Statistical Classification of Knowledge-Intensive Business Services (KIBS) with NACE Rev. 2

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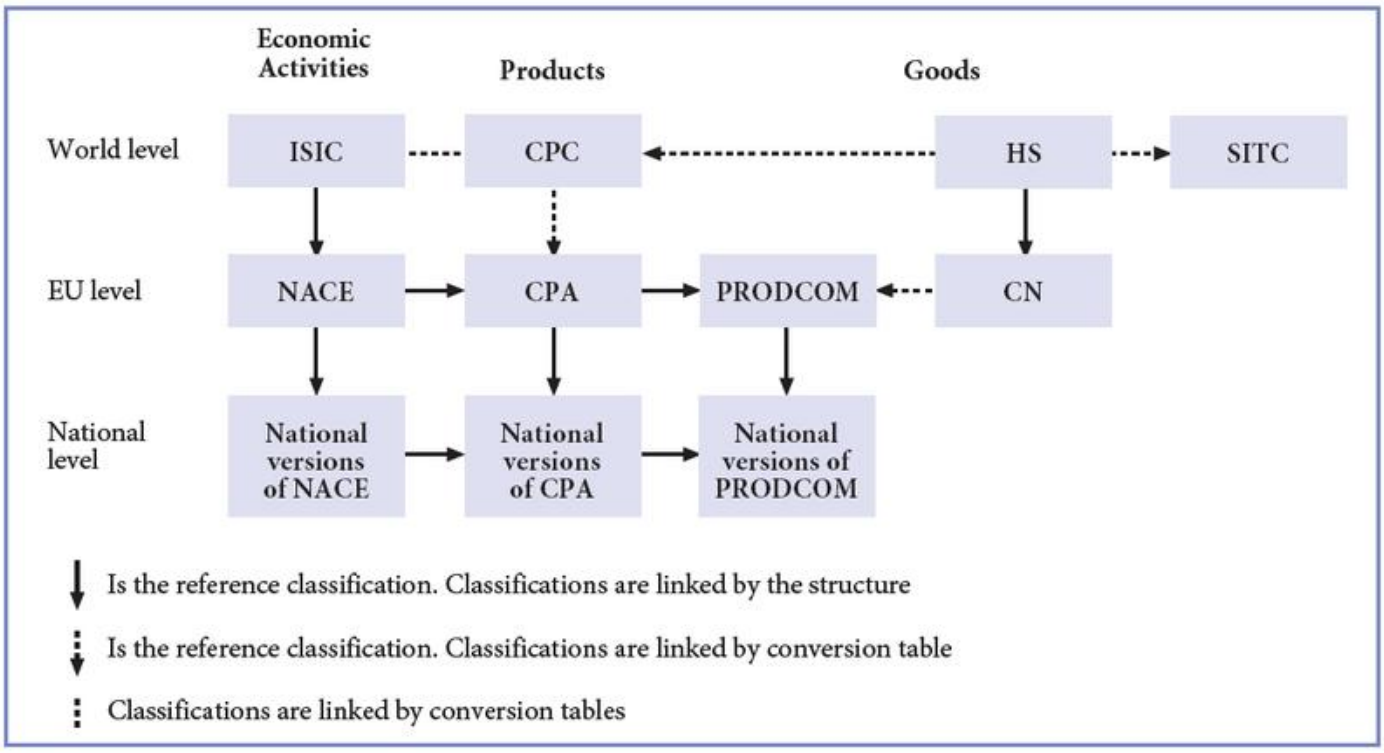
Introduction and starting-point

Statistical analyses of economic questions have to be based on reliable data in order to obtain thorough information on targeted aspects. Research questions frequently refer to pertinent aspects in specific industrial sectors so that analyses in this field use data for selected industrial branches or sectors. Due to the process of European integration and as economic activities are becoming increasingly internationalised, previous national statistics have been harmonised in order to enable international analyses and comparisons. A broad range of statistical classifications have been developed concerning the question under discussion.[1] In Europe, the Statistical Classification of Economic Activities in the European Community (*Nomenclature statistique des activités économiques dans la Communauté européenne*, NACE) has been developed since the 1970s in order to lay the base for the collection and treatment of data with respect to economic activity. The European Member States collect their data according to the NACE classification and transfer it to Eurostat, the Statistical Office of the European Union. So NACE data is not only comparable at the European, but also at the pan-European level. As Figure 1 shows, various statistical classification systems for economic activities, products and goods exist at national, European and international levels. They can be linked through conversion tables. So, "… NACE is part of an integrated system of statistical classifications, …". (Eurostat 2008: 13). Figure 1 also illustrates that NACE is based on ISIC, the international classification of economic activities. This means that both classifications are identical on the highest classification levels, but that NACE on the lower levels is more detailed (Eurostat 2008).

Figure 1: The international system of economic classifications



Source: Eurostat (2008: 13).

In order to harmonize international classifications on products and industries and to adapt to the changes in the economy and technological development, a revision process was initiated in 2001. In particular, the increased importance of service activities called for a revision. The revision process refers to both ISIC (United Nations' International Standard Industrial Classification of All Economic Activities) and CPC (United Nations' Central Product Classification) and takes place within the UN Statistical Commission. In 2006, the new classifications were finalized

1 Cf. http://ec.europa.eu/eurostat/ramon/.

(with smaller changes at later stages). In the European Union and the Member States, the classifications were revised in parallel and the European process also influenced the international process. The new NACE Rev. 2 and CPA (European Classification of Products by Activity) were introduced in 2006 resp. in 2008 (Eurostat 2008).

The NACE classification has a hierarchical structure. Its different levels range from the most general to very fine descriptions of economic activities. So the first level of the NACE Rev. 2 classification represents sections A to U ranging from Agriculture, Forestry and Fishing (A) to Activities of extraterritorial Organisations and Bodies (U). The next levels – divisions, groups and classes – identify economic activities on an ever finer level, as for instance in section C (Manufacturing). Here, division 20 embraces the manufacture of chemicals and chemical products, while group 20.1 describes the manufacture of basic chemicals, fertilisers and nitrogen compounds, plastics and synthetic rubber in primary forms. Class 20.12 finally (four-digit level) refers to the manufacture of dyes and pigments.

The adaption to changes in economic activities is reflected in the greater level of detail in NACE Rev. 2 with regard to service activities. For example, repair activities which were previously part of the manufacturing section, became part of services. In addition, NACE codes were split up. This is reflected in the number of sections, divisions, groups and classes. Figure 2 shows the structural comparison of the former NACE Rev. 1.1 and the new NACE Rev. 2. The number of sections increased by four, while the number of divisions increased by 26. All these changes mainly refer to the service sector. For example, Information and Communication is now a separate section (J).

Figure 2: Structural comparison of NACE Rev.1.1 and NACE Rev.2

	NACE Rev. 1.1	NACE Rev. 2	Difference
Sections	17	21	+4
Divisions	62	88	+26
Groups	224	272	+48
Classes	514	615	+101
Manufacturing section			
Sections	1	1	0
Divisions	23	24	+1
Groups	103	95	-8
Classes	242	230	-12
Other sections			
Sections	16	20	+4
Divisions	39	64	+25
Groups	121	177	+56
Classes	272	385	+113

Source: Eurostat (2008: 48).

As a general rule, the overall NACE characteristics did not change with the previous revision. But new concepts and new details were introduced, aiming at reflecting different forms of production and also new industries. So the 17 sections of NACE Rev. 1.1 developed into 21 sections in NACE Rev. 2. The higher level of detail in the newest version enables finer economic analyses, but with the consequence that NACE Rev. 1.1 and NACE Rev. 2 classifications are not easily comparable. However, Eurostat provides correspondence tables that allow the comparison of classes in both NACE systems. Changes between NACE Rev. 1.1 and NACE Rev. 2 are illustrated as follows (cf. Eurostat 2008: 47/48):

- in 195 cases, NACE Rev. 1.1 classes correspond to NACE Rev. 2 classes
- in 18 cases, one NACE Rev. 1.1 class corresponds to two or more NACE Rev. 2 classes
- in 86 cases, two or more NACE Rev. 1.1 classes correspond to one NACE Rev. 2 class
- in 215 cases, two or more NACE Rev. 1.1 classes correspond to two or more NACE Rev. 2 classes.

This shows that the direct comparison of certain categories between the two NACE classifications systems is complex and difficult to realise. Particularly in an intertemporal perspective, the use of Eurostat correspondence tables is of high value;[2] however, direct comparisons and the interpretation of statistical findings strongly depend on the precise research question.

Implication for economic and innovation analyses: The new classification NACE Rev. 2 and the consequences for KIBS analyses

It becomes clear that changes in the NACE classification scheme have major implications on long-term analyses of employment or firm populations in specific industries. This means that investigations of sub-categories in the service sectors are facilitated, which is an important aspect in analyses related to knowledge and innovation. A particular sub-group of service companies – the so-called knowledge-intensive business services (KIBS) – are of special interest to innovation research, because they fulfil important functions with respect to innovation and economic growth: Not only are they very often highly innovative as such, but are also pushing innovation activities in other companies, particularly of the manufacturing sector. The main reason for this is rooted in the nature of their offer: the collection, processing and treatment of knowledge and its adaptation and appropriation to the clients' needs. It should also not be forgotten that KIBS provide highly qualified workplaces and so contribute to the economic growth of their locations (cf. the broad literature on KIBS and KIBS innovation by researchers like Paul Cunningham, David Doloreux, Faïz Gallouj, Pim den Hertog, Christiane Hipp, Hugo Hollanders, Jeremy Howells, Ian Miles, Emmanuel Muller, Luis Rubalcaba, Richard Shearmur, Simone Strambach, Bruce Tether, Peter Wood and many others).

Statistics provided by Eurostat deliver a very useful distinction within the service sector, relating to the knowledge-content of service categories. Based on the 2-digit level of NACE Rev. 2, Eurostat distinguishes between knowledge-intensive services (KIS) and less knowledge-intensive services (LKIS). While the first group – further sub-divided into knowledge-intensive market services, high-tech knowledge-intensive services, knowledge-intensive financial services and other knowledge-intensive services – includes NACE sub-sectors 50 to 51, 58 to 63, 64 to 66, 69 to 75, 78, 80, and 84 to 93 (including for instance water and air transport, publishing, motion picture, video and television programme production, telecommunications, computer-related activities, financial and insurance activities, legal and accounting, head offices, management, architectural and engineering activities, advertising and market research, employment activities, security and investigation, public administration and defence, human health, arts, entertainment, recreation and others), LKIS – further divided into less knowledge-intensive market services and other less knowledge-intensive services - refer to NACE sub-sectors 45 to 47, 49, 52 to 53, 55 to 56, 68, 77, 79, 81, 82, 94 to 96, and 97 to 99 (including activities such as wholesale and retail trade, repair of motor vehicles, land transport, warehousing, rental and leasing, real estate, travel agencies, office administration, membership organisations, repair of computers and personal goods, etc.).[3]

2 Cf. http://epp.eurostat.ec.europa.eu/portal/page/portal/nace_rev2/correspondence_tables.

3 Cf. Eurostat (2009): 'High-technology' and 'knowledge based services' aggregations based on NACE Rev. 2.

This categorisation and the available data are very valuable when producing statistics on knowledge-intensive service activities in Europe. Still, it does not allow for quantitative analyses on the specific segment of knowledge-intensive business services, which leads us to propose a new KIBS classification based on NACE Rev. 2. Very clearly, KIBS activities are a sub-group of knowledge-intensive services. The classification of KIBS activities according to the previous NACE Rev. 1.1 – which was accepted and approved in the scientific community – comprised the (former) NACE divisions 72 (Computer and related activities), 73 (Research and development), as well as the groups 74.1 (Legal, accounting, book-keeping and auditing activities; tax consultancy; market research and public opinion polling; business and management consultancy; holdings), 74.2 (Architectural and engineering activities and related technical consultancy), 74.3 (Technical testing and analysis) and 74.4 (Advertising) as KIBS activities (EC Commission Staff 2009). However, it has to be added that data availability below the two-digit level was limited, particularly when investigations targeted the regional level, so that quantitative investigations frequently had to use the complete NACE 74 aggregate.

When comparing the KIBS classification of NACE Rev. 1.1 to the new one in NACE Rev. 2, the following changes can be observed: economic activities related to information and communication activities are now found in a newly created section (J: Information and communication). This section refers to activities concerning the "… production and distribution of information and cultural products, provision of the means to transmit or distribute these products, as well as data or communications, information technology activities and the processing of data and other information service activities." More precisely, the following belong to this section: "… publishing activities, including software publishing (division 58), motion picture and sound recording activities (division 59), radio and TV broadcasting and programming activities (division 60), telecommunications activities (division 61) and information technology activities (division 62) and other information service activities (division 63), i.e. activities that formerly belonged to sections D (Manufacturing), I (Transport, storage and communications), K (Real estate, renting and business activities) and O (Other community, social and personal service activities)" (Eurostat 2008: 49).

Further, the former NACE Rev. 1.1 section K that included the KIBS categories 72, 73, and 74.1 to 74.4 was split into three new sections in NACE Rev. 2, an aspect that is crucial for analyses on KIBS activities. First, real estate activities received an individual section (L), while further activities are classified in sections M (Professional, scientific and technical activities) and N (Administrative and support service activities). Section M embraces activities "… that require a high degree of training and make specialised knowledge and skills available to users…", and section N relates to "… activities that support general business operations and do not focus on the transfer of specialised knowledge" (Eurostat 2008: 49). It thus becomes clear that the new section M is at the core of KIBS activities; along with parts of the new section J referring to computer-related economic activities.

Statistical classification of KIBS activities according to NACE Rev. 2: Our approach

These preliminary remarks show that statistical analyses on the KIBS sector are not straightforward: On the one hand, an updated classification scheme to describe the KIBS sector according to NACE Rev. 2 is to our knowledge not available yet, and on the other hand, intertemporal comparisons that have to be based on NACE Rev. 1.1 and NACE Rev. 2 are difficult to achieve. Thus, our aim here is to develop a NACE Rev. 2 based classification scheme for statistical analyses on knowledge-intensive business services. This proposition for a new statistical KIBS classification has three main objectives: (i) to describe KIBS activities as detailed as possible, (ii) to be as congruent as possible with the former KIBS classification based on NACE Rev. 1.1 (though direct comparability is not fully possible), and (iii) to follow a pragmatic approach in view of data availability, particularly on the regional level. This approach leads to consider KIBS activities on the two-digit level since regional data on the three- or four-digit level is generally not available.

Based on Eurostat's correspondence tables, as well as our knowledge of the KIBS sector and specific KIBS activities, as well as experience in statistical data treatment, we propose the following classification of KIBS activities on the base of NACE Rev. 2 (cf. Table 1):

Table 1: Classification of KIBS activities in NACE 2: Our proposition

KIBS classification NACE Rev. 2	Description of section	Description of division	Comment
Section J, division 62	Information and Communication	Computer programming, consultancy and related activities	
Section J, division 63	Information and Communication	Information service activities	
Section M, division 69	Information and Communication	Legal and accounting activities	
Section M, division 70	Professional, scientific and technical activities	Activities of head offices; management consultancy activities	If data availability allows, restrict data to class 70.2: Management consultancy activities
Section M, division 71	Professional, scientific and technical activities	Architectural and engineering activities; technical testing and analysis	
Section M, division 72	Professional, scientific and technical activities	Scientific research and development	
Section M, division 73	Professional, scientific and technical activities	Advertising and market research	

However, it has to be considered that:

1. not all former KIBS classes are included in this new classification. This is the case for the following activities:

Table 2: KIBS categories that were included in NACE Rev. 1.1, but according to NACE Rev. 2 do not belong to the KIBS sector anymore

NACE Rev. 1.1	Description NACE Rev. 1.1	Not included in KIBS group according to NACE Rev. 2	Comments
72.21	Publishing of software	58.21 Publishing of computer games	Publishing of computer games
		58.29 Other software publishing	All software publishing, except computer games publishing
72.4	Database activities	58.11 Book publishing	Publishing of books on-line
		58.12 Publishing of directories and mailing lists	On-line directory and mailing list publishing
		58.13 Publishing of newspapers	Publishing of newspapers on-line
		58.14 Publishing of journals and periodicals	Publishing of journals and periodicals on-line
		58.19 Other publishing activities	- On-line database publishing - Other on-line publishing n.e.c.
		58.21 Publishing of computer games	On-line computer games publishing
		58.29 Other software publishing	All on-line software publishing, except computer games on-line publishing
		59.2 Sound recording and music publishing activities	Music downloads (on-line publishing with provision of downloaded content)
		60.1 Radio broadcasting	Internet radio broadcasting [not explicitly mentioned in NACE 1.1/ CPA 2002]
		60.2 Television programming and broadcasting activities	Image with sound internet broadcasting [not explicitly mentioned in NACE 1.1/ CPA 2002]
72.5	Maintenance and repair of office, accounting and computing machinery	33.12 Repair of machinery	Repair and maintenance of office machinery and equipment, including photocopying and calculating machines
		95.11 Repair of computers and peripheral equipment	Repair and maintenance of office and computing machinery, excluding photocopying and calculating machines
74.14	Business and management consultancy activities	02.4 Support services to forestry	Forest management consulting services
		74.9 Other professional, scientific and technical activities n.e.c.	Agronomy consulting
		85.6 Educational support activities	Educational support services (part of inclusion "advice and help to businesses and public services")
		64.2 Activities of holding companies	Activities of holding companies not engaged in management.
74.2	Architectural and engineering activities and related technical consultancy	74.2 Photographic activities	Aerial photography
		74.9 Other professional, scientific and technical activities n.e.c.	- Weather forecasting activities - Activities of quantity surveyors

Source: Eurostat correspondence table NACE Rev. 1.1 – NACE Rev. 2 at http://epp.eurostat.ec.europa.eu/portal/page/portal/nace_rev2/correspondence_tables, own compilation

2. Some classes NACE Rev. 2 are included in KIBS activities, but did not belong to KIBS categories in NACE Rev. 1.1:

Table 3: Categories that belong to KIBS according to NACE Rev. 2, but were not part of the (statistical) KIBS sector in NACE Rev. 1.1

NACE Rev. 2	Description NACE Rev. 2	Not included in KIBS group according to NACE Rev. 1.1	Description NACE Rev. 1.1	Comments
62.09	Other information technology and computer service activities	30.02	Manufacture of computers and other information processing equipment	Installation of personal computers and peripheral equipment
63.91	News agency activities	92.4	News agency activities	News-syndicates and news-agency activities furnishing news, pictures and features to the media
63.99	Other information service activities n.e.c.	74.87	Other business activities n.e.c.	Information service activities not elsewhere classified such as: - telephone based information services - information search services on a contract or fee basis - news clipping services, press clipping services, etc.
70.22	Business and other management consultancy activities	5.01	Fishing	Fish stock management, part of inclusion "service activities incidental to fishing"

Source: Eurostat correspondence table NACE Rev. 1.1 – NACE Rev. 2 at http://epp.eurostat.ec.europa.eu/portal/page/portal/nace_rev2/correspondence_tables, own compilation

These tables clearly show that the KIBS sector – as classified in statistical terms – was larger in the former NACE Rev. 1.1 classification than according to our classification proposition based on NACE Rev. 2, a fact that needs to be considered when using the proposed new classification in intertemporal comparisons.

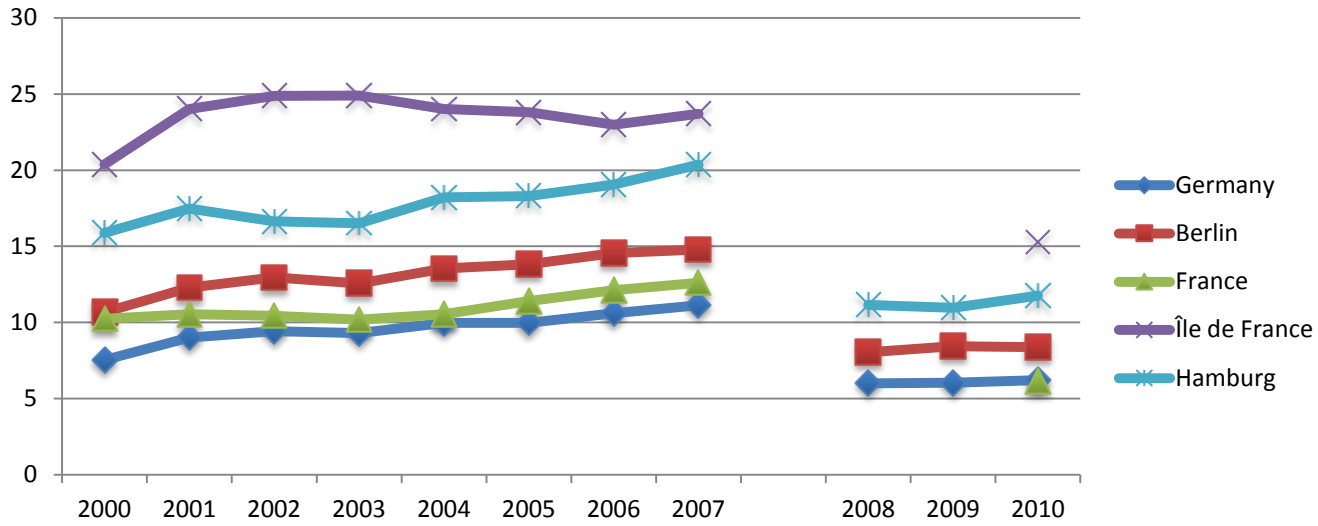
Comparison NACE Rev. 1.1 and NACE Rev. 2.2: Some evidence

The comparison of KIBS employment measured with the old classification (based at two digit level) and the classification as we proposed here shows one major difference with regard to total KIBS employment: When looking at data for 2008 for which data according to both classification is available in Germany, we find on the one hand 3.49 million KIBS employees based on NACE Rev. 1.1 and 1.97 million according to our proposed classification for KIBS in NACE Rev. 2 on the other. This difference of about 1.5 million employees is mainly due to the "non knowledge-intensive" part of economic activities which were part of division 74 of NACE Rev. 1.1. For example, employment activities like temporary employment agencies used to fall into this division. Within the new classification, these activities form their own division (78 "employment activities"). In the year 2008, 764,000 employees were employed in this field. The share of employees with an academic degree was 3% - well below the German average of 10%, which would be an indication for not including this sector into knowledge-intensive business service activities.

The second example is based on the finding that KIBS activities are mainly located within major cities (Schricke et al. 2012). Therefore, the following figure focuses on the national level of France and Germany as well as on the capital

city regions. However, as opposed to France, the German NUTS 2 region with the highest share of KIBS employment is not Berlin, but Hamburg. Therefore, also Hamburg is depicted in the graph. From 2000 to 2007, the data is based on NACE Rev. 1.1. In the following years NACE Rev. 2 is used. Unfortunately, there is no data available for France in 2008 and 2009.

Figure 3: Share of KIBS in France and Germany (2010 – 2010, in %)



Source: Eurostat, own compilation

Figure 3 very clearly shows the statistical effect induced by the change in the NACE classification, particularly the more detailed and finer definition of KIBS activities according to NACE Rev. 2. However, the example of employment agencies shows that the more recent classification scheme is better adapted to KIBS-related investigation because it allows defining the KIBS sector to a higher degree of accuracy.

Similar effects can be observed throughout Europe. Table 4 gives an overview of employment shares in KIBS between 2005 and 2010 according to both NACE classifications. In order to maintain the overview level, this table uses the national level.

Table 4: KIBS employment in EU Member States 2005-2010 (Share of industrial employment), comparison of NACE Rev. 1.1 and NACE Rev. 2

EU Member State	NACE Rev. 1.1			NACE Rev. 2		
	2005	2006	2007	2008	2009	2010
Belgium	10,23	10,69	12,05	5,37	5,50	6,15
Bulgaria	4,32	4,74	5,03	2,78	3,21	3,45
Czech Republic	8,44	9,05	9,30	5,19	5,39	5,54
Denmark	10,64	11,40	11,97	6,36	5,88	6,11
Germany	9,98	10,60	11,13	6,00	6,03	6,21
Estonia	6,88	7,63	8,14	4,51	4,64	4,92
Ireland	6,83		10,02	6,39	4,97	4,94
Greece	6,30	7,24	7,73	5,15	5,23	
Spain	10,91	11,32	11,62	5,71	5,94	5,96
France	11,40	12,12	12,61			6,13
Italy	10,57	10,70	10,99	5,94	6,06	6,12
Cyprus	4,25	4,67	4,73	4,09	4,07	5,65
Latvia	4,96	4,94	5,25	3,44	3,63	3,78
Lithuania	4,03	4,47	4,99	3,25	3,43	3,66
Luxembourg		24,93	25,99		10,79	10,98
Hungary	9,51	9,79	11,12	6,00	6,01	6,32
Netherlands	15,15	18,20	16,86	9,28	8,69	8,47
Austria	8,77	9,21	9,42	5,74	5,88	6,05
Poland	5,50	5,61	5,85	3,05	3,41	3,47
Portugal	9,71	10,51	10,98	4,74	4,88	5,05
Romania	3,61	4,10	4,57		2,50	2,39
Slovenia	6,59		7,72	5,17	5,53	5,85
Slovakia	3,80	3,98	4,60	2,69	2,82	5,15
Finland	7,09	7,65	8,32	5,65	5,78	5,87
Sweden	10,39	11,08	12,03	7,36	7,47	7,72
United Kingdom	14,58	14,68	15,35	8,33	8,86	8,06
Norway	8,96	9,36	10,02	5,51	5,65	5,74

Source: Eurostat, Structural Business Statistics (knowledge-intensive business service sector employment) and Science and technology statistics (total employment data), own compilation

This overview of KIBS employment shows that within both NACE classification schemes, figures seem quite reasonable, while this is not the case when comparing figures between both NACE classifications. The broader range of KIBS activities according to NACE Rev. 1.1 again becomes highly consistent (also due to the fact that we used the whole 74 category, since data for 74.1 to 74.4. is frequently not available, see also above). For some countries, the share of KIBS according to these statistics even halve between 2007 and 2008 which is of course a pure classification-related effect. This leads to the conclusion that intertemporal comparisons have to consider those statistical effects and respect them in their interpretation.

Conclusions

Knowledge-intensive business services – i.e. service companies that provide knowledge-intensive services to their business clients (both manufacturing and services companies) – contribute to innovation activities not only in their

own companies, but also in their clients' and thus play an important role in innovation and growth of their locations. This is well acknowledged in innovation research, and also influences innovation policy.

Sound evidence and political recommendations need a reliable and well-founded base. With the transformation from NACE Rev. 1.1 to NACE Rev. 2, a new classification of KIBS activities was needed in order to perform statistical analyses based on quantitative data. This contribution proposes a KIBS classification scheme which is embedded in the recent NACE Rev. 2. It follows three main objectives: While trying to describe the KIBS sector as detailed as possible, the classification also aims at maintaining the highest possible degree of congruency with the previous NACE Rev. 1.1, and also aims to respect data availability aspects especially on the regional level. A first comparison of data between NACE Rev. 1.1 and Rev. 2 (cf. Figure 3 and Table 4) shows that data comparability is hardly possible. This is due to the fact that NACE Rev. 2 classifies sectoral activities on a finer scale than NACE Rev. 1.1 so that the new proposition comprises a smaller share of service activities than the previous one. However, in our view, the new classification focuses better on “core KIBS activities” than it was possible before. Several non knowledge-intensive activities can be disregarded now so that a more accurate measurement of KIBS activities with available data (for example at Eurostat) is possible. But time series should be interpreted with great care, and direct comparisons are hardly possible.

To conclude, our paper aims to contribute to the discussion on KIBS activities, and we hope to enter into the discussion on measuring and analyzing KIBS activities on the regional, national and international scales.

References

EC Commission Staff (2009): *Challenges for EU support to innovation in services - Fostering new markets and jobs through innovation*, Commission Staff Working Document SEC(2009)1195 final: Commission of the European Communities.

Eurostat (2008): *NACE Rev. 2. Statistical classification of economic activities in the European Community. Eurostat Methodologies and Working papers.* Luxembourg: European Commission.

Schricke, E./Zenker, A./Stahlecker, T. (2012): *Knowledge-intensive (business) services in Europe* (= Project financed by the 6th Framework Programme for Research, for the implementation of the specific programme "Strengthening the Foundation of the European Research Area"), European Commission, D.-G.f.R.a.I. (ed.). Luxembourg: Publications Office of the European Union.