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Service Sector Linkages:

The Role of Services in Manufacturing[1]

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Abstract

We provide empirical evidence for the increasing importance of services as inputs into manufacturing production on the one hand and on the emergence of international trade in services on the other hand. These two facts taken together imply that the impact of openness to trade in services is also gaining importance. At the detailed industry level, we relate openness to trade in individual service sectors to the performance of individual manufacturing sectors distinguished by their skill and technology intensity. We find that increased imports of business services promote manufacturing exports and value added in the most technology and skill intensive industries while we observe a negative effect in labour intensive industries.

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1. Introduction

The economic landscapes of modern, developed economies are dominated by large services sectors. For the OECD members, about 70% of value added and employment are generated in the service sectors (Wölfl, 2003). For the New EU-Member States this share is slightly lower, but still ranges between 60% (Czech Republic) and more than 70% (Cyprus). The rise in the importance of services in modern economies is driven by both final and intermediate demand factors. With national and international outsourcing by – mostly manufacturing – firms, the demand for services as intermediate inputs in production has grown. The disintegration of production processes – also called "splintering" of production - together with technological progress, particularly in information and communication technologies has allowed services to become increasingly tradable. In line with the general expansion of international trade, global services exports and imports have more than doubled over the past decade.

In this article we focus on the link between openness to trade in services and the performance of the manufacturing sector. We start by examining the role of services as inputs in manufacturing and then turn to the related interaction between service sector openness and the relative performance of different industries in the overall pattern of manufacturing exports. The next section illustrates the role of services in the domestic economy. Section 3 examines the existing data on trade in services and emphasizes also current measurement problems. It further describes global and European services trade patterns. Section 4 reports some results concerning the impact of openness in the service sector on individual manufacturing sector's performance within the OECD. Section 5 concludes.
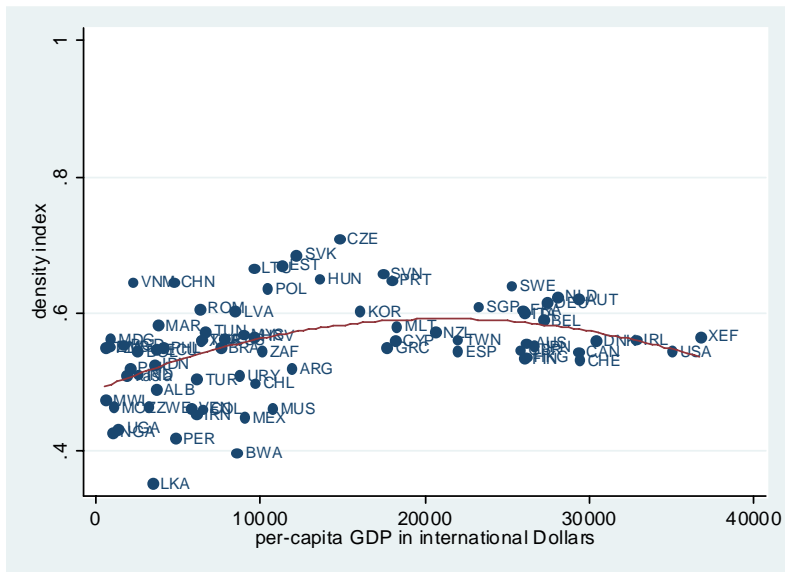
2. The Role of Services in the Economy

While both final and intermediate demand factors are important in explaining the growing share of services in the economy, the rise of services in the economy was initially attributed to final demand factors (Clark, 1940; Baumol et al., 1985). Demand-side explanations have focused on final-demand services and relate the pattern of rising final or consumer service prices to relative productivity differentials. The result is a prediction of stagnating overall productivity growth – Baumol Disease. Related literature on demand-side factors, linked to the Balassa-Samuelson hypothesis, includes Hunter and Markusen (1988), Bhagwati (1984) and Panagariya (1988). These papers focus on final demand factors and predict a shift toward final service production and rising non-tradable prices driven by final demand factors. In contrast, some authors have stressed analytical linkages between intermediate or producer services and the manufacturing sector, assigning both a direct and indirect role for services in the economy and making contrary predictions to those linked to the Baumol Diesease. Katouzian (1970), Francois

(1990a), and Hoekman (2000) have adopted the view that rising demand for producer services as inputs into manufacturing implies overall productivity growth along with a rising share of the service sector.

On the empirical side, authors like Park (1989), Park and Chan (1989), Uno (1989), and Francois and Reinert (1996) also stress the intermediate demand created by the increasing disintegration of production, which implies a rising demand for producer services in countries at higher levels of economic development. A stylized fact that emerges from this empirical literature is that in the long-run, the share of services in the economy follows a U-pattern, where the service sector in general shows an initial decline when a country shifts toward a more industrialized structure of production and then starts to increase its share in the economy again as the country moves further towards a more modern, service-based economy. Final and intermediate demand factors are interacting to generate this pattern. In earlier stages of development final demand services dominate the demand for services, while the economy exhibits a greater importance of intermediate services at later, more advanced stages. The rise in international trade in services is above all strongly linked to intermediate demand factors as a result of an increasing complexity of intermediate linkages – the overall "roundaboutness of production." (See Francois and Reinert, 1992, and Francois and Woerz, 2007.) This so-called density of production encompasses the overall linkages in the economy. Since service sectors have in general fewer linkages as compared to manufacturing sectors, an inverted U-shaped relationship emerges with respect to the density of intermediate use in the economy over time (or across economies at different stages of development). Chart 1 plots this density by plotting direct input coefficients in the cross-section of countries. The graph reflects the importance of backward linkages between sectors, relative to the total level of production activity in the economy.

Chart 1: Density of Intermediate Use Matrix, 2001

2.1 Direct Importance of Services in the Economy

Although the density of backward linkages in the economy starts to fall again after a certain level of development, the direct demand for producer related services is unambiguously increasing with the stage of development. Table 1 gives some crude evidence for this observation. For each manufacturing industry, the demand for business services (measured as the share of intermediate demand for services out of total input demand) is explained by per-capita GDP at purchasing power parities in 2001. The demand for total services is not significantly related to the level of GDP, as had been expected. However, when the focus is limited to producer related services only, a positive, non-linear relationship is revealed for most industries. The results are shown in Table 1 for an aggregate of producer services, which includes transportation, financial, insurance, communication, and other business services.[3] Similar results are found for individual producer related service sectors. However, the patterns point towards some differences across

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[3] This definition is unusual as it includes transportation services. It was motivated by the consideration that the shipment of goods is also relevant for well functioning of the manufacturing sector.

individual manufacturing industries. At the sector level, a significant, U-shaped correlation between income levels and service intensity emerges only for the following labor and resource intensive industries: food, textiles, clothing, leather, paper, coke, chemicals, and metals.

Table 1: Manufacturing Demand for Producer Services

	GDP	*t-stat*	**GDP^2**	*t-stat*	**R^2**
Food	−3.14	*−5.18**	0.19	*5.45**	0.39
Textiles	−2.93	*−2.20**	0.17	*2.30**	0.07
Clothing	−2.98	*−2.38**	0.18	*3.02**	0.19
Leather	−3.91	*−2.40**	0.23	*2.49**	0.07
Wood	−1.21	*−1.20*	0.07	*1.29*	0.03
Paper	−3.02	*−3.23**	0.18	*3.39**	0.16
Coke	−3.69	*−2.11**	0.20	*2.04**	0.10
Chemicals	−4.47	*−4.86**	0.27	*5.02**	0.21
Minerals	−0.64	*−0.54*	0.04	*0.68*	0.07
Metals	−3.32	*−3.39**	0.19	*3.38**	0.10
Machinery	0.27	*0.18*	0.00	*−0.01*	0.13
Electrical equipment	0.52	*0.42*	−0.02	*−0.29*	0.08
Motor vehicles	−0.88	*−0.93*	0.05	*1.00*	0.03
Other transport equipment	−1.01	*−0.87*	0.07	*1.08*	0.10
Other manufacturing	−1.99	*−1.42*	0.13	*1.65**	0.10

*Note: Dependent variable is the intermediate use share of producer services from the use matrix for use of intermediates of each manufacturing industry in 2001; GDP p.c. is per-capita income level, measured at purchasing parities; ** (*) denotes statistically significant at the 5% (10%) level; robust standard errors.*

Source: Francois and Woerz (2007).

2.2 Indirect Importance (Roundaboutness of Production)

The above considerations do not reflect the full importance of services for manufacturing production. If for instance the pharmaceutical industry increases its output, it not only requires additional services directly as inputs (management, advertising, legal services, and such), but also more output from the chemical industry which also uses services as inputs into production. Table 2 below considers these direct and indirect effects. The dependent variable here is the additional direct and indirect demand for business services generated by an additional unit of output in one of the listed manufacturing industries. Again we relate this direct and indirect demand for business services to GDP, which serves as a proxy for the level of development. We observe a linear and positive relationship

for all manufacturing industries, except the leather industry. Similar results are found for other producer related industries. All this reflects the increasing importance of producer related services for more advanced economies.

Table 2: Direct and Indirect Multiplier Effects in Business Services

	GDPpc	*t-stat*		**GDPpc^2**	*t-stat*		**R^2**
Food	0.0396	*4.02*	**				0.13
Textiles	0.0256	*3.43*	**				0.12
Clothing	0.0161	*1.93*	*				0.04
Leather	0.2142	*1.98*	**	–0.0117	*–1.82*	*	0.06
Wood	0.0218	*2.38*	**				0.05
Paper	0.0452	*4.56*	**				0.2
Coke	0.0151	*2.15*	**				0.04
Chemicals	0.0384	*4.48*	**				0.2
Minerals	0.0369	*4.1*	**				0.15
Metals	0.0318	*3.47*	**				0.12
Machinery	0.0411	*5.21*	**				0.26
Electrical equipment	0.0353	*4.91*	**				0.2
Motor vehicles	0.0347	*4.71*	**				0.19
Other transport equipment	0.0298	*3.65*	**				0.11
Other manufacturing	0.0294	*3.6*	**				0.11

*Note: Depend variable is the multiplier coefficient in business services in the respective manufacturing industry; robust std. errors; ** (*) indicates significance at 1% (5%) level.*

Source: Francois and Woerz (2007).

3. Trade in Services

The increasingly important role of services in modern, post-industrial economies partly arises from the externalization of business and other producer services, as has been shown above. The same development, namely outsourcing of service activities by manufacturing firms, has also led to increasing international trade flows in services. Together with technological progress in information and communication technologies this splintering of production has led to a surge in international trade in services as illustrated in chart 2 below, amounting to USD 2.7 billion in 2006. The rise in services trade is particularly pronounced in the category of "other services". More than half of total trade in services falls into this category, comprising commercial, personal and government services. Growth in this category was most dynamic as well. Within other services, about 50% constitute other business services. Financial services are the second most important category

(8%), followed by computer and information services (5%). Thus, producer related services are mainly responsible for the rise in cross-border trade in services.

Chart 2: Growth of Cross-Border Trade in Services, 1980–2005
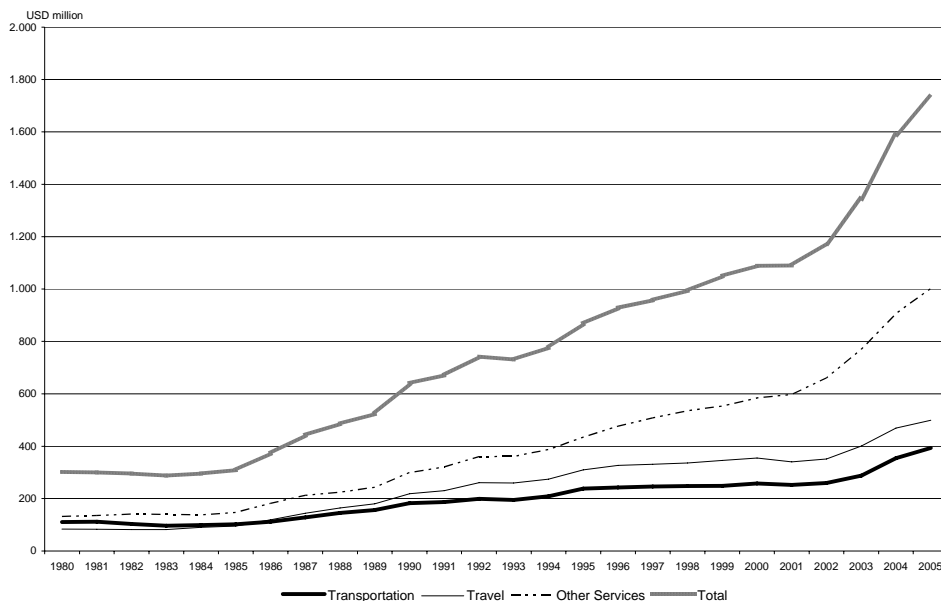
Source: IMF BOP Statistic.

3.1 Data and Problems of Measurement

Chart 2 points to a serious shortcoming in the current measurement practice with respect to trade in services. While data on merchandise trade is traditionally well recorded through customs statistics, trade in services is less well documented for obvious reasons. First of all, the definition of trade in services is far more wide reaching than that for trade in goods. The GATS (General Agreement on Trade in Services) defines four modes of trade for services, only one of which is the cross-border provision of services. Due to the intangibility and non-storability of many services, also consumer and producer movement, as well as sales of services through foreign affiliates are considered as modes of trading services across borders. The balance of payments statistics (BoP), which are generally used as the only source of data on trade in services, cover some of these modes more comprehensively than others. Cross-border trade and trade through the movement of consumers (travel, parts of transportation) is captured fairly well, while trade through foreign affiliates is captured only to a rather small extent. Parts of construction services listed in the BoP belong into this mode. The majority of trade

through foreign affiliates would however be measured adequately through Foreign Affiliate Trade in Services (FATS) statistics. Unlike BoP statistics, these statistics do not yet exist for a wide range of countries. The fourth mode - trade though the movement of the service providers - is also captured very badly in existing statistics. Again, comprehensive FATS statistics would be helpful, but also other sources need to be taken into account here. Recent estimates by the World Bank suggest that BoP statistics record about 60% of total trade in services according to this very wide definition of trade through four different modes. The remaining 40% are almost entirely remaining trade through foreign affiliates, while trade through the movement of service producers appears to be negligible. Of course, this is also related to the fact that little knowledge exists about this type of trade due to poor definitions and missing statistical sources. Taking into account all four modes of international services supply would consequently raise the share of services in total trade from the well-known 20% up to almost 30%.

In this section, we work with a mix of panel data on goods and services trade for the 30 OECD Members from 1994 to 2004, which are taken from the IMF BoP statistics and UN COMTRADE statistics. These data are based on balance of payment statistics and correspond mainly to what has been described above as GATS mode 1 – cross border trade - and mode 2 – movement of consumers. We combine this trade data with the social accounts data (i.e. data on intermediate linkages) used in the section above for 78 countries inclusive of our OECD sample and benchmarked to the year 2001 (GTAP Database, Version 6.2). In the following we give a brief overview of the most recent developments of trade in services.

3.2 Recent Developments and Trade Patterns in Services

Regionally, trade in services is more concentrated among the economically well integrated EU Member States as compared to trade in merchandise goods. About 50% of global service exports originate from the EU, while the same region accounts for "only" 40% of goods exports. The second most important trading hub for services is between the EU and the USA. Asia plays a substantially smaller role in services trade as compared to goods trade. Nevertheless, China has already emerged as the fourth most important single exporter of services in 2006, after the EU (excluding intra-trade), the USA and Japan.

Table 3 illustrates the importance that trade in services has for EU economies. With roughly 10% of exports in 2004, services trade plays a marginally greater role in the New Member States compared to the Old Members States. This hints towards differences in comparative advantages between the two groups of countries. However, also within the Old Member States, substantial differences can be observed between manufacturing based exporters like Germany and countries like the UK, which are strongly specialized in services trade.

On the import side, the data are more similar, pointing towards similar demand structures for services in all European countries. This underlines the importance of services for the functioning of modern economies.

Table 3: Trade-to-GDP-Ratios, Total Services (Cross-Border Trade & Consumer Movement)

	Exports		Imports	
	1995	*2004*	*1995*	*2004*
EU-12	10.3	9.2	7.2	7.7
EU-15	6.0	8.4	5.8	7.7
Germany	3.3	5.2	5.1	7.1
UK	6.7	9.3	5.8	7.0

Note: EU-12 stands for the EU Member States which joined the EU in 2004, EU15 for the incumbent EU Member States.

Source: Eurostat, World Bank WDI.

A decomposition of services by the three broad categories (tables 4 and 5) reveals that the greater importance of service exports for the New Member States arises from relatively high export ratios in transportation and travel services, the two categories which are loosing importance globally. Clearly, exports are underrepresented in the most dynamic category of other services. However, especially here, again import demand is comparable to the figures for the old members, reflecting the importance of producer related services as inputs for the economy.

Table 4: Trade-to-GDP-Ratios, Other Services (Cross-Border Trade)

	Exports		Imports	
	1995	*2004*	*1995*	*2004*
EU-12	3.0	2.9	2.9	3.5
EU-15	2.1	4.4	2.0	3.6
Germany	1.8	3.0	2.0	3.0
UK	3.6	6.5	2.1	2.8

Note: See table 3.

Source: Eurostat, World Bank WDI.

Table 5: Trade-to-GDP-Ratios, Transportation Services (Cross-Border Trade)

	Exports		Imports	
	1995	*2004*	*1995*	*2004*
EU-12	2.5	2.7	1.8	2.0
EU-15	1.4	1.7	1.5	1.7
Germany	0.8	1.2	0.9	1.5
UK	1.5	1.4	1.5	1.6

Note: See table 3.

Source: Eurostat, World Bank WDI.

Finally, table 6 shows FDI stocks in relation to GDP. This is used here as a crude proxy for the economic importance of trade in services through mode 3 – commercial presence abroad. Cleary, this form of services trade is mainly of importance for the more advanced Old Member States and still negligible (on both, the export and the import side) in the case of the new members. Estimates from the US-data suggest that the ratio of FDI stocks to sales of foreign affiliates (what constitutes trade through mode 3) is about 3 to 1. Applying this ratio to the European data, trade through mode 3 would amount to roughly equal importance to trade through modes 1 and 2 combined for the Old Members States. Due to lack of data for this mode of trade, we will focus on cross-border trade of producer services in what follows.

Table 6: FDI-to-GDP-Ratios, Total Services

(proxy for commercial presence)

	Outward		Inward	
	1995	2003	1995	2003
EU-12	0.0	0.7	1.5	8.1
EU-15	7.4	24.0	6.0	19.0
Germany	6.9	24.7	5.8	24.2
UK	10.8	42.3	8.2	22.3

Note: See table 3.

Source: Eurostat, OECD, World Bank WDI.

4. Services Trade and Manufacturing Performance

The evidence on the role of domestic services in the economy presented above together with the observed rise in trade in services suggests that this increased openness towards producer services may show an efficiency enhancing effect on other sectors of the economy, as argued in Markusen (1989); Francois (1990a,b); van Marrewijk et al. (1997); and Markusen Rutherford and Tarr (2005). The empirical literature on this question is rather limited up to date. From Javorcik et al. (2006) we have case-study evidence (for the Czech Republic) that service sector inward FDI can contribute to firm efficiency. Here we look for similar evidence of the direct and indirect effects of increased producer service imports on manufacturing sector performance across the OECD.

We evaluate the role played by service imports within the OECD over the time period from 1994 to 2004, whereby we differentiate between different types of services: core business services, communication, financial and insurance services.[4] We further include total FDI inflows into the service sector as an alternative route for service inputs from abroad through sales of foreign affiliates. All these variables are in logs. In addition, we control for implicit trade barriers as represented by domestic barriers to competition. For this we include indices of product market regulation from the OECD (Conway et al. 2005) for three broad dimensions: barriers to entrepreneurship, state control and barriers to foreign trade and investment. Tables 7 to 9 display the results from the following empirical model:

$$(1) \qquad DepVar_{ikt} = \alpha_i + \beta 1_i \, Mbusiness_{ikt} + \beta 2_i \, Mcomm_{ikt} + \beta 3_i \, Mfinance_{ikt}$$
$$+ \beta 4 \, Minsurance_{ikt} + \beta 5_i \, FDI_{ikt} + \beta 6_i \, Bentrepreneur$$
$$+ \beta 7_i \, Bstate_{ikt} + \beta 8_i \, Btrade_{ikt} + \mu_k + \varepsilon_{ikt}$$

We are looking at the effect of trade in services on both, the domestic performance as well as exports of manufacturing industries. The dependent variable is constructed as follows:

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[4] Data for economy-wide service imports in each category (taken from the IMF) is interacted with the share of the respective service category used in each manufacturing industry. The latter is obtained from the social accounting information provided through the GTAP database.

(2)
$$DepVar_{ikt} = \log\left(\frac{\theta_{ikt}}{1-\theta_{ikt}}\right)$$

where $\theta_{ikt} = \dfrac{X_{ikt}}{\sum\limits_{i} X_{ikt}}$ and X_{ikt} is one of the following: exports, value added or employment of manufacturing industry i in country k in year t. This should give a comprehensive picture of the full effects of economic integration within service sectors on the manufacturing sector. The importance is here to distinguish between individual manufacturing industries.[5] For industries which are strongly using producer services as inputs into production, we expect positive effects of increased openness. However, this does not necessarily have to be the case in all industries. Thus, we group manufacturing industries into one of three groups: technology intensive, labor intensive and resource intensive. What emerges from the results is that imports of business services are an important determinant of the pattern of manufacturing exports in the most advanced industries. While no significant effects from service imports on total manufacturing exports on average can be detected, there are clear positive effects in the most technology intensive industries (here defined as chemicals, electric equipment, machinery and motor vehicles). Again, as was to be expected, it is the imports of core business services that play a role here, while the coefficients on communication, insurance and financial services do not turn out to be significant for the group as such. On the other hand, a negative effect from increased business service imports emerges when we are restricting our attention to labor intensive industries only. This holds true in particular for the textiles, clothing and leather industries. Finally, no effects are found for resource intensive industries. This points to the more advanced industries being vertically integrated, not only nationally but also internationally through the off-shoring of business services. Indeed, the results in table 3 support the notion that off-shoring of business services does actually promote the competitiveness of the most skill and technology intensive industries.

The same results are found for the domestic performance of manufacturing industries (as measured through value added and employment, see tables 8 and 9). Hence, we can expect not only positive output effects, but also positive

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[5] Most of our control variables are highly correlated among themselves. In addition, there may also be a serious problem of endogeneity, especially between openness on the export side of the manufacturing sectors and their openness to service imports. Therefore we employ a 2SLS estimation, with the following variables as instruments for imports of services and the regulatory indicators in the first stage: initial values, country dummies and value added of the respective industry.

employment effects from off-shoring of services in the most skill and technology intensive industries. However, these positive effects are in contrast to negative output and employment effects in labor intensive production activities, especially so in the textile and clothing sector. Thus, the impact of business service imports differs greatly between individual manufacturing activities. The effect on the economy as a whole is ultimately a result of the sectoral structure of the economy.

Table 7: Effects of Off-Shoring on Manufacturing Exports

	Industry group					
	Tech intensive		**Labour intensive**		**Resource intensive**	
	0.2199	*	-0.2319	**	-0.1637	
Imports of business services	*1.68*		*-1.96*		*-1.26*	
Imports of communication services	-0.0819		0.2183		0.1875	
	-0.36		*0.91*		*0.99*	
	0.1618		0.0986		-0.0365	
Imports of financial services	*1.10*		*0.67*		*-0.3*	
Imports of insurance services	-0.1716		-0.0266		-0.1270	
	-1.01		*-0.13*		*-0.86*	
Total FDI inflows	-0.0016		0.0289		0.0095	
	-0.04		*0.54*		*0.22*	
Barriers to entrepreneurship	0.0093		0.4122		-0.0319	
	0.02		*1.45*		*-0.08*	
State control	-0.0806		0.2361		0.0244	
	-0.35		*1.05*		*0.13*	
Barriers to trade and investment	-0.1129		0.0643		0.1762	
	-0.43		*0.27*		*0.78*	
Constant	-3.1994	**	-4.6532	**	-3.3768	**
	-4.29		*-5.08*		*-4.67*	
Observations	182		182		182	
Groups	23		23		23	
within R2	0.2845		0.1956		0.0219	
between R2	0.3740		0.4129		0.3660	
overall R2	0.3073		0.3809		0.3094	

*Note: 2SLS regression results, instruments used: initial values, country dummies, value added of resp. industry group; ** (*) indicates significance at 1% (5%) level.*

Source: Francois and Woerz (2007).

Table 8: Effects of Off-Shoring on Manufacturing Value Added

	Industry group		
	Tech intensive	**Labour intensive**	**Resource intensive**
Imports of business services	0.1580 **	-0.2328 **	-0.0047
	(3.43)	(-3.22)	(-0.11)
Imports of communication services	0.1227	0.3692 **	0.0191
	(1.55)	(3.1)	(0.29)
Imports of financial services	0.0713	0.1152	-0.0820 *
	(1.32)	(1.33)	(-1.95)
Imports of insurance services	-0.1815 **	-0.1924 *	0.0568
	(-2.66)	(-1.86)	(1.15)
Total FDI inflows	-0.0204 *	-0.0703 **	-0.0107
	(-1.72)	(-3.36)	(-0.94)
Barriers to entrepreneurship	0.0313	0.1343 *	0.1140 **
	(0.62)	(1.68)	(2.59)
State control	-0.0746 *	0.1311 *	-0.0454
	(-1.67)	(1.78)	(-1.15)
Barriers to trade and investment	0.0588	-0.0002	0.0549
	(1.34)	(0)	(1.61)
Constant	-3.2654 **	-3.0549 **	-2.9601 **
	(-13.89)	(-8.45)	(-15.63)
Chi-squared	55.34	66.17	37.04
within R^2	0.0847	0.2081	0.1594
between R^2	0.4580	0.2133	0.0341
overall R^2	0.3588	0.2021	0.0228
Observations	182	182	182

*Note: 2SLS regression results, instruments used: initial values, country dummies, value added of resp. industry group; ** (*) indicates significance at 1% (5%) level.*

Source: Francois and Woerz (2007).

Table 9: Effects of Off-Shoring on Manufacturing Employment

	Industry group					
	Tech intensive		**Labour intensive**		**Resource intensive**	
Imports of business services	0.1484	**	-0.1705		0.0226	
	(2.51)		(-1.52)		(0.6)	
Imports of communication services	0.0030		0.2229		-0.0024	
	(0.04)		(1.39)		(-0.04)	
Imports of financial services	0.0166		0.1373		-0.0479	
	(0.24)		(0.97)		(-1.32)	
Imports of insurance services	-0.0732		-0.2321		0.0270	
	(-0.89)		(-1.5)		(0.62)	
Total FDI inflows	-0.0041		-0.0335		0.0002	
	(-0.63)		(-1.46)		(0.04)	
Barriers to entrepreneurship	0.0368		0.0094		0.0035	
	(0.89)		(0.11)		(0.15)	
State control	-0.0607	**	0.1220	*	0.0186	
	(-2.16)		(1.86)		(0.89)	
Barriers to trade and investment	0.0303		0.0383		-0.0047	
	(0.65)		(0.43)		(-0.22)	
Constant	-3.2772	**	-2.8969	**	-3.2611	**
	(-12.63)		(-5.46)		(-21.8)	
Chi-squared	79.95		48.33		9.49	
within R^2	0.2403		0.1843		0.0675	
between R^2	0.4571		0.3002		0.0001	
overall R^2	0.3547		0.2695		0.0001	
Observations	182		182		182	

*Note: 2SLS regression results, instruments used: initial values, country dummies, value added of resp. industry group; ** (*) indicates significance at 1% (5%) level.*

Source: Francois and Woerz (2007).

5. Conclusions

The tertiarization of the economy (a shift to rising dominance of services in the share of overall activity) implies not only an increased role for domestically produced services, but also for trade in services. In this paper we have emphasized in particular the role of service imports as efficiency enhancing inputs in manufacturing production. Based on social accounts data from the GTAP database, we have illustrated that the service sector – and here especially producer service sectors – is increasingly linked with the manufacturing sector, implying a greater roundaboutness of production. We have illustrated that the direct as well as the indirect demand for services is strongly increasing in the level of overall economic development. This is above all true for producer related services, in particular for business services (such as professional services, management and accounting services, etc.).

Another seminal development apart from the increasing splintering of production, resulting in a stronger role for the service sector domestically, is growing international trade in services. Technological progress, most importantly in information and communication technologies, has rendered services increasingly tradeable across larger distances and across international borders. This paper gives some evidence on the rise in trade in services over the past years, which is again particularly pronounced in the area of producer related services. Business services feature prominently in international trade flows of services, as do financial and computer and information services. Thus, in addition to an increased role for domestically produced services through the externalization of service activities by manufacturing firms, we also witness a strong internationalization of service activities.

Drawing together these two pieces of evidence, we then investigate the impact of service sector openness on the performance of the manufacturing sector. Restricting our attention to OECD members for reasons of data limitations, we find that increased import penetration by producer services has a positive effect on the skill and technology mix of exports, with greater openness in producer service sectors implying better export performance by skill and technology intensive industries. We also observe a negative impact of more producer service imports on value added and exports in labor intensive manufacturing industries. These indirect effects on the least skill-intensive industries may also explain the public resistance against opening up service sectors to trade. Protecting intermediate service sectors places high wage manufacturing sectors at a competitive disadvantage, but also implies a protection of low-wage sectors against potential negative effects. Resisting to opening up trade in services thus shows the same effects as resisting to structural change in general. It may act as a means to safeguard those sectors, which are bound to loose from long-run structural change, thus postponing but not solving current structural problems. Overall, our results - based on econometric

work with panel data on trade and a cross-section of social accounts data - complements and supports the results emerging from the current literature based on individual country/case studies.

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