enterprises in the manufacturing sector observed in the period 1965-1990. They estimate the impact of offshore employment on the non-production workers' share of the total wage bill using a skill proxy, but their study is directed toward subcontracting to foreign affiliates and therefore relates to international insourcing and not to offshore outsourcing. The paper is nevertheless included in this survey as it might give additional insights into the subject which other studies on outsourcing have not covered. Moreover, the definition of foreign affiliates is relatively wide as it includes offshoring to establishments with 10% Japanese ownership. The study estimated the effect of offshoring with both industry level data as well as data on the firm level. The measure of offshoring changes with the level of analysis but is linked to the employment of foreign affiliates' share in total firm employment.

Using a translog cost function Head and Ries find no effects of offshore employment on skill-intensity when using industry aggregates. At the firm level, however, the effect of offshoring is both positive and significant. Moreover, they find evidence that the sign of the effect on skill-intensity may depend on the income level of the country to which the offshoring activity is directed. As such, there is a tendency for skill-upgrading if the offshoring activity is directed toward relatively low-income countries, whereas this effect is reversed for offshoring directed toward sufficiently high-income countries.

Geishecker and Görg (2005) use employment data from German manufacturing industries over 1991-2000 to estimate a wage equation. In addition to the standard controls such as age, tenure, marital status, etc. they include a measure of outsourcing which relates to the broad measure of outsourcing in Feenstra and Hanson (1999). The measure is thus calculated at the industry level (2-digit NACE) and not at the plant where the person is employed. The authors distinguish between high- and low-skill intensive industries, and between high- and low-skilled individuals. They find that whereas outsourcing has a positive and significant effect on wages for high-skilled individuals, this is only true if the person is employed in industries with high skill intensities. The effect is reversed for low-skilled individuals where outsourcing has a negative significant effect on wages, but only for those employed in low-skill intensive industries.

6. Discussion

6.1. Direct evidence

There appears to be no distinct pattern regarding outsourcing and its effect on productivity from the literature presented above (some of the main results are presented in Table 1). The most apparent conclusion one seems to be able to draw at this stage is that the productivity enhancing effect of the phenomenon depends critically on the context in which it is happening. It is however possible to outline a number of indications from the literature.

Table 1. **Empirical evidence on outsourcing and productivity**

Source	Country	Industry	Period	Type of outsourcing	Productivity Measure	Remarks	Productivity effects from outsourcing		
Aggregate level							**M**	**S**	**SC**
Egger & Egger (2001b)	EU12	Manufacturing	1992-1997	Offshore	Low-skill labour level	Short-run effect	-	n/a	n/a
						Long-run effect	+	n/a	n/a
Amity & Wei (2006)	United States	Manufacturing	1992-2000	Offshore	Labour growth	General	+	++	n/a
					TFP growth	General	+	++	n/a
Amity & Wei (2004b)	United States	Manufacturing	1992-2001	Offshore	Labour growth	General	0	+	n/a
Egger et *al.* (2001)	Austria	Manufacturing	1990-1998	Offshore	TFP growth	General	+	n/a	n/a
Plant level							**M**	**S**	**SC**
Görzig & Stephan (2002)	Germany	Manufacturing	1992-2000	Any	Return per employee	Short-run effect	++	-	+
						Long-run effect	++	+	+
Görg & Hanley (2003b)	R. of Ireland	Manufacturing & services	1990-1995	Offshore	Labour growth	Electronics sector	0	0	n/a
					Labour level		0	0	n/a
					Labour level & growth	Upstream firms	0	0	n/a
						Downstream firms	0	+	n/a
							M	**S**	**MS**
Görg & Hanley (2005)	R. of Ireland	Manufacturing & services	1990-1995	Offshore	TFP level	Electronics sector	n/a	n/a	+
							+	0	n/a
Görg et *al.* (2004)	R. of Ireland	Manufacturing	1990-1998	Offshore	Labour level	General	+	0	n/a
						Exporting firms	+	0	n/a
						Domestic firms	0	0	n/a
Criscuolo & Leaver (2005)	United Kingdom	Manufacturing & services	2000-2003	Offshore	TFP level	General	n/a	+	n/a
						Manufacturing	n/a	0	n/a
						Services	n/a	+	n/a
						Domestic	n/a	+	n/a
						Foreign	n/a	0	n/a
						MNEs	n/a	0	n/a
						Non MNEs	n/a	+	n/a
						Exporter	n/a	0	n/a
						Non exporter	n/a	+	n/a
							MS	**MS * FO**	
Girma & Görg (2004)	United Kingdom	Manufacturing (subsectors)	1980-1992	Any	Labour / TFP level	Chemicals	+ / +	+ / +	
						Engineering	++ / ++	++ / ++	
						Electronics	0 / 0	0 / 0	
					Labour / TFP growth	Chemicals	0 / 0	0 / 0	
						Engineering	0 / +	+ / +	
						Electronics	0 / 0	0 / 0	
								(see Type of out.)	
Lui & Tung (2004)	Chinese Taipei	Manufacturing	2000/2001	FDI	Labour level	General			-
				Offshore		Export outsourcing			+
				FDI	Labour growth	General			-
				Offshore		Export outsourcing			+

Note: M = material outsourcing, S = services outsourcing, MS = material + services outsourcing, FO = foreign ownership. A +(-) indicates a positive (negative) significant effect, whereas 0 indicates insignificant effects. Double signs indicate that effects are larger relative to single signs for the same study. Not all effects depicted here are necessarily robust over all model variations in the different studies.

Egger and Egger (2001*b*) and Amiti and Wei (2006, 2004*b*) study the effect of offshore outsourcing on an aggregated level looking at the European Union and the United States, respectively. While Amiti and Wei find no, or only little, evidence of positive productivity effects from offshore outsourcing of materials in the United States, Egger and Egger find a positive long-run impact in the EU, but a negative effect in the short run. The difference in effects between the short and long run in the European case could possibly be explained by labour market rigidities resulting in a sluggish employment adjustment process. For instance, if an economic activity is shifted abroad, for a given level of employment, *ceteris paribus*, labour productivity falls. In the light of the seemingly contradictory results it must be emphasised that the two studies are not based on the same methodological framework and that the outsourcing measure is broader for the productivity study on the United States compared to that on the European Union. The effects are therefore not directly comparable. Work done by Egger *et al.* (2001) on Austrian manufacturing industries using a similar approach as Amiti and Wei, however, showed that offshore outsourcing of materials had a clear positive productivity impact. This could suggest differences in effects related to the size of the economic region under analysis. Large economic regions for instance tend to be less open in terms of trade flows, which may play down the role of offshoring.

Plant-level estimates for Ireland (Görg and Hanley, 2003*b*) and to some extent the United Kingdom (Girma and Görg, 2004) show little evidence of a productivity impact from material offshore outsourcing in the electronics manufacturing industries. Besides suggesting the possibility of sectoral differences as regards productivity effects from outsourcing, the results could also indicate the existence of diminishing returns to outsourcing. Material outsourcing is generally of a much larger magnitude than services outsourcing, and gains to such activities could therefore already be close to its optimum level. Offshore outsourcing of services, on the other hand, is growing from a much smaller level and is also found to affect productivity positively, at least in the US manufacturing industries (Amity and Wei, 2004*b*), for UK services establishments (Criscuolo and Leaver, 2005), and, under certain conditions, for Irish electronics firms (Görg and Hanley, 2003b). The data coverage in most studies focusing on the economic impact from material sourcing might therefore not stretch back far enough to capture the phenomenon's productivity enhancing effects.

A third reason for the insignificant effect of material outsourcing could be that the outsourcing measure includes some final goods, in addition to intermediates inputs, and therefore captures a part related to import competition which could have a negative influence on productivity. There is some indication of this as Amity and Wei (2004*b*) find a negative relationship between the import share and productivity.

Görzig and Stephan (2002); Görg and Hanley (2003*b*) and Criscuolo and Leaver (2005) all provide evidence of a positive productivity impact of services outsourcing at the plant level. Görzig and Stephan find that although the outsourcing effect is negative in the short run, it is positive in the long run. This finding supports the argument of a rigid European (in this case German) labour market as noted above. Görg and Hanley (2003*b*) find that the offshore outsourcing of services only has a positive impact in downstream operating plants of the industry (electronics). This could indicate that plants in the downstream sectors tend to outsource services that are relatively low-skill intensive allowing them to focus on high-skill activities. Plants in upstream sectors, on the other hand, seem to be increasing their focus on low-skill processes by outsourcing relatively skill-intensive tasks. Thus, assuming that upstream activities are less skill-intensive than downstream activities, these results support the theory of core competences. Criscuolo and Leaver (2005) find a positive and significant productivity effect from offshoring of services in UK establishments, but only for firms within the services sector and not for manufacturing companies. This is contradictory to the results provided by Amity and Wei (2004*b*) and to some extent Amity and Wei (2006), but in line with the results provided by Görg and Hanley (2003*b*) and Görg *et al*. (2004). As the two latter studies are based on micro-data while the former is not, the degree of data aggregation when assessing the productivity effects from offshoring could be an issue.

When comparing the results from Criscuolo and Leaver (2005); Girma and Görg (2002, 2004); Görg *et al.* (2004) and Tomiura (2004) some interesting patterns emerges. The first study finds that offshoring of services in services sector firms generally effects productivity positively but emphasises that this impact is significant only for domestically owned companies when compared with those that are foreign owned. The same holds for non-multinationals (when compared against multinationals) and for firms that primarily operate domestically (when compared against international operating firms). This is, however, not the case in Girma and Görg who find that foreign ownership re-enforces the effects of outsourcing (of materials and services combined) on productivity. Similarly, Görg *et al.* find that the productivity effects of material offshore outsourcing are of a similar positive magnitude regardless of whether the plant is foreign or domestically owned (as long as it is an exporting company) but that there is no productivity impact if the plant only operates domestically. Tomiura also finds that manufacturing firms are more likely to obtain productivity benefits from material offshoring when already globally engaged. From this, it seems that being active on the global scene when offshore activities are initiated is important for enhancing productivity concerning material sourcing, whereas this does not appear to be the case with respect to services. In fact, the opposite becomes true and could be an indication of much stronger diminishing returns to offshoring with respect to services compared to materials. This perspective,

however, is somewhat distorted by the results obtained by Lui and Tung (2004) on manufacturing firms in Chinese Taipei. They find that productivity effects stemming from material offshoring are greatest for firms that are less globally engaged, but their offshoring measure is narrower as it includes export outsourcing only and comparisons are therefore not directly applicable.

6.2. Indirect evidence

Following is a summary table of a selection of studies that might help give an indication of the productivity impact of outsourcing.

Table A. **Indirect evidence on outsourcing and productivity**

	Country	Industry	Period	Type of outsourcing	Productivity measure	Remarks	Productivity effects	
Aggregate level							**M**	
Feenstra & Hanson (1999)	United States	Manufacturing	1979-1990	Offshore	Non-production cost share	growth	+	
Egger & Egger (2001)	EU15	Manufacturing	1995-1997	Offshore	High-skill share	growth	+	
Hijzen (2003)	United Kingdom	Manufacturing	1993-1998	Offshore	Skilled cost share		+	
Hijzen, Görg & Hine (2003)	United Kingdom	Manufacturing	1982-1998	Offshore	Skilled cost share		+	
Helg & Tajoli (2004)	Germany	Manufacturing	1988-1997	Offshore	White-collar/blue-collar ratio	level	0	
	Italy	Manufacturing	1988-1997	Offshore	White-collar/blue-collar ratio	level	+	
					Skilled cost share	level	+	
Strauss-Kahn	France	Manufacturing	1977-1993	Offshore	Share of unskilled employment	growth	-	
Plant level							**M**	
Head & Ries (2002)	Japan	Manufacturing	1965-1990	Offshore	Non-production cost share	Multinationals	+	n/a
							High	**Low**
Geishecker & Görg (2005)	Germany	Manufacturing	1991-2001	Offshore	Individual wages	High-skilled	+	0
						Low-skilled	0	-

Note: M = materials outsourcing, MS = material and services outsourcing, High = skill-intensive industries, Low = low-skill intensive industries.

For all studies conducted with aggregate data, offshore outsourcing has a positive impact on the skill-intensity, proxied by the non-production workers' or skilled workers' cost share of the total wage bill, or the ratio between white- and blue-collar employment. If marginal products are higher for high-skilled workers relative to low-skilled workers, there is a potential for a positive productivity effect.

There is general support for a potential positive productivity impact in Head and Ries (2002). In Geishecker and Görg (2005) it appears that offshoring of intermediate inputs and low-skilled labour are substitutes in low-skill intensive industries, while this is not the case in skill intensive industries. A similar argument can be made for the complementarity between offshoring and high-skilled labour; there is often a positive wage effect in skill-intensive industries, but not in low-skill industries. These results could support the positive productivity effects in skill intensive industries due to increased specialisation and a focus on core competences, and are thus comparable, in essence, with some of the results derived from Görg and Hanley (2003*b*) and, to some extent, Girma and Görg (2004).

In assessing productivity impacts of offshoring it is noteworthy also to draw attention to the determinants of the phenomenon. Most research in this area finds that firms that are more productive also are globally engaged to a larger extent (*i.e.* see Lui and Tung (2004) and Tomiura (2004, 2005)). Thus, there is potential for an upward bias with respect to the positive productivity effects stemming from offshoring due to self-selection. Other concerns relate to the fact that companies that engage in offshoring also tend to be more capital and ICT-usage intensive than those who do not. This could further distort estimates but could on the other hand also indicate that a certain capacity is required to benefit from global engagement. This might also help explain why the majority of micro-level studies on offshore outsourcing attribute far most of the variation in productivity across firms to unobserved heterogeneity.

6.3. Survey indications

As shown in the sections above, the evidence of positive productivity effects stemming from offshore outsourcing of materials and services does not appear to be overwhelming. The large benefits of engaging in such activities may therefore be overrated, and much seems to depend on the heterogeneity between firms. A number of recent surveys support these views to some extent.

One survey covering 5 231 executives across North America and Europe, who would generally be considered buyers of offshore outsourcing services, found that while 47% of those engaged in offshoring activities realised cost savings, only 17% did so significantly (above 20%), while 25% had no savings, and 28% experienced increased costs. The average cost reduction accrued to offshoring was slightly below 10% (Ventoro, 2004). The same survey also found that one in three executives admitted moving work back from an offshore location due to performance problems. Gartner, a consultant firm, also found that companies which employ outsourcing firms (either domestic or international) for customer service processes pay 30% more than what the top quartile global companies pay to do the same functions in-house.

In light of the debate that exists around offshoring and outsourcing and their potential benefits to firms these survey results are surprising. Other surveys, however, point in another direction. A narrower survey of 275 finance executives from a broad range of companies conducted by the CFO magazine found that offshoring of accounting and financial activities led to significant savings in 42% of the cases, whereas only 10% had no savings. In the automotive industry, more than half of the respondents engaged in business process outsourcing (BPO) indicated cost reductions of more than 30% (A. T. Kearney, 2003), whereas a survey of companies primarily in the financial services sector found 48% enjoying the same rate of savings, albeit from a sample of only 38 companies (Weissman *et al.*, 2003).

With reservations about the quality of survey estimates, response rates and possible selection biases, one can at least draw two important messages from the above. First of all, although there is an impression that offshoring brings large economic benefits, it is not clear cut how and if such benefits are indeed realised. Second, the large cost reduction differences that exist from survey to survey could indicate large disparities between the realised benefits depending on the activities that are offshored as well as the sectoral- and firm-specific characteristics.

In practice, it seems that few companies have the organisational and capital capacity to reap the full potential of internationalisation, and in this light offshoring remains a big-company phenomenon at its current stage. There is some support for this view. In a quarterly survey by TEC International, a CEO consulting company, only 5% of about 1 100 mid-size US company CEOs said they intended to outsource IT jobs overseas. Only 12% said they planned to offshore manufacturing jobs, and about 73% had no intention of engaging in offshore outsourcing (TEC, 2004). Another survey conducted by Gartner including 956 chief information officers (CIO), of which half were from North America, draws a similar picture. Here nearly 80% did not see IT outsourcing or offshore outsourcing as a priority now or in four years. The Ventoro (2004) survey mentioned above also found that while only 19% of all companies had a current offshore strategy, this share increased to 95% if looking only at *Fortune* 1 000 companies. Thus, since the bulk of firms in the OECD economies are small and medium-sized companies, and assuming that these surveys give a representative measure of actual future offshore tendencies, the magnitude of offshoring may not be as large as is often portrayed.

7. Summary

Given the attention offshore outsourcing currently demands in the public debate, surprisingly little research on the subject exists. The growing trend in offshoring of services, and the number of jobs

potentially affected in Western economies, has directed the main focus towards labour market concerns. As such, most studies address offshore outsourcing from a labour market perspective, while the phenomenon's impact on productivity has been largely overlooked. It is the objective of this paper to give an overview of the existing research on the productivity effects of offshore outsourcing and its main results.

Most research addressing the link between offshore outsourcing and productivity is based on micro-data with a strong focus on manufacturing establishments. More recent research, however, is directed more toward both distinguishing between offshoring of materials and services as well as with a growing focus on companies in the services sectors.

There are no clear patterns as to how outsourcing affects productivity, and much seems to depend on both sector- and firm-specific characteristics. However, it is possible to draw some indicatory conclusions from the literature. First of all, there appear to be signs of diminishing returns to offshore outsourcing of materials in manufacturing companies as the productivity effects from such activities generally are found to be either small or insignificant. Contrary to offshoring of services, companies have long been engaged in offshoring of materials and the benefit from material offshoring might therefore already have reached its saturation point. Secondly, offshoring of services generally appears to have no productivity enhancing effects if undertaken by manufacturing companies while the opposite is true for firms in the services sector. Thirdly, the positive productivity impact associated with offshore outsourcing of materials is generally more pronounced if the company is already active on the international scene. There are indications, however, that the opposite is the case for enhancing productivity through offshoring of services which could suggest rapid diminishing returns to offshoring of services. And lastly, there are several indications that part of the productivity enhancing effects from material offshore outsourcing is driven by firm-specific strategic elements such as increasing the focus on core competences.

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