

A Pragmatic Service Typology – Capturing the Distinctive Dynamics of Services in Time and Space

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Abstract. *The service sector is extraordinarily heterogeneous. Since existing service classifications provide useful yet partial perspectives on this diversity, this paper reconciles and integrates distinct service taxonomies into a coherent and pragmatic typology which follows three dimensions: demand orientation, knowledge-intensity and technology-intensity. A regional analysis of services employment in Germany captures the distinctive regional dynamics. Knowledge intensive services and business services are shown to follow different sectoral and geographical dynamics than operational and consumer services. In effect, our typology integrates partial classifications into a pragmatic service taxonomy which may be helpful for longitudinal and comparative regional analysis of the service economy.*

Keywords. Service economy, service typology, regional analysis, Germany.

1. Introduction

The service economy has proven to be a conceptual umbrella for many diverse and highly heterogeneous activities. The different branches of service activities are characterized by different qualifications, productivity gains, growth rates, and distinctive locational structures and geographical dynamics. This diversity is usually studied in one of two different ways. Micro approaches usually conduct case studies within selected service branches in order to reveal the particularities of these activities (Daniels and Bryson 2005; Rusten et al. 2005; Léo and Philippe 2007) whereas macro approaches attempt to capture the diversity of services by classifying services into homogenous statistical categories of similar attributes. After a decade or more of research on service taxonomies, scholars and policy makers still lack pragmatic tools to capture and monitor the development of regional service economies. Service typologies are affluent yet incomplete and often partial in their focus. Many regional monitors are based on idiosyncratic definitions and sometimes incomparable classifications of service sectors (Laafia 2002; Jung 2006; Wood 2006; Chadwick et al.

2008). This can be observed, to take a few examples, in studies on media, consulting, logistics etc. (IHK München und Oberbayern 2003; Cook and Pandit 2007). And also academic classifications do not necessarily consent on the categorization of economic activities into service and non-service sectors: are utilities industrial goods or network services (EFBRS 2005)?

The goal of this paper is twofold. First, it aims at integrating several partial service typologies into a multi-dimensional taxonomic framework which is meant to deliver a useful differentiation of service types in the economy (section 2). Second, the paper uses employment statistics for Germany (section 3) to empirically assess the capacity of the typology in capturing a significant part of the heterogeneity of sectoral and regional development (section 4). We challenge our typology not only on its plausibility and compliance with major debates in services research but also on its ability to capture significant differences in employment growth, both in time and in space. In particular, the paper analyses how reliably the typology manages to separate employment decline from growth, geographical agglomeration from decentralized distribution and regional expansion from local clustering. Section 5 will discuss the limitations and opportunities of this approach.

2. Toward a pragmatic classification of service types

Though services research dates back many decades – at least to the well-known contributions on the structural transformation from agriculture over manufacturing to services (Fisher 1939; Clark 1940) – theories and concepts have long developed without being able to translate definitions and typologies clearly into statistical industry standards of the service economy. The current NACE standardⁱ which was introduced in 1970, was adapted only slowly to the new realities of an ever more service-based European economy. Despite the fact that today about 70% of European value-added is generated in the service sector, the industry classification distinguishes many sub-classes in manufacturing but only broad classes of service activities. Many European countries began only toward the end of the 1990s to implement systematic observations of services development and published annual statistical reports. In Germany, for instance, the federal service statistics were launched only in 2000 and the first report was based on figures from 2001 (Gans-Raschke 2006). Fortunately, the major revision of the European industry classification NACE Rev. 2 will provide more classificatory detail to service activities from 2008 onwards (Eurostat 2008).

The first step toward a service typology is to define the boundary between service activities and non-service activities. Instead of pursuing a functional approach to services (e.g. Dicken 1992) which would be difficult to break down to the level of employment data, this approach follows a sectoral perspective. Based on the European standard of industry classification, business sectors are to be qualified as primary, industrial or service activities at the three-digit level. Commonly, national and international industry classifications define the service sector as the sum of NACE groups G (wholesale and retail etc.) to O (other community, social and personal services)ⁱⁱ. In contrast to mainstream definitions, however, recent work by the European Commission (EFBRS 2005) includes utilities as network services into the service sector. In line with this extension, the service economy is defined here to comprise the NACE groups E *and* G to O.

The second step in conceptualizing this typology is to define the relevant criteria to separate different characteristics and join similar services into more or less homogeneous service types. Service typologies are as affluent as the range of criteria that are considered (e.g. Lovelock 1983; Buckley et al. 1992): services have been distinguished by the type of delivery, the nature of service activity, the type of client relationship, the degree of standardization and many other characteristics. Within the debate about the multiple distinctive aspects of services, three dimensions appear especially critical and receive full attention by researchers as well as by regional analysts and policy makers: demand orientation, knowledge-intensity, and technology-intensity. Each of these dimensions is expected to imply different economic effects for services. In the past, business services as opposed to consumer services seem to have experienced continuously higher growth rates in employment and revenues. Knowledge-intensive services seem to yield higher value-added and offer more opportunities for innovation than operational services both for themselves and for other industries. Finally, technology-based services are hypothesized to yield higher productivity gains than non-technological or simply technology-using services. In consequence, the general aim of a new typology is to build a few broad yet meaningful service types which capture significant differences in growth, innovation and productivity gains. This paper limits its analysis on growth differentials in sectoral employment and the geographical dynamics of sectoral growth in Germany.

2.1. Demand orientation

One of the first criteria to classify services is the demand orientation and the position within the supply chain. While some services are rendered directly to final consumers, other services are used by intermediary clients such as firms and other organizations (Ronning 2003). Research on business services has proliferated over the last decade because the demand for intermediary services had grown tremendously in the past. Without going into the details of the different explanations of business service growth, two major trends may be observed. On the one hand, corporations have been focusing increasingly on the core competences and have begun to externalize (or outsource) formerly internal support and administrative services (Prahalad and Hamel 1990; Fink et al. 2004). If all business services were the result of externalization, however, service growth would merely be a statistical effect of reassigning activities from the industrial to the service sector. On the other hand, there has also been an emergence of new services in the market. Given the ever more global competition, accelerating innovation cycles and an ongoing specialization in product markets, management labour has experienced an increasing division of labour (Wood 2002). As a consequence, corporate management has produced new demand for expert services and stimulated an ongoing growth and diversity of business services (Glückler 2004). In order to classify services from a demand perspective, we checked for problems of overlap between existing typologies (Haas and Lindemann 2000; EFBR 2005; Ganz 2005; Hertog et al. 2006). Based on the typology of the European Commission (EFBR 2005) and the classification used in a survey on the service economy in Bavaria (Haas and Lindemann 2000) there were no critical differences at the level of three-digit classes.

2.2. Knowledge intensity

The degree of qualification and expertise necessary for the provision of services has also been an important dimension in services research. Many researchers have looked at the particular conditions of knowledge-intensive services and their development over time and space (e.g. Hauknes and Antonelli 1997; Balaz 2004; Bryson and Rusten 2005; Glückler 2007). A perspective on knowledge-intensity investigates the input and quality of human capital in service products and is usually measured by the share of employees with a tertiary education in overall employment in a service sector (Haas and Lindemann 2000). Generally, the higher the knowledge-intensity of a service the more difficult it is to standardize these services. Problems become more specific and solutions grow more complex. The specificity and sometimes uniqueness of expertise services require and enable more innovativeness and competitiveness because standardization and cost strategies are hard to realize. Knowledge-intensity stimulates innovation in order to generate rents from temporary knowledge monopolies. This is true not only for the service providers but often also for the service users in agriculture, manufacturing and services. This paper relies on the statistical classification of the *Niedersächsische Institut für Wirtschaftsforschung* (Legler and Frietsch 2006) which has been used by many other research organizations in Germany (ZEW, DIW, Fraunhofer ISI etc.) and for the framework studies on the German innovation system carried out by the Federal Ministry of Education and Research. It assigns all NACE three-digit industry-codes to two categories: operational (i.e. less qualified) and knowledge-intensive services (Figure 1).

2.3. Technology intensity

A third important dimension related with services research is the technology-intensity. While some services simply use technologies such as information and communication technologies to transmit part of their service, other services are focused on developing or improving these technologies (e.g. software firms and databank development). The technology dimension is particularly critical for the economics of services because services are often unable to experience productivity gains (Baumol 1996). While work is an input in the manufacturing sector, which may be replaced through the application of technology at the same or higher output, work is input and output in most services. Increases in productivity over time may be achieved through increased capital per worker, improved technology, increased labour skill, better management, and economies of scale as output rises (Heilbrun 2003). In services, these sources of productivity gains are often not available. Despite these restrictions, several OECD studies provide evidence for sometimes remarkable productivity increases in technological services (Wölfl 2003). Services that focus strongly on the development or application of technology seem to be sources of productivity growth. An economic perspective which is sensitive to productivity gains therefore justifies to classify services according to their technology-intensity (Tether and Hipp 2002; Freel 2006). However, in traditional service classifications the technology-intensity has been disregarded. Only recently, the OECD (Hauknes and Antonelli 1997) and the BMBF (Legler and Frietsch 2006) have suggested an identical typology that distinguishes non-technological or technology-using from technology-based services. Since these classifications have only been developed for knowledge-intensive business services, the third dimension is still incomplete and does not distinguish technology-intensity for consumer or operational services.

A combination of the three dimensions produces a cube with eight theoretical service types of which five are empirically defined (Figure 1): These types are operational (OCS) and knowledge-based consumer services (KICS) on the one hand, and operational (OBS), knowledge-based (KIBS) and technological knowledge-based business services (TKIBS) on the other. The typology provides a complete classification of all service branches and thus produces a complete picture of the service economy. The typology has been developed from three partial classifications which are widely accepted in German and international research and which respond to critical aspects of economic analysis and policy: The demand orientation responds to growth differentials between consumer and business services over the last decade; knowledge-intensity captures the different levels of innovativeness, standardization and value-added between operational and knowledge-based services; finally, technology-intensity captures the different opportunities for productivity gains between non-technological or technology-using services and technology-based services. Apart from reconciling existing typologies into one coherent typology, the purpose of this paper is to assess the empirical viability and pragmatic use-value of this typology. Given that the service economy is extremely heterogeneous, the paper aims at capturing a significant part of the diversity in sectoral and regional employment structure and dynamics with the five service types.

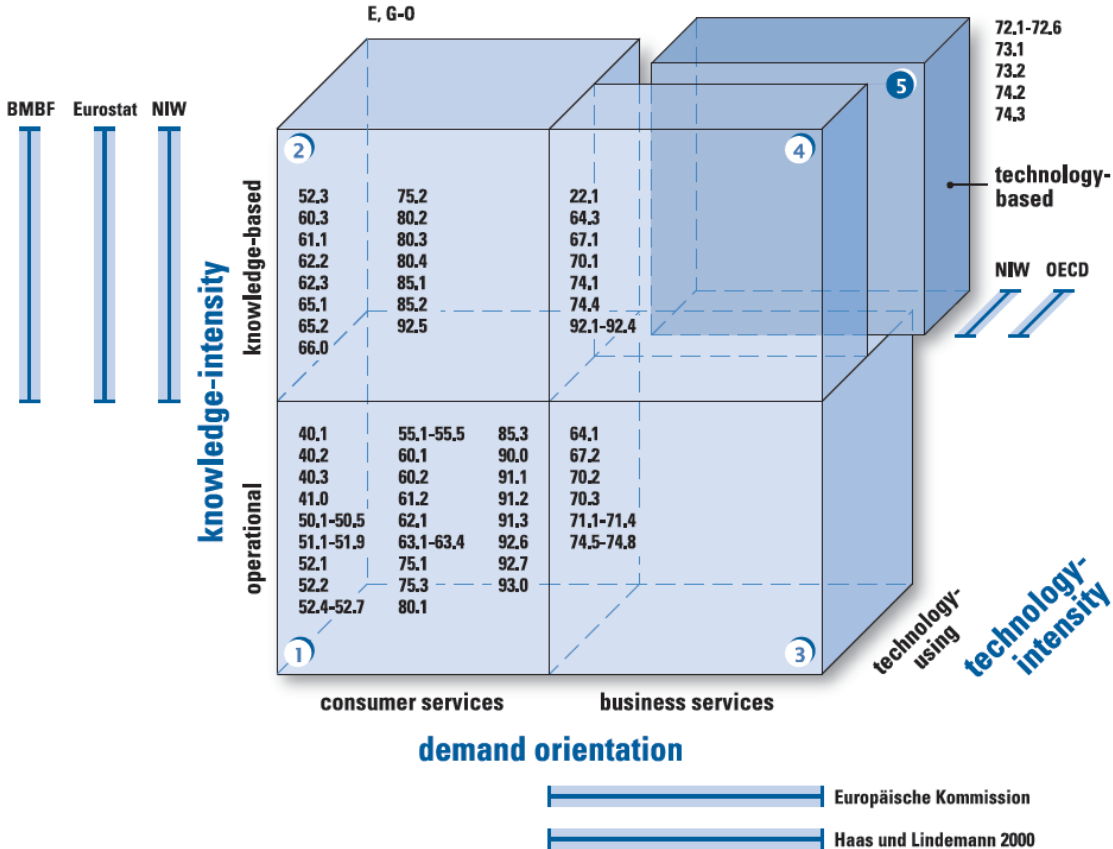


Fig. 1: Five service types in the service economy

3. Method

The empirical analysis uses the employment statistics of the German *Bundesagentur für Arbeit*. The statistics include the full population of employees subject to social insurance contribution, a group that corresponds with around 65% of the total active workforce in Germany. Other forms of work for which social security is not mandatory and which are therefore not included in these data, are state officers, self-employed, freelancers, unpaid mutual help and people employed in policy programs of so-called mini-jobs (Destatis 2007). Employment data were collected for the years 1999, 2002 and 2005ⁱⁱⁱ and were clustered by three-digit NACE codes into the five service types. The data are subject to some limitations. Data for the city-states Bremen, Hamburg and Berlin are incomplete. In addition, some sectors such as space technologies had to be excluded because of a lack of data for most regions. For reasons of anonymity, data are kept blind whenever a sector is represented by less than three local plants in a spatial unit (here: counties). These missing data may produce errors in aggregate counts which are mostly small but may lead to 50% deviation in very rare cases.

The analysis covers service employment in Germany at the NUTS-3 level^{iv} of 439 counties (*Kreise*). In later analyses, these regions are categorized into nine settlement types as defined by the BBR classification of settlement structures^v. The settlement types are defined by the size and density of the regional population as well as by the functional centrality of the settlements (Table 1). Service employment varies considerably in its regional distribution and growth dynamics at the level of the *Länder* (NUTS 1). There have been strong rates of decline in the Eastern regions, a pronounced growth in the South and a more heterogeneous development in central and northern Germany. Eastern regions have lost jobs in the order of 10% and higher since 1999. Even the high-growth types of knowledge-intensive business services and technology-based services have been under decline in the East. Only operational consumer services had some increase over the period. In contrast, the southern regions of Bavaria and Baden-Wuerttemberg have experienced a far above average job growth in services and the smallest rates of decline in non-service jobs^{vi} in Germany. The more balanced regions of central and northern Germany grew moderately in the growth sectors of the service economy (business services) and lost a considerable amount of jobs in the non-service sectors. On balance, these regions suffered from net job losses.

Given the diverse regional trends in service development, the regional analysis focuses on the two southern growth regions of Bavaria and Baden-Wuerttemberg (*BW*) which belong to the biggest German *Länder*. Together they represent around 28% of the German population (23 million citizens), nearly 30% of the 26 million employees and 27% of the 18 million service employees in Germany. Bavaria employs 2.7 million people in services and has experienced by far the highest growth rate in service jobs over the last six years. *BW* is characterized by a strong and competitive high-tech manufacturing sector (Gebhardt 2008) which may explain the below average degree of tertiarization (58%), i.e. the share of people employed in services. The composition of service types as defined by the service typology of this paper is largely identical with the German average (Table 2).

Region types	Area types (<i>Kreise</i>)	Germany	Bavaria	BW
Agglomeration	Central cities	43	4	4
	Highly agglomerated counties	44	3	9
	Agglomerated counties	40	8	-
	Rural Counties	22	2	1
Urbanized area	Central cities	29	4	4
	Agglomerated Counties	90	14	18
	Rural Counties	69	14	8
Rural area	Rural counties with higher density	60	34	-
	Rural counties with lower density	42	13	-

Table 1: Number of NUTS-3 regions (*Kreise*) by types of settlement structure in Germany (BBR 2008)

The aim of the regional analysis is to compare differentials in employment growth and in the geographical dynamics of this growth. Employment growth is measured as the simple growth rate from 1999 to 2005 in percent. Two other measures are used to assess the geographical dimension of sectoral employment and job growth. The *coefficient of localization* measures the extent to which an industry is localized compared with the spatial (multi-regional) distribution of all economic activities. It is calculated by subtracting for each region the percentage employment share of the industry in question from the total regional employment share (the region's share of national employment in all activities). The sum of the positive (or the negative, not both) deviations, divided by 100 represents the coefficient potentially varying between 0 and 1. If most jobs in a sector are highly clustered in only a few regions, the coefficient converges to one. If jobs spread equally across the regions, the coefficient approaches zero. In order to analyse the geographical dynamics, the change rates of the coefficient of localization between 1999 and 2005 are computed and then compared for each service type. Increases in the coefficient of localization indicate processes of spatial concentration and clustering whereas value decreases signal processes of geographical expansion and diffusion.

4. The service typology in practice

4.1. Differentials in sectoral employment growth

The employment statistics illustrate the overall significance of service work in Germany. In 2005, more than two thirds of the German workforce (67,6%) were employed in sectors of the service economy (Table 2): The majority of service jobs is found in operational consumer services such as retailing, logistics and other network services (OCS). Knowledge-intensive consumer services are the second large segment (KICS). Here, many jobs are related with banking, health and educational services. In comparison with consumer services, business services (OBS, KIBS, TKIBS)

employ still a minor share of service workers (22%). Generally, business services have experienced stronger growth than consumer services since 1999. Knowledge-intensive and technological business services (KIBS and TKIBS) grew strongest since 1999. However, differences in employment growth are less obvious between operational and knowledge-intensive services. In absolute terms, employment grew in all service types between 1999 and 2002, a period characterized by strong economic growth during the “new economy wave”. Between 2002 and 2005, however, only operational consumer services continued to grow at similar growth rates. At the same time, all other segments suffered from employment decline. In operational consumer services the employment loss outweighs prior growth leading to a net loss over the whole period. A big share of overall employment growth rests on a few service sectors in each segment. The largest employment group, operational consumer services, illustrates the heterogeneity of these dynamics: apart from continuously growing (e.g. social services, catering, transport services) and shrinking sectors (e.g. retailing, public administration), there is another set of sectors experiencing oscillations of growth and decline during the period 1999 to 2005. The few growth sectors accounted for more than 80% of all new jobs in this segment. Across the entire German service economy, only thirteen out of 93 sectors accounted for 82% of net job growth.

	Employees 1999	Employees 2002	Employees 2005	Share in services	abs. change (1999-2005)	rel. change (1999-2005)
Total economy	27,402,367	27,505,182	26,112,916		-1,289,451	-4.71%
Non-services	9,955,345	9,337,564	8,471,595		-1,483,750	-14.90%
Services	17,447,022	18,167,618	17,641,321	100.0%	194,299	1.11%
OCS	9,958,726	10,048,691	9,649,409	54.7%	-309,317	-3.11%
KICS	4,089,360	4,247,622	4,112,491	23.3%	23,131	0.57%
OBS	1,424,813	1,616,516	1,697,674	9.6%	272,861	19.15%
KIBS	1,174,612	1,340,973	1,294,054	7.3%	119,442	10.17%
TKIBS	799,511	913,816	887,693	5.0%	88,182	11.03%

Table 2: Service employment by service segments, in different years (own calculations)

Employment growth in the operational services is higher in absolute numbers than in knowledge services, simply because these segments are large and represent around two thirds of the workforce in the service economy. In relative terms, however, business services have grown remarkably stronger than consumer services. The increasing demand for business services is most visible in the sharp increase of jobs in operational business services (OBS). Within this sector, labour recruitment and provision of personnel account for a major part of job growth (up to 50% of the growth in OBS). A few service sectors accounted for the lion share of job growth: social services (OCS), health services (KICS), consulting (KIBS) and software development (TKIBS). Conversely, also the declining sectors spread across the segments, such as specialized retailers (OCS), credit institutes (KICS), or publishers (KIBS). Can we account for these descriptive differences in employment growth more generally?

Employment growth proves to be statistically independent from the employment size of a sector. This is important to note since it refutes simple life cycle effects of young and small sectors growing strongly and big and older sectors undergoing decline. Instead, job growth in services varies significantly across the service types. Statistical tests for mean differences demonstrate that the average growth rates of the sectors differ significantly such that each type seems to entail specific employment effects (Table 3). In Germany, operational consumer services shrunk by 5%, and knowledge-based consumer services largely stagnated (+2%). In contrast, all business services experienced a remarkable though differential growth: operational business services grew by 12%, knowledge-based business services by 6% and technological knowledge-based business services by 41%. This pattern of growth is significantly different for each type ($p < 0.01$). Bavaria and *BW* also resemble this growth pattern though there are some particularities. In Bavaria, all types grew far stronger than the German average, and knowledge-based business services grew even higher than operational business services. In *BW*, however, growth rates deviate slightly from this pattern and differences between segments are significant only at $p < 0.1$.

Region	Segment	No. sectors	Mean	S.E.	F	d.f
Germany	OCS	46	-4.84	12.62	5.56 ^a	92
	KICS	15	1.82	27.97		
	OBS	12	12.21	23.93		
	KIBS	10	6.19	18.01		
	TKIBS	10	41.15	70.72		
Baden - Wuerttemberg	OCS	46	1.65	25.11	2.021 ^b	92
	KICS	15	2.17	35.99		
	OBS	12	14.55	18.36		
	KIBS	10	10.809	26.98		
	TKIBS	10	31.971	64.85		
Bavaria	OCS	46	1.03	21.66	3.161 ^a	91
	KICS	14	13.69	33.20		
	OBS	12	15.50	20.86		
	KIBS	10	17.45	48.53		
	TKIBS	10	66.79	143.19		

Note: ^a $p < 0.01$; and ^b $p < 0.10$; d.f., Degrees of freedom; S.E., standard error.

Table 3: Test for mean differences of employment growth rates (in percent) by service types

4.2. Differentials in locational structure and geographical dynamics

The former section has demonstrated differential sectoral growth for the defined service segments. This section inquires the existence of service type-dependent differences in the locational structure and geographical dynamics of service employment and its growth. The degree of locational concentration of a sector is measured by the coefficients of localization (c_L) at the level of NUTS-3 regions (*Kreise*). Operational services (OCS and OBS) are distributed more evenly across the regions whereas knowledge services are significantly more concentrated in space. This difference is

obvious for Germany as well as for the two regions under study. A test for mean differences of the coefficients of localization demonstrates that operational business services (OBS) are most evenly distributed across space with a $c_L = 0.28$. Employment in operational consumer services spreads similarly across space with a $c_L = 0.33$. This includes services such as retailing, wholesale trade, logistics, culture, leisure and social services. Knowledge services are spatially more concentrated than operational services. KICS ($c_L = .48$), KIBS ($c_L = .40$) and TKIBS ($c_L = .45$) all cluster at significantly higher levels of spatial concentration.

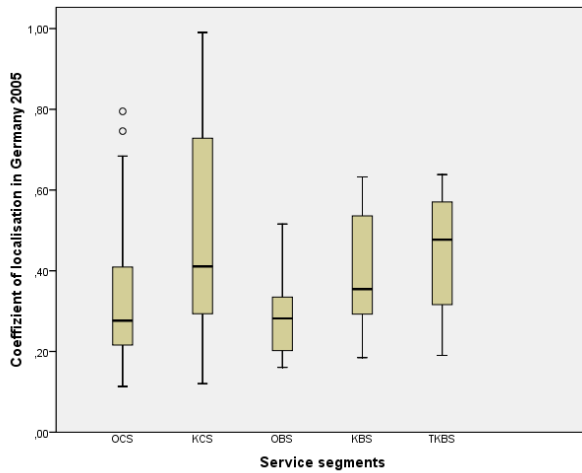
Region	Service type	No. sectors	Mean	S.E.	F	d.f
Germany	OCS	46	0.33	0.17	3.155 ^a	92
	KICS	15	0.48	0.29		
	OBS	12	0.28	0.10		
	KIBS	10	0.40	0.15		
	TKIBS	10	0.45	0.15		
Baden-Wuerttemberg	OCS	46	0.30	0.18	2.776 ^a	91
	KICS	14	0.43	0.29		
	OBS	12	0.27	0.13		
	KIBS	10	0.37	0.17		
	TKIBS	10	0.47	0.20		
Bavaria	OCS + KICS	58	0.34	0.18	2.861 ^b	91
	OBS + KIBS	24	0.42	0.21		
	TKIBS	10	0.47	0.17		

Note: ^a $p < 0.01$; and ^b $p < 0.10$; d.f., Degrees of freedom; S.E., standard error.

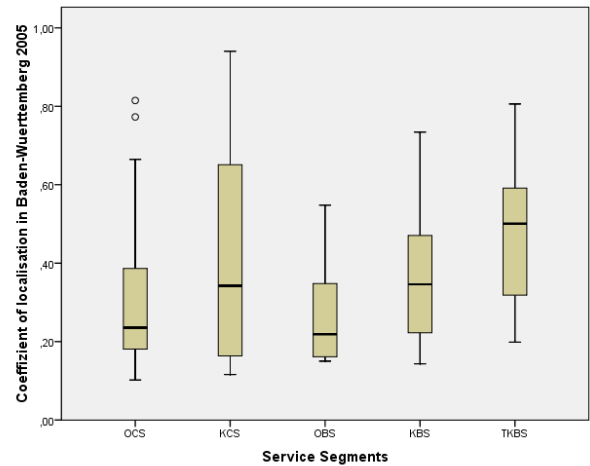
Table 4: Test for mean differences in coefficients of localization between the service segments and by region

Concentration measures vary considerably within the service types^{vii}. As Figure 2 displays, each type contains some sectors with high and low coefficients of localization. The c_L is also subject to a size effect. The more people working in a service sector, the smaller is its geographical concentration. Many of the distributed sectors such as retailing, gastronomy or logistics are big in terms of employment and therefore expand more evenly across space.

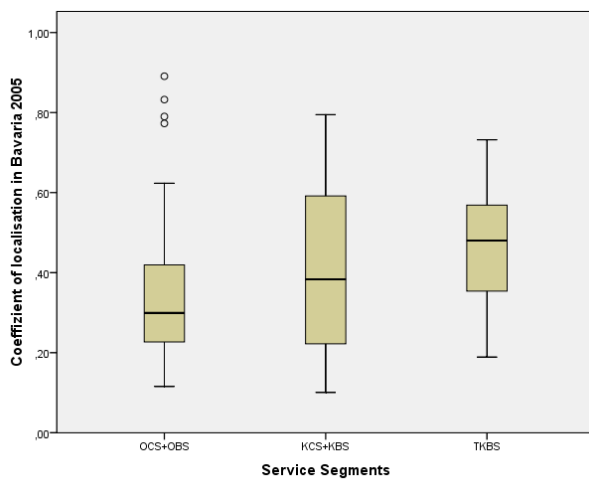
Apart from service type-dependent differences in geographical concentration, it seems that also the geographical dynamics of employment growth are dependent on the service types. All five segments have experienced significantly different geographical growth patterns of concentration and decentralization. The differential geographical dynamics are significant only for the development in Bavaria, however. Remember that Bavaria had the strongest growth in all service types in Germany. While employment in consumer services had experienced continuous spatial concentration, employment in operational and technology-based business services underwent a process of geographical diffusion (Table 5).



a) Germany, 2005



b) Baden-Wuerttemberg, 2005



c) Bavaria, 2005

Fig. 2: Distributions for the coefficient of localization by service type and region (box plots with 50% quantiles)

Notwithstanding, knowledge-based business services (KIBS) have continued to grow in urban centers and the coefficient of localization has slightly yet further increased between 1999 and 2005. This finding is in line with earlier research on the relation between strong sectoral growth at increasing rates of geographical concentration, for instance, in the management consulting business (Glückler and Löffler 1997). Much in contrast, the operational business services had also grown strongly but instead of concentrating in space, new jobs emerged in all kinds of regions following a process of spatial decentralization. The contrary spatial development of KIBS and OBS as described above, is also found in other countries, for instance in the French metropolitan area (Léo and Philippe 2007) The new service typology cannot fully absorb the heterogeneity of geographical dynamics between the many service sectors. For instance, in knowledge-based consumer services there are some sectors following a process of employment concentration (pharmacies, libraries) whereas other sectors have experienced a more decentralized job growth (utilities and other network services, and commercial banks). Similar patterns of within-group variation also occur in the other service types. In consequence, the levels of significance for the differential geographical dynamics of growth-concentration and growth-decentralization only reaches $p < 0.1$.

Region	Segment	n	Mean	S.E.	F	d.f
Germany	OCS	46	-1,54	7,01	1,449	92
	KICS	15	-1,19	4,42		
	OBS	12	-6,48	9,53		
	KIBS	10	-2,52	8,13		
	TKIBS	10	-5,27	10,44		
Bavaria	OCS	46	1,01	9,69	2,310 ^b	91
	KICS	14	3,90	16,93		
	OBS	12	-7,32	9,41		
	KIBS	10	0,18	9,44		
	TKIBS	10	-5,58	13,08		
Baden- Wuerttemberg	OCS	46	0,28	10,89	0,927	91
	KICS	14	0,99	7,64		
	OBS	12	-4,82	15,51		
	KIBS	10	4,03	21,59		
	TKIBS	10	-3,85	10,94		

Note: ^b p < 0.10; d.f., degrees of freedom; S.E., standard error.

Table 5: Test for mean differences in the rates of change in the c_L by service segments in Bavaria, 1999-2005

The differential geographical dynamics of employment produce different effects for different settlement types and regions in Germany. Operational consumer services declined in the central cities of the agglomerated areas and those of their urban hinterland, while they grew strongly in the suburban hinterland of the central cities (Table 6). Knowledge-based consumer services grew in all settlement types except for the densely populated fringe of the metropolitan regions where they declined remarkably by -22%. Operational business services grew strongest in the more peripheral areas, i.e. rural counties and more sparsely populated regions thus producing a strong effect of geographical diffusion of employment. In contrast, knowledge-based and technology-based business services grew strongest in the densely populated and agglomerated regions.

	Area Types	OCS	KICS	OBS	KIBS	TKIBS
Agglomeration	Central cities	-4.5%	2.1%	11.6%	14.1%	13.4%
	Highly agglomerated counties	1.0%	1.6%	28.9%	11.8%	22.1%
	Agglomerated counties	-0.2%	1.6%	30.7%	14.7%	5.6%
	Rural Counties	-5.0%	-6.8%	8.4%	-2.9%	-10.7%
Urbanized area	Central cities	-6.3%	0.3%	23.6%	4.4%	3.6%
	Agglomerated Counties	-0.6%	0.9%	27.7%	11.4%	8.1%
	Rural Counties	-5.5%	-1.0%	14.2%	2.8%	1.0%
Rural area	Rural counties with higher density	-2.1%	-1.6%	31.5%	0.9%	4.0%
	Rural counties with lower density	-9.4%	-5.1%	20.6%	-5.0%	-14.5%

Table 6: Employment growth in the German NUTS-3 regions by settlement types

Finally, it has to be noted that the employment growth of a service sector is independent from its geographical dynamics. There is no inherent effect that growing sectors also expand spatially. Consequently, high-growth sectors such as operational and knowledge-based business services do not necessarily follow the same pattern of geographical diffusion. Much in contrast, while the former does expand over space, the latter type seems to yield job growth predominantly in agglomerated urban contexts. This finding is important for labour market analysis and regional policy. Regional governments and policy agencies should obtain a more detailed understanding of the geographical effects of sectoral growth in order to detect opportunities and avoid misleading policies to develop activities that run counter their geographical trends.

5. Discussion and implications for future research

In this paper we have tried to propose an integrated service typology which responds to important debates about differential economic effects on service activities on the one hand, and to the demand for pragmatic use and analytical power in regional analysis. By combining three crucial dimensions – demand orientation, knowledge-intensity and technology-intensity – we defined five different service types: operational and knowledge-based consumer services (OCS and KICS), operational business services (OBS) and knowledge-based as well as technological knowledge-based business services (KIBS and TKIBS). Based on the European NACE standard of industry classification we split 93 three-digit sectors into the five service types in order to test for significant differences in employment growth, locational structure and geographical dynamics of employment in these sectors. In the context of Germany and the fast-growing regional economies of Bavaria and Baden-Wuerttemberg, we analysed service employment between the period 1999 to 2005 and found considerable support for the typology. The rates of employment growth, locational structures and the geographical processes of concentration and diffusion were shown to be significantly different for each of the service types. In consequence, a considerable proportion of diversity in the heterogeneous service economy can be captured with a pragmatic service typology of only five basic types. Regional analysts and policy makers may benefit from a pragmatic service typology which translates coherently into the industrial classification standard of the European Union (NACE).

At the same time it has become obvious that the typology could not absorb the entire heterogeneity of the 93 service sectors within each of the five service types. The typology did not work equally well for the observed growth regions Bavaria and Baden-Wuerttemberg where the key findings were not always significant. However, part of these variances may be related to differences in the state of regional development and settlement structures in the three regions. Knowledge-based consumer services (KICS) were found to be the most heterogeneous group within that typology. The 15 sectors which were grouped in this type produced sometimes very different results for some of the indicators. Future research should address more intensively the diversity and heterogeneity inherent in the service economy (Tether and Hipp 2002). Some of the weakness of the typology is based on ambivalent service sectors. To take two examples: commercial banking belongs to knowledge-based consumer services although much of their business is with other businesses. Similarly, logistics

and transport is assigned to operational consumer services but many of the activities are intermediary and facilitate movements of unfinished goods along the production chain. These and other sectors that serve final users as well as other businesses are difficult to classify and thus produce noise in the typology. However, we have maintained these in compliance with existing classifications discussed earlier.

The European Commission has now finished a revision of the NACE standard (NACE Rec. 2) which is to be used for statistics referring to economic activities performed from 1 January 2008 onwards (Eurostat 2008). The detail of the classification has substantially increased (from 514 to 615 classes). Especially for service activities, this increase is visible at all levels, including the highest one, while for other activities, such as agriculture, the increase in detail affected mostly the lower level of the classification. In future research, the typology may benefit from being adapted to this more fine-grained industry classification of NACE Rev. 2. Another opportunity to improve the significance of the service typology is to disaggregate at the four or five-digit level of the NACE code. This, however, would render its use more costly and complicated. Further application of this typology to other regions in Europe would prove helpful in order to better assess its usefulness for regional analysis.

6. References

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Endnotes

ⁱ NACE means *Nomenclature générale des activités économiques dans les Communautés Européennes* (General Industrial Classification of Economic Activities within the European Communities) and was first developed in 1970. It classifies the whole range of economic activities. Since this first taxonomy was not compatible with other international industry standards, the a joint United Nations Statistical Office/Eurostat working group got involved in the third revision of the International Standard Industrial Classification of All Economic Activities (ISIC Rev. 3), which was adopted by the United Nations Statistical Commission in February 1989. Subsequently, a working group promoted by Eurostat with representatives of Member States developed a revised version of NACE, called NACE Rev. 1. Starting from the structure of ISIC Rev. 3, details were added to reflect European activities that were inadequately represented in ISIC. NACE Rev. 1 was established in 1990. In 2002, a minor update of NACE Rev. 1, called NACE Rev. 1.1, was established. NACE Rev. 1.1 introduced a few additional items and changes to some titles. The aim of the update was to reflect new activities which did not exist before (e.g. call centres) and activities which had manifestly grown in importance. In 2002, a new revision was initiated until 2007.

ⁱⁱ The NACE groups are defined as follows: E. Electricity, gas and water supply, G. Wholesale and retail trade; repair of motor vehicles, motorcycles and personal and household goods, H. Hotels and restaurants, I. Transport, storage and communication, J. Financial intermediation, K. Real estate, renting and business activities, L. Public administration and defence; compulsory social security, M. Education, N. Health and social work, O. Other community, social and personal service activities.

ⁱⁱⁱ The month of reference was 31 June for each year.

^{iv} The Nomenclature of Territorial Units for Statistics, (NUTS) is a geocode standard for referencing the administrative divisions of countries for statistical purposes. The standard was developed by the European Union, and thus covers the member states of the EU in detail. NUTS level 3 corresponds with the administrative level of *Kreise* in Germany.

^v The BBR (*Bundesministerium für Bauwesen und Raumordnung*) is the German Federal Office for Building and Regional Planning.

^{vi} Here, non-service jobs represent the residual sectors of agriculture, fishery and forestry, industrial manufacturing, mining and construction (NACE groups WZ A, B, C, D and F).

^{vii} It has to be noted that the coefficients of localization are subject to considerable variance within some service segments. This is especially critical in segment 2.