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***IPTS WORKING PAPER on
CORPORATE R&D AND INNOVATION - No. 05/2009***

Services R&D

Jeremy Howells



The ***IPTS Working Papers on Corporate R&D and Innovation*** sheds light on economic and policy questions related to industrial research and innovation. Mainly addressed to policy analysts and the academic community, these are scientific papers (policy relevant, highlighting possible policy implications) and proper scientific publications which will be typically issued at the moment they are submitted to peer-reviewed scientific journals. The working papers are useful to communicate to a broad audience the preliminary research findings of the work we develop, to generate discussion and to attract critical comments for further improvements. The working papers are considered works in progress and are subject to revision.

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Such Working Papers Series are issued in the context of the ***Industrial Research Monitoring and Analysis (IRMA)***¹ activities that are jointly carried out by the European Commission's Joint Research Centre (JRC) – Institute for Prospective Technological Studies (IPTS) and the Directorate General Research - Directorate C, European Research Area: Knowledge-based economy.

IRMA activities aim to improve the understanding of industrial R&D and Innovation in the EU and to identify medium and long-term policy implications. More information, including activities and publications, is available at: <http://iri.jrc.es/> and <http://ec.europa.eu/invest-in-research/>

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¹ IRMA activities correspond to the implementation of the approach set out in "Investing in research: an action plan for Europe" (COM, 2003) and in further Communications of the Commission: "More Research and Innovation – Investing for Growth and Employment – A common approach", COM (2005) 488 final, "Implementing the Community Lisbon Programme: A policy framework to strengthen EU manufacturing – Towards a more integrated approach for industrial policy", COM (2005) 474 final.

Abstract

This document analyses the nature of service R&D activity and growth. The role and significance of R&D in services has been **growing** rapidly recently, although in the context of services it is also important to note that much innovative activity in the service sector remains of a non-R&D and non-technological nature. Thus, services are becoming more research intensive over time and the significance of innovation to their performance is also increasingly being recognised.

JEL Classification: O33

Keywords: R&D in services sectors, trends

1 INTRODUCTION AND METHODOLOGY

This document emerged from the *Digest of Industrial R&D*², whose objective is to provide a review of the recent literature on industrial R&D in a policy-maker friendly format, aiming for a better understanding of industrial³ R&D investment in Europe⁴. The *Digest* uses systematic information screening, selection and processing activities in order to develop a “bottom-up” picture of the most relevant issues surrounding this subject.

Publicly-available sources, including academic books and papers, documents produced by national governments and international organisations (such as the OECD, the UN and the EU), in-house research at the IPTS and other EC-related working groups, and reports by private organisations were covered in the *Digest* activities.

Four main topics emerged in the first edition of the *Digest*⁵: the impact of business R&D, levels and patterns of business R&D investment, factors that influence those investments, and the internationalisation of business R&D. Following the experience with the first edition, the methodology was improved through incorporating a wider range of sources, in-depth expert discussions for trend identification, and the use of standard templates to structure the information. The most relevant topics have been selected according to the degree of relevance for the following issues:

- (a) **Problématique**: the issue at stake and its economic and policy relevance of issues.
- (b) **State of the art**: the novelty of literature on this topic.
- (c) **Divergence**: the different points of view on the issue, based on existing literature.
- (d) **Blind spots**: areas where there is a lack of policy relevant information.

The process was designed to make the exercise as comprehensive, up-to-date and policy-relevant as possible. Given the “bottom-up” character of the process and the quality of the resulting reports, the most interesting reports are published as a self-standing document.

The present report, Business R&D in SMEs, aims to be a useful reference work for policy-making, research and business alike. Comments, feedback and other input are welcome and can be sent by email to: JRC-IPTS-IRI@ec.europa.eu.

² The Digest was an activity within the Industrial Research and Innovation Monitoring (IRIM) project carried out jointly by the Joint Research Centre (JRC) and the Directorate General Research (DG RTD) of the European Commission. The other IRIM activities are the EU Industrial R&D Investment Scoreboard, the EU Survey on R&D Investment Business Trends, and the Economic and Policy Analysis Report.

³ The terms industrial, corporate, business, and private-sector R&D are used interchangeably throughout this document.

⁴ IRIM activities are undertaken at the JRC's Institute for Prospective Technological Studies (JRC-IPTS) and are co-funded by DG Research.

⁵ The pilot Digest is available at http://iri.jrc.es/research/docs/annual_digest_ird.pdf

2 DEFINITION AND REPORTING OF R&D SERVICES: A KEY ISSUE

As with R&D more generally⁶, it is difficult to define and interpret R&D in services. For example, most R&D in manufacturing is allocated to the relevant NACE sector. However, in some cases if an R&D laboratory is freestanding and separate from manufacturing or other activities, it may be allocated to the R&D service activity (Howells, 1984). In the UK, at least, this allocation appears often to be a fairly arbitrary process. Despite rapid reporting in the growth of services R&D, there therefore still appears to be significant under-reporting of R&D in service sectors. Thus, it appears that many service firms which do engage in activities that satisfy the formal criteria for being R&D are less likely to report these activities. It is hard to establish how much of an effect this has, and how it varies across sectors and firms of different types. The underreporting is likely to be due to a combination of factors. There is often a different structure of R&D-like activities in services, such that activities that are underreported very widely are more prevalent in services. The success of Europe is intimately bound up with the success of its service economy. The majority of European jobs, GDP and productivity growth are based on service activities. Services play a major role in European member states in terms of their growth and development. The service sector plays a dominant role in the developed economies, accounting for about two thirds of employment and Gross Domestic Product (GDP) and Gross Value Added (GVA). According to Eurostat, 'Services are the only sector of the European economy that has generated jobs in the last two decades.' (Eurostat, 1999). Thus, business services, health and social work services, and wholesale and retail services accounted for more than 80% of total employment growth between 1995-2005 in the European Union (EU 27). By contrast transport equipment was the only manufacturing sector that contributed to net job growth over this period (European Commission 2007b, 28).

Social research and some software activities are areas where R&D often goes unrecorded; whilst the lack of specialised R&D occupational positions or management structures also means the profile and measurement of R&D in service industries remains neglected. The heritage of services may mean that, while services have become more active in R&D (and other innovative practices); this is not yet reflected in their organisational and reporting structures. This could be a factor, for instance, in services' rarely organising 'conventional' R&D management structures, and more often using 'project development' teams where major innovation is concerned, as with the case of financial services (see for example, Segal Quince Wicksteed, 2006). It is also underlies the fact that services are poorly linked into innovation and R&D systems in the wider economy. These features may mean that services are less familiar with the R&D construct, and less prone to use this terminology internally and/or in reporting activities to the outside world (Jankowski, 2001). Certainly it is apparent that a sizeable number of firms consider that they are undertaking unreported R&D (Gallaher *et al* 2005). However, because these firms are not familiar with working with the R&D concept, it is hard for many services to easily indicate how much R&D they do undertake.

⁶ See the definition and interpretation of R&D in the latest (6th Edition) Frascati Manual (OECD 2002).

For the European Union and in relation to the Lisbon and Barcelona agendas and targets there is a concern that although there has been growth in EU R&D service activity, Europe lags behind the U.S. and this is one of the factors behind the overall lag in R&D intensiveness of the EU (Moris, 2006). Some of the recorded growth in services' R&D, and the differentials between US and EU R&D, is likely to be a matter of different measurement practices. As such there are issues over how the US authorities may allocate R&D service activities within and between firms and this makes comparability between US and EU data extremely difficult.

Sometimes the changed practices are yielding potentially misleading results (such as a substantial share of US trade sector R&D being down to firms whose main business is manufacturing, but who employ many sales and distribution staff). Often the changed practices are recording activities that were previously hidden (Grenzmann 2000). However, services' R&D often seems to be poorly captured by established measurement techniques. It is probable that improved measurement would reveal that more R&D is undertaken in services than is currently being identified. Current statistical practice often under samples innovative services (though some countries fare better in this respect than others). Thus, R&D is defined in terms that many services do not recognise, and important areas of research of relevance to many services, such as the social sciences, are effectively ruled out.

However, there are grounds for believing that there is real growth in R&D in many service sectors, and that there is rapid growth in the levels of activity of R&D-intensive technology-based services, moreover that these trends are also being picked up in the statistics. What might be the reasons for this apparent underreporting of R&D, which would persist even if sampling were to be extended to cover more service firms? They include:

- 1) It is hard to differentiate between R&D and other innovative activities, especially those involved in service design and delivery which involve working closely with customers. Indeed, it can be hard to differentiate between innovative and more routine activities in many knowledge-intensive services (European Commission, 2006).
- 2) This is related to the fact that services identify R&D as a specialised function; R&D departments are rare, and few staff are dedicated to innovation efforts, although many do work on innovation some of the time, often in the course of service production and delivery (Howells *et al.*, 2006).
- 3) Activities, such as software and web service development, are often not seen or recorded as R&D, even though a large part of these activities now comes under the formal definition of R&D. There is also confusion about whether activities such as innovation-oriented market research should be included (Åkerblom, 2002, p.5). Market research is explicitly ruled out of the definition of R&D in the Frascati Manual (OECD, 2002, p.34).
- 4) Uncertainty also remains about whether R&D has to be oriented towards new product development (Frascati Manual – OECD, 2002, pp.47-49). Thus, much environmental and industrial scanning may be considered to be ruled out even though this may involve commissioning a research team. There may also be cases where such activity is seen as R&D when it might be more routine scanning.

- 5) Social science sometimes seems often to be ruled out. Thus, the US R&D survey form appears to do so, whilst the UK form rules out some organisation and management research as well as market research (Miles, 2007). Many activities labelled as innovative by practitioners do not meet the criteria for R&D applied by statisticians.
- 6) A final complication is how R&D activity is actually treated and recorded within R&D services as defined by NACE 73 (Section 5). There are potential issues of double counting and counting activities which are not formally classified as R&D.

3 GROWTH IN SERVICE-SECTOR R&D

Despite all the complexities and problems associated with measuring service R&D, service sector R&D is clearly growing rapidly across the world. Thus, between 1990 and 2003, service-sector R&D increased at an average annual rate of 12% across OECD member countries, compared to approximately only 3% for manufacturing sectors (Figure 1). By 2002, therefore, the European Union average for the share of services in Business Expenditure in Research and Development (BERD) had risen to over 15%, although for some countries, such as the Portugal, Denmark, the United States, and Greece, this was much higher, at over 30% (Figure 2). As a recent European Commission position paper (European Commission, 2005) noted (p 8):

'The services sector invests considerably more in R&D in the US (0.7% of GDP) than in the EU (less than 0.2% of GDP)..... Most of the EU-US R&D gap stems from a smaller R&D intensive services sector.....'. Thus, 'In the US, nearly 40% of all business R&D is performed in the service industries, whereas in the EU this share is only 15%. However, since 1997, an increasing proportion of business R&D is being performed in the services sector in Europe (from 11.5% in 1997 to 15.1% in 2002).'

Leaving aside different measurement practices between the US and the EU in relation to R&D in services, real differences between the US and Europe in terms of service R&D activity are likely to remain. In particular, it seems to relate to the fact that Europe generally has smaller R&D intensive service sectors, particularly in fields like computer and telecommunication services. Equally, in a number of service sectors where Europe is particularly strong, such as hotels and tourism and financial services, R&D intensity has traditionally been very low, even though innovation in these sectors, particularly financial services, may now be growing significantly (Dialogic/Fraunhofer *et al.*, 2006). This may also be true when considering the growth of service R&D in other advanced industrial economies (Wang and Tsai, 2005).

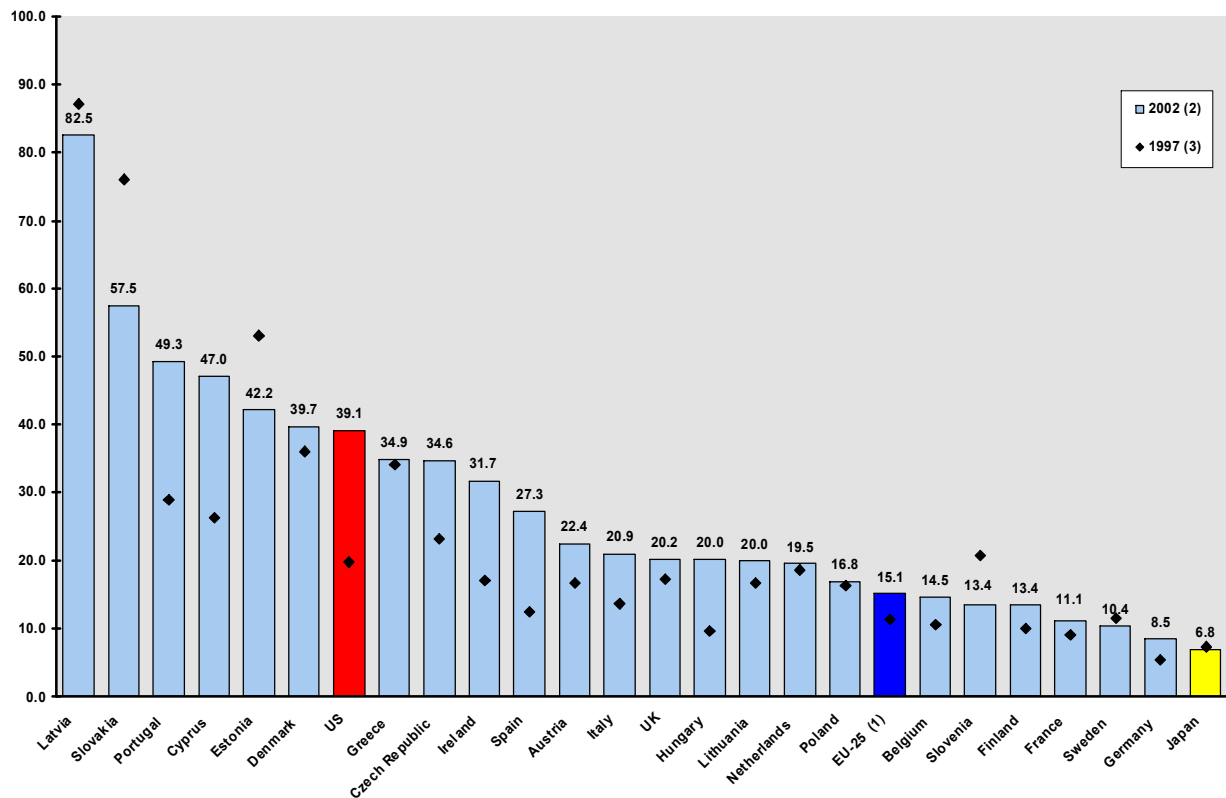
However, focusing more specifically on business services a study in Europe over the period 1995-2004 (Kox and Rubalcaba, 2007) has shown that business services in most of the EU-15 countries became more R&D-intensive than the rest of the economy did (although there are substantial intra-EU differences in the R&D share of different sub-sectors). Over the period 1995-2004 therefore, business service R&D has been very strong in most EU countries, and in several cases also higher than that occurring in the USA.

Figure 1: Average Annual Growth Rates (%) of Business R&D Expenditures, 1990-2003

Source: ANBERD Database (OECD, 2006, p.32)

Figure 2: Share of BERD Performed in Services (%), 1997 and 2002

Figure 2.3.10 Share of BERD performed in the services sector (%)



Source: European Commission (2005) Key Figures 2005 on Science, Technology and Innovation: Towards a European Knowledge Area, DG Research, p. 37

4 VARIATIONS IN SERVICE R&D GROWTH: BY SECTOR AND COUNTRY

In most European Union and OECD countries (see, for example, Rosa and Gault, 2003, for the Canadian context) and in nearly every service sector there has been real expenditure growth in R&D over the last few years, but there remain significant variations in growth both by service sector and by country, albeit often from a low absolute base.

In relation to sectoral differences, computer and related services have recorded the most consistent growth across all countries. By contrast, although growth in telecommunication service R&D has overall been significant it has shown a much more variable pattern between countries. This undoubtedly reflects differences in the timings and impacts of a raft of legislation across Europe in relation to telecommunications covering such as deregulation, privatisation and increased competition within the sector (Figure 3).

Equally, in terms of country differences, in some countries, such as the UK and Finland, the low growth of service R&D has mirrored that of manufacturing, whilst in other European countries the growth in service R&D has not only been at very high annual growth rates, but also appreciably higher than their manufacturing sector (Figure 4).

The highest shares of the services R&D growth in Europe are to be found in small and open economies with average-to-high R&D intensities, such as Iceland, Luxembourg, Denmark, Austria, Switzerland, the Czech Republic, Norway and Ireland. In the majority of low business R&D-intensive countries, the share of the services sector in Business Expenditure on Research and Development (BERD) is relatively high, comparable to the share of the manufacturing sector (such as Latvia, Lithuania, Poland, Bulgaria) or in some cases higher (such as Croatia, Estonia, Slovakia, Portugal, Cyprus). In these countries, the level of business R&D expenditure in the services sector has rapidly reached the level of manufacturing business R&D over the last 10 years (European Commission, 2007).

These major sectoral and country differences in the R&D intensity and innovation profile (OECD, 2005 and 2004) of services needs to be recognised both in our conceptualisation of such a large part of the economy and in the way we seek to develop policies for the sector. Some of the variation between R&D intensity in service industries (and firms) may be a reflection of the fact that some industries and firms are more *efficient* in their use of R&D. There are, therefore, issues here about variations in service industry R&D productivity levels. This suggests we should focus not just on the nature and role of R&D activity on service innovation, but also its impact on innovativeness (Section 6). This might seem obvious, but is often neglected in the discussion surrounding the issue of R&D and services.

Figure 3 Growth of R&D Intensity by Services Sector, 1999-2001

Source: OECD (2004) *OECD Science, Technology and Industry Outlook 2004* OECD, Paris, 130.

5 R&D IN SERVICES AND SERVICES R&D

What is fuelling this growth in services R&D? Innovative effort within the service sector is increasing and this is likely to stimulate the need for more R&D activity; not just to create new knowledge, but also to enhance the absorptive capacity of service firms. Increased technology-intensity in many services is likely to promote increased R&D of the traditional, technology-related kind as well as newer or different forms outlined earlier (Section 2). In particular the growth in service R&D is seen to be due to a number of factors, namely (European Commission, 2005, p. 37):

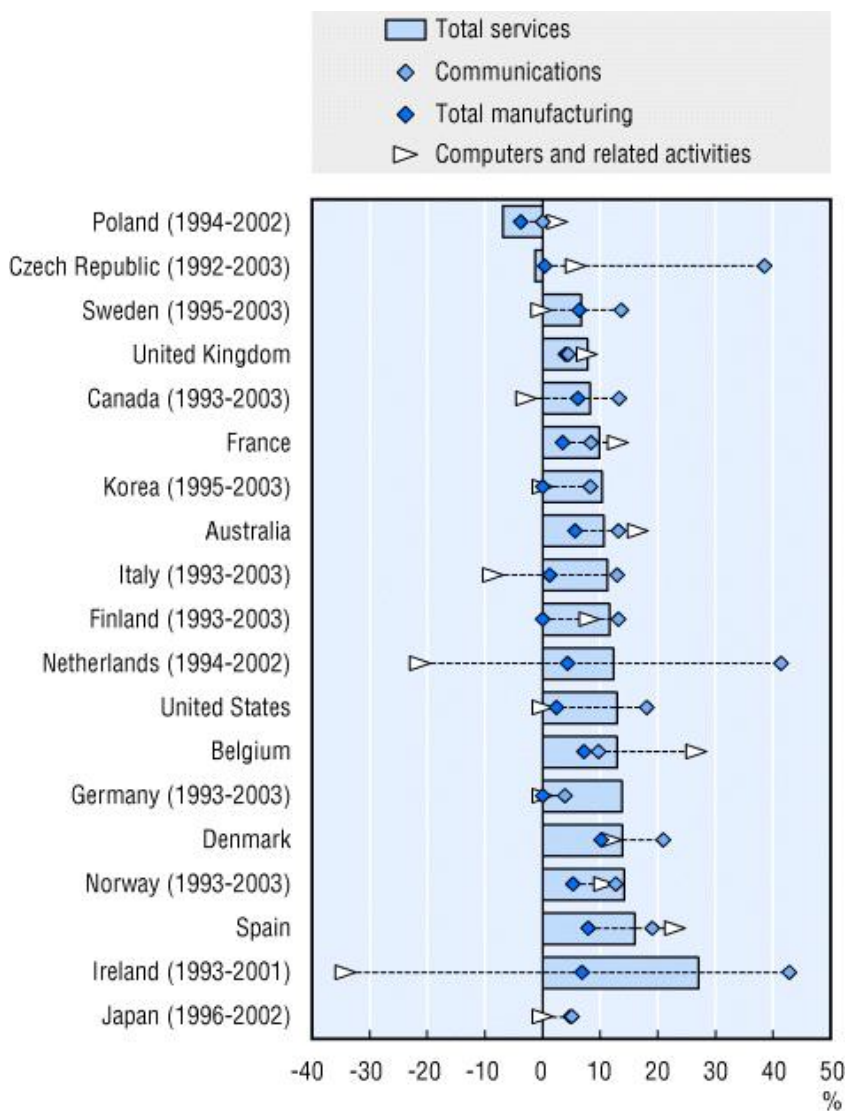
- (a) outsourcing of R&D (i.e. growth in the propensity to undertake extra-mural R&D);
- (b) the growth of technology-related services whose R&D-intensities are very high; and,
- (c) improved coverage of services' R&D (by statistics).

The outsourcing of R&D activity is likely to have had an impact on the growth of R&D activity in services. There are two obvious ways in which this could occur. Firstly by both service and manufacturing firms outsourcing their R&D to firms in the R&D services industry (NACE 73) leading to the growth of R&D activity overall in the service sector and as a 'display effect'. Secondly, by somehow making it easier for service firms to undertake R&D (by getting someone else to do it, via outsourcing), it is encouraging them: i) to do more R&D, and, ii) to consider undertake some R&D in-house as well as externally (if the previous outsourced R&D work has had a successful outcome on the operations of the firm).

On this basis it is therefore not unexpected to find that within the overall services segment there is an important sector dedicated to R&D activity, i.e. the R&D services sector, which covers the NACE/ISIC schema 73, namely research and development services. It is a significant sector in its own right and obviously an important generator and provider of R&D to other parts of the economy. Thus, in 2002, across the EU25, the value-added by R&D services was €13.3 billion, although most of this was accounted for by the EU15 – €11.9 billion. EU25 employment in R&D services was 365.5 thousand (EU15 - 289 thousand employees). There remain major differences between major EU countries in terms of the size and share of the R&D service sector in their economies. France has by far the most significant R&D service sector in terms of value added and employment expressed as a percentage of total business services, followed by Finland. By contrast, it remains very small in Spain. Analysis of input-output data on users of R&D services (ECORYS-NEI *et al.*, 2004) indicates only a highly partial view with some users of R&D services being centred in highly science-intensive sectors such as pharmaceuticals; communications equipment and defence. However, the services sectors that are intensive users of R&D services are mostly public and community services covering public administration and defence, social security, sewage and refuse disposal services, sanitation and membership organisations (European Commission, 2006, p.71).

However, what is surprising is that the R&D service sector, given the growth in R&D outsourcing, remains small compared to most other business service sectors and has not grown as fast as many other service sectors in relation to R&D (OECD, 2007, p.14). Clearly only a proportion of R&D outsourcing by firms is going to the specialised R&D services sector.

Figure 4: R&D Growth in Services in Selected Countries, 1993-2002*



Note: *Average annual growth rate.
Source: ANBERD Database (OECD)

6 SERVICE R&D AND SERVICE INNOVATION: A RELATIONSHIP

In highlighting the growth of R&D in services it is also worth noting that R&D and technological-related innovation is only one aspect of innovation activity in services (Howells, 2007). Even in manufacturing, R&D generally amounts to only about half of total investment in innovation (OECD, 2001); in services the share is even smaller. This is supported by evidence from Europe that despite the attention paid to R&D, technological advances and R&D competencies it was either the least or the second least likely of these factors to be identified in both manufacturing and service sectors (Tether *et al.*, 2001; see also Tether and Tajar, 2008). Thus, it was identified by less than one in five manufacturers, and by an even smaller proportion of the service firms. Most firms, therefore, be they manufacturers or service firms, consider that their strengths in innovation do not rely on R&D activities⁷. Other components of innovation are therefore frequently more important for services, where innovation is linked to changes in disembodied, non-technological innovative processes, organisational arrangements and markets. This was also revealed in a large scale survey that sought to capture a much wider notion of innovative change within services (Howells and Tether, 2004).

The key issue, therefore, is what type of relationship there is between R&D and innovation in service activities. It may be argued that, in general, in manufacturing this relationship is strong, but in services it is much less so. This is certainly true, but the issue is more complex than that, because in certain service industries, such as telecommunication services, the relationship remains strong, whilst in others the relationship between R&D and innovation (however measured) is much weaker. Services derive innovations from many sources (Arundel and Hollander, 2006). In some sectors the most important new services are much more conceptual developments, rather than innovations involving new techniques or technologies (more like those of manufacturing firms). Such new concepts are the case for many original financial products, for example.

There are various pressures encouraging more innovative activity in services. Levels of innovation are likely to increase (though the view that this will be the case is expressed unevenly across sectors). How far these forces are also liable to result in increased R&D is far more contentious. In some sectors innovation is very much a product of R&D, and here we can be fairly sure that R&D and innovation will increase together. These are typically technology-related services, such as computer and information technology (IT) services and engineering services (Howells *et al.*, 2006). In some sectors, however, innovation has little to do with formal R&D. Thus, sectors like accountancy, consultancy and marketing are much more active in the development of non-technological innovations which require fewer research-led inputs. Certain service sectors are therefore unlikely to witness much increase in formal R&D, even if innovation pressures continue to grow. This leaves many services where we would anticipate increasing R&D-intensity of innovation; often from a low initial base.

This would be the case for many services whose use of technology (especially IT) has been growing. These include many firms in professional services, for instance, and large service firms in a variety of sectors. Services firms could make more use of R&D, and of the products of R&D carried out elsewhere. Even when there is little scope for innovation in the core service product, there is often scope to apply new technology (and other innovations) in related aspects of the service offering and process. The informational elements of the interaction between service provider and client (specification and commissioning the service, delivering the service and/or after service and so on) are often the site of IT-related innovation,

⁷ Although those that did identify R&D competencies as one of their key strengths in innovation were more likely to regard their innovation performance as superior to that of their competitors.

such as e-commerce and e-services and call-centre technologies. However, the scope for formal R&D has hardly been explored by most service firms.

If we chart R&D intensity against innovation intensity there are certain service industries where (relatively) high levels of innovative activity are reflected by high levels of R&D and patent activity (see Blind *et al.*, 2003). This includes telecommunication services and R&D services sectors. Equally there are also service industries where this holds true, but at a low level, such as cleaning, catering and transport services. Low innovative activity is also reflected in low R&D activity. However, there are service industries which do not fit this pattern so well (and this is where the service sector overall is different from manufacturing). The former set of industries relate to those service sectors which have high levels of innovative activity but low levels of reported R&D, such as design or architectural services.

There are many services firms that undertake creative work, aimed at developing new products and solutions, on a systematic and regular basis. However, often they are not applying formal or scientific methods, but rather letting their professional workers exercise their creative talents, explore possibilities in craft-like fashion. Other activities that lie on the boundaries of R&D include aesthetic and design-oriented activities together with some sorts of market and organisational research. The latter set of industries are those where they have relative high levels of R&D activity but low levels of reported R&D activity. These are harder to discern, but include service activities which have a relatively high technical component but relatively low levels of novelty⁸. These arguably include such activities as maintenance, engineering and testing services. The relationship between R&D activity and innovative activity, for these two groups of service industries, therefore, breaks down.

Finally, and more fundamentally, should we care here about the relationship between R&D and innovation that much? Should we rather concentrate on innovativeness in general in services, whether it is supported by R&D or not? A key interest of innovation to policymakers is its impact on economic growth and development, and therefore as long as innovation generates such growth, how it is achieved should be of less concern to policymakers. It may be dangerous to assume that enhancing services' innovation is best achieved, let alone predominantly to be achieved, by promoting higher R&D levels in services. There may be good reasons for some services focusing their innovative efforts elsewhere. Services R&D should not be prioritised as the route to service innovation: we need to better understand the relations between R&D and other innovative strategies on the part of services of different sorts. If anything, technology-related innovation is likely to accelerate in many services, and to be focussed around trajectories of change that are only nascent at present, such as around mobile devices and ubiquitous computing. There are liable to be other technologies with substantial impacts on a wide range of services, too; especially those dealing with the human body, such as genomics and neuroscience-based systems. Often such developments take a decade or more to mature. Organisational innovation is liable to accelerate with the increasing size and concentration of service firms in some sectors, and the development and diffusion of management practices such as quality control, business process re-engineering, and knowledge management.

The absolute value of R&D investment may therefore also be less significant than the relative increase in R&D shares. This follows from the notions of diminishing returns to R&D expenditure, the idea that small investments may have a larger impact on firms and sectors where there is very little R&D underway, than it does on those where there is already much activity. As with other so-called 'low tech' sectors (von Tunzelmann and Acha, 2005; Hirsch-Kreinsen 2008), there may be larger returns from increasing R&D activities in the services sectors where there is currently little R&D, than in those parts of the service economy where R&D is more commonplace.

⁸ The issue of novelty in relation to service innovation has received very little attention (see, however, de Jong *et al.*, 2003).

Professional services and many financial services often undertake high levels of innovation, but a great deal of this activity centres on organisational change and new service concepts and there is little R&D underpinning them. However, some organisations (large financial services companies and some firms with requirements for rapid processing of large volumes of data) are liable to engage in more R&D-like activity in connection with their large IT investments. There may also be some increase in the share of R&D in innovation expenditures as more effort is made to record and reproduce innovations, and capitalise on the IPR associated with them. Thus, there will be a tendency for some increase in recorded R&D, though this may not correspond to the apparent innovativeness of the sectors. Technology-related business services are liable to experience ongoing high levels of innovation and R&D investment. Consumer-oriented (and mixed business and consumer oriented) technology-related services like broadcasting and telecommunications are liable to display increasingly high levels of innovation and R&D.

7 CONCLUSIONS

What has this review and analysis of services R&D concluded? Centrally, concerns remain over the definition and measurement of R&D as it relates to services. This goes back to the debate surrounding the definition of R&D in relation to the Frascati Manual (OECD, 2002), but it also concerns how innovative activity is measured more generally in the economy and particularly in service activities (Howells and Tether, 2004). It remains unclear to what extent, or how rapidly, tax credits for R&D will result in a much greater focus on R&D activities in services. Service firms generally do not consider that tax credits would have any substantial or immediate impact. By contrast, in other countries tax credits have a much bigger impact on service R&D recording. Thus, the recorded doubling of R&D in Austrian services since 1998 may, at least in part, be attributed to a higher awareness of R&D due to the new tax credit for R&D. However, this is by no means certain, and it is possible that changes in measurement practices are at least in part responsible for the rapid increase, as has been the case elsewhere. According to service firms, accountants whose clients have little R&D history, have not made much effort to get to grips with R&D. They expect that trying to identify corporate practices as R&D would lead them into difficult negotiations with tax officials. However, changes in international accounting practices are seen as having a major impact on stimulating the reporting of R&D expenditures (Stolowy and Jeny-Cazavan, 2001).

A wider conceptualisation of R&D would also be more appropriate for capturing softer forms of R&D activity in services. This would be likely to capture much more activity underway in services. Even with the established Frascati definition, measurement could be far more systematic with, for example, improvements to take into account the part-time and unspecialised nature of much R&D-like activity. More accurate recording of services' R&D would demonstrate that this is seriously underestimated in some services sectors.

However, the main reason for improving the measurement of services would not be to demonstrate progress being made towards the Barcelona targets, rather better measurement should enable a fuller understanding of the relations between services' R&D and their other innovation activities. On this basis, current trends will lead to ongoing increase in services' R&D, and changed (for the better) measurement practices will increase this yet further. It would still take a long time for the non-technology-based services to attain moderate levels of R&D-intensity. However, whether or not this is seen as problematic is a matter of whether the goal is simply one of increasing the scale of R&D as captured in statistics, or is more one of understanding and hopefully enhancing innovation processes of all kinds, regardless of whether these are recorded as R&D or not (see for example OECD 2005, 2004, and 2001). R&D is actually a means more than an end, though it happens to be a means that can be measured more conveniently and immediately than the long term objectives of innovative dynamism.

8 REFERENCES

- Åkerblom, M. (2002) 'R&D and innovation surveys in service sectors: current experience, conceptual and practical problems and future prospects.' Paper presented at the Voorburg Group on Services Statistics Meeting, Nantes, 23-27 September, 2002.
- Archibugi 2001, Pavitt's Taxonomy Sixteen Years On: A Review Article, *Economics of Innovation and New Technology*, v 10, n 5 2001 , pp 415 – 425
- Arundel, A. and Hollander, H. (2006) Searching the Forest for Trees: 'Missing' Indicators of Innovation 2006 Trend Chart Methodology Report, MERIT, Maastricht.
- Blind, K., Edler, J., Schmoch, U., Andersen, B., Miles, I., Roberts, J., Hipp, C., and Evangelista, R., (2003) Patents in the Service Sector Final Report to Directorate General for Research, Commission of the European Communities, Brussels.
- de Jong, J. P. J. Bruins, A. Dolfsma, W. and Meijaard, J. (2003) Innovation in service firms explored: what, how and why? EIM Business and Policy Research, Strategic Study B200205, Zoetermeer, p. 18.
- Dialogic/Fraunhofer IAO/PREST-CRIC-IoIR/Servilab-University of Alcala, 2006. R&D Needs of Business Related Services (RENESER), Final Report to DG Enterprise, Commission of the European Communities, Brussels.
- ECORYS-NEI, CRIC and WIFO (2004) Business Services: Contribution to Growth and Productivity in the European Union Commission of the European Communities, Brussels.
- European Commission (2005) Key Figures 2005 on Science, Technology and Innovation: Towards a European Knowledge Area DG Research, Commission of the European Communities, Brussels, European Commission (2006) The Future Policy of R&D in Services: Implications for EU Research and Innovation Policy, EUR 21959, DG Research, Commission of the European Communities, Brussels.
- European Commission (2007) Key Figures 2007 On Science, Technology and Innovation: Towards a European Knowledge Area Commission of the European Communities, Brussels. 11 June 2007
- European Commission 2007b, Raising Productivity Growth: Key Messages from the European Competitiveness Report 2007 COM (2007) 666 final Commission of the European Communities, Brussels
- Eurostat (1999) Services in Europe, Data 1995-1997, Eurostat, Commission of the European Communities, Luxembourg.
- Evangelista, R. (2000) 'Sectoral patterns of technological change in services' *Economics of Innovation and New Technology* 9, 183-221.
- Frascati Manual; OECD (2002) Standard Method Proposed for Surveys of Experimental Research and Development OECD, Paris
- Gallaher, M. Link, A. and Petrusa, J. (2005) Measuring Service-Sector Research and Development Planning Report 05-1, National Science Foundation and National Institute of Science and Technology, Arlington, VA.
- Grenzmann, C. (2000) Measurement of R&D in Services: Report on the Availability and Comparability of Service Sector R&D in Member Countries of OECD. DSTI/EAS/STP/NESTI(2000)11, OECD, Paris.
- Giuliani E, Pietrobelli C, Rabellotti R, 2003, Upgrading in global value chains: lessons from Latin American clusters, 'Clusters, Industrial Districts and Firms: the Challenge of Globalization' Conference, Modena, Italy, 12-13 September, 2003
- Hirsch-Kreinsen, H. (2008), "Low-tech" innovations' *Industry & Innovation*, 15, 19-43.

- Howells, J. (1984) 'The location of research and development' *Regional Studies* 18, 13-29.
- Howells, J. (2007) 'Services and innovation: conceptual and theoretical perspectives' in Bryson, J. R. and Daniels, P. W. (Eds.) *The Handbook of Service Industries*, Edward Elgar, Cheltenham, 34-44.
- Howells, J. and Tether, B. (2004) *Innovation in Services: Issues at Stake and Trends* Inno Studies Programme (ENTR-C/2001), Commission of the European Communities, Brussels.
- Howells, J. Tether, B. Cox, D. and Rigby, J. (2006) 'Information technology research in the UK: perspectives on services R&D and Systems of Innovation' *Science & Public Policy* 33, 17-31.
- Jankowski, J. E. (2001) 'Measurement and growth of R&D within the Service Economy' *Journal of Technology Transfer* 26, 323-336.
- Kox, H. L. M. and Rubalcaba, L. (2007) 'Business services and the changing structure of European economic growth' MPRA Paper No. 3750, CPB Netherlands Bureau for Economic Policy Analysis, The Hague.
- Miles, I. (2007) 'Research and development (R&D) beyond manufacturing: the strange case of services R&D' *R&D Management* 37, 249-268.
- Miozzo, M. and Soete, L. (2001) 'Internationalisation of services: a technological perspective' *Technological Forecasting and Social Change* 67, 159-185;
- Moris, F. (2006) 'Trade in R&D-related services: a new indicator of industrial knowledge flows' SRS InfoBrief NSF06-326 National Science Foundation, Arlington, VA.
- OECD (2001), *Innovation and Productivity in Services*, OECD, Paris.
- OECD (2002) *Frascati Manual: Standard Method Proposed for Surveys of Experimental Research and Development* OECD, Paris, 47-49.
- OECD (2004), *Science, Technology and Industry Outlook*, Paris: OECD; OECD (2001), *Innovation and Productivity in Services*, OECD, Paris.
- OECD (2005), *Enhancing the Performance of the Services Sector*, OECD, Paris
- OECD (2007) *Globalisation and Structural Adjustment: Summary Report of the Study on Globalisation and Innovation in the Business Services Sector* OECD, Paris, p. 14.
- Pavitt, K. (1984) 'Patterns of technical change: towards a taxonomy and a theory' *Research Policy* 13, 343-373.
- Rosa, J. and Gault, F. (2004) 'Research and development in the services sector' *Canadian Economic Observer*, January 2004, Section 3.1, 21-32
- Segal Quince Wicksteed (2006) *Patterns in Business R&D: A Series of Working Papers prepared for the Scottish Science Advisory Committee in Support of its Study R&D: Science Base to Business*, SegalQuinceWicksteed Consulting, Histon, Cambridge, 29-30.
- Stolowy, H. and Jeny-Cazavan, A. (2001) 'International accounting disharmony: the case of intangibles' *Accounting, Auditing & Accountability Journal* 14, 477 – 497.
- Tether, B., Miles, I., Blind, K., Hipp, C., de Liso, N., Cainelli, G. (2001) *Analysis of CIS Data on Innovation in the Service Sector Final Report to DGXII*, Commission of the European Communities, Brussels.
- Tether, B. S. and A. Tajar (2008), 'The organisational-cooperation mode of innovation and its prominence amongst European service firms,' *Research Policy*, 37, 720-739.
- von Tunzelmann N. and Acha, V. (2005) *Innovation in 'low tech' industries*, in Fagerberg, J. Mowery, D. C. and Nelson, R. R. (Eds.) *The Oxford Handbook of Innovation*, Oxford University Press, Oxford, 407-432.
- Wang, J-C. and Tsai, K-H. (2005) 'Development strategies and prospects for Taiwan's R&D service industry' *International Journal of Technology Management* 29, 308-326.
- Young, A. (1996) 'Measuring R&D in the services' *STI Working Papers*, 1996/7 OECD, Paris.

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Technical Note

Abstract

This document analyses the nature of service R&D activity and growth. The role and significance of R&D in services has been growing rapidly recently, although in the context of services it is also important to note that much innovative activity in the service sector remains of a non-R&D and non-technological nature. Thus, services are becoming more research intensive over time and the significance of innovation to their performance is also increasingly being recognised.

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