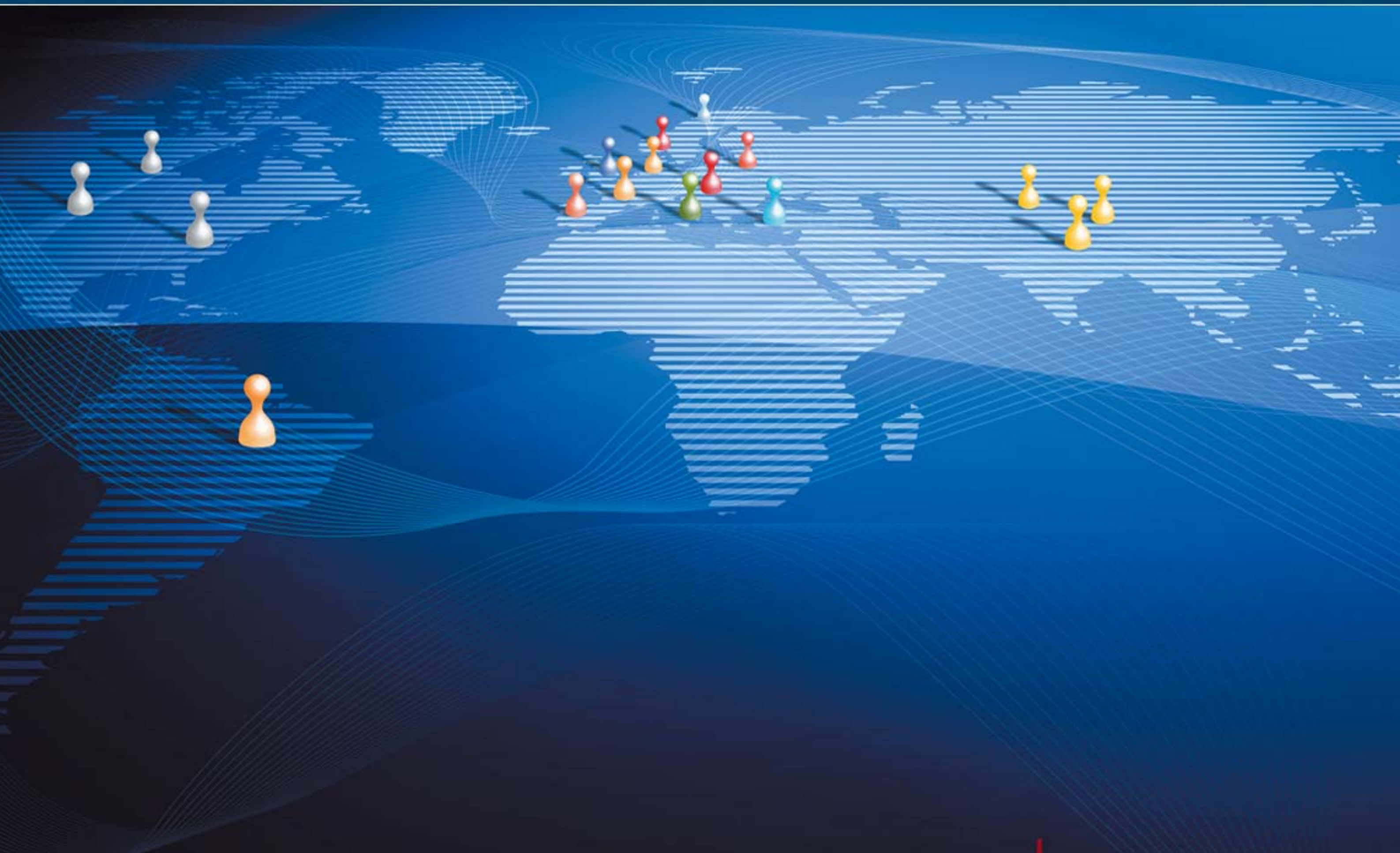
ICEG EUROPEAN CENTER



Annual Conference 2007

Conference Proceedings

Contents:

Foreword

In November 2007 ICEG European Center organised its second Annual Conference in Budapest. This conference series focus on global and European issues that have impacts on the Hungarian economy as well. In 2007 the Annual Conference focused on the factor movements; accordingly, the title of the conference was 'Factors Flows in the World Economy'. We believe that current factor movements determine the present and future development of the structure of production. In the globalising world economy capital flows contribute largely to the economic development of regions and countries. Although the role of capital flows is much more significant than that of the labour, this factor is also important and its movement raise some political and economic questions.

The invited speakers came mainly from international organisations (EU, OECD) and research institutes in Hungary and abroad. The selection of the speakers was made to cover all aspects of the factor movements. In this electronic publication we publish five papers from six authors that were prepared based on the main findings of their presentations. Certainly, all papers have a special attention to factor – capital and labour – flows.

The first paper focuses on the role of India in relocation and offshoring. In this paper Thomas Meyer emphasises that India plays a significant role in global IT services. However, according to the author, the main advantage of the country, namely low wages, will disappear in line with the development of the economy in the future.

In the second paper Deborah Schöller analyses the impact of service offshoring on manufacturing productivity in Germany. According to the author, service offshoring increased sectoral TFP and labour productivity between 1995 and 2004. Besides, Schöller also enlightens that service offshoring reduced German manufacturing employment significantly by on average -0.15% to -0.54% per annum, in the aforementioned period.

Gábor Pellényi and Magdolna Sass focus on the impacts of services relocation after EU enlargement in their paper. The authors concluded that new Member States has not "stolen" jobs from Western Europe. Although, services relocation to Central and Eastern European Member States is an ongoing process, they remain small players on a global scale due to their small size.

In the fourth paper Predrag Bejaković gives a special focus on migration and labour mobility in Southeast Europe. According to the author high unemployment in these economies will not be a barrier of EU accession. Furthermore, accession could be the solution to high unemployment via accelerated economic growth and development.

Bela Galgóczi enlightens in his paper that relocation have had limited impact on employment yet. However, some emerging economies, such as China or India could change that in the future. For the sake of employees trade unions need to help improving business climate and attractiveness of the economy and they need to express solidarity in case of firing of workers. That is how trade unions can react properly to relocation processes in the world, according to the author.

We hope you will enjoy reading this "Conference Proceedings" and we also hope we will have an opportunity to welcome you at our next Annual Conference in 2008.

Thomas Meyer:
India's specialisation in IT exports - Offshoring can't defy gravity

1. Introduction

The success of India's IT industry is iconic. It is the perfect illustration of India's accelerating growth rates and has been a constant source of pride and confidence to the Indians. Indian programmers, software developers, IT consultants and providers of other business services are held in high acclaim worldwide.

According to estimates by the Indian National Association of Software and Service Companies (NASSCOM), a business association, the Indian IT sector – including IT services, IT-based business services and IT-related R&D – generated revenues of around USD 29.5 billion in 2006. It employs around 1.3m people and grew at a rate of over 30% p.a. over the last few years (NASSCOM, 2007). As a consequence, the IT industry contributed around 0.5 to 1 pp to economic growth in India.

Exports are the primary sales channel for Indian IT services. Exports generated around 79% of software and services revenues in 2006 (NASSCOM, 2007). These exports are chiefly generated through IT offshoring, a business model where western companies relocate part of their IT services and the related IT-based business services (henceforth lumped together as IT services unless stated otherwise) to low-wage countries.

The degree of export specialisation is a commonly used indicator of a revealed comparative advantage (Balassa, 1965). By this account, India is one of the strongest contenders: Around 16% of all Indian exports are IT services. Only Israel and Cyprus have a stronger IT-services specialisation. The United States' export share is just 6%.

What is unusual about this picture is that IT services are typically skill-intensive work: IT offshoring typically covers tasks in programming, software development, data processing, or customer services which draw on qualified personnel (see for instance Rajan, 2006). Most IT services need employees with an advanced education, fluency in English and probably a college degree. However, skilled workers are abundant in the US but scarce in India. In view of the resource endowment, one would expect the country's export specialisation being just the other way round.

The emergence of India as an offshore hub has sparked substantial excitement in the scholarly literature as well as in the political arena – in particular during the 2004 presidential elections in the US. The perceived loss of qualified IT jobs to offshore destinations has caused many to believe that the educated middle class in industrialised countries stands to lose from trade this time. Protectionist rhetoric has gained new traction. And IT may only be the beginning. Alan Blinder, for instance, reckons that between 22% and 29% of all US-American jobs are "offshoreable" in principle – i.e. they can be performed from a distance (Blinder, 2007). If offshore countries were to excel also in the production of a broad array of skill-intensive goods and services at the presently low wages, the very foundations of today's rich economies may be threatened and wages of the educated middle class may erode.

This paper looks at the economic fundamentals that may explain India's export specialisation. To this end, it examines cross-country evidence for a sample of 91 countries. It employs a simple empirical model which relates the extent of export specialisation in IT services and other high-technology products to a list of fundamental characteristics, such as the level of economic development and the supply of skilled workers. Despite its parsimonious setting, this model explains between 25% and 45% of the variation in the sample. A number of observations can be taken from this exercise:

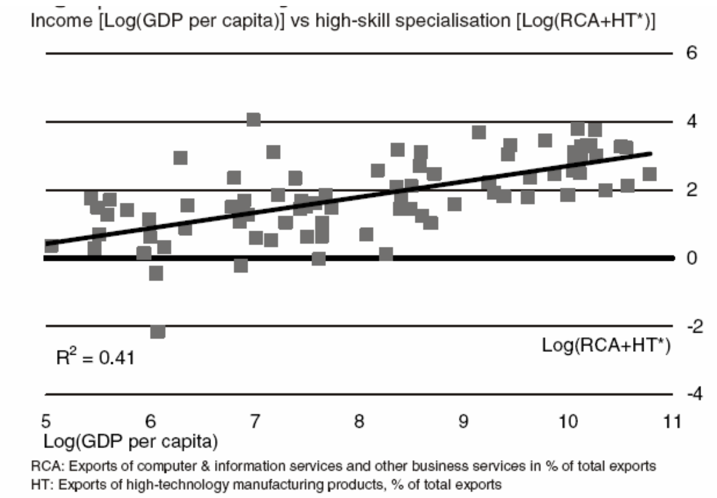
- The level of development is a driving force behind the export specialisation in IT services and other skill-intensive work such as high-tech manufacturing. Skill-intensive exports are basically the premise of rich countries which have the necessary resources.
- Offshoring offers a route for poor countries to expand their share of skill-intensive exports beyond the level traditionally predicted by their stage of development. The necessary ingredients are a (relatively) well qualified workforce at low wages and the ability to communicate effectively with international clients – preferably in English.
- India owes its export specialisation in IT services in part to its reliance on offshoring but also to a shift away from high-tech manufacturing exports – which are lower than expected.
- Offshoring is a somewhat temporary phenomenon. As countries climb up the development ladder the very foundation of the offshoring model – namely low wages – erodes. The specialisation in skill-intensive exports may actually decline in the course of development until – at some point – it picks up again.
- India's specialisation may be close to its peak: By one projection, India's export specialisation in skill-intensive products will be greatest by the year 2010 and regain this level only when GDP per capita will have reached USD 20,000 (c. 2100).

As it appears, offshoring cannot defy the shackles of economic fundamentals. Whilst there is legitimate concern in some industrialised countries that offshoring might cost jobs and prosperity, there is little evidence that poor countries could take over production of skill-intensive products on a large scale. Doing so would require a similar level of development. But then they would not be poor, low-wage countries anymore.

2. Offshoring: A new form of trade?

The fragmentation of production processes across borders is not an entirely new phenomenon. But advances in information and communication technology have accelerated this trend and enabled inroads into the services sector, which was mostly exempt from fragmentation in the past. The rise of the Indian IT offshoring industry over the last two decades is a vivid illustration.

Figure 1. | Skill-intensity rises with income



Sources: Author's calculation, based on IMF, World Bank, 2007

Whether offshoring has different implications than traditional trade is debated in the literature. Some authors discuss offshoring firmly based on the traditional trade literature (e.g. Bhagwati, 2004; Mankiw and Swagel; 2005, Meyer, 2007). Others see unique features that may or may not have different results from what traditional trade theory would say (see for instance Jones and Kierzkowski, 2000, Baldwin and Robert-Nicoud, 2007). Grossman and Rossi-Hansberg (2006b), for example, present a model of trade in tasks in which all domestic factors of production may gain from trade – as opposed to the classical Stolper-Samuelson result – because trade in tasks may effectively boost the productivity of the factor whose tasks become easier to move offshore.

By and large, the export specialisation in skill-intensive goods and services follows the resource endowment and thus confirms the general notion of traditional trade models à la Heckscher-Ohlin. As illustrated in figure 1, around 40% of the variation in the specialisation in skill-intensive exports can be explained by variations in GDP per capita. Rich countries have the necessary resources: an educated workforce, capable infrastructure, good institutions, and a high level of technology, in particular. Yet, the Indian experience and the empirical analyses of sections 3 and 4 suggest that there is also room for poorer countries to engage in skill-intensive exports.

A simple way to distinguish offshoring from traditional trade is to look at the technology used in production. Western firms which relocate certain tasks of their production chain to low-wage countries may continue to use their own, more advanced technology in the offshore country. By paying the local wage (and local overheads) but using the advanced technology of their home country, relocating firms can pocket the difference between the workers' marginal product and labour costs. Offshoring typically entails additional transaction and communication costs, if only because a remote production facility has to be managed from a distance, and these costs have to be deducted from this difference. Obviously, offshoring only pays when lower wages outweigh the additional transaction and communication costs (see Baldwin and Robert-Nicoud, 2007).

This form of technology transfer may explain why some poor countries excel in high-skilled exports although their resource endowment suggests otherwise. Offshore facilities offer attractive employment opportunities for educated people and typically produce skill-intensive intermediate goods or service tasks to parent firms in rich countries.

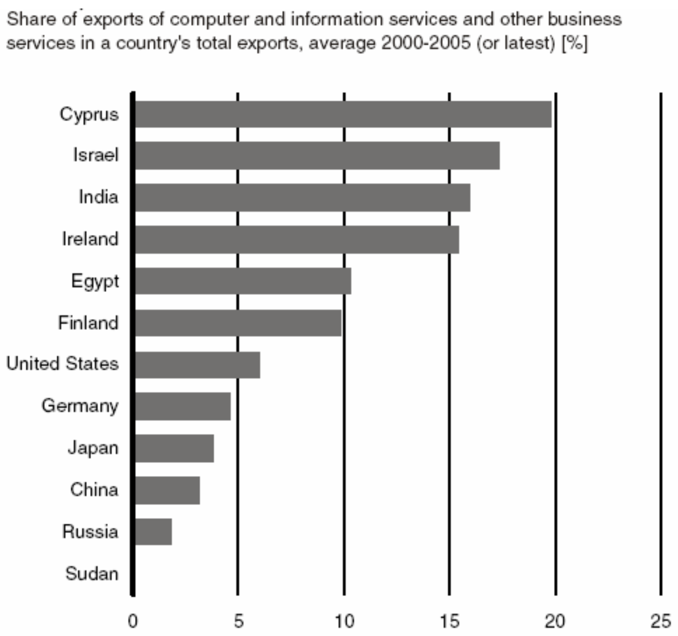
Baldwin and Robert-Nicoud (2007) call this "shadow migration" because offshoring has the same effect as if workers from poor countries were to work in rich countries' facilities at their home countries' wages. But that may be an exaggeration. Firms can only transfer firm-specific technology such as machines, work routines or management techniques but not broader, country-specific amenities such as good institutions or social capital. This limits the extent to which skill-intensive production can spread in poor countries. In fact, the differences in country-specific technology are an important reason for the wage differences and thus necessary to make the offshoring model possible in the first place.

3. How special is India's IT specialisation?

India's prominence as an offshore production hub for IT services is well visible: On average between 2000 and 2003, around 16% of India's total exports were computer and information services and *other* business *services*. Both balance-of-payments positions are being used frequently in the literature to describe the business of offshoring (see for instance Amiti and Wei, 2004). Yet, both positions are only imperfect proxies. *Computer* and informatio*n* services cover tasks such as data *processing, hardware consultancy, software implementation but also news-related services. With the exception of the latter, most of these components appear to be a fair representation of IT services. Other* business services is a residual category which covers those business services that are not allocated to other categories.

While many IT-based business services that are commonly considered to be part of offshoring are included here, such as call-centre operations and other back-office tasks, there are also potentially many services outside the realms of IT-based offshoring included here. Hence, a high figure for *other* business services may overstate the actual amount of IT-based business processes. Still, both balance-of-payments positions include valuable information on the respective industry and should therefore be included in the analysis.

Figure 2. | India reveals a comparative advantage for IT



Sources: Author's calculation based on IMF, 2007

At 16%, India's exports of IT services account for a very high share of India's total exports. Only Cyprus and Israel command a higher share. Ireland is only just behind India's level. Yet, none of the big industrial and technologically savvy countries such as the US, Germany or Japan have an export share that is nearly as high. China's export share is only 3.2%. The bottom of this list is occupied by poor African states such as Sudan and Kenya.

Table 1. | Top-5: IT and IT-based business services exports (2005 or latest)

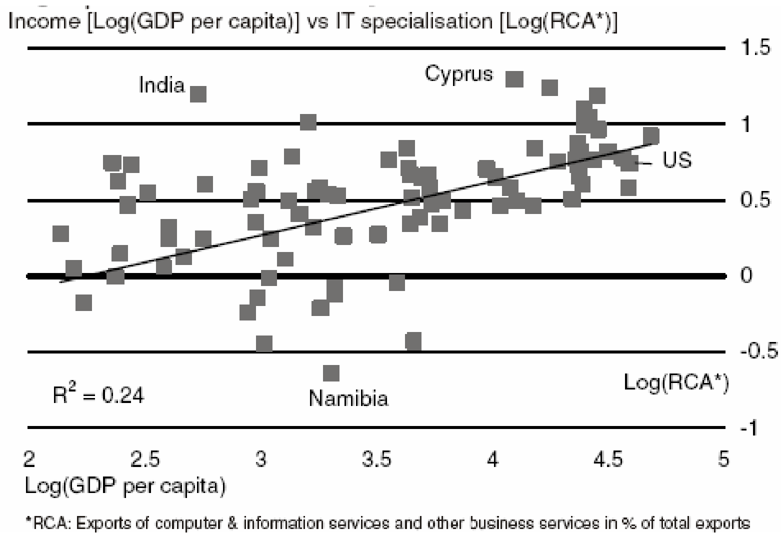
	Exports of computer and information services and other business services, USD m	Of which are computer and information services, %
Cyprus	1,719	12.5
Israel	10,056	45.0
India	13,967	81.4
Ireland	31,728	58.8
Egypt	1,574	1.6

Sources: Author's calculation based on IMF, 2007

At first glance, India's specialisation appears strong but not exceptional. After all, other countries have a similar or even higher export share. But the other countries with a pronounced export specialisation in IT services – say, those with an export share above 10% – differ in some aspects from India. Israel and Ireland are small high-income economies with a highly educated workforce. Hence, the resource endowment is much better suited for the production of more sophisticated services. Ireland in particular is a well known global offshore (some call it nearshore) centre and many firms have relocated part of their IT and business processes there. Cyprus and Egypt, on the other hand, have a lower level of GDP per capita than either Israel or Ireland and the level of tertiary education is also worse. However, their specialisation is largely based on exports of *other business services* while *computer and information services* are only a small fraction of IT services exports (see table 1). As noted above, it is quite likely that *other business services* capture more than just IT-based services. Hence, the export shares of Cyprus and Egypt may be inflated by non-IT services.

Standard trade theory suggests that in particular rich countries with a highly educated workforce should have a comparative advantage in IT services. This impression is supported by looking at the export share of IT services in relation to GDP per capita. The export share of IT services is estimated by the share of *computer and information services* and *other business services* in a country's total exports (average 2000 to 2005, or latest). The variable is named RCA. Figure 3 illustrates the positive relation between wealth and specialisation in IT services.

Figure 3. | Rich countries export IT services



Sources: Author's calculation, based on IMF, World Bank, 2007

In order to obtain a slightly more systematic impression, we estimated a simple empirical model. The dependent variable is RCA. Our line-up of explaining variables consists of (i) GDP per capita (GDP), (ii) the share of students in tertiary education (EDUC), (iii) a dummy variable if a country has English as an official language (ENGL), and (iv) the number of internet users per 1,000 people (INTER)[1]. All of them have a supposedly positive impact on the production of IT services. Most IT and IT-based business services need a qualified workforce. The Indian IT business association NASSCOM, for instance, boasts the quality of its knowledge professionals as one of the key advantages. By the same token, the main users of offshoring are located in Anglo-Saxon countries (Meyer, 2006). Therefore, low-wage countries with an English speaking populace should have an edge because communication is easier and some services – e.g. call centres – could not be possibly relocated otherwise. The degree of internet penetration captures additionally the affinity towards technology.

Low-cost offshore destinations combine high-skill workers with low wages. So the combination between high education and low GDP per capita may hold additional explanatory power. For a relocating company, the degree of education at a certain wage rate in the target country is arguably more important than the level of education per se. Since GDP per capita correlates strongly with wages, a high value of EDUC in relation to GDP should indicate the prevalence of an educated but affordable workforce which in turn should boost offshoring. However, the variable EDUC per GDP has proven to be statistically insignificant. One reason for this result may be that many countries with a socialist tradition – e.g. those formerly belonging to the Soviet bloc – boast high tertiary education but are often quite poor at the same time. Moldova, for instance has a GDP per capita of around USD 400 (figures for 2004 in prices of 2000) but nearly 32% of the people in the respective age cohort are enrolled in tertiary education. India's GDP per capita is USD 540 but only 11.5% are enrolled in tertiary education. Yet, no country of the former Soviet bloc has developed a particular export specialisation in IT services. True, many Eastern European countries have jumped on the offshoring train but their export structure remains less focused (see Meyer, 2006). As it appears, it takes more than skilled workers at affordable prices to leverage the potential of offshoring. One additional necessary condition may be the ability to communicate in English. Shifting certain tasks of the production chain to low-wage countries is only efficient if the cost differential is not foiled by excessively high transaction costs (see, for instance Baldwin and Robert-Nicoud, 2007). Speaking a different language than the sponsor would certainly boost transaction costs. Hence, we combine the variable EDUC per GDP with a dummy for English as official language – i.e. we put the following interaction term into the equation:

$$\frac{EDUC}{GDP} ENGL$$

This interaction term produces a positive value only for countries where English is an official language. Otherwise it is zero. Hence, a high value for this interaction term indicates that English is spoken, and that tertiary education is widespread in relation to GDP. A combination of high education and moderate wages should attract international sponsors. The corresponding models are given by:

$$\text{Trade(a)}: RCA = c + \beta_1 GDP + \beta_2 EDUC + \beta_3 ENGL + \beta_4 INTER + u$$

$$\text{Offshoring(a)}: RCA = c + \beta_1 GDP + \beta_2 EDUC + \beta_4 INTER + \beta_5 \frac{EDUC}{GDP} ENGL + u$$

For the sake of this analysis, the full model without the interaction term will be referred to as the

[1] Data on exports of computer and information services and other business services are from the IMF's Balance of Payment Statistics. High-technology manufacturing exports, GDP per capita (in 2000 USD), the share of students in tertiary education (% of the respective age cohort), number of internet users per 1,000 people are from the World Development Indicators (WDI) database. The dummy for English as an official language is from CEPII.

“trade” model because it follows the more standard trade theory.

“Offshoring” denotes the model with the interaction term because it explicitly allows for poor countries to make inroads into skill-intensive exports via, well, offshoring.

The results of this exercise are described in table 2. As it appears, all variables correlate individually with RCA positively and significantly. Yet, in the full “trade(a)” model, only GDP per capita retains explanatory power. That is not too surprising because of multicollinearity. Countries tend to improve education and internet penetration as they get richer.

Table 2. | Dependent variable: RCA – share of exports of computer and information services and other business services in a country's total exports, average 2000-2005 (or latest) [%] Method: OLS

	Ia	IIa	IIIa	IVa	Trade(a)	Offshoring(a)
c	2.94	3.136	3.95	2.820	2.675	2.568
GDP	0.00161*** (3.17E-05)				0.00015*** (5.29E-05)	0.00015*** (5.23E-05)
EDUC		0.0377*** (0.0152)			0.00125 (0.0201)	
ENGL			1.954** (0.932)		1.051 (0.937)	
INTER				0.00657*** (0.0016)	0.00045 (0.003)	0.000991 (0.0025)
$\frac{EDUC}{GDP}ENGL$						145.62* (0.0025)
R^2	23.2%	6.6%	4.7%	16.9%	24.6%	25.7%
N	90	90	91	89	87	87

*Standard errors are in parentheses. Asterisks denote statistical significance at ***1%, **5% and *10% levels.*
Source: CEPII, IMF WDI

The interaction term in the offshoring model turns out to be statistically significant together with GDP. This suggests that rich countries are in principle better suited to specialise in exports of IT services but that there is also room for low-wage offshore destinations. GDP has a twofold effect on export specialisation. Firstly, it indicates the level of economic development. Since IT services are skill-intensive products, richer countries are typically better suited to export them – as evidenced by the positive correlation between RCA and GDP. However, a low GDP per capita does translate into low wages. This attracts international clients seeking a low-cost destination, given that educated workers are available (even if not as abundant as in rich countries) and communication works well. Under these conditions, even poor countries can develop an export specialisation in IT services as shown by the positive correlation between RCA and the interaction term. While many other potential influences have been ignored here, even these parsimonious models explain about a quarter of the variation in RCA.

Table 3. | India's actual share of IT exports exceeds fitted values

	actual export share (%)	actual/fitted Trade(a)	actual/fitted Offshoring(a)
India	15.95	3.9	2.8
China	3.16	1.0	1.1
UK	11.16	1.3	1.5
Ireland	15.40	1.8	2.1
Israel	17.35	2.4	2.8

IT: Computer and information services plus other business services

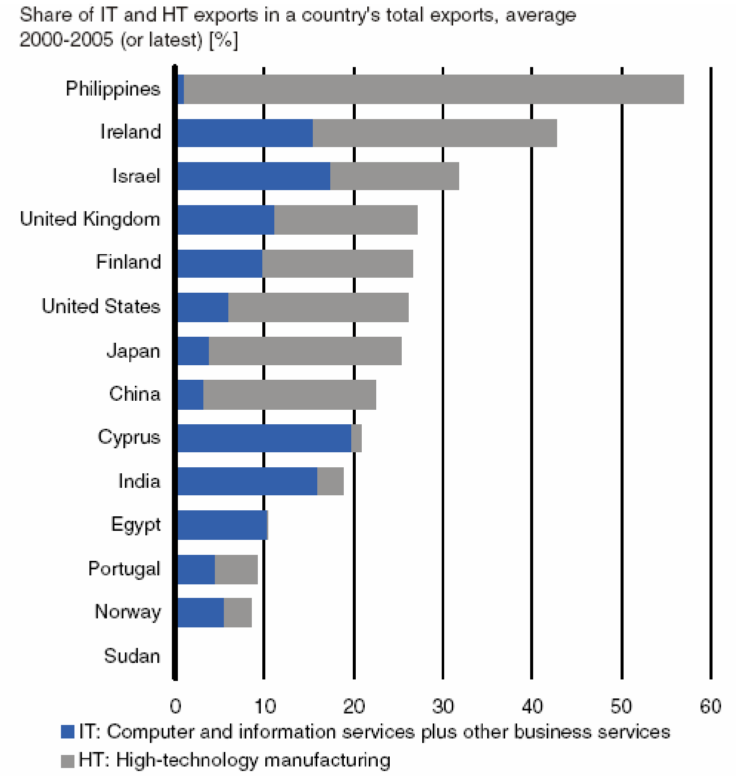
Source: Author's calculation

Using the results of the trade(a) and offshoring(a) models, it is possible to estimate the export share of IT services based on the selected fundamentals. A comparison between this predicted export share and the actual export share is an indication of how exceptional India's or any other country's position is in fact. As it turns out, India's average export share over 2000-2003 exceeds the predicted value by a factor 3.9 (trade[a]) respectively factor 2.8 (offshoring[a]).

In the trade(a) model, no other country has a higher multiple. Cyprus and Egypt come close, but for reasons explained above. The export shares of Israel and Ireland – at a level similar to India's – appear more in line with fundamentals. Their multiples are between 1.8 and 2.4 (see table 3). In the offshoring(a) model, India's export share appears less exceptional. India's multiple is on par with that of Israel, and Ireland follows closely. Cyprus and Egypt even have much higher multiples – but again, they are arguably driven by non-IT exports. Yet, bear in mind, that India is the only big country with a high multiple. Small countries are much more likely to be specialised in some sectors – simply because they are too small to achieve an efficient sector scale in many sectors. Therefore, it is to be expected that for any given sector, there are some small countries that are specialised in it. In our case, they happen to be Israel and Ireland.

4. India has a bias towards IT not high-tech

Figure 4. | India not a high-tech star



Sources: Author's calculation based on IMF and WDI, 2007

India's prominent position as an offshore hub for IT and IT-based business services does not translate into a general specialisation in sophisticated products. In fact, India's share of high-technology manufacturing exports is markedly below that of other countries. Only 2.8% of all exports are classified as high-technology. Such exports include products with a high R&D intensity, such as in aerospace, computers, pharmaceuticals, scientific instruments, and electrical machinery. A share of 2.8% is not small compared with other countries at a similar level of economic development, but it pales in comparison to the more advanced regions. The US, for instance, commands an export share of around 20%. China's export share of high-technology product exceeds 19%, the Philippine's share even 56%.

The latter two countries' shares may be inflated by exports that are still classified as high-technology but have moved down-market in the meantime. Certain electronic components for instance have become a commodity over the last few years, though they may be counted as high-tech nevertheless.

Table 4. | Dependent variable: RCA+HT – share of exports of computer and information services and other business services plus high-tech exports in a country's total exports, average 2000-2005 (or latest) [%] Method: OLS

	Ib	IIb	IIIb	IVb	Trade(b)	Offshoring(b)
c	6.387	5.006	8.281	4.776	3.404	3.009
GDP	0.00049***				0.00023	0.00027**
	(9.42E-05)				(0.00014)	(0.00013)
EDUC		0.1498***			0.0401	
		(0.0424)			(0.0571)	
ENGL			10.40***		7.273***	
			(2.646)		(2.581)	
INTER				0.0240***	0.0081	0.0141**
				(0.0044)	(0.0084)	(0.0063)
$\frac{EDUC}{GDP}ENGL$						1091.93***
						(216.02)
R^2	24.7%	12.9%	15.2%	26.3%	33.7%	44.8%
N	84	86	88	86	83	83

*Standard errors are in parentheses. Asterisks denote statistical significance at ***1%; **5% and *10% levels.*
Sources: CEPII, IMF, WDI

High-technology manufacturing products may draw on a similar set of resources as IT and IT-based business services, in particular a skilled workforce at affordable wages. Hence, a lower share of high-technology exports may just be the consequence of a higher share of IT services exports because domestic resources may have been allocated towards the latter. Combining both exports thus gives a more complete picture (see figure 4): India loses its exceptional position but it is still a strong contender with regard to sophisticated services and products. However, other countries, in particular if they are rich and technologically savvy, are typically more specialised in such exports which corresponds to standard trade theory.

We use the same empirical analysis as above but with the sum of the shares of high-technology manufacturing and IT services exports as dependant variable – named RCA+HT. The results of this exercise are given in table 4. As in the previous analysis, each of the explaining variables – i.e. GDP per capita, tertiary education, a dummy for English as an official language, and internet penetration – correlate positively and significantly with RCA+HT. In all specifications, the R2 is higher than in the original setting which suggests that the selected fundamentals are better suited to explain the general tendency to produce sophisticated products and services than just IT services. Close to 45% of the variation in RCA+HT can be explained by the offshoring(b) model.

However, the results also produce a rather remarkable result. The dummy variable ENGL turns out to exert a huge influence. A country with English as an official language appears to have a higher share of RCA+HT of between 7.3 (trade[b]) and 10.4 (model IIIb) percentage points – all other things being equal. By the same token, the interaction term $\frac{EDUC}{GDP}ENGL$ in the offshoring(b) model also has a huge coefficient.[1]

[1] The sample contains 21 countries with English as an official language which span from the UK to India, Hong Kong, Malta, Namibia or Eritrea. Colonial origin and the introduction of Anglo-Saxon-style institutions may play a role, but the strong position of ENGL remains even if the quality of institutions is controlled – e.g., by including the International Country Risk Guide (ICRG) composite indicator as an additional explaining variable.

In the first set of models, ENGL exerts are smaller influence on RCA, even if one takes into account that RCA has a mean of 4.4% whereas the mean of RCA+HT is 10.4%. The different impact is puzzling because it is the IT-service sector which should benefit most from a common language. English is the lingua franca for IT professionals and most relocating companies are based in English-speaking countries. Yet, the results from this estimation suggest that the prevalence of the English language also boosts exports of other high-technology products.

Table 5. | India's actual share of IT and HT exports within the range of fitted values

	***actual* export share (%)**	**actual/fitted** Trade(b)	**actual/fitted** Offshoring(b)
India	18.8	1.6	0.7
China	22.4	4.6	5.1
UK	27.1	1.1	1.3
Ireland	42.7	2.0	2.6
Israel	31.7	1.5	1.8

IT: Computer and information services plus other business services HT: High-technology manufacturing
Source: Author's calculation

India's actual export share of IT services plus high-technology manufacturing products is well within the range of fitted values: the multiples of actual vs fitted values are between 0.7 (offshoring[b]) and 1.6 (trade[b]). Ireland and Israel have higher multiples (see table 5). Also, China's actual export share is between 4.6 and 5.1-times higher than predicted by the models – but again that may be partly due to a excessively generous classification of high-technology.

Table 6. | Better estimates with RCA+HT

Dependent variable is RCA or RCA+HT

	RCA	RCA+HT
India's multiples (actual/fitted)	**2.8 – 3.9**	**0.7 – 1.6**
R^2	25 – 26%	34 – 45%

Source: Author's calculation

Combining the export shares of IT services with high-technology manufacturing nearly doubles the explanatory power of the models and provides estimates for India which are much closer to the actual numbers (see table 6).

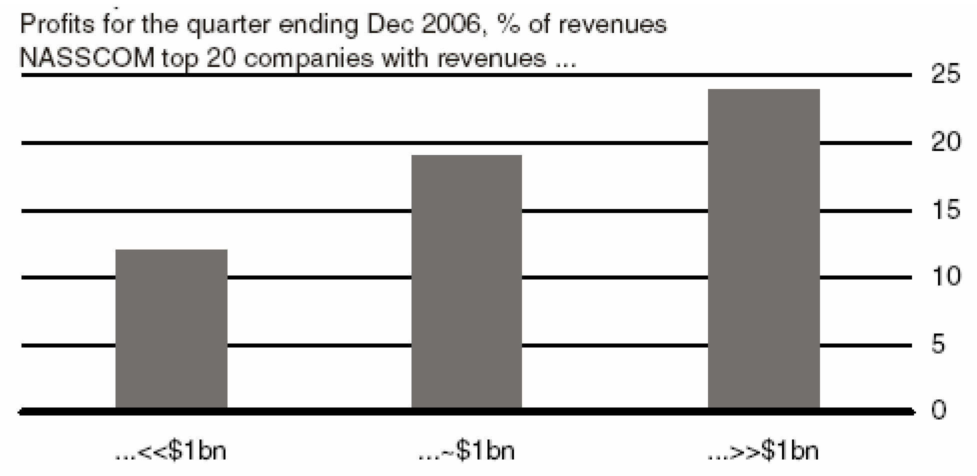
The reasons for the bias towards IT services and away from high-tech manufacturing exports are difficult to unbundle and deep analysis is beyond the scope of this paper. Yet, two factors appear to have contributed: firstly, a discriminating economic policy and, secondly, rising economies of scale. Trade barriers and red tape help to explain the somewhat low overall volume of trade in India.[1] Yet, many activities in the IT sector, in particular those in the offshoring business, are freed from such restrictions. These privileges include for instance the creation of Software Technology Parks (STP), tax breaks for IT firms, and the permission of full ownership of local firms by foreigners (WTO, 2005). The latter is particularly relevant for a certain offshoring model which requires that the provider is fully or mainly owned by the relocating company. This model is often referred to as *captive* offshoring, and is often chosen when critical tasks or sensitive data are being involved. India's former minister for telecommunications, Pramod Mahajon, once quipped that India is a leader in "IT

[1] See Neuhaus (2005) for a discussion on the different measures of openness.

and beauty contests, the two areas that the government has stayed out" (Kapur 2002: 94). As a consequence, the IT sector has benefited from a mixture of benign neglect first and outright government support after the initial success became apparent.

The Indian IT offshore sector shows evidence of rising economies of scale. The top-3 Indian providers with revenues in excess of USD 1billion have grown by around 40% (in terms of revenues) on average in the financial year 2006 compared to around 20% growth in the rest of the top-20. Also, the big ones are more profitable. Profit margins increased from 12% for smaller Indian offshore providers (revenues less than USD1billion), to 19% for medium-sized firms (revenues around USD1billion) to 24% for the top-3 (see figure 5). This gravitation towards the big players suggests the presence of rising economies of scale.

Figure 5. | Big firm, big profit



Source: Apte et al., 2007

Top-tier firms have a couple of advantages in the offshoring business. They can bundle tasks and smooth out peaks in demand. They are also finding it easier to relocate part of their work to other low-wage countries such as China or Vietnam. Besides multinationals, they are often the first choice for talented employees. Since people are the key resource in a skill-intensive business, this gives them an important edge over smaller competitors. Moreover, a big size allows to serve a dispersed client base without losing efficiency on the way – something smaller firms have struggled with (see Apte, 2007). The arguably biggest advantage of size is reputation. While many tasks are scaleable and many smaller firms could leverage efficiency by specialising in certain business fields, the appreciation as an acclaimed and reliable provider is a strong selling point vis-à-vis clients. Typical offshore contracts span over multiple years and switching to a different provider is often costly. Therefore many clients prefer a provider whose sustainability and quality of execution are indisputable.

Table 7. | Serial growth accelerations in India

Average growth in real GDP per capita p.a., %

	China	India	Asia	USA	World
1965 - 1974	3.5	0.8	3.7	2.2	2.7
1974 - 1984	6.6	2.3	5.4	2.0	1.2
1984 - 1994	8.8	3.4	7.1	1.9	1.4
1994 - 2004	8.2	4.4	6.4	2.2	1.7
1965 - 2004	**6.8**	**2.8**	**5.7**	**2.1**	**1.7**
2006 - 2020*	4.4	3.9	n.a.	2.0	n.a.

*Sources: Author's calculation, WDI, 2007; *Bergheim (2005)*

5. India may be close to its offshoring peak

The level of development appears to have two and for poor countries opposing effects on export specialisation. Firstly, there is a generally positive relation between the share of skill-intensive exports and GDP per capita. Richer countries typically have the necessary resource endowments – an educated workforce, good institutions, capable infrastructure – to boast a comparative advantage in skill-intensive goods and services. However, low GDP per capita translates into low wages. This attracts international clients seeking a low-cost destination, given that educated workers are available (even if not as abundant as in rich countries) and communication works well. Under these conditions, even poor countries can develop a specialisation in skill-intensive exports.

Yet, you can't get rich by staying poor. In the course of development, incomes and eventually wages will rise, putting the offshoring model under pressure. In contrast to the traditional trade model, offshoring may result in a declining export specialisation in skill-intensive products as countries get richer until – at some point – it picks up again.

To illustrate the point, consider the case of India. Table 5 describes the empirical relation between the export specialisation and economic fundamentals. Using these relations, it is possible to extrapolate what may happen as India gets richer.

India is still a poor country – classified as low income by the World Bank. Yet, real growth rates of GDP per capita have been rising constantly. In the mid-60s, the average Indian produced less than USD 200 compared with more than USD 500 in 2004 (in prices of 2000). The average per capita growth rate between 1965 and 2004 of 2.8% may be less than the Asian average (5.7%) or China's (6.8%) but it exceeds for instance that of the US (2.1%) as well as global growth (1.7%). Going forward, India's growth rate is projected to stay high in the foreseeable future – at a rate of 3.9% it is only just behind China's 4.4% (see table 7). The extrapolation in this section uses a future growth rate of 3.9% p.a.

How will the share of students enrolled in tertiary education (EDUC) and the internet diffusion (INTER) evolve as India gets richer? Both variables are highly correlated with GDP per capita as shown in table 8.

Table 8. | (Method: OLS)

Dependent variable:	EDUC	INTER
C	-61.32	-748.32
Log GDP	12.06*** (1.134)	124.08*** (8.149)
R^2	57.4%	73.2%
N	86	87

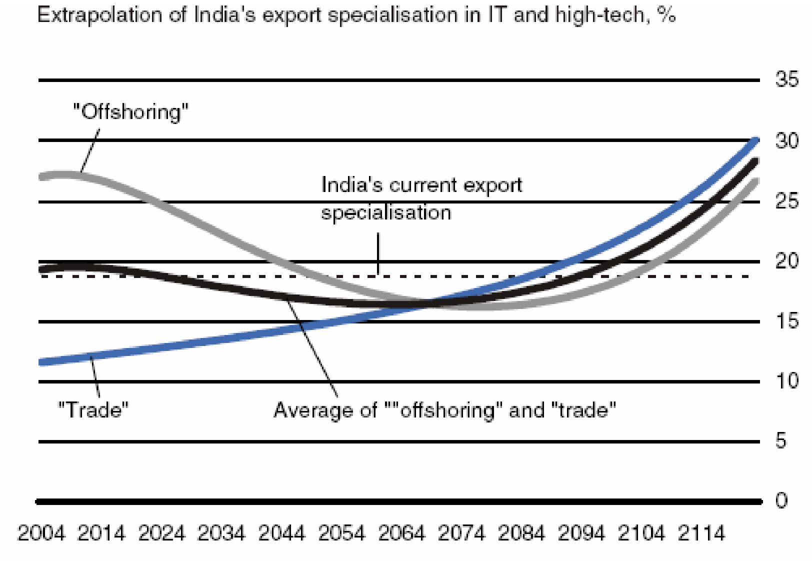
*Standard errors are in parentheses. Asterisks denote statistical significance at ***1%; **5% and *10% levels.*
Sources: WDI

Using the coefficients in table 8 allows projecting the rise in education and internet adoption in the course of development based on cross-country averages. We have adjusted both constants slightly – using -64.33 (instead of -61.32) for education and -747.82 (instead of 748.32) for internet diffusion – in order to get starting values that match India's exactly.

With projections on GDP per capita, education and internet diffusion, it is possible to estimate India's share of skill-intensive exports over time (see figure 6). The traditional "trade" model shows the typical monotonously upward sloping evolution. The "offshoring" model shows a more twisted development. According to the "offshoring" extrapolation, the export specialisation rises at a quite early stage of development, then declines and then rises again broadly in line with the traditional "trade" model. The "offshoring" model predicts a higher, the traditional "trade" model a lower export specialisation than India actually has. Interestingly, a simple average of both models delivers a prediction (19.3%) that is quite close to the actual share of 18.8%.

As it appears, India may still be in a period of growing specialisation in skill-intensive exports. Growth in education more than compensates rising GDP per capita which makes relocations more attractive. But that may be about to change. The turning point of the pure "offshoring" extrapolation is already 2007, that of the average extrapolation is 2010. Beyond these turning points, the rise in GDP per capita more than outweighs the gains in education and high-skill specialisation declines. This decline continues far into this century with a low point of 16.4% around the year 2060 for the average extrapolation. At that time, India will boast GDP per capita of around USD 5,100 (in prices of 2000) and close to 39% of the respective age cohort will be enrolled in tertiary education. Going forward, the share of skill-intensive exports will rise again, but it will take until the year 2100 for export specialisation to reach a similar level as in 2010. The average Indian will then produce close to USD 20,000 and student enrolment will reach 55%.

Figure 6. | Dip ahead



Source: Author's calculation

The exercise in figure 6 illustrates the typical u-shape in the relation between the specialisation in skill-intensive exports and the level of development within the "offshoring" model. It shows that the revealed comparative advantage in the production of skill-intensive products that some poor countries enjoy is a rather temporary phenomenon. This puts the current excitement and alarm over the rise of offshoring into perspective. After all, the basic notion that rich and technologically savvy countries have a comparative advantage in the production of skill-intensive products is unaffected by the "offshoring" model. What is more, the comparative advantage currently enjoyed by offshore destinations such as India should not be extrapolated linearly into the future. Rather a dip and convergence to the traditional "trade" model is more likely.

Note, however, that although the "offshoring" model does not lend support to the idea of an ever growing comparative advantage in skill-intensive products for poor countries it doesn't predict a collapse either. The export specialisation predicted by the "offshoring" model – and therefore necessarily also by the average model – stays well above the traditional "trade" model until far into this century despite its declining relative weight. Moreover, there is little reason to expect a decline in skill-intensive exports in absolute terms. The shift in the relative weights appears relatively minor compared with the overall export growth. All this points to a more balanced view: Offshoring – as described in this analysis – allows some poor countries to develop an export specialisation in skill-intensive products which they would not enjoy otherwise. But neither does offshoring overthrow the traditional economic pecking order nor is it an over-hyped business model that is going to fade away anytime soon.

A word of caution is in order here. The extrapolation in figure 6 serves as an illustration but it is not a forecast. Changes in technology which boost or curb transaction costs, for instance, may reshape the path of the "offshoring" model. The same goes for policy changes. Also, the gains in education and internet diffusion in the course of development are based on contemporary cross-country evidence (see table 8) which may or may not be appropriate for India in the future. However, the fundamental structural relation – the u-shape – is robust to a variety of different specifications.

6. Conclusions

The rise of India's IT industry is obvious. Its success draws on India's supply of well-educated, English-speaking and affordable workers. But these fundamentals explain only part of the story – as illustrated by our simple empirical analysis. India's actual export specialisation in IT services exceeds the fitted values of the empirical "trade" model by a factor 4. No other country has a higher multiple; only Israel and Ireland come close. This paper argues that two factors contribute to this specialisation: Firstly, India makes extensive use of the offshoring model by which western firms relocate part of their production to low-wage countries. Offshore production facilities typically combine local talents at local wages with the advanced technology of the parent company. They often use this combination to produce and export skill-intensive goods and services back home. As a consequence, the skill-intensity of exports may be upwardly biased in the presence of offshoring compared to the intensity suggested by the level of development. However, the actual/fitted multiple declines only to 2.8 if the empirical estimation addresses offshoring more directly. This suggests that the presence of offshoring is not sufficient to explain India's export specialisation in IT services.

A second observation is that the specialisation in IT services comes – at least partly – at the expense of other high-tech manufacturing exports. The actual/fitted multiple declines to values between 0.7 ("offshoring") and 1.6 ("trade") if high-tech manufacturing exports are included because India exports relatively little of them. Moreover, the explanatory power of the estimation rises when high-tech manufacturing exports are being included: the R^2 rises from around 25% to between 34 and 45%. IT services and high-manufacturing exports appear to draw on a similar set of economic fundamentals – a well educated workforce, in particular – and a bias towards one seems to crowd out the other.

Obviously, there is no magic behind India's IT specialisation. This should lend comfort to those who feel threatened by the rise of offshoring and the progress some poor countries have made in exporting skill-intensive products. In the long run, the level of development is the leading driver behind a comparative advantage in the production of skill-intensive products. Offshoring allows a country to export more skillintensively at an early stage of development – provided that transaction costs are sufficiently low – but this model draws on low wages in the first place. Yet, wages tend to rise as countries climb up the development ladder. This crowds out the very foundation of the offshoring model and results in a declining export specialisation for intermediate stages of development. The example of India, detailed in section 4, illustrates this u-shaped evolution: India's specialisation in skill-intensive exports may reach a peak between 2007 and 2010 and decline afterwards. It may take until the year 2063 for specialisation to rise again and until the end of this century for the current level to be reached again (see section 5 for assumptions and qualifications). While this should not be seen as a forecast, it serves to illustrate the ups and downs in the evolution of export specialisation.

The success of India's IT industry has additional effects that are not easily measured in economic terms. It is a constant source of pride and confidence to the Indian economy and has contributed to the growing perception of India as an economic powerhouse. This has a great marketing effect for Indian products and companies.

Deborah Schöller:

Service offshoring and its impact on productivity and labor demand in Germany: Evidence from revised input-output data

Abstract

Besides material offshoring, economists have started to analyze the impact of service offshoring on domestic employment. Services are of particular interest since their significance has grown in terms of both quantity and quality. One decade ago, most services were considered non-tradable, but the emergence of new information and communication technologies has contributed to overcoming geographical distance. The move towards liberalization of international service trade has further accelerated this process.

Our empirical analyses use revised input-output data from 1995 to 2004 at a sectoral level. First, German service offshoring intensities are calculated, which represent the proportion of imported service inputs used in domestic production. Second, the author estimates the impact of service offshoring on German manufacturing productivity. The estimation results indicate that service offshoring significantly increased sectoral total factor productivity and labor productivity between 1995 and 2004. Third, the influence of service offshoring on German domestic manufacturing employment is estimated. The author refers to the labor demand specification of Hamermesh using output, wages, and other input prices as exogenous variables. The estimation results indicate that service offshoring reduced German manufacturing employment significantly by on average -0.15% to -0.54% p.a. between 1995 and 2004.

JEL No. F1, F2
Keywords: Service Offshoring, Employment, Labor Productivity, Total Factor Productivity, Globalization

1. Introduction
1.1 Definition of service offshoring

Intensifying globalization processes have coincided with low economic growth rates and high unemployment in Germany especially in the 1990s. Globalization in the economic sense comprises the transnational movement of production factors, commodities and services, which is reflected in a higher integration of international goods, money, and capital markets (Reining, 2003). Trade and investment flows, in particular, have increased, which often leads to the one-sided conclusion that growing globalization causes negative labor market effects. This popular belief, which might also contribute to the increasingly pessimistic attitude of the working population in Germany, demands academic clarification.

Globalization processes impact domestic labor markets through three main channels. 1. Integrated product markets intensifying the international commodity and service trade, 2. economic integration via Foreign Direct Investment (FDI) and the fragmentation of production, and 3. labor market integration via migration. Channels 1 and 2 have an indirect effect on national labor markets, whereas the third channel has a direct effect (Landesmann, 2000). Regarding offshoring-induced labor market effects, economists distinguish between quantitative aspects, i.e. the *overall level of home employment*, and qualitative aspects, such as *employment or income distribution*.

Offshoring is used as a general term to describe all kinds of entrepreneurial activities taking place in a foreign country in order to support a domestic company's business. Terms such as outsourcing, international outsourcing, offshoring or offshore outsourcing[1] are often used to refer to the same phenomenon but technically do not have the same meaning. A clear definition of offshoring is required, beginning with a distinction between outsourcing and offshoring. Outsourcing asks for the "source" of production, i.e. if the input is produced by an internal source (self-production or subsidiary) or an external source (independent supplier/subcontracting) wherever the source might be located geographically. Offshoring, on the other hand, asks for the "shore", or the country of production, i.e. if the input is produced at home or abroad regardless of the source. *Figure 1* shows the 4 possible combinations of both dimensions: (a) internal production in the home country (captive home production), (b) external production in the home country (onshore outsourcing), (c) internal production abroad (captive offshoring or FDI) and (d) external production abroad (offshore outsourcing or international outsourcing). Offshoring comprises both internal and external production in a foreign country (c and d).

Figure 1. | Classification of Offshoring

Dimension: Country	**outside**	*Captive Offshoring / FDI*	*Offshore Outsourcing*
	inside	*Captive Home Production*	*(Onshore) Outsourcing*
		inside	**outside**
		Dimension: Firm	

Source: Own illustration.

[1] "Fragmentation" and even "FDI" are also used.

In the US, economists have started to consider the damaging potential of offshoring on domestic employment. Samuelson (2004) argued with a theoretical Ricardian model that offshoring might provoke negative domestic labor market effects when the trade partner has productivity gains in its initially import-competing sector. That means that the trade partner gains some of the comparative advantage that was previously limited to the domestic economy. In this case, technological innovation could permanently reduce the per capita income in the country of origin (Samuelson, 2004). Free trade advocate Alan Blinder's (2007a) estimations on the potential offshorability of 30 to 40 million American service jobs is quoted lately in newspaper articles, such as "Pain from free trade spurs second thoughts" in the Wall Street Journal on March 28th 2007 (Wessel and Davis, 2007) or "Free trade's great, but offshoring rattles me" in the Washington Post on May 6th 2007 (Blinder, 2007b).

Recently, the newer phenomenon of *service offshoring* seems to have spread to Germany. The discussion has become more relevant due to the geographical and cultural proximity of the new Central and Eastern European Countries (CEEC) that have joined the EU. Services are of particular interest since their significance has grown in terms of both quantity and quality. One decade ago, most services were considered non-tradable, but the emergence of new information and communication technologies (ICT) has contributed to overcoming geographical distance.

While the above classification refers to offshoring in general, the following paragraph aims at giving an appropriate definition of service offshoring. Service trade has been fostered by global drivers that have appeared simultaneously. *Developments in ICT* have led to what is sometimes called the digital-electronic revolution. For a long time, services, unlike commodities, were considered intangible and invisible and thus neither storable nor transferable.[1] Hence, direct contact between the producer and consumer of a service was required. According to the *uno-actu-principle* either the consumer of a service had to seek out the producer (e.g. retail, wholesale, tourism sector) or vice versa (e.g. transport sector, waste disposal). Recent developments in ICT have made it possible to uncouple information from its physical storage, rendering the transfer of huge amounts of data possible in a matter of seconds ('disembodied services'). Thus, the generality of the uno-actu-principle has been called into question. Besides the developments in ICT, the move towards the *liberalization of international service trade* has further accelerated this process.

Service offshoring in the broader sense comprises all kinds of foreign service activity of a multinational company (MNC) aimed at supporting its domestic production. The motives behind an offshoring decision can be market-oriented, cost-oriented, or procurement-oriented. Service offshoring is expected to have the potential for harming employment when formerly home-produced services are transferred for cost reasons. Therefore, our definition of service offshoring in the narrower sense focuses on cost-oriented motives:

"Service offshoring designates the provision of service inputs from a foreign supplier that are produced abroad mainly for cost reasons and re-imported to the home country. Here, the foreign procurement either happens externally, via an independent supplier (offshore outsourcing), or internally within the multinational company (captive offshoring)."

[1] This distinction between services and commodities should not be understood in a strict sense. Some services have features of commodities and are tangible (e.g. the printed report of a management consultant) or visible (e.g. theatre). Beyond this, most commodities depend on service inputs in their production and vice versa.

The next section gives a brief literature overview of empirical research dealing with the effects of offshoring on domestic productivity and employment. The second chapter shows how service offshoring is measured. The third chapter estimates the impact of service offshoring on German manufacturing productivity on a sectoral basis, where we distinguish between total factor productivity (TFP) and labor productivity. In the fourth chapter, the effects of service offshoring on German manufacturing employment are estimated at a sectoral level, referring to the theoretical model of Hamermesh (1993).

1.2 Literature overview

The service offshoring debate in Germany is not yet well established. There are four main deficits concerning German studies dealing with labor market effects: First, German empirical research focuses more on material offshoring, whereas tradable services have not been integrated into empirical studies yet. Second, there are only few empirical studies for Germany at a sectoral level to our knowledge. Third, most studies focus either on the effects of offshore outsourcing or FDI. Only few studies consider both simultaneously in their empirical analyses. Fourth, German studies including *service inputs* stress some aspects, but neglect others. For example, Görzig and Stephan (2002) do not differentiate between domestic and foreign service purchases, when studying the effects of service outsourcing on firm-level performance. The McKinsey Global Institute measures the welfare gain of service offshoring for the US, Germany and France, but does not clearly reveal the underlying method. According to this study Germany experiences a welfare loss of 26% (Farrel, 2004; McKinsey Global Institute, 2005). Falk and Koebel (2002) only consider the impact of domestically purchased services and imported material inputs on the domestic *labor demand structure*. Moreover, they use data from 1978 to 1990, which does not cover the relevant ICT-period.

Remarkably, there is no empirical research on potential *productivity effects* of German service offshoring, especially at a sectoral level. Even the Anglo-Saxon countries show few empirical studies. In the US, Mann (2003) calculates the productivity effect of service offshoring in the IT industry between 1995 and 2002. She finds that real GDP growth increased by 0.3 percentage points per year. The aforementioned McKinsey Global Institute report (McKinsey Global Institute, 2005) finds a welfare gain of service offshoring for the US of around 14 to 17%. Amiti and Wei (2004, 2006) find positive evidence of service offshoring on TFP and on labor productivity in the manufacturing sector. Thus, service offshoring had a significant positive impact on US productivity between 1992 and 2000, which is estimated at a sectoral level. Girma and Görg (2003) measure the impact of service *outsourcing* on total factor productivity and on labor productivity for three UK manufacturing sectors between 1980 and 1992. As their study focuses on outsourcing, their explanatory outsourcing variable does not differentiate between domestic and foreign service outsourcing. Also, foreign in-house produced services are not considered. Görg and Hanley (2003) analyze the impact of service offshoring on labor productivity for Ireland using plant level data. The effect was positive in the electronics industry between 1990 and 1995.

The impact of service and material offshoring on the *employment level* has been empirically measured for the US by Amiti and Wei (2004, 2006). At a highly disaggregated sectoral level (450 industries) they derive a significantly negative effect, whereby service offshoring reduced manufacturing employment by 0.4 to 0.7 percent per year between 1992 and 2001. At a more aggregated level (100 industries), the negative effect disappears. The authors interpret this phenomenon with the potential of service offshoring to increase efficiency in certain sectors which leads to the creation of new jobs in other sectors. Amiti and Wei (2005) test the impact of service offshoring on home employment for the UK between 1995 and 2001 integrating 78 industries.

They find a significantly positive correlation between service offshoring and manufacturing employment citing the same explanation as in their US study. Schöller (2007a, b) analyzes the impact of service offshoring on labor demand at a sectoral level and finds evidence of a negative impact of service offshoring on German manufacturing employment between 1991 and 2000, which constitutes the first empirical study for Germany to our knowledge.

The *main contributions* of this study are the following: First, we use newly published revised input-output data for the period from 1995 to 2004, making this the first study to our knowledge that reflects the relevant ICT-period. Second, we differentiate not only between imported service and material inputs, but also between domestically produced service and material inputs, which has not been done in other studies so far. Third, our calculations of German offshoring intensities are based on published German import matrices, whereas the Anglo-Saxon studies (e.g. Amiti and Wei, 2005, 2006) only use proxy variables for imported inputs. Fourth, we measure the effects of service offshoring on both productivity and labor demand. Fifth, we apply GMM methods when measuring the different labor market effects. Finally, our results confirm the positive productivity effects of the US-studies related to service offshoring, but show that German manufacturing employment is negatively affected, which is not in line with the US studies.

2. Service offshoring intensity

The following analysis for Germany uses revised input-output data from the Federal Statistical Office which originally comprises 71 sectors. Revised input-output data covers the period from 1995 to 2004 and thus reflects the relevant ICT-period. We consider all 36 manufacturing sectors plus 7 selected service sectors (see *Appendix I*). The primary sector (sectors 1-3) and the sectors 'mining' and 'quarrying' of the secondary sector (sectors 4-8) are dropped, as they generally do not represent offshoring sectors. The selection of the 7 out of 27 service sectors includes *tradable business activities* in the broader sense according to the aggregation of Kalmbach et al. (2005) except for the wholesale sector[1]. Consumer-related[2] and social services[3] are not considered, since the former do not represent typical offshoring services and the latter are not tradable. Business activities comprise 'other business activities' in a narrower sense (sector 62), as well as the following 6 sectors: post and telecommunications; financial mediation (except insurance and pension funding); activities related to financial mediation; rental of machinery and equipment; computer and related activities; research and development (sectors 54, 55, 57, 59-61).
The service offshoring intensity OSS_{ist} measures the share of *imported* inputs of service s out of all non-energy inputs used by sector *i* at time *t*:

$$OSS_{ist} = \frac{(imported\ inputs\ of\ service\ s\ used\ by\ sector\ i)_t}{(total\ non\text{-}energy\ inputs\ used\ by\ sector\ i)_t}$$

The denominator contains all 36 non-energy manufacturing inputs, plus the 7 service sectors selected above (see *Appendix I*). The service offshoring intensity OSS_{it} for sector *i* at time *t* is calculated by summing OSS_{ist} over all services *s*:

$$OSS_{it} = \sum_s OSS_{ist}$$

[1] The sector 'wholesale, trade and commission excl. motor vehicles' (sector 46) was dropped for comparability reasons with a former study (Schöller, 2007a, b) that only includes unrevised 1991-2000 data. The unrevised data showed strong unexplicable fluctuations between 1991 and 1995.
[2] Sectors within the classification of the Federal Statistical Office: 45, 47-53, 56, 58, 69-71
[3] Sectors within the classification of the Federal Statistical Office: 63-68

The sectoral service offshoring intensity OSS_{it} should not be confused with OSS_{st}, which represents the average offshoring intensity of a certain service *s* across all sectors *i*. This is calculated by aggregating the respective OSS_{ist}, weighted by their sectoral output:

$$OSS_{st} = \sum_i OSS_{ist} * (Y_{it} / Y_t) \text{, where } Y_t = \sum_i Y_{it}$$

Summing OSS_{st} over all services *s* yields the average service offshoring intensity OSS_t at time *t* across all sectors and services: $OSS_t = \sum_s OSS_{st}$. Another possibility to calculate OSS_t is: $OSS_t = \sum_i OSS_{it} * (Y_{it} / Y_t)$.

The material offshoring intensities OSM_{imt}, OSM_{it}, OSM_{mt}, and OSM_t are defined analogously.
The above definition of offshoring intensities suffers from two related shortcomings. First, the measures underestimate the actual offshoring values, since the import prices of these services are generally lower than their purchase prices. Second, total non-energy inputs only include purchased inputs, but do not include self-produced inputs used by a given sector *i*. Nonetheless, the offshoring intensities represent a good measure for the proportion of imported service inputs being used in home production.

The first column of *Table 1* presents the *average service offshoring intensities* OSS_{st} (weighted by sectoral output) of the 7 selected services *s* in the years *t*=1995 and *t*=2004. The next column shows the (unweighted) mean and standard deviation over the 43 sectors. The average service offshoring intensity OSS_t has more than doubled from 1.68% in 1995 to 4.01% in 2004. At the services level, computer and related activities grew strongly from the rank 5 (0.09%) in 1995 to rank 3 (0.53%) in 2004. Research and development services grew from 0.10% in 1995 to 0.33% in 2004. Other business activities more than doubled their intensities from 0.79% in 1995 to 1.74% in 2004. The three service sectors associated with service offshoring (computer and related activities, research and development, and other business activities) represent almost two thirds (2.60%) of the total OSS_t in 2004.

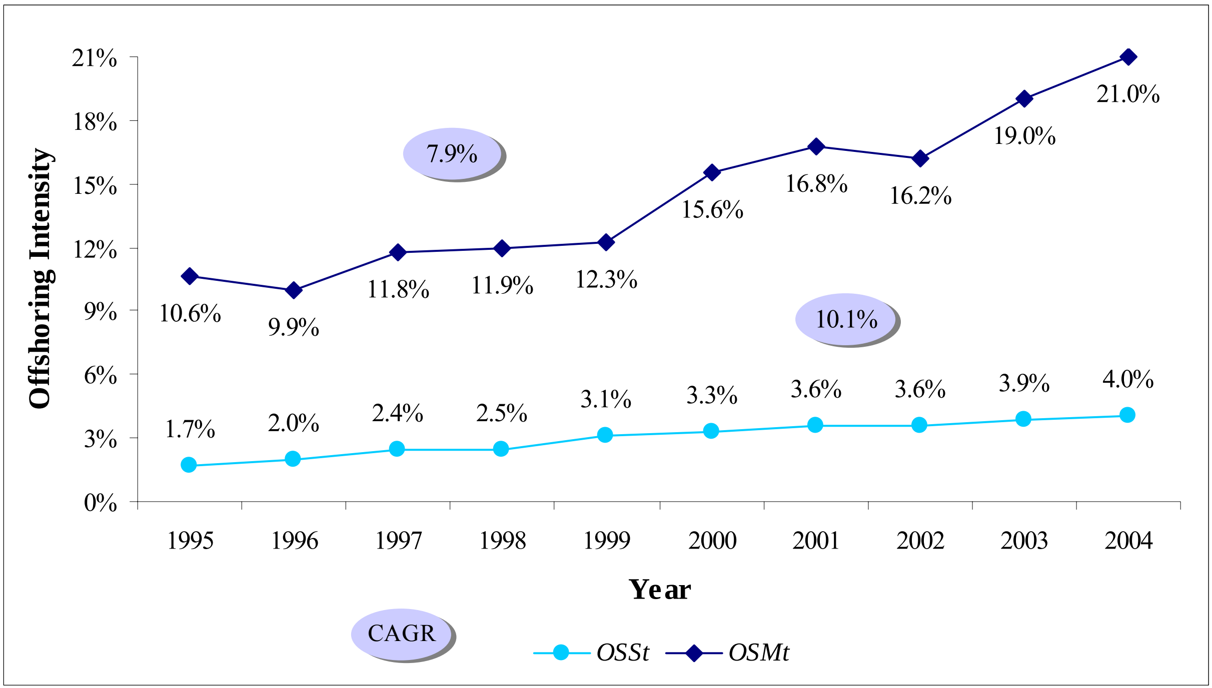
Table 1. | Service Offshoring Intensities per Service Category in Germany

Service s	Rank	OSS s 1995 (weighted average)	Mean	Std Dev	Rank	OSS s 2004 (weighted average)	Mean	Std Dev
Post and telecommunications	3	0.27%	0.25%	1.49%	2	0.70%	0.49%	3.04%
Financial intermediation	6	0.09%	0.06%	0.08%	6	0.19%	0.18%	0.10%
Activities related to financial intermediation	2	0.33%	0.19%	1.24%	4	0.52%	0.80%	4.71%
Renting of machinery and equipment	7	0.00%	0.00%	0.00%	7	0.00%	0.00%	0.00%
Computer and related activities	5	0.09%	0.13%	0.62%	3	0.53%	0.64%	2.07%
Research and development	4	0.10%	0.24%	1.00%	5	0.33%	0.64%	2.91%
Other business activities	1	0.79%	0.35%	1.03%	1	1.74%	0.73%	2.06%
Total OSS,t		**1.68%**	**1.23%**	**2.53%**		**4.01%**	**3.48%**	**6.98%**

Source: Own calculations, Data: Federal Statistical Office, revised input-output tables (1995 and 2004).

Figure 2 plots the development of the *average* OSS_t *and* OSM_t *intensities* in Germany. Service offshoring intensities have grown considerably by an average of 10.1% per year, from 1.7% in 1995 to 4.0% in 2004, possibly due to the increased use of ICT. Average material offshoring intensities have risen by 7.9% per year, from 10.6% in 1995 to 21.0% in 2004. The relatively strong annual growth rate of material offshoring compared to service offshoring may seem surprising, as the process of material offshoring has started much earlier. One explanation might be the fall of the iron curtain, followed by FDI towards the CEECs, and subsequent re-imports back to Germany, and likewise the growing significance of the Asian markets.

Figure 2. | Offshoring Intensity of Intermediate Inputs in Germany (1995-2004)

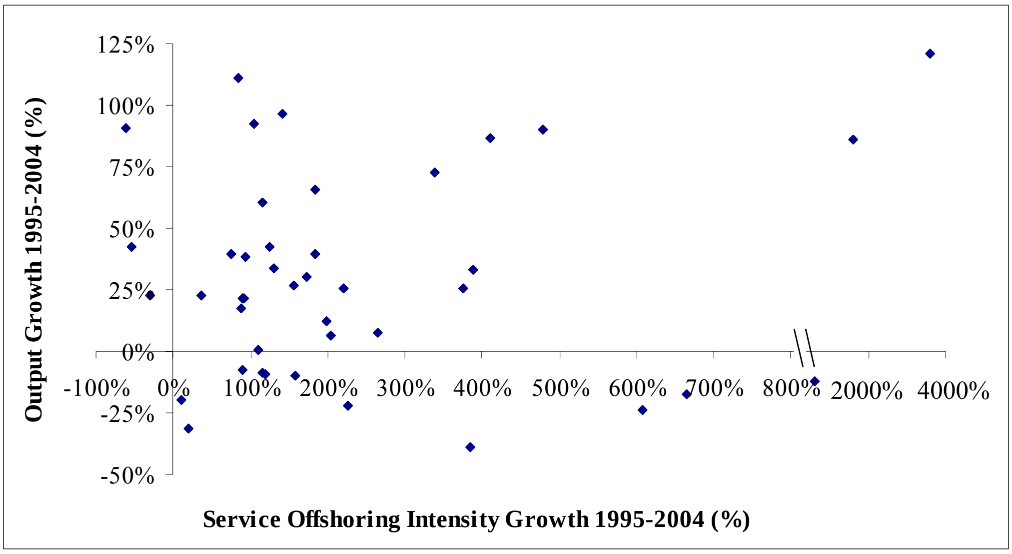


Source: Own calculations. Federal Statistical Office, revised input-output tables (1995-2004). Average across all sectors i weighted by outputs at time t.

3. Service offshoring and productivity
3.1 First indications

First indications of the relationship between service offshoring and TFP are given in *Figure* 3. The scatter plot shows *German service offshoring intensity vs. output growth rates* between 1995 and 2004. 42 sectors are taken into account using the OSS_i measures; only the sector 'leather, leather products, and footwear' is excluded, since service offshoring intensities are not available. 31 sectors show a positive output growth ranging from 0.4% (wood and products of wood and cork) to 121% (activities related to financial intermediation) over the given period. The majority of the sectors, namely 28, are placed in the 1st quadrant, suggesting a positive relationship between service offshoring growth and output growth. Only 3 sectors fall in the 2nd quadrant and 11 sectors in the 4th quadrant, as would be characteristic of a negative relationship between both variables.

Figure 3. | German Service Offshoring Intensity vs. Output Growth (1995-2004)



Source: Own calculations. Data: Federal Statistical Office.

For further evidence the 10 sectors with the strongest service offshoring growth between 1995 and 2004 are tabulated in *Table 2,* and their *OSS* growth rates compared with output growth rates. Six of these sectors experienced positive output growth over the respective period. Four of the sectors experienced negative output growth, including three of the Top Five service offshoring sectors (manufacturing n.e.c., textiles, gas and gas supply). We cannot unambiguously predict a positive relationship between service offshoring and output growth rates from these results.

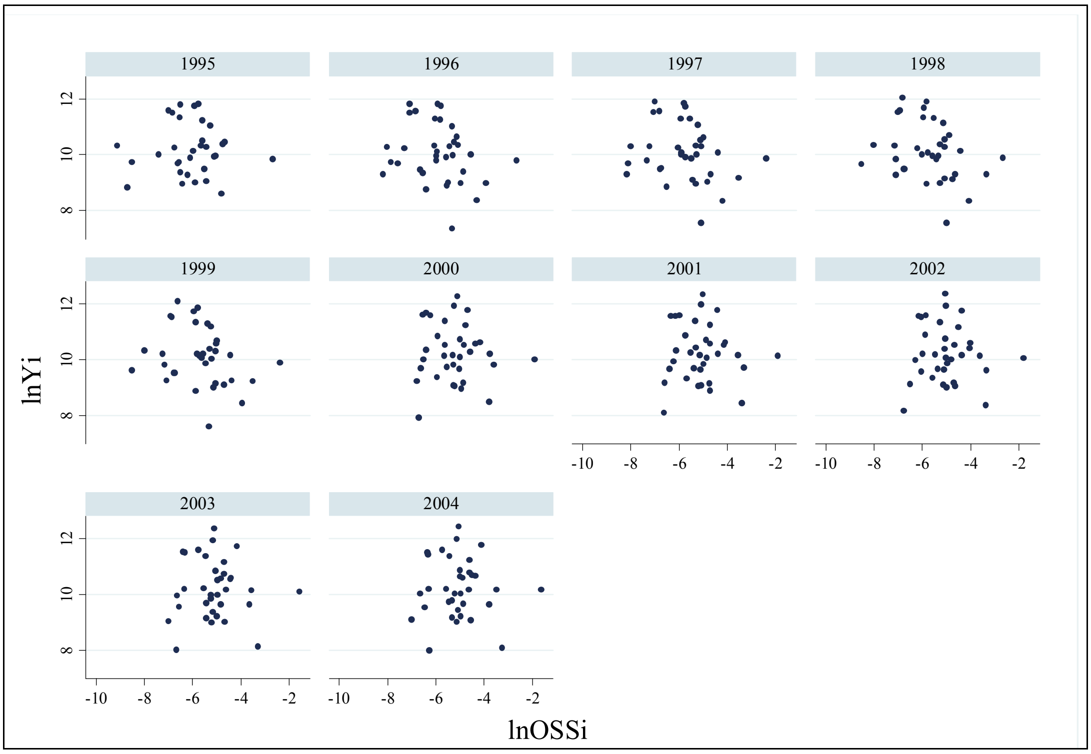
Table 2. | Ranking of *OSS* Growth and Output Growth in Germany (1995-2004)

Ranking of Service Offshoring Growth	Service Offshoring Intensity Growth		Output Growth	
Sector	**%**	**Rank**	**%**	**Rank**
Top Ten				
Activities related to financial intermediation	81539.0%	1	120.7%	1
Metal castings	3705.0%	2	86.0%	8
Manufacturing n.e.c.	1567.0%	3	-12.0%	36
Textiles	665.2%	4	-17.4%	37
Gas and gas supply	607.7%	5	-24.1%	40
Iron and steel	478.4%	6	90.1%	6
Office, accounting, and computing machinery	410.6%	7	86.4%	7
Non-ferrous metals	388.0%	8	33.1%	18
Tobacco products	385.3%	9	-39.2%	42
Publishing	374.5%	10	25.6%	21

Source: Own calculations. Data: Federal Statistical Office.

Figure 4 shows scatter plots of the *development of German OSS vs. output in the manufacturing sectors* in logarithms by year as a final indication. The scatter plots show that the sectors were already diversified in the mid 1990s regarding service offshoring intensities, which further spread over the period. If outliers are not considered, it seems as if the scatter plots are first shifted to the bottom from 1995 to 1998, followed by a shift to the top right over the subsequent period. This indicates a positive relationship between sectoral service offshoring and output. The causality between both variables will be tested in a next step.

Figure 4. | German *OSS* vs. Output in the Manufacturing Sectors (1995-2004)



Source: Own calculations. Data: Federal Statistical Office.

3.2 Empirical model

3.2.1 Total Factor Productivity

A firm's linearly homogenous production function *F* with constant returns to scale is described as follows:

$$Y = F(L, K, S, M, T) \qquad \frac{\partial F}{\partial x_1} > 0,\ \frac{\partial^2 F}{\partial x_1^2} < 0,\ \frac{\partial^2 F}{\partial x_1 \partial x_2} > 0 \qquad \text{with } x_1, x_2 = L, K, S, M, T \qquad (1)$$

where labor *L*, capital *K*, intermediate services *S*, intermediate materials *M*, and technology *T* are the input factors. The *technology shifter* $T = T(OSS, OSM, DOS, DOM, RD/Y)$ is a function of service and material offshoring *OSS* and *OSM*, domestic service and material outsourcing *DOS* and *DOM*, and research and development (R&D) -intensity *RD*/*Y*. *T* represents a change of the production function due to international trade (offshoring), domestic outsourcing, and technological progress.

According to the *Solow growth decomposition,* output growth can be attributed the growth rates of the input factors (e.g. *L*, *K*, *S,* and *M*) and the growth rate of an unexplained residual called *total factor productivity*. Besides the rate of technology, efficiency is considered the most important part of TFP. Both are partially included in the technology shifter *T*, since offshoring, outsourcing, and R&D-intensity not only reflect technological progress, but are also expected to increase efficiency. Equation (1) can be written in the log-linear form:

$$\ln Y_{it} = \alpha_0 + \alpha_1 \ln L_{it} + \alpha_2 \ln K_{it} + \alpha_3 \ln S_{it} + \alpha_4 \ln M_{it} + \beta_1 \ln OSS_{it} + \beta_2 \ln OSM_{it}$$
$$+\beta_3 \ln DOS_{it} + \beta_4 \ln DOM_{it} + \beta_5 \ln(RD/Y)_{it} + \delta_t D_t + \varepsilon_{it}$$

(2)

where *i* designates the sector dimension, *t* the time dimension, D_t year fixed effects (such as common shocks influencing all sectors), and ε_{it} an idiosyncratic error term.

Offshoring and domestic outsourcing is expected to influence *output Y* positively via a rise in *T* with $\beta_1>0,\ \beta_2>0,\ \beta_3>0,$ and $\beta_4>0$ (see equation 2). Offshoring and domestic outsourcing can increase *T* through at least four channels: (1) First, a *static efficiency gain* obtains, when firms offshore or outsource less efficient parts of the value chain, which leads to higher productivity of the remaining activities. (2) Second, when the firm's offshoring or domestic outsourcing decision is combined with *restructuring measures* expanding its technology frontier, the remaining labor may become more efficient. This might rather be the case for services than for materials. (3) Third, *learning externalities* could arise when purchased services improve the productivity of the workers. This would imply that domestic workers increase productivity due to learning externalities from other firms. (4) And fourth, *variety effects* could raise productivity when various new service and material inputs are used (Amiti and Wei, 2006).

A higher R&D-intensity is expected to increase output via an increase in *T* with $\beta_5>0.$ Despite the definitional relationship between output and R&D intensity, *RD/Y* should be included as it controls for the variation in the R&D-intensity of *Y*, whereas the remaining output variation is controlled by the other exogenous variables. The input factors labor, capital, services, and materials are also expected to influence output positively with $\alpha_1>0,\ \alpha_2>0,\ \alpha_3>0$ and $\alpha_4>0.$

3.2.2 Labor productivity

As an alternative to the model above, we could postulate the following equation:

$$(Y - S - M)/L = VA/L = G(K,T), \quad \frac{\partial G}{\partial x_1} > 0,\ \frac{\partial^2 G}{\partial x_1^2} < 0,\ \frac{\partial^2 G}{\partial x_1 \partial x_2} > 0 \quad \text{with } x_1, x_2 = K, T \qquad (3)$$

where $VA = (Y - S - M)$ designates the value added and is the difference between real output and real service and material inputs. *Labor productivity* is calculated dividing value added by labor input *L*. Thus, the modified empirical estimation equation in the log-linear form is:

$$\ln(VA/L)_{it} = \alpha_0 + \alpha_1 \ln K_{it} + \beta_1 \ln OSS_{it} + \beta_2 \ln OSM_{it}$$
$$+\beta_3 \ln DOS_{it} + \beta_4 \ln DOM_{it} + \beta_5 \ln(RD/Y)_{it} + \delta_t D_t + \varepsilon_{it}$$

(4)

Concerning *labor productivity* in equation (4), all coefficients are expected to be positive according to the theoretical predictions. Labor productivity could also be measured as output per labor unit, which would be *Y/L*. This measure has the disadvantage that offshoring (or domestic outsourcing) necessarily increases labor productivity holding all other variables constant, because less labor is required for the same amount of produced output at time *t*. Offshoring (or domestic outsourcing) leads to the substitution of domestic labor for purchased service and material inputs, which reflects the substitution of domestic labor for labor in another country or another sector producing these inputs (Houseman, 2006). Therefore, value added per labor unit is a more appropriate measure, since the increase in purchased service and material inputs due to offshoring (or domestic outsourcing) will also be reflected in a smaller numerator. Hence, equation (4) only measures productivity effects that go beyond the above described *input substitution effects*.

3.3 Empirical specification

The following panel regression analysis measures the impact of service and material offshoring on productivity in 35 manufacturing sectors. Our analysis uses revised input-output data from 1995 to 2004. In a first step, the *correct estimation model* is selected. In the presence of unobserved time-constant sector-specific effects c_i, one considers the following panel data model $y_{it} = \alpha + \beta x_{it} + c_i + \varepsilon_{it}$. We distinguish two cases. (1.) If c_i is correlated with some explanatory variables x_{it}, usual pooled OLS regression would be biased and inconsistent.

Transforming the pooled OLS using first differences or the fixed effects estimator, removes these time-invariant effects c_i. Either method allows for correlation between c_i and some x_{it}, and c_i is estimated as part of the intercept $(\alpha + c_i)$.

(2.) If c_i is not correlated with some x_{it}, it is considered a stochastic variable or random effect. In such a case, c_i is assumed to be independent and identically distributed over the panels (sectors) and considered as part of the composite error term $v_{it} = c_i + \varepsilon_{it}$. Therefore, the Hausman test (1978) is run to test the null hypothesis that c_i is uncorrelated with some x_{it}. Using equation (2) without year fixed effects, the Hausman test cannot reject the null hypothesis (Prob>chi2=0.2179).[1] Only when one-period lags of each explanatory variable are added, the null hypothesis can be rejected (Prob>chi2=0.0000). In light of these ambiguous results, the following estimations should use the less efficient, but consistent, fixed effects estimators.

In a second step, the pooled OLS model including year fixed effects is tested for possible *heteroscedasticity* by performing a White test of the null hypothesis of homoscedasticity against unrestricted forms of heteroscedasticity. H_0 can be rejected (Prob>chi2=0.0000).[2] Second, a test for *autocorrelation* in ε_{it} of linear panel-data models is run as discussed by Wooldridge (2002). The null hypothesis of no first-order autocorrelation is also rejected, regardless of whether year fixed effects are included or not (Prob>F=0.0000). Therefore, the estimations include the "robust cluster" option which produces standard errors robust to both heteroscedasticity (Huber-White sandwich estimators) and any form of intra-cluster correlation. Since the clusters are sectors in our case, this option corrects for intra-sector serial correlation and any other correlation provoked by common intra-sector shocks. Some specifications integrate year fixed effects D_t, i.e. time-specific cross-sectoral effects, such as common shocks influencing all sectors at time *t*.

[1] When year fixed effects are included to equation (2), the model fails to meet the asymptotic assumptions of the Hausman test. Furthermore, the Hausman test cannot reject the null hypothesis (Prob>chi2=0.9942) when equation (2) is used without *DOS* and *DOM* including year fixed effects.

[2] A further test for heteroscedasticity in the fixed effects model is run as suggested by Greene "Econometric Analysis" (1993, page 395). This test amounts to a likelihood ratio test of the null hypothesis of homoscedasticity. Again, H_0 is rejected (Prob>chi2=0.0000). The STATA command hetgrot is used as proposed by Nunziata and allows for period lags of the independent variables (see http://www.decon.unipd.it/personale/curri/nunziata/software.htm).

3.4 Estimation results

3.4.1 Total Factor Productivity

The results of the *Fixed Effects Estimations* are shown in columns 1 to 4 of *Table 3*. In the case of short time series and a limited number of sectors *outliers* could lead to biased results. Therefore, the model drops the identified outliers 'pharmaceuticals', due to extremely high service offshoring intensities, and 'tobacco', due to very low output figures combined with a high *OSS* (see Figure 4).

Capital is subdivided into capital spending on equipment and buildings, as the effects on output can be different. The input factors labor, capital in the form of equipment, services, and materials have an overall positive impact on real output as predicted, which is significant except for labor. The F-tests reject the null hypothesis of no joint significance of the contemporary and lagged variable mostly at the 5%-level.

Capital in the form of building, however, has a significantly negative overall effect on real output. The first two columns only consider the offshoring variables and R&D-intensity, whereby the second column includes year fixed effects.

Concerning the technology shifter, service and material offshoring affect real output positively, which is significant for the respective contemporary variables for the overall effect. R&D-intensity, however, has a negative and significant effect to show. Column 3 only considers the domestic outsourcing variables *DOS* and *DOM* besides R&D-intensity including year dummies. *DOS, DOM,* and R&D-intensity show a negative overall effect on output, which is significant for *DOM* and R&D-intensity (see F-tests).

Integrating all variables of the technology shifter in column 4 confirms the described separate trend that offshoring seems to influence output positively, while domestic outsourcing and R&D-intensity have a negative impact. The overall effects are insignificant for material inputs, i.e. for *OSM* and *DOM*.

Table 3. | Total Factor Productivity without Outliers (1995-2004)

Dependent variable: lnY_t								
	Fixed effects estimator w/o outliers[1)]				Instrumental Variables 2SLS: Fixed Effects[1)]			
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
lnL_t	0.0465	0.0174	0.0255	0.0049	-0.0769	-0.0812	-0.0540	-0.0819
	(0.716)	(0.895)	(0.839)	(0.962)	(0.494)	(0.481)	(0.552)	(0.458)
lnL_{t-1}	-0.0217	0.0557	0.1543	0.1024	0.0457	0.1103	0.0346	0.0314
	(0.844)	(0.612)	(0.175)	(0.355)	(0.568)	(0.142)	(0.603)	(0.637)
ln$(K^{equip})_t$	-0.2116	-0.3078	-0.2893	-0.1111	0.1303	-0.3471	0.2036	0.0743
	(0.538)	(0.444)	(0.482)	(0.777)	(0.761)	(0.279)	(0.478)	(0.841)
ln$(K^{equip})_{t-1}$	0.6995**	0.8789**	1.0836**	0.7470*	0.3538	0.8027**	0.2141	0.3530
	(0.041)	(0.027)	(0.011)	(0.057)	(0.393)	(0.047)	(0.490)	(0.359)
ln$(K^{build})_t$	0.2253	0.3836	0.4638	0.3116	-0.1200	0.4447	-0.1200	-0.0266
	(0.575)	(0.377)	(0.269)	(0.461)	(0.784)	(0.316)	(0.744)	(0.949)
ln$(K^{build})_{t-1}$	-0.6644*	-0.8479*	-1.2339***	-0.8461*	-0.2012	-0.7030	-0.1012	-0.2164
	(0.072)	(0.055)	(0.008)	(0.063)	(0.635)	(0.140)	(0.773)	(0.587)
lnS_t	0.2557	0.2183	0.3995**	0.5959***	0.0028	0.1105	0.1022	0.0562
	(0.106)	(0.162)	(0.020)	(0.004)	(0.978)	(0.563)	(0.624)	(0.763)
lnS_{t-1}	-0.0278	-0.0921	0.0441	-0.0721	-0.1114	-0.0523	-0.0682	-0.0842
	(0.724)	(0.273)	(0.736)	(0.612)	(0.102)	(0.609)	(0.235)	(0.149)
lnM_t	0.1846**	0.1957**	0.3517**	0.2154	0.5649***	0.6750***	0.5627***	0.5870***
	(0.033)	(0.036)	(0.010)	(0.148)	(0.000)	(0.000)	(0.002)	(0.001)
lnM_{t-1}	-0.0154	0.0030	-0.1268	-0.0867	-0.2169**	-0.2327*	-0.2052**	-0.2139*
	(0.870)	(0.977)	(0.106)	(0.386)	(0.036)	(0.075)	(0.021)	(0.050)
lnOSS_t	0.0901***	0.0721**		0.0809***	0.0621*		0.0912***	0.0844**
	(0.004)	(0.019)		(0.007)	(0.064)		(0.009)	(0.025)
lnOSS_{t-1}	-0.0043	0.0068		0.0171				
	(0.717)	(0.586)		(0.142)				
lnOSM_t	0.1089**	0.0987*		0.1028	0.1088		0.0808	0.0758
	(0.040)	(0.070)		(0.198)	(0.226)		(0.394)	(0.421)
lnOSM_{t-1}	-0.0535*	-0.0472		-0.0364				
	(0.094)	(0.257)		(0.395)				
lnDOS_t			-0.1618	-0.4839**		-0.0745	-0.1687	-0.0828
			(0.371)	(0.017)		(0.726)	(0.456)	(0.687)
lnDOS_{t-1}			-0.1123	0.0532				
			(0.210)	(0.658)				
lnDOM_t			-0.1548*	-0.0524		0.0262	0.0326	0.0082
			(0.057)	(0.619)		(0.837)	(0.840)	(0.957)
lnDOM_{t-1}			0.0521	0.0050				
			(0.389)	(0.954)				
ln$(RD/Y)_t$	-0.1033**	-0.0782*	-0.1099**	-0.1017***	-0.0058	0.0167	-0.0044	0.0030
	(0.025)	(0.060)	(0.016)	(0.009)	(0.870)	(0.580)	(0.865)	(0.930)
ln$(RD/Y)_{t-1}$	-0.0458	-0.0761**	-0.0606*	-0.0669**				
	(0.149)	(0.031)	(0.071)	(0.045)				
Year fixed effects	No	Yes	Yes	Yes	Yes	Yes	No	Yes
Joint significance:								
lnL_t + lnL_{t-1} = 0	p>F=0.9351	p>F=0.8250	p>F=0.2861	p>F=0.5767	p>F=0.7214	p>F=0.2368	p>F=0.7731	p>F=0.6817
ln$(K^{equip})_t$ + ln$(K^{equip})_{t-1}$ = 0	p>F=0.0395	p>F=0.0225	p>F=0.0085	p>F=0.0165	p>F=0.0372	p>F=0.0779	p>F=0.0673	p>F=0.0695
ln$(K^{build})_t$ + ln$(K^{build})_{t-1}$ = 0	p>F=0.0415	p>F=0.0501	p>F=0.0064	p>F=0.0305	p>F=0.2196	p>F=0.2739	p>F=0.4479	p>F=0.3776
lnS_t + lnS_{t-1} = 0	p>F=0.1089	p>F=0.0563	p>F=0.0649	p>F=0.0134	p>F=0.2012	p>F=0.6672	p>F=0.2139	p>F=0.2585
lnM_t + lnM_{t-1} = 0	p>F=0.0018	p>F=0.0098	p>F=0.0075	p>F=0.1095	p>F=0.0000	p>F=0.0001	p>F=0.0001	p>F=0.0009
lnOSS_t + lnOSS_{t-1} = 0	p>F=0.0061	p>F=0.0037		p>F=0.0020				
lnOSM_t + lnOSM_{t-1} = 0	p>F=0.0241	p>F=0.0568		p>F=0.2211				
lnDOS_t + lnDOS_{t-1} = 0			p>F=0.2719	p>F=0.0408				
lnDOM_t + lnDOM_{t-1} = 0			p>F=0.0659	p>F=0.8818				
ln$(RD/Y)_t$+ln$(RD/Y)_{t-1}$ = 0	p>F=0.0322	p>F=0.0227	p>F=0.0179	p>F=0.0048				
Shea Partial R-squared:								
OSS_t					0.4569		0.5031	0.4639
OSM_t					0.2769		0.4692	0.4272
DOS_t						0.3137	0.4027	0.4139
DOM_t						0.2934	0.3018	0.3380
$(RD/Y)_t$					0.3276	0.3455	0.3523	0.3356
Hansen J statistic[2)] P-value					$X^2(6)$=0.49	$X^2(6)$=0.08	$X^2(10)$=0.35	$X^2(10)$=0.22
AIC	-601.9	-609.1	-613.5	-644.3	-557.6	-552.9	-562.3	-556.3
Observations	287	287	298	287	221	230	221	221
R-squared (within)	0.66	0.69	0.65	0.73	0.68	0.63	0.66	0.67

Source: Own calculations. p<0.1, p**<0.05, p***<0.001 (p-values in parentheses). 1) All estimations without the outliers 'pharmaceuticals' and 'tobacco'. 2) Over-identification test of all instruments.*

In a next step, the explanatory variables should be controlled for potential endogeneity. It is plausible that more productive sectors aim at increasing their output and labor demand and thus self-select into offshoring, domestic outsourcing, and/or spending more on R&D. Similarly less productive sectors might hope to benefit from offshoring, domestic outsourcing, and/or R&D in order to increase their technology shifter (see Amiti and Wei, 2006).

The following specifications use the *Instrumental Variables Two Stage Least Squares (2SLS) Fixed Effects Estimator*, which corrects both heteroscedasticity (Huber-White sandwich estimators) and any form of intra-cluster correlation ("robust cluster" option).[1] Columns 5 to 8 use the first three lags of potentially endogenous variables as instruments for $\ln OSS_t$, $\ln OSM_t$, $\ln DOS_t$, $\ln DOM_t$, and $\ln(RD/Y)_t$.

Concerning the input factors, only capital in the form of equipment and materials have an overall significantly positive effect to show in all specifications. The net effect of labor and service inputs is not clear, while capital in the form of buildings still remains negative, all of these variables being insignificant. Column 5 only considers offshoring and R&D-intensity and shows that *OSS* and *OSM* have a positive impact on real output, which is significant only for *OSS*.

R&D-intensity shows a negative and insignificant coefficient sign. Focusing on the domestic outsourcing variables in column 6, *DOS* has a negative and *DOM* a positive coefficient. R&D-intensity turns positive, but none of the results is significant. Including all technology variables simultaneously in columns 7 and 8 confirms the above described pattern. Thus, only service offshoring has a significant impact on output which is positive. To draw a first conclusion, service offshoring seems to influence TFP positively.

3.4.2 Labor productivity

In the following, the effect of service offshoring on labor productivity, defined as value added per labor unit, is estimated as specified in equation (4). The results are shown in *Table 4*. Column 1 to 4 again use the *Fixed Effects Estimator* without the identified outlier 'pharmaceuticals'. The 'tobacco' sector, that was dropped in the previous study, is no longer an outlier when labor productivity is used as dependent variable.

Capital is the only input factor besides technology. Here capital spending on equipment and buildings is aggregated, since disaggregation yields no significant results for both variables. The first two columns only consider the effect of offshoring and R&D-intensity on labor productivity. Capital has a negative overall impact when year fixed effects are not included (column 1). Service and material offshoring still have a positive overall effect on labor productivity, which is only significant for service offshoring.

R&D-intensity again shows a negative overall effect, which is almost significant at the 10% level in column 2. Column 3 focuses solely on the domestic outsourcing variables and R&D-intensity adding year fixed effects. Domestic service outsourcing has a positive overall impact, whereas domestic material outsourcing has a negative impact on labor productivity. R&D-intensity still remains negative. Column 4 includes all variables simultaneously and confirms the results except for domestic service outsourcing, which now has an overall negative effect. This could be due to a collinearity problem of *DOS* with some other explanatory variables (see *Appendix 4*).

[1] The Stata command xtivreg2 is used. See Schaffer and Stillman (2007) for further information.

Table 4. | Labor Productivity without Outlier (1995-2004)

Dependent variable: $\ln(VA/L)_t$								
	Fixed effects estimator w/o outlier[1)]				Instrumental Variables 2SLS: Fixed effects estimator w/o outlier[1))]			
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
$\ln K_t$	-0.4858	-0.2604	0.1062	0.3366	-1.7039**	-1.8323**	-2.0205***	-1.8161***
	(0.657)	(0.826)	(0.951)	(0.824)	(0.012)	(0.042)	(0.001)	(0.007)
$\ln K_{t-1}$	-0.3580	-0.3861	-0.7730	-0.7089	1.1321**	1.2866*	1.3446**	1.1960**
	(0.766)	(0.738)	(0.609)	(0.592)	(0.045)	(0.054)	(0.022)	(0.037)
$\ln OSS_t$	0.2696**	0.2457*		0.2999**	0.1539*		0.1381*	0.1386*
	(0.033)	(0.057)		(0.043)	(0.064)		(0.075)	(0.081)
$\ln OSS_{t-1}$	0.0587	0.0701		0.0979				
	(0.375)	(0.351)		(0.181)				
$\ln OSM_t$	0.2240	0.1916		0.1648	0.0938		0.1485	0.1102
	(0.171)	(0.277)		(0.357)	(0.513)		(0.231)	(0.392)
$\ln OSM_{t-1}$	-0.0892	-0.1154		-0.1452				
	(0.363)	(0.258)		(0.179)				
$\ln DOS_t$			0.0456	-0.2468		0.2184	0.2431	0.0548
			(0.861)	(0.155)		(0.399)	(0.270)	(0.796)
$\ln DOS_{t-1}$			0.0992	0.0813				
			(0.592)	(0.472)				
$\ln DOM_t$			-0.4165	-0.5660		-0.0046	0.3935***	0.2009
			(0.177)	(0.113)		(0.990)	(0.006)	(0.279)
$\ln DOM_{t-1}$			0.1686	0.0695				
			(0.138)	(0.606)				
$\ln(RD/Y)_t$	-0.0239	-0.0104	-0.0573	-0.0764	0.0136	0.0457	-0.0243	0.0127
	(0.872)	(0.943)	(0.717)	(0.553)	(0.884)	(0.587)	(0.716)	(0.884)
$\ln(RD/Y)_{t-1}$	-0.1119	-0.1517	-0.0970	-0.2236				
	(0.373)	(0.255)	(0.477)	(0.224)				
Year fixed effects	No	Yes	Yes	Yes	Yes	Yes	No	Yes
Joint significance:								
$\ln K_t + \ln K_{t-1} = 0$	p>F=0.0202	p>F=0.2563	p>F=0.3170	p>F=0.5019	p>F=0.0417	p>F=0.1184	p>F=0.0029	p>F=0.0256
$\ln OSS_t + \ln OSS_{t-1} = 0$	p>F=0.0022	p>F=0.0200		p>F=0.0306				
$\ln OSM_t + \ln OSM_{t-1} = 0$	p>F=0.3829	p>F=0.4000		p>F=0.3539				
$\ln DOS_t + \ln DOS_{t-1} = 0$			p>F=0.8629	p>F=0.0943				
$\ln DOM_t + \ln DOM_{t-1} = 0$			p>F=0.1352	p>F=0.2463				
$\ln(RD/Y)_t + \ln(RD/Y)_{t-1} = 0$	p>F=0.1653	p>F=0.1079	p>F=0.3266	p>F=0.0539				
First stage results:								
Shea Partial R-squared:								
OSS_t					0.4295		0.4174	0.3934
OSM_t					0.3190		0.4111	0.4208
DOS_t						0.2408	0.2753	0.2826
DOM_t						0.2292	0.2780	0.3056
$(RD/Y)_t$					0.3797	0.3987	0.3785	0.3750
Hansen J statistic[2)] P-value					$\chi^2(6)=0.42$	$\chi^2(6)=0.31$	$\chi^2(10)=0.57$	$\chi^2(10)=0.52$
AIC	220.7	225.7	251.8	218.1	-165.7	-145.0	-145.2	-158.1
Observations	285	285	296	285	224	233	224	224
R-squared (within)	0.28	0.31	0.24	0.35	0.43	0.34	0.35	0.42

Source: Own calculations. p<0.1, p**<0.05, p***<0.001 (p-values in parentheses).*
1) All estimations without the outlier 'pharmaceuticals'.
2) Over-identification test of all instruments.

Columns 5 to 8 use the *Instrumental Variables 2SLS Fixed Effects Estimator* to control for potential endogeneity of offshoring, domestic outsourcing, and R&D-intensity. Now, capital shows significant individual results, which are positive for the lagged variable and turn negative for the contemporary variable in all specifications. Hence, the overall effect of capital on labor productivity is negative. The results of columns 5, 7 and 8 show that service and material offshoring have a positive effect being significant only for *OSS*. R&D-intensity becomes positive, but insignificant. Domestic service outsourcing always shows positive, but insignificant coefficient signs in columns 6 to 8, while domestic material outsourcing shows a negative sign in column 6 and positive ones in columns 7 and 8, which is significant in column 7. R&D-intensity always shows positive coefficients when year fixed effects are added (columns 5, 6 and 8).

Another alternative is to apply the *dynamic General Method of Moments (GMM) estimator* as proposed by Arellano-Bond (1991). This GMM estimator uses the lagged levels of the dependent and the predetermined variables, and the differences of the strictly exogenous variables as instruments. First differences remove the assumed fixed sector effects c_i. Additionally, the one-period lag of the dependent variable $\Delta \ln(VA/L)_{t-1}$ is included, making the model dynamic. *OSS, OSM, DOS, DOM* as well as R&D-intensity are treated as *predetermined variables*. Predetermined variables assume that $E[\varepsilon_{it} x_{iu}] \neq 0$ for $t < u$, but $E[\varepsilon_{it} x_{iu}] = 0$ for all $t \geq u$. Thus, idiosyncratic shocks ε_{it} may have an influence on subsequent x_{iu} for $t < u$. The results are shown in *Table 5*. The offshoring variables might have absorbed effects due to other omitted correlated variables. We address this problem by *adding the shares of total imports in total output* by sector in some specifications as suggested by Amiti and Wei (2006). The higher the import share of a sector, the more probable is service and material offshoring. Import shares are also treated as predetermined variables.

The specifications in columns 1 to 3 only consider the offshoring variables as well as R&D-intensity. Capital has an overall negative effect on labor productivity, which is significant in columns 1 and 2. Service offshoring has a significantly positive effect in all three specifications, while the impact of material offshoring is also positive, but insignificant. R&D-intensity shows a positive influence, which is significant in columns 1 and 2. Adding import shares in column 3 hardly change the coefficient size of *OSS* but strongly increases the coefficient size of *OSM*. Columns 4 and 5 only focus on domestic outsourcing and R&D-intensity. *DOS* has a positive, *DOM* a negative coefficient sign, but both are insignificant. R&D-intensity has a positive and significant effect on labor productivity. Columns 6 to 8 include all variables of the technology shifter. The overall effect of capital is negative and almost reaches the 10%-level in columns 6 and 7. *OSS* always shows a positive and highly significant impact on labor productivity. *OSM* has also positive coefficients, which are larger and turn significant only when import shares are included (column 8). *DOM* and R&D-intensity follow the previously described trends, but *DOS* turns negative in these specifications. This is possibly due to a multicollinearity problem. To conclude, service offshoring invariably shows positive coefficients and is statistically significant.

Table 5. | GMM Estimations (1995-2004)

Dependent variable: $\Delta\ln(VA/L)_t$								
	GMM Arellano-Bond dynamic estimator w/o outlier[1)]							
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
$\Delta\ln K_t$	-1.0596	-1.1114	-1.0480	-0.8124	-0.9134	-0.7883	-0.8077	-0.7548
	(0.137)	(0.133)	(0.210)	(0.275)	(0.230)	(0.273)	(0.278)	(0.368)
$\Delta\ln K_{t-1}$	0.2592	0.3079	0.3981	0.3164	0.4848	0.1076	0.1762	0.1373
	(0.717)	(0.676)	(0.633)	(0.670)	(0.522)	(0.881)	(0.812)	(0.869)
$\Delta\ln OSS_t$	0.1846***	0.1415**	0.1341*			0.1664***	0.1451**	0.1885***
	(0.003)	(0.033)	(0.055)			(0.004)	(0.017)	(0.005)
$\Delta\ln OSM_t$	0.0760	0.0766	0.1432			0.0389	0.0503	0.1722*
	(0.437)	(0.438)	(0.159)			(0.670)	(0.590)	(0.095)
$\Delta\ln DOS_t$				0.2536	0.1773	-0.0429	-0.1014	-0.1851
				(0.184)	(0.355)	(0.806)	(0.567)	(0.369)
$\Delta\ln DOM_t$				-0.1832	-0.1371	-0.1824	-0.1638	-0.1698
				(0.186)	(0.310)	(0.166)	(0.220)	(0.240)
$\Delta\ln(RD/Y)_t$	0.2078*	0.2108*	0.1249	0.2303**	0.2295**	0.2046**	0.1961*	0.0848
	(0.069)	(0.071)	(0.275)	(0.030)	(0.031)	(0.045)	(0.064)	(0.449)
$\Delta\ln(IM/Y)_t$			-0.3459**					-0.1948
			(0.023)					(0.184)
$\Delta\ln(VA/L)_{t-1}$	0.0305	0.0687	0.0720	0.0923	0.1074*	0.0599	0.0891	0.0780
	(0.643)	(0.306)	(0.289)	(0.150)	(0.100)	(0.350)	(0.172)	(0.248)
Year fixed effects	No	Yes	Yes	No	Yes	No	Yes	Yes
Joint significance:								
$\Delta\ln K_t + \Delta\ln K_{t-1} = 0$	p>F=0.0570	p>F=0.0562	p>F=0.1663	p>F=0.2679	p>F=0.3010	p>F=0.1049	p>F=0.1389	p>F=0.2265
Sargan test[2)]	$p>X^2$=1.00	$p>X^2$=1.00	$p>X^2$=1.00	$p>X^2$=1.00	$p>X^2$=1.00	$p>X^2$=1.00	$p>X^2$=1.00	$p>X^2$=1.00
H_0: no 2nd order autocorrelation	p>z=0.60	p>z=0.47	p>z=0.54	p>z=0.22	p>z=0.24	p>z=0.44	p>z=0.38	p>z=0.54
Observations	247	247	226	255	255	247	247	226

Source: Own calculations. p<0.1, p**<0.05, p***<0.001 (p-values in parentheses).*
1) All estimations without the outlier 'pharmaceuticals'.
2) Null hypothesis that over-identifying restrictions are valid.

The results show that service offshoring had an overall positive effect on TFP and labor productivity in the German manufacturing sectors from 1995 to 2004. In the following, the results should be interpreted when year fixed effects are included beginning with TFP. The overall coefficients of the Fixed Effects Estimations vary between 0.0789 and 0.098. Controlling for endogeneity, the coefficients of service offshoring in the instrumental variables 2SLS Fixed Effects Estimations vary between 0.062 and 0.0844. Between 1995 and 2004, the CAGR of service offshoring was 12.2% for the manufacturing sector. Thus, service offshoring increased real output by on average 0.76 to 1.20% per year and 6.61 to 10.26% over the period.

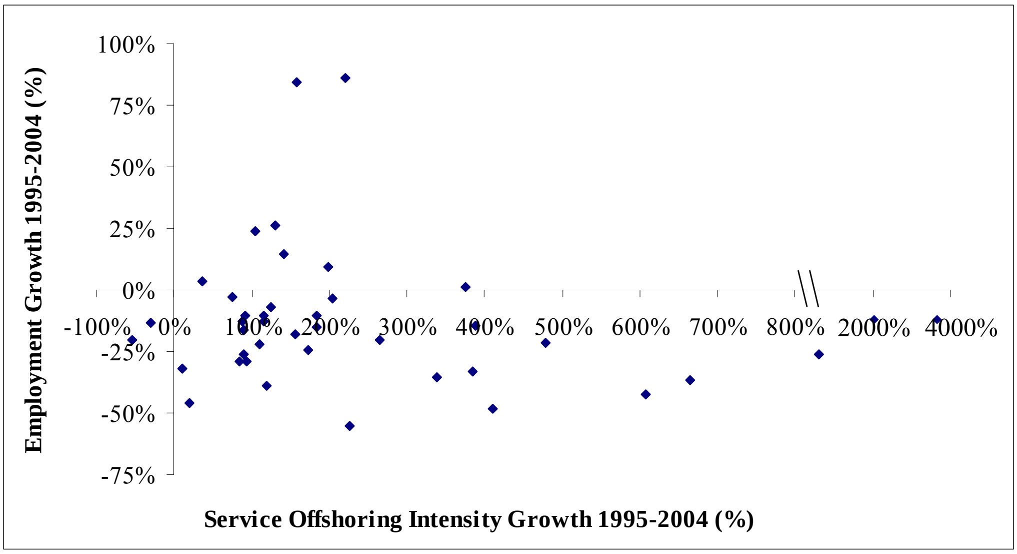
In a next step, the discussion for labor productivity follows. The overall coefficients of the Fixed Effects Estimations vary between 0.3158 and 0.3977 when year fixed effects are considered. The coefficients of the instrumental variables 2SLS estimations vary between 0.1386 and 0.1538. Using the GMM dynamic estimator, the coefficients vary between 0.1341 and 0.1885.When one controls for potential endogeneity of service offshoring, the coefficient sizes are much smaller. Therefore, the more 'conservative' results should be interpreted. Service offshoring increased labor productivity by on average 1.64 to 2.30% per year and 13.8% to 19.9% over the whole period, respectively.

4. Service offshoring and labor demand

4.1 First indications

First indications on the relationship between of service offshoring and employment are given in *Figure 5*. The scatter plot shows *German service offshoring intensity vs. employment growth rates* between 1995 and 2004. The sector 'Leather, leather products, and footwear' was dropped, since service offshoring intensities are not available. Therefore, 42 sectors have been taken into account. 33 sectors show a negative employment growth ranging from -3% (medical, precision, and optical instruments) to -55% (wearing apparel, dressing, and dying of fur) over the period. The majority of the sectors, namely 22 are placed in the 4th quadrant, implying a possible negative relationship between service offshoring growth and employment growth. Only 8 sectors are located in the 1st quadrant and 2 sectors in the 3rd quadrant, where one would expect a possible positive relationship between both variables.

Figure 5. | German Service Offshoring Intensity vs. Employment Growth (1995-2004)



Source: Own calculations. Data: Federal Statistical Office, STAN Industrial Database OECD.

The sector 'Leather, leather products, and footwear' was dropped, since service offshoring intensities are not available. *OSS* growth rates for the sectors 'wearing apparel, dressing, and dying of fur', 'recycling', and 'collection, purification, and distribution of water' are calculated for 1996-2004, since *OSS* is not available for 1995.

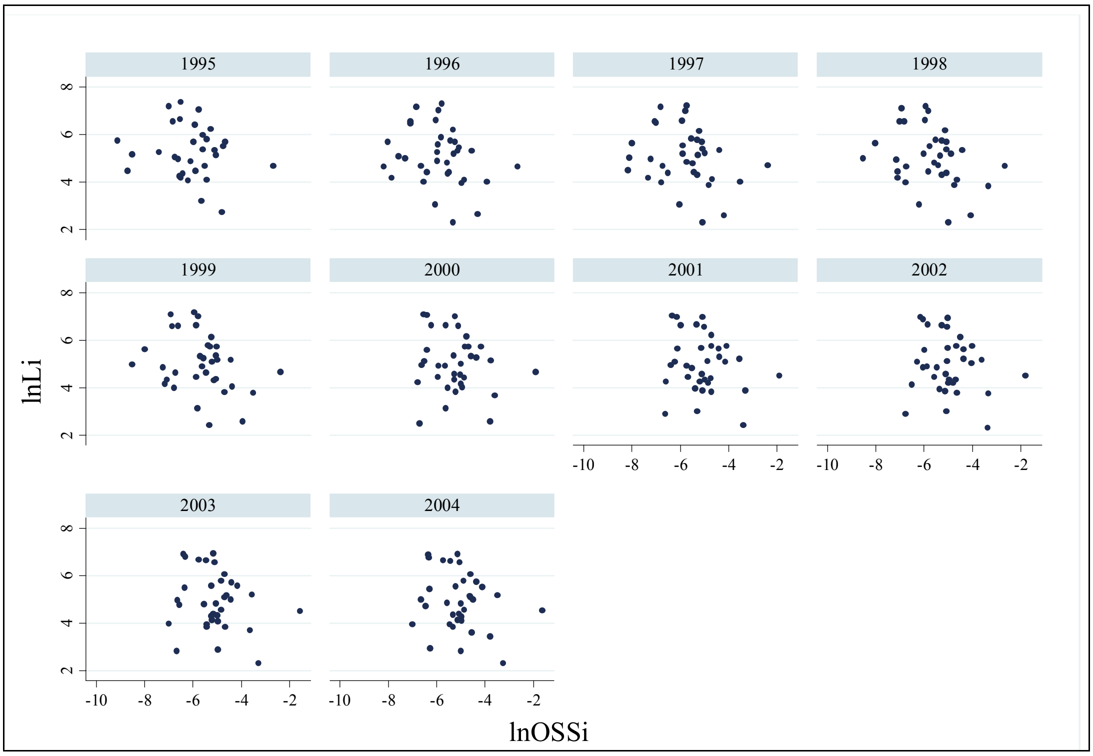
For further indications the sectors with the strongest service offshoring growth between 1995 and 2004 are ranked in *Table 6* and compared with employment growth rates. The 10 sectors with the largest service offshoring intensity growth rates are listed. It is evident that almost all of these sectors have experienced negative employment growth over the respective period except for the sector 'publishing'. Even the service sector 'activities related to financial intermediation', which has the highest *OSS* growth, shows a negative, but relatively small employment reduction. As four of the seven service sectors fall in the 1st quadrant of Figure 5, one might presume a negative relationship between service offshoring and employment especially for the manufacturing sectors.

Table 6. | Ranking of OSS Growth and Employment Growth in Germany (1995-2004)

Ranking of Service Offshoring Growth	Service Offshoring Intensity Growth		Employment Growth	
Sector	**%**	**Rank**	**%**	**Rank**
Top Ten				
Activities related to financial intermediation	81539.0%	1	-8.0%	14
Metal castings	3705.0%	2	-8.0%	13
Manufacturing n.e.c.	1567.0%	3	-26.3%	31
Textiles	665.2%	4	-36.7%	37
Gas and gas supply	607.7%	5	-42.2%	39
Iron and steel	478.4%	6	-21.5%	27
Office, accounting, and computing machinery	410.6%	7	-48.3%	41
Non-ferrous metals	388.0%	8	-14.3%	21
Tobacco products	385.3%	9	-33.3%	35
Publishing	374.5%	10	1.2%	9

Source: Own calculations. Data: Federal Statistical Office, STAN Industrial Database OECD. The sector 'Leather, leather products, and footwear' was dropped, since service offshoring intensities are not available. OSS growth rates for the sectors 'wearing apparel, dressing, and dying of fur', 'recycling', and 'collection, purification, and distribution of water' are calculated for 1996-2004, since OSS is not available for 1995.

Figure 6. | German OSS and Employment in the Manufacturing Sectors (1995-2004)



Source: Own calculations. Data: Federal Statistical Office, STAN Industrial Database OECD.

As a final indication, *Figure 6* maps the *German OSS and employment development in the manufacturing sectors* in logarithms by year. The scatter plots show that the sectors were already diversified in the mid 1990s regarding service offshoring intensities. If outliers are not considered, it seems as if the scatter plots show a stronger shift towards the left over the period, indicating a negative relationship between sectoral service offshoring and employment. The causality between both variables is tested in a next step.

4.2 Empirical model

A firm's production function is assumed as specified in equation 1. The corresponding linearly homogeneous cost function, conditional on the level of output *Y*, is the following:

$$C = C(Y, w, r, p^S, p^M, p^T) \qquad \frac{\partial C}{\partial c_1} > 0, \quad \frac{\partial C}{\partial c_1 \partial c_2} > 0 \qquad \text{with } c_1, c_2 = w, r, p^S, p^M, p^T \qquad (5)$$

where *w* designates wages, *r* the rental rate on capital, p^S, p^M and p^T the prices for service, material and technology inputs, and *Y* the constant output.

Using *Shephard's Lemma*[1], the conditional labor demand function L^d is derived as follows:

$$L^* = L^d(Y, w, r, p^S, p^M, p^T)$$

(6)

The following section measures the impact of service and material offshoring on labor demand in the manufacturing sector including the 36 manufacturing and 7 service sectors in a panel regression analysis. The conditional labor demand function (equation 6) can be written in *log-linear* form as:

$$\ln L_{it} = \alpha_0 + \eta_Y \ln Y_{it} + \eta_L \ln w_{it} + \eta_K \ln r_{it} + \eta_S \ln p_{it}^S + \eta_M \ln p_{it}^M + \eta_T \ln p_{it}^T \qquad (7)$$

In this form, the equation results in the employment-output elasticity η_Y, the price elasticity of demand for labor η_L, the cross-elasticity of demand for labor due to a change in the rental rate on capital η_K, the cross-elasticities of demand for labor due to a change in input prices for services, materials, and technology η_S, η_M, and η_T.

Besides wages, the other input prices need to be concretized as follows. The *rental rate on capital r* is expected to be the same for all companies and a function of time *r=f(t)*. *r* is not directly included in the estimation model, but will be captured by adding fixed year dummies. The *input prices for service and material inputs* p^S *and* p^M can be subdivided into foreign input prices and domestic input prices. As for *foreign input prices*, foreign wages could serve as a proxy. This is, however, only applicable to employment in foreign affiliates. In the case of offshore outsourcing, companies are more interested in import prices than foreign wages. Furthermore, fixing an adequate income level becomes difficult for certain countries. Therefore, Amiti and Wei (2005) decided to use offshoring intensities as inverse proxies for import prices of services as well as materials. The lower the input prices of services or materials, the higher should be their intensities. Therefore, the *OSS* and *OSM* measures which have been calculated in the previous chapter are used.

[1] According to Shephard's Lemma factor demand is determined by the first partial derivative of the cost function with respect to the corresponding factor price, regardless of the kind of production function.

Concerning *domestic input prices*, the prices of domestically purchased material and service inputs should be taken into account. As it is difficult to determine the adequate price level for each sector, I used domestic outsourcing intensities *DOS* and *DOM* as inverse proxies for domestically purchased services and materials, where *DOS* is calculated as follows:

$$DOS_{ist} = \frac{(domestic\ inputs\ of\ service\ s\ used\ by\ sector\ i)_t}{(total\ non\text{-}energy\ inputs\ used\ by\ sector\ i)_t}$$

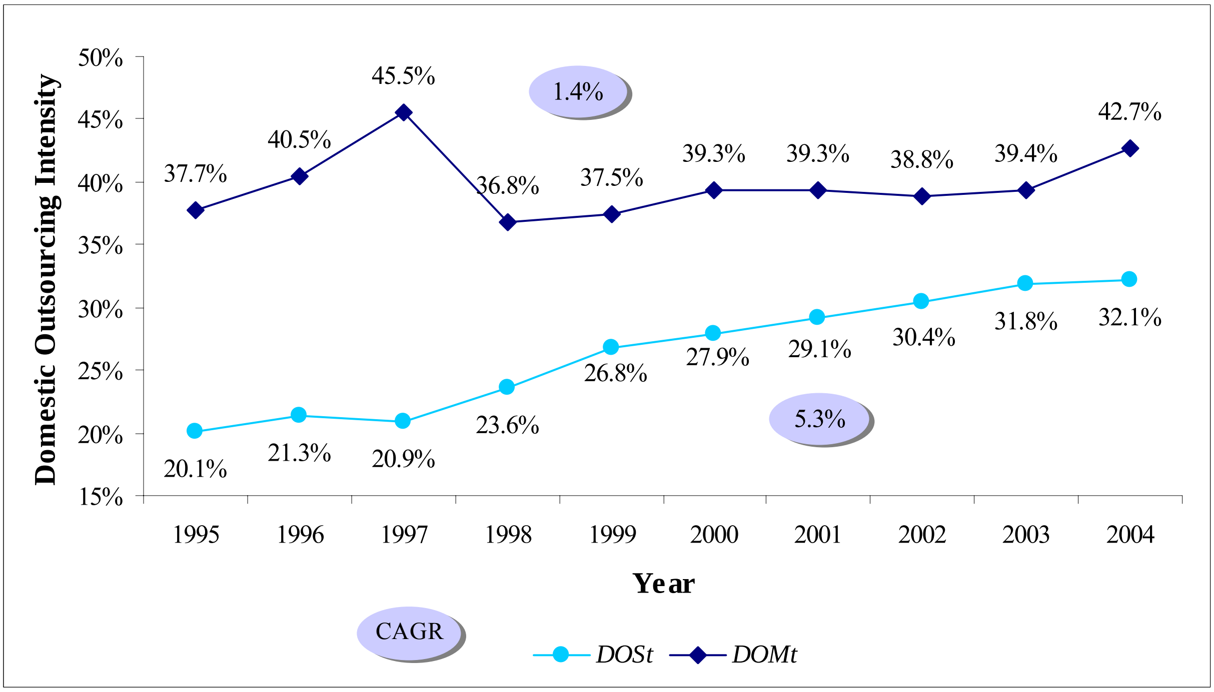
The domestic service outsourcing intensity DOS_{it} for sector *i* at time *t* is calculated by summing DOS_{ist} over all services *s*: $DOS_{it} = \sum_s DOS_{ist}$.

Summing DOS_{it} over all sectors *i*, weighted by their sectoral outputs, yields the average domestic service outsourcing intensity $DOS_t = \sum_i DOS_{it} * (Y_{it} / Y_t)$.

The domestic material outsourcing intensities DOM_{imt}, DOM_{it}, and DOM_t are defined analogously.

The *development of domestic outsourcing intensities* in Germany is plotted in *Figure 7*. There is strong evidence that the overall levels of intensities are much higher than the offshoring intensities. *Domestic service outsourcing intensities* increased by 5.3% on average per year from 20.1% in 1995 to 32.1% in 2004. *Domestic material outsourcing intensities* show higher overall levels than domestic service outsourcing intensities. The CAGR of 1.4% is also positive, but smaller starting with a *DOM* of 37.7% in 1995 and rising to 42.7% in 2004. To conclude, service outsourcing seems to have increased more strongly over the considered period compared to material outsourcing.

Figure 7. | Domestic Outsourcing Intensity of Intermediate Inputs in Germany



Source: Own calculations. Federal Statistical Office, revised input-output tables (1995-2004).

Average across all sectors *i* weighted by outputs at time *t*.

Finally, *the input prices* p^T of the technology shifter *T* need to be determined. Since adequate measures for p^T are not available, we use *OSS*, *OSM, DOS, DOM,* and *RD/Y* as inverse proxies for p^T. Falling prices p^T of technology inputs would be reflected in a higher offshoring, outsourcing, or R&D-intensities.

Equation (7) thus specializes to:

$$\ln L_{it} = \alpha_0 + \eta_Y \ln Y_{it} + \eta_L \ln w_{it} + \eta_{OSS} \ln OSS_{it} + \eta_{OSM} \ln OSM_{it}$$

$$+\eta_{DOS} \ln DOS_{it} + \eta_{DOM} \ln DOM_{it} + \eta_{RD} \ln(RD/Y)_{it} + \delta_t D_t + \varepsilon_{it} \quad (8)$$

Note that *OSS*, *OSM, DOS,* and *DOM* have *two functions* in equation (8). First, they are used as inverse proxies for other foreign input prices, and second, they are used as inverse proxies for the prices of the technology shifter *T*. R&D-intensity, however, is only used as an inverse proxy for the prices of technology.

A rising output is expected to influence labor demand positively with $\eta_Y > 0$, whereas increasing wages are expected to have a negative impact with $\eta_L < 0$. Concerning *OSS* and *OSM*, their net effect is not unambiguously predictable (Amiti and Wei, 2006). Offshoring, domestic outsourcing, and R&D-intensity can have a threefold negative effect on employment. 1. If input prices p^S and p^M fall, i.e. if *OSS*, *OSM*, *DOS*, and *DOM* increase, imported and domestically purchased inputs are likely to be substitutes for labor (*input substitution effect)*. 2. If input prices p^T decrease, i.e. if *OSS*, *OSM*, *DOS*, *DOM,* and *(RD/Y)* rise, labor is likely to be substituted for technology (*technology substitution effect)*. 3. Offshoring, domestic outsourcing, and R&D-intensity could augment productivity via *T* so that less labor is needed for the same amount of output (*productivity effect*). The substitution effect influences labor demand in a direct manner, whereas the productivity effect is indirect. The previous chapter showed empirical evidence that service offshoring has a significantly positive impact on TFP and labor productivity. Thus, a productivity-induced decrease in labor demand is expected.

Opposing these three negative effects, *scale effects* could influence labor demand positively. If productivity effects lead to lower prices, this could result in higher competitiveness of firms and foster the demand for goods and labor. Thus, the net effect of offshoring, domestic outsourcing, and R&D-intensity is not clear. If the negative substitution and/or productivity effects are larger than the positive scale effects for all variables, then $\eta_{OSS} < 0$ and $\eta_{OSM} < 0$, $\eta_{DOS} < 0$, $\eta_{DOM} < 0$, and $\eta_{RD} < 0$. Conversely, if the scale effects dominate the other effects, one expects $\eta_{OSS} > 0$, $\eta_{OSM} > 0$, $\eta_{DOS} > 0$, $\eta_{DOM} > 0$, and $\eta_{RD} > 0$. A multitude of more differentiated scenarios is also conceivable.

4.3 Empirical specification

The following section measures the impact of service and material offshoring on the conditional demand for labor in the manufacturing sector (including 35 manufacturing and 7 service sectors) in a panel regression analysis from 1995 to 2004. In a first step, the *correct estimation model* is selected. Like in the previous estimations, we need to test whether unobserved time-constant sector-specific effects c_i are correlated with some explanatory variables x_{it} or not. Running regressions of equation (8) including one-period lags of each explanatory variable without year fixed effects and without the outlier 'pharmaceuticals', the Hausman test suggests the Fixed Effects Estimator with Prob>chi2=0.0000. Including year fixed effects, the Hausman tests prefers the more efficient Random Effects Estimators with Prob>chi2=0.9725. When only *OSS* and *OSM* and year fixed effects are included (as in column 2 of Table 7), the Hausman test suggests the Fixed Effects Estimators with Prob>chi2=0.0002. Due to these ambiguous results, the consistent Fixed Effects Estimator should be applied to all specifications.

In a second step, the pooled OLS model including year fixed effects is tested for possible *heteroscedasticity* by performing a White test of the null hypothesis of homoscedasticity against unrestricted forms of heteroscedasticity. H_0 can be rejected (Prob>chi2=0.0000).[1] Second, a test for *autocorrelation* in ε_{it} of linear panel-data models is run as discussed by Wooldridge (2002). The null hypothesis of no first-order autocorrelation can also be rejected, regardless of whether year fixed effects are included or not (Prob>F=0.0000). Therefore, the estimations are corrected for heteroscedasticity (Huber-White sandwich estimators) and any form of intra-cluster correlation. Most specifications integrate year fixed effects D_t.

4.4 Estimation results

The estimation results using the *Fixed Effects Estimators* are shown in *Table 7*. The identified outlier 'pharmaceuticals' was dropped due to extremely high service offshoring intensities. As employment effects are not always instantaneous, one period lags of the independent variables are included in the subsequent specifications. *Y* is expected to affect employment in the next period, because companies adapt their investment and other decisions (such as labor demand) to their expected output, which is mostly calculated on the basis of preceding years' results. Assuming labor market rigidities wage changes are also likely to influence labor demand in the next period. Hence, one period lags $\ln Y_{t-1}$ and $\ln w_{t-1}$ should be included in the model. Finally, technology could also influence labor demand in the next period, so we add one-period lags of the offshoring, domestic outsourcing, R&D-intensity variables.

Real wages have a negative influence on labor demand in all specifications, which is always significant at the 1%-level for $\ln w_t$ and mostly significant for $\ln w_{t-1}$. As expected, real output has a positive effect on labor demand. $\ln Y_t$ is mostly significant in these specifications except for column 4, whereas $\ln Y_{t-1}$ is only significant when import shares are not included in columns 1 to 4. The F-tests indicate a joint significance of the real wage variables in all specifications, which is highly significant with p>F=0.0000, while real output is mostly highly significant except for columns 7 and 8.

Columns 1 and 2 solely focus on the effects from offshoring (foreign input prices). The negative influence of $\ln OSS_{t-1}$ and the overall negative effect on labor demand are both significant at the 1%-level without year fixed effects and at the 5%-level controlling for year fixed effects. The coefficient sizes of *OSS* become smaller when year fixed effects are included in column 2. Material offshoring also

[1] The above described test for heteroscedasticity in the fixed effects model is run as proposed by Nunziata. The null hypothesis of homoscedasticity is rejected (Prob>chi2=0.0000).

shows a negative, but insignificant overall effect, which is stronger when year fixed effects are not considered (column 1). Concerning the effects of the domestic outsourcing variables (domestic input prices) in columns 3 and 4, domestic service outsourcing has an overall negative effect to show when year fixed effects are not integrated (column 3), whereas the effect turns significantly positive in column 4. Domestic material outsourcing always shows a positive overall impact, but the F-test cannot reject the null hypothesis of no joint influence on labor demand.

Columns 5 and 6 include all foreign *(OSS, OSM)*, domestic *(DOS, DOM)*, and technology input prices *(OSS, OSM, DOS, DOM, RD/Y)*. The results unambiguously confirm the overall significantly negative influence of service offshoring on labor demand. The negative overall effect of material offshoring slightly exceeds the 10%-level (p>F=0.1418), with a significant individual effect of $\ln OSM_{t-1}$ in column 5, while none of the results are significant in column 6. Domestic service outsourcing shows an overall positive impact on labor demand, which is significant when year fixed effects are integrated in column 6. Domestic material outsourcing, however, has no clear trend to show, as the overall effect now turns negative in contrast to columns 3 and 4. R&D-intensity has positive instantaneous effects that become negative for the one-period lag, but are insignificant.

Including the additional control variable import shares in columns 7 and 8 makes the negative effects of service offshoring smaller. The effect of material offshoring now turns negative, which could be due to high positive correlation of around 55% with import shares (see *Appendix 5*). Domestic service outsourcing now shows a significantly positive impact in column 8, while the overall effect of domestic material outsourcing is positive. The Akaike's information criterion however shows that one should prefer the specifications without import shares in columns 5 and 6. The only unambiguous results are obtained for the service offshoring variables. It seems as if offshoring has a rather negative influence on labor demand, while domestic service outsourcing shows positive coefficient signs. Domestic material outsourcing, however, does not show a clear trend.

Table 7. | Fixed Effects Estimations without Outlier (1995-2004)

Dependent variable: $\ln L_t$								
	Fixed effects w/o outlier[1)]						Fixed effects plus import share[1)]	
	(1)		(2)	(4)	(5)	(6)	(7)	(8)
$\ln Y_t$	0.0971	0.1297**	0.1231*	0.1264**	0.0559	0.0608	0.1508**	0.1250*
	(0.107)	(0.018)	(0.065)	(0.022)	(0.427)	(0.373)	(0.039)	(0.060)
$\ln Y_{t-1}$	0.2914***	0.2530***	0.1719*	0.2209**	0.3144***	0.2597**	0.0873	0.0862
	(0.001)	(0.009)	(0.052)	(0.012)	(0.002)	(0.017)	(0.334)	(0.345)
$\ln w_t$	-0.5002***	-0.4770***	-0.5373***	-0.4651***	-0.4813***	-0.4242***	-0.3831***	-0.3853***
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
$\ln w_{t-1}$	-0.1591**	-0.1090*	-0.2263***	-0.1125*	-0.1629**	-0.1007	-0.1477***	-0.1777***
	(0.015)	(0.067)	(0.006)	(0.098)	(0.018)	(0.109)	(0.008)	(0.001)
$\ln OSS_t$	-0.0203	-0.0097			-0.0147	0.0064	0.0112	0.0042
	(0.258)	(0.641)			(0.508)	(0.781)	(0.589)	(0.850)
$\ln OSS_{t-1}$	-0.0510***	-0.0398**			-0.0520***	-0.0362***	-0.0245**	-0.0273***
	(0.000)	(0.013)			(0.000)	(0.006)	(0.023)	(0.005)
$\ln OSM_t$	-0.0242	-0.0040			-0.0156	0.0111	0.0071	-0.0018
	(0.245)	(0.825)			(0.499)	(0.618)	(0.780)	(0.947)
$\ln OSM_{t-1}$	-0.0323	0.0039			-0.0507*	-0.0221	0.0263	0.0220
	(0.248)	(0.882)			(0.066)	(0.481)	(0.343)	(0.421)
$\ln DOS_t$			-0.0311	0.0911*	0.0420	0.0725*		0.1206**
			(0.538)	(0.062)	(0.247)	(0.054)		(0.028)
$\ln DOS_{t-1}$			-0.0842	0.0424	-0.0257	0.0322		0.0756**
			(0.201)	(0.372)	(0.570)	(0.388)		(0.029)
$\ln DOM_t$			0.0058	0.0233	-0.0067	0.0073		0.0304
			(0.917)	(0.518)	(0.866)	(0.791)		(0.224)
$\ln DOM_{t-1}$			0.0362	-0.0066	-0.0193	-0.0338		-0.0215
			(0.479)	(0.890)	(0.679)	(0.425)		(0.581)
$\ln(RD/Y)_t$					0.0155	0.0159		0.0346
					(0.707)	(0.696)		(0.346)
$\ln(RD/Y)_{t-1}$					-0.0113	-0.0173		-0.0374
					(0.771)	(0.619)		(0.271)
$\ln(IM/Y)_t$							0.0488	0.0558**
							(0.136)	(0.030)
$\ln(IM/Y)_{t-1}$							-0.0231	-0.0203
							(0.560)	(0.611)
Year fixed effects	No	Yes	No	Yes	No	Yes	Yes	Yes
Joint significance tests:								
$\ln Y_t + \ln Y_{t-1} = 0$	p>F=0.0020	p>F=0.0047	p>F=0.0716	p>F=0.0121	p>F=0.0045	p>F=0.0199	p>F=0.1121	p>F=0.1256
$\ln w_t + \ln w_{t-1} = 0$	p>F=0.0000	p>F=0.0000	p>F=0.0000	p>F=0.0000	p>F=0.0000	p>F=0.0000	p>F=0.0000	p>F=0.0000
$\ln OSS_t + \ln OSS_{t-1} = 0$	p>F=0.0003	p>F=0.0398			p>F=0.0004	p>F=0.0186	p>F=0.0478	p>F=0.0162
$\ln OSM_t + \ln OSM_{t-1} = 0$	p>F=0.3568	p>F=0.9643			p>F=0.1418	p>F=0.7434	p>F=0.6074	p>F=0.6478
$\ln DOS_t + \ln DOS_{t-1} = 0$			p>F=0.4212	p>F=0.0907	p>F=0.2814	p>F=0.1416		p>F=0.0572
$\ln DOM_t + \ln DOM_{t-1} = 0$			p>F=0.7501	p>F=0.6675	p>F=0.9116	p>F=0.6397		p>F=0.2653
$\ln(RD/Y)_t + \ln(RD/Y)_{t-1} = 0$					p>F=0.9267	p>F=0.8805		p>F=0.5302
$\ln(IM/Y)_t + \ln(IM/Y)_{t-1} = 0$							p>F=0.2608	p>F=0.0784
AIC	-782.0	-803.3	-699.4	-809.0	-758.7	-808.6	-786.3	-790.3
Observations	303	303	315	315	296	296	278	274
R-squared	0.62	0.66	0.49	0.66	0.58	0.66	0.66	0.70

Source: Own calculations. p<0.1, p**<0.05, p***<0.001 (p-values in parentheses).*
1) All estimations without the outlier 'pharmaceuticals'.

In a next step, the explanatory variables should be controlled for potential endogeneity. The following specifications use the *Instrumental Variables Two Stage Least Squares (2SLS) Fixed Effects Estimator (Table 8)*. All specifications use the first three lags of potentially endogenous variables as instruments for $\ln OSS_t$, $\ln OSM_t$, $\ln DOS_t$, $\ln DOM_t$, $\ln(RD/Y)_t$ and $\ln(IM/Y)_t$. The instantaneous and the lagged real wage and real output variables influence labor demand as expected. Service offshoring has a negative impact on labor demand, but the results are highly insignificant when year fixed effects and import shares are added at the same time (columns 4 and 8). The coefficient sizes are larger compared to the previous estimation results. Material offshoring also shows negative coefficients, which are significant in columns 1 and 5 and narrowly miss the 10%-level in columns 3 and 7.

Domestic service outsourcing affects labor demand positively, which is significant when year fixed dummies are included in columns 6 and 8. Domestic material outsourcing seems to influence labor demand negatively, but the results are not significant. Adding R&D-intensities yields similar results compared to columns 7 and 8, but service offshoring is no longer significant. Therefore, the results are not presented in Table 8.

Table 8. | Instrumental Variables 2SLS: Fixed Effects Estimations (1995-2004)

Dependent variable: lnL_t								
	Instrumental Variables 2SLS: Fixed effects w/o outlier[1)]							
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
lnY_t	0.2549***	0.1439*	0.3297*	0.0406	0.3480***	0.1672	0.4726**	0.1592
	(0.002)	(0.059)	(0.053)	(0.833)	(0.000)	(0.179)	(0.014)	(0.509)
lnY_{t-1}	0.2424***	0.2361***	0.1530***	0.0974*	0.2069***	0.2069***	0.1162***	0.0853
	(0.001)	(0.006)	(0.002)	(0.088)	(0.002)	(0.009)	(0.008)	(0.155)
lnw_t	-0.4750***	-0.4573***	-0.4255***	-0.3846***	-0.5681***	-0.4875***	-0.5442***	-0.4526***
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
lnw_{t-1}	-0.1405**	-0.1078*	-0.1994***	-0.1231*	-0.1276**	-0.0982*	-0.1723**	-0.1324***
	(0.029)	(0.073)	(0.000)	(0.054)	(0.048)	(0.091)	(0.014)	(0.007)
lnOSS_t	-0.0625***	-0.0402	-0.0538**	-0.0043	-0.0692***	-0.0441*	-0.0514**	-0.0201
	(0.008)	(0.161)	(0.011)	(0.833)	(0.007)	(0.065)	(0.043)	(0.333)
lnOSM_t	-0.1181**	-0.0238	-0.1222	0.0561	-0.1411*	-0.0527	-0.1589	-0.0127
	(0.019)	(0.627)	(0.134)	(0.491)	(0.070)	(0.485)	(0.116)	(0.922)
lnDOS_t					0.1921	0.2908*	0.1569	0.3101**
					(0.285)	(0.088)	(0.290)	(0.027)
lnDOM_t					-0.1901	-0.0725	-0.2384	-0.1029
					(0.210)	(0.636)	(0.130)	(0.514)
ln$(IM/Y)_t$			0.0883	0.0025			0.1052	0.0583
			(0.271)	(0.975)			(0.239)	(0.554)
Year fixed effects	No	Yes	No	Yes	No	Yes	No	Yes
Joint significance tests:								
lnY_t + lnY_{t-1} = 0	p>F=0.0002	p>F=0.0128	p>F=0.0081	p>F=0.2288	p>F=0.0002	p>F=0.0232	p>F=0.0100	p>F=0.3598
lnw_t + lnw_{t-1} = 0	p>F=0.0000	p>F=0.0000	p>F=0.0000	p>F=0.0000	p>F=0.0000	p>F=0.0000	p>F=0.0000	p>F=0.0000
First stage results:								
Shea Partial R-squared:								
lnOSS_t	0.5274	0.5066	0.5115	0.4815	0.5482	0.5125	0.4262	0.4427
lnOSM_t	0.4144	0.3173	0.1854	0.1394	0.3428	0.3399	0.1934	0.1777
lnDOS_t					0.2588	0.2702	0.2215	0.2122
lnDOM_t					0.2217	0.2509	0.2871	0.2897
ln$(IM/Y)_t$			0.2575	0.2276			0.2704	0.2715
Hanson J statistic[2)] P-val.	$X^2(4)$=0.05	$X^2(4)$=0.42	$X^2(6)$=0.05	$X^2(6)$=0.65	$X^2(8)$=0.22	$X^2(8)$=0.26	$X^2(10)$=0.42	
AIC	-610.7	-666.8	-592.5	-658.4	-595.6	-647.5	$X^2(10)$=0.28	
Observations	235	235	216	216	235	235	-577.3	-646.2
R-squared	0.50	0.63	0.49	0.49	0.48	0.60	216	216
							0.46	0.63

Source: Own calculations. p<0.1, p**<0.05, p***<0.001 (p-values in parentheses).*
1) All estimations without the outlier 'pharmaceuticals'.
2) Over-identification test of all instruments.

Another alternative to address the potential endogeneity is to apply the *dynamic General Method of Moments (GMM) estimator* as proposed by Arellano-Bond (1991). The results are shown in *Table 9*. All specifications included year fixed effects and some specifications integrate import shares. Concerning real wages, $\Delta \ln w_{t-1}$.turns positive, but the overall effect still remains negative as expected for all specifications. Real output influences ΔL_t positively, but the overall effect turns insignificant when import shares are included in columns 2, 5, and 7. The specifications in columns 1 and 2 only consider the effects of the *OSS* and *OSM*. Service offshoring has a negative, but smaller effect on labor demand, which is always significant except for column 2. Material offshoring shows negative coefficient signs in columns 1 and 4, which turns positive in the other specifications. The main explanation would be collinearity problems with either import shares and/or domestic outsourcing variables.

$\Delta \ln DOS_t$ always shows positive coefficients, which become significant and larger when import shares are added in columns 5 and 7. $\Delta \ln DOM_t$ always affects ΔL_t negatively, which is only significant when import shares are not added (columns 4 and 6). The coefficient of R&D-intensity seems to depend on the integration of import shares, as it is positive in column 6 and negative in column 7, none of them being significant. The Sargan test rejects the null hypothesis that the over-identifying restrictions are valid in columns 1 to 3[1], hence one might prefer the specifications in columns 4 to 7. Anyhow, two of the four specifications, namely the specifications with import shares (columns 5 and 7), show second-order autocorrelation, which makes the estimators inconsistent. Hence, the only valid columns for our consideration are columns 4 and 6.

Table 9. | GMM Estimations (1995-2004)

Dependent variable: $\Delta \ln L_t$							
	GMM Arellano-Bond dynamic estimator w/o outlier[1)]						
	(1)	(3)	(2)	(4)	(5)	(6)	(7)
$\Delta \ln Y_t$	0.0964**	0.0386	0.0631*	0.1005***	0.0294	0.0955**	0.0516
	(0.013)	(0.352)	(0.095)	(0.009)	(0.492)	(0.013)	(0.248)
$\Delta \ln Y_{t-1}$	0.0485	0.0257	0.0219	0.0451	0.0227	0.0246	0.0086
	(0.197)	(0.468)	(0.548)	(0.205)	(0.510)	(0.489)	(0.811)
$\Delta \ln w_t$	-0.4498***	-0.4191***	-0.4583***	-0.4603***	-0.4363***	-0.4444***	-0.4262***
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
$\Delta \ln w_{t-1}$	0.2407***	0.1883***	0.2821***	0.2635***	0.1869***	0.2807***	0.2253***
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
$\Delta \ln OSS_t$	-0.0168**	-0.0115		-0.0191***	-0.0137**	-0.0127*	-0.0120*
	(0.015)	(0.107)		(0.003)	(0.039)	(0.065)	(0.092)
$\Delta \ln OSM_t$	-0.0193	0.0281**		-0.0109	0.0234	0.0003	0.0137
	(0.180)	(0.040)		(0.401)	(0.104)	(0.979)	(0.350)
$\Delta \ln DOS_t$			0.0261	0.0187	0.0468**	0.0103	0.0491**
			(0.300)	(0.405)	(0.039)	(0.647)	(0.035)
$\Delta \ln DOM_t$			-0.0205	-0.0290*	-0.0035	-0.0281*	-0.0050
			(0.201)	(0.075)	(0.830)	(0.086)	(0.769)
$\Delta \ln (RD/Y)_t$						0.0034	-0.0012
						(0.810)	(0.925)
$\Delta \ln (IM/Y)_t$		0.0019			-0.0014		0.0079
		(0.920)			(0.933)		(0.647)
$\Delta \ln L_{t-1}$	0.6420***	0.6161***	0.7300***	0.6764***	0.6305***	0.7034***	0.6875***
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
Year fixed effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Joint significance tests:							
$\Delta \ln Y_t + \Delta \ln Y_{t-1} = 0$	p>F=0.0004	p>F=0.2260	p>F=0.0196	p>F=0.0000	p>F=0.3381	p>F=0.0009	p>F=0.3076
$\Delta \ln w_t + \Delta \ln w_{t-1} = 0$	p>F=0.0000	p>F=0.0000	p>F=0.0000	p>F=0.0000	p>F=0.0000	p>F=0.0000	p>F=0.0000
Sargan test[2)]	$p>X^2=0.02$	$p>X^2=0.01$	$p>X^2=0.00$	$p>X^2=0.25$	$p>X^2=0.56$	$p>X^2=0.63$	$p>X^2=0.98$
H_0: no 2nd order autocorrelation	p>z=0.13	p>z=0.04	p>z=0.33	p>z=0.27	p>z=0.07	p>z=0.22	p>z=0.06
Observations	272	248	280	272	248	266	245

Source: Own calculations. p<0.1, p**<0.05, p***<0.001 (p-values in parentheses).*
1) All estimations without the outlier 'pharmaceuticals'.
2) Null hypothesis that over-identifying restrictions are valid.

Finally, the results should be interpreted in terms of job losses or job creation due to service offshoring, using the largest and smallest significant coefficients of those specifications that include year fixed effects and at least all offshoring and domestic outsourcing variables simultaneously. The coefficients of service offshoring range between -0.0127 (GMM, column 6) and -0.0441 (IV 2SLS, column 6). Between 1995 and 2004, the CAGR of service offshoring was 12.2% for the manufacturing sector. Thus, service offshoring led to an average employment reduction of between -0.15% and -0.54% p.a., which represents a reduction of between -1.40% and -4.95% over the entire period. Interestingly, the effect of real output appears to be strongly positive so that it could counteract

[1] The rejection of the null hypothesis could also be due to heteroscedasticity.

possible negative employment effects. However, compared to material offshoring the potential of service offshoring has not been fully exploited yet, which is why negative employment effects could be stronger in the future.

5. Concluding remarks

Since the new tradability of services has made them vulnerable to relocation, the public awareness of service offshoring and its potential labor market effects has increased sharply. This paper aims at giving an understanding what service offshoring concretely means. Our definition of service offshoring focuses on cost-oriented offshoring motives, as re-imports and potential layoffs of domestic employees mainly fall within this category. Therefore, our measure of service offshoring represents the proportion of imported service inputs used in domestic production. The German overall service offshoring intensities more than doubled from 1.68% in 1995 to 4.01% in 2004, which corresponds to an annual average growth rate of 10.1%. The stronger growth rate of *OSS* compared to *OSM* reflects the importance of ICT fostering trade in services.

The results show that service offshoring had an overall positive effect on TFP and labor productivity in the German manufacturing sectors between 1995 and 2004. Thus, service offshoring increased real output by on average 0.76 to 1.20% per year and 6.61 to 10.26% over the period. Service offshoring also augmented labor productivity by on average 1.64 to 2.30% per year and 13.8% to 19.9% over the whole period, respectively.

At the same time, service offshoring led to an average employment reduction of between -0.15% and -0.54% p.a., which represents a reduction of between -1.40% and -4.95% over the entire period. These results indicate that input substitution and/or productivity effects have a stronger impact on labor demand than scale effects.

Why does service offshoring translate into job losses in Germany despite productivity gains, whereas the studies for the UK and the US show positive employment effects? One explanation could be that companies in Germany that offshore services do not create new jobs despite efficiency gains, and thus, layoffs are not compensated for. This hypothesis is supported by a study of the McKinsey Global Institute stating that the US gained 1.14 to 1.17USD for every Dollar being invested in the Indian service sector. Germany, on the other hand, obtains only 0.74€ per Euro that has been invested in Indian and Eastern European service jobs, indicating an overall economic loss of 26%. According to this study, the principal reason is the higher reemployment chance of released labor in more productive activities in the US due to the more flexible labor market as well as the disposability of more productive jobs in the high-tech sector (Farrel, 2004; McKinsey Global Institute, 2005).

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Appendix 1. | Sectoral Classification

	Manufacturing Sectors (36 Sectors)
1	Food products
2	Beverages
3	Tobacco products
4	Textiles
5	Wearing apparel, dressing and dying of fur
6	Leather, leather products and footwear
7	Wood and products of wood and cork
8	Pulp and paper
9	Paper products
10	Publishing
11	Printing
12	Coke, refined petroleum products and nuclear fuel
13	Pharmaceuticals
14	Chemicals exluding pharmaceuticals
15	Rubber products
16	Plastic products
17	Glass and glass products
18	Ceramic goods and other non-metallic mineral products
19	Iron and steel
20	Non-ferrous metals
21	Metal castings
22	Fabricated metal products, except machinery and equipment
23	Machinery and equipment, n.e.c.
24	Office, accounting and computing machinery
25	Electrical machinery and apparaturs, n.e.c.
26	Radio, television and communication equipment
27	Medical, precision and optical instruments
28	Motor vehicles, trailers and semi-trailers
29	Other transport equipment
30	Manufacturing n.e.c.
31	Recycling
32	Electricity, steam and hot water supply
33	Gas and gas supply
34	Collection, purification and distribution of water
35	Construction site and civil engineering
36	Construction installation and other construction
	Service Sectors (7 Sectors)
37	Post and telecommunications
38	Financial intermediation except insurance and pension funding
39	Activities related to financial intermediation
40	Renting of machinery and equipment
41	Computer and related activities
42	Research and development
43	Other business activities

Source: Input-output tables, Federal Statistical Office

Appendix 2. | Data

The empirical analysis covers 10 observations over time for 36 manufacturing industries which leads to a total number of 360 observations per variable. Input-output data at current prices is used to calculate offshoring intensities OSS and OSM as well as domestic outsourcing intensities DOS and DOM, which are used as inverse proxies for the input prices of services and materials. Since ratios are calculated, deflation of the numerator and the denominator is not necessary. German input-output tables are disaggregated to 71 sectors following the three-digit and, for some sectors, the four-digit NACE Rev. 1.1 classification (German Federal Statistical Office: revised input-output tables 1995 to 2004 in current prices; Fachserie 18 Reihe 2). R&D expenditures are retrieved from the OECD STAN Industrial Database (ANBERD, R&D Expenditure in Industry (ISIC Rev.3), Vol. 2006 release 01) and divided by gross output to obtain R&D-intensities.

Output data Y is often mapped by gross output or value added in the empirical literature. Since the input factors in our production function are not only labor and capital, but also service and material inputs, gross output seems to be a more appropriate measure (for a short discussion see Strauss-Kahn, 2004). Gross output is also derived from the input-output tables. We calculated real output using sectoral producer price indices from the German Federal Statistical Office.[1] Capital input K is matched using the sectoral net capital stock at 2000 prices from the German Federal Statistical office. Net capital stock instead of gross capital stock is chosen, as the latter does not account for depreciation, which in fact, does represent at least two difficulties. First, depreciation reflects physical deterioration and efficiency losses, and second, different rates of depreciation are applied to different types of capital (Hijzen, Görg, and Hine, 2005).[2] Some sectors have only data available at a more aggregated level. Therefore, disaggregation is acquired weighting the net capital stock data by its sectoral output share to fit the input-output aggregation.[3]

Total sectoral service and material inputs comprise both domestically produced and imported inputs and are derived from the input-output tables of the German Federal Statistical office. We calculated real service and material inputs using the above mentioned sectoral producer price indices as deflators. The number of employees and labor demand is mapped using sectoral employment data from the input-output tables. The number of employees is preferred to the number of total employment. The latter considers all persons that are engaged in domestic production of a country, whereas the former excludes self-employed an unpaid family workers and better reflects the workforce of companies that is exposed to layoffs due to offshoring.

[1] Producer price indices are available at several aggregation levels (28, 107 and 225 sectors). Since some producer prices at the required input-output aggregation level were not available, we used producer prices of more disaggregated sectors (within the same industry) as a proxy, because similar price trends can be expected there. This procedure was also used in a few cases where some years were missing.

[2] Besides Hijzen, Görg and Hine (2005), Falk and Koebel (2002), Strauss-Kahn (2004), Geishecker (2006) also used net capital stocks measuring labor demand equations, whereas the OECD (2007) study uses the gross fixed capital formation due to data limitations. Other studies do not offer further information on the capital used.

[3] The two sectors 'publishing & printing' and 'electricity, steam and hot water supply & gas and gas supply' do not have data available at the input-output aggregation level. Therefore, disaggregation is acquired weighting the gross capital stock data by its sectoral output share to match the input-output classification.

Sector-specific labor compensation of employees is used as a measure for disaggregated wages w and is retrieved from the OECD STAN Industrial Database based on Federal Statistical Office data. Labor compensation consists of annual wages and salaries of employees at a sectoral level paid by producers as well as supplements such as contributions to social security, private pensions, health insurance, life insurance and similar schemes. Labor compensation instead of gross wages and salaries is chosen, since labor demand is rather driven by a firm's entire labor costs. Some sectors only have wage data available at a more aggregated level. Therefore, disaggregation is acquired weighting the wage data by its sectoral output share.[1] The data is divided by the respective sectoral employment to calculate average annual labor compensation per employee. As labor demand depends on real wages, an appropriate price index is needed. Therefore, sectoral producer price indices from the Federal Statistical Office are used, since producer prices rather than consumer prices matter.

[1] Thus, for instance, wage data is only available for the aggregated sector 'food products and beverages'. The wages of the aggregated sector are weighted with the respective output shares of the single sectors 'food products' and 'beverages' in order to achieve more disaggregated sectoral wages. This procedure was done 8 times in the following sectors: 1-2; 8-9; 10-11; 15-16; 17-18; 19-21; 32-33 and 35-36.

Appendix 3. | Summary Statistics

Variable	Obs	Mean	Std Dev	Min	Max
$\ln OSS_t$	347	-5.451265	1.188521	-9.113486	-1.56484
$\ln OSS_{t-1}$	312	-5.495673	1.196417	-9.113486	-1.56484
$\ln OSM_t$	360	-1.739417	0.7123115	-4.569239	-0.401197
$\ln OSM_{t-1}$	324	-1.777272	0.708497	-4.569239	-0.4675112
$\ln DOS_t$	360	-1.936494	0.6071819	-3.278526	-0.6629233
$\ln DOS_{t-1}$	324	-1.953852	0.6071599	-3.278526	-0.6946971
$\ln DOM_t$	360	-0.7984013	0.3877476	-2.42753	0.2644965
$\ln DOM_{t-1}$	324	-0.8074394	0.3885173	-2.42753	0.2644965
$\ln(RD/Y)_t$	352	-5.280297	1.687199	-8.782787	-1.59469
$\ln(RD/Y)_{t-1}$	316	-5.270217	1.684027	-8.782787	-1.59469
$\ln Y_t$	360	10.09768	1.057592	7.352441	12.43005
$\ln Y_{t-1}$	324	10.08927	1.05493	7.352441	12.37422
$\ln(VA_t/L_t)$	347	4.126026	0.7588547	-1.560648	7.417142
$\ln L_t$	360	4.95857	1.193256	2.079442	7.375882
$\ln L_{t-1}$	324	4.97094	1.192352	2.079442	7.375882
$\ln(K^{equip})_t$	360	1.935083	1.057593	-0.6733446	4.016563
$\ln(K^{equip})_{t-1}$	324	1.943254	1.054028	-0.6539265	3.954124
$\ln(K^{build})_t$	360	1.569947	1.142959	-0.7339692	4.669084
$\ln(K^{build})_{t-1}$	324	1.577622	1.139551	-0.7133499	4.669084
$\ln S_t$	360	8.475727	1.05771	6.124683	10.53207
$\ln S_{t-1}$	324	8.470551	1.056535	6.124683	10.53207
$\ln M_t$	360	9.128885	1.227188	6.018593	11.98627
$\ln M_{t-1}$	324	9.122354	1.225259	6.018593	11.90399
$\ln(IM/Y)_t$	330	-1.291672	1.220144	-4.816542	0.9946187
$\ln(IM/Y)_{t-1}$	297	-1.307515	1.223805	-4.814771	0.9946187
$\ln w_t$	360	3.684319	0.3741977	2.885917	4.724108
$\ln w_{t-1}$	324	3.677526	0.3706786	2.919391	4.724108

Appendix 4. | Correlation Matrix Estimation 1 (1995-2004)

	$\ln L_t$	$\ln L_{t-1}$	$\ln K_t$	$\ln K_{t-1}$	$\ln S_t$	$\ln S_{t-1}$	$\ln M_t$	$\ln M_{t-1}$	$\ln OSS_t$	$\ln OSS_{t-1}$	$\ln OSM_t$	$\ln OSM_{t-1}$	$\ln DOS_t$	$\ln DOS_{t-1}$	$\ln DOM_t$	$\ln DOM_{t-1}$	$\ln(RD/Y)_t$	$\ln(RD/Y)_{t-1}$	$\ln(IM/Y)_t$	$\ln(IM/Y)_{t-1}$
$\ln L_t$	1.0000																			
$\ln L_{t-1}$	0.9984	1.0000																		
$\ln K_t$	0.6544	0.6560	1.0000																	
$\ln K_{t-1}$	0.6557	0.6576	0.9990	1.0000																
$\ln S_t$	0.8416	0.8429	0.6830	0.6856	1.0000															
$\ln S_{t-1}$	0.8390	0.8412	0.6793	0.6819	0.9949	1.0000														
$\ln M_t$	0.8101	0.8094	0.5964	0.5996	0.8580	0.8551	1.0000													
$\ln M_{t-1}$	0.8133	0.8133	0.5938	0.5967	0.8581	0.8581	0.9916	1.0000												
$\ln OSS_t$	-0.2206	-0.2192	0.0007	-0.0033	-0.0048	-0.0102	-0.2417	-0.2464	1.0000											
$\ln OSS_{t-1}$	-0.2130	-0.2112	0.0097	0.0063	0.0031	-0.0015	-0.2329	-0.2362	0.9258	1.0000										
$\ln OSM_t$	0.0574	0.0591	-0.1151	-0.1108	0.0444	0.0493	0.3192	0.3163	-0.0905	-0.0990	1.0000									
$\ln OSM_{t-1}$	0.0560	0.0604	-0.1356	-0.1295	0.0344	0.0457	0.2966	0.3085	-0.1248	-0.1052	0.9346	1.0000								
$\ln DOS_t$	-0.1667	-0.1659	0.0620	0.0577	0.0275	0.0246	-0.4275	-0.4217	0.5481	0.5563	-0.4497	-0.4570	1.0000							
$\ln DOS_{t-1}$	-0.1665	-0.1636	0.0630	0.0595	0.0223	0.0380	-0.4211	-0.4144	0.5362	0.5404	-0.4316	-0.4265	0.9735	1.0000						
$\ln DOM_t$	0.2755	0.2698	0.2766	0.2735	0.1546	0.1609	0.3479	0.3312	-0.3127	-0.2924	-0.1661	-0.1907	-0.2018	-0.1891	1.0000					
$\ln DOM_{t-1}$	0.2806	0.2762	0.2601	0.2558	0.1522	0.1586	0.3087	0.3434	-0.3139	-0.2906	-0.1203	-0.1704	-0.1653	-0.1567	0.8608	1.0000				
$\ln(RD/Y)_t$	-0.0053	-0.0057	-0.0049	-0.0067	0.0892	0.0750	0.1785	0.1625	0.3508	0.3382	0.3478	0.3444	-0.1570	-0.1726	-0.3969	-0.4241	1.0000			
$\ln(RD/Y)_{t-1}$	-0.0136	-0.0146	-0.0092	-0.0112	0.0850	0.0700	0.1769	0.1574	0.3487	0.3321	0.3425	0.3306	-0.1578	-0.1769	-0.3931	-0.4317	0.9934	1.0000		
$\ln(IM/Y)_t$	-0.2801	-0.2702	-0.3467	-0.3387	-0.1727	-0.1752	-0.0393	-0.0467	0.0383	0.0303	0.5332	0.5565	-0.3153	-0.3005	-0.5418	-0.5362	0.4640	0.4653	1.0000	
$\ln(IM/Y)_{t-1}$	-0.2800	-0.2704	-0.3448	-0.3374	-0.1677	-0.1735	-0.0270	-0.0398	0.0246	0.0153	0.5525	0.5514	-0.3220	-0.3141	-0.5293	-0.5240	0.4520	0.4583	0.9849	1.0000

Appendix 5. | Correlation Matrix Estimation 2 (1995-2004)

	lnY_t	lnY_{t-1}	lnw_t	lnw_t	lnOSS_t	lnOSS_{t-1}	lnOSM_t	lnOSM_{t-1}	lnDOS_t	lnDOS_{t-1}	lnDOM_t	lnDOM_{t-1}	ln$(RD/Y)_t$	ln$(RD/Y)_{t-1}$	ln$(IM/Y)_t$	ln$(IM/Y)_{t-1}$
lnY_t	1.0000															
lnY_{t-1}	0.9951	1.0000														
lnw_t	0.1125	0.0993	1.0000													
lnw_{t-1}	0.1194	0.1065	0.9772	1.0000												
lnOSS_t	-0.1234	-0.1279	0.3333	0.3371	1.0000											
lnOSS_{t-1}	-0.0982	-0.0934	0.3451	0.3449	0.9075	1.0000										
lnOSM_t	-0.0426	-0.0533	0.1572	0.1625	-0.1042	-0.1089	1.0000									
lnOSM_{t-1}	-0.0802	-0.0706	0.1443	0.1462	-0.1539	-0.1265	0.9130	1.0000								
lnDOS_t	-0.0395	-0.0290	0.0701	0.0711	0.6050	0.6033	-0.4090	-0.4233	1.0000							
lnDOS_{t-1}	-0.0502	-0.0346	0.0693	0.0717	0.5933	0.5920	-0.4036	-0.4035	0.9749	1.0000						
lnDOM_t	0.4016	0.3984	-0.1454	-0.1151	-0.2981	-0.2863	-0.1833	-0.2214	-0.2330	-0.2210	1.0000					
lnDOM_{t-1}	0.3618	0.3705	-0.1794	-0.1611	-0.2975	-0.2737	-0.1574	-0.2185	-0.1860	-0.1812	0.8787	1.0000				
ln$(RD/Y)_t$	0.0162	-0.0051	0.4554	0.4325	0.2595	0.2424	0.3144	0.2932	-0.1509	-0.1707	-0.3470	-0.3930	1.0000			
ln$(RD/Y)_{t-1}$	0.0268	0.0056	0.4677	0.4450	0.2760	0.2576	0.3145	0.2961	-0.1454	-0.1650	-0.3329	-0.3826	0.9947	1.0000		
ln$(IM/Y)_t$	-0.3901	-0.4060	0.3178	0.3038	0.0367	0.0220	0.5451	0.5534	-0.3248	-0.3260	-0.4244	-0.4404	0.6393	0.6316	1.0000	
ln$(IM/Y)_{t-1}$	-0.3764	-0.3960	0.3166	0.3023	0.0300	0.0117	0.5472	0.5534	-0.3366	-0.3385	-0.4089	-0.4310	0.6375	0.6300	0.9947	1.0000

Gábor Pellényi - Magdolna Sass:
Offshoring services: the case of NMS and Hungary

1. Introduction

Relocation of services is a growing global phenomenon. EU enlargement provided an opportunity to Western companies to offshore many business services to new EU Member States to take advantage of cost advantages. However, due to data constraints, the extent and the impacts of services relocation have not been adequately analysed yet. This paper gives some indications on the direction and magnitude of offshoring within Europe, and offers a case example on economic impacts in a host country of services FDI. The evidence on services offshoring from old to new EU Member States is sporadic. While some Central Eastern European countries are net beneficiaries of the process, it is not immediately obvious that Western European economies should lose output and jobs to the new EU members.

2. Main characteristics

After outsourcing/offshoring the low- and medium-skilled production processes in manufacturing, starting mainly from the 1990s, the relocation (offshore outsourcing) of certain production processes of specific services from developed to other developed or emerging/developing countries has started to become more and more widespread.

Table 1. | Categories used in the analysis

Location of production	Internalised	Externalised (outsourcing)
Home country	Production kept in-house at home	Outsourcing (at home)
Foreign country(offshoring)	Intra-firm (captive) offshoring	Offshore outsourcing

Source: based on UNCTAD, 2004, p. 148

The process was induced by technological development in many various ways. As a result of technological developments, the fragmentation, standardisation and algorithmisation of services processes, the evaluation of service process elements as well as the digitalisation of information were made possible. This is similar to the fragmentation process in manufacturing. On the basis of available evidence fragmentation can go even deeper in services processes. After such fragmentation, certain service processes can be separated and done in locations where they are cheaper, more efficient, or where they provide better quality. As a result, certain services became tradable, even internationally. It is now possible to produce certain services in far away locations and consume them in another far away location at the same time, or even at different times. Services dealing with information are particularly suitable for offshoring.

Moreover, (information) technology development allowed the standardisation of business service activities became for a number of manufacturing and/or services activities. For the same reasons, certain services became transportable. New products appeared which acted as “mediators” (e.g. CDs, software) in services trade. Moreover, the outsourcing of services was helped by the ongoing liberalisation process of services trade, even if the actual level of liberalisation has not reached that of manufacturing goods.

Relocated services have specific common characteristics. They are usually:

- labour-intensive,
- structured, describable with simple algorithms, and can be standardised,
- connected to information (e.g. information processing), and rely on telecommunication (e.g. internet),
- routine work which can be relatively easily measured, evaluated,
- mass production but can be provided from one location,
- relatively low risk where the trust factor is not significant,
- exploiting significant differences in wages (labour costs) between the home and host country for the affected service activity, and
- low costs of the establishment of a plant/office/location.

They are very diverse activities, and their skill content varies from the least skill intensive (involving physical work, e.g. photocopying, transporting documents) to processes using the highest quality workforce (e.g. software development). Even for the same activity the skill content may differ depending on the actual content of the activity: e.g. a call centre can provide basic information in one language or in multiple languages, or more comprehensive information in multiple languages.

3. Global and Eastern European trends

The process of services outsourcing started in the U.S. Initially other Anglo-Saxon countries (first of all Great Britain) joined the U.S. in that process. Countries of continental Europe began offshoring services later, and they are currently catching up with the first movers. On the receiving end, “mirroring” home countries and reflecting the dominance of the English language, Ireland, India, Canada and Israel are the most important targets (UNCTAD, 2004). Ireland’s market share in IT and business services can be still around 25%. The overwhelming majority of production is still located in developed countries, and in the relocation process, the developed countries are still the main targets. Thus, the market share of emerging and less developed countries (with the exception of India) is still much lower than one would think on the basis of media news. According to a Gartner survey, in 2005, the total sum spent on services outsourcing was USD 34 billion, of which 3-3 billion went to Central- and Eastern Europe, to China, to South-East Asia and to Latin-America.

Among less developed countries, India is traditionally the most important target. The use of the English language is one of the key reasons for this. The early start and the important role of India in offshoring is underlined by the growing number of Indian companies specialised in services outsourcing (e.g. Satyam, Tata, Infosys). Besides India, “emerging” Asia (China, Malaysia, Singapore etc.) are important relocation targets. There are very few data available, but it is revealing that two-thirds of financial sector employees working abroad through offshoring are employed in India.

In Europe, traditionally, Ireland is the most important host country, but other “old” EU member countries also have a relatively high market share (first of all the United Kingdom, Portugal and Spain are important targets). It is also characteristic for Europe that local affiliates of U.S. companies are the first movers (see e.g. cases described in Hunya, Sass, 2006, such as EDS or GE), while European-owned companies react slower, and opt for services outsourcing with greater difficulty.

There are more and more countries joining in the services outsourcing process. Wages grow in traditional host countries; suitable labour becomes less available; and potential host countries develop their infrastructure and business environment. As a result, new countries appear on the map of services outsourcing. The importance of new EU members as service relocation destinations grows. However, their market shares are very small, and even their role in relocations is quite limited. Due to methodological problems this statement is difficult to prove. Nevertheless, a number of information sources lead to similar conclusions.

An obvious starting point is to look at data on realised FDI projects. In Europe, there are 1400-1500 services centres, of which 150-180 are located in Central Eastern Europe, mainly in the Czech Republic, Hungary and Poland. About 40-50 such projects were realised in each country until now, including captive service centres. The Czech Republic joined in the process a little later than the other two countries. While Poland and Hungary host a wide range of activities, Czech centres tend to specialise in IT-related activities.

It is important to note that the majority of bigger projects go to India even from Europe. According to the data of UNCTAD (2004), one-third of services outsourcing projects by European multinationals went to India. The share of Western European countries (Ireland, Portugal, Spain and Great Britain) was 29% and 22% of the projects moved to Central and Eastern Europe, mainly to Hungary, Poland and Romania. (Since then, the Czech Republic caught up with the others.) As larger-than-average projects go to India, the country's share in terms of the value of FDI can be as high as 50%. Altogether, the role of Central and Eastern Europe is growing, though it is not as big as one could expect on the basis of the information. Usually centres servicing Europe are relocated to and concentrated in the region, mainly by extra-European (U.S.) multinationals. The most important attracting factors for these kinds of projects are the level of information technology infrastructure and use; the availability of skill base/(required) language knowledge; in certain cases FDI incentives, and finally, proximity/good geographic location. As the cost advantage of Central Europe has been gradually eroding, there is some upgrading while certain activities move further to cheaper Romania and Bulgaria.

A second source of information is the New Cronos database of Eurostat, which provides annual enterprise statistics on services including data on turnover and employees. If relocation takes place between European countries, then sectoral output and employment should rise significantly in host countries while it should fall in sending countries. However, there are two important caveats. First, fast growth of certain sectors could simply be a consequence of economic catch-up and structural change. Second, services relocation need not be associated with declining services output in sending countries.[19]

Keeping these in mind we compared the performance of EU members in three business service sectors by three measures. We estimated the relationship between the level of economic development (GDP per capita measured on PPS) and the size of these service sectors (relative to GDP) to account for structural changes that accompany economic growth. Then we calculated the size of services sectors implied by the level of economic development in each country. Our first measure of interest is a 'development gap': the difference between the actual and implied European market share of a country's service sector. A positive development gap suggests that the service sector is more developed than expected. FDI inflows are one possible explanation for such a phenomenon. The second measure is relative growth: the growth of services output relative to GDP growth. Strong relative growth indicates ongoing structural change, which can be catalysed by relocation. The third measure is the (absolute) growth of turnover and employment in services over

[19] As an example, consider an industrial company that outsources some business processes (e.g. accounting, IT) to a subsidiary in another country. Before outsourcing these processes were accounted for as costs within the manufacturing sector. Following relocation, they are accounted for as purchased services from a different sector. Outsourcing then leads to lower value added in manufacturing and higher value added in services. We do not undertake to measure the effect of outsourcing on industrial value added in this study.

the 2000-2005 period. A necessary condition for the identification of relocation is strong growth of services performance in host countries. In the tables below 'strong' performance means 'significantly above EU average', while 'weak' performance means a fall of the respective indicator. Strong performance by these indicators raises the suspicion of relocation to a country; consistently weak performance may suggest relocation from a country.

Table 2. | Growth of selected services sectors in EU members, (2000-2005)

a) Computer and related activities

	Strong	Weak
Development gap (actual European market share / market share implied by level of economic development)	**BG**, CZ, **HU**, **RO**, SE, UK	CY, GR
Relative growth (sectoral output growth / GDP growth)	**BG**, **HU**, **RO**	**NL**
Absolute growth (turnover and employment)	**BG**, CY, EE, GR, **HU**, LV, LT, **RO**, SK, SI, ES	BE, **NL**, SE

b) Research and development

	Strong	Weak
Development gap (actual European market share / market share implied by level of economic development)	UK	**BG**, EE, IT, LT, **PL**, PT, **ES**
Relative growth (sectoral output growth / GDP growth)	**DE**, **GR**, **LT**	**BG**, CZ, FI, LV, NL, **PL**, RO, **SK**, **ES**, SE
Absolute growth (turnover and employment)	AT, EE, **DE**, **GR**, **LT**	**BG**, LV, NL, **PL**, **SK**

c) Other

	Strong	Weak
Development gap (actual European market share / market share implied by level of economic development)	**HU**	CY
Relative growth (sectoral output growth / GDP growth)	**BG**, **HU**, IE, IT, LV, LT, **RO**	GR, PL, **SE**, **UK**
Absolute growth (turnover and employment)	**BG**, EE, **HU**, LV, LT, **RO**	**SE**, **UK**

Source: Eurostat, own calculations
note: bold=countries with strong/week performance by at least to measures

Some clear trends emerge from this qualitative analysis. Some new EU members (most notably Bulgaria, Hungary and Romania) have fast-growing business service sectors in the fields of computer and related activities as well as other services (including accounting, engineering, call centres). The Netherlands lost ground in computer and related activities, while Sweden and the UK are falling behind in other services. On the other hand, research and development is languishing across Central and Eastern Europe.

Locally-owned facilities often lack resources while multinationals (for now) tend to keep development in their home countries. Perhaps surprisingly, German research and development enjoyed strong growth, along with its Greek and Lithuanian counterparts.

The key conclusion from Eurostat enterprise data is that relocation could have indeed taken place. However, large-scale changes in sectoral performance are limited only to a handful of countries. In most EU members the actual amount of relocation could be limited.

4. Effects of services relocation: the case of Hungary

Hungary takes part in services relocation mainly as a host country. However, contrary to what is suggested by the media, Hungary's share is modest in the services outsourcing process, even if we consider only intra-European transactions. Hungary started to take part in the process from the late 1990s; a boom in services FDI connected to outsourcing has been recorded from 2002. At present around 20 thousand people work for various service centres in Hungary, around three fourth of which are employed in Budapest, including "captive" service centres.

Table 3 contains a list of those projects, where ITDH (the Hungarian Investment Promotion Agency) acted as mediator in the establishment of local affiliates and who received government support. These 16 companies carry out various activities, from call centres to financial services to software development. Their combined job creation exceeds ten thousand. While their main location is Budapest, more and more shared service centres (SSCs) go to countryside towns. Anecdotal evidence suggests that the available labour pool around Budapest is being depleted and new entrants resort to labour poaching, which sends wages spiralling upwards. Nevertheless, firms generally remain reluctant to choose locations outside Budapest.

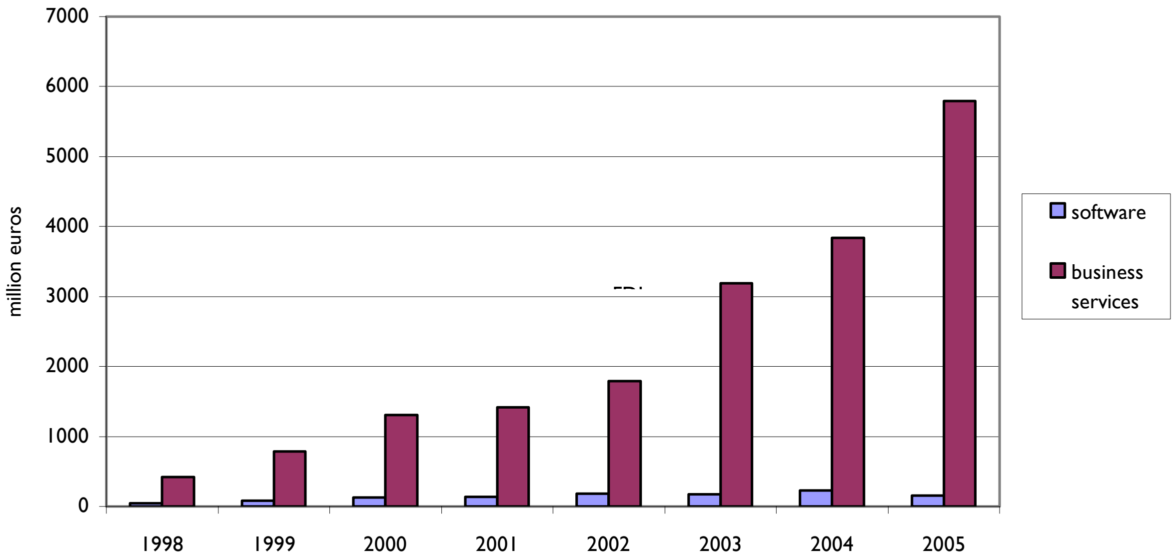
Table 3. | Supported SSCs in Hungary

Company	Sector	Country of origin	Location	Number of jobs created (planned)
ExxonMobil	Energy	USA	Budapest	1200
IBM ISSC	IT	USA	Budapest	1300
Diageo	Beverages	United Kingdom	Budapest	600
Getronics	Electronic manufacturing	Netherlands	Budapest	510
Jabil	Electronic manufacturing	USA	Szombathely	719
SAP	IT	Germany	Budapest	600
Tata	IT	India	Budapest	450
Convergys	Business services	USA	Budapest	282
EDS	IT	USA	Budapest, Szeged	1150
InBev	Beverages	Belgium	Budapest	380
Budapest Bank	Financial	USA	Békéscsaba	530
Morgan Stanley	Financial	United Kingdom	Budapest	450
Citigroup	Financial	USA	Budapest	302
Vodafone	Telecommunications	United Kingdom	Budapest	746
British Telecom	Telecommunications	United Kingdom	Budapest, Debrecen	700
T-Systems	IT	Germany	Budapest, Debrecen	1750

Source: Hungarian Investment and Trade Development Agency (ITDH)

Services offshoring has been associated with high growth of FDI inflows in affected sectors, mainly software and business services. It is especially in business services after 2002, that this growth has become very robust. FDI in business services represents around 10% of the total stock of FDI in Hungary.

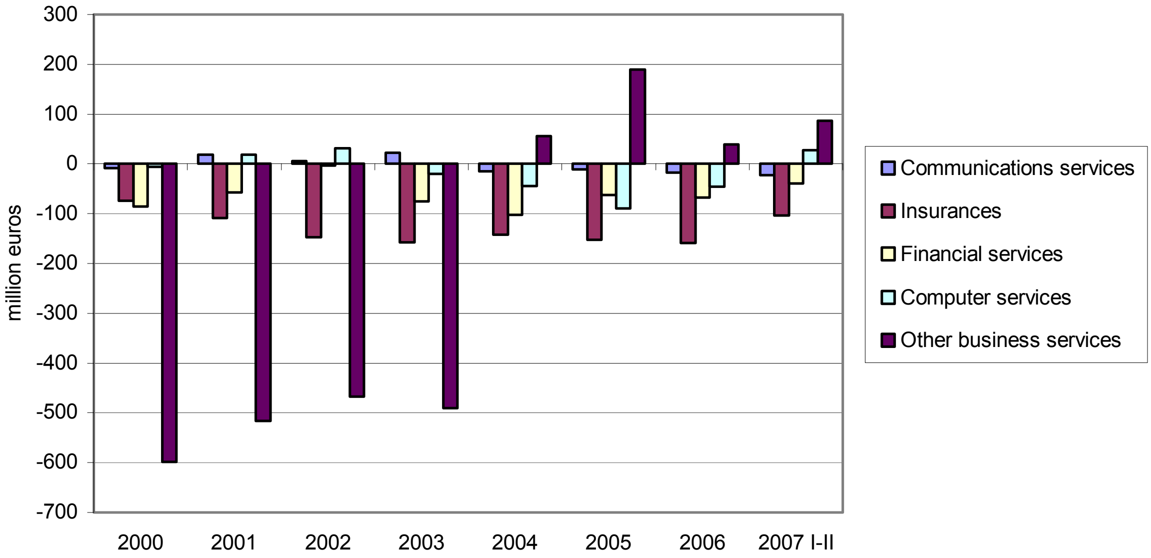
Figure 1. | FDI stock in selected branches, (1998-2005)



Source: Hungarian National Bank

The impact of offshore outsourcing of services is also apparent in the development of services trade balances. It is mainly Other business services which turned the trade balance positive in 2004; since then it has remained in surplus. Moreover, starting from 2007, preliminary data indicate a similar change for computer services.

Figure 2. | Service trade balances, selected branches, (2000-2007 I-II)



Source: Hungarian National Bank

5. Conclusions

Services relocation is affecting the new EU members: their geographical proximity, low labour costs and improving infrastructure make them attractive offshoring targets. However, the magnitude of relocation flows suggests that they do not “steal” jobs from Western Europe. Indeed, given their small size they are likely to remain small players on a global scale. Nevertheless, individual host countries can benefit from services relocation. These relatively labour-intensive sectors create white-collar jobs and exports with high skill content.

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Predrag Bejaković:
Labour markets and labour force mobility in Southeast Europe: Status and problems

Abstract

Migration, or labour mobility, is an important economic phenomenon. Migrants flow from regions with high unemployment and/or low incomes to more prosperous regions, attracted by higher wages and/or better employment prospects. The article explores the situation with labour markets and labour force mobility in South East Europe. Existing high unemployment will probably not be a major barrier to possible entry of SEE countries into the EU. According to the experience of several countries (Ireland and Portugal for example), integration into the EU, because of accelerated economic growth and development and the increased entry of foreign investors, can be a very successful way of solving the problem of unemployment. Also, there is no reason to overestimate the number of people willing to migrate to Western Europe. Economic development in SEE is *essential* in the palliation of poverty and limiting desire for migration, but it is not a *sufficient* condition of success. Economic development is nevertheless crucial because it increases the chances of finding work, and work is the capital the people in SEE depend on most.

Keywords: labour market, migration, labour force mobility, South East Europe, EU accession

1. Introduction

The past decade has been a decade of dramatic transformation in South East Europe (SEE) countries. The process of transformation in the last twenty years from a centrally planned to a market economy brought deep structural economic and political changes that had a strong impact on the real output in all of the transitional countries, albeit with different intensities. These changes were most important in real output and factor markets, especially in labour allocations. The labour market has the most important role in determining the standard of living of citizens of every society. One cannot separate the events on the labour market from the general economic, political and social context in which it was developed, so analysis of current labour market situation and labour mobility requires a brief insight in country's trajectory.

The article explores the situation with labour markets and labour force mobility in South East Europe. After Introductory notes, Section 2 gives the theoretical framework, with the basic facts about the competitiveness and labour mobility. Section 3 deals with motivations for migrations, while Section 4 examines experiences of previous EU accession. Section 5 provides international comparison and situation on labour markets in particular countries. Short Section 6 is dedicated to the role of EU accession, while Section 7 is dedicated to concluding considerations.

2. The theoretical framework
2. 1 What is competitiveness and why is it important?

According to the most widely accepted definition, competitiveness is the ability to achieve success on markets, which then leads to a productive economy and improved living standards for the overall population. Acceptance of the concept of competitiveness is a key to country's further development, because numerous studies (Sachs, Zinnes, and Eilat, 1999; Bassanini, Scarpetta, and Visco, 2000; OECD, 2001) have shown a strong link between competitiveness indicators and economic growth, and this in turn influences the attraction of foreign investment, alleviation of poverty and inequality, political stability, and so forth.
When speaking of a given economy's competitiveness, the importance of labour force competitiveness is the focus of particular attention. Barro and Sala-i-Martin (1995) have shown that level of education of the labour force (measured by years of schooling), as well as public sector allocations for education, exhibit a high correlation to the growth in real per capita income. The most important factors in labour force competitiveness are the educational structure, and compatibility of labour supply and demand in the sense of knowledge, expertise, ability and labour costs. Contemporary knowledge clearly stresses the importance of human capital under the current conditions of the global economy and a knowledge-based world.

The better education of the general populace and the labour force and lower public spending improve a country's attractiveness to foreign investors, which facilitates the acceptance and development of modern technological and organizational solutions, paves the way for the rule of law and limits the extent of the informal (grey) economy, increases demands for education and in turn spurs the competitiveness of the economy. Benhabib and Spiegel (1994) have established that the degree of education influences economic growth primarily through technological innovations, as well as through the speed of the assumption and spread of new technologies. A better-educated labour force finds it easier to embrace foreign technology and rapidly develop its own.

Educational institutions and the education level of a population not only influence the creation of human capital, but also the invigoration of socially beneficial capital and the minimization of dysfunctional forms of social capital. Education doubtlessly carries ancillary non-market effects (for example, easier access to information, greater care for personal health, more active participation in social life which encourages responsible democratic civic behaviour, election of democratic authorities, and actualization of the rule of law) (Wolfe and Haveman, 2001).

Education is certainly essential in the creation of the necessary competitiveness of an economy and society as a whole. It helps a country move up "the ladder of development" and prompts its transition from producing simpler products to more complex items. A more educated labor force finds it easier to adopt foreign technology and to more rapidly develop its own. Another vital aspect in all of this is the acceptance of the rule of law. Human capital is *a critical component* of competitiveness and economic development (return on investment in education is greater than that of any other investment), but there is no *guarantee* that the formal education structure accurately reflects real abilities and skills.

2. 2 Basic facts and lessons about the labour mobility

Migration, or labour mobility, is an important economic phenomenon. In particular, geographical labour mobility has been suggested as a strong instrument to foster fast economic adjustment and growth. Migrants flow from regions with high unemployment and/or low incomes to more prosperous regions, attracted by higher wages and/or better employment prospects. In this manner, migration helps facilitate regional adjustment to adverse shocks to economic activity: excess labour leaves depressed regions, thereby driving down inter-regional differentials in wages and unemployment.

While economic growth and the creation of new jobs are strongly associated with the willingness to take up chances across regions, the supply of jobs also regulates the flow of people seeking work. Zimmermann (2004) underlines that in the today globalised world, migration is a controversial and challenging issue. Only when a significant rise in economic growth will boost the demand for labour and create new jobs will the geographic mobility of natives rise significantly.

In a hypothetical economy with perfect factor mobility, regions would adjust to asymmetric shocks immediately. When factor mobility is limited and prices and wages rigid, the effects of asymmetric shocks persist and regional economies have to rely on other mechanisms, such as inter-regional fiscal redistribution (Fidrmuc, 2001). However, in the real world, this is not the case and mostly due to bureaucratic reasons poor unskilled workers have highly restricted opportunities to migrate to work in richer countries (World Bank, 2005).

3. Motivations for migration and its decomposition

The recent labour flows in SEE Europe region seem largely to be a response to poorly functioning labour markets, insufficient productive capital, the low quality of life in a number of migration sending countries, and a rising demand for unskilled labour for the non-traded services sector in the labour-importing economies in the EU. As mentioned, people migrate because of wage differences and economic motivations but also by the desire to escape wars, civil conflict, systemic transition and relocate to ethnic homelands in many instances.

Thus, it is possible to hypothesize that broad, quality of life considerations drive or even inhibit migration. Differences in political stability, human rights situations, and the general rule of law may also affect migration, because these factors serve as a proxy for the level of individually perceived insecurity. Many people agree (or were forced) to leave their familiar surroundings when their home countries do not provide for their physical protection from attack or abuse, or have poor public-service delivery and governance at the local and national level, an uncertain business investment environment, or high unemployment.

Motivation for migration can be grouped according economic and demographic, political and social and cultural factors on one side and on the push and pull factors on the another (Table 1).

Table 1. | Motivation for migration

	Push factors	Pull factors
Economic and demographic	Poverty Unemployment Low wages High fertility rate Lack of basic health and educational services Unfavourable entrepreneurial and investment climate	Prospect of higher wages Potential for improved standard of living Personal and professional development
Political	Conflict, insecurity, violence Poor governance Disrespect of human and political rights Corruption	Safety and security Political freedom
Social and cultural	Discrimination based on ethnicity, gender, religion, and the like	Family reunification Ethnic (Diaspora migration) homeland Freedom from discrimination

Source: World Bank, 2006; Fidrmuc, 2001.

Borjas (1987) points out that migration responds not only to average wages but also to their dispersion reflecting underlying inter-regional differences in rewards to skills. In particular, regions (countries) with relatively egalitarian wage distribution will attract primarily low-skilled workers, whereas high-skilled workers will choose to migrate to regions with more uneven wage distribution, where the returns to skills are higher. As much of the Diaspora migration ran its course and security risks diminished, migration flows began "normalizing" and much current migration reflects perceived expectations about differences in income and the quality of life.

Zimmermann (2004) believes that migration challenges can be decomposed into a number of channels. A *first* channel is unskilled migration consisting of the poor and helpless, those are knocking at the European doors. A *second* channel is migration of the most skilled in the labour force because human capital is the ultimate resource of the 21st century. Most of developed economies face a strong and increasing excess demand for skilled labour, fostered by technological change, population aging and a subsequent decline in the future native European workforce. The upcoming needs hardly can be satisfied by the local labour force or the local educational system. Europe is participating more and more in a competition to attract international skilled labour to fill the gaps. A *third* channel for the global impact of migration on the economy is the required productive mix of skilled and unskilled workers at the workplace. It is increasingly obvious that the lack of qualified workers decreases the incentives to hire low-skilled workers.

If Europe fails to train enough people or to attract high-skilled labour, there will be soon a pressing need to develop markets that supply jobs for unskilled labour. Factor mobility is the *fourth* channel of labour competition. If people do not move or are not allowed to move, trade or capital mobility may take its place. For instance, cheap labour is embodied into the imports of goods, and this threatens home production and low-skilled workers in particular.

4 Lessons from the European experience with migration

4. 1 Lessons from the previous migration

Succinctly, the lessons from the European experience are:
In the past, the labour market integration of migrants has been slow, but steady. The impact on the natives has not been very strong, but mostly beneficial. First generation migrants are not faring well in comparison to natives, but second generation migrants are becoming more similar to the natives. However, with globalisation and the particular pressure on low-skilled workers and the increased demands on high-skilled people, the nature of the game seems to change.

Both trade and labour flows in today's world are qualitatively different from those observed during the earlier period of globalization. During the earlier globalization period, migrated mainly unskilled workers, while today *brain drain* is a key feature of international migration. Furthermore, increased international flows of goods serve to reduce international labour mobility.

The Eastern enlargement process has caused debates about additional immigration from the SEE, since all labour markets will eventually have to open up to workers from the new and future Member States. The aim is to rapidly raise living standards in the new Member States and to improve economic conditions in the EU in general. Thus, there is a ubiquitous question with EU Eastern enlargement process: are there reasons for fear? Some EU members are considering imposing restrictions to the latest (Romania and Bulgaria) and future members (Croatia).

4.2 Is there a reason for fear?

Experiences of previous EU accession showed that fears were exaggerated. Accession of Greece (1981), Portugal (1986), and Spain (1986) to the European Community (EC) was accompanied by predictions of massive waves of economic migration to Western and Northern Europe. Similar "doomsday" scenarios resulted when EU membership expanded into Central and Eastern Europe (CEE) in 2004. The income differentials between these new Member States and the majority of the EC raised fears that wages would be depressed and unemployment of indigenous workers would result in the older EC states.

The most extreme of migration levels were not as elastic to wage and employment differentials as some empirical estimations would predict. Though the decision to migrate for more productive and lucrative jobs is certainly related to the search for a higher-quality life, wage and unemployment differentials alone will not explain as much migration as when combined with these broad quality-of-life concerns. Significant increase of real wage premium, might be of little consequence to the prospective migrant if his chances of actually securing a job are very low (Todaro, 1969).

There are also substantial "disutility" costs associated with the relocation from one's own social - cultural - linguistic context into an alien one. Although ignored in the literature, these costs are in fact among the most important factors that set natural limits to international migration. Significant portions of country's workforce may, all else being equal, prefer to remain at home rather than take on the risks of moving abroad and leave family and friends because of language as well as cultural and traditions factors.

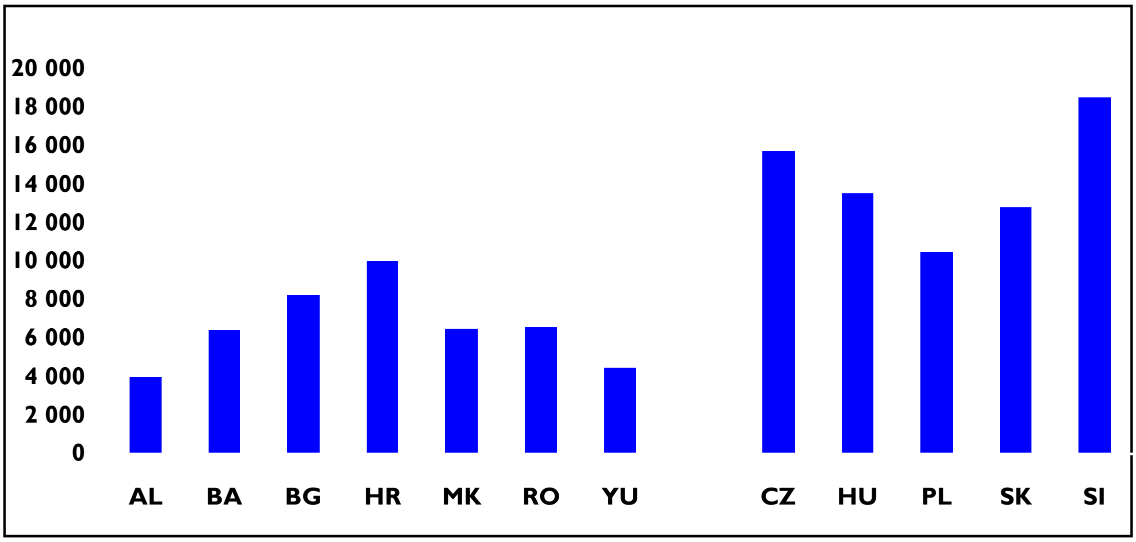
5. International comparison and national Situation
5.1 Common characteristics

Emigration and immigration have many dimensions including social and humanitarian, but (probably) economic situation and labour market conditions are crucial. Thus, we briefly analyse:

- GDP level and trends
- Unemployment and employment rates
- Poverty rates and socio-economic situation.

As seen from Figure 1, there are huge differences in economic development between SEE and Central Europe countries. SEE countries are significantly lagging behind new EU members.

Figure 1. | GDP per capita USD at PPP (2002)



Source: World Bank

However, in the last few years some of the SEE countries (particularly Serbia and Albania) realised respectable economic growth (Table 2). Economic growth accelerated significantly in 2007 year in most countries in the region in comparison with the previous year. Real GDP growth reached 6.1% in average in the Western Balkan countries. It was 0.9 percentage point higher than that in 2006. The rapid economic growth was supported by high private consumption and investments, which reflects that domestic demand fuels most of these economies (ICEG European Center, 2008).

Table 2. | Real Gross Domestic Product: Rates of Change

Country	Real GDP Annual Growth (%)					Cumulative change
	1990-2000	1995-1999	2000-2004	2003	2004	1989-2004
Albania	3.5	5.3	5.4	5.7	5.9	30.1
Bosnia and Herzegovina	-	22.9	4.9	3.2	4.0	229.9*
Croatia	-1.6	3.4	4.5	4.3	3.8	-5.3
Macedonia	0.8	3.0	0.7	2.8	2.9	-16.5
Serbia & Montenegro	-1.5	0.4	4.7	2.1	8.0	-46.3

Sources: World Bank, World Development Indicators 2006,
UNECE, Economic Surveys of Europe, No. 2/2005,
** 1995=100*

As the situation on the labour market changes relatively slowly, it is necessary to analyse it in a longer time period. The employment/unemployment situation varies in the EU Member States, but all current non-members countries in SEE had high unemployment rates at the beginning of the decade (in the range from 14.5% in Albania to 40% in Bosnia and Herzegovina) and various economic activity rates (low in Croatia and Bosnia and Herzegovina, high in Albania – probably due to the high activity rates in agriculture and the significant number of people active as individual farmers). Table 3 presents unemployment rates in Central and East Europea countries for comparison.

Table 3. | Low employment and high unemployment rate (2001)

	Unemployment rate		Economic activity rate1
	Registered	Labour Force Survey	
Albania[2]	14.5		66.1
Bosnia and Herzegovina	40.0	.	.
Bulgaria	17.3	19.7	49.6
Croatia	23.1	15.9	49.7
Macedonia	.	30.5	55.5
Romania	8.4	6.6	62.2
Serbia & Montenegro	27.9	12.9	57.3
Czech Republic	8.9	8.1	60.0
Hungary	7.9	5.7	53.3
Poland	17.5	18.2	56.3
Slovakia	18.6	19.2	60.8
Slovenia	11.8	6.4	58.2

Source: World Bank; Note: 1) Labour force in % of working age population 15+, 2) Data on Albania for 2000.

The situation has improved, but not significantly. Participation and employment rates are still generally low and dependency ratios high. Unemployment remains the weak point of the mentioned countries in SEE. The average unemployment rate is expected to fall to under 20% in 2007. However, unemployment exceeds 30% in Bosnia and Herzegovina and the FYR of Macedonia. Croatia has the lowest unemployment rate in the region, the only under the 10% threshold. Unemployment has been gradually decreasing in line with growing employment in the Western Balkan countries mainly due to high economic growth and decreasing informal sector. It is expected unemployment to decrease even further, to 18.5% on average.

According to absolute criteria, poverty in Croatia, Serbia & Montenegro and Macedonia is not very high (less than 2%), particularly if it is compared with Albania (Table 4). Still, poverty in those countries lasts a long time; those who become poor need a lot of time to extricate themselves from poverty (IMF, 2005, 2006).

Table 4. | Poverty and Income Inequality

Country	Year	Poverty rate in %	% Population below 2 USD	Gini Index
Albania	2002	23	11.8	0.28
Bosnia and Herzegovina	2001	19	-	0.25
Croatia	2001	8	<2	0.29
Macedonia	1998	11	<2	0.36
Serbia & Montenegro	2003	10.5	-	0.28

Source: IMF, WB, various publications

In all of the mentioned countries, people have developed their own survival strategies as the region disintegrated internally and as markets and jobs and income diminished or disappeared. Many have gone into the informal economy and into subsistence agriculture. The division in many countries between formal, informal and casual employment and unemployment is obscure as many people adopt lifestyles with multiple employment status, but still not many are prone to (permanent) emigration. The large scale of the informal economy throughout the region helps people cope with their difficult economic circumstances but damages and delays transition and the development of public services. Key factors such as the labour market improvements, transparency and quality of public services are still not developing with adequate speed, and quite a lot of time is still required for them to be improved.

All the mentioned factors – economic underdevelopment, high unemployment and limited employment possibilities, relatively high poverty rates, unsatisfactory quality of public services - caused significant emigration pressure. Next to seeking work in the informal economy, leaving the country to find employment abroad is a prevalent response of workers to unemployment or unsatisfactory job offers at home. Where public income support for the jobless is low, overseas migration may be seen as a survival strategy of workers. Although there are many similarities among the mentioned countries, regarding the situation on the labour markets there are also considerable divergences among them.

5.2 Particular countries

Albania – Albania has an agrarian subsistence economy, characterised by a big percentage (94%) of micro and small enterprises and high degree of informality. The extremely high levels of self-employment (63% of all employment) cast doubts on the existence of a functioning labour market. The lack of formal jobs leads people to start their own activity for income generation which is often low skilled, low value added and low paid.
Bosnia and Herzegovina - New entrants have great difficulty in finding jobs in the formal economy. Those with employment contracts are sometimes without work or pay or under the threat of redundancy (and often unwilling to take a new job because they fear losing pension and other social insurance rights); many work informally. Furthermore, there is weak attachment to the labour market and a large informal economy. Large flows in the labour market are mainly symptoms of financial insecurity for very many people of working age regardless of their employment status.

Croatia - The number of jobs created and lost and the number of people who move between jobs is relatively low. There is very little variety in working patterns and part-time employment is extremely rare in the formal economy. Many discouraged and poorly motivated people in long term unemployment especially in the war torn areas have dropped out of the workforce.

Macedonia (FYR) - Sectoral changes in employment have been relatively modest. Even so, many people went into the informal sector, especially subsistence agriculture, due to lack of formal employment opportunities. Educational indicators suggest large skill gaps compared to the EU and even some SEE countries. But despite demand for higher level skills, there are no other strong signals from the labour market about extensive skill shortages. The working population has grown significantly. In the absence of parallel increases in labour demand, low employment and participation rates have been dragged further downwards.

Montenegro – The service industries account for over 55% of people in employment while industrial activities account for only 15% of employment, significantly less than agriculture. Activity rates for young people are comparatively high but so is unemployment at around 50%. Irregular employment is common. As part of the strategy to legalise businesses the public employment service has been energetic in removing people from the unemployed register who are not actively seeking work. Registered unemployment has been falling since 2000. Much of this reduction was due to the removal of people only registered for basic health insurance. Nevertheless, long-term unemployment is severe; 40% of unemployed people have been without work for over 5 years.

Serbia - The destruction of non-productive and artificially maintained jobs in the formal sector increased the number of people who lost their jobs. Agriculture and SMEs have been the main source of net job creation in Serbia but these sectors are most developed in the informal economy. Labour market mobility in Serbia is quite high but this is not an indication of a dynamic well-functioning labour market but rather of the high frequency of insecure short-term formal or informal jobs.

6. The role of EU accession

More than half of the Member States have entirely implemented the free movement of people. Since the last enlargement round, unemployment rates have been declining and economic growth has increased in the old EU-15. These are clear indicators of the positive effect of applying fully Single Market principles. To enhance this timely limited success, it is necessary to complete the aim of Free Movement. But the Member States will still maintain the right and responsibility to impose certain restrictions.

In overcoming all of the aforementioned obstacles, an important positive role can be played by pressure from international organizations or *external anchors*, such as EU requirements based on the *acquis communautaire* to develop expert and effectual governmental and public institutions as well as flexible labour market. Approaching and eventually joining the EU will certainly help each country raise its competitiveness and create economic and social development, but *expectations are without doubt too high and unrealistic.*

7. Concluding considerations

Existing high unemployment will probably not be a major barrier to possible entry of SEE countries into the EU; rather, according to the experience of several countries (Eire and Portugal for example), integration into the EU, because of accelerated economic growth and development and the increased entry of foreign investors, can be a very successful way of solving the problem of unemployment. Also, there is no reason to overestimate the number of people willing to migrate to Western Europe.

Economic development in SEE is *essential* in the palliation of poverty and limiting desire for migration, but it is not a *sufficient* condition of success. Economic development is nevertheless crucial because it increases the chances of finding work, and work is the capital the people in SEE depend on most.

Finally, it is necessary to learn more about how immigrants currently fare in European member countries, and how they affect the economic well-being of the native populations and public sector finances. It is furthermore important to understand how policy measures have contributed to the current migration situation.

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Béla Galgóczi:
Policy responses in dealing with location competition

1. Introduction

Struggle for survival or fight for new investment has become a daily practice at production locations in Europe. Cases like Volkswagen Brussels, the European restructuring programme of General Motors with location competition between the German plant in Rüsselsheim and the Swedish Trollhätten or the German Bochum and Polish Gliwice demonstrate this day by day.

Nokia's decision to close down its mobile phone manufacturing unit in Bochum, Germany, by mid-2008 and after having opened up a new plant in Romania a few months earlier has again shed light to the phenomenon of relocation and to the policy options how to deal with it. The case itself represented a bad example of unilateral location decisions by multinationals but at the same time pointed to the responsibility of several other stakeholders. From a purely technical point of view this seems to be a textbook example of relocation. Looking behind the media headlines, however, it appears to be more complex, as most such cases are. The mobile phone assembly plant is not being relocated 'one to one' to Romania; part of production will be moved to Hungary, location of Nokia's major manufacturing plant in Europe, other activities to Romania and some R&D related tasks to Finland. At the same time, some activities will also be relocated from the Hungarian plant to the newly opened Romanian unit, while other manufacturing tasks will be moved from Finland to Korea.

The case also has a number of implications for regional policy. The Finnish management argues that closing the Bochum plant is also linked to the fact that supplier industries could not have been established in the region, while the *Land* of North Rhine Westphalia has alleged the misuse of regional subsidies. The case also shows, how the lack of forward looking location policy by several actors (local management, regional actors) have finally led to a point where only passive and defensive measures could have been taken. It is fully justified in a case like this that employee representatives concentrate now on making the exit option of the firm the highest possible in order to provide proper support for the employees in their labour market transition.

In branches, as ICT manufacturing or IT services, the processes in most cases are even less apparent, insofar as complex business strategies conducted on a global scale decide about the future of workplaces at one or another location. While workers are confronted with pressures by employers to cut wages or work longer hours in order to keep their jobs, concessions do not always guarantee the jobs, as the case of the mobile phone unit of Siemens in Germany showed.

Multinational corporations (MNCs) have become mighty actors able not only to move capital around the world in order to capture global advantages from lower production costs but also to use the threat of relocation in order to obtain more favourable regulation from governments and concessions from trade unions.

With the integration into world trade and global factor flows of countries that had been isolated for several decades, not only did new markets emerge but a huge labour force of hundreds of millions of workers also became integrated into the world economy. Central Eastern Europe /CEE/ (and also, to some extent, China) have at their disposal a medium- to high-skilled labour force at much lower costs. These regions have very different features whether in terms of labour and capital, or commodity price ratios and cost structures. The combination on a large scale of global capital and the additional labour supply from emerging countries has effected a fundamental shift in comparative advantages.

Pressures have been further amplified as global capitalism has changed its face and managerial capitalism has been giving way to financial capitalism with shareholder value often taken to extremes.

These processes have resulted in a shift of balance between labour and capital to the detriment of labour and it is to be expected that factor mobility will continue to be a decisive element of the world economy while the pressure exerted by global capital and product markets is unlikely to decrease.

This does not mean, however, that employees and trade unions will remain confined to a defensive role, often able to do no more than focus their efforts on minimising the social consequences of relocation and restructuring in a passive way.
Given the complexity of the 'relocation' phenomenon, there is a need to address the diverse patterns of capital mobility and location competition by policy makers and interest representations at different levels.

2. What policy makers and unions do and can do in order to manage location competition in a socially sustainable way

2.1 Principles of socially responsible location management

It is quite clear that increased capital mobility is not a temporary phenomenon and, despite convergence, wage and income differences in the world will remain substantial in the foreseeable future, while the pressures from global product and capital markets are unlikely to ease. Even if the eastern enlargement of the EU represents an important attempt to diminish regional differences, the convergence of the poor eastern European regions will take several decades and wage differences are bound to remain substantial in this period.

We have shown some characteristics of location competition and the pressures exerted by capital mobility on production locations, inducing restructuring waves and often pressing for concessions from workers (Galgoczi et al 2006).

Trade unions need to face these challenges – rather than hoping that they will disappear – and acknowledge that permanent change has become the reality in a global environment. It is precisely this unprecedented restructuring challenge that represents the central impact of global capital mobility that needs to be addressed not by trade unions alone but also by policy-makers on different levels of the economy.

There are two major dimensions of socially responsible location management under the circumstances of increased location competition induced by global capital mobility:

- fair distribution of the costs of restructuring;
- maintaining the competitiveness of the location through the 'high-road' approach in an advanced looking way.

First, accepting the necessity of change does not mean accepting a dictate from the employers. The costs of whatever restructuring should be borne equally by all parties (employers, workers and the state) and not by workers alone, as is mostly the case. Recently corporate profits and management incomes have been soaring in Europe and worldwide, while employee compensation is stagnating in the developed countries and, in the case of emerging economies, fails to keep pace with productivity gains. Employees should benefit from the gains of globalisation and should be compensated for the losses attached to it. 'Social damage reduction' is an elementary obligation of employers in cases where dismissals or company closures appear unavoidable.

A fair share of 'pains and gains' also means that employers and, to some extent, the state should provide the necessary conditions to enable employees to develop their ability to respond positively to change.

At the sectoral and national levels, efforts to upgrade the economy and labour force must be strengthened. This requires a *genuine industrial policy strategy* involving both generalised support for research and innovation (the horizontal dimension) and also specific sectoral ('vertical') policies, such as developing and supporting sectors like clean and renewable sources of energy, clean technologies, and environment-friendly transport. Support should aim to help the European economy to move up the ladder of international specialisation and focus on those sectors and activities where world demand is dynamic and where Europe can develop its comparative advantages, building on its profile of high wages but also a skilled labour force and advanced capital stock. Corresponding strategies on the national level are also needed, referring to all countries – whether high-wage or low-wage – in a convergence process (in this regard the national dimension of the Lisbon Strategy should be taken seriously).

In order to facilitate change there is a need for policies to balance flexibility and security, as well as lifelong learning strategies, for which responsibility has to be taken by all parties, namely, the state, the employer and the employee. The current `flexicurity` agenda of the Commission needs more concrete responses and proposals in this regard to avoid that flexibility would be a very concrete and easily applicable strategy, while the security element of the policy mix remains vague and non-defined.

Secondly, an active, forward-looking strategy is needed in order to maintain and update the competitiveness of the production location. The principles of 'high-road' competition strategy should be applied, whereby the comparative advantages of the firm are exploited through innovation and investment, rather than the 'low road' of cost-cutting and social dumping strategies. To formulate a business strategy along these lines is, above all, the responsibility of the management, although employees can be partners in such strategies through information, consultation and participation. Co-operative corporate cultures can offer benefits in business efficiency and could serve as a basis for managing change.

Anticipating change does not mean simply receiving news on time about 'company closure or dismissal plans'. It is much more a question of a socially responsible location management (designed to prevent potential relocation) in order to keep the location viable through training, investment, and innovation conducted in conjunction with unions and works councils.

2.2 Practical examples of attempts at location management

There are already some cases where maintaining the competitiveness of a location has been managed in a forward-looking way that has proved socially sustainable.
The case of the 'Auto 5000' model at Volkswagen's Wolfsburg plant could be seen as an initiative in this direction (Schumann *et al.* 2006).

Although wages of 5000 Deutschmarks (ca 2500 Euro) – i.e. lower than the general company collective agreement – were offered for each of the 5000 new jobs (for which unemployed workers were recruited), the plan was accompanied by a qualification initiative and a work organisation model that made workers responsible for quality.

The collective agreement of 2004 contained guarantees against dismissals for operational reasons up to 2011, an investment programme for German plants and no wage increases until 2007. Cost reduction programmes (e.g. agreements to cut costs with suppliers) and a new working system consisting of three shifts from Monday to Thursday were applied.

The model goes beyond a 'traditional' concession-bargaining case, as the whole package contains several active location-management initiatives, from training measures through innovative work organisation methods to investments.

Employability agreements for managing outsourcing have been concluded at several firms already.

ABN AMRO signed an employability agreement with the four unions regarding the outsourcing of services for 2004–2008. However, "*agreement was not reached on the employer's responsibility to sustain the same level of employment, quantitatively or qualitatively*."

In 2003 ABN AMRO made a major outsourcing of IT services to EDS involving 500 transfers and also an outsourcing of insurance activities to Delta Lloyd (600 transfers) – 10% of the transferred employees used their 'right to return', many of these being older workers.

In 2004, back-office activities were offshored to India with 184 jobs affected. 140 employees were transferred to the internal employability centre and the remainder to other positions within the bank.

Influencing offshoring is above all a matter of anticipation and timely information. None of the commitments was, however, actually able to prevent the offshoring project from taking place.

The offshoring charter of UNI trade union – a good practice example

The offshoring charter of the services union UNI lays down the basic framework on which socially responsible offshoring practices should be based. The most important points cover a wide range of issues from public policies through workers' involvement and labour standards to investment strategies.

Where public policy support is concerned, according to the charter, outsourcing should only follow after a proper public policy debate which has ensured that unions, governments and local community authorities are in full possession of the facts.

Offshoring should be the subject of consultation and negotiation with the relevant unions and works councils.

On employment security, the document calls for the avoidance of compulsory redundancy as a result of remote outsourcing or offshore outsourcing of work. Redeployment of displaced workers should be given priority with protection of career value and conditions of employment. Training or support in finding alternative jobs is necessary, if no other option remains.

Continuing financial savings should be partly invested in skill development to anticipate and better manage change and increase the adaptability of workers whose jobs are at risk.
Where labour standards at offshore destinations are concerned, they should abide by all the core ILO labour standards subject to monitoring by national trade unions and UNI. To prevent "a race to the bottom", agreements on decent wages and working conditions must prevail.

2.3 Potential strategies of trade unions to deal with location competition

Potential strategies of trade unions can be classified along three major lines:

- Strategies to prevent relocation/offshoring and secure the long-term viability of the location;
- Dealing with the social consequences of unavoidable relocation, downscaling cases;
- Building networks of international solidarity among workers to decrease the probability of employer strategies to play off employees at different locations against each other.

Strategies to prevent relocation/offshoring and secure the long-term viability of the location

This first pillar is likely to be the most important strategy element in enabling trade unions to face the challenges of capital mobility and location competition. This is at the same time the most complex issue and the most difficult to put into practice, insofar as the balance of power has shifted to the detriment of labour in the recent period.

Reducing the incentives for relocation can be done in a defensive or an offensive way, corresponding to high- or low-road strategies (see above). Elements of concession bargaining, whereby lower wages and longer working time is accepted in exchange for greater stability of the workplace, are also preventive measures designed to avoid relocation or downscaling. These are defensive measures that, given the current balance of power between employers and employees, cannot always be avoided. Even in such cases, other elements of the agreement should have a more active, future-oriented character, such as, for example, training and investment plans[20].

In order to maintain the long-term competitiveness of the location in a socially sustainable way, more offensive strategies are needed.

A future-oriented location management strategy should thus be backed up by agreements between the management and employee representatives for the long-term viability of the location. Such agreements should necessarily be based on timely information and consultation, while also entailing a co-determination aspect. They can then result in a well-funded joint strategy that anticipates future challenges, based on the examination of alternative scenarios preferably several years ahead. Agreements like this could comprise traditional bargaining issues but should, more importantly, ensure the upgrading of workers' skills by further training to increase productivity in a sustainable way, including also work organisation issues, innovation, R&D and future investments.

This model is possible only on the basis of a strong participatory culture and a trustful employer-employee relationship (co-operative enterprise culture). Unfortunately this is often not the case. But this objective still could offer guidance in cases where the framework of such co-operative enterprise culture still remains to be created.

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[20] In this regard we recall the Siemens case, where a comprehensive agreement had been concluded in 2005 to avoid relocation plans of the mobile phone unit to Hungary (including concession bargaining elements, but also investment and training commitments). The bitter experience was that, even though the imminent relocation was avoided, as a result of a buyout of the unit by a Taiwanese firm, workplaces fell victim to a bankruptcy procedure.

Dealing with the social consequences of unavoidable relocation, downscaling cases

In many cases companies are managed in such a way that the 'official announcement' on restructuring or relocation decisions to workers` representatives takes place when the competitive edge of the location has already been weakened by anticipation and management failures.

The restructuring plan is thus unveiled to workers' representatives with a defined solution of cost-cutting and downscaling that rules out alternative solutions. In other words, employee representatives are presented with a *fait accompli* according to which relocation and a consequent downscaling or company closure is announced as inevitable.

Even in such cases, a number of policy alternatives are available to reduce the negative impacts of actual cases of relocation. They imply that both the company and society take some responsibility for the fate of the workers affected.

Appropriate social plans should accompany company closures or mass dismissals, the costs of which should express the true social costs of such measures, thereby also serving to increase the exit costs for employers that have to be taken into account in their business calculations (the example of the AEG in Nuremberg or the case of Nokia in Bochum show this).

Within this framework, active help for employees during their labour market transition should be provided by the employer. Advance notification of workers is an important precondition, as it provides workers with a head start in seeking new jobs and provides a timeframe for support measures for workers. This allows (public) employment offices and sectoral readjustment schemes to liaise with the company and organise adjustment programmes. Every retrenched worker should have a right to *readjustment support* and European policy-makers and European social dialogue should translate this principle into 'hard guarantees'. The European Globalisation Adjustment Fund should be expanded from its currently symbolic level and passive orientation towards more active and forward looking policies and also be applied to fund innovation measures at local level. Plans for job counselling, retraining and job schemes in other firms from the moment a worker receives notice of retrenchment should be arranged in active cooperation with workers' representatives. Such schemes could be financed in such a way that employers bear a share of the costs, while European structural funds could also be used to support social partner schemes that ensure a right to reinsertion in the labour market.

Building networks of international solidarity among workers to prevent them from being played off against each other

Improving labour conditions in low-wage countries is a general objective in the effort to avoid social dumping. On the global level the core ILO labour standards apply and should be monitored continuously via international cooperation among trade unions and supported by international framework agreements, using also instruments such as codes of conduct and principles of corporate social responsibility.

Within Europe a wide range of legal and institutional arrangements are available, from elements of European legislation to wide-scale co-operation among trade unions. A European framework for common minimum social and labour standards should be drawn up in the future.

Different levels of networks among workers' representatives should be developed to prevent location competition from being used by employers to play them off against each other inducing a downward spiral of social standards.

One important factor in countering such tendencies is the strengthening of information and consultation networks. European works councils and structures beyond (such as, for example, the European Employee Forum of General Motors) can co-ordinate employee strategies to deal with restructuring programmes and relocation threats, building on international solidarity. Such efforts proved successful in the past in hammering out restructuring plans in which no location had to be closed down ('share the pain, share the gain').

Moreover, initiatives such as the European Restructuring Forum could be helpful in implementing mechanisms for applying and monitoring existing guidelines on restructuring, as could a discussion on best practices as set out in the existing guidelines on restructuring, thereby promoting best practice in such a way that European works councils can become more effective in acknowledging their role as agents for change.

In dealing with a relocation threat, often it is enough if trade unions in different countries keep one another regularly informed, but more international co-operation is needed as some positive examples already show (for example, the Vienna Memorandum on co-operation between CEE metalworkers unions).

In addition, trade unions, recognising that their bargaining outcomes are becoming increasingly interrelated, could step up their *coordination of collective bargaining* activities, through the exchange of information, as well as cross-border agenda-setting. Such coordination can avoid the drifting apart – in either direction – of wage and productivity trends within Europe, preventing a race to the bottom on wages and working conditions and permitting a gradual upward convergence of income levels in the newly unified Europe. At present, information and reporting systems are being developed at the ETUC and within the European Industry Federations but these would require substantial strengthening if they are to meet the objectives of coordination.

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