

# Knowledge-Intensive Business Services: Ambiguities and Continuities

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# Knowledge Intensive Business Services: Ambiguities and Continuities


## Structured Abstract

*Purpose of this paper*

The substantial growth in literature on Knowledge Intensive Business Services (KIBS) has thrown light on their contributions to innovation and innovation systems: this paper is the first of a set that examines major debates and conclusions to have emerged from this growing body of evidence.

*Design/methodology/approach*

This is a review essay, which also presents relevant statistics. It addresses definitional issues and controversies, and sets out basic trends and characteristics of the KIBS industries. The focus is mainly on KIBS firms, though the production of similar services in other types of organisation is also considered.

*Findings*

Many of the conclusions of an earlier (2005) review in this journal remain valid, though difficulties in capturing these activities in official statistics, mean that there are many issues that demand closer inspection. Understanding the role and future prospects of KIBS will also require looking beyond the literature that focuses just on KIBS industries.

*Research limitations/implications (if applicable)*

The study involves literature review and statistical analysis. Future work would benefit from involvement of practitioners and users of KIBS.

*Practical implications (if applicable)*

More explicit consideration of KIBS in statistical frameworks is still required, and novel approaches to data conceptualisation and production should be explored.

*What is original/value of paper*

The growing literature on KIBS, and its implications for understanding the roles and future development of the firms and their relationships to innovation systems, requires systematic analysis. Available statistics have been brought together, and the paper also reflects critically on the trajectories of research on these topics.



*Keywords*

Knowledge intensive business services; knowledge economy.

*Article type*

Conceptual paper.


## Introduction

This journal featured an essay on "Knowledge Intensive Business Services" (KIBS) a little over a decade ago (Miles, 2005; we shall refer to this as *f2005* in the following discussion.). The terminology of KIBS was then little more than one decade old. The present essay is the first of three that re-examine the role of KIBS and the possible future evolution of these activities. While these essays draw on extensive literature

reviews, we find that much of the voluminous body of work on the nature and functioning of KIBS has little explicit discussion of several major issues that arise in this context. (The second essay will focus on the role of KIBS in innovation systems, and the consequent important role they may play in fostering large-scale sociotechnical transitions. The third will attend more to the future of KIBS work and social relations.) We shall briefly introduce the field, preceding this with a first account of just what the term KIBS actually means.

What are the elements that comprise Knowledge-Intensive Business Services? We will review debates in the literature later; but first let us provide a first overview:

- Knowledge-Intensive: being highly reliant on expert knowledge – for example, a high share of the workforce consists of professionals with substantial education or training in relevant fields. Examples – architects, computer scientists, designers, lawyers.
- Business – providing inputs to business processes, rather than final consumption activities, thus the customers are mainly other organisations. Both small and large businesses, charitable organisations and public sector bodies may employ accountancy firms to do work for them, for example.
- Services – we can describe services as "doing things rather than making things", as activities, or industries that specialise in such activities, whose main function is effecting some transformations in the world other than the production of a tangible product. (Intangible artefacts like software, databases, media content are regarded as services)[1]. The word "services" is ambiguous, as we shall discuss later; while most KIBS discussion refers to service firms and industries, some refers to the activities or outputs of such firms and industries.

We shall revisit the question of definitions later, since this is a subject that has attracted much attention. Whether or not the construct is ambiguous, since *f2005* was published, KIBS research has expanded dramatically. The terminology "Knowledge Intensive Business Services" first appeared in publications in the mid-1990s (the "trigger" publication comes from 1995). Figure 1 presents data documenting trends in the usage of the term, extracted via the tool *Publish or Perish* (*PoP*) (Harzing, 2010). (We compare it with the usage of "Professional Services" (PS), a longer-established formulation.) *PoP* extracts information from Google Scholar searches. This entails some false "hits" (e.g. in a few cases the words "Professional" and "Services" are not contiguous; some publications are cited in substantially different ways and then counted twice). But it has one big advantage: it covers publications of all sorts – not only scholarly publications in reputable journals, but also books and book chapters, theses, and official reports[2]. Much of the early work on KIBS, and several major recent studies, takes these forms. Some of the most impressive compilations come from reports, especially those to, or produced by, the European Commission.

********** INSERT FIGURE 1 HERE **********

More publications used "Knowledge Intensive Business Services" in their titles - therefore implying a focus on the topic - in the five years after 2005 than had ever done before. By 2015, the number of extant publications was just under four times that in 2005. (A slightly larger number were added in each period after 2005, than is the case for PS.) Examining references to "Knowledge Intensive Business Services" *within* documents (not just in titles), found merely 28 before 1995; a tenfold growth

followed in 1996-2000 to 229; roughly fivefold growth in 2001-05 (over 1000), roughly doubling again in 2006-2010 (over 2500) and in 2011-15 (over 4700). At the very least, this suggests considerable, continuing interest in the topic. When the term appears in the title, it is safe to assume that generally the KIBS will be the focus of the study, when the terms is used in the text it may be that one specific KIBS sector or case is examined, or that KIBS as a whole are being mentioned along with some broader term ("innovation intermediaries", the "knowledge economy" and so on), or perhaps being contrasted with some other category (such as "consumer services"). Mentions of KIBS may rise as parts of accounts of broad socioeconomic change.

In part, this interest will reflect the continuing rapid growth of KIBS sectors of the economy - as documented for the EU, Japan and USA in European Commission (2011), from which Figure 2 draws its data. (We update these data later in this paper.) But another important driver of this interest is the growing concern with innovation. Interest in KIBS emerged alongside interest in service innovation and in innovation systems more generally. KIBS are by definition dealing with knowledge, and knowledge is seen as critical for innovation. KIBS differ from PS in this respect, as we can see in publications' titles. Only 23 publications feature "Professional Services" and "Innovation" together in their titles over 1990-2015 - but over 150 feature "Knowledge Intensive Business Services" and "Innovation" together. (This is almost a third of the publications on KIBS.)

********** INSERT FIGURE 2 HERE **********

The expanding literature has been the subject of numerous reviews. Three recent studies were based on bibliometric tools. These sought to cover the entire set of studies identified in established repositories of scholarly publication (inevitably fewer than located by *Google Scholar*, and missing out on several key works.)

In the first of these studies, Scarso (2015)[3] located 190 papers published from 1999 to 2013, by searching the *Scopus*, *Business Source Premier* and *EconLit* databases for studies with the terms KIBS or "knowledge intensive business service" in their titles, abstracts, or keywords. Studies were classified according to their main discipline, research approach and method, and the countries and sub-sectors analysed. Braga and Marques (2016) considered 140 publications from 1994-2015, via *Web of Science.* J-Figueiredo *et al.* (2017) drew on 235 publications captured from 2000 to 2014 in the *Scopus*, *ISI Web of Science* and *SciELO* databases. The interest was particularly on innovation and in addition to KIBS and Knowledge-Intensive Business Services, the keywords Knowledge creation, Knowledge Transfer, and/or Innovation were additional criteria. Both studies, unsurprisingly, report an increasing rate of publication over the years considered, though the rate varies across years.

Scarso (2015) found innovation to be the topic most frequently examined in KIBS; that KIBS themselves are generally seen to be particularly innovative firms; their own innovation goes beyond technological innovation; and they contribute to innovation in their clients. Studies indicate that KIBS firms are heterogeneous in knowledge bases and behaviours, which helps explain the variety of innovation patterns found. But development of knowledge through interaction with clients is commonly noted, as is the relatively limited use of formal tools (such as patents) for protection of Intellectual Property. KIBS firms are frequently reported to be geographically clustered around particular locations (this may again vary according to the specific KIBS involved, but the literature frequently points to the large numbers of PS firms – advertising,

consultancies, etc. – in capital cities like London) and studies generally agree that they support regional dynamism; there is also some evidence that the internationalisation of these firms is on the rise.

The second and third studies (Braga and Marques, 2016; J-Figueiredo *et al.*, 2017), examine citation and cocitation patterns. Most of the published literature shares references to a small number of central studies (among J-Figueiredo's top three is *f2005*, which sample used by Braga and Marques (2016) excludes). Braga and Marques (2016) identify four clusters of publications: (1) innovation concepts and processes, (2) knowledge and KIBS, (3) innovation networks and cooperation, and (4) Location and Client Relationships. J-Figueiredo *et al.* (2017) conclude that the field has moved from earlier foci on the definition and structure of KIBS firms, and on KIBS' Intellectual Property protection, to a later wave of studies examining issues like innovation management and the transfer of knowledge across organisations and space.

At this point, we should issue a warning. The burgeoning literature has involved contributions from many countries, drawing on data from various points in time. Such variations may account for the different emphases apparent across studies, and may limit the generalisability of results that have been derived from specific spatial and temporal contexts. [There have been few explorations of these issues. Some pointers come from Mason and Wagner (1999) (UK and German firms differed in their use of engineering services); Muller & Zenker (2001) (different interactions between KIBS and small and medium-sized enterprises in France and Germany); Doroshenko *et al.* (2013) (following the 2008-9 economic crisis, Russian KIBS firms changed their emphasis on standardized versus customized services); and Belousova & Chichkanov (2016) (following the 2015 economic crisis, Russian KIBS firms converted fewer clients' inquiries into real orders). Input-output tables reveal that the pattern of use of KIBS across industrial sectors varies considerably across countries: for a detailed analysis of input-output information on KIBS see Baker *et al.* (2008).] There are positivistic tendencies in academic social research to seek "underlying truths" that stand outside of space and time. But if we overlook how specific situations affect our topics, then we remain ignorant of the variables that can describe these situations and exert such influences. Replication of research in different contexts can be of value, and we cannot expect highly localised experiences to be reproduced elsewhere.

Numerous literature reviews follow less systematic procedure than the two just discussed (e.g. Muller and Doloreux, 2009; Zieba, 2013), but nevertheless draw many similar conclusions. This and the subsequent essays will draw on these reviews. We will also deploy our own examination of published studies and ongoing research, to consider what the rise of KIBS, and of academic interest in KIBS, has to tell us about present and future directions of social and economic change. This will mean going beyond the KIBS literature per se, to consider emerging themes from other lines of enquiry that are highly relevant to the future of KIBS and KIBS studies. But first, we should clarify just what the term KIBS means - which will lead us to a discussion of statistical frameworks.

This might seem to be mainly a technical issue, but actually raises broader considerations. Statistical classification systems do not just report on socioeconomic structures and trends. They are themselves social products, and they reflect changing understanding of such structures and trends. They are the instruments that produce the data that we work with, but they often fail to have a perfect match with the concepts we wish to employ in our analysis. Classification systems can be changed, but they are path-dependent: their composition reflects the historical accumulation of

knowledge about how to ask questions and organise information in the areas under observation. They are also shaped by compromise between multiple interests, with policy concerns about raising taxes, employment, competitiveness, and other matters being balanced with fears of overloading respondents, exposing confidential information, and so on. One result of this, as we shall see, is that new ideas – from KIBS and the creative industries to information society and the experience economy – may be captured only partly in official data. Much of the confusion about what constitutes KIBS, we suggest, simply derives from the difficulty of capturing the construct readily in official data – there are almost always omissions and commissions.

## Revisiting the Definition of KIBS

In *f2005*, KIBS were defined as "Services that provide knowledge-intensive inputs to the business processes of other organisations… such as Computer services, R&D services, Legal, Accountancy and Management services, Architecture, Engineering and Technical Services, Advertising and Market Research" (Miles, 2005, p39). This is fairly often quoted and rarely contested.

However, as noted above, there is some ambiguity as to what is meant by "services"[4]. Are we are talking of service organisations, or of their activities and products (which are also known as services - whereas manufacturers produce goods, so there is less ambiguity)? Most of the literature up to and after *f2005* actually referred to KIBS firms and the sectors formed by classifying these firms together. There are some cases of confusion between actors and activities, however – and there is often awkwardness when people refer to "KIBS' services", and the like.

One development underway at the time of *f2005*, and in the succeeding years was a flurry of interest in the idea of "Knowledge Intensive Service Activities" (KISA). Some 48 publications with this term in their titles are picked up by *PoP*, of which more than half were produced in 2004 and 2005. This reflects the period of intense activity in an OECD project on the topic of KISA (cf. OECD, 2006; Martinez-Fernandez *et al*., 2011), which included but was not restricted to the activities to KIBS firms. While these firms are specialists in provision of such services to support organisations' business processes, this 11-nation study sought also to include activities undertaken by public sector bodies, and activities within business organisations. Again the focus was on inputs to innovation, and an interesting classification of service activities in relation to these roles ensured. This contrasted *Renewal services* (those directly related to innovation, for instance R&D and strategic management consulting); *Routine services* (contributing to improvement of maintenance and management of various subsystems within organisations, e.g. accounting); *Compliance services* (enabling organisations to work within legal frameworks and regulatory regimes, e.g. auditing and some legal services) and *Network services* (supporting communication, knowledge exchange and flexible allocation of resources, among which informal personal networks were included, alongside production-related networks) (OECD, 2006, p8).

The limited level of publication since 2006 (12 items with "Knowledge Intensive Service Activities" in their titles, so only just over one publication per year on average) suggests that the KISA idea has failed to gain traction. This is surprising in several respects. Surely, if the activities performed by KIBS firms are important ones, then the performance of similar activities elsewhere in the economy will also be important. What accounts for whether activities are performed in-house or contracted

out to KIBS firms (or to other KISA actors)? Are these complementary, synergistic, or competing activities? When do they contribute to innovation, to regional dynamism, to the performance of their users? A focus on KISA also suggests that we should pay attention to the skills and competences involved in specific activities, and this could be extended to questions such as: what types of education are required for these capabilities? How and why are they bundled together into particular jobs and professions? What activities might be subject to automation?

While questions are increasingly being asked about KIBS, as we have seen, attention to KISA seems to have waned. This may be mainly a matter of statistical convenience – it is easier to talk about sectors and policies related to them, than about occupations and, especially, activities. Professional and expert jobs and employment do receive some attention, it should be noted, in relation to matters of training and, latterly, job loss associated with offshoring[5].

If KISA has failed to gain traction in the research field, another category where there are some overlaps with KIBS has achieved some prominence in scholarly and policy discussions. The distinction between firms/sectors and activities/occupations in the KIBS/KISA case has an interesting parallel in relation to work on "creative industries". This is another piece of terminology that came to prominence in the 1990s[6] in an effort to describe a phenomenon that was actually long-established. To summarise the issue very briefly, there was considerable enthusiasm in the UK and a few other countries, early in the present century, in the role of creative industries as an engine of growth. But again, how do we define the "creative industries"? This was a matter of some debate, not least because some commentators saw in this a commercially-motivated attack, or an economistic marginalisation of the familiar cultural sectors of the economy. After all, galleries, museums and similar facilities, and operas, concerts and other activities, are as much about the quality of life as they are about commerce. But the "creative industries" encompassed also sectors such as advertising, architecture, broadcasting, entertainment software and fashion design. Furthermore, the classification of these industries seemed to have descended "from above", in a series of documents produced by a government ministry (the Department of Culture, Media and Sport – e.g. DCMS, 1998).

Controversy concerning which industries to encompass, or exclude, from the category of "creative industries" led Bakhshi *et al.* (2013) to attempt to validate and/or improve the classification by first identifying creative occupations[7], and then the industrial sectors in which they are most concentrated. Creative work was found to be a dynamic and growing part of the workforce. The numbers employed in creative occupations were substantially larger than earlier estimates had suggested. The analysis suggested some revision of the sectors of the economy which can most accurately be defined as creative industries; more strikingly most creative workers in the UK turn out to be employed outside of the creative-intensive sectors (several of which are also KIBS sectors).

The effort to classify and map creative occupations and industries is intrinsically important, given the role attached to these activities in the UK economy, and the effort to develop policies that can nurture them effectively. Furthermore, it demonstrates the challenges that are encountered when we try to fit new understandings of socioeconomic activities within received statistical frameworks. Particularly, but not only, when there is controversy, we need to proceed with care - and, as in this case, be prepared to experiment with different approaches to classification. Examining the topic from several angles, for instance by deploying

different sorts of category – firms, sectors, occupations, tasks, and so on – may be necessary to establish a firmer grasp on such contemporary changes.

Returning to the definition of KIBS, after the mention of services in *f2005*, the discussion moved to the "KIBS sector", which "consists of firms who have emerged precisely to help other organisations deal with problems for which external sources of knowledge are required." The emphasis on KIBS **firms**, that can be classified together into KIBS sector(s), continues the approach established in the earlier studies of KIBS. They are firms, in other words, private organisations engaged in commercial activities. KIBS firms will be those whose main commercial activities involve providing KIBS (services). Industrial classifications like NACE are mainly organised around what it is that industries produce; they are not usually concerned with the issue of public or private ownership (nor, from NACE1 on, with whether they are market or nonmarket activities).

Some authors argue that organisations like Universities and Public Research Institutes (PRIs) should be classified as KIBS (because, although they are not firms, they can produce KIBS-like service products as inputs to other organisations). But Universities have other functions – teaching (not just training for enterprises), pure research (not mainly applied R&D) – as their main functions; and PRIs are not private firms[8]. It may be of value to group these sectors together as frequent suppliers of KIBS (services), or KISA outputs, to other organisations.

One lesson that emerges from the literature reviews, then, is the need for clarity as to the object of discussion, and, perhaps, to warn us that familiar terms may be deployed in different ways, engendering confusion. As a result, the present essays will need to be explicit, on many occasions, when their focus is KIBS firms and sectors/subsectors, rather than on the service products and relationships they provide. The main emphasis will be on firms, but there is a good chance that much of the discussion about KIBS products and processes will apply to greater or lesser extent to the knowledge-intensive services supplied by other types of organisation.

Many of the reviews do begin with a discussion of definitional issues[9]. This may seem to be recondite, or even pedantic, and sometimes it is, but the reviews report that there is ongoing uncertainty as to exactly what constitutes KIBS. Many cite *f2005* in this context, but the discussion there does not seem to have resolved matters. Almost always, this discussion centres around which industrial sectors to classify as KIBS; the question of whether we are talking about sectors, or about activities, or about (service) products is neglected. Thus, we sometimes find KISA cited alongside KIBS sectors.

## Industrial Classifications

One point on which practically everyone is agreed, is that KIBS are, by definition, "business services". Interest in business services was evidently related to the high importance of private business in innovation, with the innovation systems approach stressing that innovation involves many activities and stakeholders than just R&D and R&D performers. (One problem for policy was that its main lever was funding of public R&D, with little influence on downstream innovation activities.) But from the outset, it was clear that KIBS firms' clients are not always private firms themselves. So how could the KIBS firms be called **business** services? *f2005* addressed this by explaining that the services provided constitute support for **business processes**, rather than only business organisations[10]. Business processes are usually defined as constituting structured activities that are undertaken as part of the design, production

and/or delivery of goods or services. Thus the clients could be charities (some of whom are large-scale and even international organisations with many employees), non-profit and social enterprises, and public sector organisations. (The latter have outsourced many activities regarded as public services[11], as well as purchasing, for example, telecommunications, computer, and management consultancy services). Charitable and other organisations may also purchase support for their business processes from KIBS firms. The point is that the service (products) they supply are very largely not purchased by consumers for their own use (note that the outputs of some service industries, such as advertising - and in a different way, architecture and design - may be used extensively by consumers; but they do not, by and large, purchase the service outputs themselves).

We can validate the "business" aspect of KIBS sectors by reference to input-output tables, which tell us what share of various sectors' outputs are consumed by other sectors. Household (and some governmental and charitable) consumption is treated as final consumption, while most purchases by other sectors (including, for example, health and education) are treated as intermediate consumption. Once we take exports (and gross fixed capital formation) out of the equation, we can examine what share of a sector's output is consumed by households: the argument is that KIBS should be mainly consumed by other economic sectors. The proportion of KIBS outputs that then emerges as final consumption – rather than being employed in business processes – is predicted to be low. This turns out to be the case, with one partial exception; we have rather unwieldy aggregations of KIBS activities to deal with, but the results are telling when we look at input-output tables for Great Britain from 2001, 2007 and 2014[12]. We find that only around 1% of "legal and accounting activities; activities of head offices and management consultancy activities" is counted as final consumption; a similar share is allocated to "advertising and market research" in 2001 and 2007, dropping to less than 0.6% in 2014; "architectural and engineering activities; technical testing and analysis" hover around 2%; "computer programming, consultancy and related activities; information service activities" between 3 and 4%; "Scientific research and development" is never more than 6% (though this seems surprisingly high, and drops substantially in 2014). The exception is "other professional, scientific and technical activities; veterinary activities" at around 25% being final consumption; we come back to this anomalous category later. In any case, it is still dominated by intermediate outputs, and thus may be mainly considered a business service.

Agreement that these are business services is only the first step. We shall return to the matter of knowledge-intensity later. The literature contains much discussion of the statistical definition of KIBS sectors. Disagreements as to sectoral coverage can throw light on conflicts and changes in understanding, that in turn can tell us about social development. Some reviews list the statistical groups that different studies have employed when seeking to examine KIBS. Two points should be made. First, this would be important if it were discussed in relation to the results of the studies – perhaps conclusions should be interpreted in terms of varying sectoral coverage (for example, technology-related KIBS may have distinctive dynamics where it comes to innovation, so an emphasis on these firms might lead to different results from research that focused more on PS). Second, it is all very well to strive for precision, but often researchers are forced to use secondary data that is not generated in an ideal way. Often, the statistical coverage employed is more or less a matter of convenience – what cases can be derived, at what level of aggregation, from a particular data source.

Sometimes this is a matter of a particular population or set of populations that the researcher is able to access. Mainly, researchers are concerned with data that can be extracted from national accounts or from official statistics such as the Community Innovation Survey (CIS).

Our statistical systems have been developed over many decades, and for good reasons (need for continuity in time series, need for consensus among different sets of statistician and statistics user) they typically change fairly slowly. Reviewing the contents of these systems is quite a helpful way of getting an overview of the range of industries we deal with under the heading of KIBS[13]. The evolution of these systems tells us quite a lot about the changing understanding of economic life that producers and users of statistics are employing. Business services industries - by which we mean sectors of the economy that are specialised in producing services (service products) for other organisations (rather than for consumers) - in general only become prominent in Western economies in the last quarter of the twentieth century. Business services had been subsumed, in the International Standard Industrial Classifications (ISIC), in a group together with renting of equipment and real estate services. The very earliest discussions of KIBS were hampered by the fact that many statistical publications collapsed these into one group (and often combined them with financial services, too!). The service industries in general had been poorly represented in the ISIC, but the growth of employment and output in these industries made this increasingly untenable by the 1990s.

Thus, during that decade, 1990s ISIC revision resulted in much more detail on services activities appearing in the industrial classification systems NACE (Nomenclature Statistique des Activités Économiques dans la Communauté Européenne) and NAICS (North American Industry Classification System). Initially NACE followed ISIC's treatment of business services, classifying many diverse activities together in its Section K (Real estate, Renting and Business activities), which comprised divisions 70 (Real estate), 71 (Rental of machinery and equipment), together with 72 (Computer and related activities), 73 (R&D), and 74 (PS together with some T-KIBS like architecture and engineering, and some more routine business services). But in the twenty first century, the EU's NACE revision 2 (Eurostat, 2008 – henceforth, NACE2, contrasted with NACE1) classifies many business services (i.e. service industries whose main customers are other organisations, rather than private consumers) into two distinct "sections"[14] (M - Professional, Scientific and Technical Activities, and N - Administrative and Support Service Activities. The next few paragraphs, summarising and commenting on this elaborate classification, heavily draw on Eurostat (2008).

Section M covers many (though not all) of the sectors generally considered to be KIBS. The distinction between sections M and N reflects an effort to identify KIBS as distinct from more routine business services. Divisions 69 and 70 of section M cover many of what are of considered to be PS, and are thus often distinguished in the KIBS literature as P-KIBS, among them:

- Legal services [class 69.1],
- Accounting, Bookkeeping and Tax Consultancy services [69.2];
- Management Consultancy Services (divided into public relations [70.21] and Strategic, Organisational, Human Resource and Financial Planning [70.22]);
- The Activities of Head Offices (oversight and management of other units of the same enterprise) [70.1].

Section M also includes "Scientific and Technical activities", which are liable to be more closely linked to technological innovation (which tends to preoccupy the innovation studies literature, even though innovation can involve doing new things without necessarily any new technology). Thus section M includes Technology-related KIBS (T-KIBS):

- Architectural and Engineering Activities and related Technical Consultancy [class 71.1]
  - 71.11 Architectural activities;
  - 71.12 Engineering activities and related technical consultancy (This class includes a wide range of activities, such as engineering design (of machines, materials, instruments, structures, processes and systems) and consulting activities (for machinery, industrial processes and industrial plant, civil engineering and a list of numerous other types of projects), geophysical, geologic and seismic surveying, and cartographic and spatial information activities.
- Technical testing and analysis [71.2]; and
- Scientific Research and Development Services [72], subdivided into: natural sciences and engineering [72.1]; social sciences and the humanities [72.2].

This last set of service firms has been examined remarkably rarely in the KIBS literature, given the significance of R&D for innovation. Here an issue arises that is important in considering some countries' industrial statistics on R&D services, though will be a fairly minor concern for most KIBS sectors. To elaborate: the original definition of KIBS industries specifies that these are private businesses. But the NACE2 classifications are based on type of activity and not on ownership. Public sector organisations with R&D as their main activity, going by such labels as PRIs and "Government Laboratories" that have may be located in group 72. Also liable to be categorised in this division are Private Non-Profit Institutions, whose "status does not permit them to be a source of income, profit or other financial gain for the units that establish, control or finance them" (OECD, 2015, p95). This category includes "independent professional and learned societies[15], and charitable organisations that are not controlled by units in the Government or the Business enterprise sectors" (OECD, 2015, p288). They may receive government funds, but (unlike public research organisations) their major decisions are not under government control.

NACE2's section M also includes:

- Advertising [73.1],
- Market Research and Public Opinion Polling [73.2],
- Veterinary Activities [75] and
- Other Professional Scientific and Technical Activities [74].

These sets of activity require consideration. The first two are generally regarded as P-KIBS, though Market Research might be seen as having much in common with R&D (which can include social research), with technical testing, or with various types of monitoring activity (weather forecasting and the like). While marketing advice may be consultancy, large-scale surveys have much in common with social research.

Advertising is closely related to market research, but introduces its own features – related to the fact that it is often also classified as a key "creative industry" (and when advertisers talk of innovation, they almost invariably refer to creativity in advertising content). Miles (2011) argues that we should consider a further distinction within KIBS, introducing the notion of C-KIBS to identify activities requiring more

symbolic and cultural knowledge (as compared to professional knowledge of administrative and juridical systems, and technical knowledge of science and engineering)[16]. Advertising, architecture, and design services are examples of KIBS where such knowledge plays an important role. The terminology of C-KIBS has not yet been widely accepted (and the alternative formulation, CIBS - creativity-intensive business services - is introduced by Masiello *et al*. (2014), in a study of advertising firms). But the general point about the need to differentiate among distinctive types of KIBS is one made by several writers.

Design services (excluding things like architectural and web design) comprise a remarkably heterogeneous set of activities put together in class 74.1. This includes not only fashion design (textiles, clothes, shoes, jewellery, furniture, etc.) but also industrial design. This does not focus on "fashion", but on "optimisation of the use, value and appearance of products... taking into consideration human characteristics and needs, safety, market appeal..." (Eurostat, 2008, p271). Graphic designers and interior decorators are also included here. Photographic Activities [74.2] are arguably also C-KIBS. However, how far these are business services rather than consumer services may be debated, and quite possibly varies over time and space. The same could be said of veterinary services, since both farm and pet services are included here; these are unusual KIBS, with much in common with human health services; while again we can expect international variations, in the UK many more veterinary practices are registered as "small animal" practices than are "farm" ones[17]. While in general the section M classification does deal with knowledge intensive business services, this case may be an anomaly, featuring a preponderance of services to consumers – at least in countries where many people are attached to their "companion animals". This probably helps account for the input-output result noted above, that around a quarter of the output of "Other professional, scientific and technical activities; veterinary activities" went to final consumption by households, a figure far in excess of that recorded for any other KIBS category.

A more significant problem for KIBS research is the treatment of a set of activities that have been regarded as KIBS from the outset of research in the area. Computer services have usually been treated as T-KIBS. They were classified along with the T-KIBS in section M in NACE1, with the data cited in *f2005*, and in NACE's predecessor, the International Standard Industrial Classification (ISIC). But NACE2 introduced some substantial changes. It featured a new Section J (Information and Communication), within which we find:

- Computer Programming [class 62.01];
- Computer Consultancy [62.02];
- Computer Facilities Management [62.03], and
- Other Information Technology and Computer Services [62.09].

This puts these KIBS in a section spanning; "publishing activities (division 58), including software publishing, motion picture and sound recording activities (division 59), radio and TV broadcasting and programming activities (division 60), telecommunications activities (division 61), information technology activities (division 62) and other information service activities (division 63)" (Eurostat, 2008, p247). The logic for this move corresponds to theories of, and policies for, the Information Society. The Information Society was a major topic of discussion at the time the revision was being formulated, and continues to be a major element of EU policy and research. The creation of section J reflects longstanding debates about what we now know as digital convergence – while there was considerable distinction

between telecommunications and computer activities in the 1980s, by the dawn of the present century this had proved unsustainable and European Commission structures were changing accordingly[18].

But this does not make statistical analysis of KIBS much easier. It will not be surprising if many future studies using NACE2 statistics to depict the KIBS sectors choose to omit computer services and instead focus on section M. The situation is different for North American statistics, as organised through NAICS. Here the two digit code 54 includes business-oriented computer services: 541511 (Custom Computer Programming Services), 541512 (Computer Systems Design Services). 541513 (Computer Facilities Management Services) and 541519 (Other Computer Related Services). Software publishing (511210) is in a two digit "Information" group 51, this includes publishing of applications software (some is bound to be business applications) but excludes custom software. This organisation makes analysis of KIBS relatively easier with North American data: however, though there are very rich economic data available for Canada and the USA, they lack much of the survey data we draw on below.

As the phrase "knowledge-intensive" implies, this is support that requires more than the sort of routine input that is provided by business service industries in NACE2 section N, such as recruitment and personnel selection, security and transport of valuables, clerical and similar business support (including call centres), and so on. Some section N services are manual activities such as building and office cleaning, or relatively routine types of office work. (cf. Kox and Rubalcaba, 2007 - who also identify an additional set of business services they term "network services", including financial, telecommunications and transport services). Some of the activities classed into section N might well be considered knowledge-intensive (for example, document editing, if done well, requires professional skill).

While mentioning KIBS-type activities that fall into sections other than M (and J), we might also note:

- Section P – Education – includes all types of vocational education and training
- Section R – Arts, Entertainment and Recreation – contains class 90.03 (Artistic creation) within which we find that "activities of individual writers" include technical writing; class 91.01 (Library and archives) includes specialist libraries and archives, and stock photo and movie libraries and services.
- Section S – Other Service Activities - contains classes 94.11 (business and employers membership organisations) and 94.12 (professional membership organisations); these are not only business-relevant, but are also sometimes important intermediaries in innovation processes (e.g. setting standards, disseminating information on best practice, etc.).
- Furthermore, many support services that are specifically targeted to particular industries are classified within the sections associated with these industries. To take just one example, in Section A – Agriculture, Forestry and Fishing - we find, inter alia, class 02.40 (Support services to forestry) which includes some activities that may well be KIBS (e.g. forest management consulting) and others which are more ambiguous (e.g. timber evaluation) and others which are business services but not likely to be knowledge-intensive (e.g. transport of logs within forests)!

The implication of this, of course, is that it is inevitably going to be difficult to capture everything that is a KIBS firm, and to exclude everything that is not, in the statistics we have to work with (including NAICS as well as NACE). Even if we could define sectors precisely, it is likely that within sectors there are also firms that

are more or less knowledge-intensive. Still, Figure 3 represents our effort to specify how KIBS sectors may best be defined in terms of official statistics; unfortunately, we are often forced to use more approximate aggregations.

********** INSERT FIGURE 3 HERE **********

Likewise, it will be no surprise if future studies continue to problematise the definition of KIBS[19]. Indeed, the complexity of contemporary economic life is such that no one statistical framework, however frequently brought up to date, can hope to be optimal for all approaches to understanding major trends. Though there may be problems of commercial confidentiality and privacy to contend with, the best hope here is for microdata to be sufficiently available to allow for many more analysts, equipped with powerful computing facilities, to explore the value of alternative classification systems. In the meantime, the data we present below will involve a variety of formats, depending upon the particular source they have been derived from.

## The Evolving KIBS Landscape

*Trends in KIBS sectoral activity levels*

This essay began with some evidence as to the continuing growth of the KIBS sector as reported at the beginning of this decade. We can bring matters more up to date using data derived from the KLEMS dataset, (see Figures 4 and 5 below) where a considerable effort has been made to render information for different countries and regions comparable – even so data for different periods draws on different NACE classifications.

********** INSERT FIGURE 4 HERE **********

********** INSERT FIGURE 5 HERE **********

The NACE2 classification of KIBS as section M clearly gives us a smaller set of industries than that from NACE1. But the two sets of data show continuing growth in the KIBS sectors in the EU and USA. There was some wavering in this trend associated with the economic crisis 2008, but growth has subsequently been resumed.

What accounts for the growth of KIBS? *f2005* noted that many business services may experience growing demand, as organisations focus on "core competences", outsourcing non-core activities to specialised suppliers. But the rapid growth in KIBS is also generally attributed in part to increasing requirements for external knowledge. Businesses - and other organisations - confront changing environments and technologies, and such knowledge is sought to help them to confront the associated challenges and opportunities. This point is repeatedly made in the literature, and often related to the growing complexity[20] of economies and the technologies which are deployed in them. Combinations of knowledge are required that go beyond those embedded into all but the most dynamic and large organisations. This is rather similar

to the case that has been made for "fully-fledged foresight" as having to engage broader participation from experts and stakeholders, beyond that available within policy bodies (cf. Georghiou *et al*., 2008; Miles *et al*., 2016). New technologies often require knowledge of multiple technical domains, and T-KIBS like computer, engineering, R&D and technical testing services clearly have role to play here. P- and C-KIBS are liable to be more prominent when dealing with issues such as globalisation of business operations, dealing with evolving legislative systems, and cultural change; but here too there are liable to be specialisms ranging from Intellectual Property and computer law, through to advertising, marketing and training connected with new technologies.

We discuss the role of KIBS in innovation systems in the later essays. For now, we recap some of the main features of KIBS as described in *f2005* and further documented in later publications and statistics.

*Knowledge-Intensity*

The notion of "knowledge-intensity" is not unproblematic. *f2005* noted that KIBS sectors are outstanding in terms of the share of the workforce with graduate qualifications (rivalled only by public services like education and health). This feature is confirmed in more recent data as shown in Figure 6 below. We include some non-KIBS service industries (including a knowledge-intensive creative sector) for purposes of comparison; sectors such as retail and distribution, manufacturing, construction and the primary sector typically have graduate employment shares of less than 20%.

********** INSERT FIGURE 6 HERE **********

The statistics on graduate-intensity of employment in these sectors clearly differentiate between T-KIBS (high shares of science and engineering graduates) and others; there is no basis here for differentiation between P-KIBS and C-KIBS. (To explore that distinction further, it might be necessary to examine occupation data.)

University education is only telling us about particular types of knowledge (or, rather, how these types of knowledge have been attained). It might be argued that much knowledge is acquired through lived experience in particular occupations - consider the knowledge that some farmers display of the soil, weather, crops and animals they work with. They may indeed be better equipped to deal with local circumstances than someone with academic qualifications. But the argument is that higher education provides one with more abstract understanding; in principle, this can be applied to a wider range of problems and situations. In the context of innovation, the argument is that KIBS employees can combine such knowledge with the knowledge of local circumstances provided by their clients, to produce original solutions to clients' problems. The KIBS workforce, and occupations associated with KISA, do report relatively high levels of such experiences at work as: solving unforeseen problems, learning new things, and being able to apply own ideas to the task (survey evidence for this in the European workforce is presented in Martinez-Fernandez *et al.* (2011, Chapter 11). There does seem to be some validity, then, in interpreting the indicator of graduate-intensity as signifying the intensity of use of important kinds of knowledge within KIBS production. Whether other types of skill important for the knowledge economy are being neglected – consider the debates about emotional intelligence and emotional labour, for example – remains a topic for further research. Surveys of

workplace skills and working conditions may be useful ways of addressing such matters.

*The Structure of the KIBS Sector*

What is the relative contribution of different subsectors to the KIBS sector as a whole? Figure 7 displays European data demonstrating first, that KIBS have continued their growth in the last decade, and second, that there are large differences in the size of distinct activities. Traditional P-KIBS – legal and accounting services – together constitute the largest group in terms of employment, while computer services feature highest value-added, with another T-KIBS (architecture/engineering services) and then management consultancy also representing large subsectors. The remaining activities, though significant in terms of employment and economic contribution, are on a much smaller scale – note particularly that R&D services are one of the smallest subsectors in these terms.

********** INSERT FIGURE 7 HERE **********

We can now also provide statistical data on other structural features of KIBS sectors. One notable feature is the gender composition of the workforce. As shown in Figure 8, the T-KIBS (computer, architecture/engineering) tend to be male-dominated, the classic P-KIBS somewhat more female-dominated. R&D services and consultancy tend to be less "gendered", though there is likely to be less the case as we focus on more senior positions. The evidence is that while many service industries tend to have a greater share of the female workforce, the T-KIBS are often more like manufacturing industry in this respect.

********** INSERT FIGURE 8 HERE **********

*European Business: Facts and Figures – 2009* (Eurostat, 2009 – the last date of this publication, which contains much information on business services) also finds both professional and technical business services to spend relatively more on personnel, and less on equipment, than most economic sectors, reflecting the importance of high-skilled labour in their activities.

Another structural feature of industries on which data are now available for EU countries from Eurostat is firm size. We already know that service industries tend to feature smaller establishments (in terms of employment) than manufacturers. This is markedly the case when we look at KIBS. As Figure 9 shows, the mean size of enterprises in KIBS industries is very small, many are microbusinesses. We previously noted a trend toward formation of larger units (through growth and through mergers and acquisitions), and the existence of large and often transnational enterprises in many of these business areas.

********** INSERT FIGURE 9 HERE **********

Figure 10 shows that while microbusinesses may predominate, large shares of employment and value-added actually stem from the larger firms – especially in the case of R&D services. A relatively small number of large firms can easily create more

employment than a large number of small firms. Even for the "business service" category – and these are typically not the more routine business services, that are classified elsewhere – a large share of employment is in firms of 50 or more employees, and much of this is in firms of 250 or more.

********** INSERT FIGURE 10 HERE **********

But although large firms are active in KIBS fields, their relative contribution seems to be diminishing (at least over the 2006-14 period), and that of smaller businesses increasing. This is a new finding as compared to *f2005*, and it would be interesting to know how far this is a long-term trend, and how far it might reflect the economic turbulence post-2008. It may be that some KIBS firms are downsizing; it may be that new small entrants are playing an increasing role (perhaps resulting from firms in other sectors, and in some countries, spinning-off professional employees into KIBS microbusinesses). This is a subject requiring further study.

*Geography and location*

The spatial location of KIBS firms has been a persistent theme in the literature – indeed, many contributors to KIBS research are industrial geographers. One reason for this is that it is generally agreed that the benefits of using KIBS often require close contact (and thus proximity) between service supplier and client. In the innovation context, growing interest in KIBS' role in regional innovation systems has been documented in a systematic literature review of the latter by Doloreux and Gomez (2017) – about 10% of the literature located deals with KIBS, and this has been a growing trend (from less than 5% of publications before 2005, and over 12% of those from 2010-2015). The point that some locations may be disadvantaged is elaborated in a detailed review by Savic (2016), who reports a general consensus among published researchers that KIBS firms tend to locate in large metropolitan areas.

Figure 11 presents recent data from the European Cluster Observatory, whose category of "Business Services" appears to mainly consist of KIBS. The map indicates which regions tend to be more and less specialised in Business Services, in terms of the industry localisation quotient. (This is the industry's share of total employment in each region compared to the industry's share of total employment in all countries considered: a quotient equal to 1 means that the given region is not specialized in the given industry, one equal to 2 means that the given industry has a 100% bigger share of employment in the given region than it has in employment across all regions). We can see specialisation around capital cities and in several regions of Western and Northern Europe, while KIBS are underrepresented in Eastern Europe.

********** INSERT FIGURE 11 HERE **********

Further analysis of these issues is provided by Schrike *et al.* (2012), who present a wealth of data, maps and analysis on KIBS, and more general knowledge-intensive services, across the regions of the EU. They confirm the clustering of KIBS in capital regions, with KIBS nevertheless contributing to growth in many more regions; evidence as to linkages between KIBS concentration and advanced manufacturing industries is less clear.

*Trade and internationalisation*

International service firms are prominent in most cities in the contemporary world – while global fast-food chains are evident on the high streets and global retailers in the shopping malls, the skyline often bears witness to overseas financial institutions like banks and insurance companies. But services trade has persistently remained low, compared to the share of services in national and global economies, and the need for proximity has affected KIBS like many other services. In part this means that Foreign Direct Investment, franchising, and partnership arrangements often complement, or take the place of, trade in services (which cannot simply be packaged up and put on a ship or aeroplane).

However, some data on trade are available, and Figure 12 presents trend data for a set of major economies. Briefly: services grow as a share of trade in terms of exports from all regions except BRICS; KIBS exports grow as a share in all regions, strikingly so for the EU.

********** INSERT FIGURE 12 HERE **********

Miozzo and Miles (2015) review the issues around KIBS internationalisation, and Molinuevo and Saez (2014) detail the regulatory factors that make trade in many PS problematic. It seems apparent that some KIBS activities are internationalized as service firms follow their clients overseas, and/or seek new markets in (especially) emerging economies. Meanwhile, the phenomenon of offshoring, long apparent in some manufacturing and office services (e.g. call centres, data entry) is apparent in certain KIBS – notably in certain T-KIBS especially but not only computer services) and of the more routine elements of P-KIBS (e.g. some parts of accountancy and related services). While issues of offshoring have generated a great deal of debate, the more interesting trend is likely to be the emergence of KIBS firms within emerging economies – catering to local and/or world markets. We already see some international consultancy and software companies of this sort (a prominent example is Tata Consultancy Services).

## Conclusions

This review has established the continuing significance of KIBS, and the relevance of the analysis in *f2005*. It has presented key data and pointed to sources of further information. One of the subsequent essays will examine what KIBS mean for innovation systems, and particularly the functioning of innovation systems necessary for our societies to effectively confront Grand Challenges. The third essay will examine innovation in KIBS, and implications for the future of KIBS firms and the professions and expertise that they mobilise.

What can be said, additionally, on the basis of the present overview, is that while we have considered (and hopefully helped to resolve) the ambiguities associated with the term KIBS, the construct is bound to remain somewhat controversial. Although it has become a well-established area of social research, its reflection in official statistics is rather obscured as the effort to capture KIBS (section M) is partly subverted by efforts to depict Information Society industries (section J). Similar difficulties are liable to face other new constructs – however useful they are for understanding socioeconomic change, they are liable to require compromises with other analyses when it comes to the production of official statistics. However, we can hope that more powerful data

processing capabilities and more open data will allow for a wider range of experiments with alternative approaches, satellite accounts, and the like.

We found it valuable to draw on sources other than those that are regarded as the most legitimate pools of published knowledge. Online sources, official reports, book chapters may not undergo as scrupulous a process of refereeing as that of the more established scientific journals – some do, especially reports scrutinised by users and scientific committees, but we have recently been beset by a flood of low-quality journals and conferences operated on a commercial basis with scant regard for quality control[24]. Additionally, some online resources are inadequately maintained, so that publications drop out of access. There are ways of archiving material, and these need to be complemented by guides to quality standards. Such challenges beset knowledge development in many emerging fields.

Finally, we note that the focus of much attention is on KIBS firms, and that the distinction between P-KIBS and T-KIBS has remained robust (with some effort to introduce a C-KIBS category). Much of this work focuses on their behaviour and relationships; rather less on the actual activities they perform, and competences they bring to bear. Does the limited take-off of the KISA initiative indicate that these are inherently difficult things to study? Possible ways forward here include the analyses of surveys of employees by Martinez-Fernandez *et al.* (2011), of occupational descriptions by Consoli and Elche (2013), and of representations of activities in company websites (Pina and Tether, 2016). There are many ways in which distinctions can be drawn between different types of KIBS firm and activity, but exploration of the ways in which knowledge bases are drawn upon and applied is bound to be of fundamental importance.

## Notes

[1] Some services have supply of a material object at their core. In the case of retail services, the service is provision of access to goods, not production of the goods. In the case of restaurant, the creation of the physical meal is only part of the experience that is being created. Occasionally some element of tangible "making" does feature in service organizations – part of the activity of a bicycle shop may be the assembly of bikes from a pack supplied by manufacturers; part of the activity of a dentist may be the production of false teeth, and so on.

[2] These data were extracted from *PoP* on March 10, 2016. One correction was made to the data – the Miles *et al.* (1995) report - which was never issued in print form!- was listed under no less than nine different combinations of authorship and title, reflecting its multi-authored nature. Publications with no date attached to them were excluded from the analysis.

[3] Ironically, this is to date only available as a conference paper, and would not be captured in the data sources used in these two systematic reviews. Information on this paper was located via https://www.research.unipd.it/handle/11577/3162092?mode=full.214#.WYh32FFhVdg (accessed 28 September 2017), and the author kindly provided a copy.

[4] See Miles (2010) for discussion of the ambiguities surrounding both "service" and "innovation".

[5] Work on IT professional skills (e-skills) within the IT services and among user organizations has been an ongoing activity, with studies undertaken by CEPIS (2006)

and continuing interest in supply and demand for such occupations is reported in, for example the e-Skills Monitor (available at: http://eskills-monitor2013.eu/home.html, accessed 18 September 2017). Martinez-Fernandez *et al.* (2011) present occupational analyses of KISA.

[6] The earliest use of the term in a publication's title, according to *PoP*, was in 1990. *PoP* data on KISA were generated on 17 September 2017.

[7] Defined as involving "a role within the creative process that brings cognitive skills to bear to bring about differentiation to yield either novel, or significantly enhanced products whose final form is not fully specified in advance" (Bakhshi *et al*., 2013, p24). This notion, which suggests some degree of knowledge-intensity, was further elaborated in terms of five criteria.

[8] However, PRIs are often pushed to act like KIBS (cf. Barker *et al.,* 2012; Coccia and Rolfo, 2010); and in terms of statistical classification, many of them are placed in the same category as private R&D service firms (because the industrial classification system does not differentiate organizations on the basis of private or public ownership). An earlier study (Hales, 2001) is a sad testimony to the volatility of "grey literature" – it is just one output of the multi-country RISE project, whose numerous reports are hard to locate online.

[9] Zieba (2013) is a good example.

[10] Even the term "business" can be applied to non-profit organizations and state-owned enterprises, though many commentators are reluctant to regard essential public services as businesses.

[11] There are even official reports talking of the "Public Service Industry" - cf. Julius (2008).

[12] We here draw on input-output tables as provided in the valuable World Input-Output Database, at http://www.wiod.org/database/niots16 (accessed 20/11/2017). See Timmer et al (2013) for more documentation.

[13] For discussions, see Miles (2011), Schnabl and Zenker (2013).

[14] The statistical system divides industries into *sections,* that are further split into *divisions*, broken down even further into *groups*.

[15] Below we see that these may appear in Section S.

[16] This idea was already pursued by Strambach (2008).

[17] Information from Royal College of Veterinary Services, available at: https://www.rcvs.org.uk/home/ (accessed 28 September 2017; it may be of interest that this website has sections on innovation and on futures (linking to https://www.vetfutures.org.uk/ ).

[18] The convoluted history of EC organisational structures in this area continues to evolve. DG Information Society acquired Media from DG Education and Culture in 2005, but itself has become DG Connect (Directorate General for Communications Networks, Content and Technology) from 2012.

[19] Indeed, recent reports for The *European Cluster Observatory* by Ketels and Protsiv (2014, 2016) include the KIBS outlined here as the greatest share of their "Creative Industries" emerging sector.

[20] See for example, the essays in *Harvard Business Review* of 09/2012; for an innovation policy perspective see Rycroft and Kash (1999). On efforts to measure the complexity of economic systems, see Hausmann *et al.* (2014).

[21] The first available data for M72 Scientific R&D are dated 2007, and for M75 Veterinary Activities 2008. Data for value added at factor costs for J62 Computer Programming is estimated without J6203 (Computer Facilities Management Activities).

[22] The R&D value-added data may be somewhat incomplete, data for the category of R&D services with 10 to 19 employees was not available in the primary source from which these figures are computed. We doubt that this has a major impact on the statistics.

[23] 2001 Japanese data on export of Computer services (9.2) and Information services (9.3) are not available, thus the apparent growth in KIBS exports for Japan may be overstated.

[24] See http://beallslist.weebly.com/ (accessed 28 September 2017) for listings of "predatory" journals and publishers.

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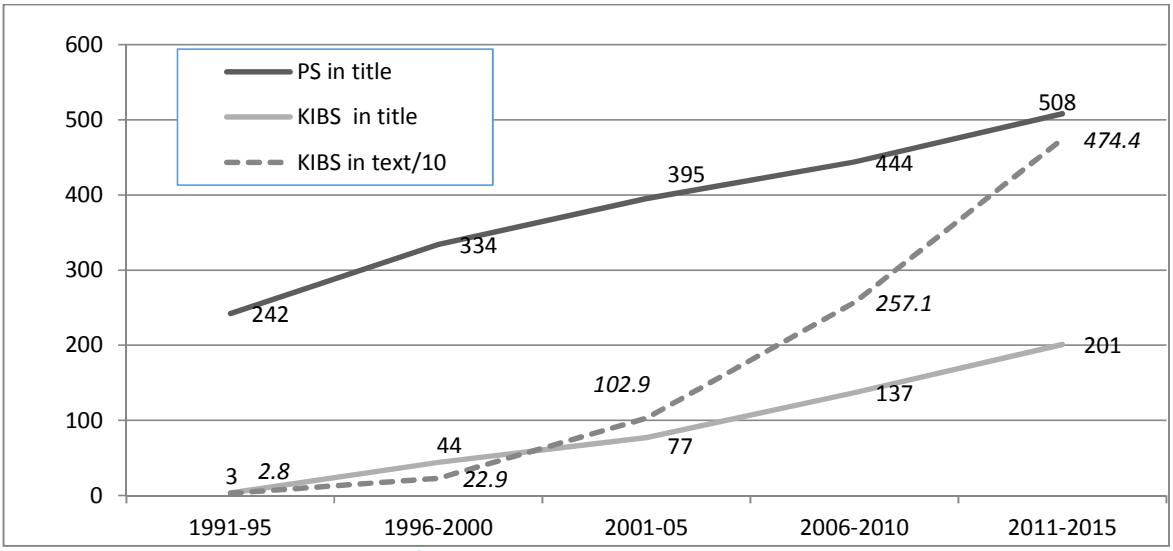
**Figure 1 Publications with "Professional Services" or "Knowledge Intensive Business Services" in their titles**

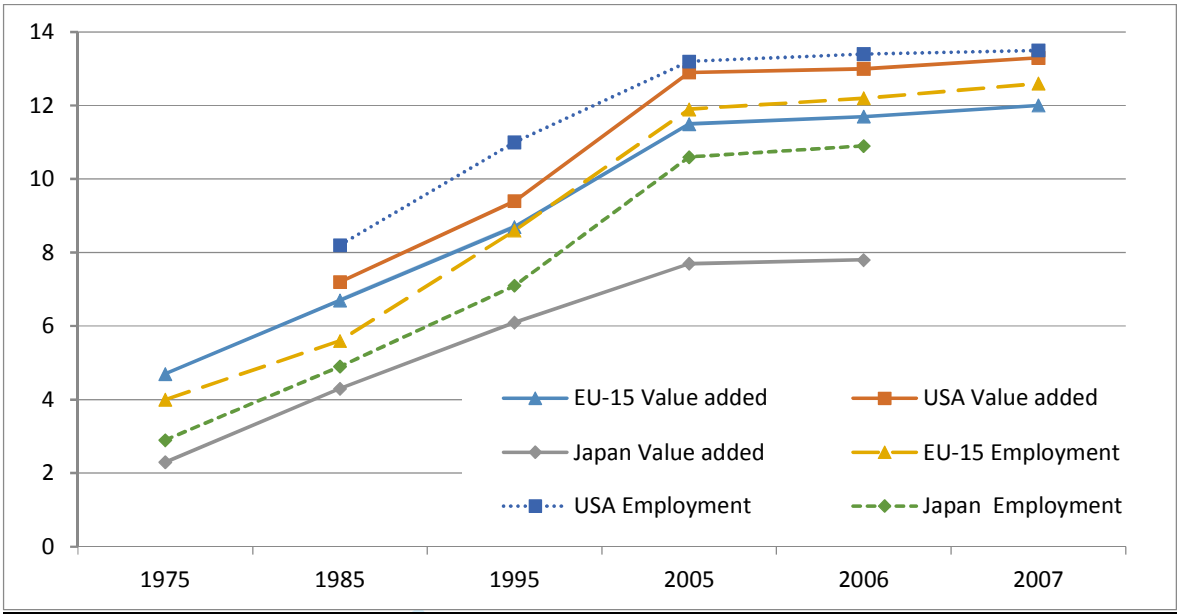



Note: PS = Professional Services; KIBS = Knowledge Intensive Business Services

Data for KIBS being mentioned in text are divided by ten, to fit the chart – thus 474.4 = 4744 publications.

Source: Calculated using Harzing's Publish or Perish (accessed 10/03/2016)

**Figure 2: Trends in share of KIBS sectors in major economies**




Note: KIBS here includes NACE rev. 1.1 category 71, renting of machinery and equipment alongside the "true" KIBS - 72 computer and related activities, 73 R&D and 74 other business activities.

Source: European Commission (2011)

**Figure 3: Mapping KIBS in Official Statistics**

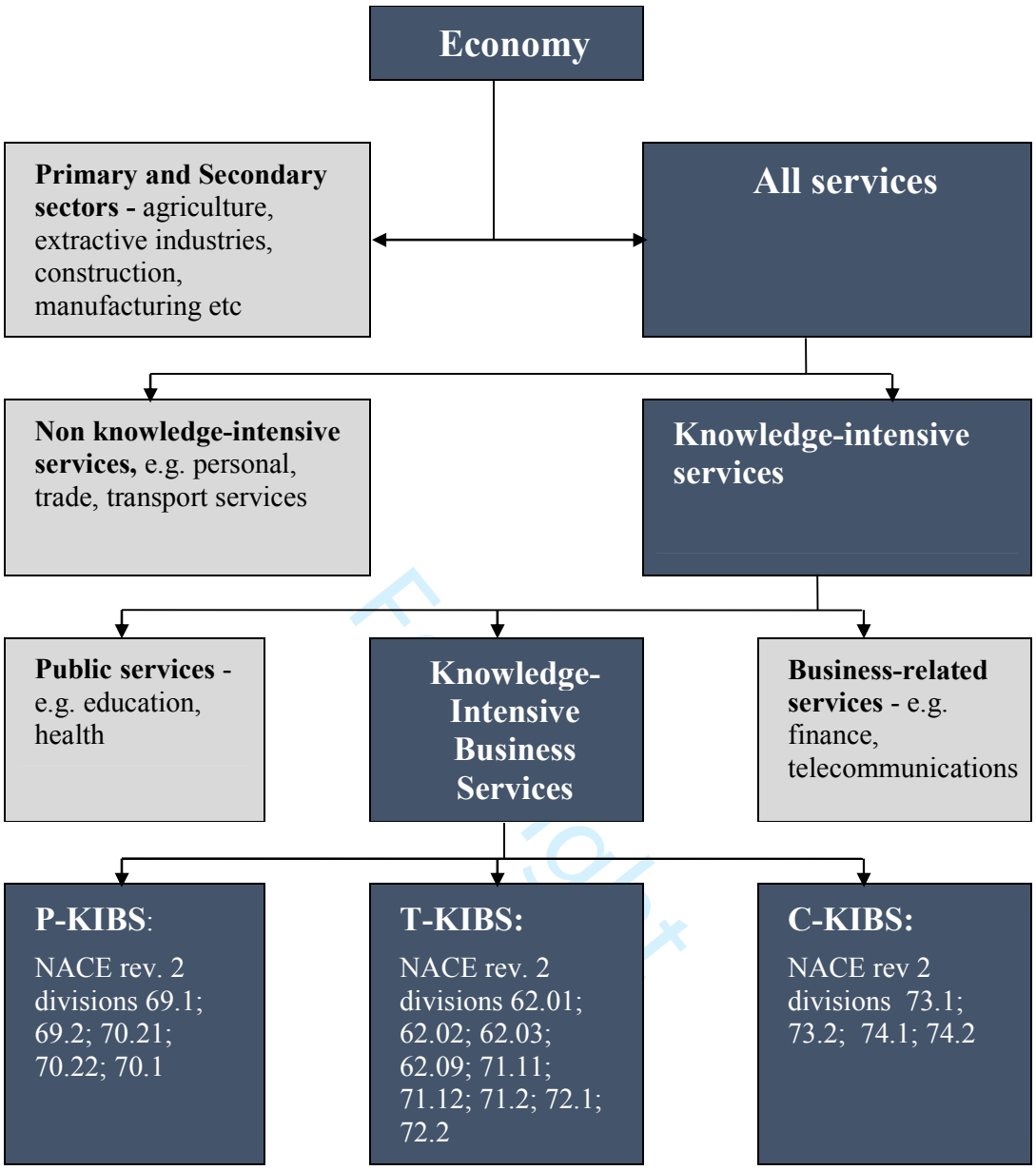
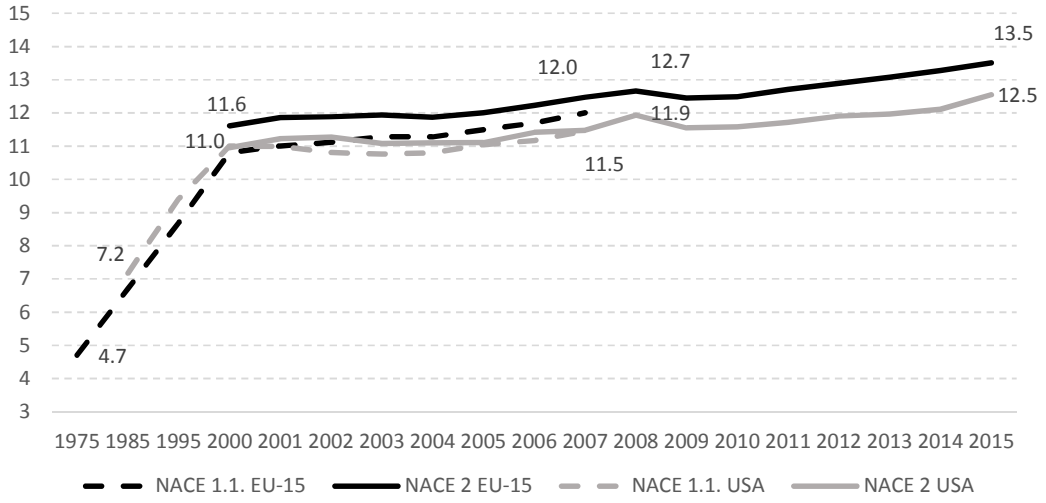


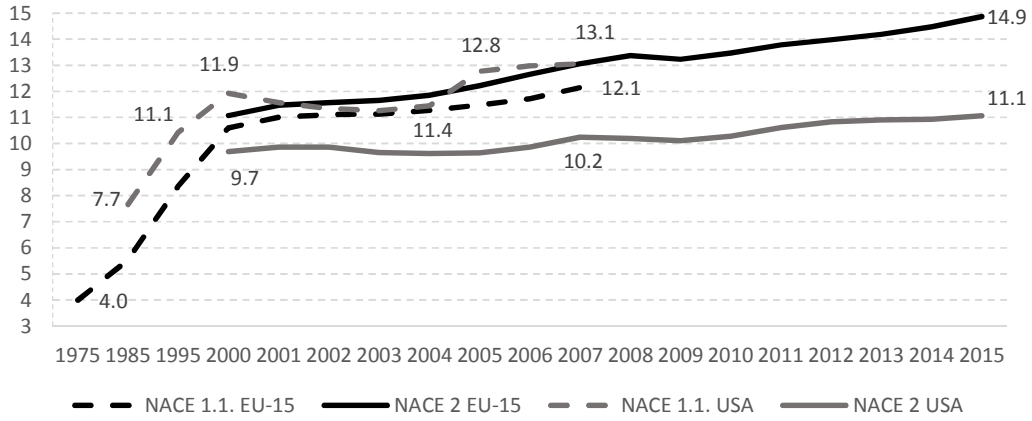
**Figure 4. Share of value added in KIBS sector, %**




Note: in NACE1.1. KIBS is defined as 71-74 (as in Figure 2, above); in NACE2, sections M and N (unfortunately these sections are aggregated) plus J62-63.

Source: EU KLEMS (2017) EU KLEMS Growth and Productivity Accounts: Statistical Module, ESA 2010 and ISIC Rev. 4 Industry classification, available at: http://www.euklems.net/ (accessed 22/09/ 2017) – cf.Jäger, K. (2017)

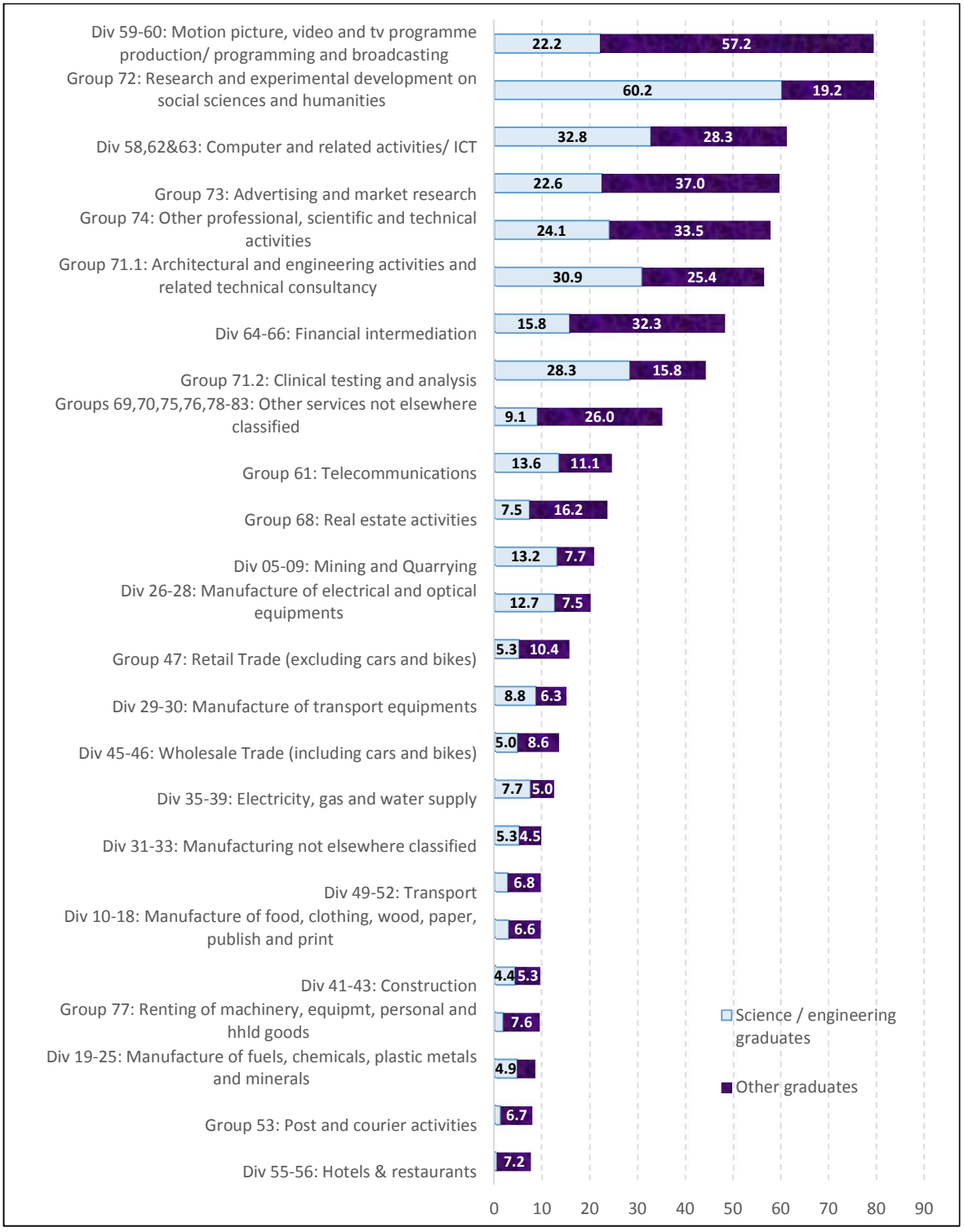
**Figure 5. Share of employment in KIBS sector, %**




Note and Source: as Figure 4.

**Figure 6. Graduate-Intensity of Employment in Various Sectors, UK, 2014.**

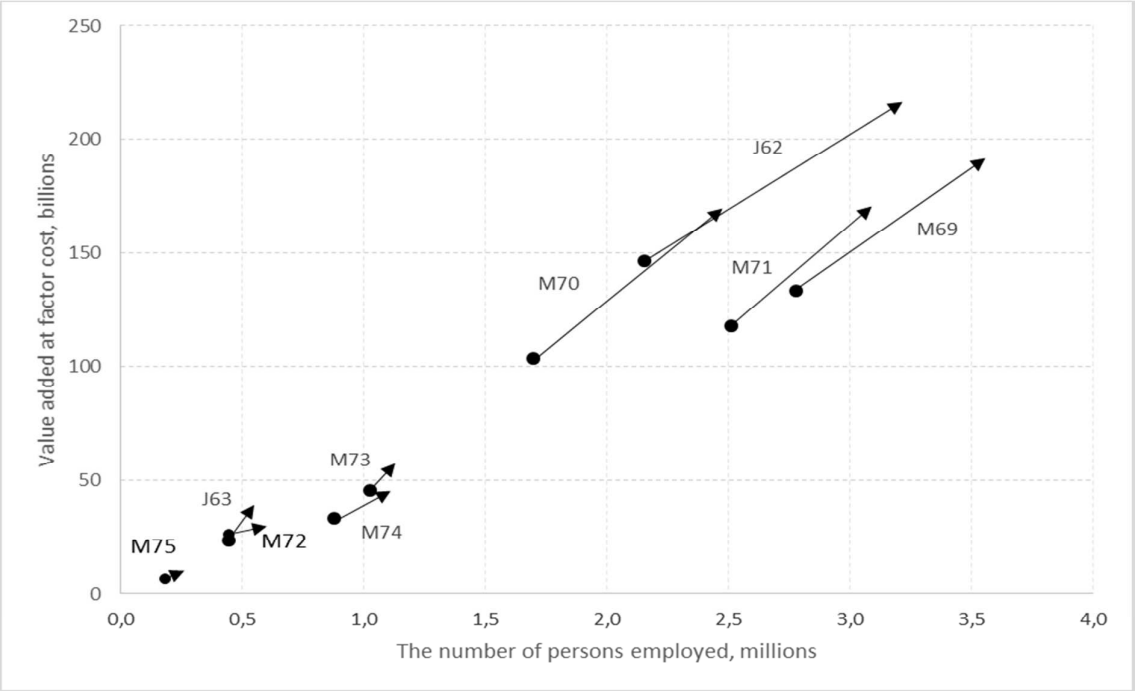
(Percentages of the workforce reported as possessing University-level qualifications)




Note: these are the categories, using the UK Standard Industrial Classification, provided in the dataset (available at http://*doc.ukdataservice.ac.uk/doc/6699/mrdoc/excel/6699bis-14-p106-uk-innovation-survey-2013.xlsx*, accessed 21/09/2017). The mapping onto KIBS is imperfect; "Division 58, 62 & 63 - Computer and related activities/ICT", includes non-digital publishing activities and computer games alongside software publishing and computer programming and consultancy, and information service, activities.

Source: UK Innovation Survey, 2013

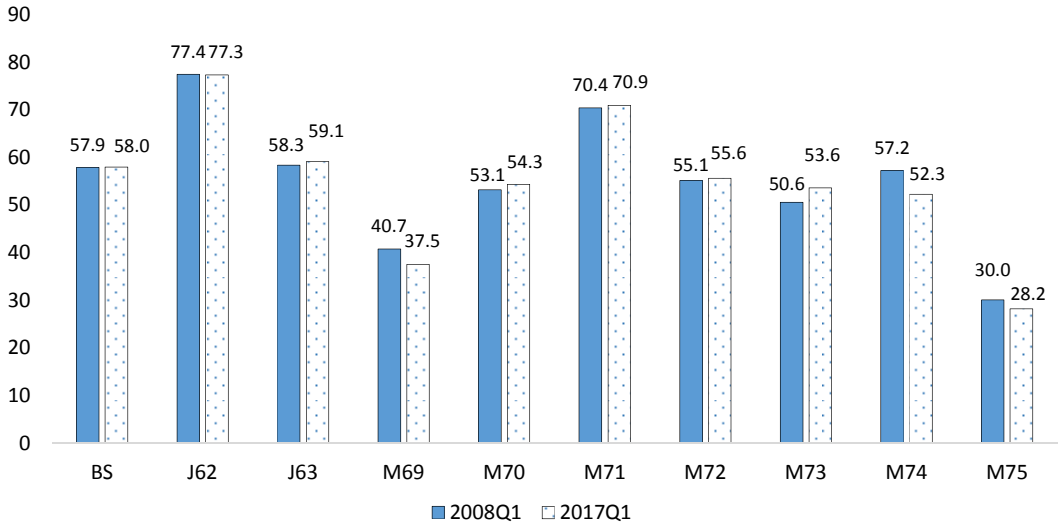
**Figure 7. Changes in Employment and Value-Added in Knowledge-Intensive Business Services from 2005 (EU-27) to 2014 (EU-28)[21]**




J62 - Computer programming, consultancy and related activities; J63 - Information service activities; M69 - Legal and accounting activities; M70 - Activities of head offices; management consultancy activities; M71 - Architectural and engineering activities; technical testing and analysis; M72 - Scientific research and development; M73 - Advertising and market research; M74 - Other professional, scientific and technical activities; M75 - Veterinary activities

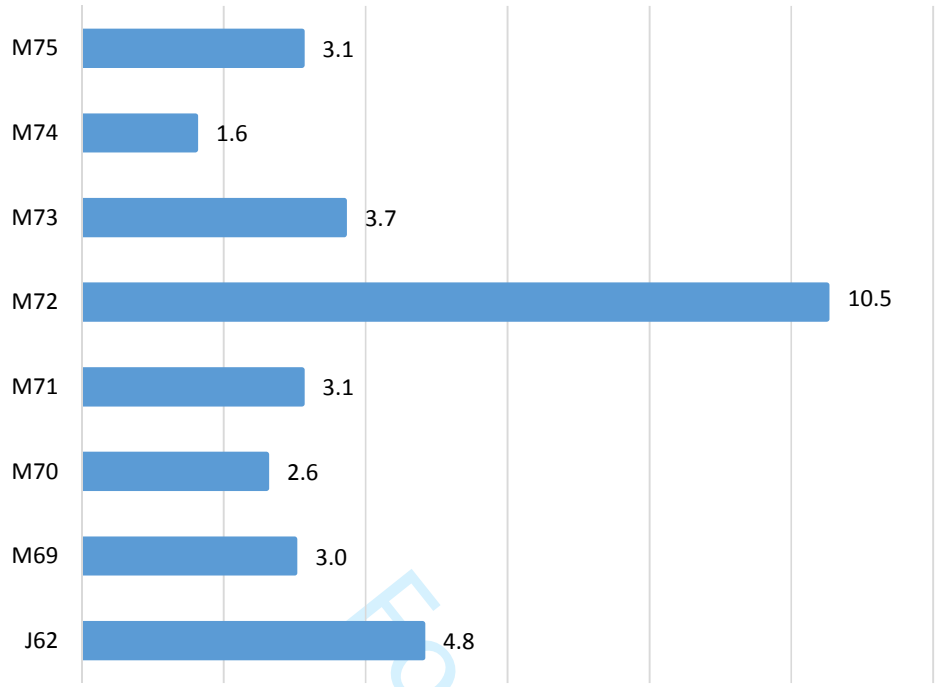
Source: Eurostat (2017) "Structural Business Statistics Database", available at: http://ec.europa.eu/eurostat/data/database (accessed 22/09/2017).

**Figure 8. Share of males in total employment by industry, 2008 and 2017 (%)**



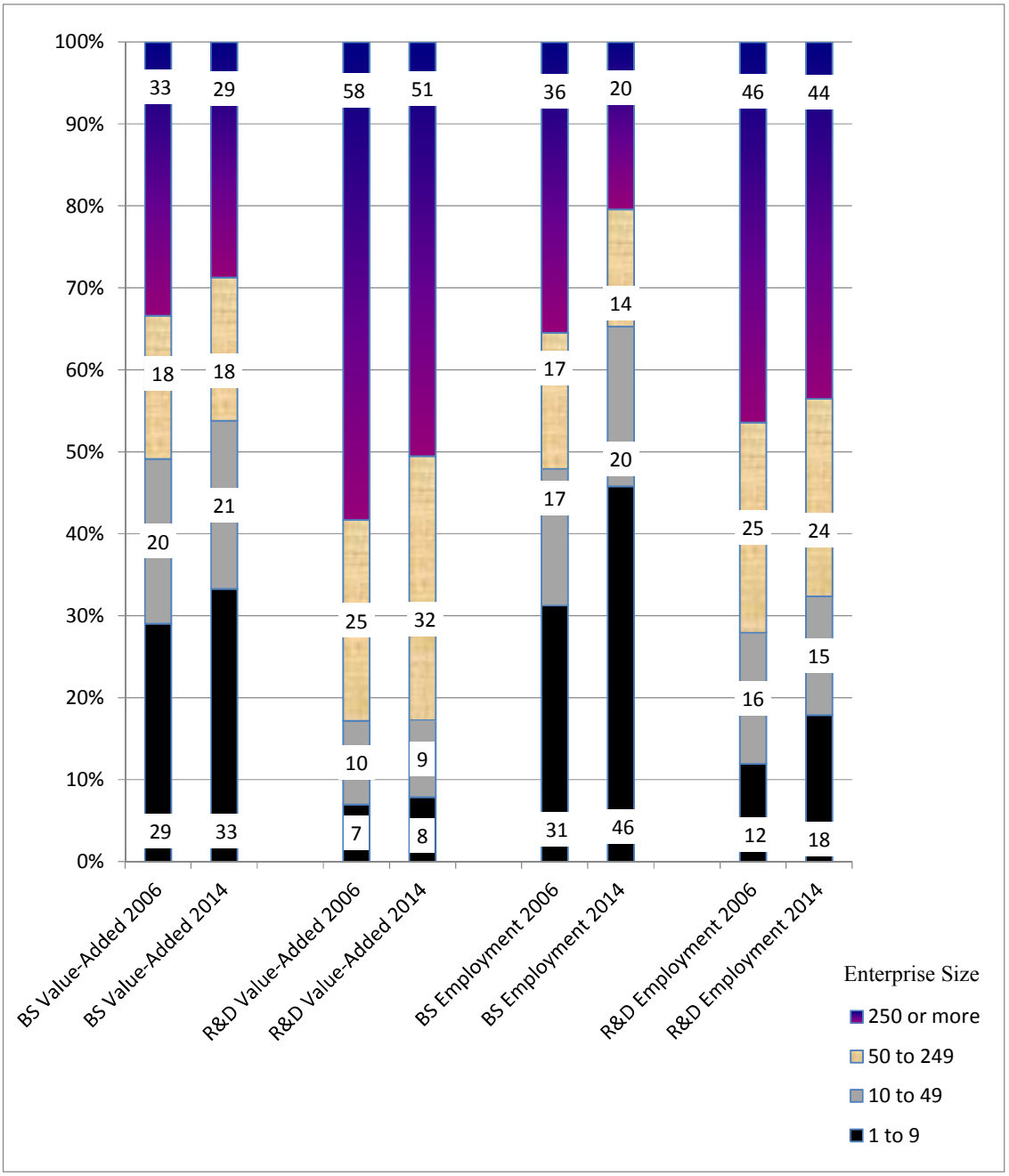

Note and Source: as Figure 6, plus BS – Knowledge-Intensive Business services (i.e. total of subsectors featured here.

**Figure 9. Number of persons employed per enterprise, EU28, 2014**




Note and Source: as Figure 7, plus number of persons employed is calculated as mean

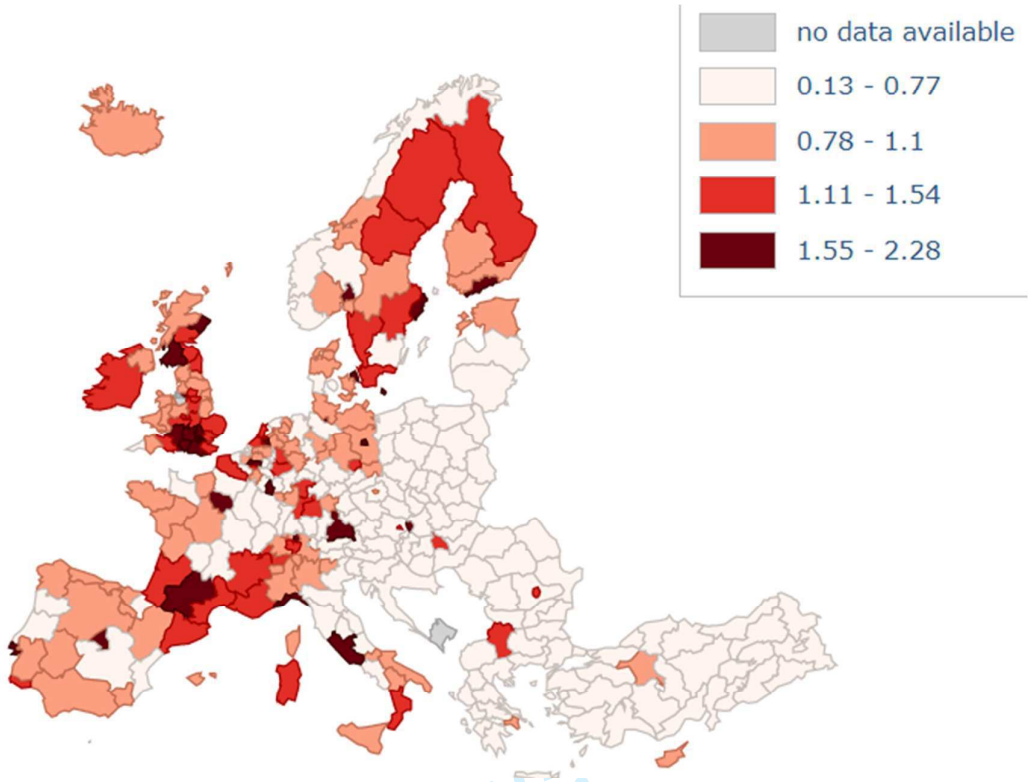
**Figure 10. Contributions of Enterprises of Different Sizes to Sectoral Employment and Value Added, EU-27, 2006 and EU-28, 2014 (%)**




Note: in 2006: R&D services = NACE1 Division 73; BS, Business Services = NACE1 Divisions 72, 74; in 2014 R&D services = NACE2 Division M72[22]; Business services = NACE2 Divisions J62, J63 and M 69-71, 73-75.

Sources: 2006 data from European Business 2009, Tables 24.2, 25.3 and 2014 data from Eurostat (2017) "Structural Business Statistics Database", available at: http://ec.europa.eu/eurostat/data/database (accessed 02/09/ 2017).

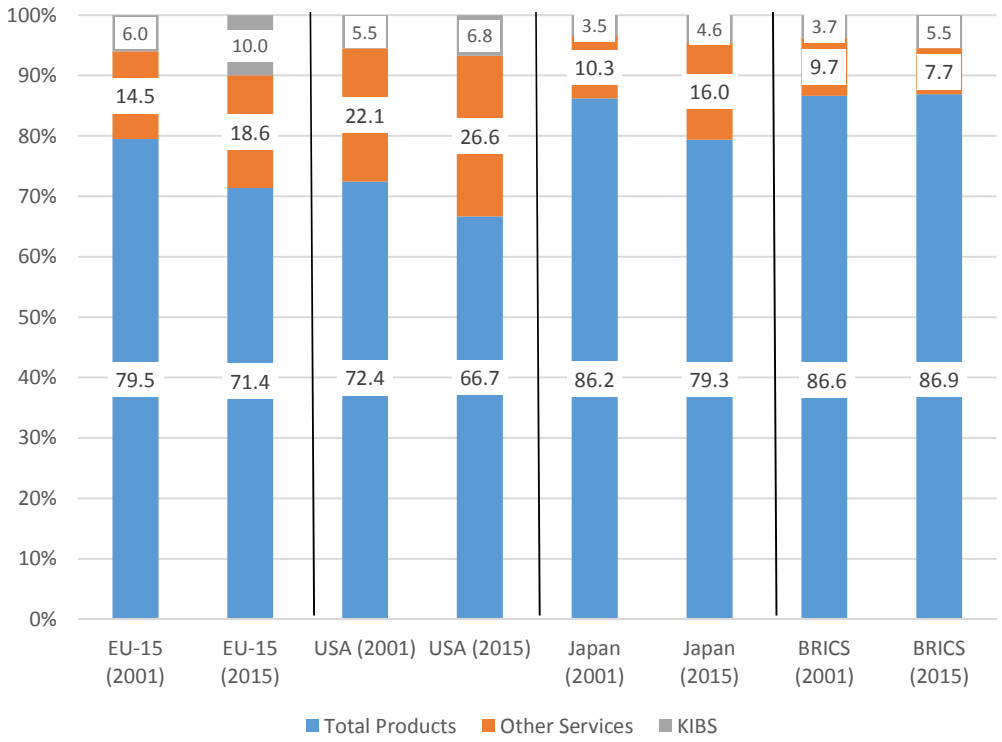
**Figure 11. Specialisation (Location Quotient) for Business Services (2013)**




Note: Business Services

Source: Map produced by European Cluster Observatory, using sector data from national sources, available at: https://ec.europa.eu/growth/smes/cluster/observatory/cluster-mapping-services/mapping-tool_en (accessed at 27 September 2017)

**Figure 12. Share of trade by export type in 2001 and 2015 (%)[23]**




Note: KIBS include sections 9.2 Computer services, 9.3 Information services and 10 Other business services (10.1 R&D, 10.2 Professional and management consulting services, 10.3Technical, trade-related and other business services). Trade in US$. BRICS = Brazil+Russia+India+China+South Africa. Ttrade data count also intra-EU and intra-BRICS trade in their totals

Source: International Trade Centre (2017) Trade Map, available at http://www.trademap.org/Index.aspx (accessed at 27 September 2017)