

Internationalization, Technology and Business Services Specialization in Europe

by

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Abstract

This paper investigates the determinants of specialisation in business services (R&D; computer and related services; other business services) for a sample of European regions over the period 1998-2005. We find that the composition of the manufacturing sector, technology and human capital are strategic factors affecting regional ability to specialise in business services. We also find that regions with capital cities have high levels of employment in business services, indicating an important role played by agglomeration economies in these sectors.

Keywords: Business Services, Regional Specialisation, Services-Manufacturing Linkages, Technology.

JEL Codes: R12, L80, O3

1. Introduction

Recently a flourishing literature has emphasised the role of business services for economic growth, technology diffusion and internationalisation (see among others Guerrieri et al. 2005; Cox and Rubalcaba, 2007a, 2007b). Business services (BS) not only have exhibited high rates of growth of employment, value added and international trade but have also contributed to a process of reorganisation of the ways in which goods and services are produced, delivered and traded both within and across countries. The growth of BS has been favoured by the development and diffusion of Information and Communication Technologies (ICT) that have affected the linkages between manufacturing and service industries, on the one hand by increasing the service content of many manufacturing activities, and on the other by facilitating the “splintering” away of activities once performed inside manufacturing firms.

Some studies have looked at the role of intermediate demand (Francois 1990a, Rowthorn and Ramaswamy, 1999; Klodt, 2000; Francois and Woerz, 2008), of the changing structure of intersectoral linkages (Guerrieri and Meliciani, 2005) and of the increasing production and use of ICTs (Freund and Weinhold, 2002; Guerrieri and Meliciani, 2005) to explain the rapid pace of growth and internationalisation of business services. However, we are not aware of any study investigating the spatial dimension of sectoral specialisation in business services.

We think that this aspect deserves special attention. In fact new geography models have shown that, in the presence of transport costs, demand varies across locations, meaning that forward and backward linkages play a role in the international distribution of production and that industries will tend to locate close to supplier and customer industries. We argue that forward linkages play a special role in the location of Business services since the growth of these activities is highly dependent on intermediate demand by specific industries. This gives also a special role to agglomeration economies to explain the development of business services. In order to better capture these effects we adopt a regional perspective.

Demand and agglomeration economies alone cannot explain specialisation in business services. Recent studies have shown the high technological intensity of Business services, the specific role played by ICTs and the high levels of skills required by these activities. In order to explain specialisation in Business services we, therefore, also include variables capturing regional technological level and human capital availability.

In particular we study the determinants of specialisation of EU-27 regions in Business services (R&D; computer and related services; other business services) over the period 1998-2005, looking at the role played by: (1) the region-specific structure of intermediate linkages; (2) human capital;

(3) a series of indicators of technological intensity; (4) agglomeration economies and (5) country effects. The paper is organised as follows: Section 2 reviews the literature that informs the choice of the variables to be related to specialisation in business services; Section 3 describes the estimated equation, the data and the empirical results; finally, Section 4 draws the main conclusions of the paper.

2. Explaining specialisation in Business Services

This section addresses the question: what determines regional specialisation/location of business services? Theory suggests a role for both supply considerations (factor endowments, technology), and for the cross-country and/or cross-regional distribution of demand for each sector's output. The presence of transport costs or other trade frictions means that the location of demand matters. Countries at different locations have different market potential, and this shapes their industrial structures (see for example Midelfart-Knarvik et al. 2000). In the case of Business services we argue that the location of customer industries is particularly relevant, we provide evidence that Business services are heavily demanded as intermediate inputs by specific manufacturing and service industries and we argue that agglomeration economies should also play a role in affecting the location of Business services (Section 2.1).

Together with the role of intermediate demand, theory also suggests to look at technology and human capital. The role of technology and human capital are further discussed in Section 2.2.

2.1 Business services, sectoral interdependencies and agglomeration economies

Several authors have argued that the rise of services, particularly of producer services, in the last thirty years is mostly due to an increase in the demand for services as intermediate goods (Francois, 1990a, 1990b; Rowthorn and Ramaswamy, 1999; Klodt, 2000). The growing complexity in the organisation of manufacturing production and distribution resulting from the application and use of new technologies, and the significant increase in coordination problems has increased the service content of many manufactured goods (Miozzo and Soete, 2001). Bhagwati (1984) has suggested that producer services appear to be a growing sector in part because firms are externalising service activities that were formerly performed inside the firm. However the "splintering" away of activities once performed inside manufacturing firms does not fully explain the rise in producer services. In fact, producer services also represent an increasing share of the remaining activities still performed within manufacturing firms (Francois, 1990a; Miozzo and Miles, 2003). This evidence suggests that the production and export of producer services is not independent from the production and exports of manufactures.

A recent study (Guerrieri and Meliciani, 2005) used Input-Output data to show that there are some regularities across countries in the major users of Financial, Communication and Business services (FCB). In particular among the manufacturers that make considerable use of FCB services, they found mainly knowledge-intensive industries (office & computing machinery, professional goods, electrical apparatus & radio, TV & communication equipment, industrial chemicals & drugs), while labour and scale-intensive industries appeared, on average, to be low or medium users of FCB services. Similar results are found by Francois and Woerz (2008) that show how business services are highly demanded especially by knowledge intensive industries.

In order to test whether there are important regularities across countries in the industries that are high/low users of Business services, we performed an analysis of variance looking at the importance of industry effects in explaining the share of Business services on the output of various manufacturing industries and service industries using Eurostat symmetric input-output tables for the year 2000 across a large sample of European countries¹.

The analysis of variance indicated that there are significant industry effects explaining the use of Business services ($R^2=0.67$, $F=41.52$ significant at 1%), although weaker with respect to the sample including only the larger European countries, Canada, US and Japan used in Guerrieri and Meliciani (2005). Table 1 reports the coefficients in the regression of the share of Business services in total output on industry dummies, distinguishing between manufacturing and service sectors. Among the manufacturers that make considerable use of Business services, we find knowledge-intensive industries with the exception of Tobacco products (Printed matter and recorded media; Chemicals and chemical products; Office machinery and computers, Radio, television and communication equipment and apparatus; Medical, precision and optical instruments, watches and clocks), while labour and scale-intensive industries appear, on average, to be low or medium users of Business services (see table 1).

At the same time we can observe that, of the service sectors, as expected, the highest users are the same Business services sectors (Computer and related services, Other services and R&D services) followed by other “knowledge intensive services” (such as those linked to Insurance and Financial intermediation and Post and telecommunications, together with Wholesale and retail trade) while the lowest shares are found in Transport services, Hotel and Restaurants and Real Estate.

¹ The countries included are: Austria, Belgium, Denmark, Estonia, Finland, France, Germany, Greece, Hungary, Ireland, Italy, Latvia, Lithuania, Netherlands, Norway, Poland, Portugal, Slovakia, Slovenia, Spain, Sweden, United Kingdom.

Table 1 The share of Business Services in total industry output

Above average manufacturing Industries		Share	Above average service industries		Share
Printed matter and recorded media		8.2%	Computer and related services		19.5%
Chemicals and chemical products		8.1%	Other business services		17.5%
Office machinery and computers		8.0%	Research and development services		13.9%
Tobacco products		7.6%			
Radio, television and communication equipment and apparatus		7.3%			
Medical, precision and optical instruments, watches and clocks		6.4%			
Average manufacturing Industries		Share	Average service industries		Share
Machinery and equipment n.e.c.		5.0%	Insurance and pension funding services, except compulsory social security services		10.5%
Electrical machinery and apparatus n.e.c.		4.8%	Services auxiliary to financial intermediation		9.0%
Other transport equipment		4.8%	Wholesale trade and commission trade, except of motor vehicles and motorcycles		8.9%
Rubber and plastic products		4.5%	Post and telecommunications services		8.1%
Food products and beverages		4.4%	Renting of machinery and equipment without operator and of personal and household goods		8.0%
Furniture; other manufactured goods n.e.c.		4.2%	Financial intermediation services, except insurance and pension funding services		7.7%
Wearing apparel; furs		4.1%	Sale, maintenance and repair of motor vehicles and motorcycles; retail sale of automotive fuel		7.6%
Other non-metallic mineral products		4.0%	Retail trade services, except of motor vehicles and motorcycles; repair services of personal and household goods		6.7%
Below average service industries		Share	Below average service industries		Share
Motor vehicles, trailers and semi-trailers		3.9%	Supporting and auxiliary transport services; travel agency services		5.3%
Pulp, paper and paper products		3.7%	Water transport services		5.2%
Recovered secondary raw materials		3.5%	Air transport services		4.5%
Fabricated metal products, except machinery and equipment		3.4%	Hotels and restaurants services		4.1%
Textiles		3.3%	Real estate services		3.5%
Leather and leather products		3.0%	Land transport; transport via pipelines services		3.3%
Basic metals		2.8%			
Wood and of products of wood and cork (except furniture); articles of straw and plaiting materials		2.3%			
Coke, refined petroleum products and nuclear fuels		2.0%			
<i>Average</i>		<i>4.7</i>			<i>8.4</i>
<i>Standard Deviation</i>		<i>1.9</i>			<i>4.5</i>

Notes: Industries are defined as above (below) average when the share is higher (lower) than the average plus (minus) (1/2)*standard deviation.

Overall these results suggest that the structure of economy (in particular its sectoral composition) can condition the rise of Business services. In fact we expect countries/regions with a high share of

activities in knowledge-intensive manufacturing industries to experience a higher demand for Business services and, therefore, to be more likely to specialise in these activities.

Not only intersectoral linkages play an important role in affecting the rise of Business services via intermediate demand, but it has also been observed that these services (and in particular the subgroup of Knowledge Intensive Business Services, KIBS) are typically supplied to business through strong supplier user interactions (Miles et al., 1995; Muller and Zenker, 2001). This leads to the specific role of agglomeration economies in favouring the location of Business services: “KIBS are confronted with the specific problems of their clients and thus they require most often direct contacts with them in order to conceive solutions by recombining existing knowledge and complementing it with new inputs if necessary. A high share of these interactions, especially in the starting phase of a consulting activity, is characterized by a strong tacit content, requiring personal contacts in particular. Proximity (geographical, social, cultural, etc.) is hence helpful to manage these phases” (Muller and Zenker, 2001, p. 1506).

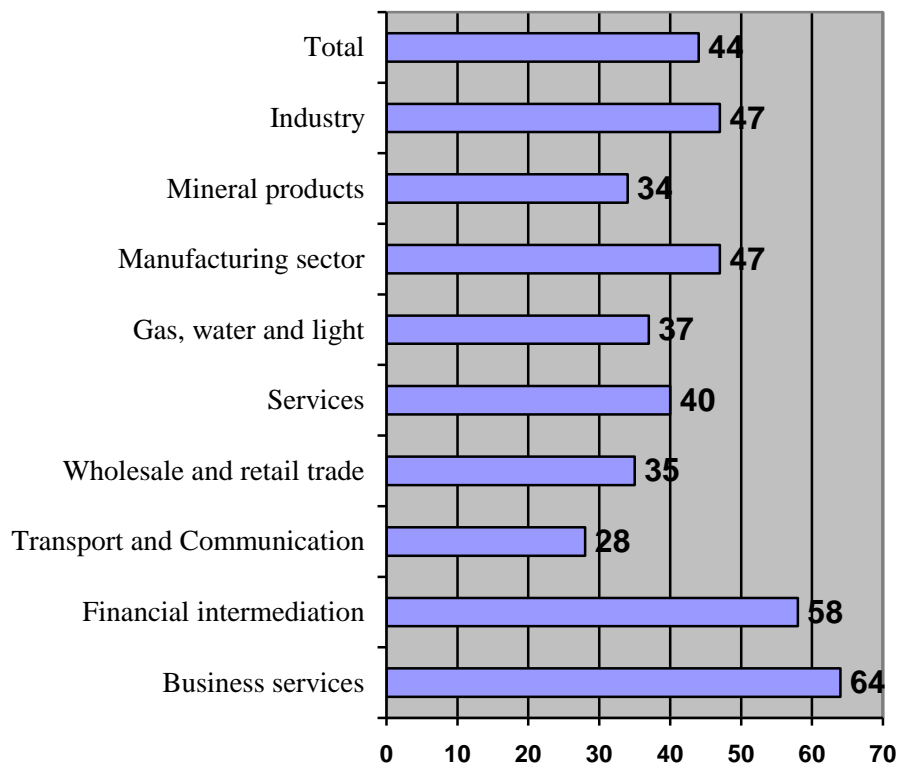
Consistently with this, Antonietti and Cainelli (2007) find that spatial agglomeration, that is, the location of firms within a dense industrial area, where the probability of finding specialized external providers is high and which favours face-to-face contacts and close spatial interaction, is an important factor affecting the location of Business services. Based on this evidence we will look at the impact of agglomeration economies in affecting regional specialisation in Business services.

2.2 The contribution of technology and human capital

Together with intermediate demand also technology and human capital can play an important role in explaining specialisation in service industries.

While services have long been considered laggard in terms of technology development and adoption, nowadays there is increasing evidence that many service sector firms play important roles in innovation, and not only in the use, but also in the creation and diffusion of new technologies. Following data collected under the Community Innovation survey across Europe, services certainly emerge as innovators (Tether *et al.*, 2001): just under half of services enterprises engaged in innovative activities between 1994 and 1996, even if innovators vary by size and sector. In particular the share of innovative firms in some service industries (Financial services and Business services) is higher than in the manufacturing sector (Figure 1).

**Figure 1: Share of innovative firms across sectors, EU
1998-2000**



Source: Eurostat Third Community Innovation Survey, 2004

Note: business services are: Information services, R&D services, engineering and consultancy

Some service sectors are not only among the major users of Information Technologies (IT), but they also play a crucial role in diffusing technological improvements to others sectors. Many studies stress this role in the case of business services (i.e. Miles *et al.*, 1994; Antonelli, 1998). Regional technological intensity, therefore, adds an important dimension to the explanation of specialisation in Business services.

Among technological indicators, Information and Communication Technologies (ICT) play a special role in facilitating the production and trade of producer services. It has been observed that the diffusion of knowledge-intensive service industries is deeply affected by the parallel diffusion and implementation of the new information and communication technology systems (Antonelli, 1998). The intangible and information-based nature of services gives the generation and use of ICTs a central role in firms' innovation activities and performance (Evangelista, 2000).

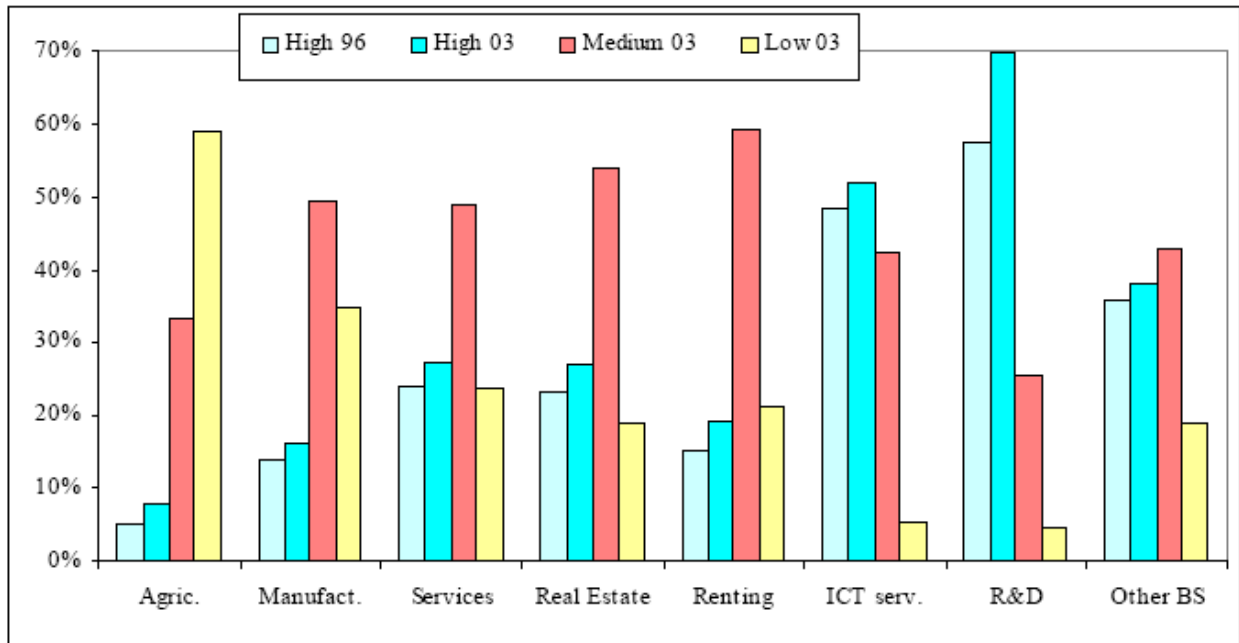
The role of ICTs as “enabling technologies” is also at the basis of the “reverse product cycle” model proposed by Barras (1986) for representing the dynamics of the innovation process in

services. In this view, in the first stages of the reverse product cycle, services use IT for reasons of back-office efficiency. Subsequently, learning activities lead to process and product innovations. Finally, IT brings services into the industrial era when they begin to use an industrial technology appropriate to their information-intensive activities. Information and communication technologies also allow for the increased transportability of service activities by making it possible for services to be produced in one place and consumed simultaneously in another (Soete, 1987; Miozzo and Soete, 2001). Guerrieri and Meliciani (2005) find that ICT positively affects both export specialisation and export shares in Financial, Communication and Business services.

Human capital also appears as a crucial factor in Business Services. Kox and Rubalcaba (2007b) find that the sector has a very strong orientation towards higher education, much more than most other industrial or service sectors. As shown in Figure 2, data from the European Labour Force Surveys indicate that in European countries in the aggregate manufacturing and services sectors the education profile of employees is dominated by the intermediate educational level. In manufacturing there is also a high share of workers with low education levels, while in services high levels of education prevail over low levels. When we look at the three categories of Business services considered in this study, both computer services and R&D services show very high shares of highly educated people. Moreover also in Other Business Services, despite the fact that this aggregate includes sub-sectors like cleaning or security services, which employ many low-skilled workers, the share of highly educated workers is high.

A further indication of the high educational profile in business services can be derived from the percentage of BS enterprises that provides their workers with any type of training. This indicator may reflect the extent to which workers are prepared to adapt to new requirements and manage to deal with increasing organisational and work complexity. Data for 2000 from the European Labour Force Survey indicate that in all EU15 countries, business services invests more in providing continuous vocational training (CVT) to their workers than the average for the total economy (Kox and Rubalcaba, 2007b). Summing up, it appears that Business services make an extensive use of highly educated people, therefore we expect that regional specialisation in these sectors is related to the regional availability of human capital.

Figure 2: Education attainment levels in business services compared to other economic activities, EU15, 1996 and 2003



Source: Kox and Rubalcaba (2007b), calculated on the basis of data from European Labour Force Surveys

3. Empirical analysis

3.1 The estimated equation

As we have already discussed in the previous section, specialisation may depend on both supply considerations (factor endowments, technology), and, in the presence of transport costs, on the cross-country and/or cross-regional distribution of demand for each sector's output. In the case of Business services we argue that the location of customer industries and agglomeration factors are particularly relevant since, as we have seen, Business services are heavily demanded as intermediate inputs by specific industries. Together with the role of intermediate demand, theory suggests to look at technology and human capital. In fact, as we have already stressed, Business services' firms are highly innovative and employ people with high skill levels, therefore we can expect that they will locate in regions with high levels of technological intensity and human capital availability. We therefore estimate the following equation for specialisation in Business services:

$$BUS_{it} = \alpha_1 S_{it} + \alpha_2 TEC_{it} + \alpha_3 H_{it} + \alpha_4 AGGL_{it} + e_{it} \quad (1)$$

where BUS_{it} is the share of employment in business services over total employment of region i at time t ; SM is the weighted share of employment in manufacturing industries that are high users of Business services over total employment (for a better description of this variable see next Section), TEC is a technological variable (R&D/GDP and Patents in ICT over population), HC is human capital (measured as the share of population with tertiary education) and $AGGL$ is the effect of agglomeration economies (captured by the share of population over the regional area and by dummies for regions where capital cities are located). Country and time dummies are also included. Equation (1) is estimated both using pooled least squares for a panel of 259 EU27 regions over the period 1998-2005 and in dynamic form using the Arellano Bond dynamic panel data estimator.

3.2 The data

In order to look at regional specialisation in business services we use the Eurostat database “Regio”. The database contains information on number of persons employed, number of local units, investment in tangible goods and wages and salaries at the sectoral level (NACE Rev. 1.1) for a sample of European regions at various levels of aggregation (NUTS 1 and 2) over the period 1995-2005. For the empirical analysis we have chosen to focus the attention on the following service sectors: Computer and related services (K72); R&D services (K73); Other Business services (K74). This choice has been dictated by several reasons. First these services have shown particularly high levels of innovation. Second, business services have been particularly dynamic both considering international trade (WTO 2002, 2005, 2008) and production (Kox and Rubalcaba, 2007a). Finally they are strategic inputs to manufacturing sectors. Overall the literature on the economic impact of business services has highlighted not only direct positive effects on growth and employment creation (countries with high shares of production/employment in these sectors are more likely to grow fast in production and employment) but also indirect effects due to the reorganization of production that takes place through an increasing production and use of business services (Cox and Rubalcaba, 2007b).

Due to lack of available data on internationalization at the level of European regions over the time span considered in this study, in the regression analysis we measure specialisation using employment data. However, in the descriptive analysis, we compare our indicators with those focussing on exports or Foreign Direct Investment reported in other studies.

For the empirical analysis data on specialisation in business services have been integrated with data on regional technological intensity, human capital and population density. These data are also drawn from the Regio database. In particular as technological variables we use R&D/GDP and Patents in ICT over population. Human capital is measured as the share of people with tertiary

education over total population, while population density is given by the ratio between population and the regional area. Finally in order to construct specialisation in manufacturing sectors that are high users of Business services for each region we take the weighted sum of employment in above average users manufacturing industries (see Table 1) divided by total regional employment, where weights are given by the average (across countries) share of Business services in total industry output as computed from Eurostat symmetric Input Output tables (see Table 1). When we consider all variables together in the empirical estimation we have an unbalanced (due to many missing values) panel of 259 NUTS 2 regions over the period 1998-2005.

Employment growth in Business services and Internationalisation

Table 2 shows the average annual employment growth rate of the aggregate of Computer and related services, R&D services and Other Business services compared with other service sectors, total manufacturing and total employment by country and as a European average (the data refer to averages across NUTS1 regions for which data are available). Table 3 looks at the internationalisation of a similar group of services at the world level.

Looking at employment, we can observe that in all countries the rate of growth in business services has been remarkably higher than the average rate of growth of employment (for the EU average 6.74 compared to 1.04). Moreover in almost all countries the rate of growth of employment in this sector is higher than in any other service sector and in the manufacturing sector (exceptions are Spain, Greece, Italy and Slovakia). The highest rates of growth are found in Ireland, United Kingdom, Portugal and Romania and the lowest in Czech Republic, Spain, Norway and Hungary, while the highest shares are found in United Kingdom, the Netherlands and Belgium and the lowest in Bulgaria, Romania and Greece.

Looking at exports, if we adopt the classification of commercial services adopted by the International Monetary Fund, we can distinguish three main categories within the broad sector of commercial services: Transport, Travel and Other commercial services. This last group includes mainly knowledge-intensive activities such as business services, communication services, computer and information services and corresponds more or less to the group of services examined in this paper².

² In 2004 the distribution of the various components in European trade in this group was: Other business services 48%; Financial services 15%; Computer and information services 9%; Royalties and license fees 9%; Insurance services 7%; Construction services 5%; Communication services 4% and Personal, cultural and recreational services 3% (WTO, 2006).

Disaggregated data on trade in services (see Table 3) show that this group of services has grown at a faster rate with respect to the other categories (14% compared to 12% for transports and 9% for travel over the period 2000-2007).

In 2007 the growth of these services has been remarkable (20%) so that these services accounted for 51 per cent of the overall total for commercial services. In particular the European Union accounted for more than half of the total value of other commercial services exported to the world. Looking at more disaggregated data (see WTO, 2008), “Other business services” and “financial services” accounted for 67 per cent of EU exports of Other commercial services. The United States was the second-largest exporter in 2007 but its share of world exports has declined considerably.

Table 2: Employment growth in business services and other sectors

Country	Business services/ total empl	Business services	Wholesale and retail trade	Hotels and restaurants	Transport, storage and communication	Manufacturing	Total employment
Austria	7.24%	5.57%	2.21%	2.89%	-0.11%	-0.17%	0.92%
Belgium	10.49%	6.80%	1.35%	1.77%	0.16%	3.97%	0.96%
Bulgaria	3.35%	7.29%	3.17%	4.58%	-2.26%	-2.81%	0.99%
Czech Republic	8.74%	2.17%	-1.96%	0.12%	-1.91%	-0.84%	0.36%
Germany	8.59%	6.12%	0.11%	1.98%	4.67%	-0.93%	0.58%
Spain	8.12%	3.08%	2.37%	3.26%	3.35%	2.15%	3.81%
Finland	5.08%	8.11%	2.09%	2.37%	2.67%	-0.85%	0.95%
France	6.65%	6.80%	2.35%	3.42%	3.88%	0.83%	1.74%
Greece	3.92%	6.33%	4.78%	2.00%	-2.17%	12.01%	0.93%
Hungary	7.09%	4.02%	-0.46%	2.91%	-4.31%	-2.85%	0.42%
Ireland	5.69%	11.56%	5.86%	2.40%	2.73%	-0.30%	3.80%
Italy	8.17%	5.83%	1.54%	15.51%	1.10%	0.24%	1.47%
Netherlands	13.34%	4.70%	1.91%	3.84%	0.60%	-0.93%	1.36%
Norway	7.83%	3.04%	0.88%	-2.83%	-1.47%	1.60%	0.56%
Poland	4.45%	5.36%	1.20%	0.84%	-2.83%	-1.84%	-0.56%
Portugal	6.34%	18.55%	3.96%	5.51%	8.35%	-1.18%	1.13%
Romania	3.14%	14.41%	2.15%	3.77%	-2.31%	-2.05%	-1.90%
Slovakia	4.27%	8.24%	9.36%	8.18%	-0.51%	-1.44%	0.96%
United Kingdom	12.93%	11.24%	2.01%	7.61%	-1.30%	1.21%	0.84%
Average	8.07%	6.74%	2.02%	5.03%	1.06%	0.82%	1.04%

Source: Eurostat Regio database

Table 3: Growth of commercial services exports by category and by region, 1990-2007 (annual % change)

	World	North America	South and Central America	Europe	CIS	Africa	Middle East	Asia
Commercial services								
1990-95	8	8	9	na	na	na	na	na
1995-00	5	7	6	na	na	na	na	4
2000-07	12	7	10	13	21	na	13	13
2005	12	11	20	10	20	na	17	15
2006	12	9	14	11	24	13	17	16
2007	18	13	17	20	27	22	13	19
Transportation services								
1990-95	6	4	7	na	na	na	na	11
1995-00	3	3	1	3	na	na	na	3
2000-07	12	6	11	12	16	na	14	12
2005	13	12	20	12	17	na	18	14
2006	9	10	10	7	17	17	11	11
2007	19	12	15	21	20	31	16	20
Travel								
1990-95	9	7	10	na	na	9	na	na
1995-00	3	6	7	2	na	6	na	2
2000-07	9	3	7	10	20	14	8	12
2005	7	8	13	5	11	15	18	9
2006	9	5	11	8	24	12	13	16
2007	14	10	12	15	28	17	10	18
Other commercial services								
1990-95	10	12	10	na	na	na	na	16
1995-00	7	11	9	na	na	na	na	6
2000-07	14	10	14	16	28	na	15	15
2005	14	12	32	12	35	na	15	19
2006	16	12	20	15	32	10	23	20
2007	20	16	26	22	36	23	12	19

Source: WTO, 2008

Specialization in business services

Table 4 shows the list of regions specialised in Business services in the year 2005, while Figure 3 reports on a map the degree of specialization of the regions. Comparative advantage is computed as the share of employment in Business services over total employment in region *i* divided by the average share of employment in Business services across all regions. The picture emerging from these data is compared with that found in Castellani and Pieri. (2009) using inward FDI data (see Figure 4). The data are not perfectly comparable since our employment data refer to sectors (R&D, Computer and related services and Other business services) while FDI data refer to Business Services activities. Moreover the map with employment data refers to 2005, while the map with FDI data refers to the cumulated number of investment projects over the period 2004-2008.

Table 4: Regions specialised in Business Services in 2005

Code	Regio	CA	Code	Regio	CA
Uki1	Inner London	5.81	nl23	Flevoland	1.42
be1	Région de Bruxelles-Capitale	3.54	Ukh1	East Anglia	1.38
es3	Comunidad de Madrid	3.14	Ukk2	Dorset and Somerset	1.37
fr1	Ile de France	2.98	de21	Oberbayern	1.36
Ukj1	Berkshire, Bucks and Oxfordshire	2.68	Ukl2	East Wales	1.35
nl31	Utrecht	2.48	Ukj4	Kent	1.35
pt17	Lisboa	2.41	Uke3	South Yorkshire	1.33
				Derbyshire and	
nl32	Noord-Holland	2.21	Ukf1	Nottinghamshire	1.32
Ukh2	Bedfordshire, Hertfordshire	2.19	nl42	Limburg (NL)	1.32
de6	Hamburg	2.11	de92	Hannover	1.32
Ukj2	Surrey, East and West Sussex	2.05	be21	Prov. Antwerpen	1.29
de71	Darmstadt	2.03	de25	Mittelfranken	1.27
fr71	Rhone-Alpes	1.98	de73	Kassel	1.26
No01	Oslo og Akershus	1.95	Ukd5	Merseyside	1.26
				Provence-Alpes-Cote	
Hu1	Kozép-Magyarország	1.95	fr82	d'Azur	1.26
Ukj3	Hampshire and Isle of Wight	1.95	itc3	Liguria	1.25
at13	Wien	1.94	Ukh3	Essex	1.25
Ukd2	Cheshire	1.91	itc1	Piemonte	1.24
nl33	Zuid-Holland	1.89	Ukm2	Eastern Scotland	1.20
de5	Bremen	1.88	Ukd4	Lancashire	1.20
ro08	Bucuresti (SRE 2002)	1.84	be31	Prov. Brabant Wallon	1.20
Ukd3	Greater Manchester	1.79	es21	Pais Vasco	1.19
itc4	Lombardia	1.78	itd5	Emilia-Romagna	1.18
Ukk1	Gloucestershire, Wiltshire and Bristol/Bath area	1.71	Dec	Saarland	1.16
				Provincia Autonoma	
Uki2	Outer London	1.70	itd2	Trento	1.15
Dea2	Koln	1.69	itc2	Valle d'Aosta	1.15
Ukg3	West Midlands	1.67	nl12	Friesland (NL)	1.14
Ite4	Lazio	1.65	Uke2	North Yorkshire	1.11
nl41	Noord-Brabant	1.64	ite1	Toscana	1.10
Ukg1	Herefordshire, Worcestershire and Warks	1.64	itd4	Friuli-Venezia Giulia	1.09
De12	Karlsruhe	1.62	Ukk4	Devon	1.09
Dea1	Dusseldorf	1.62	gr3	Attiki	1.08
De3	Berlin	1.59	Ded3	Leipzig	1.07
Be24	Prov. Vlaams Brabant	1.59	Ukc1	Tees Valley and Durham	1.06
Sk01	Bratislavsky kraj	1.59	pl12	Mazowieckie	1.06
Ukf2	Leicestershire, Rutland and Northants	1.55	fi18	Etela Suomi	1.05
				Shropshire and	
De11	Stuttgart	1.55	Ukg2	Staffordshire	1.05
nl22	Gelderland	1.49	nl34	Zeeland	1.04
ukm3	South Western Scotland	1.49	at31	Oberosterreich	1.04
Es51	Catalana	1.48	itd3	Veneto	1.02
nl21	Overijssel	1.48	Dea4	Detmold	1.02
Ukc2	Northumberland, Tyne and Wear	1.48	ite2	Umbria	1.01
				Region Autonoma da	
Uke4	West Yorkshire	1.44	pt3	Madeira (PT)	1.00

Note: comparative advantage is computed on employment data

From table 4 we can observe that many of the regions with the highest values of employment specialization in business services are regions where capital cities are located. This is the case not

only in high income countries, but also in Spain, Portugal, Greece and in some new entrant eastern countries (Közép-Magyarország: the region of Budapest; Bucuresti; Bratislavsky kraj; Mazowieckie: the region of Varsavia). We can also observe that, when we exclude regions with capital cities, there appear to be important “country effects” in affecting regional specialisation in Business services. In fact all Dutch regions and the great majority of UK and German regions appear as specialised in these activities. On the other hand, no region from new entrant countries, Portugal, Greece, Norway and Finland (with the exception of regions with capital cities) shows a comparative advantage in Business services. Regions in Spain, France and Italy show a more variegated pattern although on average appear not to be specialised in Business services; finally among the 11 Belgian regions, 4 show a comparative advantage in Business services.

From the map, we can also observe a spatial pattern of employment specialisation in business services with Southern and Eastern regions having low specialisation levels.

Comparing the map of employment specialisation with the map reporting the number of inward FDI projects in Business services activities, we can notice a similar patterns, again with high values of inward FDI in Business service activities in the UK, the Netherlands, Germany and Northern Italy and in capital cities. On the other hand some Spanish and French regions perform better in business services’ internationalisation than in business services employment specialisation.

Figure 3: Employment specialisation in Business Services in 2005

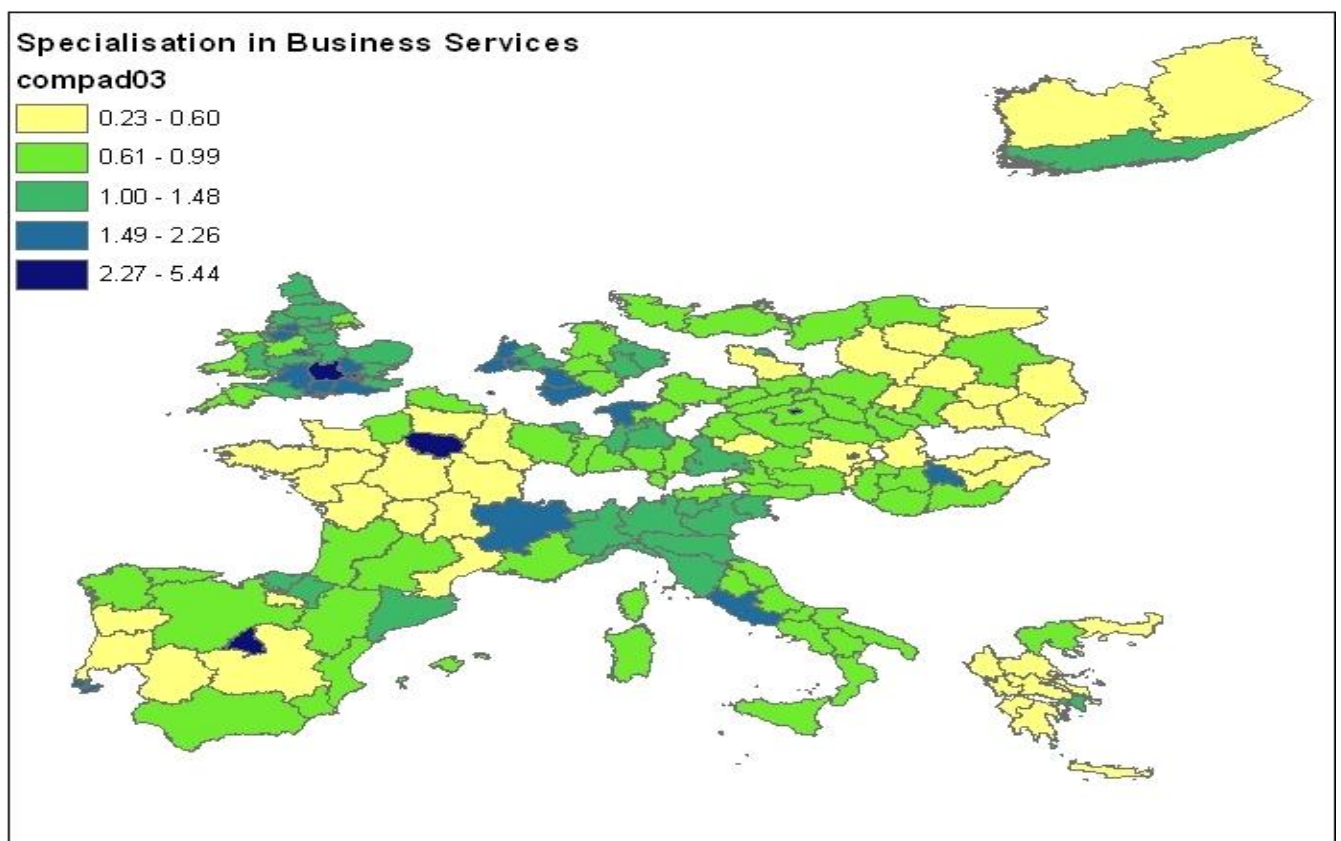
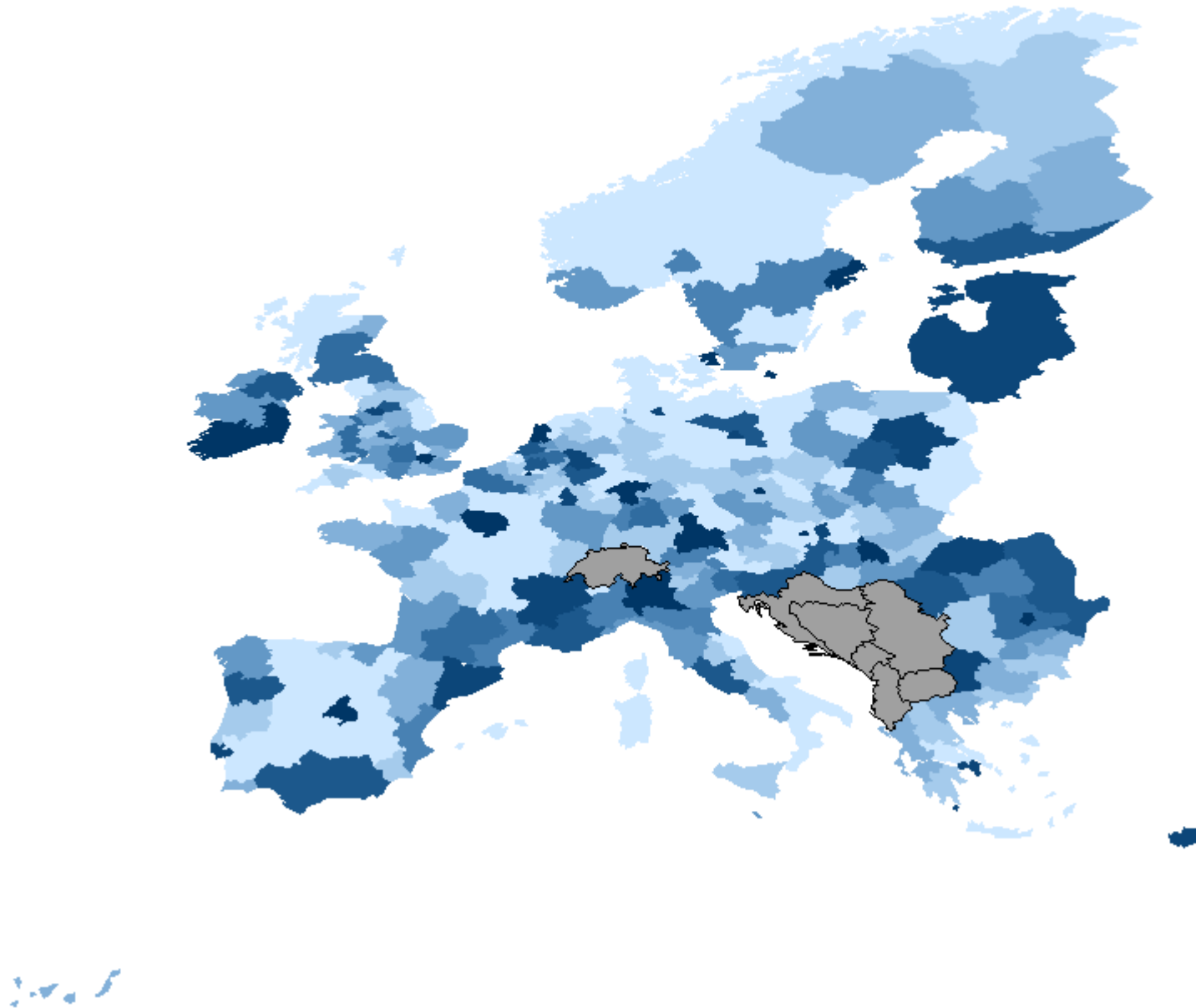


Figure 4: Number of inward FDI projects in Business service activities 2004-2008

Number of inward FDI projects in Business Service activities by NUTS2 region 2004-2008



It is worth observing also that, while there appears to be a positive correlation between employment specialisation in Business services and inward FDI investment in Business services activities, this correlation is much weaker when one considers inward FDI specialisation in Business services activities (or the share of inward FDI in Business services activities divided by total inward FDI, see Castellani and Pieri, 2009). Since the FDI specialisation indicator cancels out the degree of internationalisation of the region, it appears that regions specialised in business services in terms of employment are also the more internationalised.

3.3 Econometric results

Table 5 reports the results of the estimation using pooled generalised least squares (static estimations) and using Arellano Bond generalised method of moments (dynamic specification). We can observe that in the static regression (pooled least squares) all coefficients have the expected sign and are significant (with the exception of R&D). The insignificant coefficient for R&D expenditures may depend on some collinearity with the patent indicator (if we drop the patent indicator from the regression the R&D variable becomes significant). In the dynamic estimation (Arellano-Bond) again all coefficients have the expected sign and are significant (the “city” variable is not included in this regression since it does not vary over time).

Overall the econometric results show that specialisation in Business services (and its evolution) depends on supply factors (technology and human capital), intermediate demand factors (as captured by the index of potential intermediate demand from manufacturing industries) and agglomeration economies. It is also interesting to observe that, also when included simultaneously, both population density and the dummy for regions with capital cities positively affect regional specialisation in Business services, highlighting a specific role played by urban economies for the development of these services.

Table 5 Explaining specialisation in business services: pooled least squares estimates

<i>Method of estimation</i>	<i>Pooled Generalised Least Squares</i>		<i>Arellano-Bond dynamic panel data estimator(differences)</i>	
Variables	Coefficient	z-ratio	Coefficient	t-ratio
Specialisation lagged			-0.393***	-3.31
Potential manufacturing demand	6.358***	9.08	16.18*	1.71
Share of population with tertiary education	0.436***	8.46	3.255***	3.71
Patents in ICT over population	0.352***	5.12	0.276***	2.95
R&D over GDP	0.172	0.27	6.519***	2.53
Population density	0.023***	5.77	5.202***	14.38
Regions with capital cities	60.99***	11.70		
	Wald $X^2=1804.34$		Wald $X^2=254.32$	
			Sargan test $X^2=3.46$	
			ArellanoBond AR(1) $z=0.46$	

Notes: Estimates are heteroscedasticity-consistent. *, **, *** indicate significant at the 10%, 5% and 1% levels respectively. Country and time dummy variables are included. Coefficients cannot be interpreted as elasticities.

4. Conclusions

Our study aimed at investigating the determinants of specialisation in Business services at the regional level. We identified intermediate demand from the manufacturing sector, human capital,

technology and agglomeration economies as strategic variables. That the manufacturing base affects performance in business services has important implications since it suggests that a region's ability to develop an efficient and dynamic service economy is linked to the structure of its manufacturing sector. In particular, we found that knowledge-intensive industries are the main users of business services. As a consequence, regions specialised in these industries are in a favourable position for developing a comparative advantage in business services.

We also found that technology (R&D and patents in ICT) has a positive and significant impact on specialisation in business services. This supports those theories that emphasise the role of technology in affecting specialisation and is consistent with the view that ICT plays a special role in the case of business services. It also suggests that technology policy focussing on the development and use of new technologies can impact positively on regional specialisation in business services, an area that is becoming strategic for its high rate of growth and its linkages with the manufacturing sector. We found a positive impact also of human capital. This is not surprising since business services employ people with high levels of skills, therefore the availability of a well educated workforce is a prerequisite for regions to become specialised in these knowledge-intensive services. Finally we found strong evidence of the role played by agglomeration (and urban) economies in favouring the development of business services. Not only population density positively affects specialisation in business services, but these services tend to be localised in regions with capital cities.

Our analysis has focussed on employment specialisation, however a comparison of our indicator of specialisation with that of inward foreign direct investment in Business service activities has shown a very similar pattern. This suggests that the variables that we have found to affect employment specialisation may matter also for internationalisation of business services. However, future research is needed to give direct support to this hypothesis.

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