Country Reports
Internationalisation of business R&D investments by country

Internationalisation of business investments in R&D and analysis of their economic impact (BERD Flows)

December 2016

SPECIFIC CONTRACT 30-CE-0677869/00-21/A4/2014

Internationalisation of business expenditures on R&D and analysis of their economic impact (BERD Flows)

Implementing

Framework Contract n° - 30-CE-0496925/00-52

for the provision of Services in the Field of Research Evaluation and Research Policy Analysis ([1] 2010/S 172-262618) - Lot 2: Data collection and performance indicators to monitor European research policy

4.1. Internationalisation of business R&D investments by country

This annex provides an overview of the current status of the internationalisation of business R&D at the country level. Building on the data presented in D3.1, the analysis of foreign R&D investments is introduced at the national level for EU28 and a selection of other countries (Candidate Countries, EFTA, and a set of non-European countries. These country case-studies are structured as follows:

- Country Summary
- Background
- Inward Perspective
- The country perspective
- The sectoral perspective

The section also includes

1. Short essay on China, utilizing alternative data-sources to fill the gap
2. Deliverable 3.3. in which the US case is put forward as one of two pilot cases: the other being Austria.

The paper version of this report is furthermore complemented by a number of interactive online maps featuring the country level. These maps can be customized by readers according to their interest, for example, by changing the indicators or the countries displayed, is available at the project homepage:

http://www.ait.ac.at/departments/internationalisation-of-business-investments-in-rd-and-analysis-of-their-economic-impact/

https://public.tableau.com/profile/georg.zahradnik#!/vizhome/BERD_Flows/Amounts

https://public.tableau.com/profile/georg.zahradnik#!/vizhome/BERD_Flows/Indicators

Country Profile: Austria

Internationalisation of business investments in R&D and analysis of their economic impact (BERD Flows)

December 2016

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Country Summary

Austria is one of the most internationalised countries in the European Union in terms of inward BERD. Inward BERD amounts to 50% of total BERD in 2013. The sectors with the highest share of inward BERD are mostly high- and medium-high-technology industries – electrical machinery and apparatus, motor vehicles, computer, electronic products or pharmaceuticals. The share of service industries is growing fast.

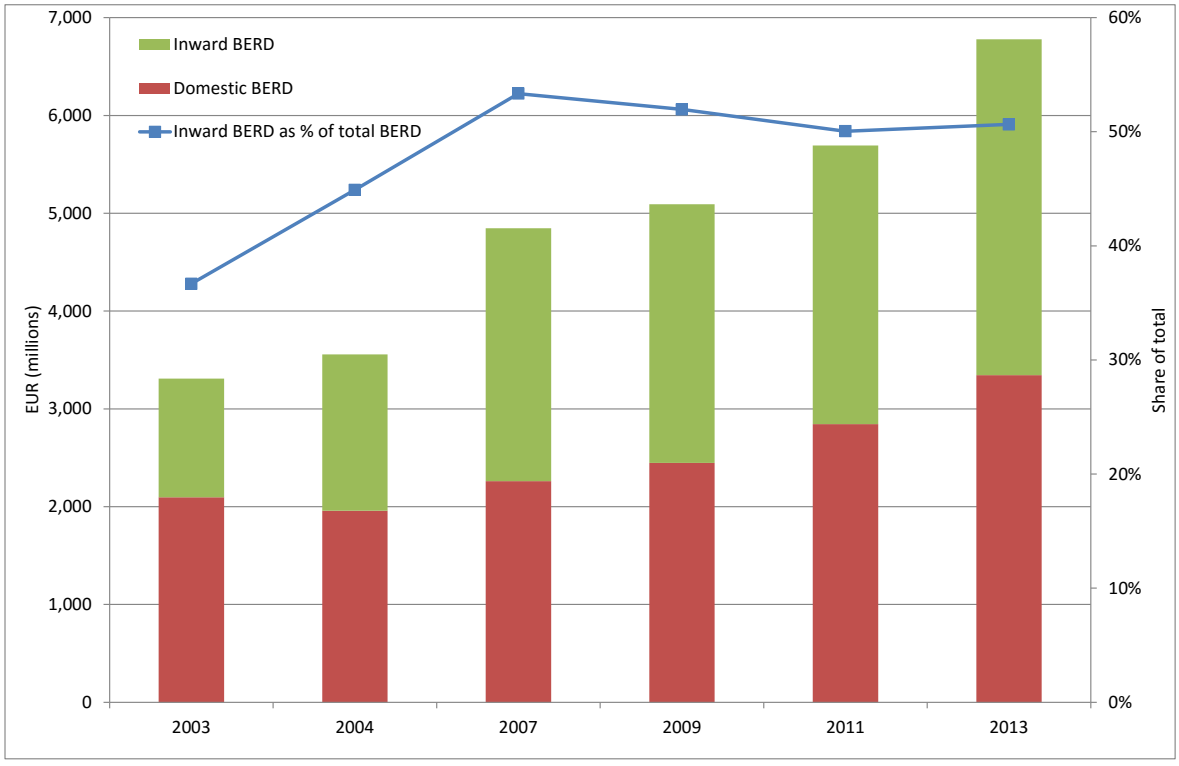
Inward BERD in Austria mainly originates from two neighbouring countries – Germany and Switzerland – which together account for around 60% of total inward BERD in Austria. The share of these two countries, however, is decreasing due considerable growth of R&D activities by non-EU firms, most notably the US. Asian countries have also a fair share on this development. Altogether, R&D internationalisation in Austria became less dependent on investment from other EU countries in recent years.

Inward Perspective

Austria is a small, open European economy with strong economic ties to neighbouring countries. Exports and imports have a high share on GDP. Added together, exports and imports equal Austria's GDP. Hence, in terms of internationalisation of trade, Austria can be compared to other small European countries such as Belgium, Finland, Sweden, Denmark, Ireland, the Czech Republic or Hungary (OECD 2010).

Austria is also highly internationalised in terms of terms of R&D. Around half of the total business expenditures for R&D originate from foreign-owned firms (see Figure 1 below). This is one of the highest inward R&D intensities among all countries covered in the project.

Figure 1: Inward, domestic BERD and inward BERD as % of total BERD, 2003-2013



Source: Statistics Austria, own calculations

This is mainly due to developments in the last decade. From 2003 to 2007, the R&D expenditure of foreign-owned firms (inward BERD) in Austria increased from about 1.2 billion Euros to 2.6 billion Euros, while domestic BERD only slightly increased from about 2.1 billion Euros to almost 2.3 billion Euros during the same time period.

As a result, inward BERD rose in relative terms from 37% of total BERD in 2003 to 52% in 2007. The increase of total BERD in this period can therefore mainly be attributed to the activities of foreign-owned affiliates. However, it is important to note that according to representatives from Statistics Austria, this increase is at least partly caused by advances in identifying foreign-owned firms, particularly in the service sector.

Internationalisation of R&D lost momentum after 2007. From 2007 to 2011, inward BERD intensity decreased from 53% to 50%. This was mainly due to a stronger growth of domestic BERD and may also be related to the financial crisis of 2008/09 which hit international economic activity severely. There was, however, no decrease in inward BERD.

The most recent data indicates that the growth of inward BERD has accelerated in the period 2011 to 2013. For the first time since the crisis, R&D expenditures of foreign-owned firms grew faster than R&D by domestic firms. The share of foreign-owned firms on employment, in contrast, remained constant. This is a strong sign that Austria is still an attractive location for R&D of foreign multinationals.

The country perspective

The distribution of inward BERD in Austria in terms of countries of origin reveals two important facts. First, internationalisation of R&D – despite the term – is still very much a regional phenomenon. Austria's neighbouring countries – most important Germany and Switzerland - together account for 60% of total inward BERD in Austria. This reflects the fact that distance between countries, cultural proximity, relative size of the home and host country, and the existence of foreign direct investment stocks between the two countries are decisive for R&D internationalisation (Leitner, Stehrer and Dachs 2013). No inward BERD is reported for Austria's neighbouring countries Czech Republic, Hungary, Slovakia and Slovenia.

Germany is by far the most important home country for inward BERD performed in Austria (Figure 2). German firms account for 1.6 billion Euros or around half of total inward BERD in Austria in 2013. This is double the amount of German inward BERD in 2003 in current prices. However, due to the large increase of R&D expenditure by firms from other countries, Germany's share on total inward BERD decreased from 66% in 2003 to 47% in 2013.

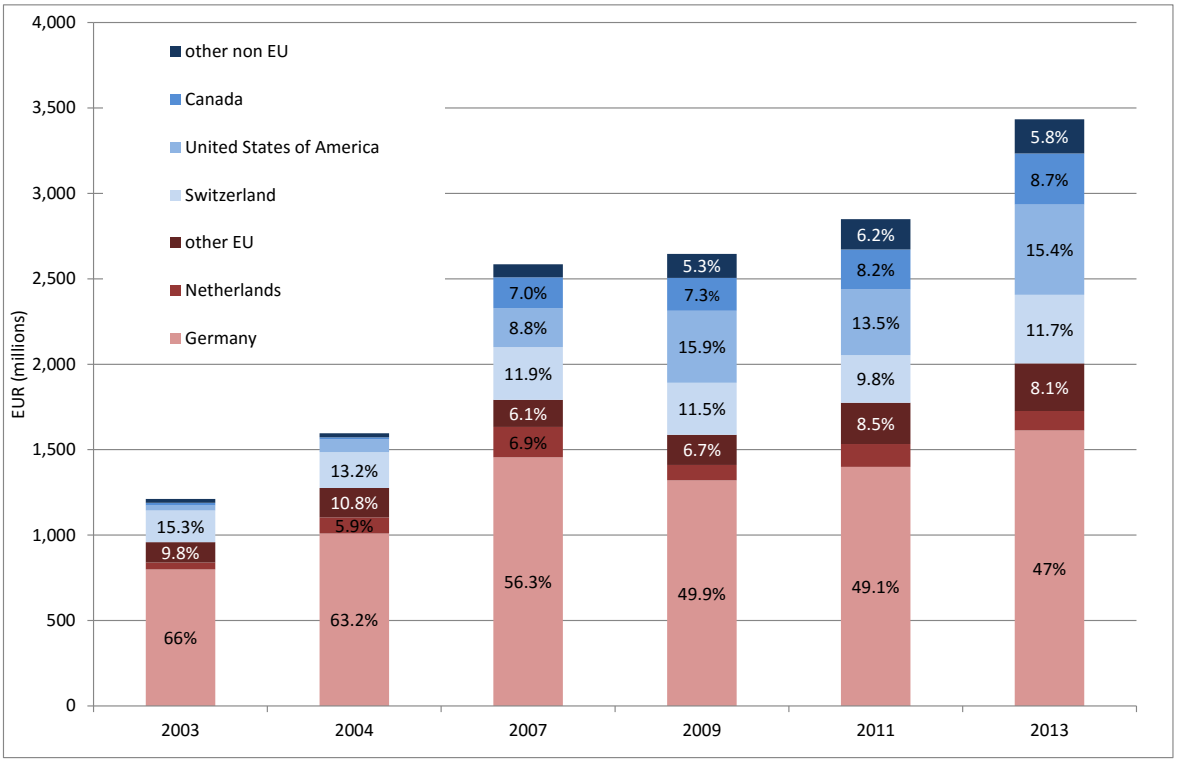
The focus on neighbouring countries decreases only slowly. The share of EU member states on total inward BERD decreased between 2003 and 2013 from 80% to 58%, while the share of non-EU countries increased proportionally. It should be noted that total inward BERD more than doubled between 2003 and 2013, so the decease of EU member states was in relative, but not in absolute terms.

The second most important home country is the United States, with slightly more than 520 million Euros inward BERD in 2013. The corresponding share of the US on total inward BERD is 15%. US firms have overtaken Switzerland in terms of total inward BERD in 2009. Switzerland is now on third place. Another important non-European investor country is Canada (298 million Euros)

The country group which grew fastest between 2003 and 2011 is 'other non-EU countries' excluding the US, Canada and Switzerland. These countries could more than triple their share, from 1.8% in 2003 to 5.8% in 2013. Total inward BERD for these countries amounts to 200 million Euros in 2011. It includes R&D expenditures by firms

from China, (86 million Euros) the United Arab Emirates (49 million Euros), various offshore financial centres (36 million Euros) and a number of other non-European countries. No data is reported for India, South Korea, Turkey, or Israel on the country level.

Figure 2: Inward BERD - country of origin, Austria, 2003 to 2013



Source: Statistics Austria, own calculations

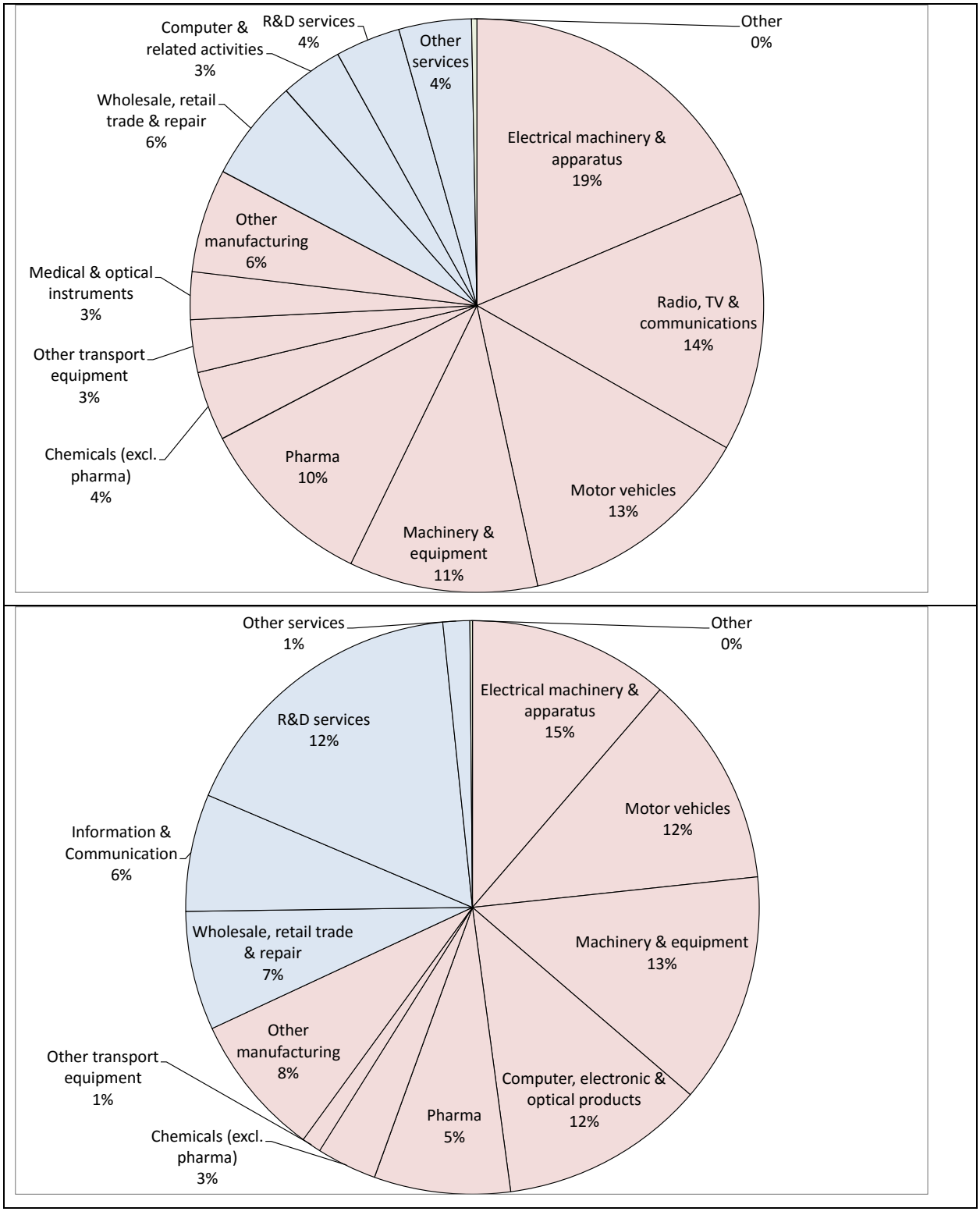
The sectoral perspective

In terms of sectors, there was a remarkable shift in Austrian inward BERD between 2007 and 2013. In 2007, medium-high- and high-technology manufacturing industries accounted for around than ¾ of all inward BERD in Austria. This share has decreased considerably in favour of service industries which account for about a third of total inward BERD in 2013 (Figure 2). Commercial R&D services and communication and information services are leading this trend. A similar development can also be observed in other countries (Dachs, Stehrer and Zahradnik 2014).

The growth of R&D by service firms is, on the one hand, triggered by the international expansion many service firms have started in recent years. On the other hand, it is also a sign of structural change; commercial R&D services also include biotechnology firms, so the decrease of pharmaceutical research by foreign firms in Austria may reflect a shift from 'old pharma to biotech. A similar shift may have occurred between electrical machinery and apparatus and information and communication which also includes software services.

Due to changes in the NACE classification of industries the shares of different sectors between 2007 and 2013 are not fully comparable. However, we can say for sure that the share of the pharmaceutical and the electrical and electronics industry has decreased considerably, while the shares of communication services and commercial research and development services increased.

Figure 3: Shares of various industries on total inward BERD, Austria, 2007 and 2013



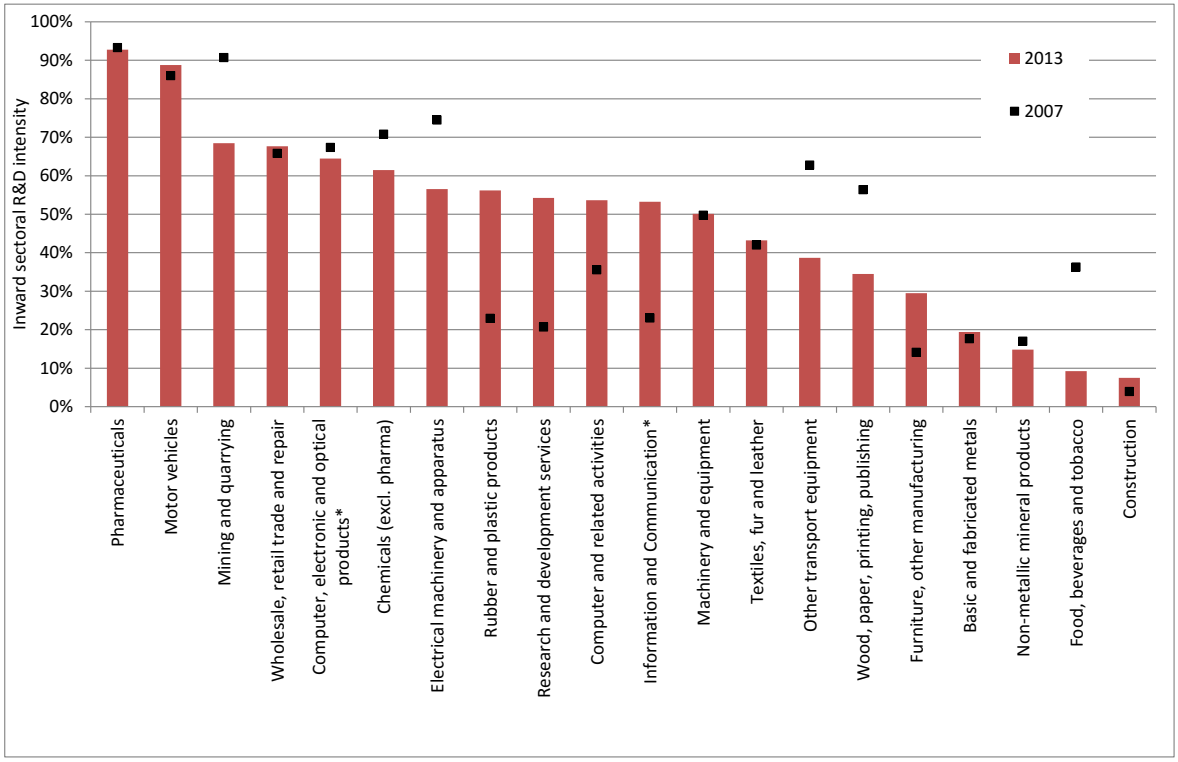
Source: Statistics Austria, Eurostat, OECD, own calculations

Inward R&D intensity - the ratio of inward BERD to total BERD – can also be applied at the sectoral level to measure which industry is most internationalized in terms of R&D

(Figure 4). In Austria, the highest inward R&D intensity is found in pharmaceuticals with a value of around 90%, followed by motor vehicles and the mining industry. Nearly all other R&D intensive sectors have values of over 50% which indicates that the majority of R&D activities in these sectors are performed by foreign-owned firms. Machinery and equipment is the large R&D performing sector with the highest share of domestic ownership.

The lowest inward BERD intensities are found in low-technology sectors and in construction. Service sectors mostly reveal inward BERD intensities below or around 50%, but are catching up fast. The comparison between 2007 and 2013 shows that inward R&D intensity has more than doubled in the largest service sectors, information and communication and research and development services.

Figure 4: Inward sectoral R&D intensity (2007 and 2013)



Note: The inward sectoral R&D intensity is defined as inward BERD in sector Y / total BERD in sector Y

Source: Statistics Austria, Eurostat, OECD, own calculations

References

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Country Profile: Belgium

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Country Summary

Belgium is amongst the most internationalized countries in terms of inward BERD, with foreign firms accounting for well over half of all industrial R&D. Their relative importance has increase over time as their share of BERD has gone from 54% in 2003 to 62% in 2013. The largest increase in inward BERD have occurred since 2007. Hence the rapid increase in overall R&D in Belgium can be attributed a large part to the activities of foreign firms.

Firms from 3 countries dominate these flows: USA, UK and France, accounting for around 70% of the total. Amongst these the most important firms are those from the USA, with one third of total inward R&D in 2013. In terms of trends the relative importance of US firms has declined and that of British firms has increased. The other notable trend has been an increase in the share of Japanese firms.

Two of the most important sectors for overall Belgian BERD are also the sectors with the largest shares of inward flows: Pharmaceuticals and Private services. Each of these accounted for more than a third of total inward BERD in 2013.

Background

Belgium is a small open economy with high levels of international trade[1] and foreign direct investment. It is also a multi-lingual country and is the base for the headquarters of a number of the EU institutions and NATO. In the latest Innovation Union Scoreboard Belgium is described as a *Strong Innovator*.[2] Overall innovation performance has increased over the past decade. Business R&D has increased rapidly over the last 10 years and R&D intensity stands at around 1.8% of GDP in 2014. Total R&D (GERD) intensity follows a similar trend going from 1.8% of GDP in 2005 to 2.5% in 2014. The industrial structure of the economy is heavily oriented towards Private services

Inward Perspective

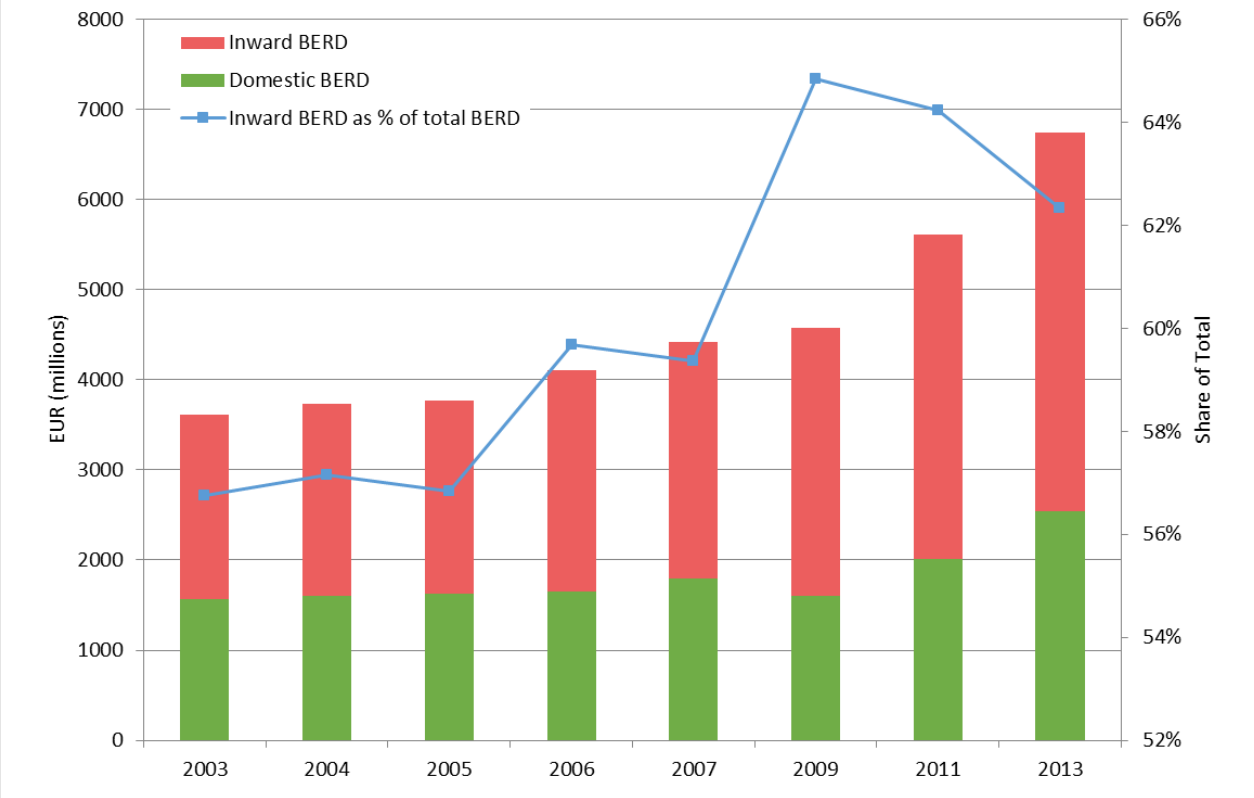
Belgium is amongst the most internationalized in terms of inward BERD. For example well over 60% of business R&D originated from foreign firms in 2013 (Figure 1). This proportion has increased from 54% in 2003 to 62% in 2013.

The data reported in Figure 1 show a number of distinctive trends. First is the period from 2003 to 2007 when both Domestic and Inward BERD increased at around the same rate. However since then Inward BERD has increased by nearly 90% from €2.2 billion in 2007 to €4.2 billion in 2013. In the same period the expenditures of domestic firms have increased by 36%. Hence the rapid rise in total BERD in recent years can be attributed in a large part to the activities of foreign firms.

[1] According to the World Bank figures trade as a % of GDP for Belgium in 2015 was 167% (http://databank.worldbank.org/data/reports.aspx?source=2&series=NE.TRD.GNFS.ZS&country=)

[2] http://ec.europa.eu/DocsRoom/documents/17838

Figure 1: Inward, domestic BERD and inward BERD as % of total BERD, 2003-2013

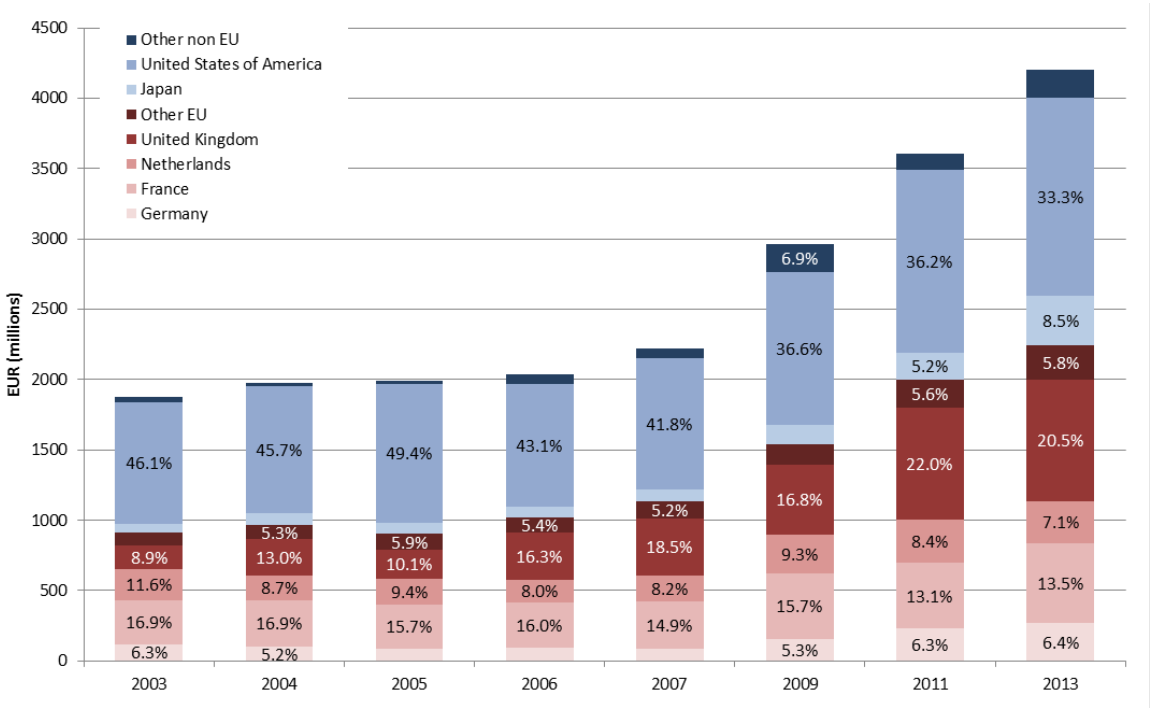


Source: Belgian Science Policy, Eurostat

The country perspective

There is a high degree of concentration in the distribution of inward R&D by country of origin for Belgium. As shown in Figure 2, around 70% of total incoming R&D expenditures during the period 2003 to 2013 originated from firms headquartered in 3 countries: USA, UK and France. By far the largest investments are from US companies: they account for between half and one-third of all foreign funds. However their relative importance has declined over time, going from 46% of total inward BERD in 2003 to 33% in 2013. In the same period UK firms have increased in importance, with their share going from 9% of the total to more than 20%. The position of French firms has declined over time. Firms from 3 other countries are also important for the Belgian R&D system: Netherlands, Germany and Japan. Of particular note is the relative increase in the share of Japanese firms: from 3.5% to 8.5%.

Figure 2: Inward BERD - country of origin, Belgium, 2003 to 2013



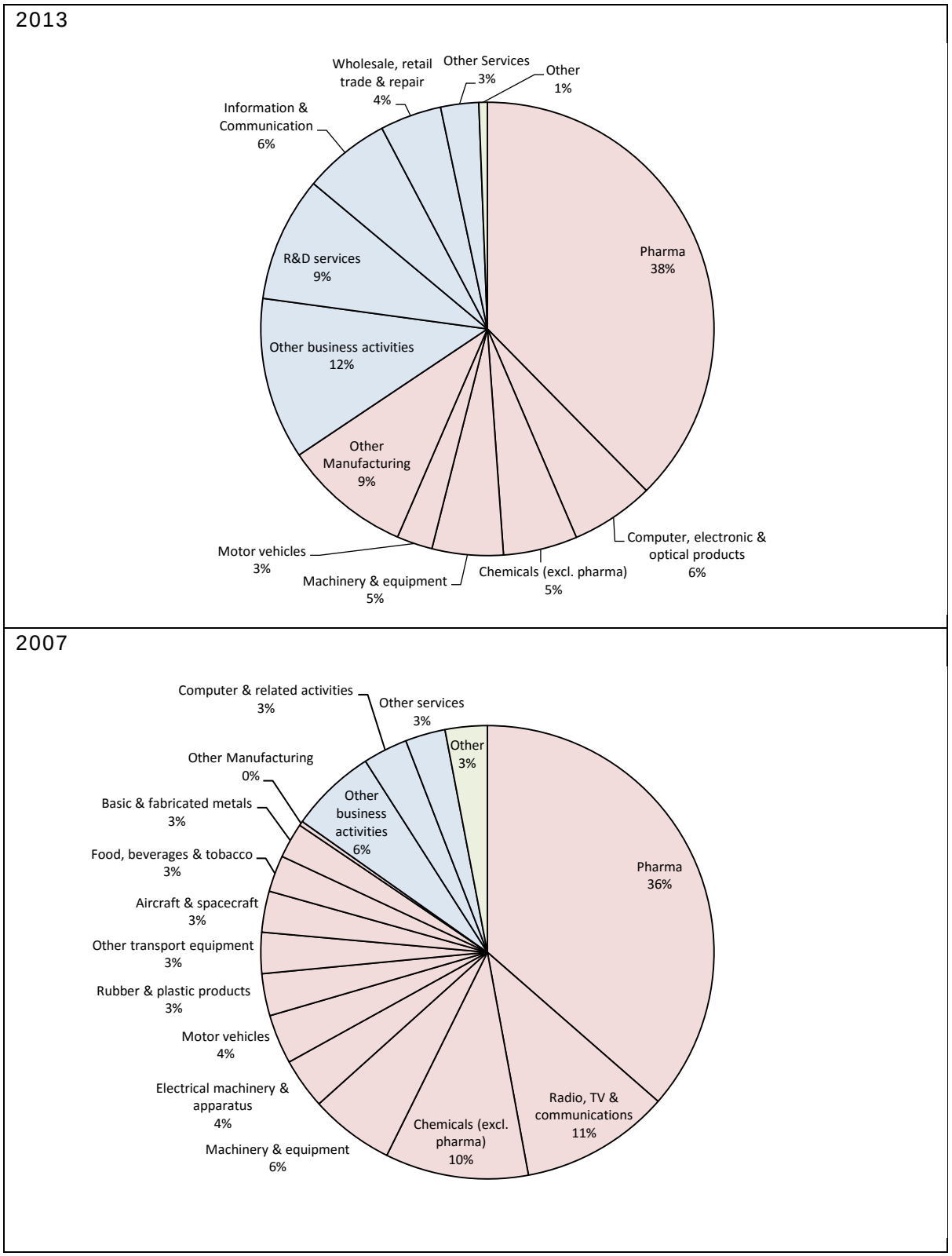
Source: Belgian Science Policy

The sectoral perspective

Figure 3 shows that Pharmaceuticals dominates the inward flows of R&D in Belgium, with a share of 38% of the total in 2013. It is difficult to make precise comparisons over time due to changes in the NACE classification. However the importance of Pharmaceuticals has remained constant over time and the relative importance of services increased, going from 12% of the total inward R&D in 2007 to 34% in 2013.

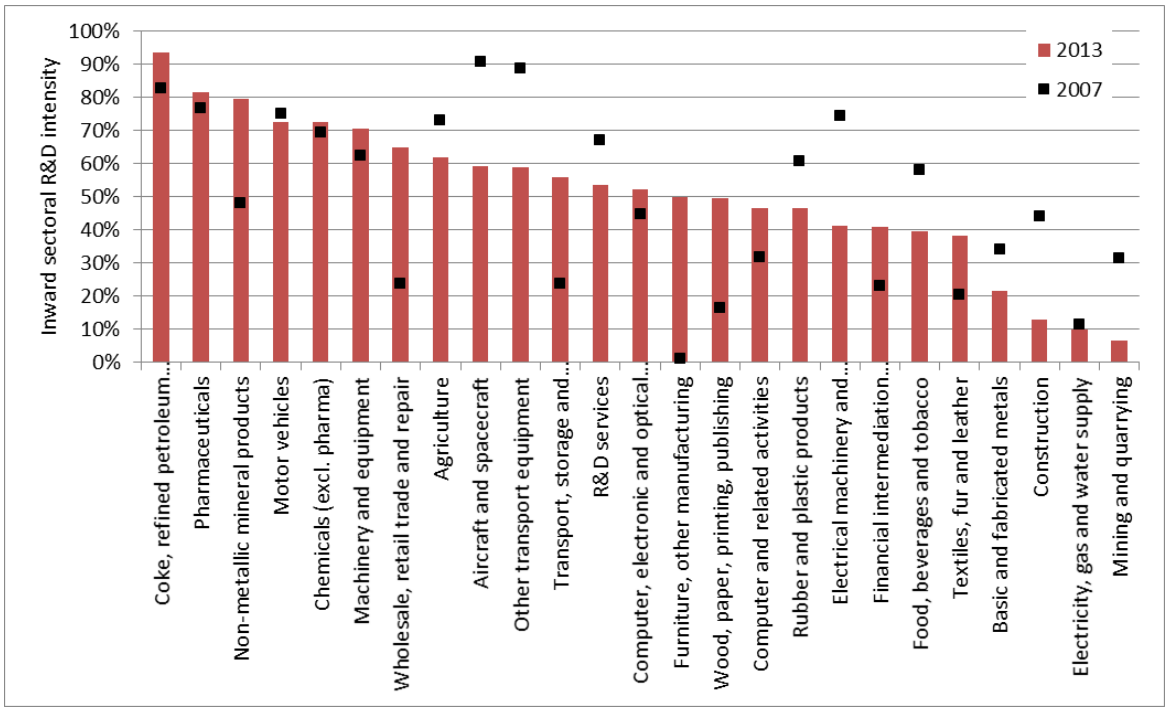
A measure of foreign penetration in a sector is the inward R&D share: the ratio of inward BERD to total BERD within a sector. According to this measure the most internationalized sectors in Belgium are Coke and Petroleum related, Pharmaceuticals, Non-metallic mineral products and Motor vehicles (Figure 4). In all these sectors foreign firms have a share of more than 70% of total BERD in 2013. The least internationalized are Mining and Quarrying, Utilities and Construction with inward R&D share of 10% or less.

Figure 3: Shares of various industries on total inward BERD, Belgium, 2007 and 2013



Source: Belgian Science Policy

Figure 4: Inward sectoral R&D share (2007 and 2013)



Note: The inward sectoral R&D share is defined as inward BERD in sector Y / total BERD in sector Y ; Computer, electronic and optical products has no value for 2007 and we have used the following value: Office, accounting and computing machinery
Source: Belgian Science Policy, Eurostat

Country Profile: Bulgaria

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Country Summary

There are severe data limitations in analysing international flows of business R&D for Bulgaria. The main issue is the exclusion of Services (one of the main sectors in Total BERD) from inward R&D statistics after 2007. Additionally sectoral data are extremely limited. Nevertheless the available evidence indicates that overall foreign firms play a very small role in Bulgarian R&D system. The most important foreign actors are firms from outside the EU.

Background

Bulgaria is described as a 'modest innovator' (Innovation Union Scoreboard 2016).[1] While Business R&D intensity has increased rapidly over the last 10 years, it remains low: 0.5% of GDP in 2014.[2] Overall R&D (GERD) intensity has also increased over time, going from 0.4% of GDP in 2005 to 0.8% in 2014. In terms of sectoral composition, BERD is highly concentrated in private Services (around 85% of the total in 2013).

Inward Perspective

There is a major problem in the inward BERD data for Bulgaria: the exclusion of private Services after 2007. As most of BERD is focused on this part of the economy, it is difficult to make a proper assessment of the trends in inward BERD.

As discussed above total BERD has increased rapidly in Bulgaria since 2003. However foreign firms account for a very small share of this total: on average around 5%.

Figure 1: Inward, domestic BERD and inward BERD as % of total BERD, 2003-2007

Source: Eurostat, National Statistical Institute (Bulgaria)

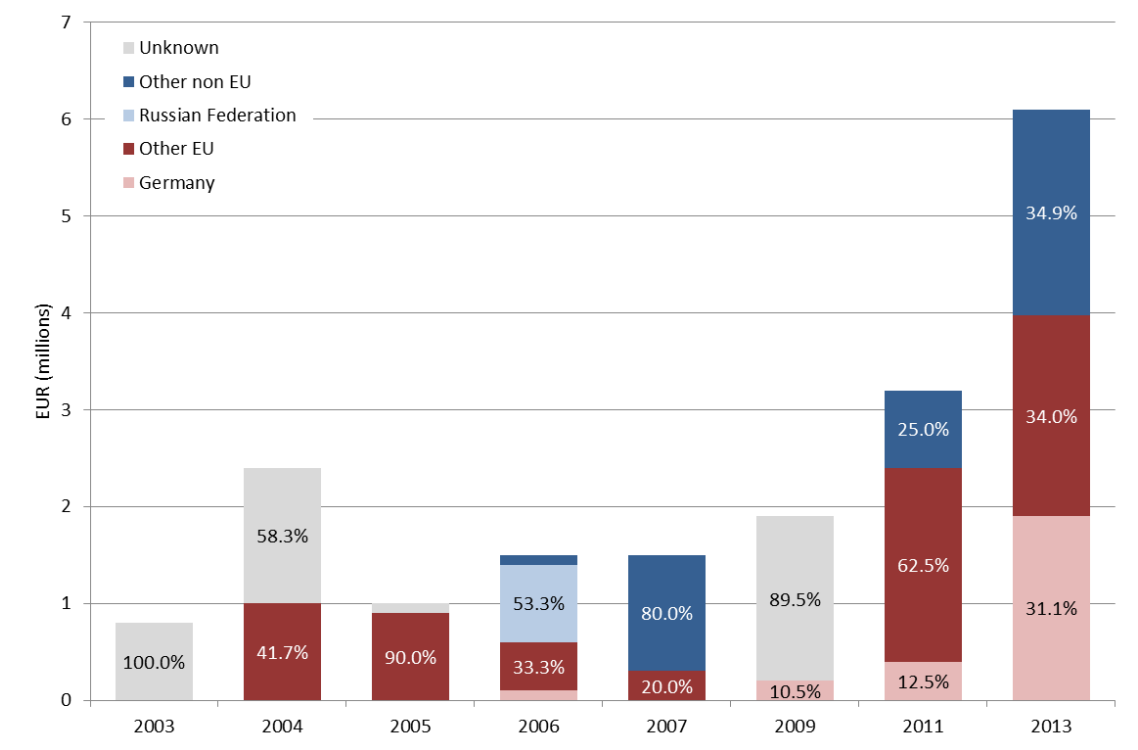
[1] http://ec.europa.eu/DocsRoom/documents/17829/attachments/1/translations/en/renditions/native
[2] https://rio.jrc.ec.europa.eu/en/country-analysis/Bulgaria/country-report

The country perspective

The exclusion of Services from the Inward BERD data after 2007 poses some difficulties in interpreting the results according country distribution. This means that the data presented in Figure 2 are not strictly comparable over the whole time period from 2003 to 2013.

Notwithstanding these limitations we can gain some hints in the structure of inward BERD. Firms from outside the EU make a large contribution to inward flows of R&D in the case of Bulgaria. An interesting observation is that Russian firms accounted for more than 50% of the total flows in 2008. In the last few years German and other EU firms have become important players in inward R&D in the Manufacturing industries.

Figure 2: Inward BERD - country of origin, Bulgaria, 2003 to 2013



Source: Eurostat, National Statistical Institute (Bulgaria)

The data after 2007 exclude services.

The sectoral perspective

Due to severe data limitations it is difficult to present any analysis by sector. The only industrial sector for which inward BERD data is available in 2007 is Chemicals which accounts for 20% of the total. In 2013 there are two sectors for which such data are available: Non-electrical and Electrical machinery. The former accounts for around one-third of total inward BERD in Manufacturing and the latter around 10%.

Country Profile: Canada

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Country Summary

R&D expenditures from foreign firms play an important role in Canada. These flows are dominated by US firms, accounting for more than 60% of the total. It is difficult to gauge the contribution made by EU firms as they are not separated in the data for confidentiality reasons. The Service sector has become a relatively more important locus of inward BERD accounting for around 50% of the total in 2013. Foreign R&D has increased in importance in Mining and Quarrying, an important sector for the Canadian economy. On the other hand the share of inward R&D accounted for by Pharmaceuticals has declined dramatically.

Background

A critical feature of the R&D system in Canada is the sharp decline in total BERD intensity, e.g. from 1.26% in 2001 to 0.80% in 2014. The other feature of note is the decline in the relative share of Manufacturing and the resulting increase in Service sector in industrial R&D. In the year 2000 the latter accounted for just 28% of the total, but this proportion has increased to around 50% in 2013. The final observation is that compared to many of its counterparts, Canada has a relatively high proportion of BERD accounted for by SMEs.

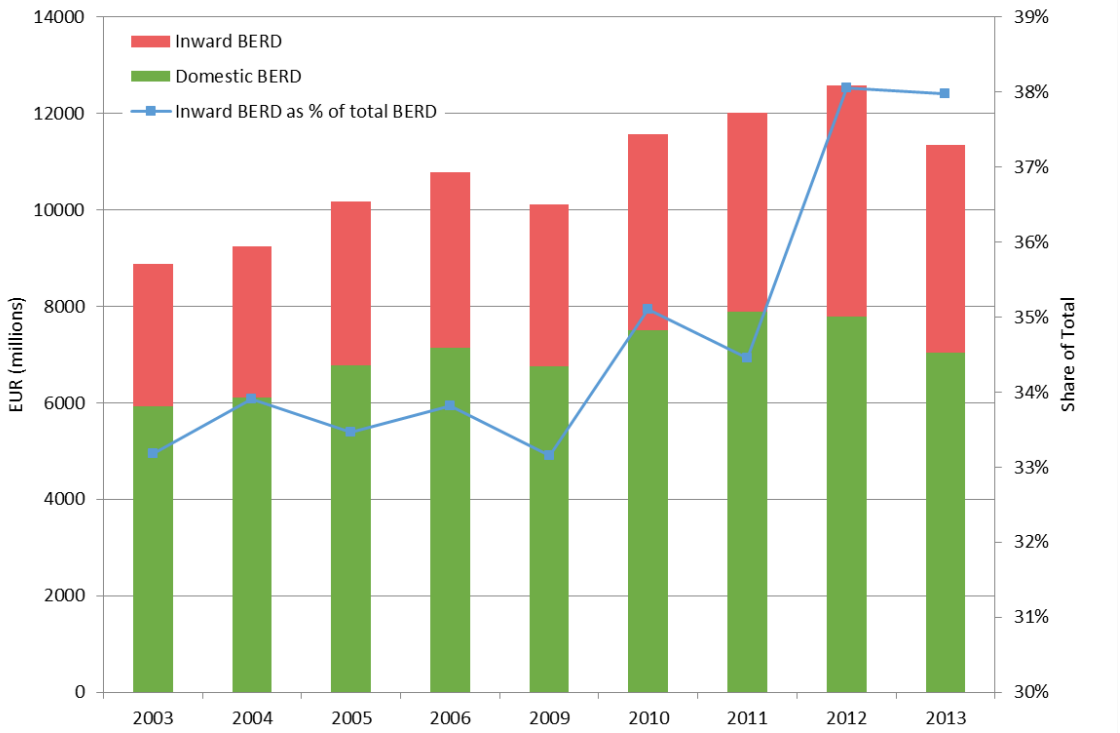
Inward Perspective

Foreign firms in Canada play an important role in industrial R&D in Canada. As shown in Figure 1, they accounted for around one-third of total BERD in the period 2003 to 2013. This proportion remained stable up to 2009 but has increased slightly to around 38% in 2013.

The country perspective

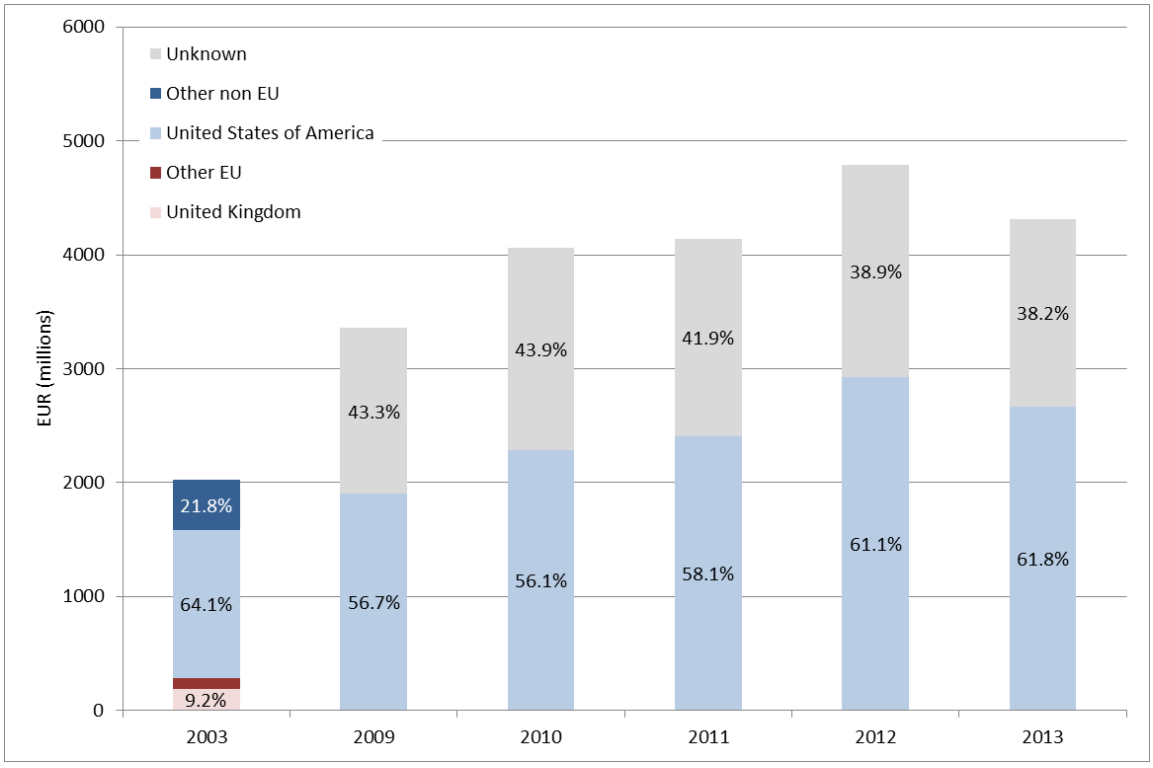
There is a high degree of concentration in the distribution of inward R&D by country of origin for Canada. As shown in Figure 2, US firms are overwhelmingly the most important actors in Canadian R&D: they accounted for around 60% of the total. The other important set of companies is those from outside the EU. A caveat to bear in mind is that is difficult to gauge the contribution made by EU firms as they are not separated in the data for confidentiality reasons. There has been a

Figure 1: Inward, domestic BERD and inward BERD as % of total BERD, 2003-2013



Source: OECD, Statistics Canada

Figure 2: Inward BERD - country of origin, Canada, 2003 to 2013



Source: OECD, Statistics Canada
Note: 2003 is only manufacturing / mostly only US data available apart from 2003

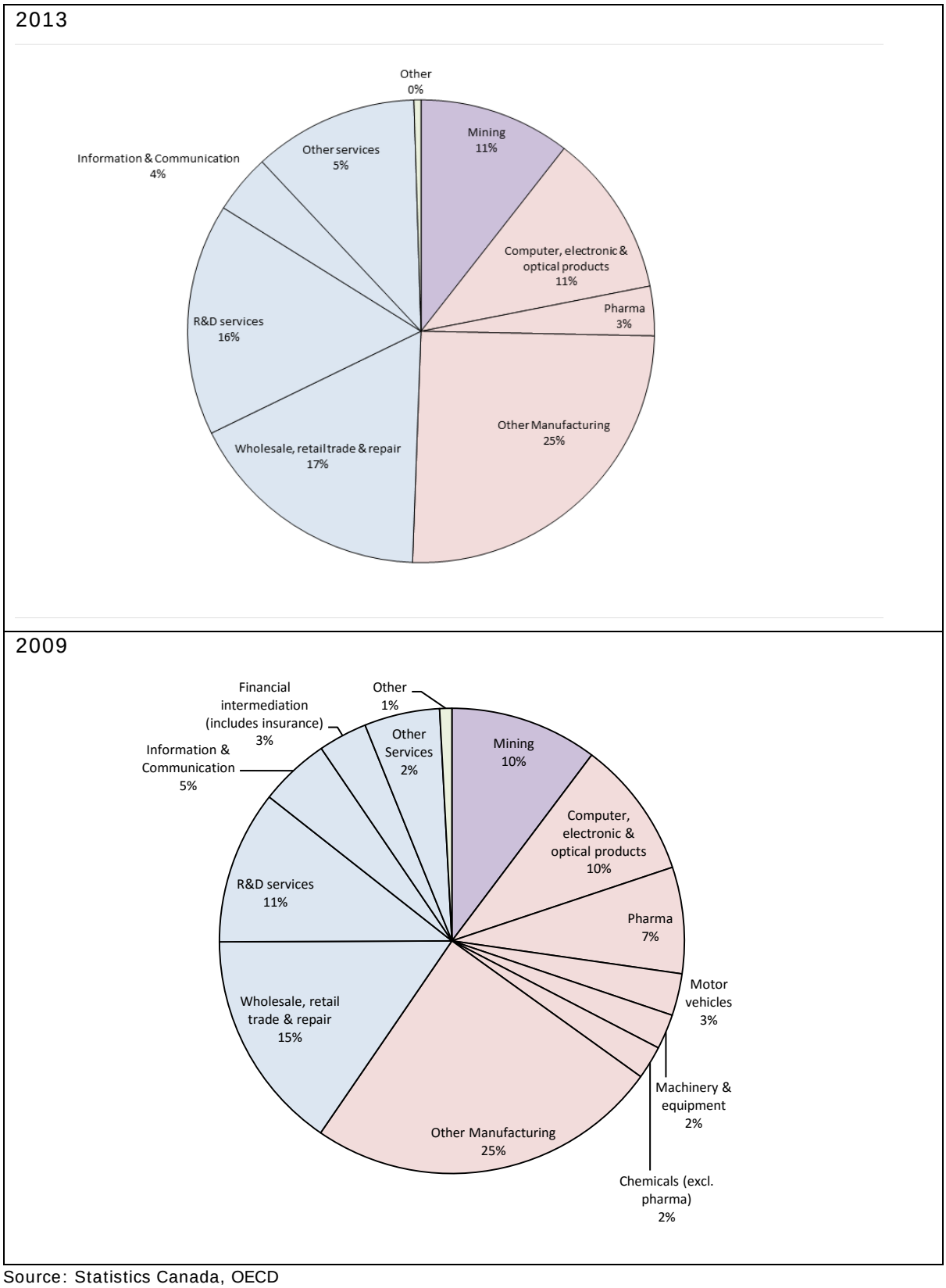
The sectoral perspective

There have been a number of important changes in the structure of inward R&D in Canada. The first is the changing relative importance of Manufacturing and Services, mirroring the trends in total industrial R&D. In 2003 nearly two-thirds of foreign R&D was in Manufacturing industries. This proportion has now dropped to 40%. The other side of the same phenomenon is the rise in services from around 30% of the total to nearly 50%. Another important structural change has been the increase in relative importance of Mining and Quarrying, an important sector for the Canadian economy.

Figure 3 shows that the share of Pharmaceuticals in foreign BERD has declined from 11% in 2007 to 3% in 2013. At the same time the relative importance of Electronics has increased. The two service sectors that have seen dramatic growth in the period from 2007 to 2013: R&D services and Wholesale and Retail trade. In the case of the former, foreign firms have tripled their R&D expenditures and in that of the latter the increase has been two–fold.

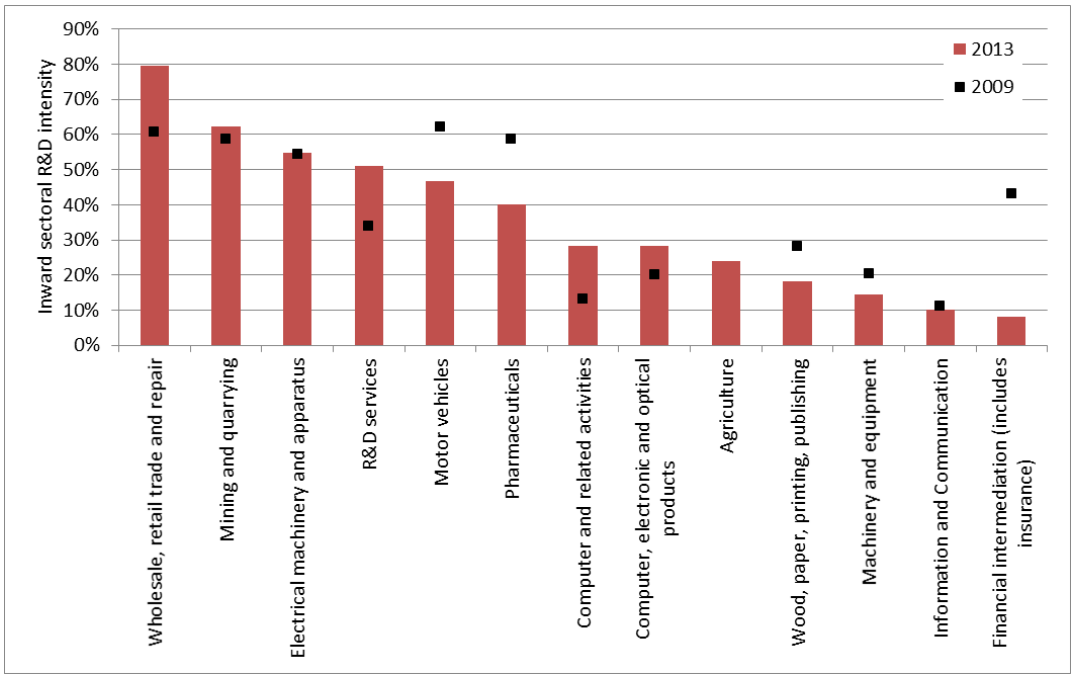
A measure of foreign penetration in a sector is the inward R&D share: the ratio of inward BERD to total BERD within a sector. According to this measure the most internationalized sectors in Canada is Wholesale and Retail trade, where 80% of R&D is accounted for by foreign firms. In Mining and Quarrying the foreign penetration rate is more than 60%. There are a number of services that are dominated by domestic firms, namely ICT and Financial services where non Canadian firms account for only around 10% of total R&D.

Figure 3: Shares of various industries on total inward BERD, Canada, 2009 and 2013



Source: Statistics Canada, OECD
Excludes computer and related activities

Figure 4: Inward sectoral R&D share (2009 and 2013)



Note: The inward sectoral R&D share is defined as inward BERD in sector Y / total BERD in sector Y . Due to data problems we only include data for 2009

Source: OECD, Statistics Canada

Country Profile: Croatia

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Country Summary

There are considerable problems in analysing Inward BERD for Croatia, with poor data availability. There is no information before 2011 and data are only available for 4 sectors which account for only 6% of inward BERD in 2013 (the year in which Croatia joined the EU). Thus it is difficult come to any conclusions about the role of foreign firms in Croatia on the basis of the available information.

Background

Croatia is classed as *Moderate Innovator* in the 2016 EU IU Scoreboard[1], with performance below the EU average in most dimensions of innovation. BERD intensity is very low around 0.35% of GDP for most of the period since 2005. Total R&D (GERD) intensity decreased slightly over time, going from 0.86% in 2005 to 0.79% in 2014. Services account for a slightly higher proportion of BERD than Manufacturing.

Inward Perspective

There are considerable problems in analysing Inward BERD for Croatia as there are no data available before 2011. It is difficult conclude much on the relative contribution of foreign firms in BERD as there is considerable variation in the Inward BERD intensity from 2011 (50%) to 2013 (less than 5%).

The country perspective

The data on country distribution of Inward BERD are only available for 2013. As shown in Figure 2 Inward BERD is dominated by Dutch firms accounting for more than 90% of the total.

The sectoral perspective

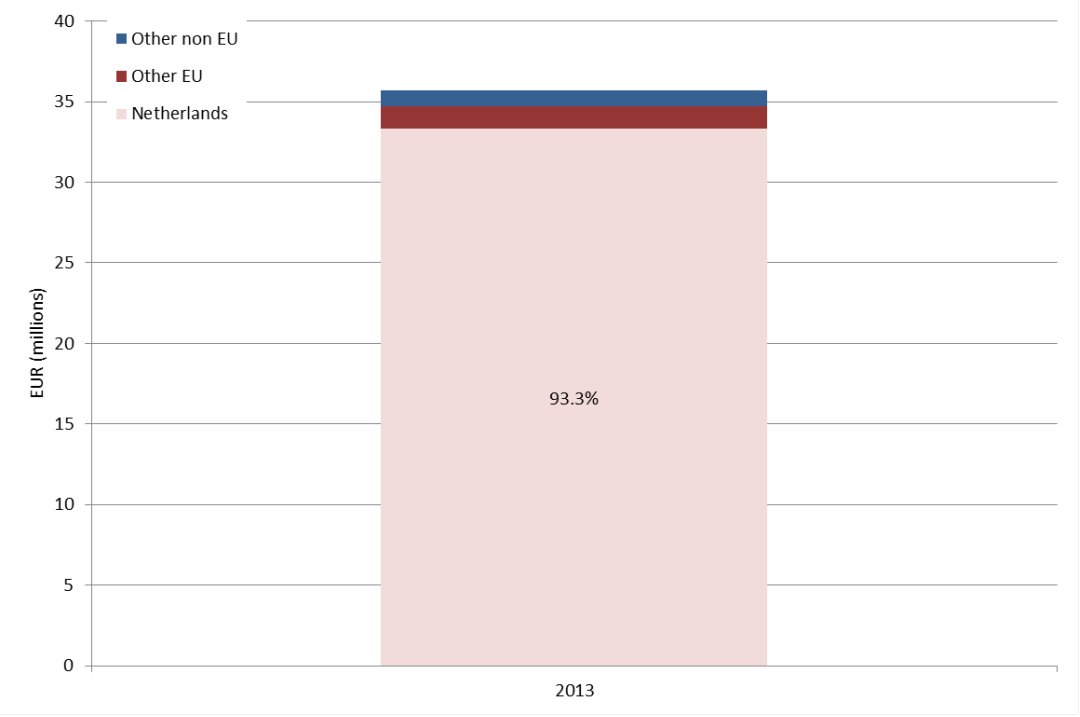
Data availability by sector is poor, with many missing values. For example in 2013 information is only available for 3 sectors, accounting for 6% of total inward BERD. Food, Drink and Tobacco is an important sector (Figure 3) but has declined in importance from 2011 to 2013.

[1] http://ec.europa.eu/DocsRoom/documents/17831

Figure 1: Inward, domestic BERD and inward BERD as % of Manufacturing BERD, 2011-2013*

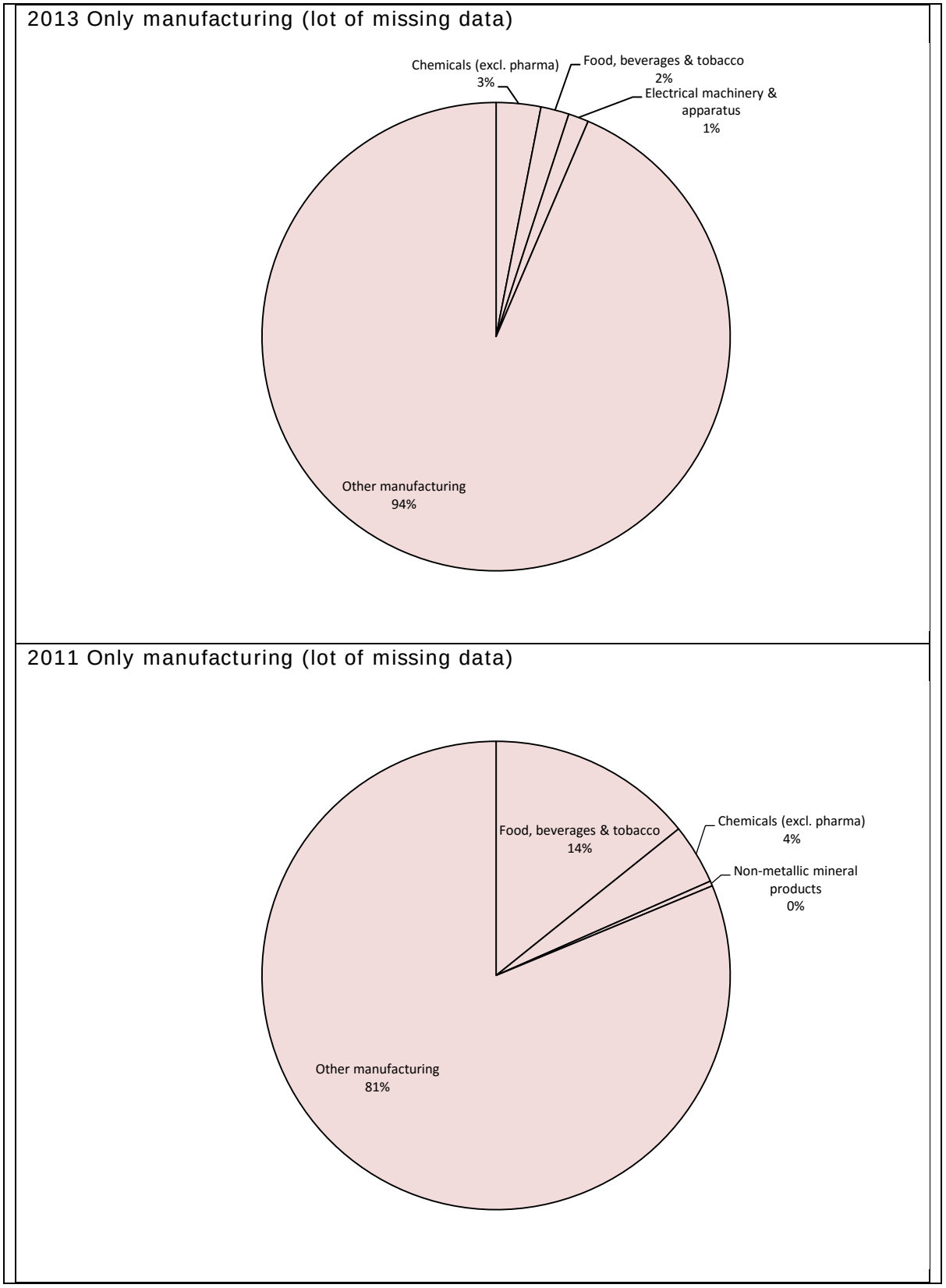
Source: Eurostat

Figure 2: Inward BERD - country of origin, Croatia, 2013



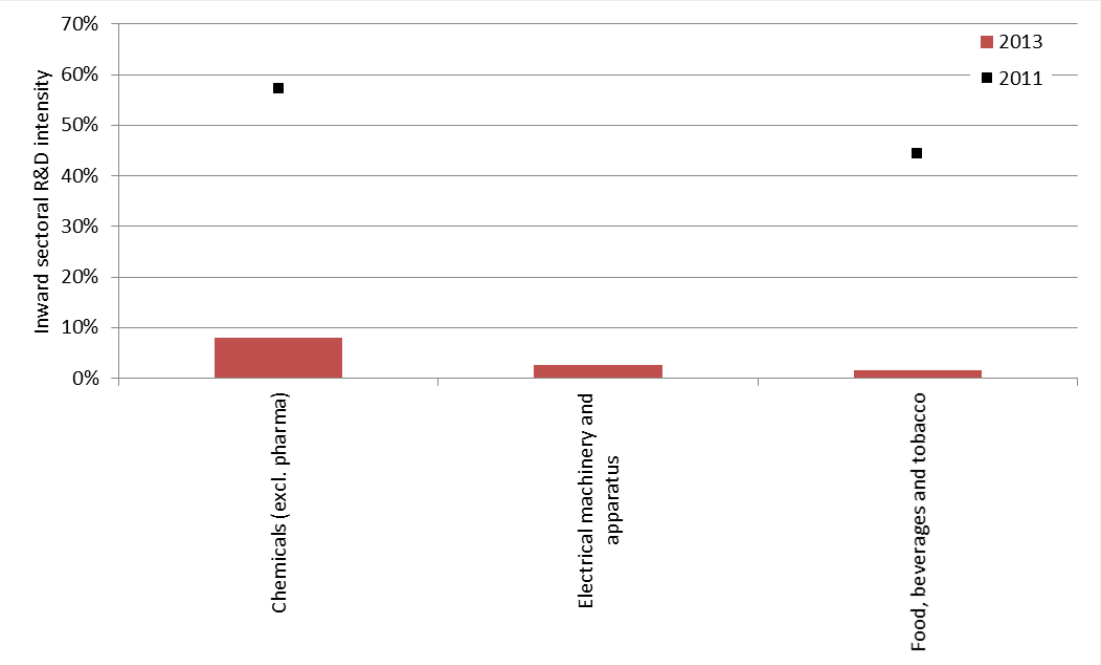
Source: Eurostat

Figure 3: Shares of various industries on total inward BERD, Croatia, 2011 and 2013



Source: Eurostat

Figure 4: Inward sectoral R&D share (2011 and 2013)



Note: The inward sectoral R&D share is defined as inward BERD in sector Y / total BERD in sector Y
Source: Eurostat

Country Profile: Cyprus

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Country Summary

Data on Inward BERD for Cyprus are not available. This report uses other ad hoc data to comment on the role of foreign firms. The data on patenting show that foreign firms are the most important actors in national technology creation, accounting for around 60% of all patents. Moreover, non-EU firms account for a large share of foreign inventions.

Background

Cyprus is classed as *Moderate Innovator* in the 2016 EU IU Scoreboard[1], with performance below the EU average in most dimensions of innovation. BERD intensity is the lowest amongst the EU-28, less than 0.1% of GDP for the period from 2005 to 2014. In 2014 the value was 0.08%. Overall R&D (GERD) intensity is also low but has increased over time, going from 0.37% of GDP to 2005 to 0.46% in 2014. This suggests that the public sector is the largest performer of R&D in Malta. In the most recent years Services and Manufacturing are of equal importance in industrial R&D

Inward and Country Perspective

As there are no data on Inward BERD we use the data on foreign ownership of domestic inventions to comment on the role of foreign firms in Cyprus. These data show that for the period 2011 to 2013[2], 60% of all inventions were in the hands of foreign firms. Of these 36% were owned by US companies, 16% by EU-28 companies and 48% by those from the rest of the world.

Patent applications filed under the PCT, with priority dates between 2011 and 2013

Share of patents owned by foreign organisations	60%
Share of US	36%
Share of EU28	16%
Rest of the world	48%

[1] http://ec.europa.eu/DocsRoom/documents/17830

[2] Priority dates of the patent

Country Profile: Czech Republic

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Country Summary

Foreign R&D plays a very important role in the Czech Republic. It accounted for more than 55% of total BERD in 2013. In some sectors the relative contribution of foreign firms is significantly higher and has increased over time, most notably in Motor Vehicles where their share has risen from 45% 2007 to more than 95% in 2013.

Firms from Germany are by far the largest category of foreign investors, for most years they accounted for more than 40% of inward BERD. Non-EU firms and especially those from the US are significant players. American firms increased their expenditures rapidly in 2011 and 2013. On the other hand firms from the Netherlands have reduced their spending in the same period.

Background

The Innovation Union Scoreboard describes the Czech Republic as a *Moderate Innovator* with improving innovation performance over time. In terms of R&D, Industrial R&D increased rapidly since 2005, resulting in BERD intensity rising from 0.69% in 2005 to more than 1.1% in 2014. Total R&D (GERD) intensity has also shown a similar trend, going from 1.2% of GDP in 2005 to 2.0% in 2014. This points to the relative importance of public sector in overall R&D performance (accounting for 50% of the total in 2014).

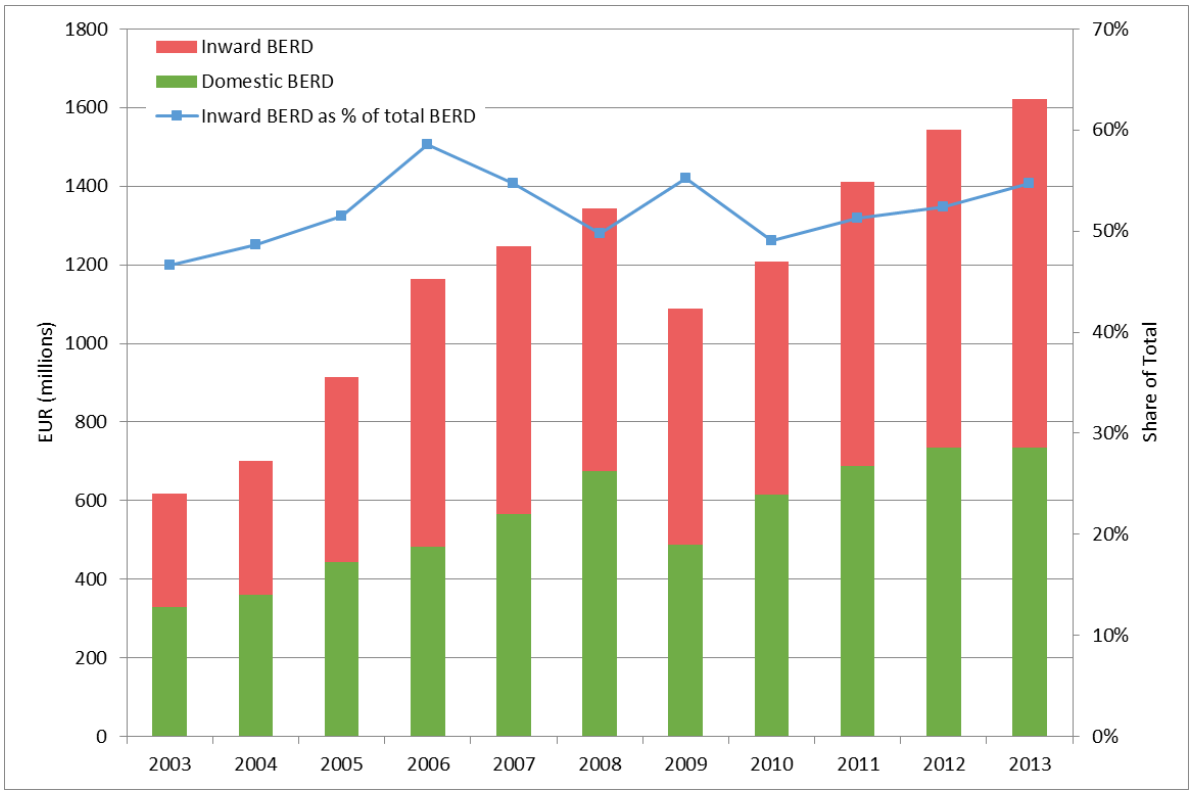
Although Manufacturing accounts for the largest share of the total, the relative position of the Service sector has improved over time. In 2003, the share of total BERD in Services was around 19%. This has increased to more than 33% in 2013. The sector with the largest proportion of R&D is the Motor Vehicles sector (more than 22% in 2013). The other feature to note is the increasing relative importance of Computer and related services: from around 8% of total BERD in 2003 to more than 14% in 2013.

Inward Perspective

Czech Republic is highly internationalized in terms of inward BERD. Around 55% of business R&D originated from foreign firms in in the period 2013 (Figure 1). This proportion has increasing over time: from 47% in 2003 to th5 55% in 2013.been

The data reported in Figure 1 show that there was a rapid rise in inward BERD from €288 million in 2003 to €683 million in 2007. Since then there has been a stagnation in these expenditures on R&D from €1.65 billion to €1.61 billion. There are some signs that in the last two years foreign firms have started increasing their R&D expenditures in the Czech Republic.

Figure 1: Inward BERD, domestic BERD and inward BERD as % of total BERD (2003-2013)



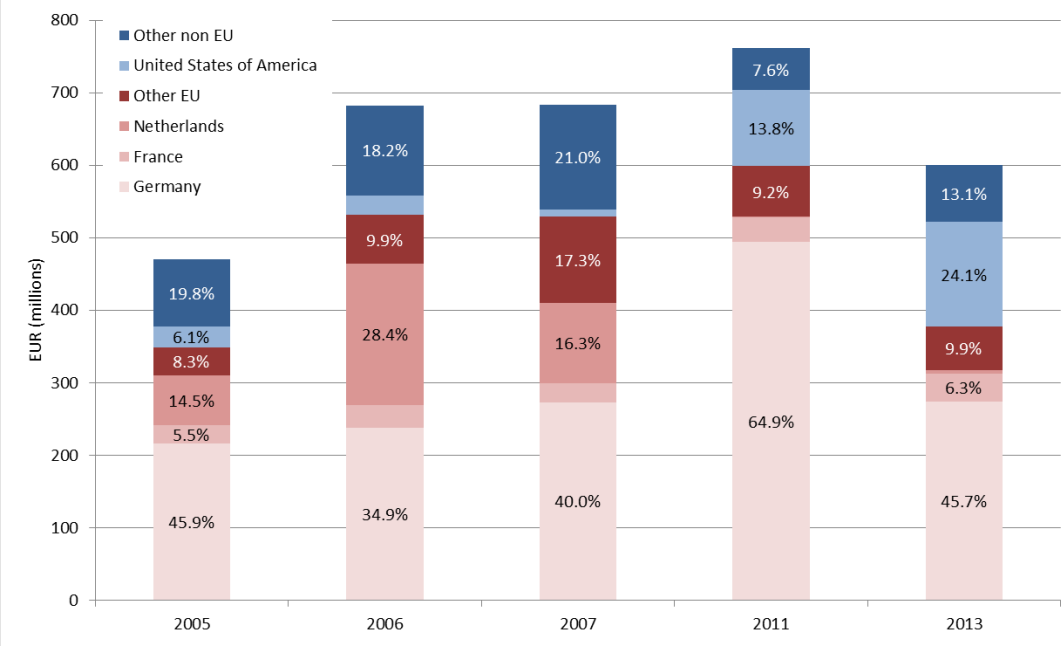
Source: Eurostat, Czech Statistical Office

The country perspective

Figure 2 presents the changing country distribution of inward BERD from 2005 to 2013. There is an important caveat to bear in mind when considering the reported trends: the data for 2005 to 2007 are for total BERD, whereas those for 2011 and 2013 do not include Services.

German firms are by far the largest category of foreign investors, for most years they account for more than 40% of inward BERD. Non-EU firms and especially those from the US are significant players in Czech Republic R&D, together they account for more than 20% of the total foreign R&D. US firms have increased their share dramatically in 2011 and 2013. The other trend to note is that Dutch companies which were relatively large investors have declined in the last two years.

Figure 2: Inward BERD - country of origin, Czech Republic, 2005 to 2013



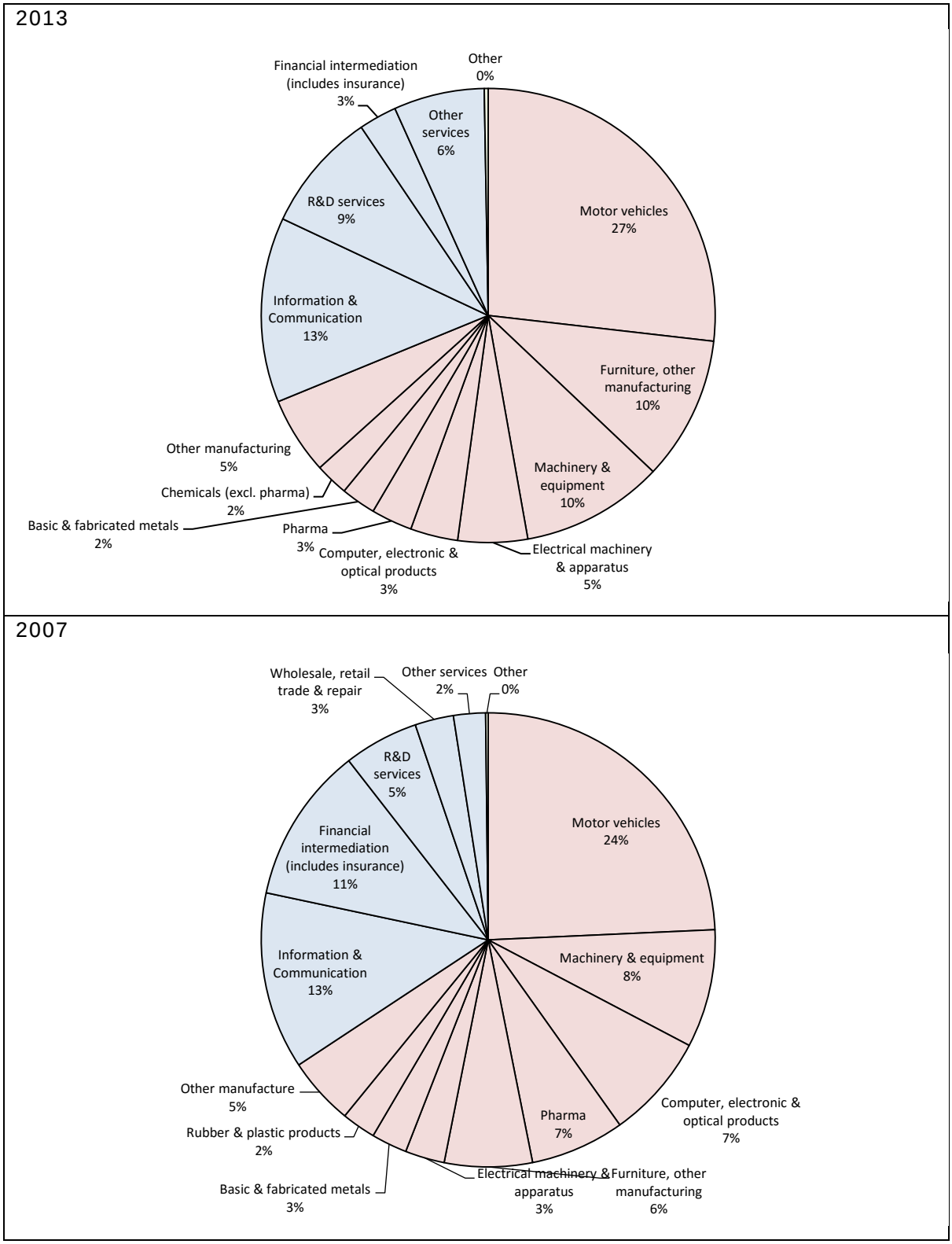
Source: Eurostat, Czech Statistical Office. 2011 and 2013 is Total Business excluding services

The sectoral perspective

Manufacturing industries account for a very large proportion of total inward BERD: just under 70% in 2013. The distribution between Services (~30% of total) and Manufacturing has changed very little between 2007 and 2013. The largest share of inward BERD is in Motor Vehicles (27% of the total in 2013), a sector that is important for the Czech Republic economy. Two other manufacturing industries have significant shares of foreign R&D: Machinery & equipment and Furniture and Other manufacturing: each with 10% of the total. A service sector that is relatively important is Information & Communication services. Finally the role of Financial Services has diminished over time.

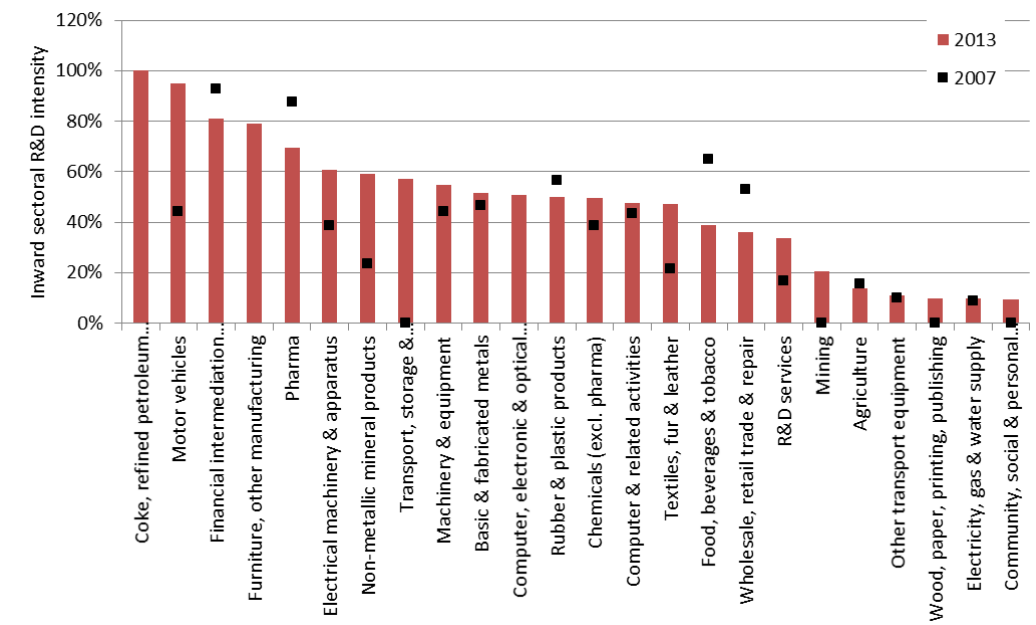
A measure of foreign penetration in a sector is the inward R&D share: the ratio of inward BERD to total BERD within a sector. According to this measure (Figure 4) the most internationalized sectors in the Czech Republic are Coke, refined petroleum products & nuclear fuel, Motor Vehicles, Financial Services and Furniture and Other manufacturing. While Coke and Petroleum accounts for a very small share of overall BERD, the remaining three are important sectors for overall R&D. In all 4 sectors foreign firms accounted for 80% or more of the total R&D. In the case of Motor Vehicles foreign penetration has increased from around 44% to more than 95%.

Figure 3: Shares of various industries on total inward BERD, Czech Republic, 2007 and 2013



Source: Czech Statistical Office

Figure 4: Inward sectoral R&D Share (2007 and 2013)



Note: The inward sectoral R&D share is defined as inward BERD in sector Y / total BERD in sector Y

Source: Czech Statistical Office, Eurostat

Country Profile: Denmark

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Country Summary

Data availability on Inward BERD for Denmark is severely limited. There is no country breakdown and data on sectoral distributions are very limited (e.g. very few sectors are reported and there is no information on Services). Further there are only 2 years for which any information is available. Despite these problems, we can conclude that from a modest position, the importance of foreign firms in Danish R&D has increased since 2007. They now account for 23% of national BERD.

Two sectors dominate inward flows of R&D: Chemicals and Machinery and Equipment. Together they account for more than 60% of the total inward BERD. Their relative position has changed over time, with Machinery and Equipment becoming more important and Chemicals becoming relatively less important. In Machinery and equipment the role of foreign firms has increased dramatically, with their share has growing from 30% in 2007 to 70% in 2013.

Background

Classed as an *Innovation Leader* in the 2016 EU Innovation Union Scoreboard[1], Denmark has consistently maintained a high level of industrial R&D expenditures in the period since 2000. This has resulted in BERD intensity growing steadily between 2005 and 2009 and stabilising at just under 2% of the GDP from 2010 onwards, and it stood at 1.95% in 2014. Total R&D (GERD) intensity is amongst the highest in the world, standing at 3% of GDP in 2014. The public sector represents around one-third of total GERD.

Manufacturing and Services are almost equal contributors to industrial R&D, with the former having a slightly higher share than the latter. The most important sectors are Pharmaceuticals and three services: R&D services, Information and Communication, and Financial services. Together these 4 sectors account for 60% of total BERD.

Inward Perspective

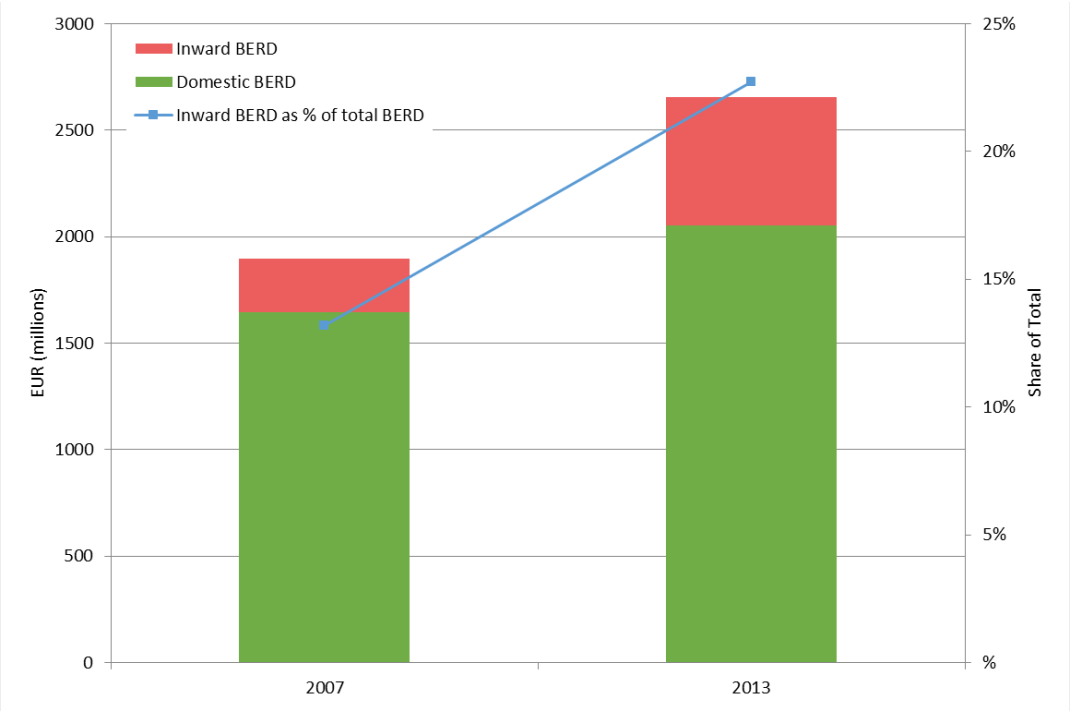
For a small country, foreign firms play a very modest role in national R&D for Denmark. As shown in Figure 1, this position has changed in recent years with inward BERD increasing from 13% of the total in 2007 to 23% in 2013.

The country perspective

No country breakdown available

[1] http://ec.europa.eu/DocsRoom/documents/17833

*Figure 1: Inward BERD, domestic BERD and inward BERD as % of total BERD (2007-2013)**



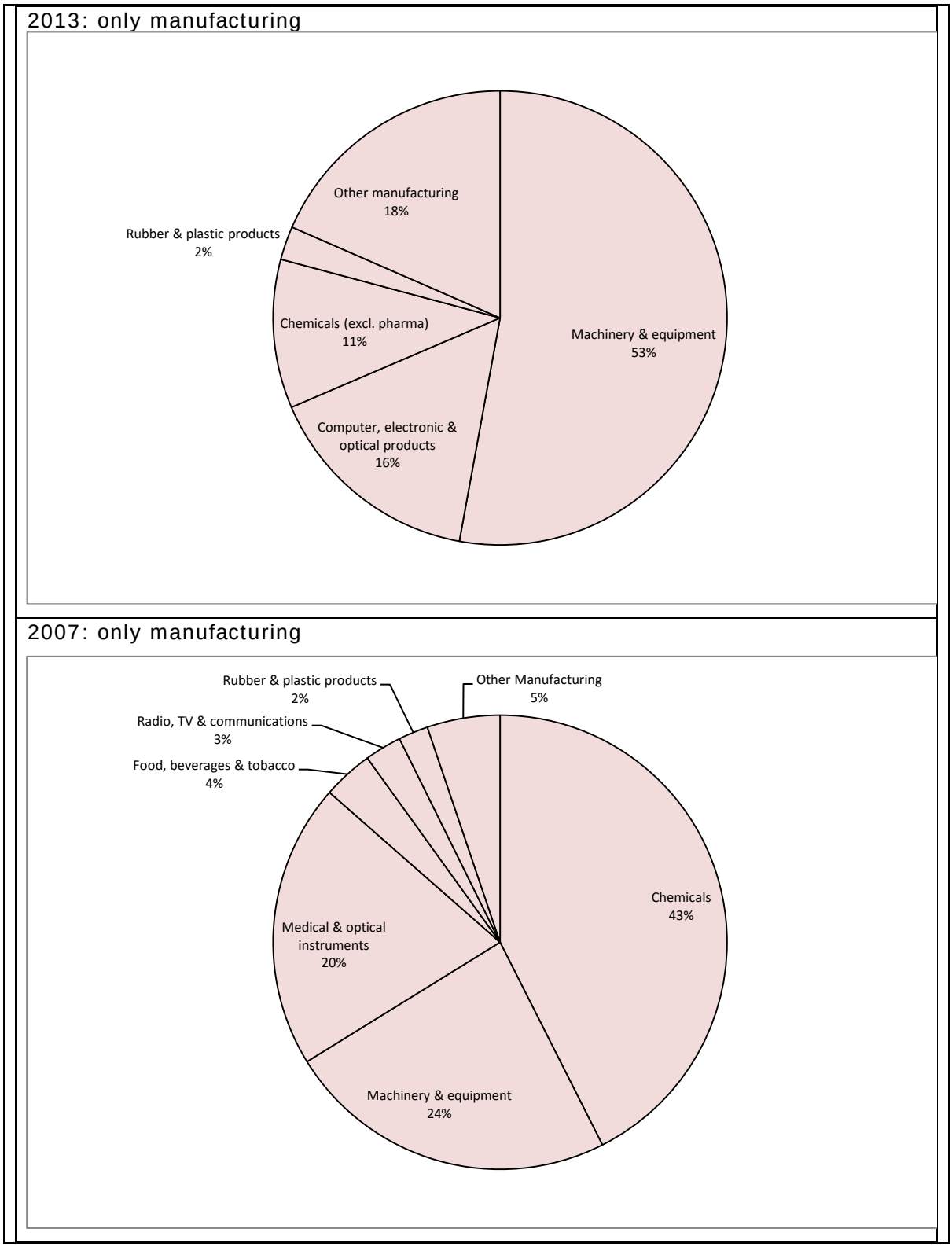
Source: Eurostat
*Note: Manufacturing only

The sectoral perspective

Two sectors dominate inward BERD in Denmark: Chemicals and Machinery and Equipment. Together they accounted for more than 60% of the total in both 2007 and 2013. The relative position of these two industries has changed over time, with Machinery and Equipment becoming more important and Chemicals becoming relatively less important.

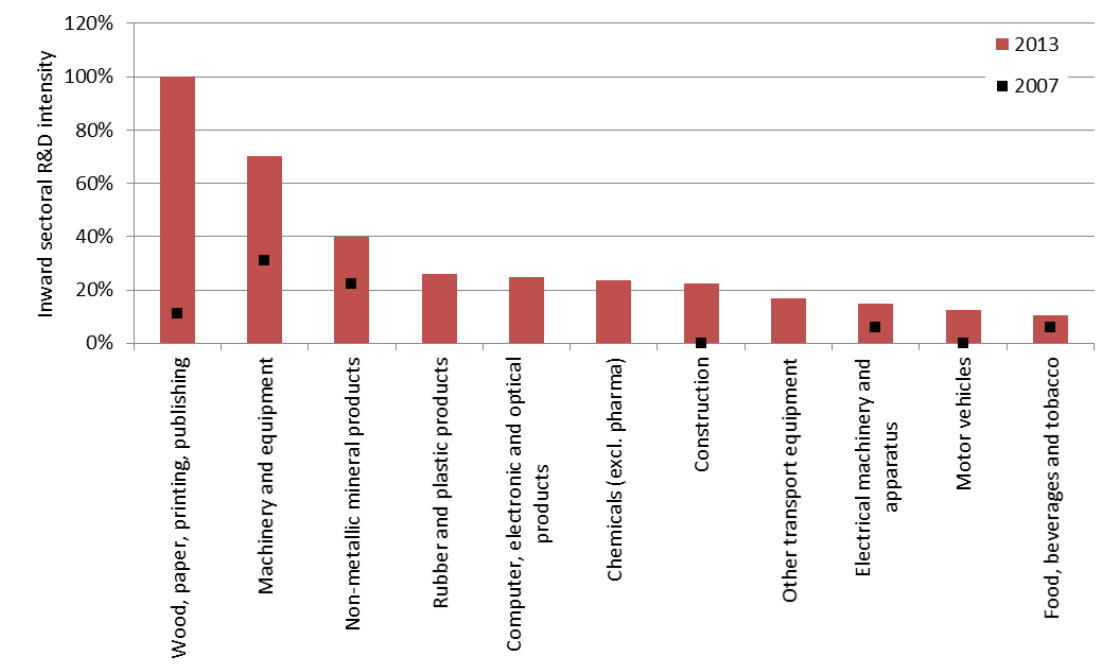
A measure of foreign penetration in a sector is the inward R&D share: the ratio of inward BERD to total BERD within a sector. According to this measure the most internationalized sectors for Denmark are Wood, Paper and printing and Machinery and Equipment (Figure 4). In the case of the former foreign firms are completely dominant, with a 100% share in 2013. In Machinery and equipment the role of foreign firms has increased dramatically, with their share has growing from 30% in 2007 to 70% in 2013.

Figure 2: Shares of various industries on total inward BERD, Denmark, 2007 and 2013



Source: Eurostat

Figure 3: Inward sectoral R&D share (2007, 2013)



Note: The inward sectoral R&D share is defined as inward BERD in sector Y / total BERD in sector Y
Source: Eurostat

Country Profile: Estonia

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Country Summary

There are severe data limitations in analysing inflows of foreign R&D into Estonia, with very small numbers and many missing values. There are no reported data on Service and none on sector or country distributions after 2007.

Notwithstanding these caveats the main point to emerge is that foreign firms account for somewhere between 20% and 40% of BERD. Firms from two countries are by far the most important investors in R&D in Estonia: US and neighbouring Finland. In terms of sectors Machinery and Equipment and Chemicals are consistently the most important contributors to total inward flows of R&D. Foreign firms account for more than 70% of BERD in Machinery and Equipment, Chemicals and Food, Drink and Tobacco.

Background

Estonia is classified as a *Moderate Innovator* in the 2016 EU Innovation Union Scoreboard[1], with a steady increase in innovation performance up to 2012. Underlying this is a strong increase in BERD, which grew 10-fold in the period from 2003 to 2012. The result has been a rapid increase in industrial R&D intensity from 0.26% to 1.22% of GDP in 2012, with a sharp decline to 0.62% in 2014. GERD intensity has followed a similar trajectory, going from 0.92% in 2005 to 2.31% in 2011 and then falling to 1.44% in 2014. Public sector accounts for between 40% and 50% of total R&D.

Service industries are relatively more important than manufacturing ones in total BERD: they accounted for more than 60% of the total in 2013 compared to 34% in the case of manufacturing. Within services the most important sectors are Information and Communication and Computer and related activities. Together they represent 50% of total R&D in 2013. One other sector of note is Coke, refined petroleum products and nuclear fuel which accounted for 21% of BERD in 2013.

Inward Perspective

It is difficult to make precise comparisons of the importance of foreign firms in Estonia as the data on total inward BERD are not comparable over time. The main problem is that after 2007 the reported data only cover Manufacturing. Thus below we present two figures: Figure 1a for total BERD (2003 to 2007) and Figure 1b for Manufacturing BERD only. Another data issue is that the reported figure for total Manufacturing BERD for 2011 seems an anomaly.

Notwithstanding these caveats the main point to emerge is that foreign firms account for somewhere between 20% and 40% of BERD. There have been some fluctuations over time but these are not easy to analyse due to data problems.

The country perspective[2]

Data problems mean that we can only analyse the country distribution of inward BERD from 2003 to 2007. The most important point to emerge is that firms from 2 countries are by far the most important investors in R&D in Estonia: US and neighbouring Finland.

[1] http://ec.europa.eu/DocsRoom/documents/17834

[2] *Data quality by country very poor after 2007 (small numbers and missing values).*

Figure 1a: Inward, domestic BERD and inward BERD as % of total BERD: 2003-2007

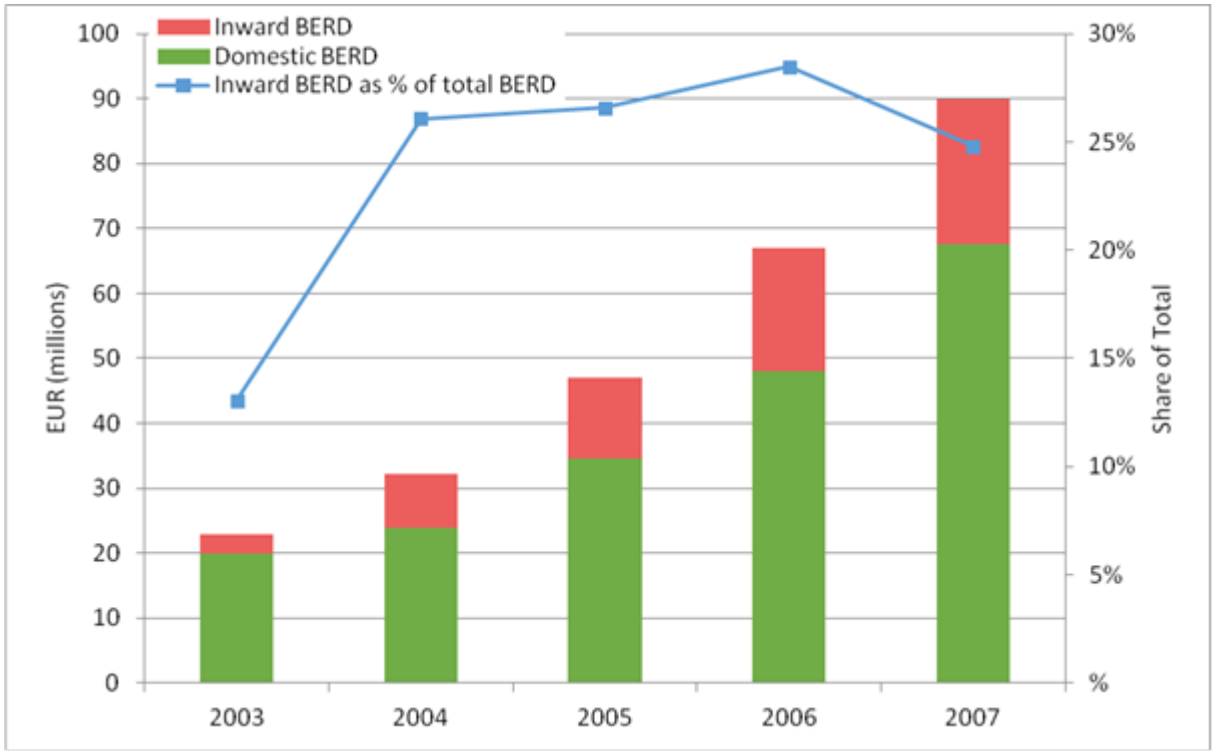
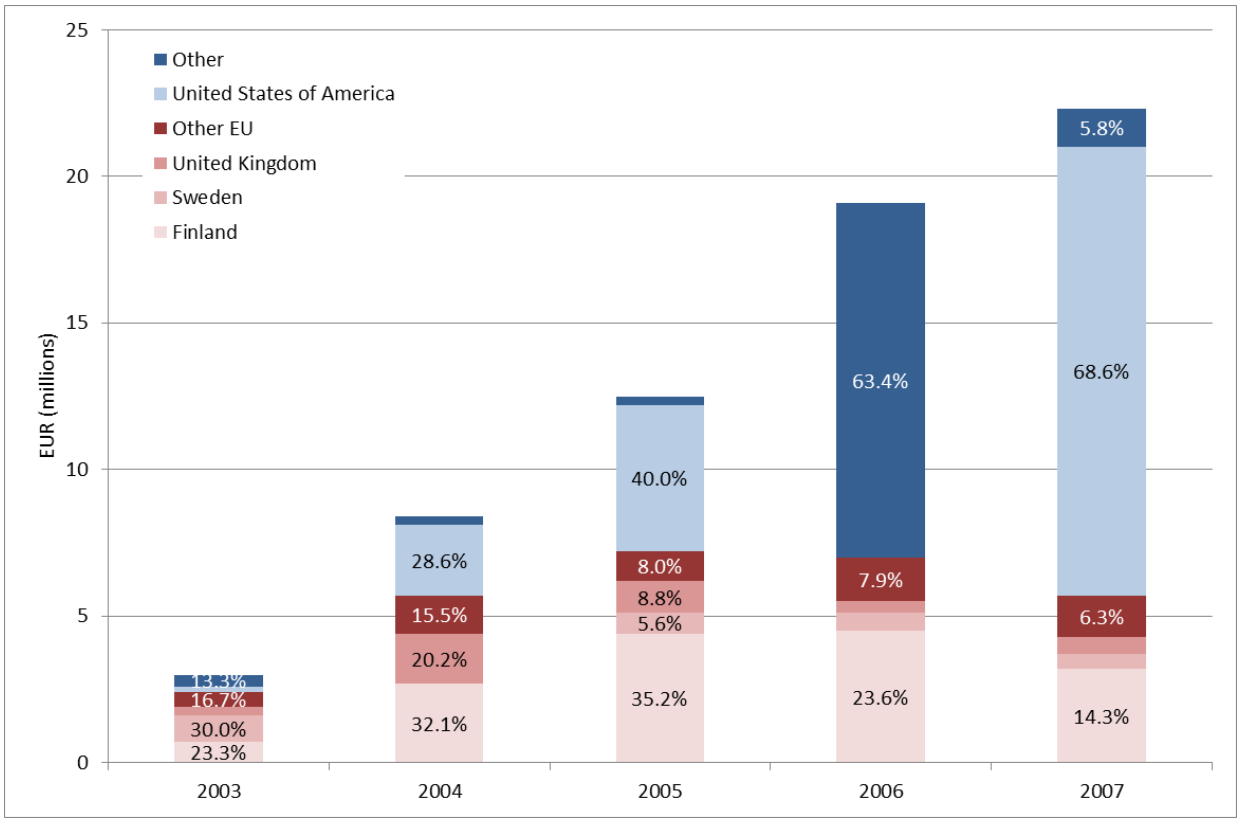


Figure 1b: Inward, domestic BERD and inward BERD as % of BERD (Manufacturing only): 2003 to 2013

Source: Eurostat, OECD

Figure 2: Inward BERD - country of origin, Estonia, 2003 to 2007



Source: Eurostat, OECD
Data quality by country very poor after 2007 (small numbers and missing values).

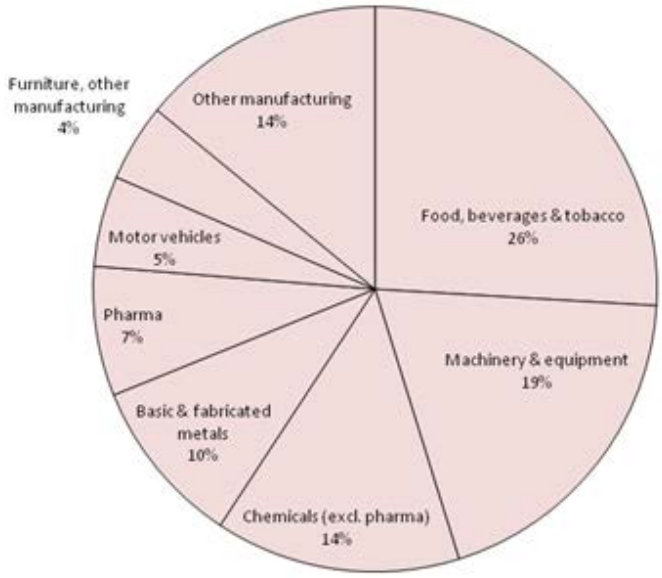
The sectoral perspective

There is very little consistency in the sectoral distribution of inward BERD over time (Figure 3). This may be due to the poor quality of the data as the numbers involved are very small: total manufacturing BERD in 2007 was €7 million and in 2013 €13.5 million. Nevertheless we can conclude that Machinery and Equipment and Chemicals are consistently the most important contributors to total inward flows of R&D. Food, Drink and Tobacco has become more important over time.

A measure of foreign penetration in a sector is the inward R&D share: the ratio of inward BERD to total BERD within a sector. According to this measure the most internationalized sectors for Estonia are: Machinery and Equipment, Chemicals and Food, Drink and Tobacco (Figure 4). Foreign firms account for more than 70% of BERD in each of these sectors. Foreign penetration has increased in most sectors, the most prominent being Food, Drink and Tobacco where the share of foreign firms has gone from less than 5% in 2007 to nearly 75% in 2013.

Figure 3: Shares of various industries in total inward BERD, Estonia, 2007 and 2013

2013 only manufacturing



2007 only manufacturing

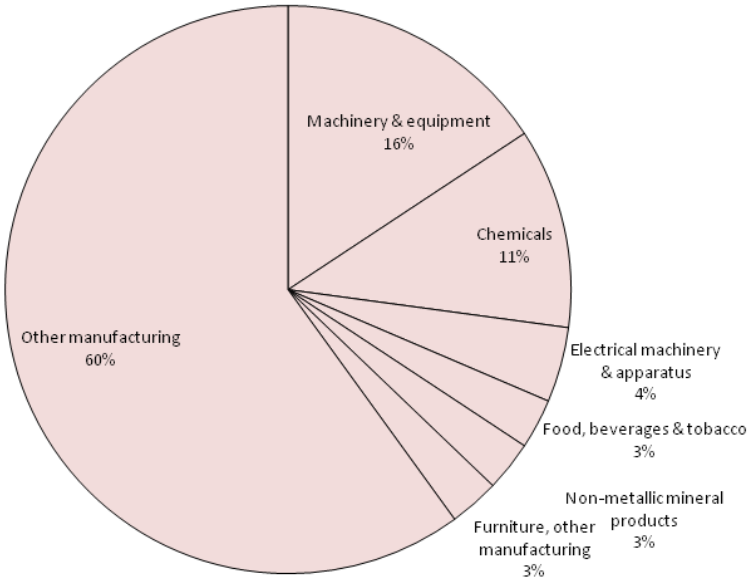
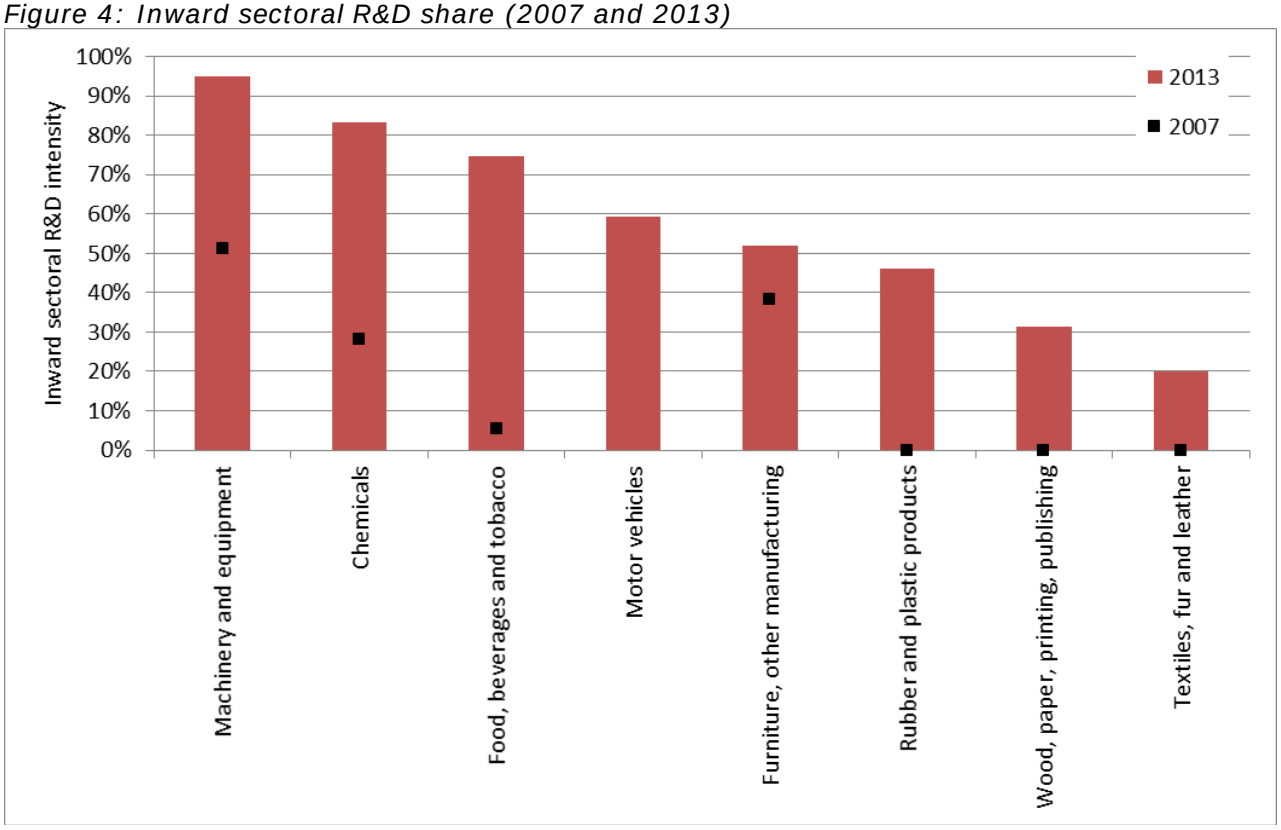


Figure 4: Inward sectoral R&D share (2007 and 2013)



Note: The inward sectoral R&D share is defined as inward BERD in sector Y / total BERD in sector Y
The following are not reported as there are problems with data consistency: Pharmaceuticals, and Basic and fabricated metals.
Source: Eurostat

Country Profile: Finland

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Country Summary

Foreign firms play a very modest role in national industrial R&D in Finland. They accounted for less than 15% of total BERD throughout the period since 2003. However they have enjoyed a higher growth rate than domestic firms, and hence an increasing share. A large proportion of Inward BERD flows into Finland are from firms headquartered in two non-EU countries: USA and Switzerland. Their relative position has changed over time with US firms diminishing in importance and those from Switzerland becoming much more important.

The sectoral distribution of Inward BERD shows the dominance of two sectors: Electrical Machinery and Computer, Electronic and Optical products, together they account for around 50% of total foreign R&D in Finland. These two sectors show contrasting trends over time, with Computer, Electronic and Optical products diminishing in importance and Electrical Machinery becoming relatively more important. Moreover in terms of foreign penetration they are also different: in Electrical Machinery foreign firms are predominant, accounting for nearly 70% of total BERD, but in Computer, Electronic and Optical products domestic firms predominate, with foreign firms accounting for less than 5% of total BERD.

Background

Finland is classed as an *Innovation Leader* in the 2016 EU IU Scoreboard[1], with high levels of performance along many different dimensions of innovation. Industrial R&D expenditures have been consistently high with BERD intensity exceeding 2% over the period since 2005. There has been a small decline in total BERD since 2008/09 and industrial R&D intensity stands at 2.15% of GDP in 2014. Total (GERD) R&D intensity has remained high throughout the period since 2005, exceeding 3%. It declined from a high of 3.75% of GDP in 2009 to 3.17 in 2014. Public sector accounts for around one-third of total R&D.

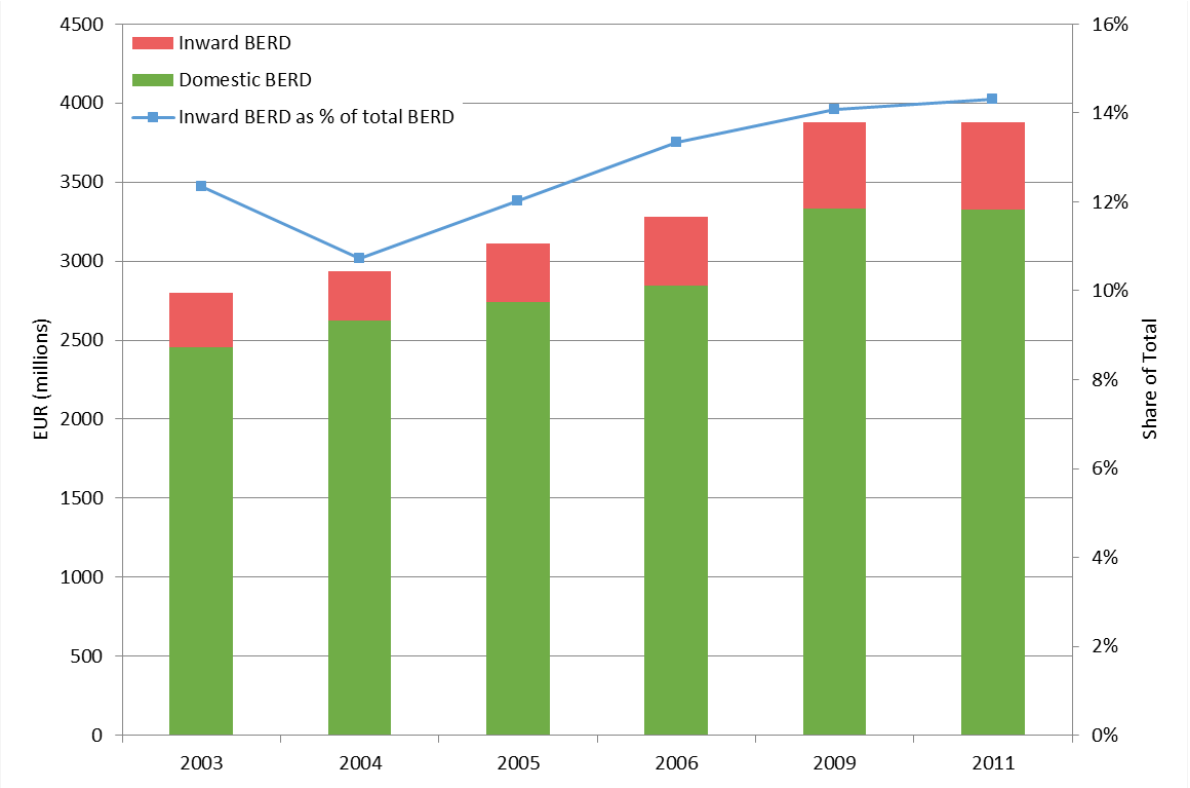
The industrial structure in Finland is dominated by ICT industries and this is evident in terms of business R&D. More than 70% of total BERD is performed by Manufacturing firms, although the relative importance of Services has increased over time. By far the most significant sector undertaking R&D is Computer, Electronic and Optical products, accounting for nearly 40% of the total. Non-Electrical and Electrical Machinery are also important as are ICT and Computing services. Large firms are relatively important players in the national R&D systems.

Inward Perspective

Foreign firms play a very modest role in national industrial R&D in Finland. They account for less than 15% of total BERD throughout the period since 2003. Their relative position has changed over time as their growth rate has been higher than that of domestic firms. They increased their spending on R&D by 60% from 2003 to 2011, compared to the 35% increase for domestic firms.

[1] http://ec.europa.eu/DocsRoom/documents/17835

Figure 1: Inward, domestic BERD and inward BERD as % of Manufacturing BERD, 2003-2011*

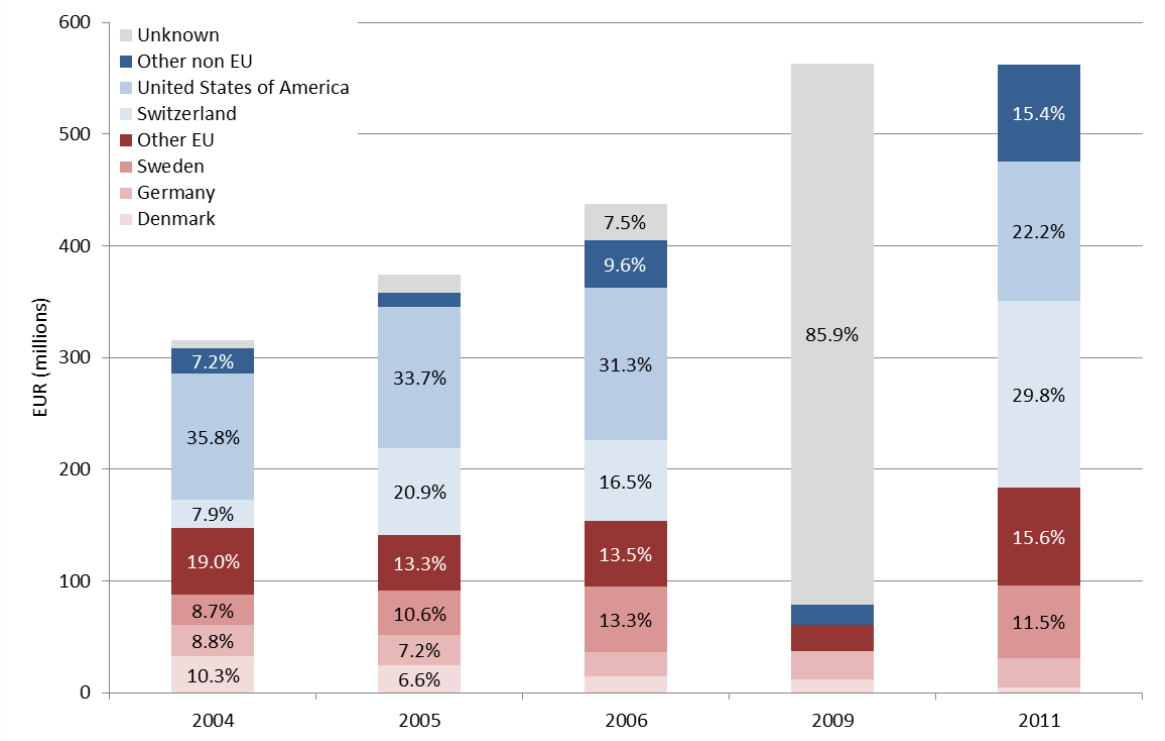


Source: OECD, Eurostat

The country perspective

A large proportion of Inward BERD flows into Finland are from firms headquartered in two non-EU countries: USA and Switzerland. They account for between 44% and 54% in the period since 2004. Their relative position has changed over time with US firms diminishing in importance and those from Switzerland becoming much more important. The share of the former has declined from 36% in 2004 to 22% in 2011, whereas that of the latter has increased from 7.9% to 29.8%. The other important contributors to inward BERD are firms from Sweden, Germany and Denmark.

*Figure 2: Inward BERD by country of origin, Finland, 2004 to 2011**



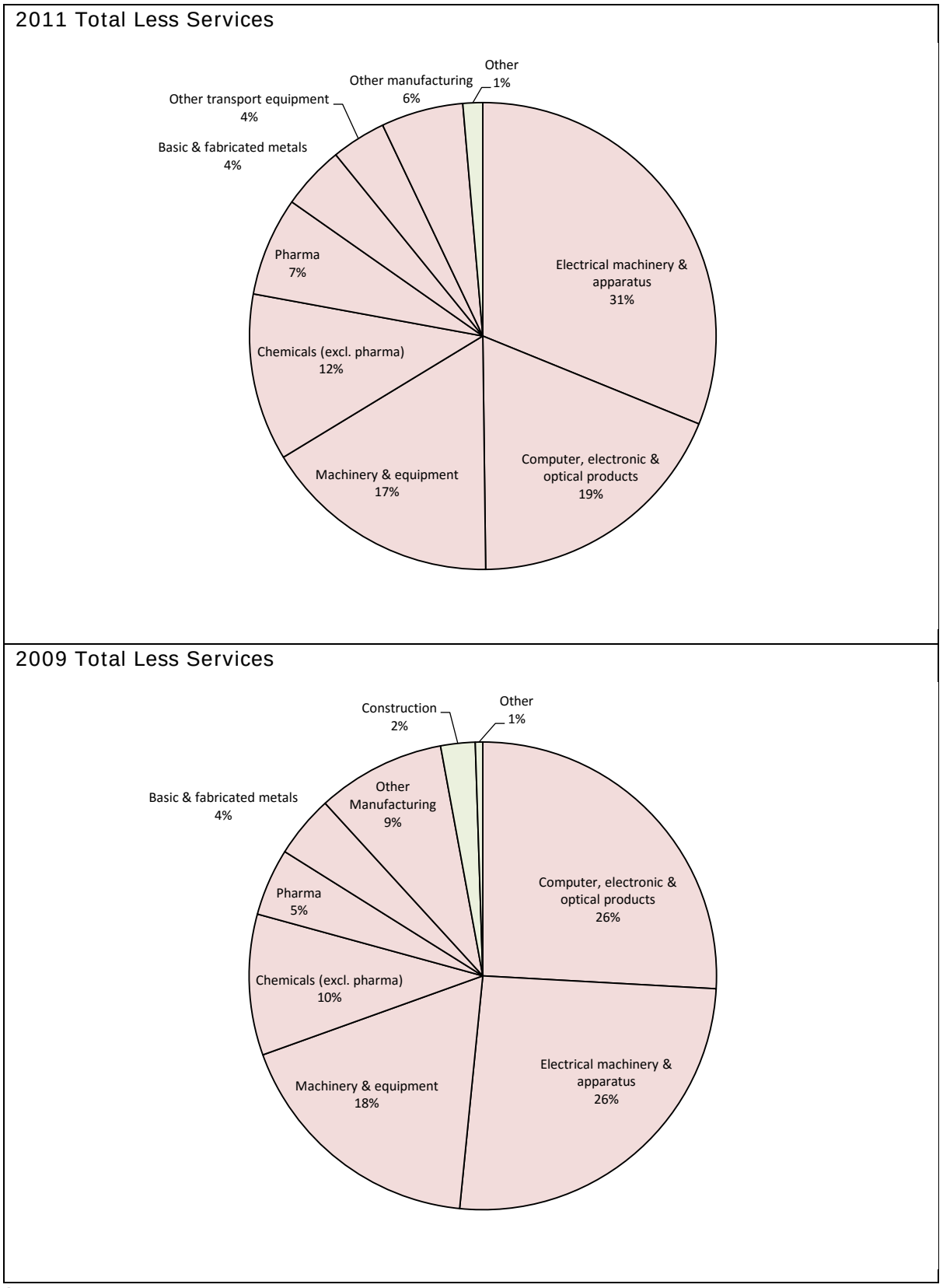
Source: OECD, Eurostat
*Manufacturing only in 2004, 2005 and 2006; Total less Services in 2009 and 2011. In 2009 data for many large countries are missing.

The sectoral perspective

Data on sectoral distribution of Inward BERD for Finland are limited, hence in Figure 3 we report on two recent years for which there is extensive information: 2009 and 2011. The analysis shows the dominance of two sectors: Electrical Machinery and Computer, Electronic and Optical products. Together they account for 50% or more total foreign R&D in Finland. They show contrasting trends over time with Computer, Electronic and Optical products diminishing in importance (with its share declining from 26% to 19%) and Electrical Machinery becoming more important (increasing its share from 26% to 31%). The other important sector for inward flows is Machinery and equipment.

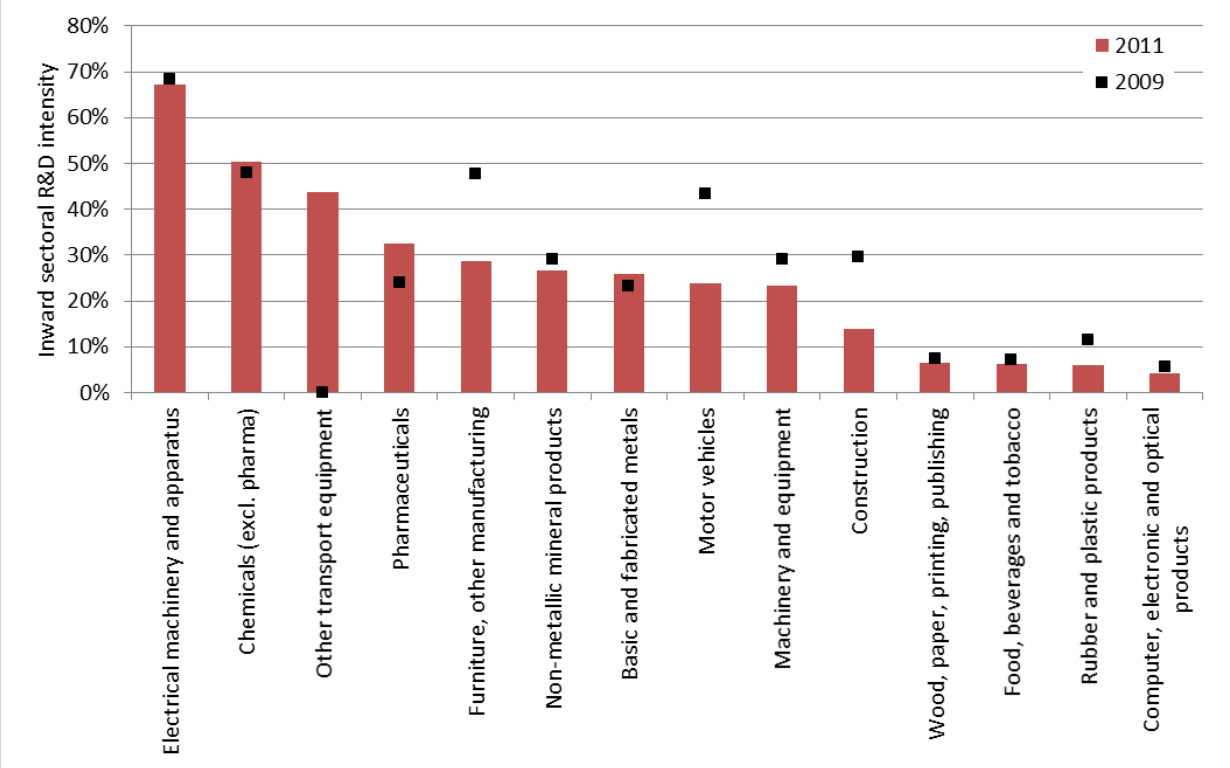
A measure of foreign penetration in a sector is the inward R&D share: the ratio of inward BERD to total BERD within a sector. The two relatively important sectors identified above show contrasting levels of foreign penetration (reported in Figure 4). In Electrical Machinery foreign firms are predominant accounting for nearly 70% of total BERD. On the other hand in Computer, Electronic and Optical products domestic firms predominate, with foreign firms accounting for less than 5% of total BERD. Machinery and equipment occupy an intermediate position with a penetration rate of around 25%.

Figure 3: Shares of various industries in Inward BERD, Finland, 2009 and 2011



Source: Eurostat

Figure 4: Inward sectoral R&D share (2009, 2011)



Source: Eurostat
Note: The inward sectoral R&D share is defined as inward BERD in sector Y / total BERD in sector Y

Country Profile: France

Internationalisation of business investments in R&D and analysis of their economic impact (BERD Flows)

December 2016

Frédérique Lang and Parimal Patel

SPRU

SPECIFIC CONTRACT 30-CE-0677869/00-21/A4/2014

Internationalisation of business expenditures on R&D and analysis of their economic impact (BERD Flows)

Implementing

Framework Contract n° - 30-CE-0496925/00-52

for the provision of Services in the Field of Research Evaluation and Research Policy Analysis ([1] 2010/S 172-262618) - Lot 2: Data collection and performance indicators to monitor European research policy

Country Summary

Data availability makes it difficult to arrive at firm conclusions about the role of foreign firms in industrial R&D in France. The main problem is that the data on Services (which are increasingly important part of overall BERD) are missing for most years. Nevertheless with the available data we can conclude that foreign firms play a relatively important role in French R&D and that their relative importance has increased dramatically since 2006.In 2013 their share of BERD stood at 46%.

There is a high degree of concentration in the distribution of Inward R&D by country of origin for France. Firms from 3 countries account for between half and two-thirds of all foreign R&D in the period 2003 to 2013: USA, the Netherlands, and Germany. Between 2007 and 2013 there has been big changes in this distribution, with Dutch firms increasing their expenditures dramatically and the American firms declining.

The data on sectoral composition are severely limited with no information after 2009. With this caveat in mind, the analysis shows that 3 industries dominate Inward BERD, accounting for more than 50% of the total: Computer, Electronic and Optical products, Motor vehicles and Pharmaceuticals. In the Pharmaceuticals industry foreign firms are predominant with more than 75% of total BERD. On the other hand their role in Computer, Electronic and Optical products is more limited, with domestic firms accounting for more than 70% of total R&D. Motor Vehicles occupies a position that is between these two extremes as foreign firms represent 46% of the total. In terms of trends both Pharmaceuticals and Motor Vehicles have seen an increasing level of foreign penetration since 2006.

Background

France is a classed as a *Strong Innovator* in 2016 EU Innovation Union Scoreboard[1], with increasing levels of Innovation performance in the period up to 2012. Amongst the EU countries, France spends more on industrial R&D than all countries except Germany. BERD intensity has increased over the whole period since 2003, with the largest increases since the financial crisis in 2008. It stood at 1.5% of GDP in 2014. Total R&D (GERD) intensity has been over 2% of GDP since 2003 and has increased to 2.26% in 2014.

Manufacturing industries account for around half of total BERD and the relative importance of Services has increased over time. Within manufacturing, the Computer, Electronic and Optical Equipment sector is the most important research performer. Aerospace and Motor Vehicles are also relatively important. The two most important service sectors are R&D services and Information and Communications services. Large firms are important actors in R&D performance as witnessed by the presence of a number of French headquartered companies in the largest R&D investors worldwide in 2015.[2]

Inward Perspective

Data availability makes it difficult to arrive at a firm conclusion about the role of foreign firms in industrial R&D in France. The main problem is that the data on Services (which are increasingly important in overall BERD) are missing for most years. Hence Figure 1 is based on either Manufacturing only or Total BERD less Services. With this caveat in mind, the main conclusion from the analysis in Figure 1 is that foreign firms play a relatively important and that their relative importance has increased over time.

[1] http://ec.europa.eu/DocsRoom/documents/17837
[2] https://ec.europa.eu/assets/jrc/eu-scoreboard-2015/

There are two distinct periods in the evolution of BERD in France. The first is the period from 2003 to 2006 when there was a steady increase in both Domestic and Inward BERD. Since 2006 each of these components has moved in a different direction. There has been a decrease in overall BERD mainly precipitated by a reduction in the expenditures of French firms, going from €16.1 billion in 2006 to €8.8 billion in 2013. In the same period foreign firms increased their spending on R&D from €4.6 billion to €7.6 billion. The result is that the share of foreign firms has increased from around 25% in the period up to 2006 to 46% in 2013.

Figure 1: Inward, domestic BERD and inward BERD as % of Total BERD, 2003-2013*

*Manufacturing only 2003 to 2009, Total less Services in 2013.
Source: OECD, Eurostat

The country perspective[3]

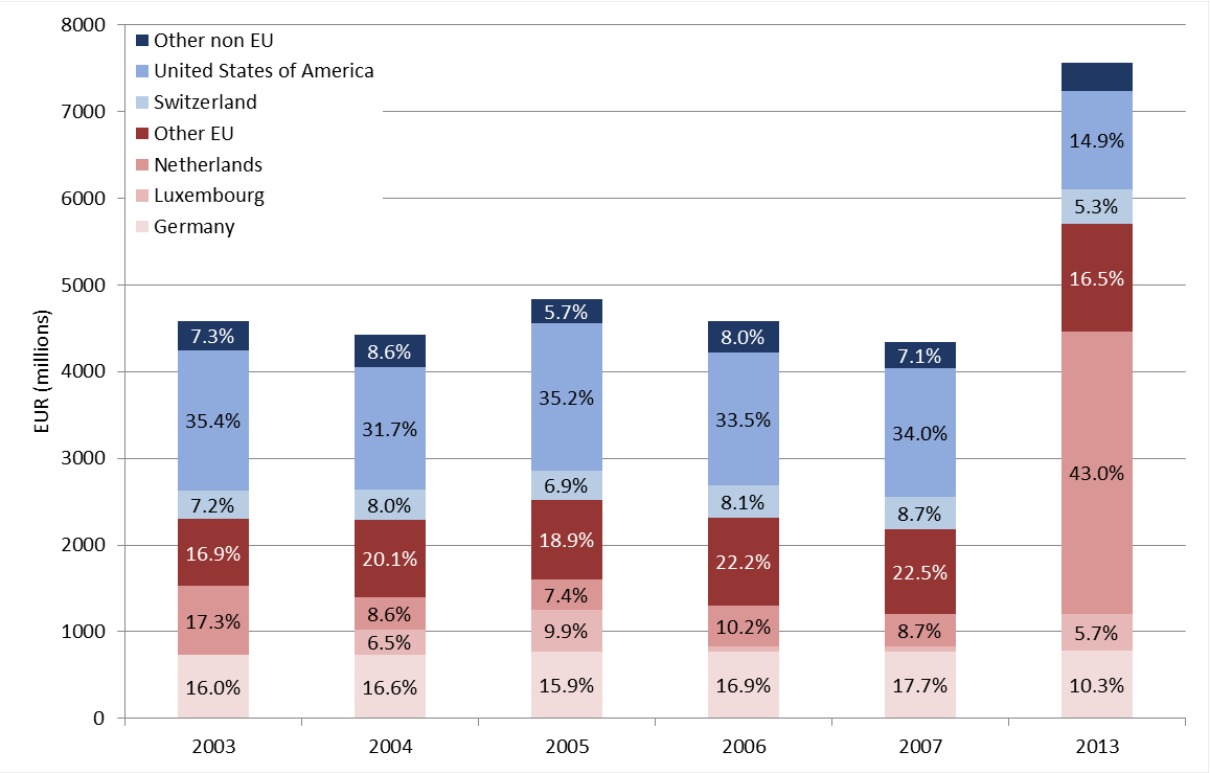
There is a high degree of concentration in the distribution of Inward R&D by country of origin for France. Firms from 3 countries accounted for between half and two-thirds of all foreign R&D in the period 2003 to 2013: USA, the Netherlands, and Germany. However the relative positions of these countries have changed considerably over time. The most dramatic increase has been in the R&D activities of Dutch firms, with spending increasing from €379 million in 2007 to €3,251 million in 2013.[4] This has resulted in their share in foreign R&D increasing from 9% to 43% in the same period. On the other hand US firms

[3] As noted above, data on Inward R&D for Services are missing for France. Additionally for the period 2003 to 2009 the country distributions are based on Manufacturing BERD only, while for 2013 we include Total BERD less Services (i.e. Manufacturing plus, Mining, Agriculture, Utilities and Construction). Thus the data are not strictly comparable but give a good indication of trends.

[4] Part of this may be explained by the fact that Airbus has its headquarters in the Netherlands but many R&D as well as production facilities in France.

have decreased their expenditures since 2007, with their share declining from 34% to 15% in 2013. The relative importance of German firms has also declined over time. The final point to note is that other EU firms are important contributors to the foreign total. The detail data show that prominent amongst these are firms from Sweden and the UK.

Figure 2: Inward BERD - country of origin, France, 2003 to 2013



Source: OECD, Eurostat
From 2003-2007 is Manufacturing only, 2013 Total less Services. 2009 excluded as there are missing data for many countries.

The sectoral perspective

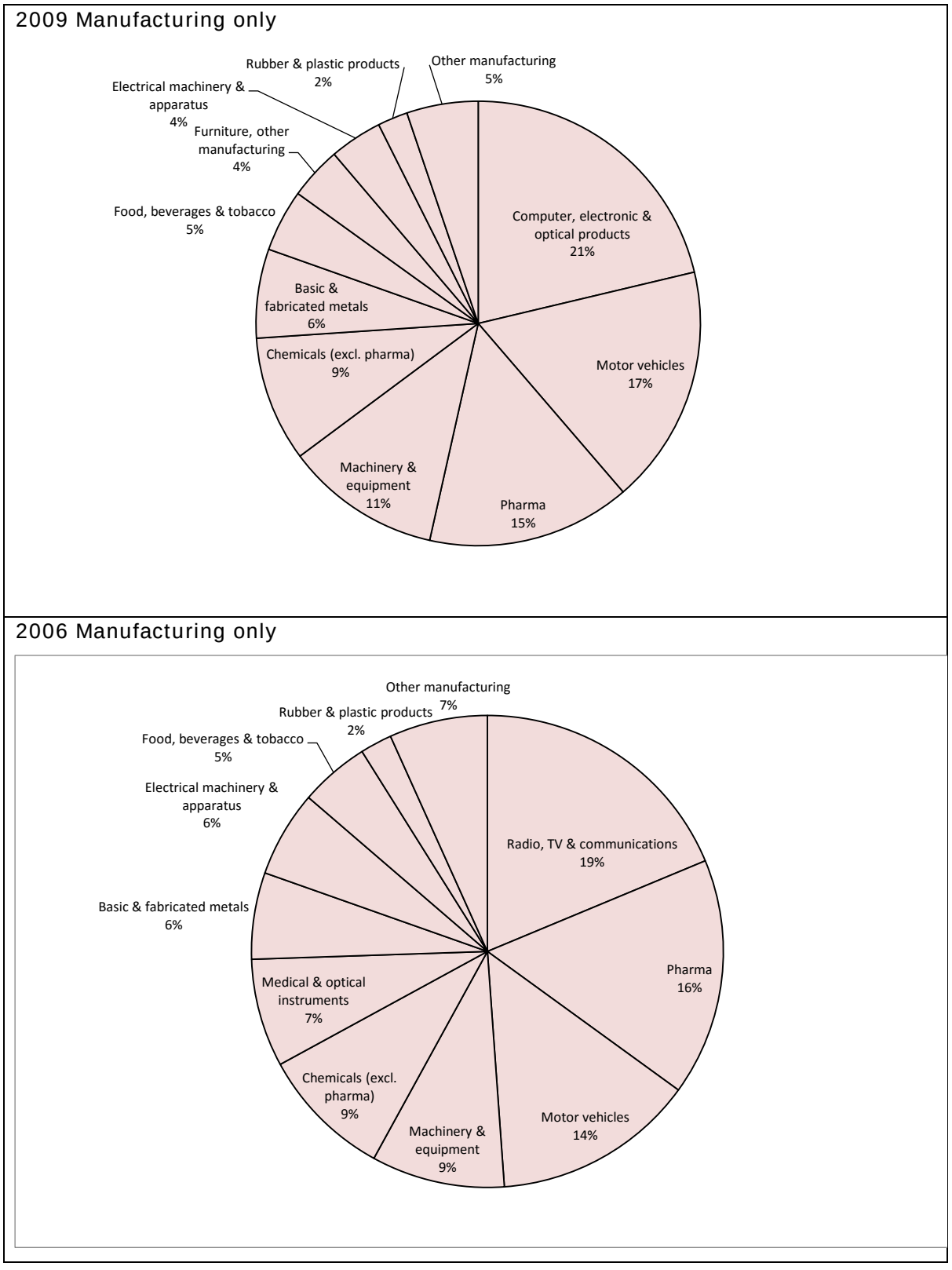
There are a number of difficulties in making sectoral comparisons of Inward BERD for France. As mentioned above the data on Services are missing but even for Manufacturing industries data are severely limited with many missing values and changes in sectoral designations. There is no disaggregation by sector after 2009, making it difficult to comment on the latest trends. Thus Figures 3 and 4 are based on the years 2006 to 2009.

Three industries, namely, Computer, Electronic and Optical products, Motor vehicles and Pharmaceuticals dominate Inward BERD, accounting for more than 50% of the total in 2009 (Figure 3). If we include Machinery and Equipment and Chemicals (other than Pharmaceuticals) then the proportion reaches nearly 75%. Finally the role of Radio, TV and communications has diminished over time.

Figure 4 shows the rate of foreign penetration by sector (i.e. how much R&D is accounted by non-French firms). The three sectors identified above show contrasting patterns. At one extreme, in the Pharmaceuticals industry foreign firms are predominant with more than 75% of total BERD. On the other hand their role in Computer, Electronic and Optical products is more limited with domestic firms accounting for more than 70% of total R&D. Motor Vehicles occupies a position that is between these two extremes as foreign firms

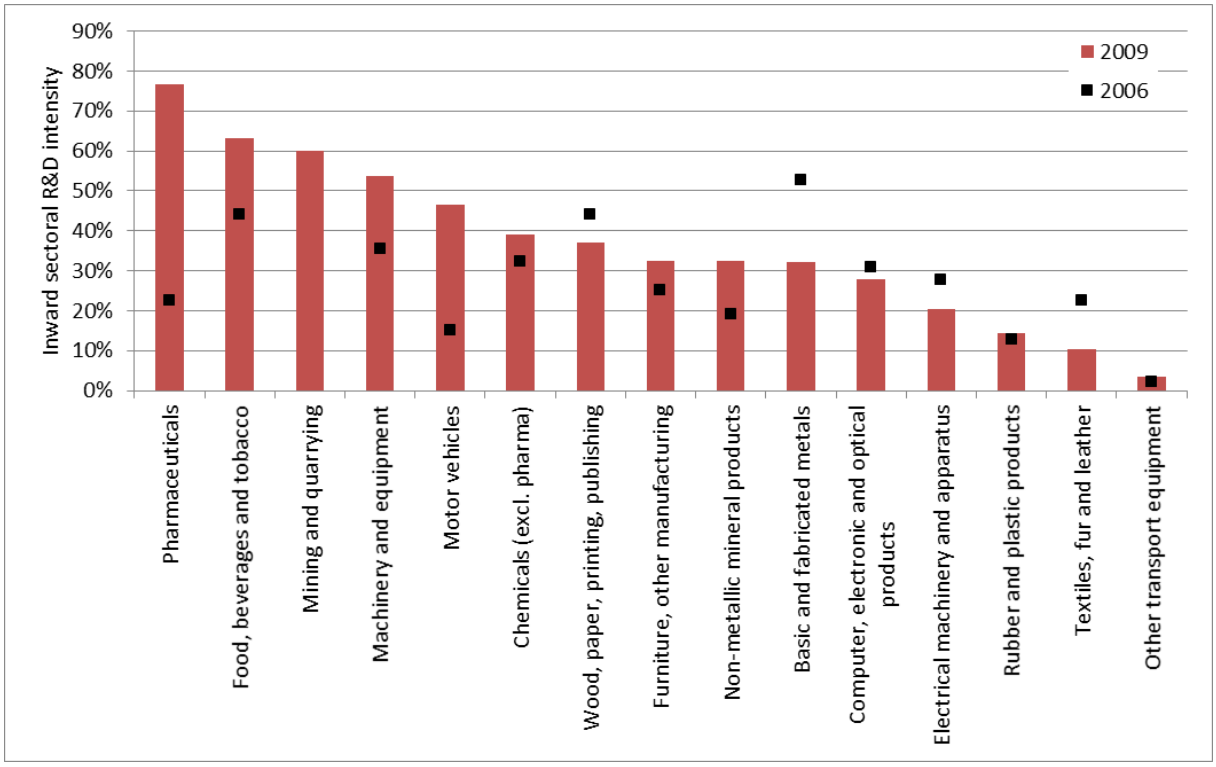
represent 46% of the total. In terms of trends both Pharmaceuticals and Motor Vehicles have seen an increasing level of foreign penetration since 2006.

Figure 3: Shares of various industries on Manufacturing Inward BERD, France, 2006 and 2009



Source: OECD, Eurostat

Figure 4: Inward sectoral R&D Share(2006, 2009)



Source: OECD, Eurostat
There have been some changes in sectoral designations. For example from Office, Accounting & Computing Machinery to Computer Electronic and Optical Machinery (as we moved from NACE 1 to NACE 2)
Note: The inward sectoral R&D share is defined as inward BERD in sector Y / total BERD in sector Y

Country Profile: Germany

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Country Summary

Germany, the leading R&D spending country in the EU, occupies a 'middle' position in terms of the role played by foreign firms in national R&D. They account for 30% or less of the total expenditures. Firms from 4 countries dominate inward BERD: USA, the Netherlands, Switzerland and France, accounting for more than two-thirds of the total. By far the largest investments are from US companies: they represented on average around one-third all foreign funds. However their relative importance has declined over time. The other point to note is that Germany is a strong hub for conducting R&D for a range of neighbouring countries and increasingly so over time.

Motor Vehicles, a sector of strategic importance, dominates the inward flows of R&D in Germany, accounting for around 19% of the total in 2013. Another important sector is Aerospace. The big puzzle in the data is the declining importance of Pharmaceuticals: Inward BERD declined from €1.75 billion in 2007 to €0.85 billion.

Background

Germany is classed as *Innovation Leader* in the 2016 EU Innovation Union Scoreboard.[1] It spends more on industrial R&D than any other EU country. BERD intensity has increased from 1.7% of GDP in 2003 to 1.9% in 2014. Total R&D (GERD) intensity is also amongst the highest in the EU and has increased from 2.9% of GDP in 2005 to 2.9% in 2014.

The structure of industrial R&D is dominated by Manufacturing industries with Services accounting for a very small share of the total (13% in 2013). The sector with the largest share of R&D is Motor vehicles (just under one-third in 2013). The other important sectors are Chemicals (including Pharmaceuticals), Computer, electronic and optical products, and Machinery and Equipment. Together these 3 sectors represented around 37% of total BERD in 2013. Large firms are also important actors in R&D performance as shown by the presence of 8 German headquartered firms the list of 50 largest R&D investors worldwide in 2015.[2]

Inward Perspective

Amongst the large R&D spending countries in the EU, Germany occupies a 'middle' position in terms of the role of foreign firms in national R&D, with UK on the one hand with high levels of foreign R&D and France on the other with more modest levels. As shown in Figure 1, Inward BERD accounted for between 21% and 30% of total Manufacturing BERD[3] in the period 2003 to 2013.

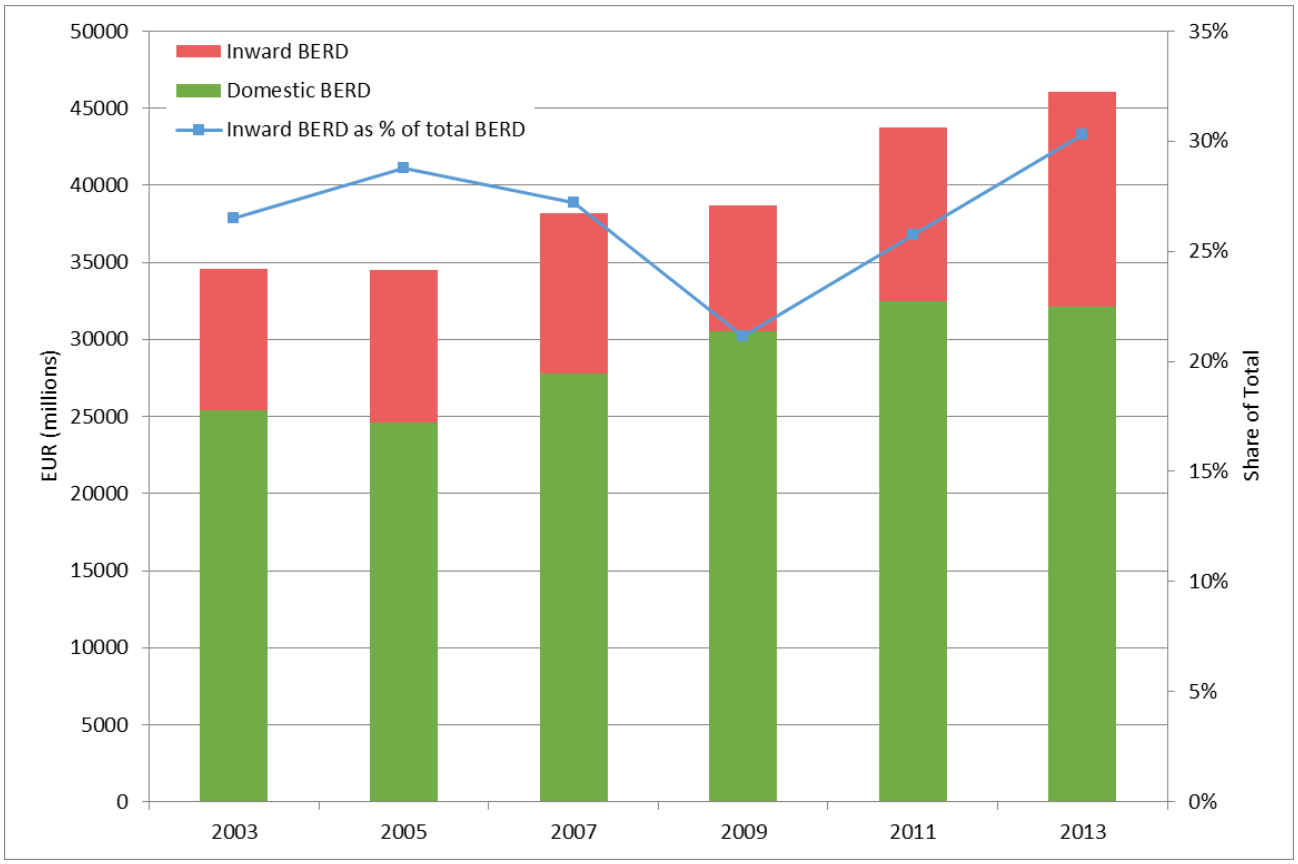
There are two distinct phases in the evolution of foreign R&D expenditures. The first is from 2003 to 2009 when these expenditures declined in nominal terms, from €9.2 billion to €8.2 billion. However since 2009 foreign R&D spend has increased by nearly 70% to €13.9 billion.

[1] http://ec.europa.eu/DocsRoom/documents/17838

[2] https://ec.europa.eu/assets/jrc/eu-scoreboard-2015/

[3] There are no data for Services post 2007.

Figure 1: Inward, domestic BERD and inward BERD as % of total BERD, 2003-2013*



Source: Eurostat, OECD
*Note: Manufacturing only

The country perspective[4]

There is a high degree of concentration in the distribution of inward R&D by country of origin for Germany. More than two-thirds of total incoming R&D expenditures during the period 2003 to 2013 are accounted for by firms from 4 countries: USA, the Netherlands, Switzerland and France. However the level of concentration has declined over time, with the total for these 4 countries declining from 85% in 2003 to 67% in 2013.

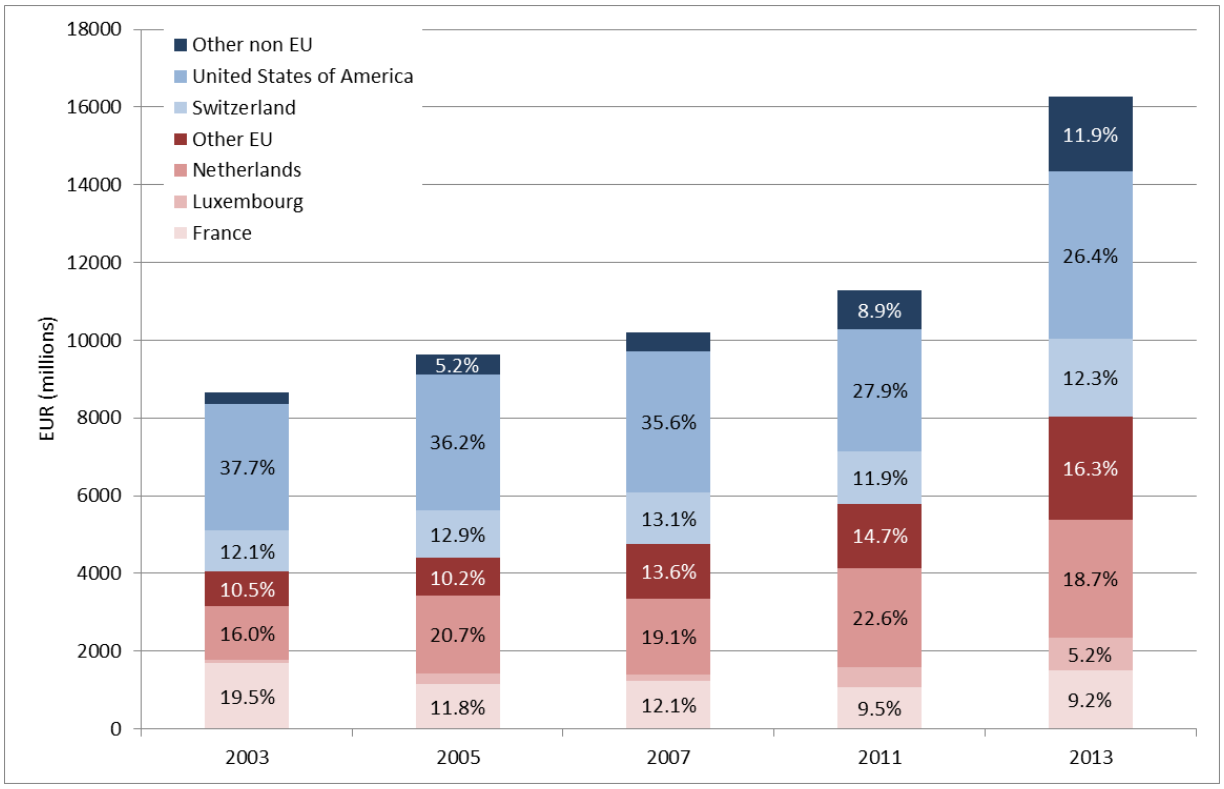
By far the largest investments are from US companies: they represented on average around one-third of all foreign funds. However their relative importance has decreased over time from 38% of total inward BERD in 2003 to 26% in 2013.

In the same period the relative importance of other-EU firms has increased. The detailed data show that firms from neighbouring countries such as Luxembourg, Austria, Belgium play an important role in this trend. Of note are also UK based firms which have increased their investments in the last few years.

The other notable change has been the relative importance on non-EU firms, especially in 20011 and 2013. The notable contributors to this trend are Japanese and Canadian firms.

[4] As noted above, data on Inward R&D for Services are missing for Germany. Additionally for the period 2003 to 2007 the country distributions are based on Manufacturing BERD only, while for 2011 and 2013 we include Total BERD less Services (i.e. Manufacturing plus, Mining, Agriculture, Utilities and Construction). Thus the data are not strictly comparable but give a good indication of trends.

Figure 2: Inward BERD - country of origin, Germany, 2003 to 2013



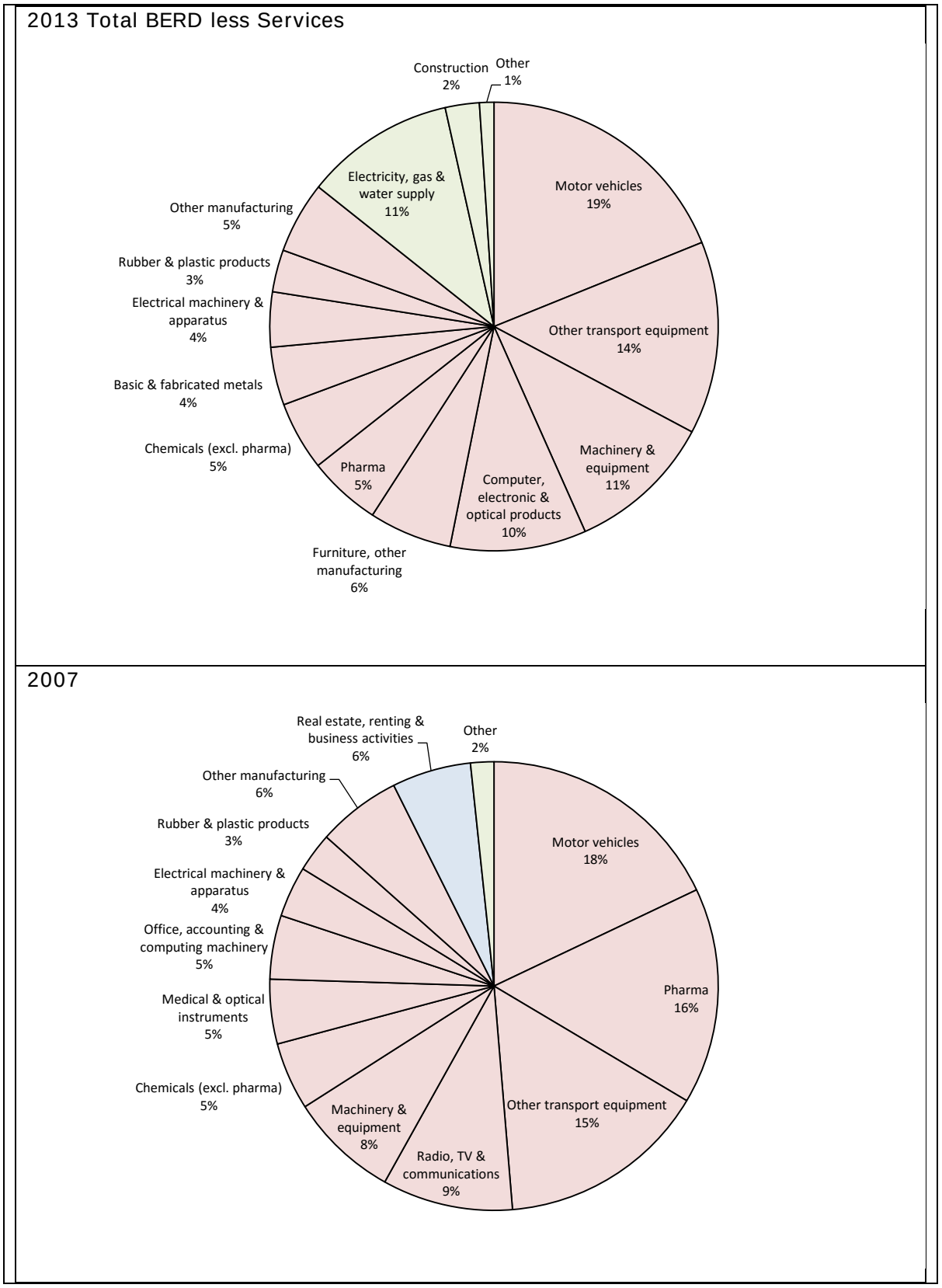
Source: Eurostat, OECD
Manufacturing only from 2003 to 2007, and Total less Services in 2011 and 2013

The sectoral perspective

As shown in Figure 3 Motor Vehicles dominates the inward flows of R&D in Germany, accounting for around 19% of the total. This is also a sector of great importance for overall German R&D performance. The other sector with relatively high share of inward BERD since 2007 is Other Transport Equipment (dominated by Aerospace). The big puzzle in the data is the declining importance of Pharmaceuticals: Inward BERD declined from €1.75 billion in 2007 to €0.85 billion, resulting in a steep drop in its relative position.

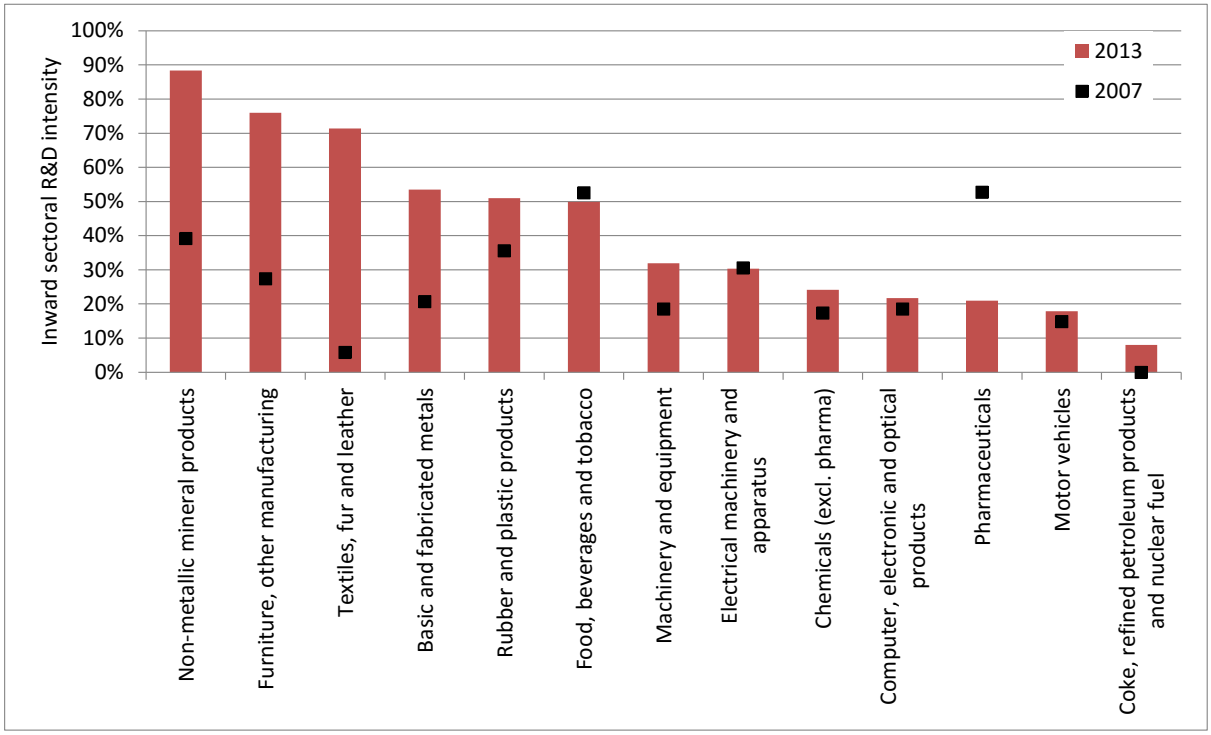
A measure of foreign penetration in a sector is the inward R&D share: the ratio of inward BERD to total BERD within a sector. According to this measure the most internationalized sectors for Germany are Non-metallic mineral products, Furniture, other manufacturing, Textiles and leather, and Basic & fabricated metals (Figure 4). In all of these sectors foreign firms account for more than 50% of BERD. At the other end of the spectrum are Motor Vehicles and Pharmaceuticals where such firms account for 20% or less of the total. Again the big change has occurred in Pharmaceuticals where foreign firms accounted for more than 50% of BERD in 2007 but the proportion has declined to 20%.

Figure 3: Shares of various industries on total inward BERD, Germany, 2007 and 2013



Source: Eurostat, OECD

Figure 4: Inward sectoral R&D Share (2007, 2013)



Source: Eurostat, OECD

Notes: The inward sectoral R&D share is defined as inward BERD in sector Y / total BERD in sector Y.
The following have been excluded due to data inconsistencies: mining and quarrying, electricity, gas and water supply, and construction, wood paper and printing, and other transport equipment.

Country Profile: Greece

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Country Summary

Data on Inward BERD for Greece are not available. This report uses other ad hoc data to comment on the role of foreign firms. The data on patenting show that foreign firms are of considerable importance in national technology creation, accounting for around 40% of all patents. Both EU and US firms are significant actors, with the former being relatively important than the latter.

Background

Greece is classed as *Moderate Innovator* in the 2016 EU IU Scoreboard[1], with performance below the EU average in most dimensions of innovation. Industrial (BERD) R&D intensity is very low, less than 0.3% of GDP for most of the period since 2005. After a period of stagnation up to 2007 this intensity has increased from 0.16% to 0.28% in 2014. The same trend can be observed in overall (GERD) R&D intensity, the value of which goes from 0.58% of GDP in 2005 to 0.84% in 2014. This points to the important role played by the public sector in R&D performance. Services account for a slightly higher proportion of BERD than Manufacturing.

Inward and Country Perspective

As there are no data on Inward BERD we use the data on foreign ownership of domestic inventions to comment on the role of foreign firms in Greece. These data show that for the period 2011 to 2013[2], 40% of all inventions were in the hands of foreign firms. Of these 35% were owned by US companies, 42% by EU-28 companies and 23% by those from the rest of the world.

Patent applications filed under the PCT, with priority dates between 2011 and 2013

Share of patents owned by foreign organisations	40%
Share of US	35%
Share of EU28	42%
Rest of the world	23%

[1] http://ec.europa.eu/DocsRoom/documents/17839

[2] Priority dates of the patent

Country Profile: Hungary

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Country Summary

There are considerable problems with analysing the Inward BERD data for Hungary, the main one being the lack of detailed information on the Service sector before 2011. Additionally there are many missing values before this year. Nevertheless the analysis of the available data indicates that foreign firms are a very important component of BERD, contributing well over half the total. Their relative importance has grown since 2007 as they have increased their spending at a time when domestic firms' expenditure has slowed down. This has resulted in an upward trend in Inward R&D intensity.

Inward flows are highly concentrated, with firms from Germany, Sweden and France accounting for nearly 60% of the total. The relative importance of French and Swedish firms has declined since 2004 and that of German firms has increased. Non-EU firms, notably those from US and Israel, are also an important part of Hungarian R&D, accounting for around a quarter of total Inward BERD.

The most important sectors for foreign R&D within Manufacturing are Pharmaceuticals and Motor vehicles. Within Services, Wholesale & Retail trade and Other Business activities are important. In two of these, Motor vehicles and Wholesale & Retail trade, foreign firms predominate with more than 75% of total BERD. In Pharmaceuticals this proportion is more than 50%.

Background

The 2016 EU Innovation Union Scoreboard[1] describes Hungary as a *Moderate Innovator*, with performance levels that are below the EU average in most dimensions of innovation. In the period since 2003, R&D intensity more than doubled from 0.34% to 0.98% of GDP in 2014, with a dramatic increase since 2007 (i.e. after the financial crisis). A similar trend is visible in Total R&D (GERD) intensity, which increased from 0.99% in 2008 to 1.37% in 2014.

There has been a change in the structure of BERD with Manufacturing sectors decreasing in importance and the Service industries increasing. In 2013 Manufacturing accounted for 57% of total industrial R&D (down from 80% in 2003) and Services 39% (up from 19% in 2003). Within manufacturing, Pharmaceuticals is the most important research performer. In services, the most prominent are ICT and Computer related services. Hungary has a relatively large number of big firms amongst the R&D performers.[2]

Inward Perspective

There are considerable problems with analysing the Inward BERD data for Hungary, the main one being the lack of detailed information on the Service sector before 2011. Additionally there are many missing values in the data before this year. This means that in Figure 1 we focus only on Manufacturing as a whole, realising that an increasing important component of BERD in Hungary, the Service sector, is missing.

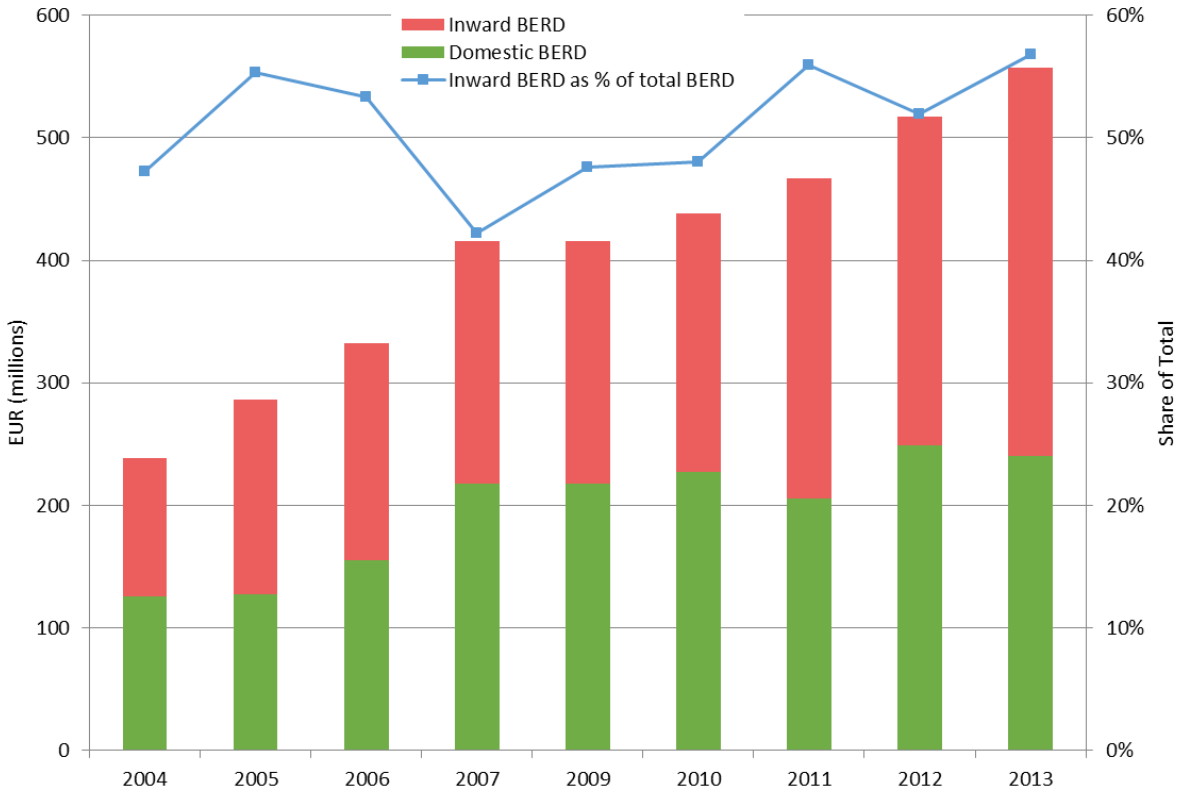
The first point to note is that Manufacturing BERD has increased rapidly in Hungary since 2004. During the whole period foreign firms have been a very important component, with their expenditures exceeding 50% of the total in a number of years. In terms of trends there are two distinct phases. The first is from 2004 to 2007 when BERD doubled in volume and the period since then where it has grown more slowly. Up to 2007 domestic firms were

[1] http://ec.europa.eu/DocsRoom/documents/17840

[2] https://rio.jrc.ec.europa.eu/en/country-analysis/Hungary/country-report

increasing their expenditures faster than their foreign counterparts. However since then the latter have continued to increase their spending on R&D (going from €184 million in 2007 to €280 million in 2013). At the same time Hungarian firms spent less in 2013 than in 2007. This has resulted in an upward trend in Inward R&D intensity.

Figure 1: Inward BERD, domestic BERD and inward BERD as % of total BERD (2003-2013)*



Source: Hungarian Central Statistical Office (HCSO), Eurostat
**Manufacturing only*

The country perspective[3]

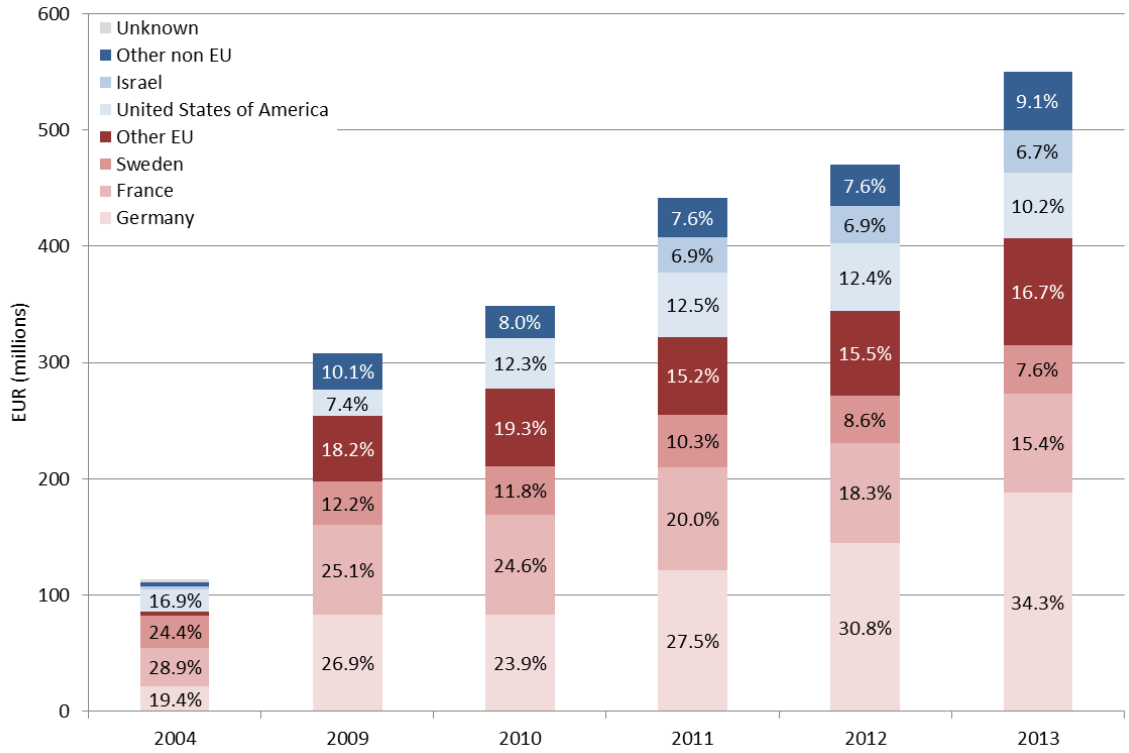
Inward BERD in Hungary is concentrated in firms from 3 EU countries: Germany, Sweden and France. Together these firms have accounted for just under 60% of all the inward flows since 2004. If we include US firms, then the level of concentration is even higher. For example in 2013 firms from these 4 countries were responsible for 68% of all foreign R&D.

The relative importance of these firms has followed different trajectories. French and Swedish firms have declined since 2004 and German firms have increased in importance. For example in 2010 German firms spent €83 million, by 2013 this had increased to €189 million. In the same period French firms continued to spend a steady €86 million and Swedish firms maintained an expenditure of around €42 million.

[3] As noted above, data on Inward R&D for Services are missing for Hungary for the period up to 2010. From 2011 onwards data on Services are included. Thus the data are not strictly comparable but give a good indication of trends.

Figure 2 shows that the non-EU firms, notably those from US and Israel, are an important part of foreign R&D. Together they account for around one-quarter of total Inward BERD.

Figure 2: Inward BERD - country of origin, Hungary, 2004 to 2013



Source: Hungarian Central Statistical Office (HCSO), Eurostat

The sectoral perspective

As already discussed there are considerable problems in analysing the sectoral data on Inward BERD due to missing values. Thus in Figures 3 and 4 we focus on the two years for which we have more detailed data: 2011 and 2013.

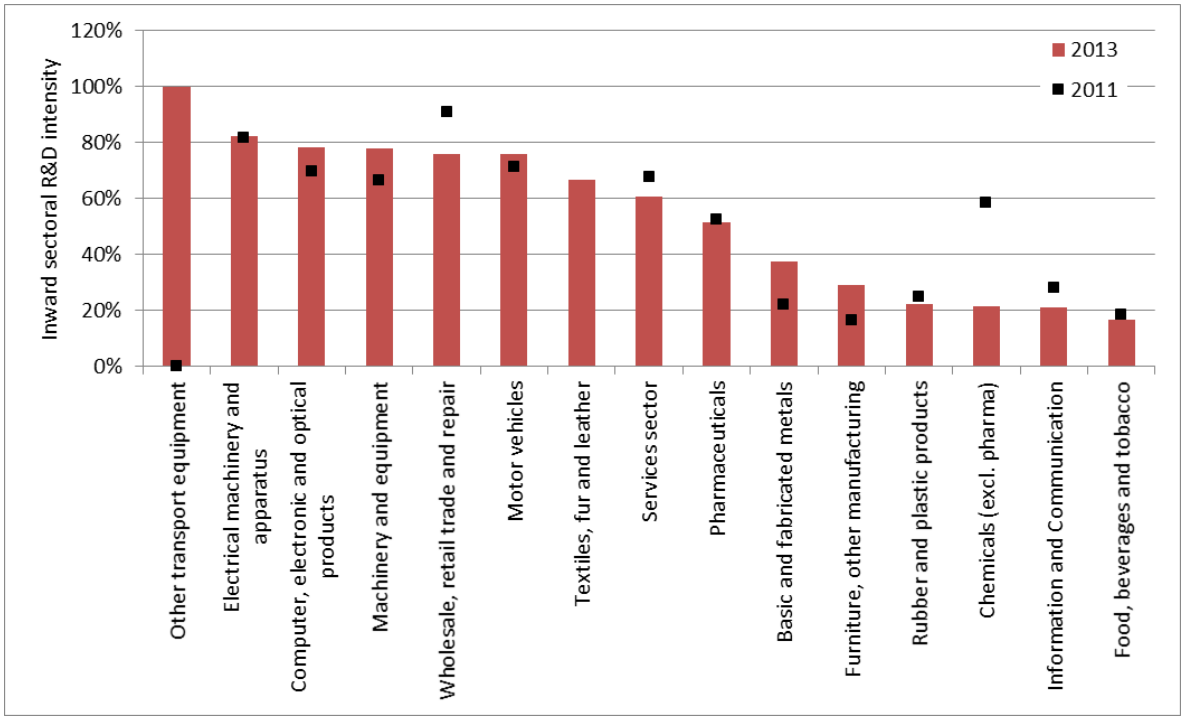
The most important sectors for foreign R&D are Pharmaceuticals and Motor vehicles within Manufacturing and Wholesale & Retail trade and Other Business activities within Services (Figure 3). Together these 4 account around 70% of Inward BERD. The trend since 2011 is decreasing importance of Pharmaceuticals and Wholesale & Retail trade and increasing importance of Other Business activities and Motor Vehicles.

A measure of foreign penetration in a sector is the inward R&D share: the ratio of inward BERD to total BERD within a sector. If we discount the sectors with very low levels of R&D activity (such as Other Transport equipment) then Figure 4 shows that foreign firms are of overwhelming importance in 5 sectors: Electrical machinery and apparatus, Computer, Electronic and Optical products, Machinery and equipment, Wholesale & Retail trade and Motor Vehicles. In another sector that is important in the Hungarian R&D system, namely Pharmaceuticals, the foreign penetration rate is more than 50%.

Figure 3: Shares of various industries on total inward BERD, Hungary, 2011 and 2013

Source: Hungarian Central Statistical Office (HCSO), Eurostat

Figure 4: Inward sectoral R&D Share (2011 and 2013)



Source: Hungarian Central Statistical Office (HCSO), Eurostat
Note: The inward sectoral R&D share is defined as inward BERD in sector Y / total BERD in sector Y
Total R&D in Other transport and equipment was €0.9 million in 2013 and €0.8 million in 2011

Country Profile: Ireland

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Country Summary

There are considerable problems in analysing Inward BERD for Ireland, with consistent data are only available for 3 years: 2008, 2010 and 2012. There is very little information on country distribution and none on sectoral composition. Nevertheless the available data show that Ireland is amongst the most internationalised countries in Europe, with foreign firms accounting for between 70% and 80% of total BERD. Scant information on the nationality of the investing firms shows that the dominant players in BERD are the US firms, accounting for more than 75% of Inward BERD.

Background

Ireland is classed as Strong Innovator in the 2016 EU IU Scoreboard[1], with increasing level of innovation until 2012. It is a country with amongst the highest level of Foreign Direct Investment in the EU. Business R&D intensity is around 1.1% of GDP and has remained stable. Total R&D (GERD) intensity has increased from 1.2 % of GDP in 2007 to 1.5% in 2014.

High tech services account for large proportion of BERD and their relative importance has increased over time. The country is also dominated by large multinational firms.

Inward Perspective

There are considerable problems in analysing Inward BERD for Ireland. For example consistent data are only available for 3 years: 2008, 2010 and 2012. While we report data for 2003, 2005 and 2007, these figures are not compatible with the subsequent years. The main conclusion from Figure 1 is that Ireland is amongst the most internationalised countries in Europe, with foreign firms accounting for between 70% and 80% of total BERD.

The country perspective

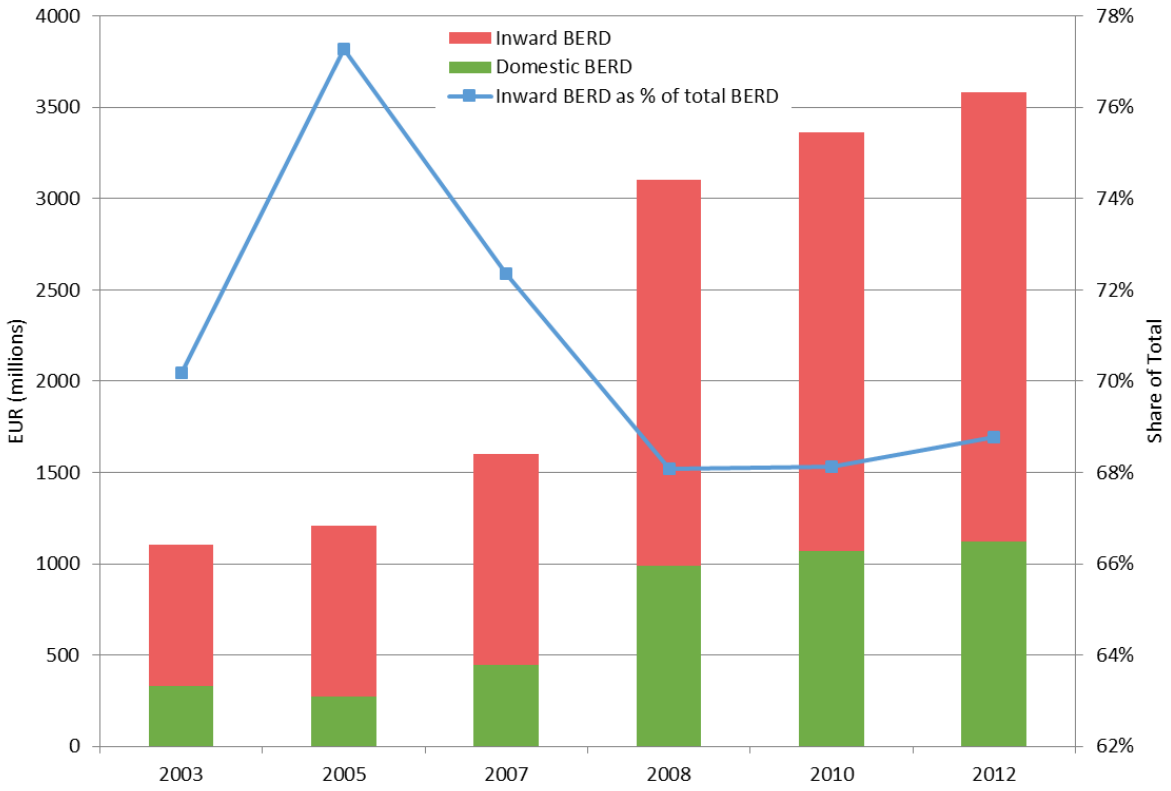
The data on country distribution of Inward BERD are missing for most years. The only available figures are for 2005 and are reported in Figure 2. As discussed above these are not consistent with the data for subsequent years. Nevertheless Figure 2 shows that Irish BERD is dominated by US firms accounting for more than 75% of Inward BERD in 2005.

The sectoral perspective

No data available.

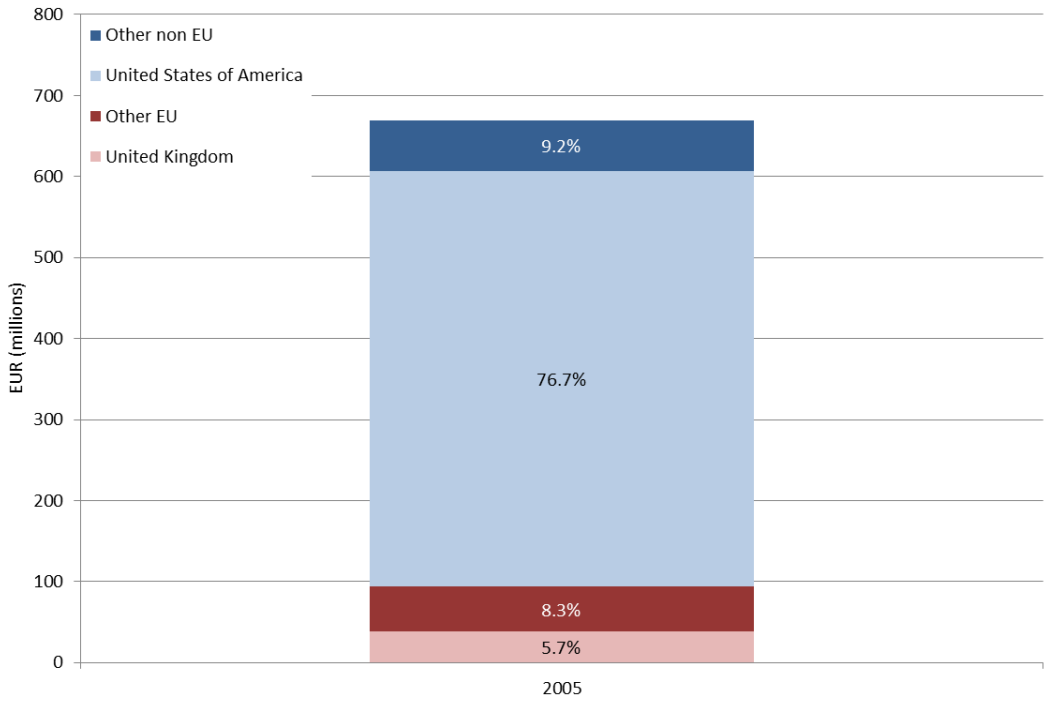
[1] http://ec.europa.eu/DocsRoom/documents/17842

Figure 1: Inward, domestic BERD and inward BERD as % BERD, 2003-2012



Source: Eurostat, OECD, Central Statistics Office (Ireland)

Figure 2: Inward BERD - country of origin, Ireland, 2005*



Source: OECD
*Only manufacturing

Country Profile: Israel

Internationalisation of business investments in R&D and analysis of their economic impact (BERD Flows)

December 2016

Frédérique Lang and Parimal Patel

SPRU

SPECIFIC CONTRACT 30-CE-0677869/00-21/A4/2014

Internationalisation of business expenditures on R&D and analysis of their economic impact (BERD Flows)

Implementing

Framework Contract n° - 30-CE-0496925/00-52

for the provision of Services in the Field of Research Evaluation and Research Policy Analysis ([1] 2010/S 172-262618) - Lot 2: Data collection and performance indicators to monitor European research policy

Country Summary

There are severe data limitations in analysing Inward BERD for Israel. Information is only available for a few years and suggests that foreign firms play a big role in industrial R&D, accounting for around 60% of total BERD. Firms from one country dominate these flows: the USA. The two sectors that predominate overall BERD are also most prominent in relation to Inward BERD: Computer Services and R&D Services. They account for nearly 80% of all foreign expenditures. In both these sectors foreign firms are responsible for more than 70% of all R&D.

Background

According to the 2016 EU Innovation Union Scoreboard[1] Israel is a *Strong Innovator*, with performance levels that are higher than the EU average in most dimensions of innovation. Its expenditure on industrial R&D as a proportion of GDP is amongst the highest in the world, averaging between 3% and 3.5% over the last 15 years. Two service sectors dominate total BERD: Computer Services and R&D Services, accounting for around two-thirds of the total.

Inward Perspective

Data on Inward BERD for Israel are severely limited, hence this report is based on two years for which we have relatively more information: 2010 and 2011.

Foreign firms are very important for Industrial R&D in Israel. They account for more than 60% of total spending on BERD.

The country perspective

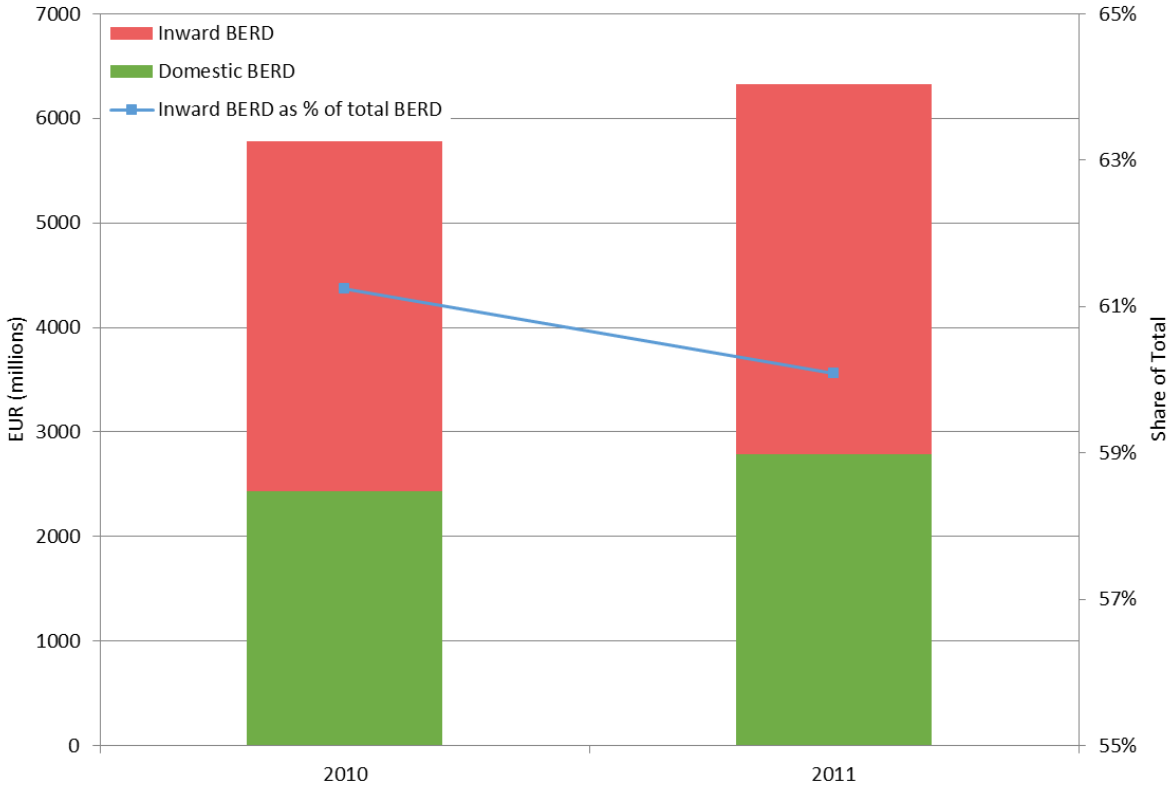
Given the close relationship between the two countries, it is not surprising to note that firms from the US dominate foreign R&D in Israel, accounting for nearly 60% of the total inflows. Dutch firms are also present as are firms from a number of other EU countries.

The sectoral perspective

The two sectors that predominate overall BERD are also the two that are most prominent in relation to foreign R&D: Computer Services and R&D Services. They account for nearly 80% of all inflows (Figure 3). Figure 4 shows that in both Computer Services and R&D Services foreign firms are of overwhelming importance, accounting for more than 70% of total R&D.

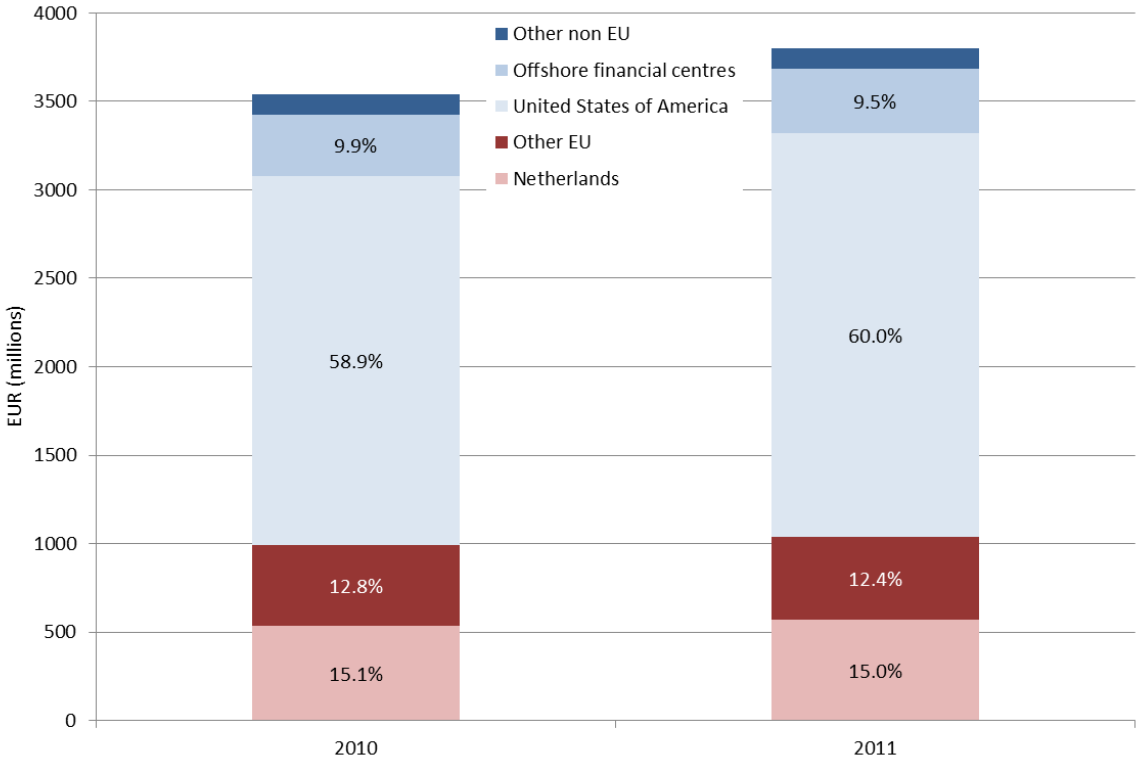
[1] http://ec.europa.eu/DocsRoom/documents/17843

Figure 1: Inward BERD, domestic BERD and inward BERD as % of total BERD (2010-11)



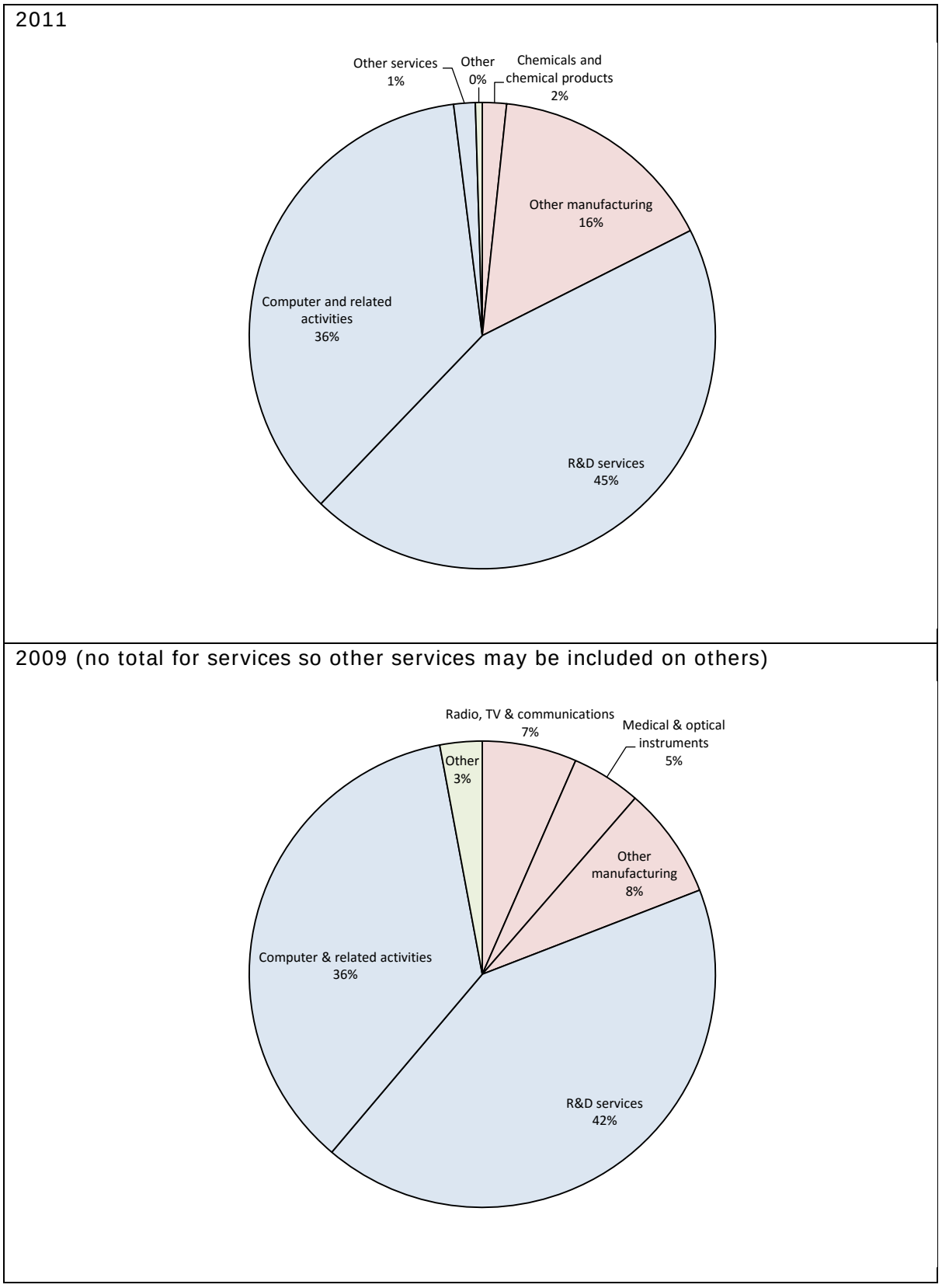
Source: OECD, Israel Central Bureau of Statistics

Figure 2: Inward BERD - country of origin, Israel, 2010 and 2011



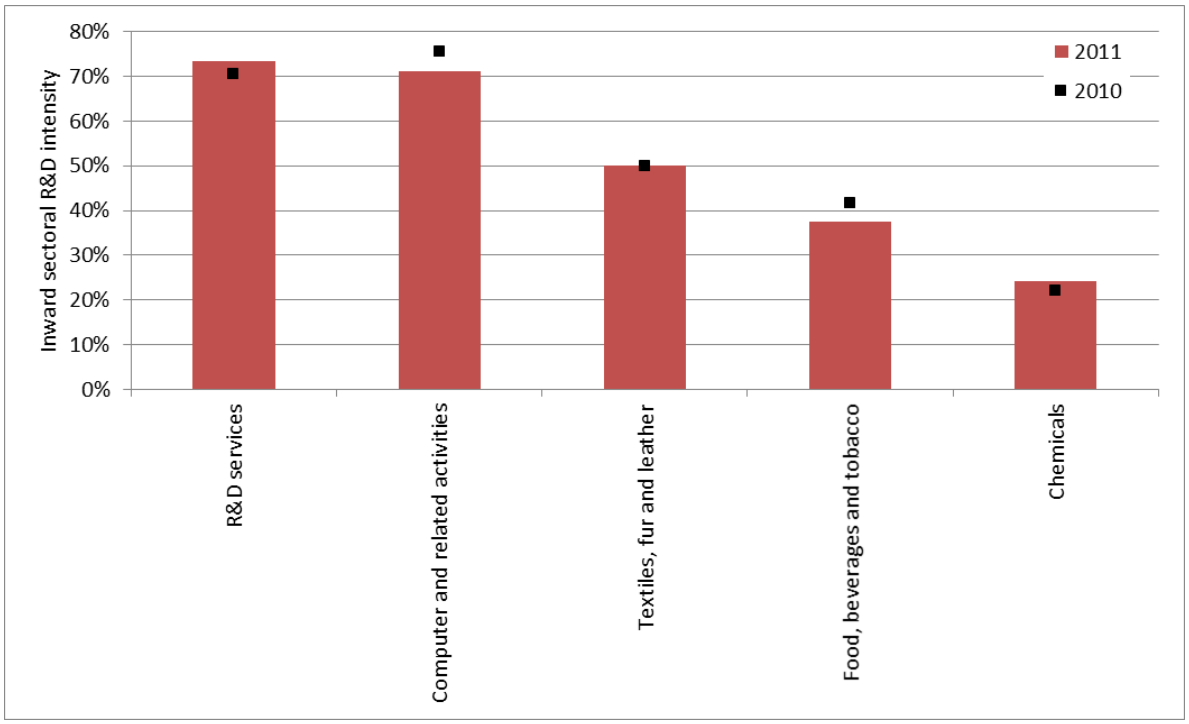
Source: OECD

Figure 3: Shares of various industries on total inward BERD, Israel, 2009 and 2011



Source: OECD, Israel Central Bureau of Statistics

Figure 4: Inward sectoral R&D Share (2010 and 2011)



Many sectors are missing
Note: The inward sectoral R&D share is defined as inward BERD in sector Y / total BERD in sector Y
Source: OECD, Israel Central Bureau of Statistics

Country Profile: Italy

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Country Summary

There are considerable problems in analysing the trend in Inward BERD for Italy. For example there are no data on Services after 2007, and all information between 2008 and 2010 is missing. Moreover there are many missing values in sectoral and country distributions. Despite these issues we can arrive at the following conclusions.

Foreign firms play a modest role in Italian industrial R&D, accounting for around 25% of total BERD from 2003 to 2013. The most important foreign investors in R&D in Italy are US firms, spending nearly €500 million in 2013, with a share of around 27% of total inward flows. Firms from Germany, France and Switzerland are also significant players.

The most important sectors for Inward BERD are Machinery and Equipment, Chemicals (including Pharmaceuticals), Motor Vehicles and Computer, Electronic and Optical Products. Within these sectors foreign firms play a large role in the first two, with a share of more than one-third of BERD.

Background

The 2016 EU Innovation Union Scoreboard[1] describes Italy as a *Moderate Innovator*, with performance levels that are below the EU average in most dimensions of innovation. BERD intensity is low but has been increasing slowly since 2007. In the period up to 2007, industrial R&D accounted for around 0.5% of GDP, but has risen since then to 0.7% of GDP in 2014. A similar upward trend can be seen in Total R&D (GERD) intensity, increasing from 1.1% of GDP in 2007 to 1.3% in 2014.

Manufacturing accounts for more than 70% of BERD and this proportion has remained stable over time. The most important sectors performing industrial R&D are Motor vehicles, Computer, Electronic and Optical Products, and Machinery and Equipment. Within services two sectors are relatively more important: ICT services and R&D services.

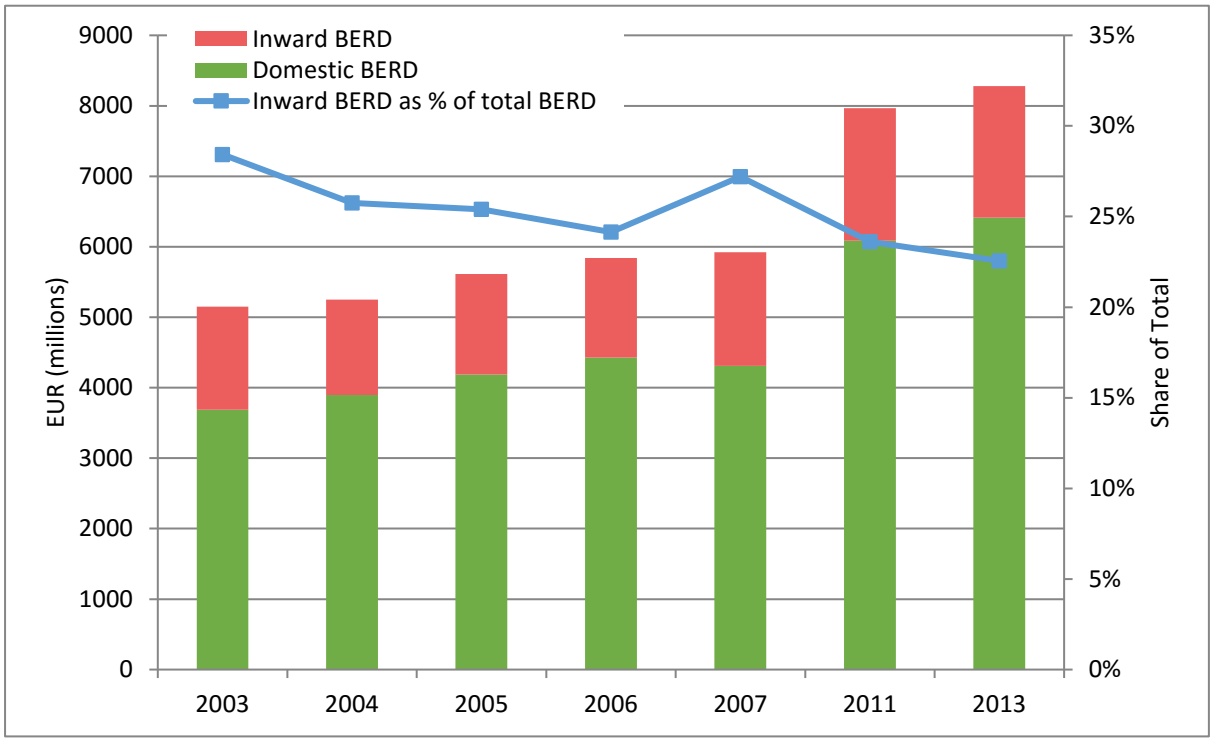
Inward Perspective

There are considerable problems in analysing Inward BERD for Italy. There are no data for 2008-2010, and from 2011 to 2013 the only available figures are for Manufacturing only. Thus services are missing for most of the years under consideration. These issues are important in interpreting the trends over time.

Figure 1, which is based on the Manufacturing industries, shows that foreign firms play a modest role in Italian industrial R&D. Their share of total BERD has remained steady in a range around 25% from 2003 to 2013. In terms of trends, they reduced their expenditures from €1,464 million in 2003 to €1,410 million in 2006 but have since increased them to €1,867 in 2013. Overall the increases in total BERD for Italy since 2007 have been fuelled by domestic firms.

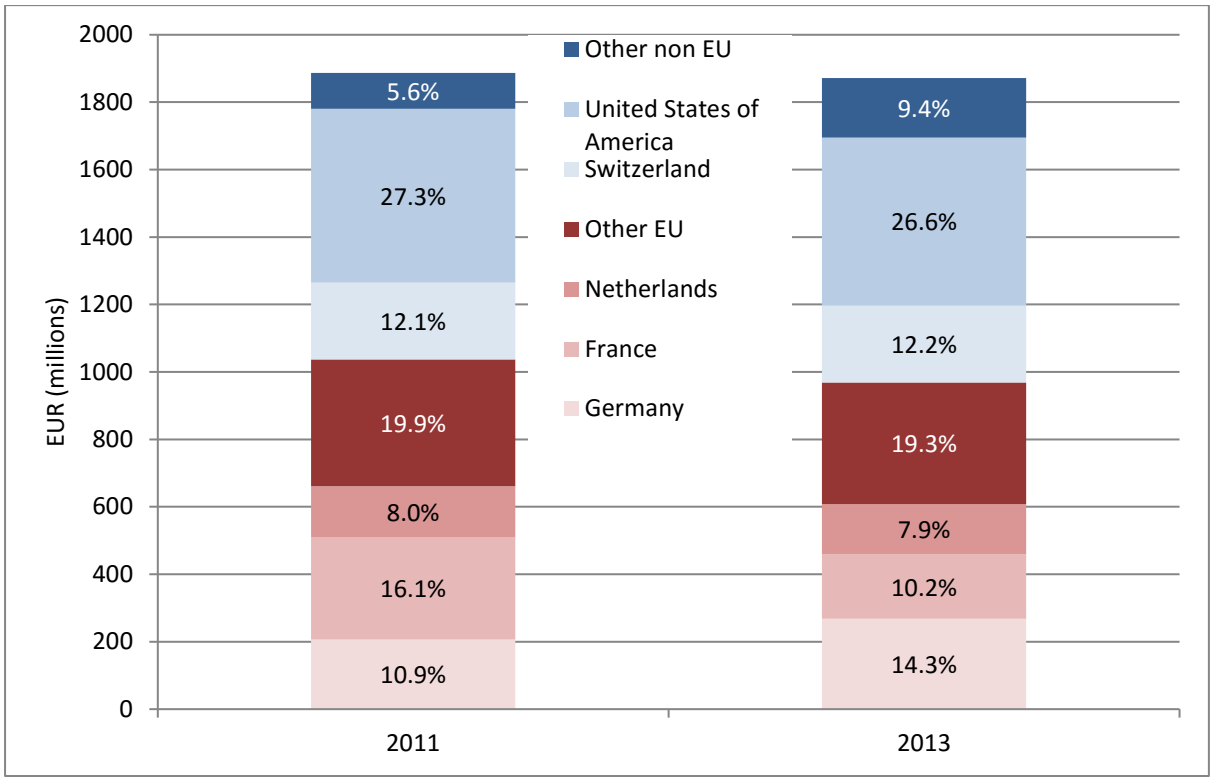
[1] http://ec.europa.eu/DocsRoom/documents/17844

Figure 1: Inward BERD, domestic BERD and inward BERD as % of total BERD (2003-13)



Manufacturing only
Source: OECD, Eurostat

Figure 2: Inward BERD - country of origin, Italy, 2011 and 2013



Total BERD less Services
Source: Eurostat

The country perspective

The lack of data by country of origin over time means that it is difficult to analyse time trends. Figure 2 (based on Total BERD less Services) shows that most important investors in R&D in Italy are US firms, spending nearly €500 million in 2013. They are responsible for around 27% of all inward flows. In second tier are firms from Germany, France and Switzerland with expenditures around €200 million in 2013, and accounting for between 10% and 14% of the total. French firms have reduced their spending from 2011 to 2013 and German firms have shown an increase.

The other significant investors in Italian R&D are firms based in a range of other EU countries, for example those from the Netherlands, and to a smaller extent those from Sweden, UK and Belgium (included in the 'Other EU' in Figure 2)

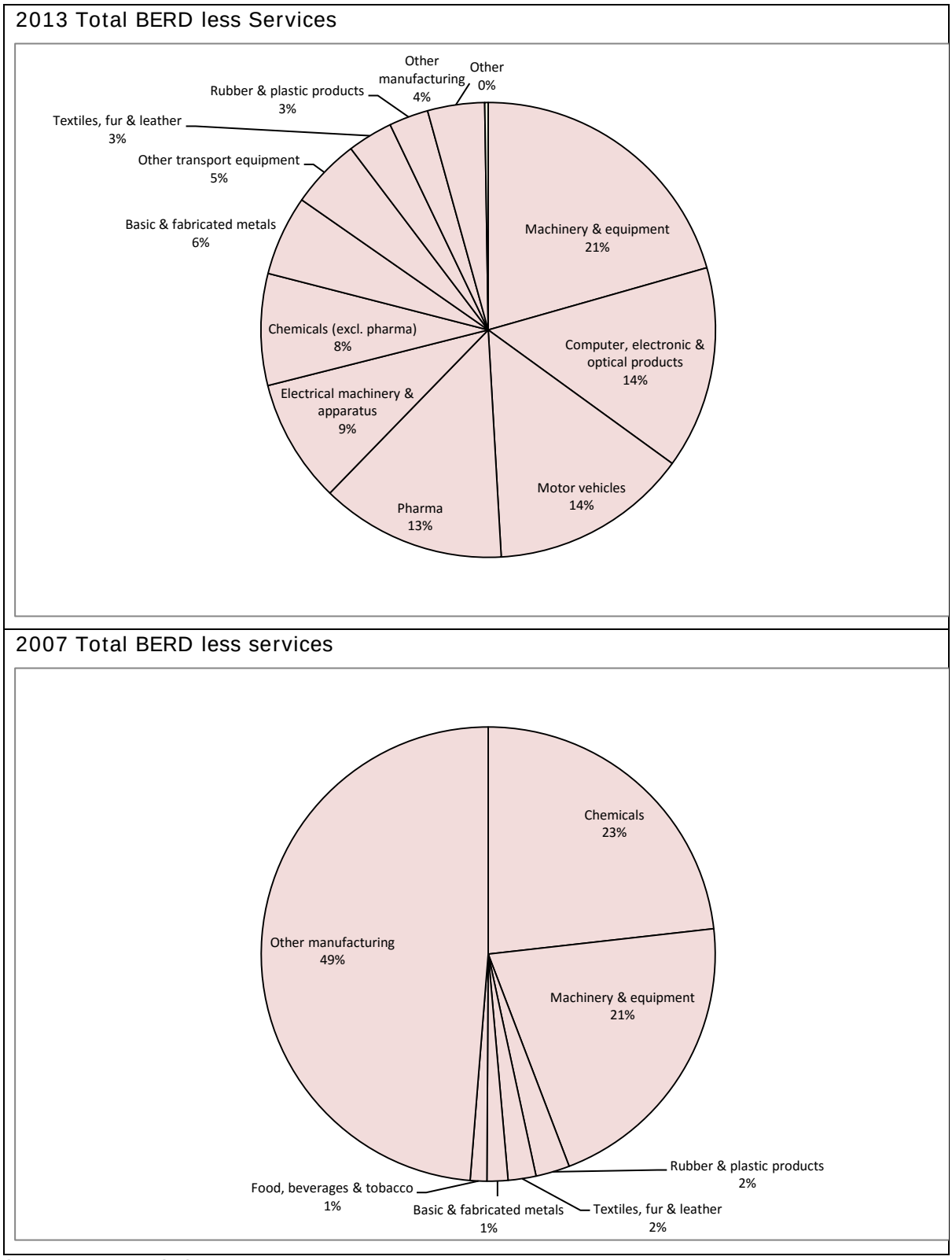
The sectoral perspective

The problems with analysing Inward BERD data by sector are illustrated in Figure 3. In 2007 data availability means that we can present the sectoral distribution for Total Inward BERD. However in 2013 the lack of data on Services results in a distribution based on Manufacturing only. This implies that comparisons over time are difficult to make. The other data issues are also highlighted in this figure. In 2007, there is no disaggregation by sector for just under half of BERD, labelled here as 'Other Manufacturing'. Presumably this includes Motor Vehicles and Computer, Electronic and Optical Products which are the most important sectors in overall BERD, and are shown to be important for Inward BERD in 2013. Additionally in 2007 there is no figure for Pharmaceuticals (only for Chemicals as a whole), when this is important part of inward flows of R&D as shown in the pie-chart for 2013.

Despite these issues, we can conclude that Machinery and Equipment, Chemicals (including Pharmaceuticals), Motor Vehicles and Computer, Electronic and Optical Products are amongst the most important sectors in terms of foreign R&D expenditures. A range of private services (Computer services, R&D services and Other Business services) are also probably important for inward R&D flows.

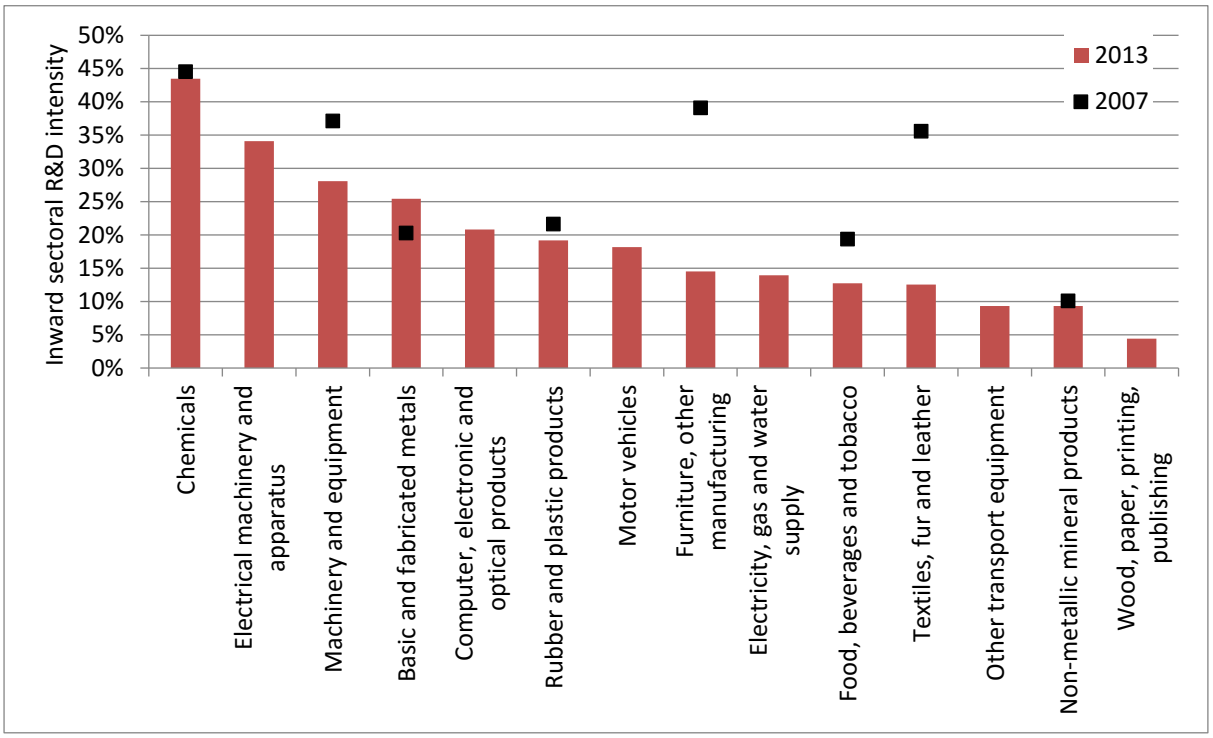
A measure of foreign penetration in a sector is the inward R&D share: the ratio of inward BERD to total BERD within a sector. According to this measure (Figure 4) the most internationalized sectors are Chemicals (including Pharmaceuticals) and Electrical equipment where foreign firms account for more than one-third of total R&D. Motor Vehicles and Computer, Electronic and Optical Products have a much lower penetration rate of 20% or under.

Figure 3: Shares of various industries on total inward BERD 2007 and 2013



Source: Eurostat, OECD

Figure 4: Inward sectoral R&D Share(2007 and 2013)



Note: No Services included here.

The inward sectoral R&D share is defined as inward BERD in sector Y / total BERD in sector Y
Source: Eurostat, OECD

Country Profile: Japan

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Country Summary

Foreign firms play a negligible role in R&D activities in Japan, accounting for around 5% of total BERD. After a period of expansion up to 2009, their expenditures have declined sharply in the last few years.

There are considerable difficulties in analysing foreign R&D in Japan by nationality of companies as there are no data available after 2007. The information from 2003 to 2007 shows that by far the largest foreign investors are EU firms, with 80% of the total. Within this group French firms are by far the biggest contributors, responsible for around 60% total Inward BERD.

It is difficult to come to any firm conclusions on the relative importance of different sectors due to lack of consistency in the data over time. One definitive finding is that in the period up to 2007 by far the largest share of foreign R&D (over 60%) belonged to the Motor Vehicles sector. The other is that in the period since 2010, Pharmaceuticals occupies this position with a share of around 45%.

Background

Japan is amongst the world innovation leaders. It has consistently spent around 2.5% of GDP on industrial R&D, despite two decade of slow economic growth. In 2014 BERD intensity was 2.8% and Total R&D (GERD) intensity was 3.5% of GDP in 2013.

BERD is dominated by Manufacturing industries, which account for more the 80% of the total. Amongst these 3 industries are predominant, namely, Computer, Electronic and Optical Products, Motor vehicles and Chemicals. Together they performed 65% of total BERD in 2013.

Inward Perspective

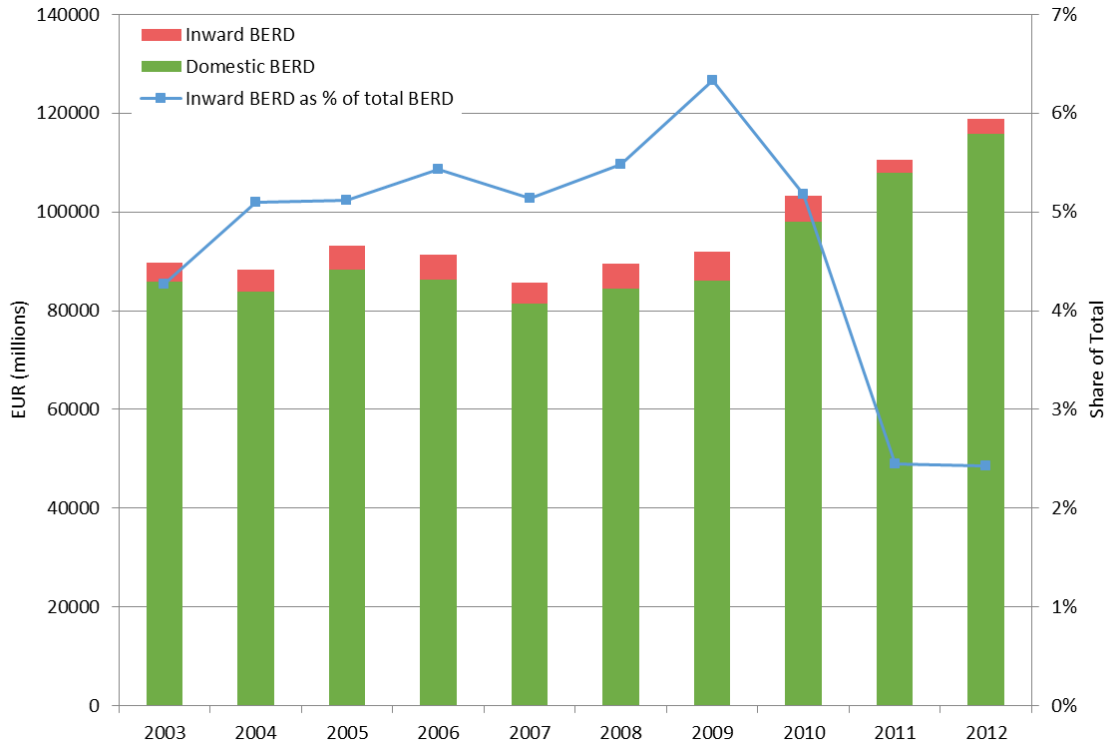
Amongst the leading R&D spending countries in the world, Japan occupies an extreme position in terms of the role of foreign firms in national R&D. As shown in Figure 1, on average inward flows accounted for less than 5% of total R&D in the period 2003 to 2012.

Detailed data show that foreign expenditures in Japan increased from €3.8 billion to €5.8 billion in 2009. However since then they have declined sharply reaching a value of €2.9 billion in 2012. In the same period expenditures by Japanese firms have risen steeply from €86.1 billion in 2009 to €115.9 billion in 2012.

The country perspective

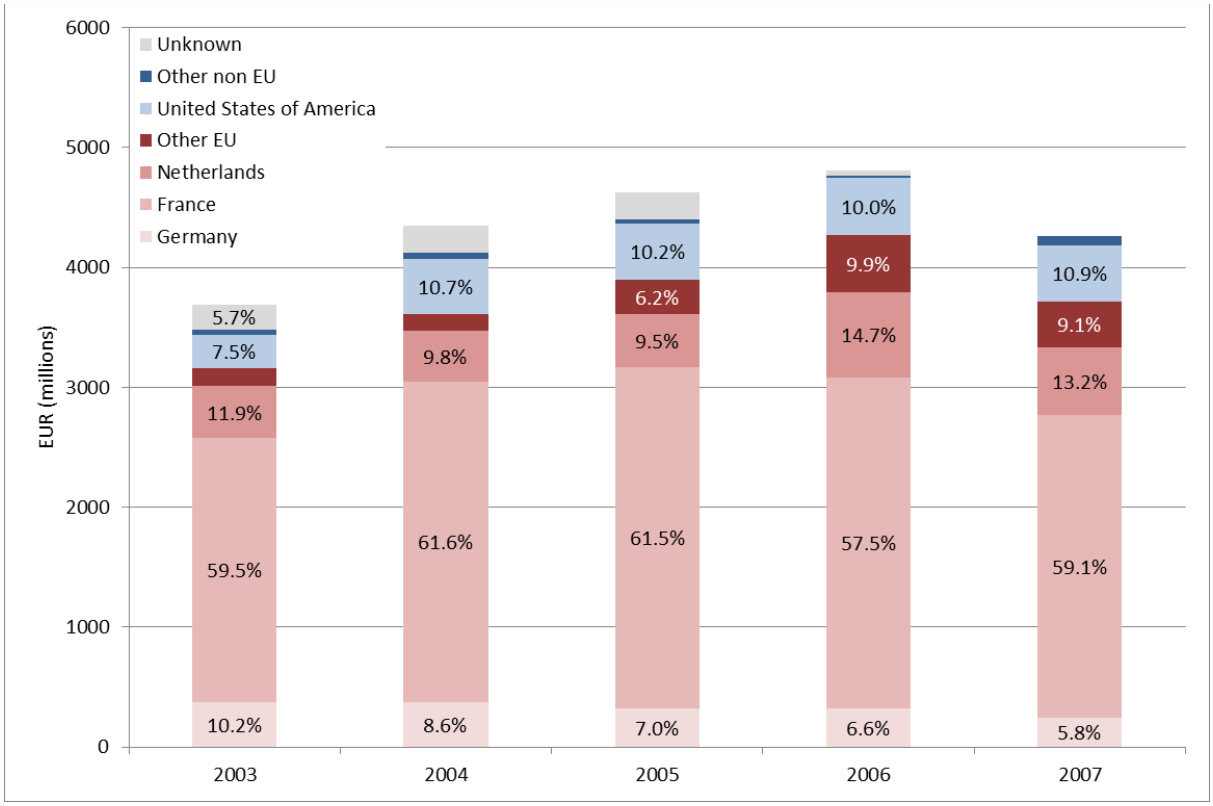
There are considerable difficulties in analysing Inward BERD by country, the main one being the lack of data after 2007. Thus Figure 2 only shows the country distributions from 2003 to 2007. Main point to note is that EU firms are the largest investors of foreign R&D in Japan with more than 80% of the total spend. Amongst these, firms from France are by far the largest contributors, with average expenditures of €2.6 billion throughout the period 2003 to 2007. They are responsible for around 60% of total Inward BERD. The other notable contributors are firms from the Netherlands and those from USA, accounting for around 10% of the total.

Figure 1: Inward BERD, domestic BERD and inward BERD as % of total BERD (2003-2012)



Source: OECD, Eurostat

Figure 2: Inward BERD - country of origin, Japan , 2003 to 2007*



Source: OECD
*Data for Manufacturing only.

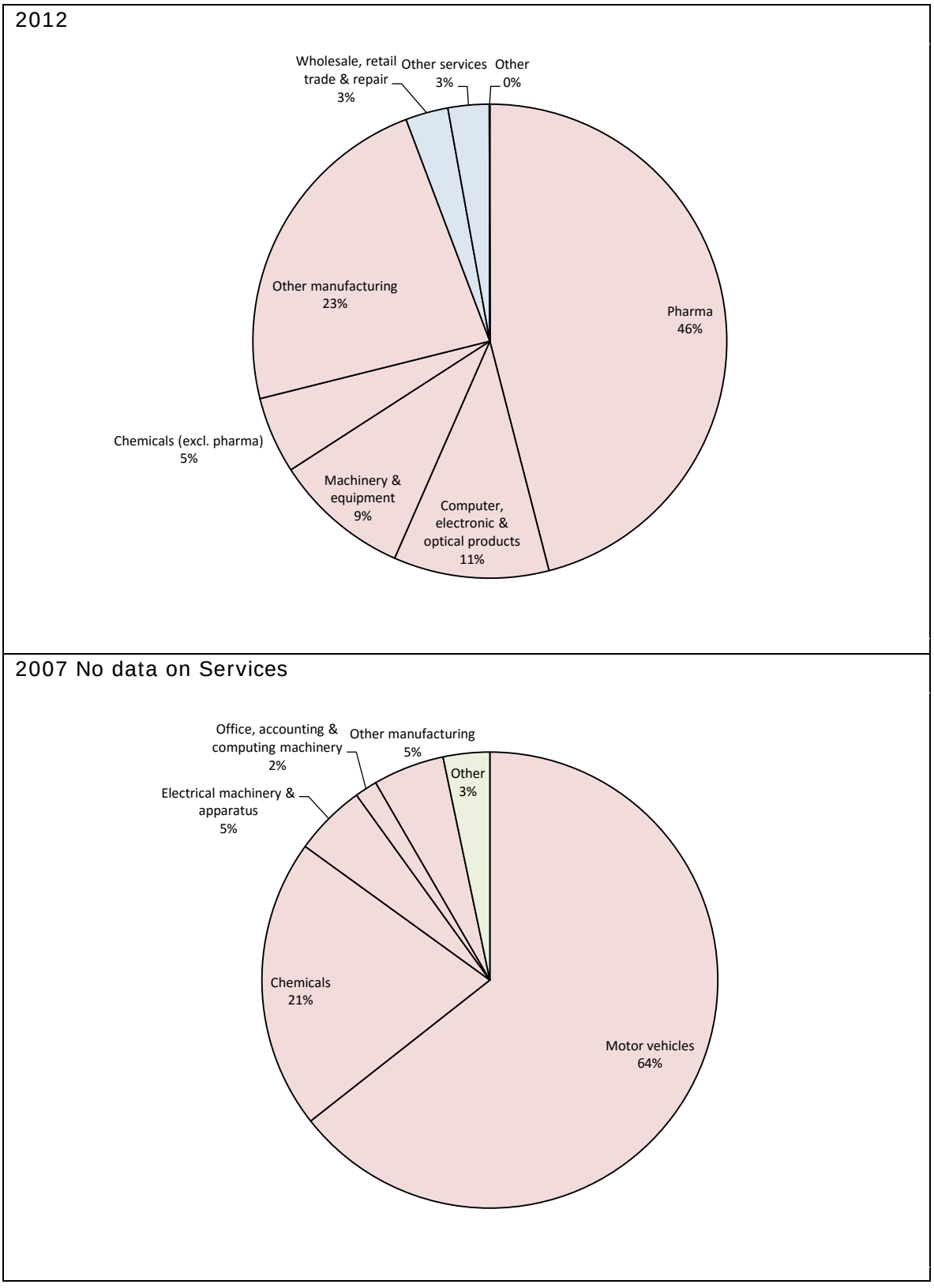
The sectoral perspective

Data by sector are limited with many missing values. First there is no information on Services in 2007. Secondly for some important sectors availability is sporadic. For example (as shown Figure 3) Motor Vehicles, with by far the largest share of foreign R&D in 2007, does not appear in the dataset after this year. Similarly Pharmaceuticals, an important sector according to the data in 2012 does not appear in the dataset before 2008. This makes it difficult to come to any definitive conclusions on the relative importance of different sectors.

However two findings can be highlighted. First is that Motor Vehicles is by far the largest sector in Inward BERD, with a share of more than 60% in the period 2003 to 2007. Subsequently this accolade belongs to Pharmaceuticals, accounting for around 45% of the total foreign spend.

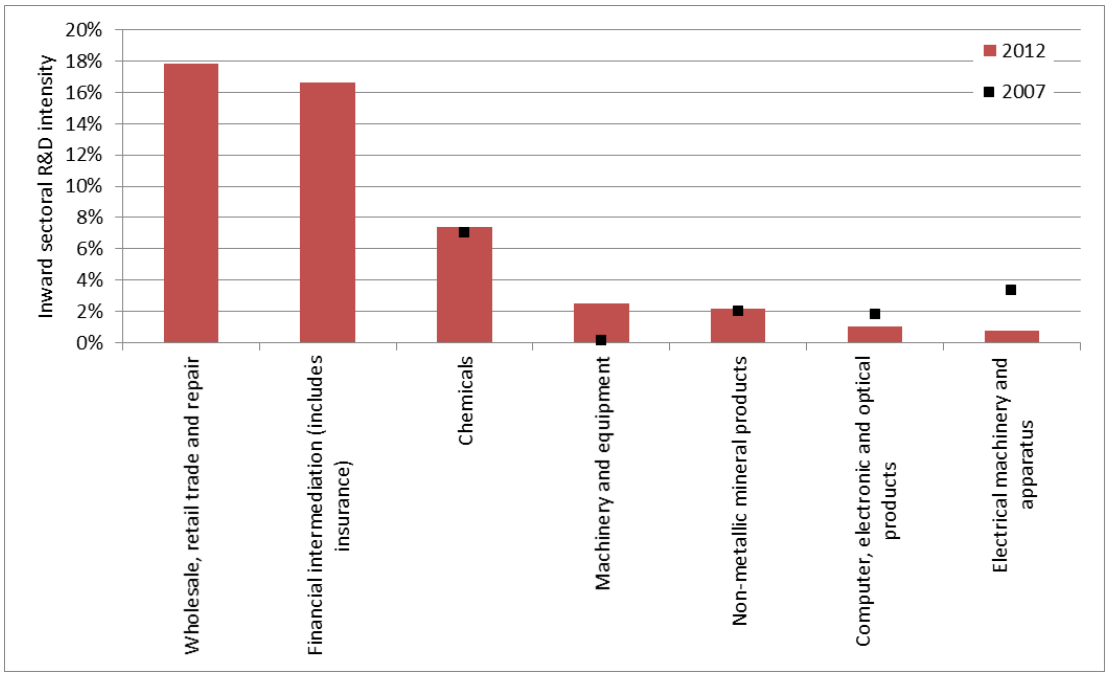
A measure of foreign penetration in a sector is the inward R&D share: the ratio of inward BERD to total BERD within a sector. According to this measure (Figure 4) the most internationalized sectors are two Service sectors: Wholesale and Retail Trades and Financial Services. Chemicals also has a relatively high share of foreign R&D expenditures.

Figure 3: Shares of various industries on total inward BERD, Japan, 2007 and 2012



Source: OECD

Figure 4: Inward sectoral R&D Share(2007 and 2012)



Note: The inward sectoral R&D share is defined as inward BERD in sector Y / total BERD in sector Y
For Computer, electronic and optical products, the 2007 figure is for Office accounting and computing machinery.
Source: Eurostat, OECD

Country Profile: Latvia

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Country Summary

There are severe data limitations in analysing international flows of business R&D for Latvia. The most important limitation is that there is no information after 2007. Even in the period 2003 to 2007 sectoral breakdowns are missing. Thus it is difficult come to any firm conclusions about the role of foreign firms in Latvia on the basis of the available information.

The available data suggest that foreign firms play a negligible role in R&D for Latvia, accounting for less than 5% of BERD. Firms based in two EU countries are the most important investors: Denmark and Germany. The relative importance of Danish firms has increased and that of German firms decreased.

Background

According to the Innovation Union Scoreboard 2016 (IUS) Latvia is a *Moderate Innovator* with relative performance levels well below the EU average.[1] Expenditure on industrial R&D is very low, averaging around €35 million in the last 15 years. Hence BERD intensity is lowest amongst the EU countries, standing at 0.24% GDP in 2014. Total R&D (GERD) intensity is also low, with a value of 0.68% of GDP in 2014.

Service industries are an important component of BERD, accounting for more than half of the total in the period from 2003 to 2010. However since 2011 the share of Manufacturing has increased to around 60%. The most important industries are Chemicals (including Pharmaceuticals) and R&D services.

Inward Perspective

There is a major problem regarding data availability in analysing Inward BERD for Latvia. Firstly data are only available for 2003 to 2007. Second there is no sectoral distribution. There is a lack of consistency in the country breakdowns and the numbers are very small. For example total inward R&D amounts to less than €1 million throughout the period.

The available data suggest that foreign firms play a negligible role in R&D for Latvia. Their share is less than 5% throughout the period (Figure 1).

The country perspective

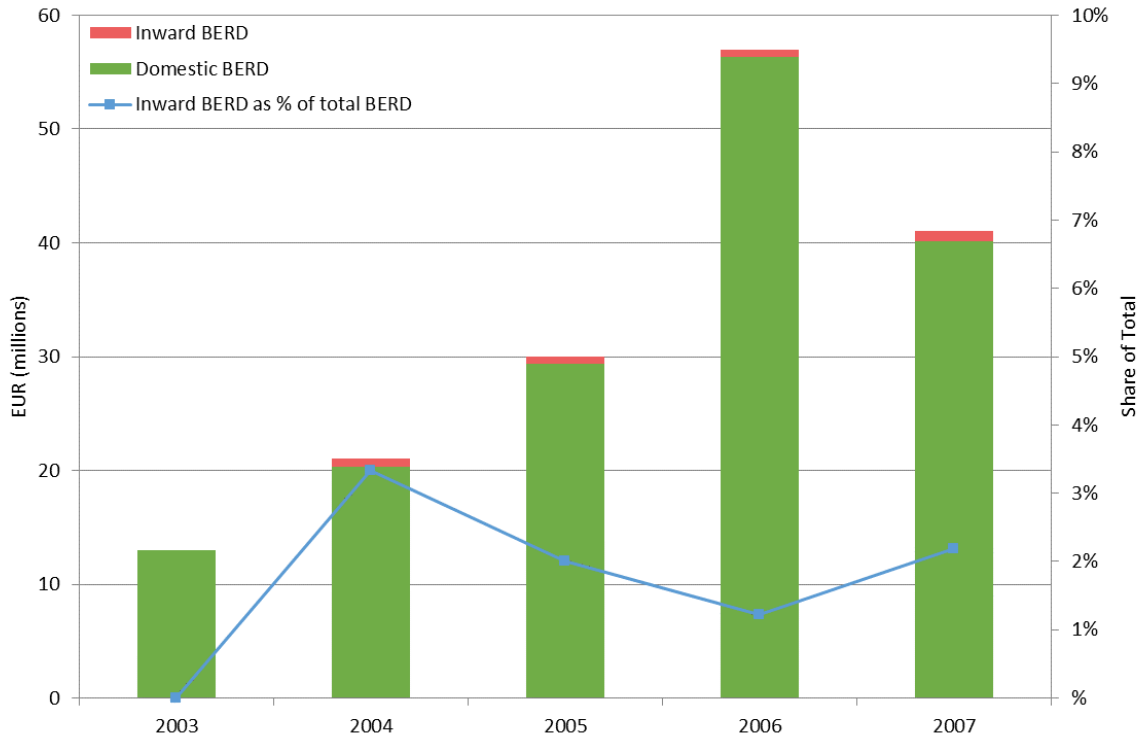
Given the small numbers involved, it is difficult to conclude on the relative importance of firms from different countries in Inward BERD. Figure 2 shows that firms based in two EU countries are the most important investors: Denmark and Germany. The relative importance of Danish firms has increased and that of German firms decreased.

The sectoral perspective

Data not available

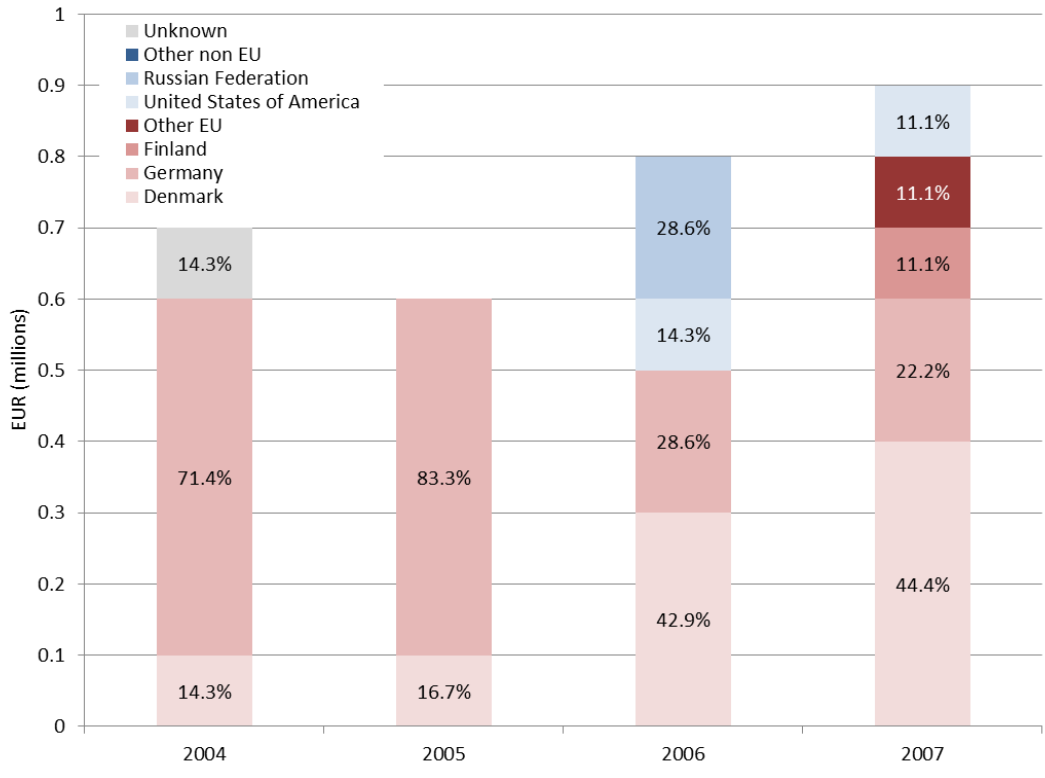
[1] http://ec.europa.eu/DocsRoom/documents/17845

Figure 1: Inward, domestic BERD and inward BERD as % of BERD, 2003-2007



Source: Eurostat

Figure 2: Inward BERD by country of origin, Latvia, 2004 to 2007



Source: Eurostat
Missing data in 2003. In 2006 the sum of country expenditures is greater than reported total Inward BERD.

Country Profile: Lithuania

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Country Summary

Data on Inward BERD for Lithuania are not available. This report uses other ad hoc data to comment on the role of foreign firms. The data on patenting show that foreign firms are of minor importance in national technology creation, accounting for around 17% of all patents in 2011 to 2013. Other EU firms are the most important actors.

Background

Lithuania is classed as *Moderate Innovator* in the 2016 EU IU Scoreboard[1], with performance below the EU average in most dimensions of innovation. Industrial R&D (BERD) intensity is very low, less than 0.3% of GDP for most of the period since 2005. In terms of trends, this intensity has increased from 0.15% in 2005 to 0.30% in 2014. In the same period Total R&D (GERD) intensity has increased from 0.75% of GDP in 2005 to 1.01% in 2014. This points to the important role of public R&D in the country. Services account for a much larger proportion of BERD than Manufacturing.

Inward and Country Perspective

As there are no data on Inward BERD we use the data on foreign ownership of domestic inventions to comment on the role of foreign firms in Lithuania. These data show that for the period 2011 to 2013[2], 17% of all inventions were in the hands of foreign firms. Of these 5% were owned by US companies, 63% by EU-28 companies and 32% by those from the rest of the world.

Patent applications filed under the PCT, with priority dates between 2011 and 2013

Share of patents owned by foreign organisations	17%
Share of US	5%
Share of EU28	63%
Rest of the world	32%

[1] http://ec.europa.eu/DocsRoom/documents/17846

[2] Priority dates of the patent

Country Profile: Luxembourg

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Country Summary

Data on Inward BERD for Luxembourg are not available. This report uses other ad hoc data to comment on the role of foreign firms. The data on patenting show that foreign firms are important actors in national technology creation, accounting for around 30% of all patents. EU-28 firms account for just over one half of all foreign inventions.

Background

Luxembourg is classed as *Strong Innovator* in the 2016 EU IU Scoreboard[1], with performance levels above the EU average in a number of dimensions of innovation and indicators. BERD intensity has been high but on a declining path since 2005. Thus the value was 1.4% of GDP in 2005 but has declined to 0.66% in 2014. The decline in Total R&D (GERD) intensity is not as pronounced, going from 1.59% of GDP in 2005 to 1.26% in 2014. This suggests that public sector R&D has become relatively more important performer of R&D over time. Services, especially Financial Services, are the most important component of BERD.

Inward and Country Perspective

As there are no data on Inward BERD we use the data on foreign ownership of domestic inventions to comment on the role of foreign firms in Luxembourg. These data show that for the period 2011 to 2013[2], 30% of all inventions were in the hands of foreign firms. Of these 29% were owned by US firms and 51% by EU-28 companies, and the remaining 20% by those from the rest of the world.

Patent applications filed under the PCT, with priority dates between 2011 and 2013

Share of patents owned by foreign organisations	30%
Share of US	29%
Share of EU28	51%
Rest of the world	20%

[1] http://ec.europa.eu/DocsRoom/documents/17847

[2] Priority dates of the patent

Country Profile: Malta

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Country Summary

Data on Inward BERD for Malta are not available. This report uses other ad hoc data to comment on the role of foreign firms. The data on patenting show that foreign firms are important actors in national technology creation, accounting for around 50% of all patents. Moreover, EU-28 firms account for an overwhelming share of foreign inventions.

Background

Malta is classed as *Moderate Innovator* in the 2016 EU IU Scoreboard[1], with performance levels below the EU average in most dimensions of innovation and indicators. Industrial R&D (BERD) intensity is low, less than 0.5% of GDP for most of the period from 2005 to 2014. In terms of trends this intensity has increased from 0.38% in 2005 to 0.51% in 2014. The same trend can be observed in Total (GERD) intensity, which increased from 0.53% of GDP to 0.83% in 2014. Services, especially Business Services, are the most important component of BERD.

Inward and Country Perspective

As there are no data on Inward BERD we use the data on foreign ownership of domestic inventions to comment on the role of foreign firms in Malta. These show that for the period 2011 to 2013[2], 50% of all inventions were in the hands of foreign firms. Of these 18% were owned by US companies and 82% by EU-28 companies.

Patent applications filed under the PCT, with priority dates between 2011 and 2013

Share of patents owned by foreign organisations	50%
Share of US	18%
Share of EU28	82%
Rest of the world	0%

[1] http://ec.europa.eu/DocsRoom/documents/17848

[2] Priority dates of the patent

Country Profile: Netherlands

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Country Summary

Foreign firms are an important component of R&D in the Netherlands, accounting for just under one-third of total BERD from 2008 to 2013.[1] While Inward BERD increased by 26% from 2008 to 2011, it has stagnated since then. In the meantime Domestic firms have increased their investments in R&D greatly in the last few years.

There is a high degree of concentration in the country distribution of Inward R&D for the Netherlands and this is dominated by non-EU firms. For example firms headquartered in the USA and Japan account for around half of all inward flows. The former are by far the largest investors with a share of around 40%. Japanese companies have more than doubled their expenditures since 2009. Indian companies have also risen in prominence, spending around €78 million in 2013. Of the EU firms the most prominent are German and French firms. The former have increased their expenditures more than 3-fold since 2009.

While Manufacturing remains the main focus of Inward BERD, Service sectors have become relatively more important over time. The most prominent Manufacturing industries are Pharmaceuticals, Chemicals, Machinery and Equipment, and Computer, Electronic and Optical products. Within Services, majority of foreign firms are concentrated in R&D services, ICT services, and Computer services. An important trend has been the relative decline of the importance of Pharmaceuticals in Inward BERD, going from 28% of the total in 2008 to 11% in 2013. This is also an industry where R&D that is dominated by foreign firms.

Background

Netherlands is classed as *Innovation Leader* in the 2016 EU Innovation Union Scoreboard.[2] Its performance is above the EU average for most dimensions of innovation and the level of innovation performance has been increasing over time. While industrial R&D expenditures were more or less stagnant until 2009, the period since then has seen high levels of growth. This has resulted in BERD intensity increasing from 0.79% of GDP in 2009 to 1.11% in 2014. Total R&D (GERD) intensity also shows a similarupward trend and stands at 1.97% of GDP in 2014.

While Manufacturing industries remain predominant, the share of Services has increased from 17% of total BERD in 2003 to 34% in 2013. Within manufacturing the most important industries are Computer, Electronic and Optical products, Machinery and Equipment and Chemicals (including Pharmaceuticals). The two most important service sectors are R&D services and Information and Communications services. Large firms are important actors in R&D performance as witnessed by the presence of a number of national firms in the largest R&D investors worldwide in 2015.[3]

Inward Perspective

Foreign firms are an important component of industrial R&D in the Netherlands. As shown in Figure 1 they account for just under one-third of total BERD. There have been small changes in this share over the period 2008 to 2013.

From 2008 to 2011 the expenditures of foreign firms increased by 26%, from €1,556 million to €1,966 million. However since then they have stagnated. In the meantime

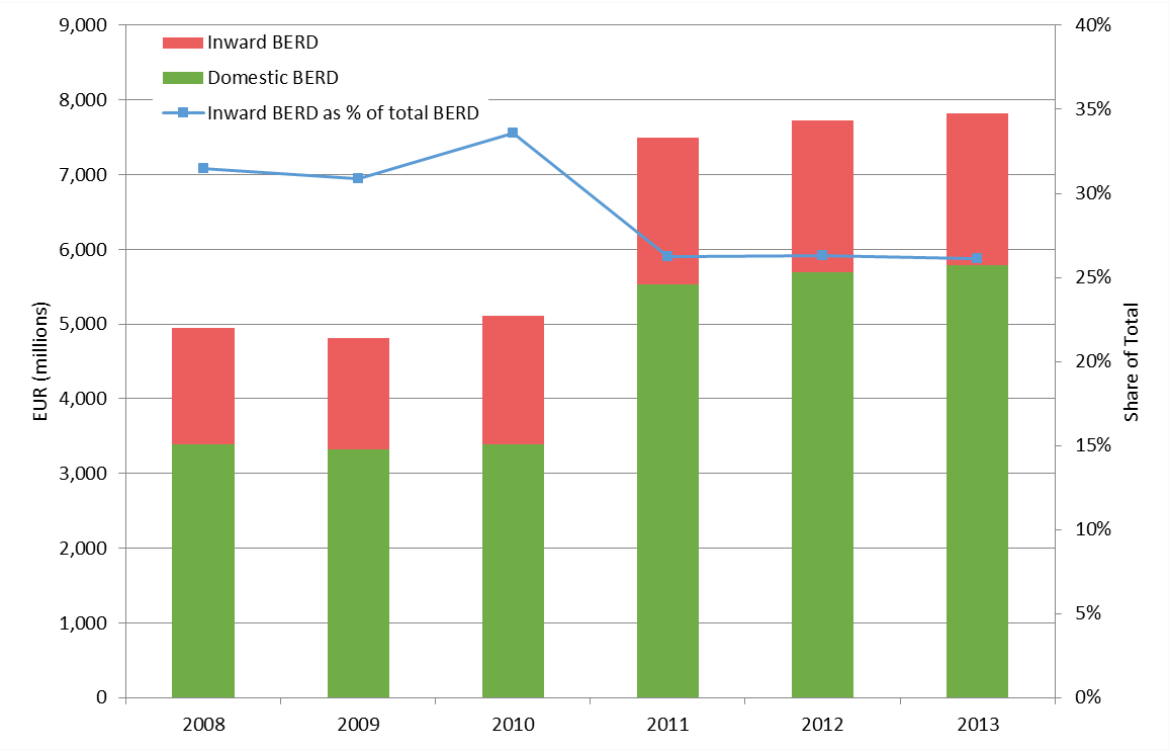
[1] There are no Inward BERD data for 2003 to 2007

[2] http://ec.europa.eu/DocsRoom/documents/17849

[3] https://ec.europa.eu/assets/jrc/eu-scoreboard-2015/

Domestic firms have increased their expenditures from €3,387 million in 2008 to €5,783 million in 2013, an increase of 70%.

Figure 1: Inward, domestic BERD and inward BERD as % Total BERD, 2008-2013*



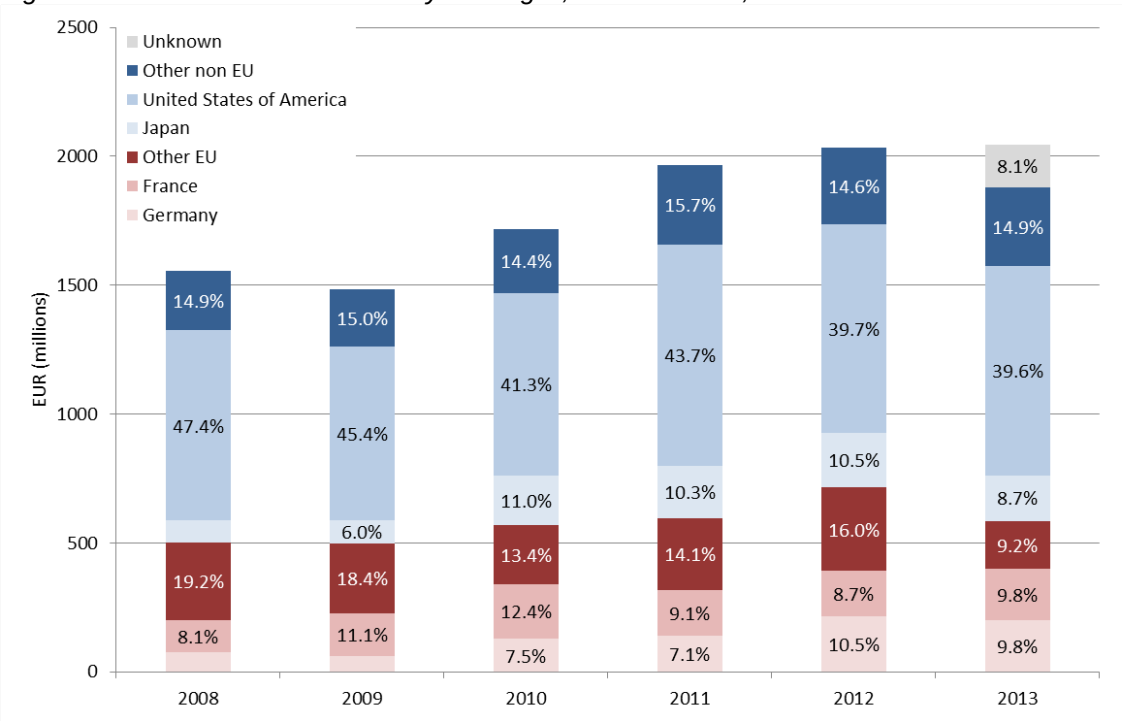
**Excluding Agriculture*
Source: Statistics Netherlands

The country perspective

There is a high degree of concentration in the country distribution of Inward R&D for the Netherlands and this is dominated by non-EU firms. For example as Figure 2 shows, firms headquartered in the USA and Japan account for around 50% of inward flows. If we add a range of other companies from outside the European Union such as Switzerland, India and Canada then this share rises to two-thirds. By far the largest investors are US companies, spending €800 million per annum in the last few years. They alone account for 40% or more of foreign R&D. Amongst the non-EU firms the largest increase has been for Japanese firms who more than doubled their expenditures from 2008 to 2013. Indian companies have also risen in prominence, spending around €78 million in 2013.

Amongst the EU firms the most conspicuous are those from France and Germany, each accounting for around 10% of inward BERD. Of these the largest increases have been for German firms, going from €61 million in 2009 to €199 million in 2013. This has resulted in their share of total inflows increase ng from 5% to 10% in that period.

Figure 2: Inward BERD - country of origin, Netherlands, 2008 to 2013



Source: Statistics Netherlands

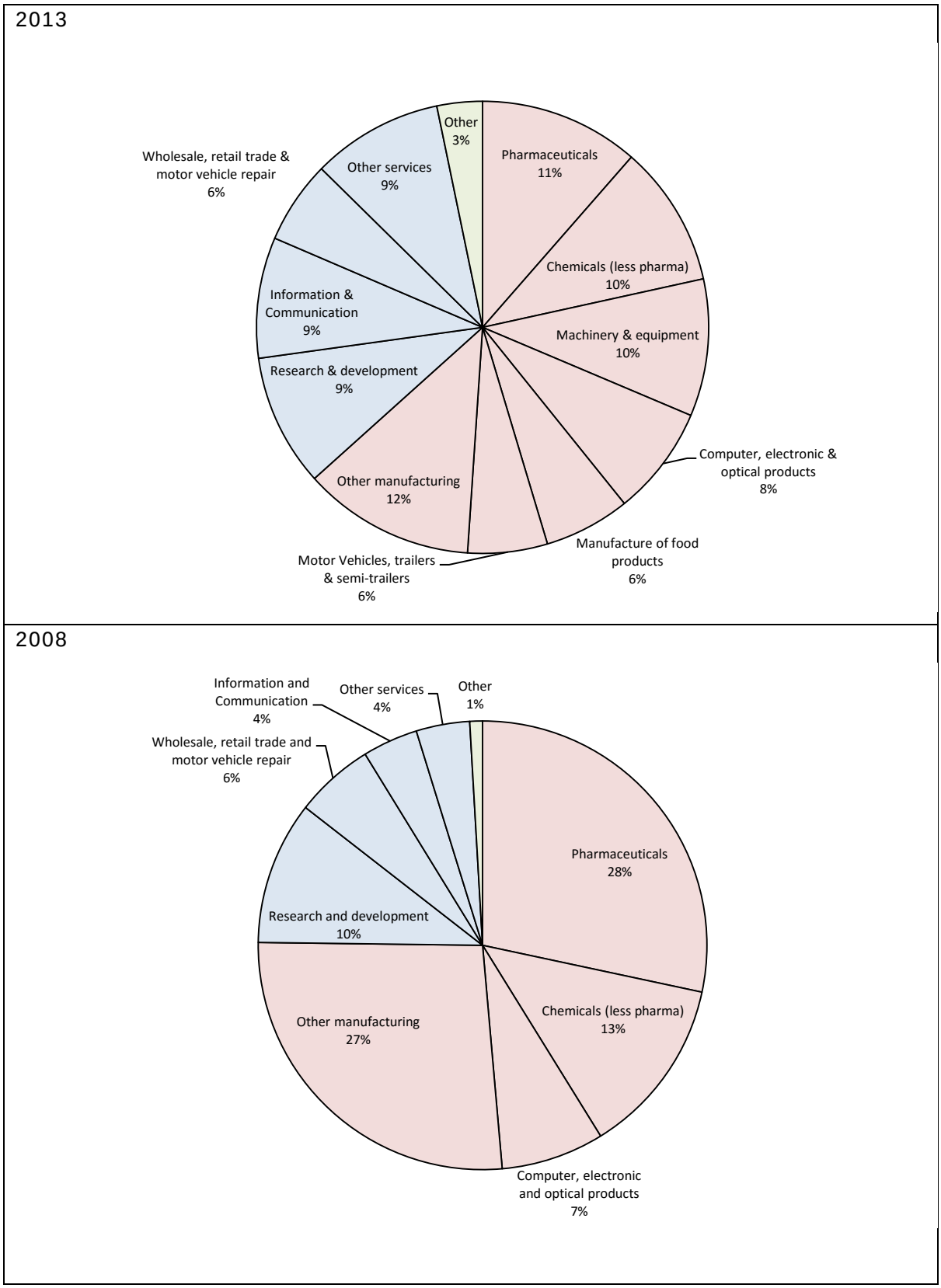
The sectoral perspective

As with overall expenditures on R&D, foreign R&D is also concentrated in the Manufacturing industries. These industries accounted for more than 60% of total inward BERD in the period 2008 to 2013. However Service sectors have become relatively more important over time, with their share increasing from around 23% in 2008 to 35% in 2013.

As shown in Figure 3, within Manufacturing four industries are relatively more important: Pharmaceuticals, Chemicals, Machinery and Equipment, and Computer, Electronic and Optical products. Three Service sectors are also prominent in Inward BERD, namely R&D services, ICT services, and Computer services. In terms of changes over time, the most important trend has been the decline in Pharmaceuticals, where the expenditure of foreign firms has gone from €441 million in 2008 to €234 million in 2012. Consequently their share of the total has gone from 28% to 11%.

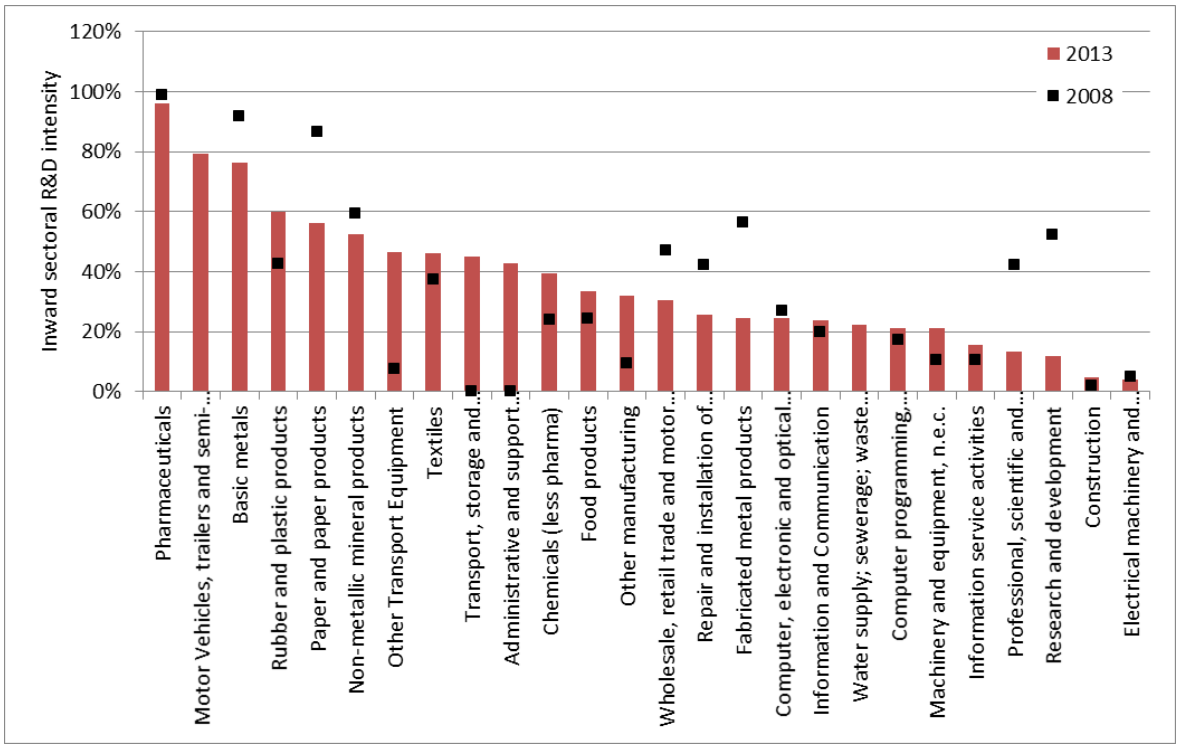
Figure 4 shows the rate of foreign penetration by sector (i.e. how much R&D is accounted by firms not headquartered in the Netherlands). It shows that industrial R&D in the Pharmaceuticals industry is completely dominated by foreign firms. On the other hand in the 3 service sectors identified above (i.e., R&D services, ICT services, and Computer services) Domestic firms account for around 75% or more of total BERD. The most spectacular change has been in R&D services where the share of foreign firms has declined from over 50% in 2008 to 12% in 2013.

Figure 3: Shares of various industries in Inward BERD, Netherlands, 2008 and 2013



Source: Statistics Netherlands

Figure 4: Inward sectoral R&D Share(2008, 2013)



Note: The inward sectoral R&D share is defined as inward BERD in sector Y / total BERD in sector Y

Source: Statistics Netherlands

Country Profile: Norway

Internationalisation of business investments in R&D and analysis of their economic impact (BERD Flows)

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Country Summary

Getting an accurate picture of the role of foreign firms in Norwegian industrial R&D is hampered by the lack of data on the Services, which are an increasingly important part of the overall system. Nevertheless the analysis based on Manufacturing only shows that the role of such firms is modest, accounting for around 30% of total expenditures.

There have been some changes in Inward BERD since 2005, with a period of decline up to 2009, followed by a very sharp increase. For example foreign firms increased their expenditures by more than 50% from 2009 to 2013. During the same period the spending of Domestic firms increased by a modest 7%. The available data by country of origin show that by far the largest foreign investors in Norway are US firms, accounting for one-third of all incoming flows. The main trends have been that Swedish firms have decreased their expenditures since 2005 and those based in a number of EU countries (Denmark, Finland, Germany, Netherlands and Austria) have expanded.

There have been a number of changes in the sectoral distribution of Inward BERD, with Chemicals becoming relatively less important and Machinery & Equipment more important. The most internationalized sectors are Motor Vehicles, Pharmaceuticals and Non-Metallic Mineral products, where foreign firms account for around half or more of total BERD.

Background

According to the Innovation Union Scoreboard 2016 (IUS) Norway is a *Moderate Innovator* with relative performance levels below the EU average in most dimensions of innovation.[1] While there has been an increase in industrial R&D expenditures since 2003, they remain below the OECD median. [2,3] BERD intensity has been below 1% over the last 15 years with very little change. In 2014, Total R&D (GERD) intensity stood at 1.71% of GDP.

While Services have become relatively more important over time and now account for more than 50% of total BERD. Relative importance of Manufacturing industries has declined over time. The most important sectors are ICT services, Computer services and R&D services. Within manufacturing the predominant sectors are: Computer, electronic and optical products, Basic and fabricated metals and Machinery and equipment.

Inward Perspective

Data availability makes it difficult to arrive at a firm conclusion about the role of foreign firms in industrial R&D in Norway. The main problem is that the data on Services (which are increasingly important in overall BERD) are missing after 2007. Hence the analysis here is based on Manufacturing only. With this caveat in mind the main conclusion from the available information is that foreign firms play a modest role in Norwegian industrial R&D, accounting for around 30% of the total.

There are two distinct phases in the evolution of foreign R&D expenditures for Norway since 2005 (Figure 1). The first is the period up to 2009 where such expenditures declined from €266 million in 2005 to €202 million in 2009. At the same time the expenditures of Norwegian firms increased, resulting in a decline in Inward R&D intensity from 29% in 2005 to 22% in 2009. However since 2009 foreign BERD has increased rapidly to €315 million in 2013, a growth rate of more than 50%. Domestic firms have also increased their

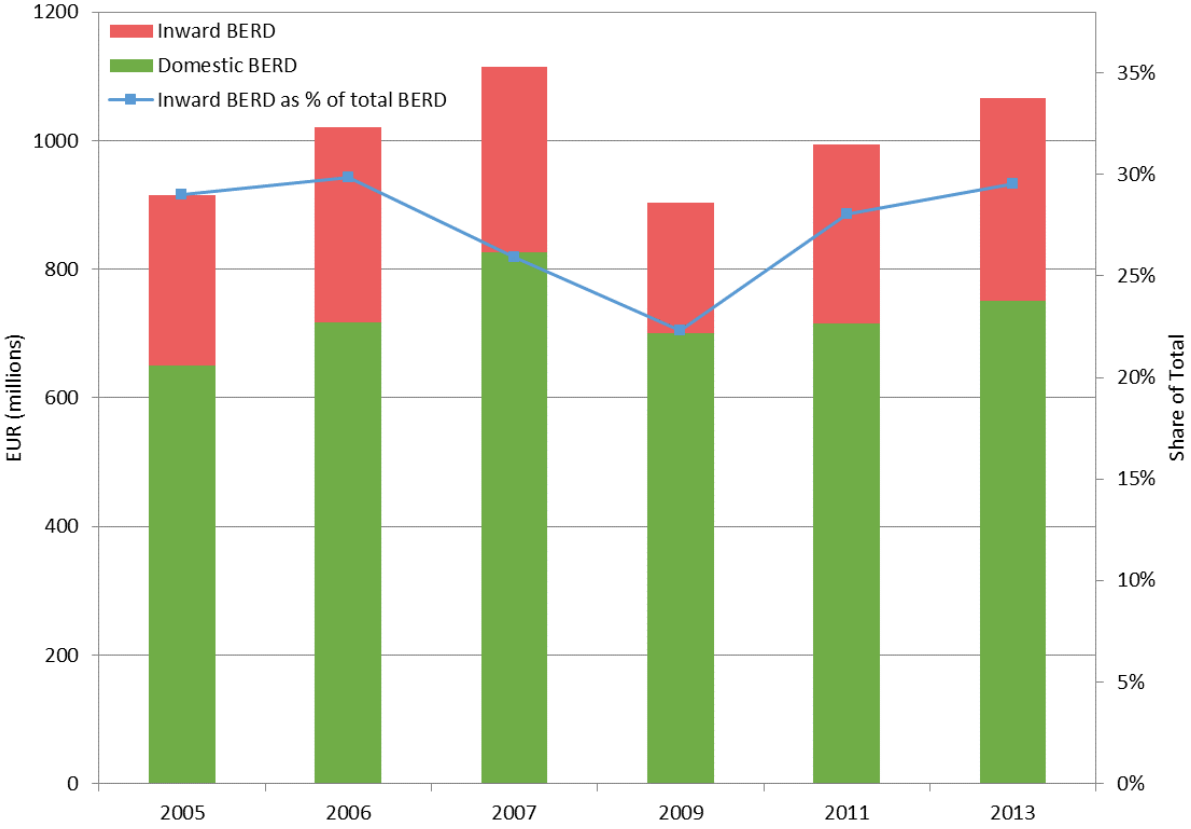
[1] http://ec.europa.eu/DocsRoom/documents/17853

[2] OCED Science, Technology and Industry Outlook 2014.

[3] The low intensity is partly due to the industrial structure (e.g. size of the oil industry).

expenditures, but by a modest 7%. This has resulted in the share of foreign firms going from 22% in 2009 to 30% in 2013.

Figure 1: Inward BERD, domestic BERD and inward BERD as % of Manufacturing BERD (2005-2013)



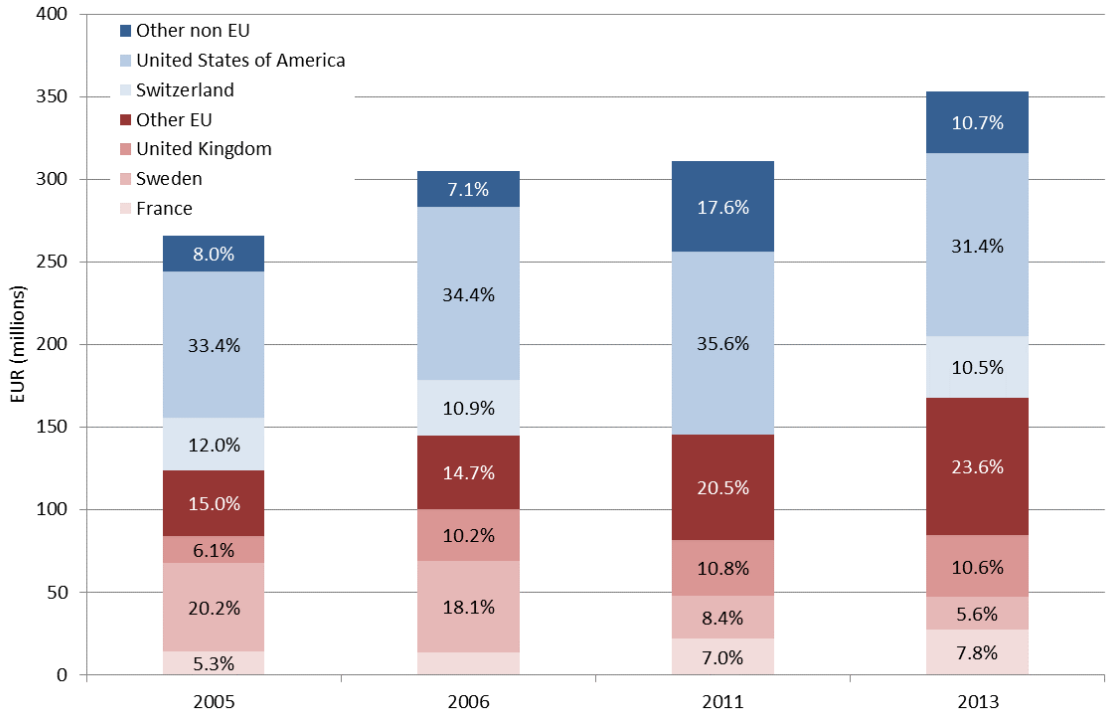
Source: OECD, Eurostat

The country perspective

Due to data limitations, our analysis of country distributions of Inward BERD is based on 4 years only. The main problem is that although some data are available for 2007 and 2009 they are not compatible with the figures for the previous years (2005 and 2006) or the later years (2011 and 2013). For example expenditures of Swedish firms go from €55 million in 2006 to €142 million in 2007 and then to €16 million in 2009. In a similar vein the data for US firms are: €105 million in 2006, €16 million in 2007 and missing for 2009 (due to confidentiality).

Despite these limitations we can arrive at a number of robust results. Firstly the most important foreign investors in industrial R&D for Norway are US firms. They spent an average of €100 million in the period from 2005 to 2013 and account for around one-third of all inward R&D. Firms from neighbouring Sweden have reduced their expenditures from €54 million in 2005 to less than €20 million in 2013. The final point to notice is that the detailed data show that companies from a number of European Union countries increased their exposure. The main ones are those based in neighbouring Denmark and Finland, as well as Germany, Netherlands and Austria.

Figure 2: Inward BERD - country of origin, Norway, 2005 to 2013



Source: OECD, Eurostat
Data for 2007 and 2009 are not compatible. 2005-2006 Manufacturing Only, 2011 and 2013 onwards Total Less Services. 2011 Switzerland missing

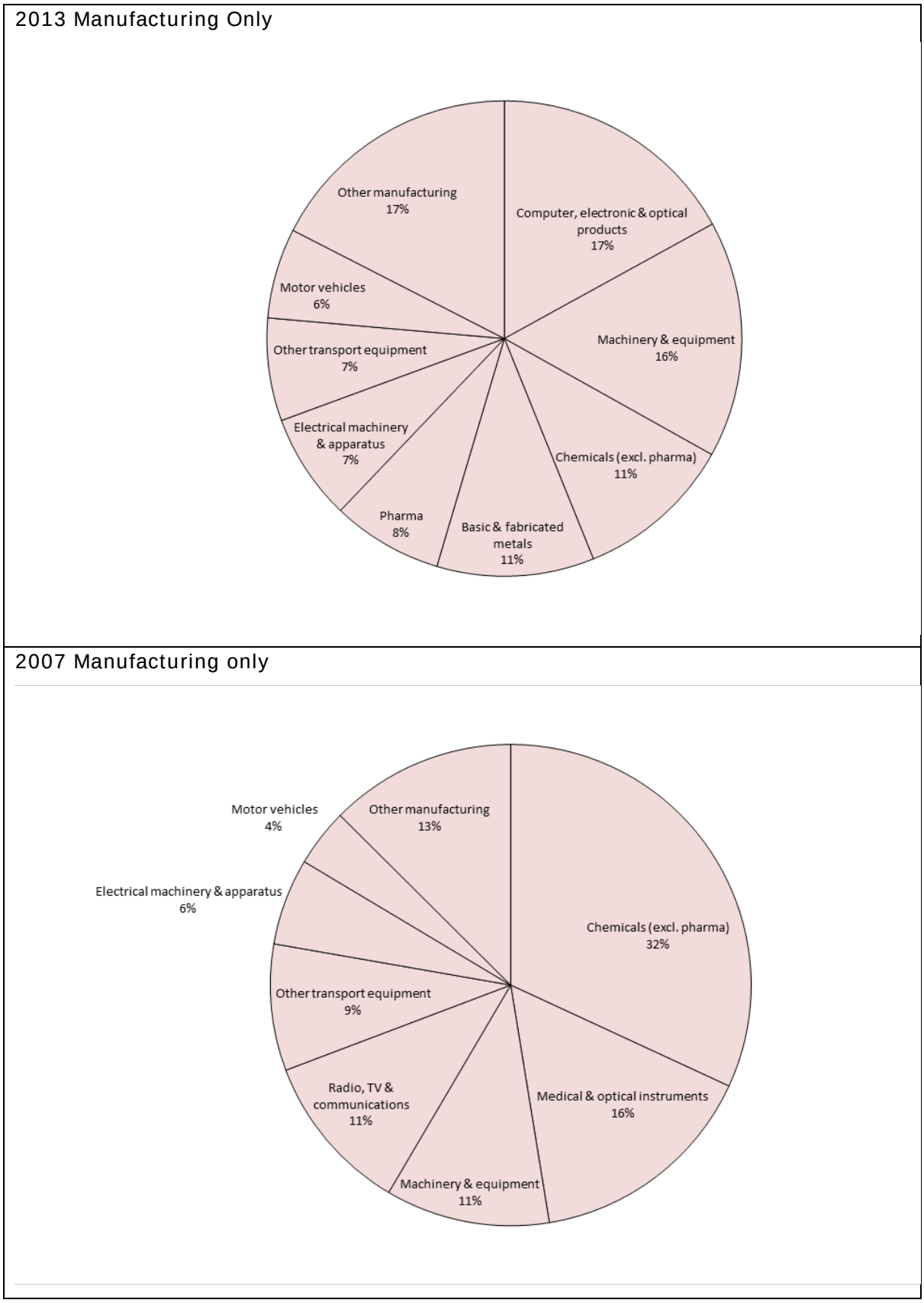
The sectoral perspective

It is difficult to make comparisons of the sectoral distribution of Inward BERD as there is little consistency in sectoral composition over time. The most important sectors in 2007 are Chemicals (excluding Pharmaceuticals) and Medical and Optical Instruments. By 2013 the former reduces dramatically in relative importance and the latter disappears altogether. It is not clear whether this is a function of data availability or dramatic structural change in a short period.

Figure 3 shows that the 4 most important sectors in Inward BERD for 2013 are: Computer, electronic & optical products, Machinery & equipment, Chemicals (excl. pharma) and Basic & fabricated metals. Together they account for more than half of all foreign R&D. Foreign firms have reduced their expenditures in Chemicals from €92 million in 2007 to €58 million in 2013. On the other hand in Machinery and Equipment their expenditure has increased from €32 million in 2007 to €51 million in 2013.

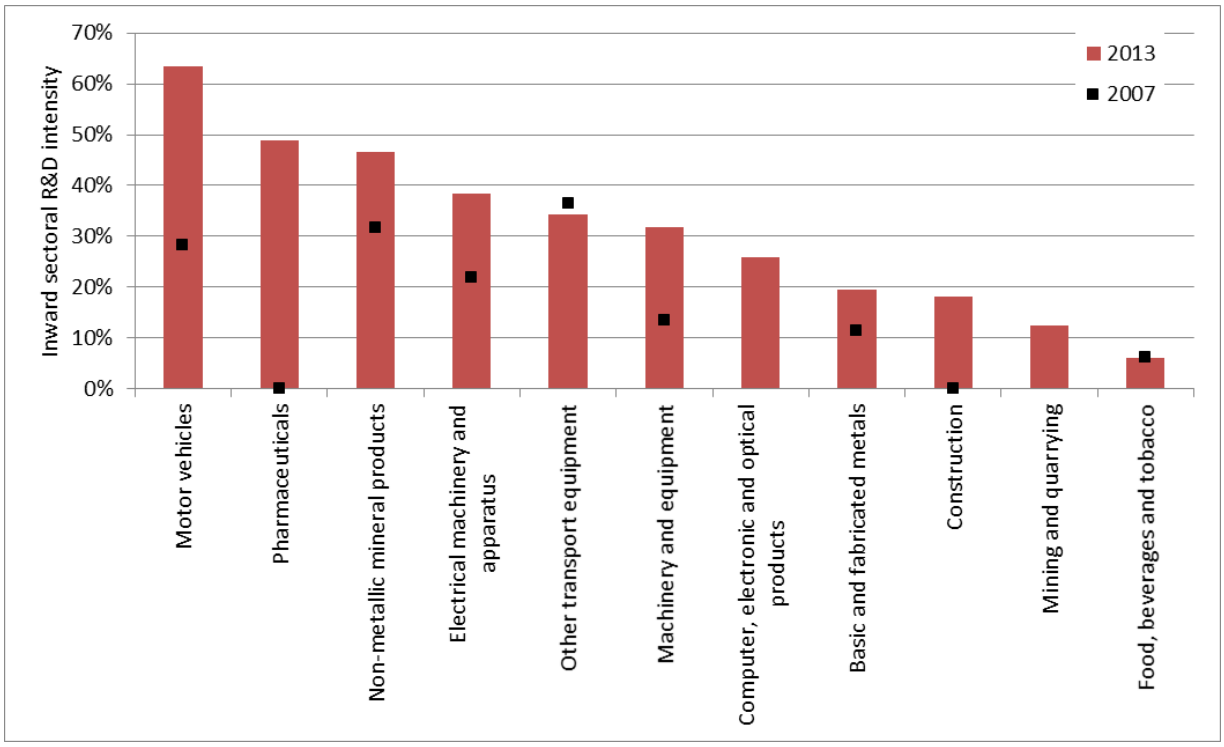
A measure of foreign penetration in a sector is inward R&D share: the ratio of inward BERD to total BERD within a sector. According to this measure the most internationalized sectors for Norway are Motor Vehicles, Pharmaceuticals and Non-Metallic Mineral products. In all these cases foreign firms account for around half or more of total BERD.

Figure 3: Shares of various industries in Inward BERD, Norway, 2007 and 2013



Source: OECD, Eurostat

Figure 4: Inward sectoral R&D share (2007, 2013)



Note: For Chemicals (2013) Inward R&D larger than total BERD
The inward sectoral R&D share is defined as inward BERD in sector Y / total BERD in sector Y
Source: OECD, Eurostat

Country Profile: Poland

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Country Summary

R&D expenditures of foreign firms have been a very important component of the increases in overall BERD in Poland. Their share of the total has gone from 17% in 2003 to more than 50% in 2013. There has been a large surge in Inward BERD in the last 2 years, with expenditures going from €193 million in 2011 to €339 million in 2013, an increase of 75%. While Domestic firms have also been increasing their R&D expenditures, this has been at a much more modest rate. Thus a large part of the increase in overall BERD for Poland in the last 6 years can be attributed to the activities of foreign firms.

While the most important foreign investors in R&D for Poland are firms based in the US, their relative importance has declined over time, going from 36.6% of total Inward BERD in 2009 to 26.8% in 2013. The other significant R&D investors are firms from a number of EU countries: Netherlands, France, Germany and the UK. The most spectacular changes have been the sudden increase in the activities of British firms from a very low base and also those of German firms. During the same period the relative importance of Dutch and French firms has declined.

In terms of sectoral composition, the Motor Vehicles sector has been the most important sector in Inward BERD, accounting for 36% of the total in 2013. It is also a sector where the expenditures of foreign firms have increased most rapidly since 2007. In contrast the relative importance of Food, Drink and Tobacco has declined. In Motor vehicles, Other transport equipment and Chemicals foreign firms account for more than 70% of total BERD in 2013.

Background

The 2016 EU Innovation Union Scoreboard describes Poland as a *Moderate Innovator*, with performance levels that are below the EU average in most dimensions of innovation.[1] The level of Industrial R&D has increased continually since 2003, with the largest increases since 2009. Although BERD intensity remains amongst the lowest in the EU, it has more than doubled since 2009 (going from 0.19% of GDP in to 0.44% in 2014). The change in Total R&D (GERD) intensity has been less pronounced, increasing from 0.67% of GDP in 2009 to 0.94% in 2014

Both Manufacturing and Services are equally important components of BERD. In the former, the most important sectors are Motor Vehicles, Electrical Machinery, Pharmaceuticals and Basic Metals. In the latter Information and Communications services and R&D services are predominant. Wholesale and Retail Trades has also risen in importance over time.

Inward Perspective

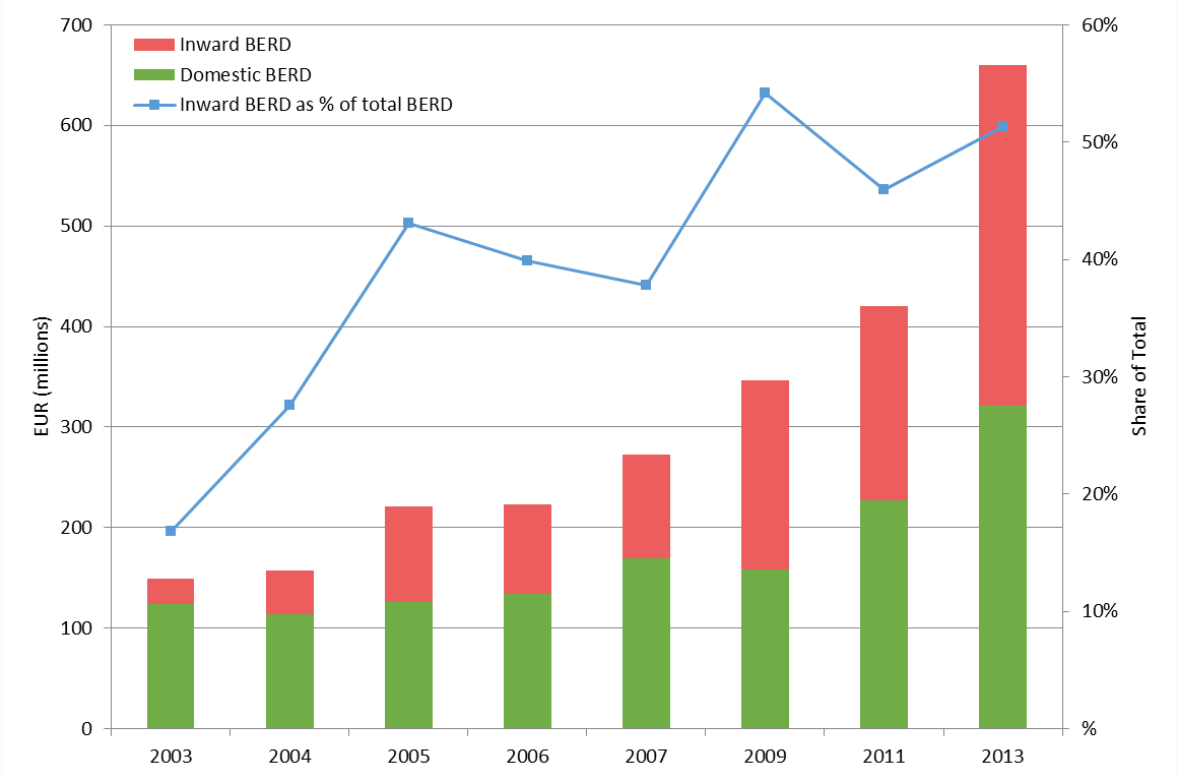
Foreign firms are a very important component of BERD[2] in Poland. As shown in Figure 1 their expenditures have risen continually since 2003. This upward trend was modest up to 2006 but the period since then has seen very large increases in foreign R&D expenditures. The most spectacular increase has been from 2011 to 2013, when foreign spend has gone from €193 million to €339 million, an increase of 75%.

[1] http://ec.europa.eu/DocsRoom/documents/17851

[2] Data on Service sector are missing; hence the analysis is based on mainly Manufacturing.

Domestic BERD has also increased but at a slower rate. The result is that the share of foreign firms has gone from 17% in 2003 to 51% in 2013. The main conclusion is that expenditures of foreign firms are a critical component of the rise in overall BERD over the last few years.

Figure 1: Inward BERD, domestic BERD and inward BERD as % of Manufacturing BERD (2003-2013)



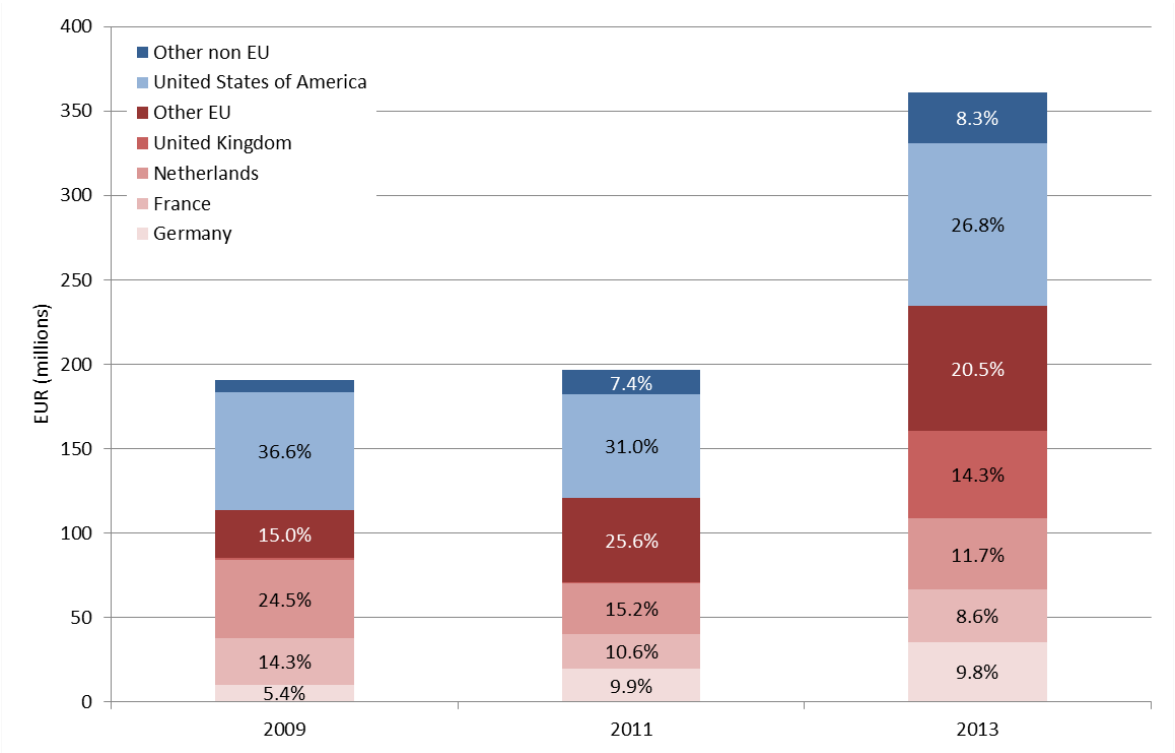
Source: OECD, Eurostat

The country perspective

Information on country distribution of Inward BERD is limited to a few recent years. The most important foreign investors in R&D for Poland are firms based in the US. They invested an average of €76 million per annum between 2009 and 2013. However their share of Inward BERD has declined from 36.6% in 2009 to 26.8% in 2013. The other significant R&D investors are firms from a number of EU countries: Netherlands, France, Germany and the UK.

The surge in foreign R&D from 2011 to 2013 is spread more or less evenly across the different firm nationalities. However the most spectacular change has been the sudden increase in the activities of British firms, from less than €1 million in 2011 to €52 million in 2013. The other notable change has been in the spending of German firms: from €10 million in 2009 to €35 million in 2013. At the same time the Dutch firms have decreased their R&D expenditures in Poland, with a decline in their share of the total from 24.5% in 2009 to 11.7% in 2013. The same declining trend in relative importance is visible in the activities of French firms.

Figure 2: Inward BERD - country of origin, Poland, 2009 to 2013



Source: Eurostat
Note: Total less Services.

The sectoral perspective

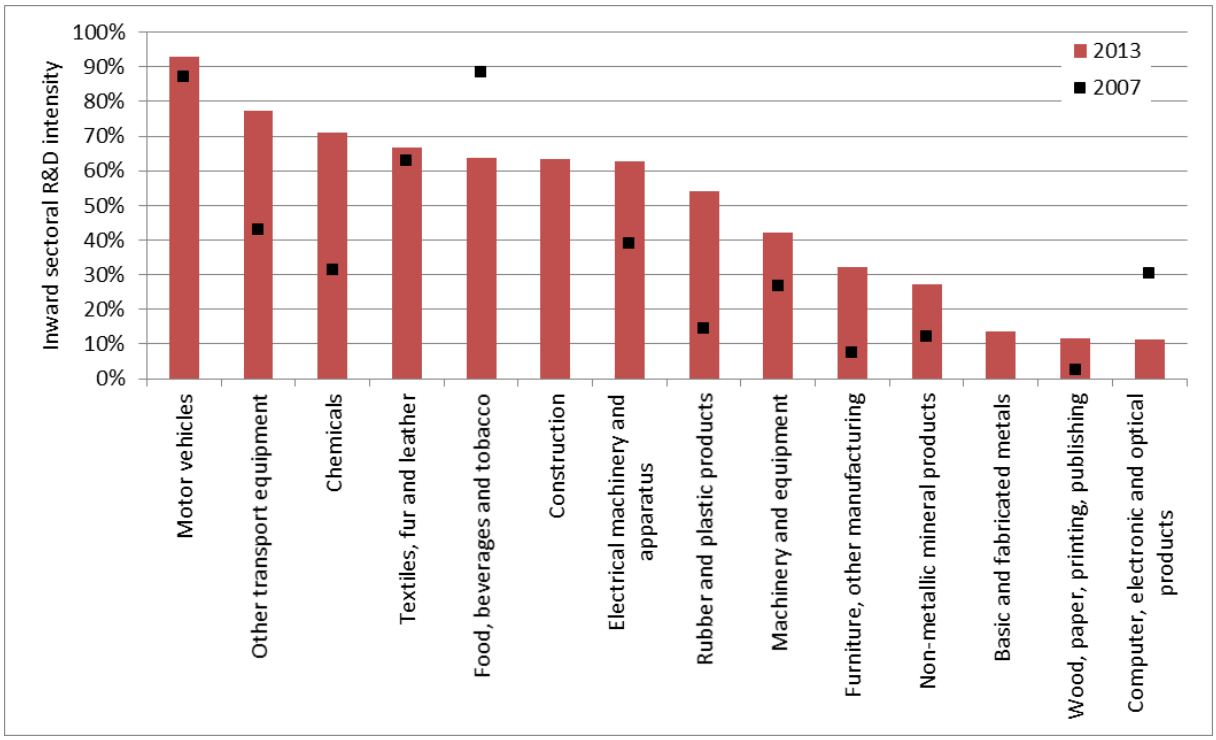
The most important sector in Inward BERD is Motor vehicles. It is also a sector where the expenditures of foreign firms have increased most rapidly, going from €23.4 million in 2007 to €121.1 million in 2013. The result is that Motor Vehicles now accounts for 36% of total foreign R&D expenditures. The opposite trend has occurred in the case of Food, Drink and Tobacco, with its share declining from 21% in 2007 to 6% in 2013. Three other sectors are also relatively important: Electrical machinery & apparatus, Other transport equipment and Chemicals.

A measure of foreign penetration in a sector is the inward R&D share: the ratio of inward BERD to total BERD within a sector. According to this measure the five sectors discussed above are amongst the most internationalized for Poland, with foreign firms accounting for more than 60% of total R&D. In the case for Motor vehicles this foreign penetration rate is around 90%. There have been large increases in the share of foreign firms in total R&D in Chemicals, Other transport equipment and Electrical machinery & apparatus. On the other hand in Food, Drink and Tobacco, domestic firms have increased their relative presence.

Figure 3: Shares of various industries in Inward BERD, Poland, 2007 and 2013

Source: OECD, Eurostat

Figure 4: Inward sectoral R&D Share (2007, 2013)



Note: The inward sectoral R&D share is defined as inward BERD in sector Y / total BERD in sector Y
Total Less Services
As the Computer, electronic and optical products are not included in 2007 it was matched with the value of Office, accounting and computing machinery.
Source: OECD, Eurostat

Country Profile: Portugal

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Country Summary

There are severe data limitations in analysing international flows of business R&D for Portugal. The most reliable data are up to 2007, and show a strong upward surge in the activities of foreign firms in Portugal up to 2007. Their share rose from 15% in 2003 to 23% in 2007. The main foreign investors underlying this sharp increase are firms from neighbouring Spain, with R&D expenditures going up from €8 million in 2003 to €76 million in 2007. On the other hand German firms have reduced their expenditures, but still account for 15% of all inward flows.

The available data on sectoral composition are limited. Nevertheless we can conclude that two sectors are dominant: Radio, TV & communications and Motor Vehicles. The former has declined in relative importance and the latter has increased sharply. In both these cases foreign firms are dominant in terms of their contribution to overall BERD.

Background

Portugal is described as a *Moderate Innovator* in the Innovation Union Scoreboard 2016 (IUS).[1] It performance is below the EU average and has declined over time. Expenditures on Industrial R&D increased sharply from 2003 to 2009 but have declined since then. The result is that BERD intensity increased from 0.15% of GDP in 2003 to 0.75% in 2009, but then declined to 0.59% in 2014. Total R&D (GERD) intensity follows a similar trend, going from a high of 1.58% of GDP in 2009 to 1.29% in 2014.

Services have accounted for between 50% and 60% of total BERD over the last 11 years. The most important sectors are Business services and ICT services. Within Manufacturing two sectors are relatively more important: Pharmaceuticals and Food, Drink and Tobacco. The R&D landscape is dominated by SMEs.

Inward Perspective

There is a major problem with analysing Inward BERD for Portugal, namely that the data after 2007 are unreliable. For example Manufacturing Inward BERD goes from €118 million in 2007 to €1.4 million in 2009. Thus this report is based on data from 2003 to 2007.

Inward BERD increased sharply from €51 million in 2003 to €234 million in 2007, a growth rate of 450%. At the same time domestic firms also increased their spending on R&D but at a slower rate. The result was that the share of foreign firms in BERD went from 15% to 23% (Figure 1).

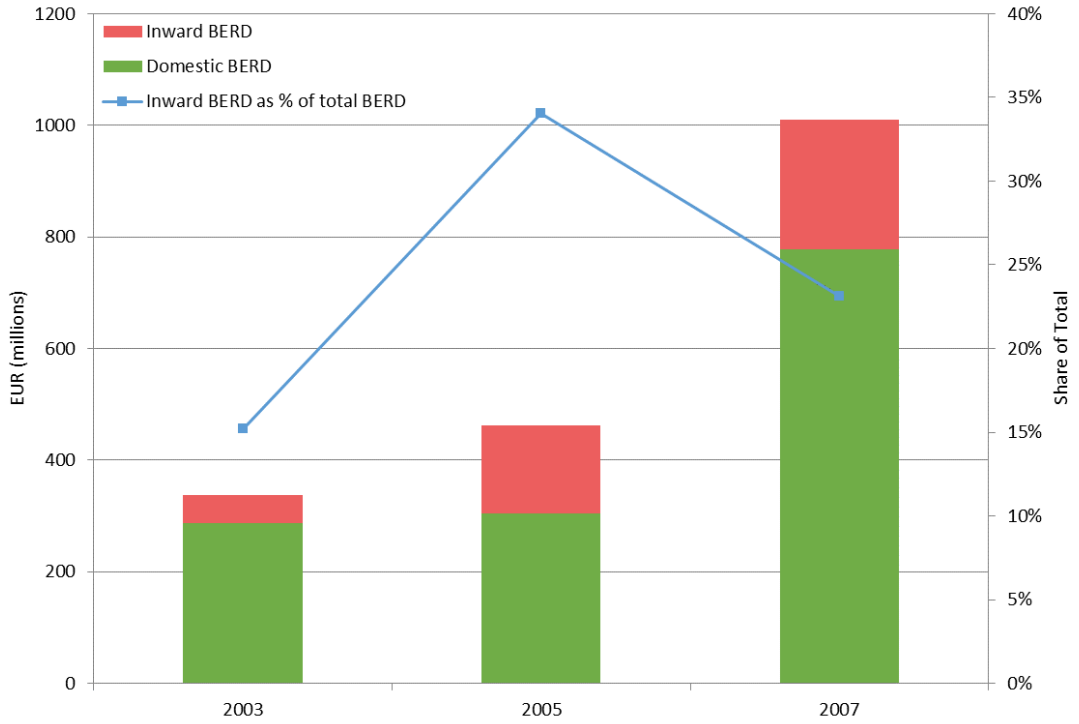
The country perspective

As shown in Figure 2, Inward BERD is dominated by firms from two countries[2]: Germany and Spain. However they show contrasting trends. Spanish firms have increased their expenditures sharply, from €8 million in 2003 to €76 million in 2007. They now account for more than one-third of all foreign R&D into Portugal. On the other hand German firms have decreased their expenditures from €72 million in 2005 to €34 million in 2007, resulting in a decreasing share from 46% to 14%. The other significant investors are Dutch firms.

[1] http://ec.europa.eu/DocsRoom/documents/17850

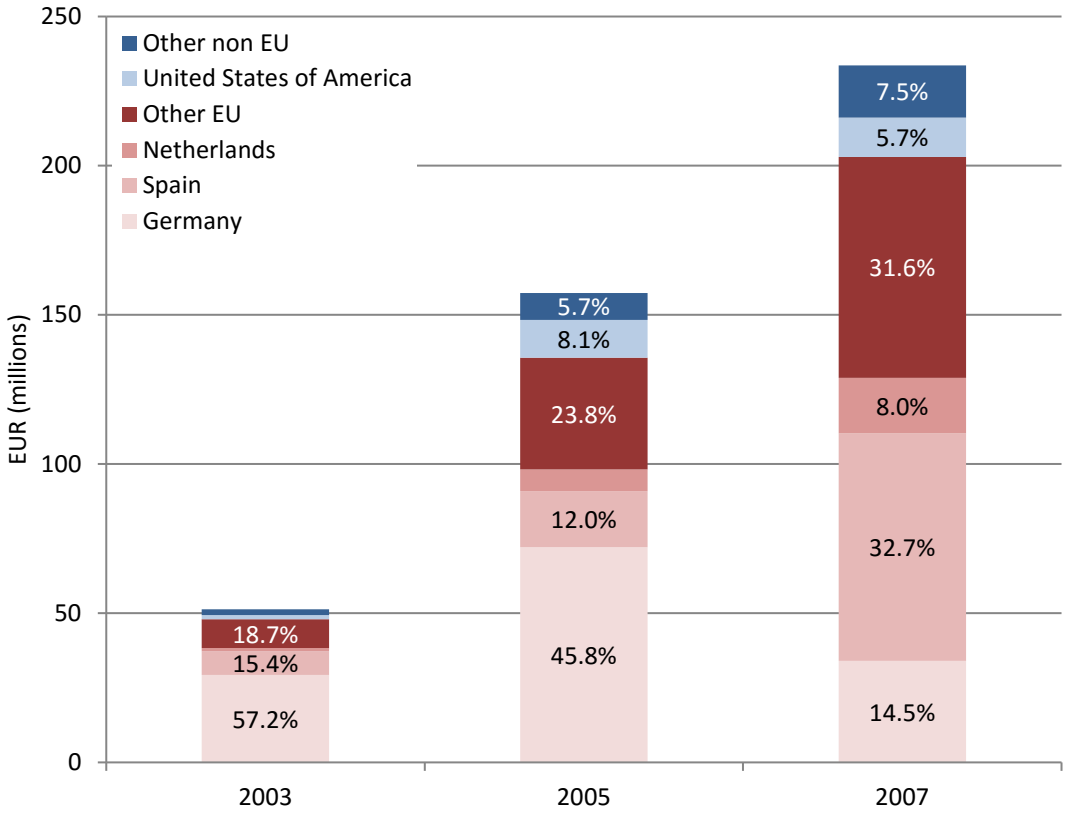
[2] The "Other EU" category is a residual and refers to unnamed countries in the dataset.

Figure 1: Inward BERD, domestic BERD and inward BERD as % of Total BERD (2003-2007)



Source: OECD, Eurostat

Figure 2: Inward BERD - country of origin, Portugal 2003 to 2007



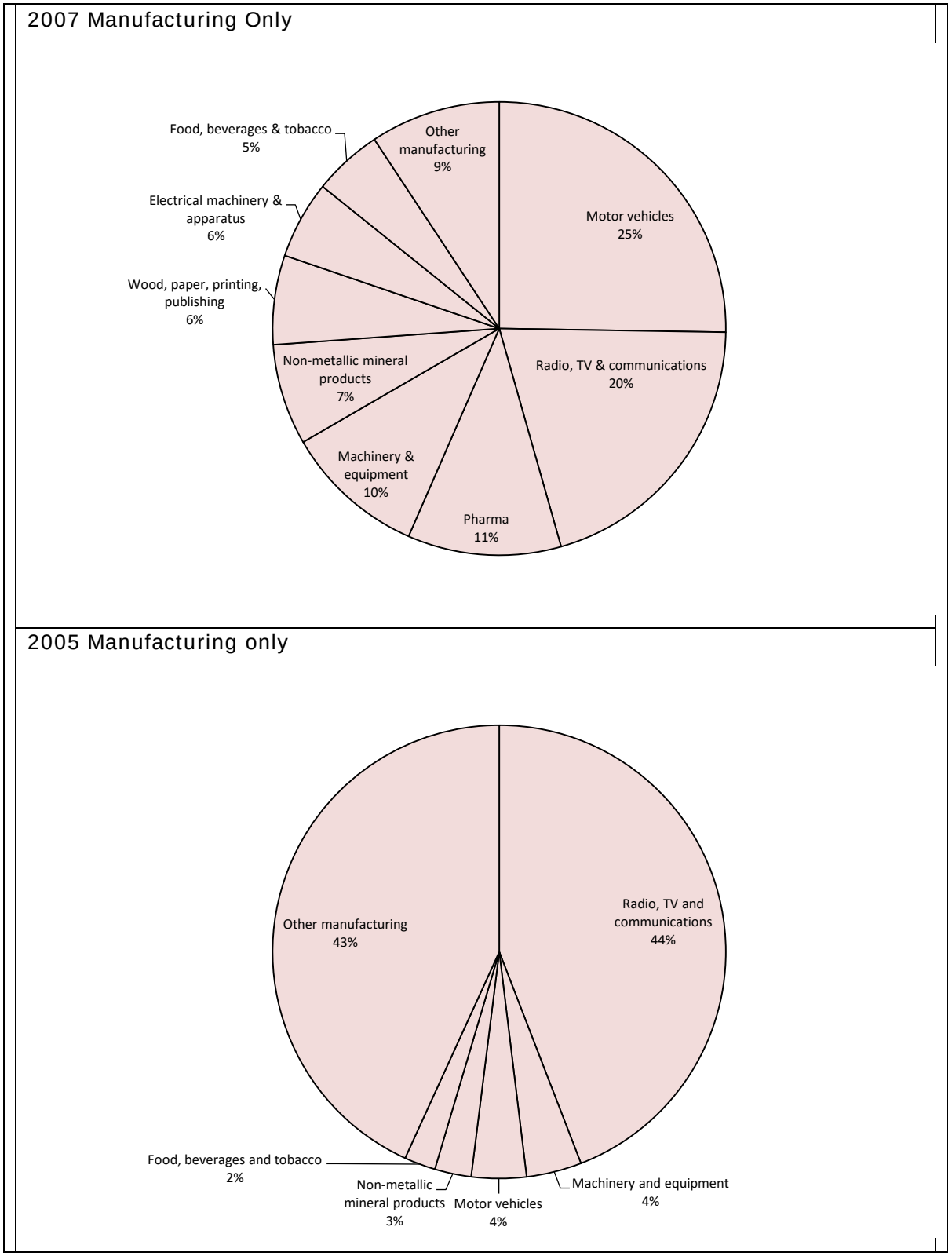
Source: OECD
Note: Other EU refers to unspecified countries (probably due to confidentiality)

The sectoral perspective

There are considerable problems in analysing the sectoral distribution of Inward BERD, due to missing values. For example there are no data by sector for 2003 and for 2005 many important sectors (e.g. Chemicals and Pharmaceuticals) are missing.

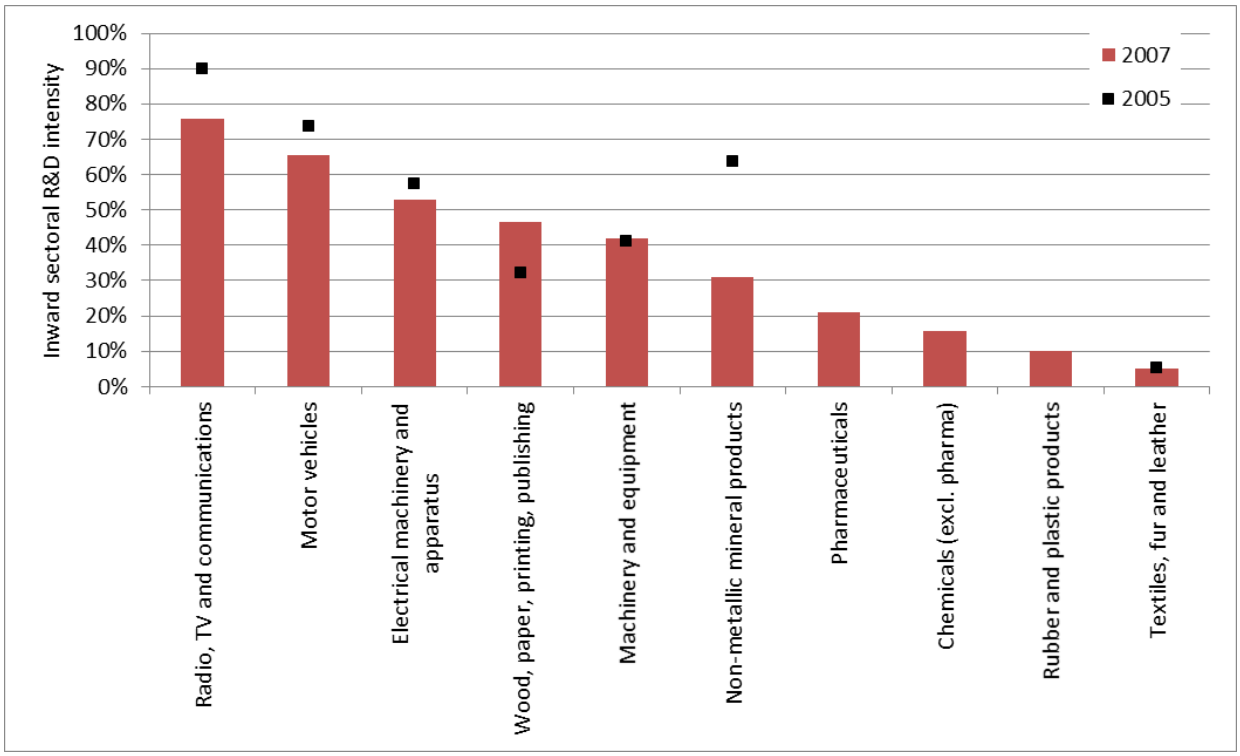
However from the data presented in Figure 3 we can arrive at two main conclusions. The first is that Radio, TV & communications continues to be an important sector for foreign firms. The second is that there has been a strong increase in expenditures in Motor Vehicles, where foreign firms have gone from €6 million in 2005 to €30 million in 2007. Thus their share of the total has gone from 4% to 25%. Moreover Figure 4 shows that in both these sectors foreign firms are predominant in overall R&D. For example in the case of Radio, TV & communications they account for more than three-quarters of the total BERD and in the case of Motor Vehicles this share is around two-thirds.

Figure 3: Shares of various industries in Inward BERD, Portugal, 2005 and 2007



Source: OECD

Figure 3: Inward sectoral R&D Share (2005 and 2007)



Note: The inward sectoral R&D share is defined as inward BERD in sector Y / total BERD in sector Y
Source: OECD, Eurostat

Country Profile: Romania

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Country Summary

There are major data limitations in analysing international flows of business R&D for Romania. Hence this report is based on the period 2009 to 2013, where the data seem to be more reliable. Foreign firms have increased their spending at the same time as domestic firms have moved in the opposite direction. The result has been an increase in the share of foreign R&D in total BERD from 47% in 2009 to 62% in 2013.

The limited data on country composition show that French firms are by far the most important investors in R&D in Romania, accounting for 64% of the total in 2013. Similarly the limited information on sectoral distribution shows that the most important sector in Inward BERD is Motor Vehicles, with more than 70% of the total. It is also a sector where foreign firms accounted for more than 90% of total BERD in 2013

Background

According to the Innovation Union Scoreboard 2016 (IUS) Romania is a *Modest Innovator* with performance levels well below the EU average in all dimensions and for all indicators.[1] Moreover its performance level has declined over recent years. Although industrial R&D expenditure is very low, there was a big increase in the period 2003 to 2007. Since then there has been a decline and hence BERD intensity is very low, standing at 0.16% in 2014. Total R&D (GERD) intensity is also relatively low, with a value of 0.38% of GDP in 2014.

While Manufacturing sectors remain an important locus of R&D, Services have gained prominence over time. Their share of total BERD has increased from around 13% in 2003 to 46% in 2013. The most services are ICT services, Computer services and R&D services. Within Manufacturing Motor Vehicles, Computer, electronic and optical products and Chemicals are the most important sectors.

Inward Perspective

There is a major problem with analysing Inward BERD for Romania, namely that the data before 2009 are unreliable. For example Manufacturing Inward BERD is less than €5 million between 2004 and 2007 and then jumps to €47.2 million in 2009. Thus this report is based on data for 2009 and 2013.

Figure 1 shows that Inward BERD has increased from €47.2 million in 2009 to €55.6 million in 2013. In the meantime Domestic firms have decreased their spending from €53.9 million in 2009 to €34.3 million in 2013. The result has been that in 2013 foreign firms account for 62% of BERD, up from 47% in 2009.

The country perspective

In the period 2009 and 2013, the only year for which data by country of origin are available is 2013. Figure 2 shows that by far the most important foreign investors in Romania are French firms. They account for 64% of all Inward BERD.

The sectoral perspective

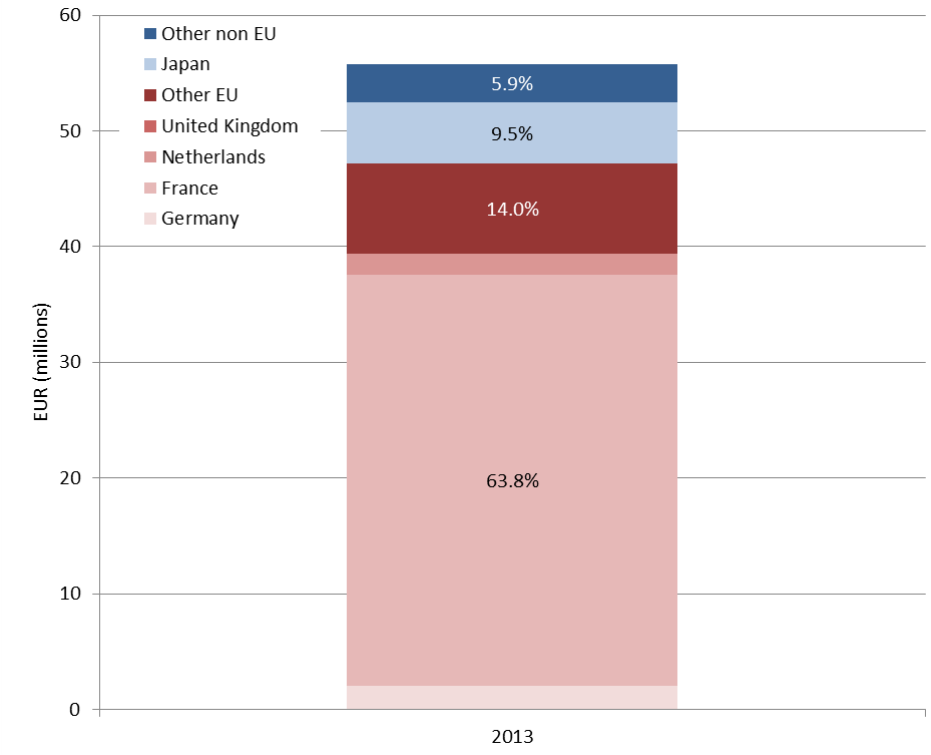
Data on sectoral distribution of Inward BERD are limited. The available information in Figures 3 and 4 shows that by far the most important sector for Romania is Motor Vehicles, accounting more than 70% of all foreign funds. It is also a sector where foreign firms accounted for more than 90% of total BERD in 2013.

[1] http://ec.europa.eu/DocsRoom/documents/17850

Figure 1: Inward BERD, domestic BERD and inward BERD as % of Manufacturing BERD (2009-2013)

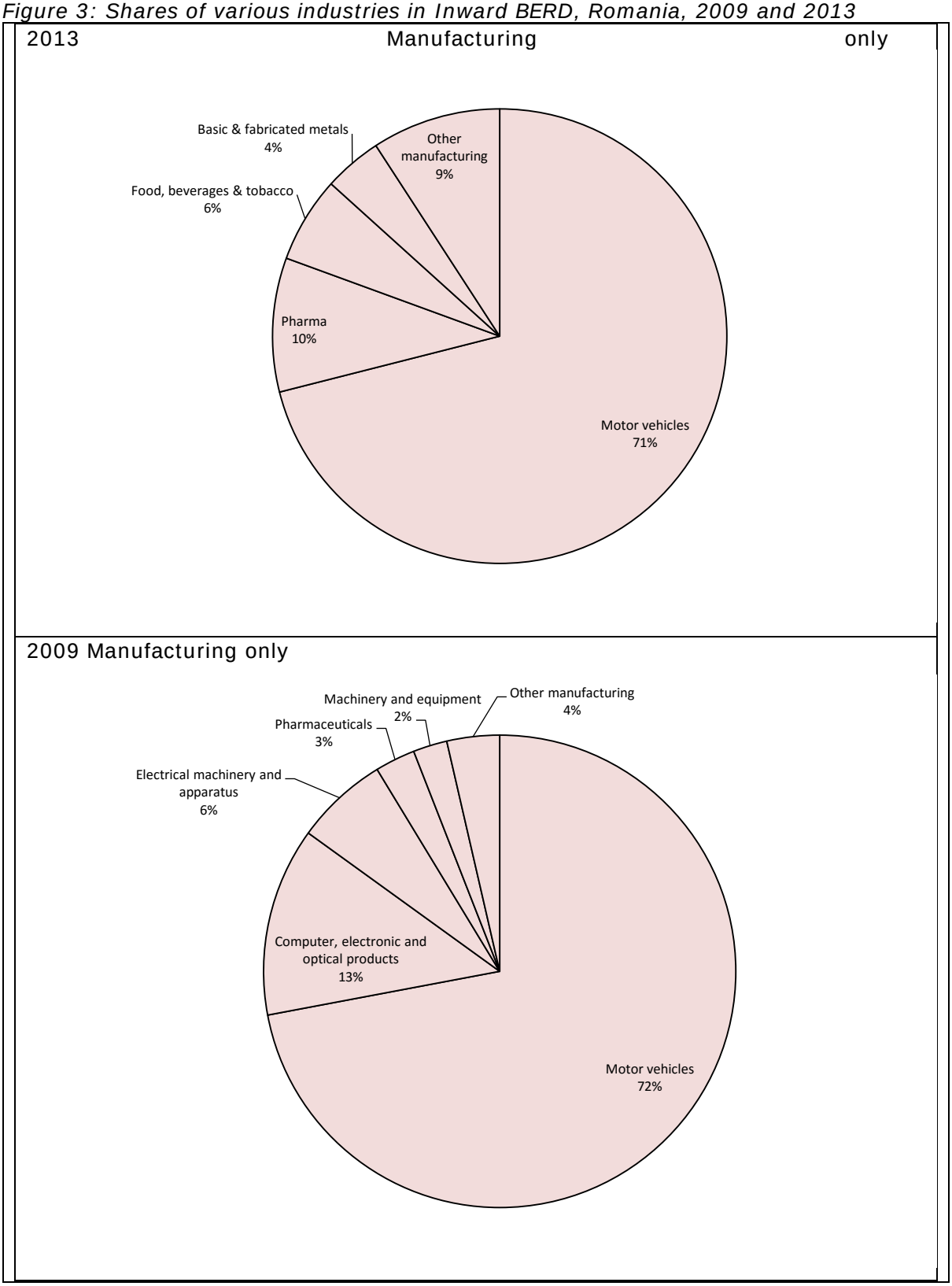
Source: Eurostat

Figure 2: Inward BERD - country of origin, Romania, 2013*



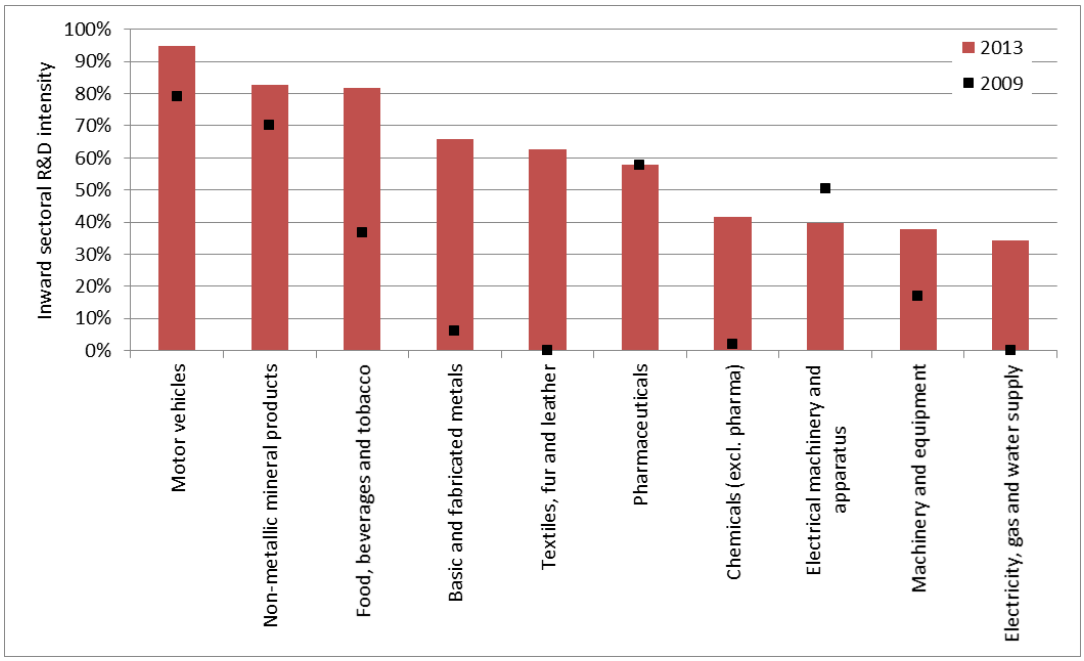
*Total less services
Source: Eurostat

Figure 3: Shares of various industries in Inward BERD, Romania, 2009 and 2013



Source: Eurostat

Figure 3: Inward sectoral R&D Share (2009 and 2013)



Note: The inward sectoral R&D share is defined as inward BERD in sector Y / total BERD in sector Y
Source: Eurostat

Country Profile: Slovakia

Internationalisation of business investments in R&D and analysis of their economic impact (BERD Flows)

December 2016

Frédérique Lang and Parimal Patel

SPRU

SPECIFIC CONTRACT 30-CE-0677869/00-21/A4/2014

Internationalisation of business expenditures on R&D and analysis of their economic impact (BERD Flows)

Implementing

Framework Contract n° - 30-CE-0496925/00-52

for the provision of Services in the Field of Research Evaluation and Research Policy Analysis ([1] 2010/S 172-262618) - Lot 2: Data collection and performance indicators to monitor European research policy

Country Summary

Foreign firms are dominant actors in Industrial R&D in Slovakia. The latest available data for 2011 suggest that they account for 90% of Manufacturing BERD. Foreign R&D has grown spectacularly especially since 2006, increasing by more than 300%. Domestic firms in the meantime have reduced their expenditures. Thus the steep growth in overall BERD since 2007 has been as a result of the activities of foreign firms.

Firms from 4 countries dominate foreign R&D expenditures: the Netherlands, Germany, France and the US. Of these the most spectacular increases since 2006 have been for French and American firms. The most important industry in Inward BERD is Motor Vehicles, accounting for more than 40% of the total foreign R&D. Two other industries are also relatively important: Rubber and Plastics and Machinery and Equipment. Together these 3 sectors account for more than 70% of all Inward flows.

Background

The 2016 EU Innovation Union Scoreboard[1] describes Slovakia as a *Moderate Innovator*, with performance levels that are below the EU average in most indicators of innovation. However innovation performance has been increasing steadily over time. Although industrial R&D expenditure is very low, it more than doubled since 2007. BERD intensity is very low, with a value of 0.33% of GDP in 2014. Total R&D (GERD) intensity has increased from1.17% of GDP in 2005 to a high of 2.00% in 2014.

While Services accounted for more than 50% of BERD in 2005 this proportion has since decreased to around 40% in 2013. Hence Manufacturing industries are now the main locus of industrial R&D. By far the most important sector is Motor Vehicles, followed by Machinery and Equipment and Electrical Machinery. Within Services the main contributors are ICT services, Research Services and Financial Services.

Inward Perspective

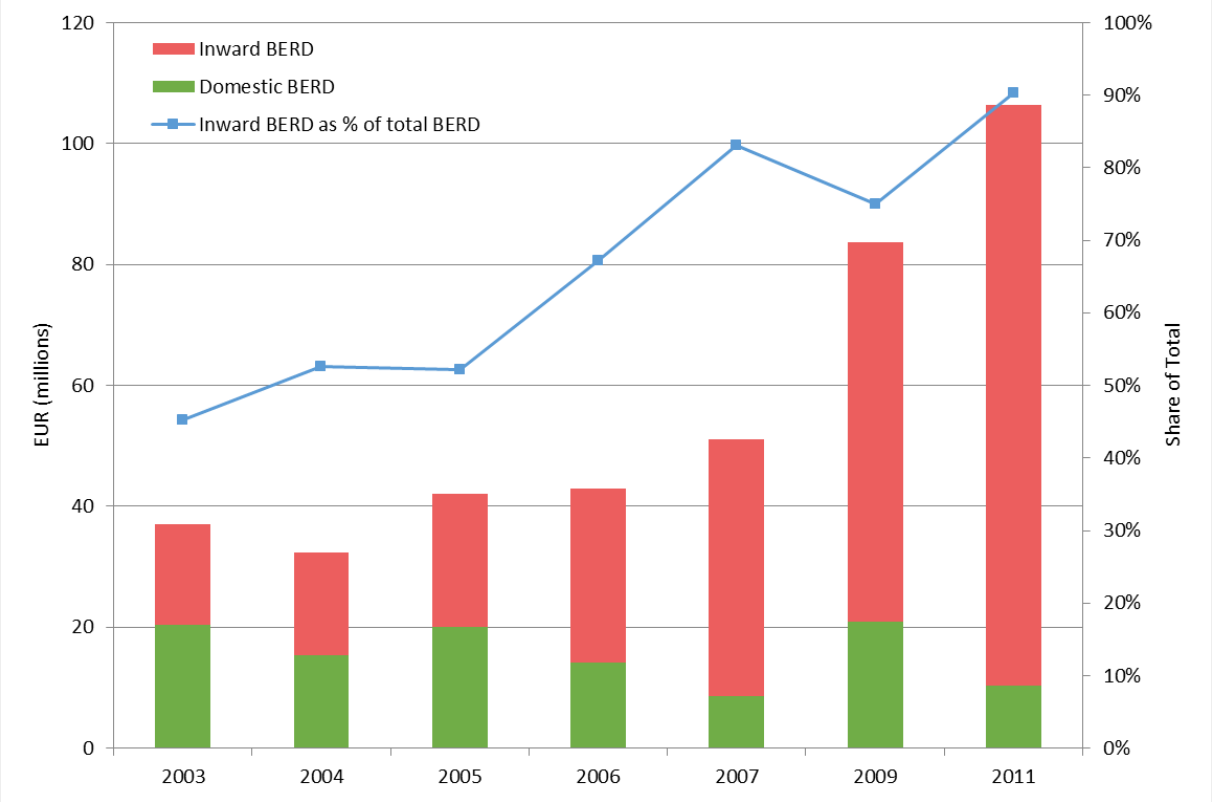
The analysis of Manufacturing Inward BERD presented in Figure 1 shows that foreign firms are now dominant in industrial R&D in Slovakia. In 2011, the last year for which we have data, they accounted for 90% of overall expenditures. They have increased their spending rapidly, going from €29 million 2006 to €96 million in 2011. Figure 1 shows that since 2003 domestic spending on R&D has reduced by a half (from €20 million in 2003 to €10 million in 2011). The result is that Inward R&D intensity has gone from 45% in 2003 to 90% in 2011. Thus the strong upward surge in industrial R&D in Slovakia since 2007 is mainly due to the increased spending of foreign firms.

The country perspective

The main foreign actors in Inward BERD are firms from 4 countries, namely, the Netherlands, Germany, France and the US. They account for more than 75% of all foreign R&D expenditures. While all these firms have increased their expenditures rapidly since 2006, the most spectacular increases have been for French and American firms. In 2006 French firms were spending less than €2 million, by 2013 their expenditures had grown to just under €22 million. In the case of firms from the US, R&D spending grew from €7 million in 2006 to €25 million in 2011.

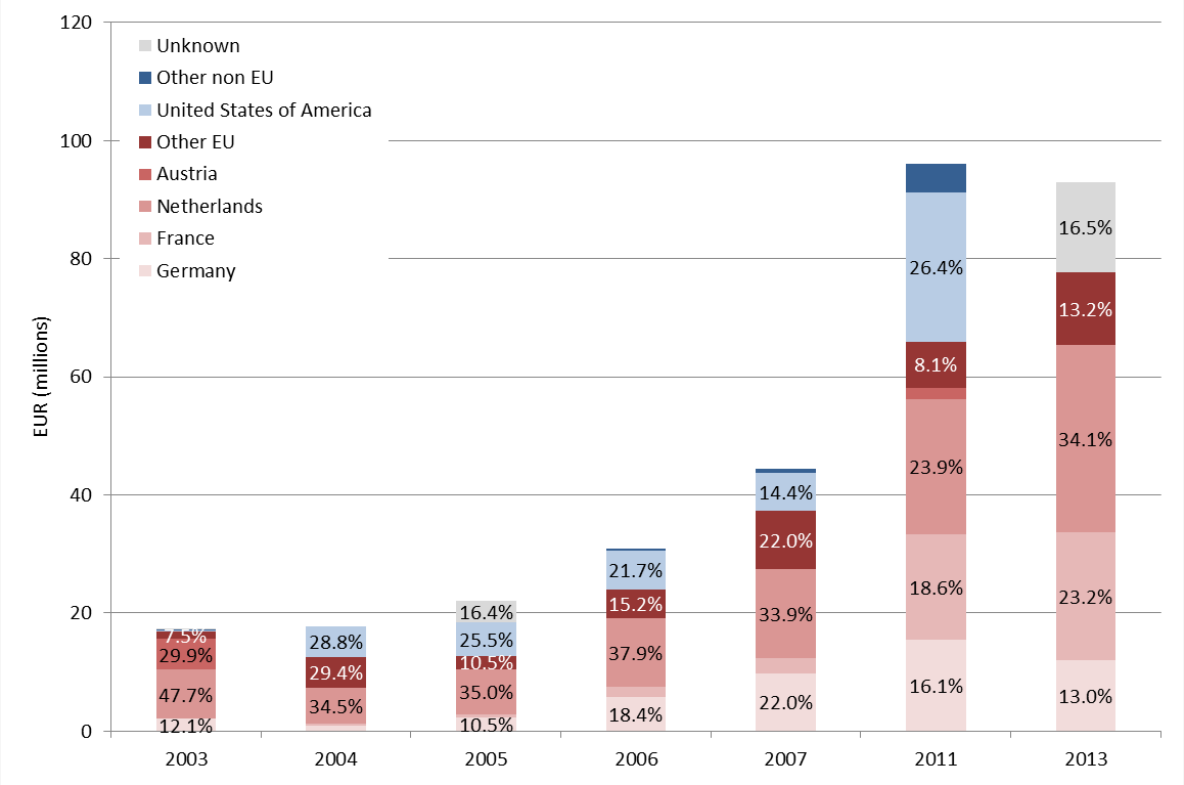
[1] http://ec.europa.eu/DocsRoom/documents/17856

Figure 1: Inward BERD, domestic BERD and inward BERD as % of Manufacturing BERD (2003-2011)



Source: Eurostat

Figure 2: Inward BERD - country of origin, Slovakia, 2003 to 2007



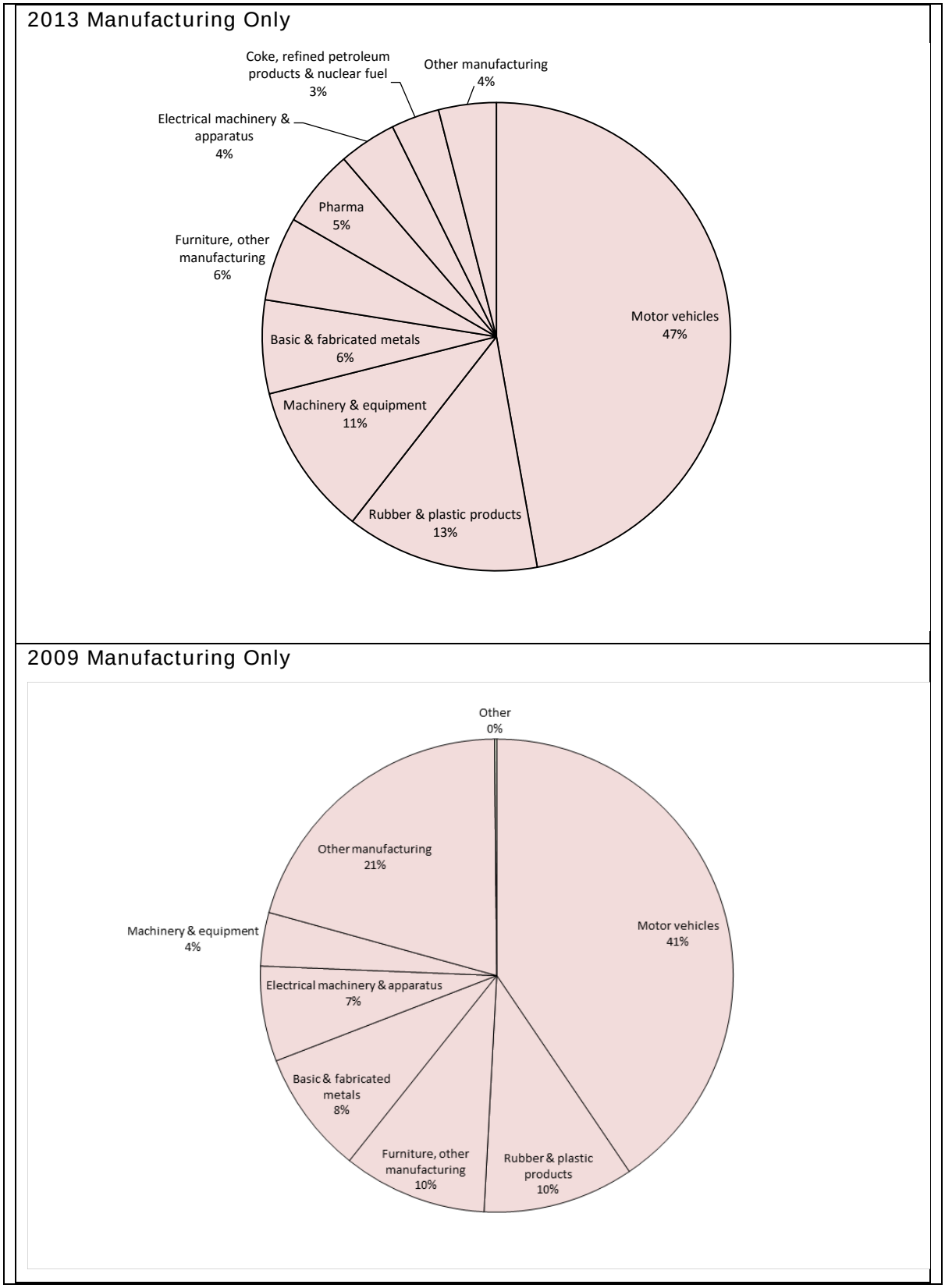
Source: Eurostat

The sectoral perspective

As shown in Figure 3, the most important industry in Inward BERD is Motor Vehicles, accounting for more than 40% of the total foreign R&D. Two other industries are also relatively important: Rubber and Plastics and Machinery and Equipment. The latter increased its share of incoming R&D from 4% in 2009 to 11% in 2013.

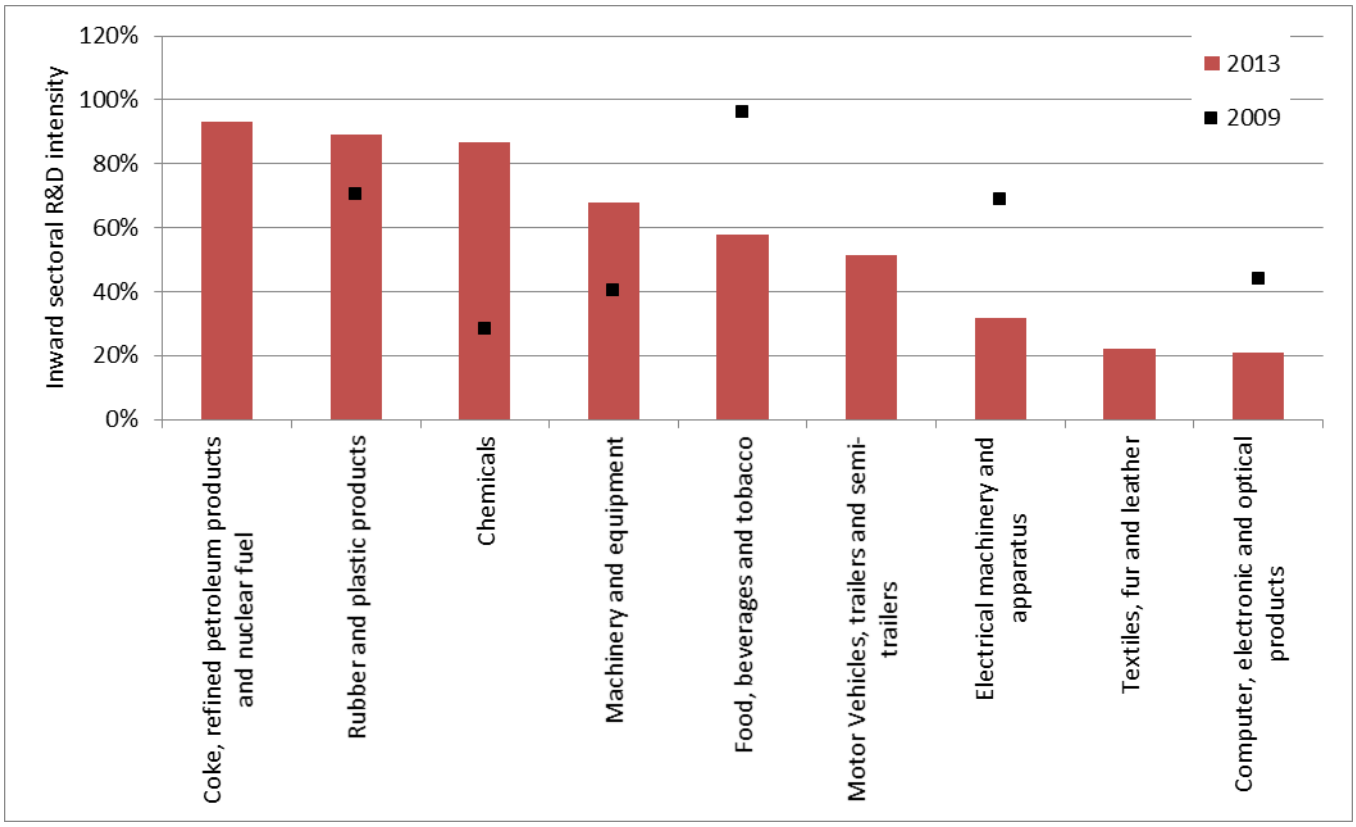
A measure of foreign penetration in a sector is the inward share of R&D: the ratio of inward BERD to total BERD within a sector. According to this measure (Figure 4) the most internationalized sectors for Slovakia are: Coke and Petroleum, Rubber and Plastics and Chemicals, with foreign firms accounting for around 90% of total BERD. In the case of the other two important sectors identified above, namely Motor Vehicles and Machinery and equipment this share is 52% and 68% respectively.

Figure 3: Shares of various industries in Inward BERD, Slovak Republic, 2009 and 2013



Source: Eurostat

Figure 3: Inward sectoral R&D share (2009 and 2013)



Note: The inward sectoral R&D share is defined as inward BERD in sector Y / total BERD in sector Y
Data for Motor Vehicles in 2009 has not been included as total inward was superior to total
Source: Eurostat

Country Profile: Slovenia

Internationalisation of business investments in R&D and analysis of their economic impact (BERD Flows)

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Frédérique Lang and Parimal Patel

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Country Summary

There are severe data limitations in analysing Inward BERD for Slovenia. There are no data for Services and the information on both sectoral and country distributions is very limited. Nevertheless one main conclusion from the available data is that foreign firms play an important role in Industrial R&D in Slovenia, accounting for around 30% of total spending. However over time domestic firms have increased their expenditures faster than foreign firms. The result is that the relative importance of foreign firms has declined since 2004. Thus domestic firms are largely responsible for the strong increase in overall BERD over recent years. The most important foreign firms active in Slovenia are those from Switzerland. They account for between 70% and 80% of all inward flows.

Background

Slovenia is described as a *Strong Innovator* in the Innovation Union Scoreboard 2016 (IUS).[1] Innovation performance has been increasing steadily over time and is close to or above average for most dimensions of innovation. There has been a strong upward surge in industrial R&D since 2007. The result is that BERD intensity has increased from less than 1% of GDP in 2007 to 1.85% in 2014, placing Slovenia as the highest amongst the EU accession countries. Total R&D (GERD) intensity has followed a similar upward trend, resulting in a value of 2.39% of GDP in 2014.

While Manufacturing accounts for the largest share of BERD, Services have become more important over time, with around one-third of the total in the last few years. By far the most important industry is Pharmaceuticals, followed by Electrical equipment and Motor Vehicles. R&D services as well as ICT services have become relatively more important over time.

Inward Perspective

The available data on Manufacturing Inward BERD show that while foreign firms have increased their expenditures in Slovenia, this has been at a slower rate than the growth in Domestic R&D. While the former grew by 44%, latter increased by 282%. The result, shown in Figure 1, is that the share of Inward BERD has diminished from 45% in 2004 to 30% in 2011. Thus the spectacular growth in overall BERD noted above has been mainly as a result of the activities of domestic firms.

The country perspective

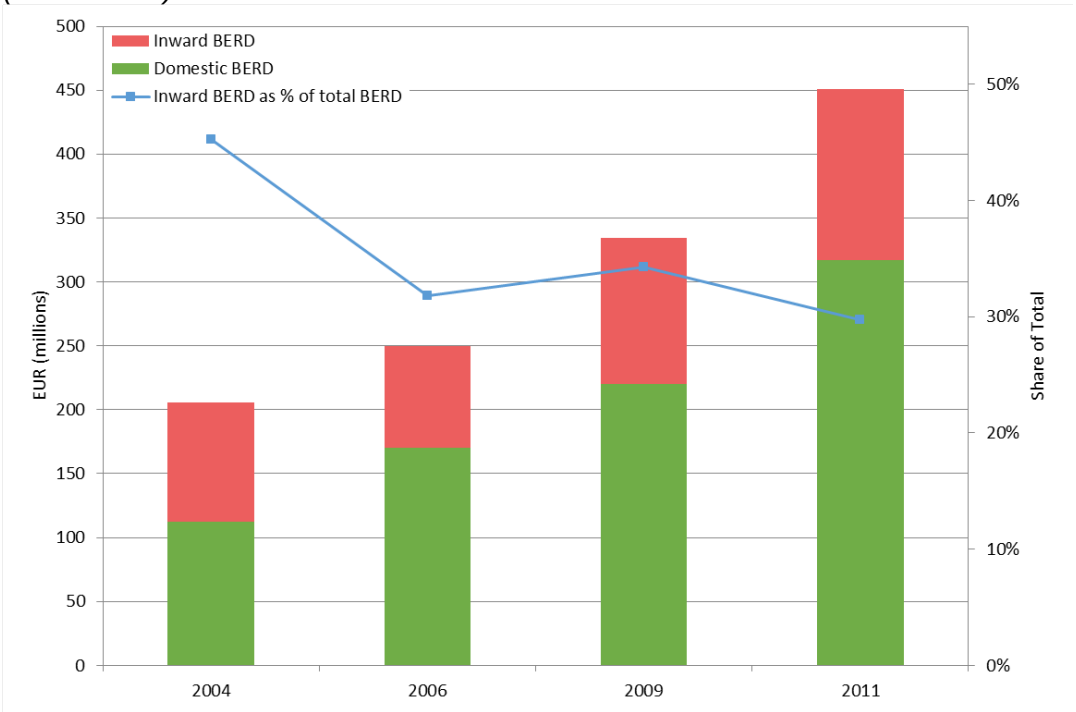
The data on country distributions are only available in sufficient detail for 2 years (Figure 2). They show that firms from Switzerland the dominant investors in Slovenia, accounting for between 70% and 80% of total inward flows. Firms from Germany and Austria are also important players.

[1] http://ec.europa.eu/DocsRoom/documents/17855

The sectoral perspective

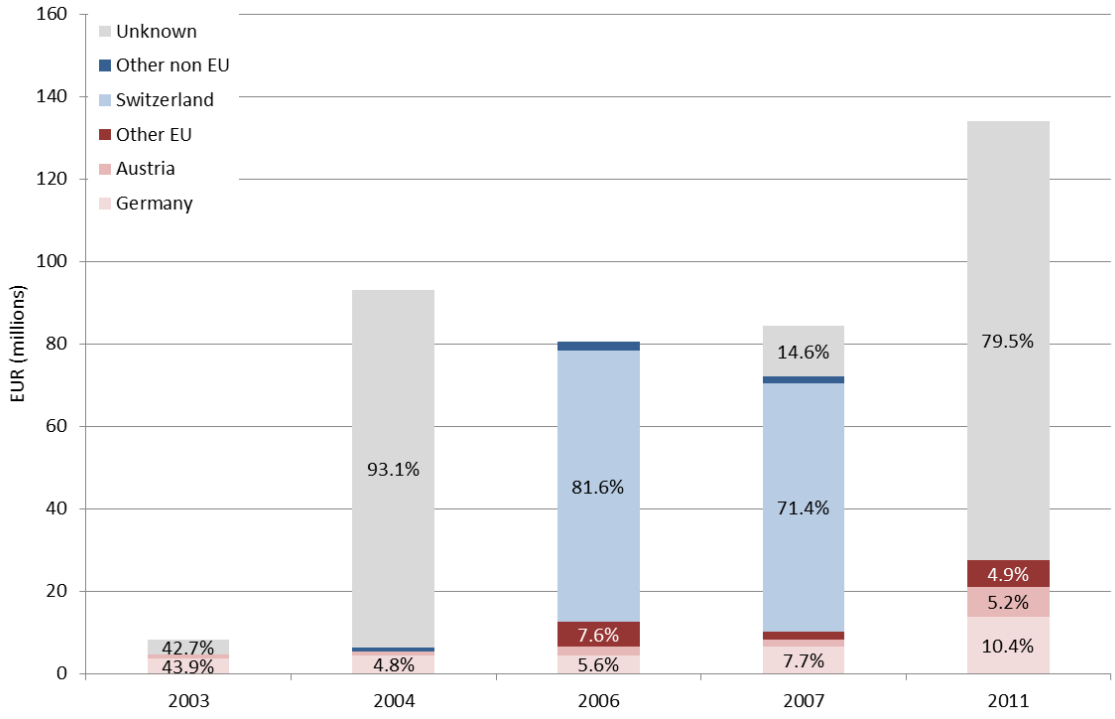
It is difficult to come to any conclusion on the relative importance of sectors as data by industry are severely limited with many missing values (Figures 3 and 4).

Figure 1: Inward BERD, domestic BERD and inward BERD as % of Manufacturing BERD (2004-2011)



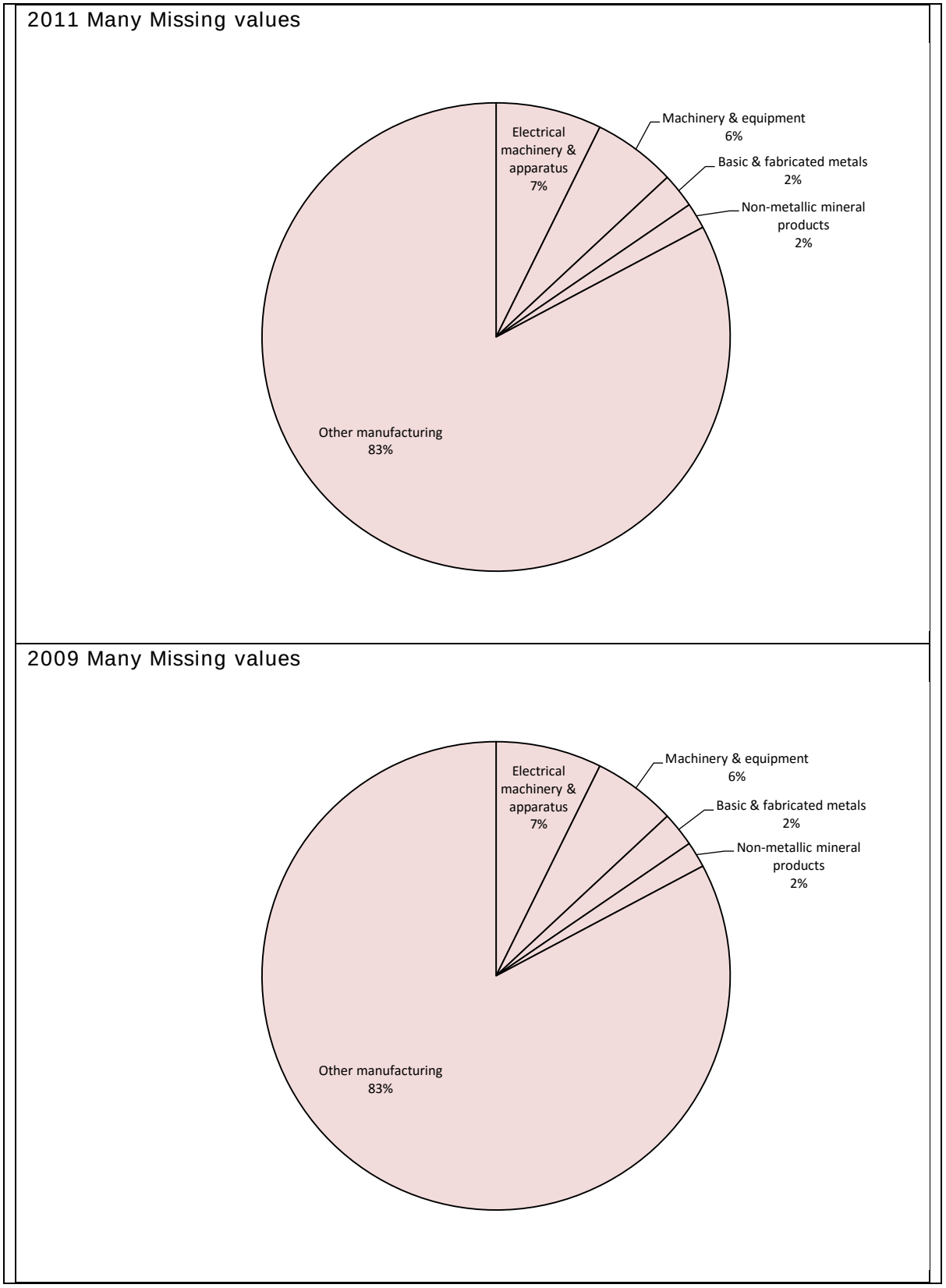
Source: Eurostat

Figure 2: Inward BERD - country of origin, Slovenia, 2004 to 2011*



* In 2011 Total less services
Source: Statistical Office of the Republic of Slovenia, Eurostat

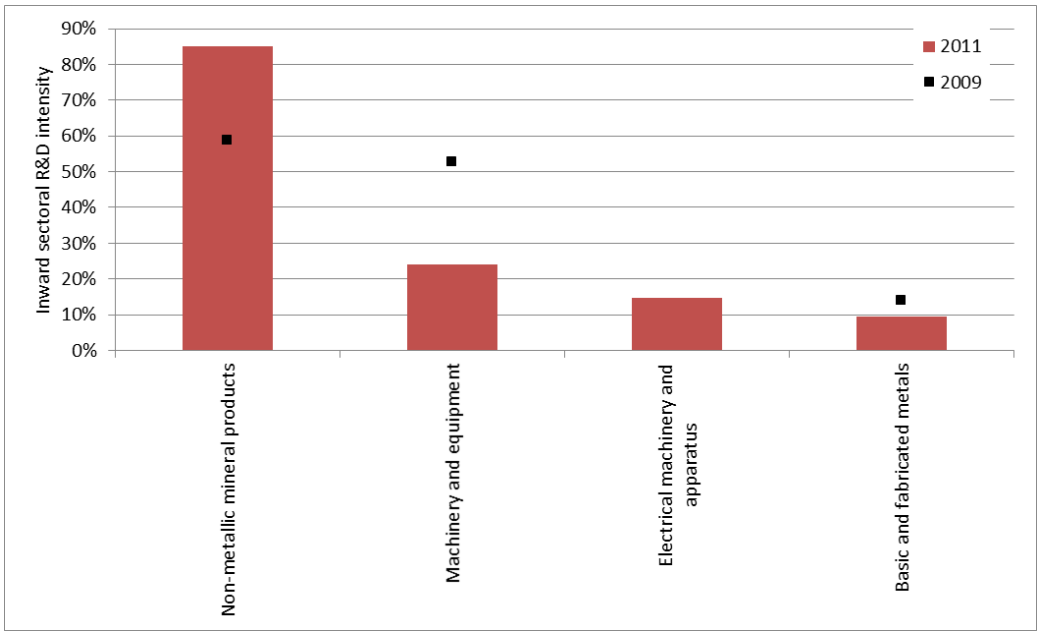
Figure 3: Shares of various industries in Inward BERD, Slovenia, 2009 and 2011*



Source: Eurostat

*Note Many Missing Values. Other Manufacturing is a residual figure (i.e. not elsewhere specified).

Figure 3: Inward sectoral R&D Share (2009 and 2011)



Note: The inward sectoral R&D share is defined as inward BERD in sector Y / total BERD in sector Y
Source: Statistical Office of the Republic of Slovenia, Eurostat

Country Profile: Spain

Internationalisation of business investments in R&D and analysis of their economic impact (BERD Flows)

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Frédérique Lang and Parimal Patel

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Country Summary

There are considerable problems regarding the availability of Inward BERD data for Spain. The most important issue is the lack of information on the Service industries which have become relatively important in conducting R&D. Moreover there is limited information on the distribution of Inward BERD by country. Nevertheless we can highlight some trends based on the available data. First is that foreign firms make an important contribution to BERD in Manufacturing industries, accounting for around 40% of the total. Firms from 3 EU countries dominate Inward BERD in Spain: Netherlands, France and Germany. They account for 60% or more of total foreign spending on R&D. French firms have increased dramatically in their relative importance, whereas Dutch firms have followed the opposite trend. The contribution of US and Swiss firms has also declined over time.

Three sectors dominate foreign R&D in Spain: Chemicals, Other Transport and Motor Vehicles, accounting for around two-thirds of Inward BERD. The relative importance of Chemicals has declined over time and that of Other Transport and Motor Vehicles increased. In these last two sectors foreign firms are the dominant actors in total BERD.

Background

Spain is classed as Moderate Innovator in the 2016 EU Innovation Union Scoreboard[1], with performance consistently below the EU mean. Industrial (BERD intensity) has been low (between 0.5% and 0.7% of GDP). From 2003 to 2008 there was a strong growth in business R&D but since then there has been a steep decline, resulting in a decline in R&D intensity (from 0.72% in 2008 to 0.64% in 2014). The same pattern can be observed in overall R&D (GERD) intensity: an increase from 1.10% in 2005 to 1.32% in 2008, followed by a decline to 1.23% in 2014.

In terms of structure, Services have become increasingly important, accounting for 50% of total BERD in 2013. The relative importance of Manufacturing has correspondingly declined. The most important sectors in total BERD are R&D services and Information and Communications services. Within manufacturing R&D, the most important sectors are Pharmaceuticals, Other Transport (mainly Aircraft) and Motor Vehicles. SMEs are relatively important players in national R&D.

Inward Perspective

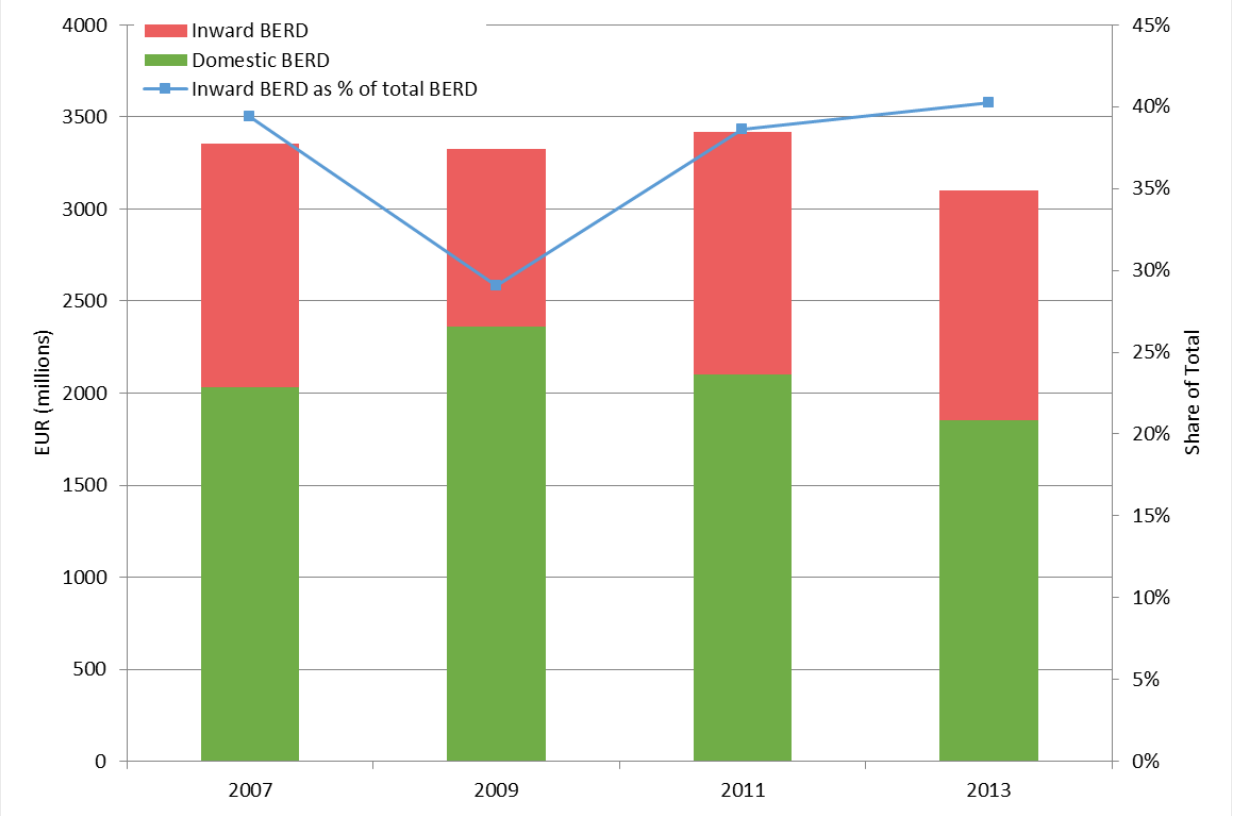
There are considerable problems regarding the availability of Inward BERD data for Spain. The most important issue is the lack of information on the Service industries which have become relatively important in conducting R&D. Detailed data by industry are only available since 2009 which makes it difficult to detect trends.

Figure 1 presents Inward BERD data for Manufacturing industries.[2] It shows that around 40% of Manufacturing R&D in Spain is conducted by foreign firms. This proportion decreased to less than 30% in 2009 but has recovered since then. Total BERD has declined from 2007 to 2013.

[1] http://ec.europa.eu/DocsRoom/documents/17857

[2] This means that around 50% of Total BERD that is located in Services is not covered here.

Figure 1: Inward, domestic BERD and inward BERD as % of Manufacturing BERD, 2007-2013

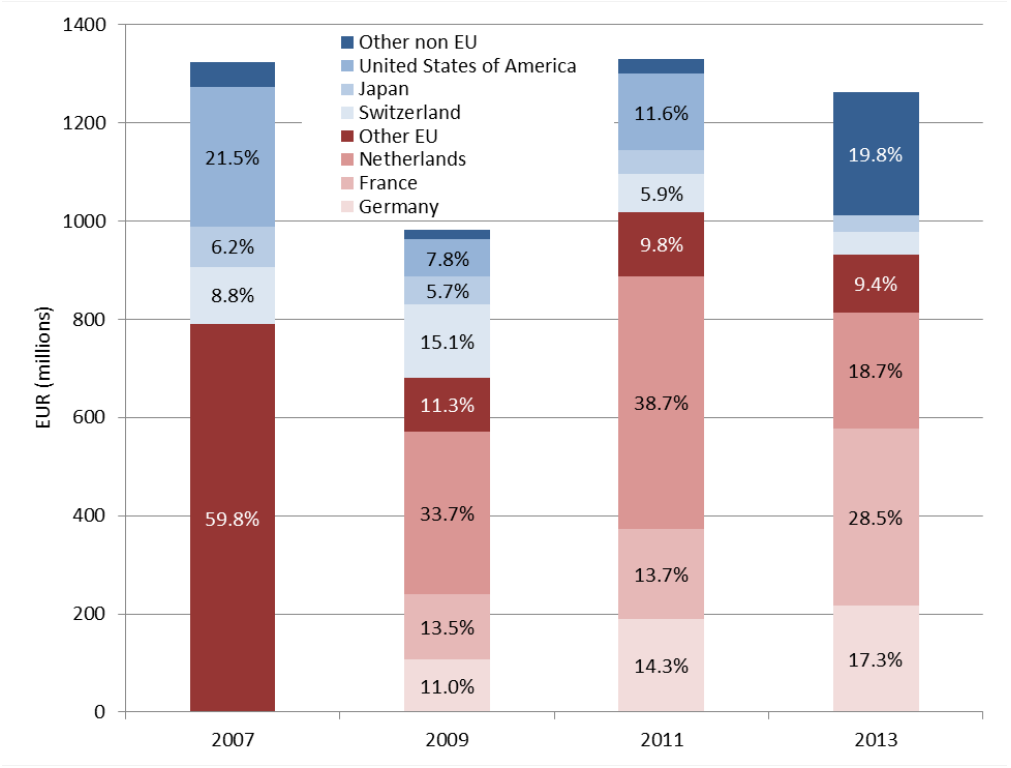


Source: OECD, Eurostat

The country perspective

There is limited information on the distribution of Inward BERD by country in the period 2003 to 2005. Moreover in 2007 there is no detailed breakdown for EU countries. Despite these limitations we can arrive at some conclusions. First firms from three EU countries dominate Inward BERD in Spain: Netherlands, France and Germany. They account for 60% or more of total foreign spending on R&D. If we include other EU then, then the European share reaches around 75%. However there have been contrasting trends amongst the top three countries. French firms have increased dramatically in their relative importance, in 2013 they represented 28% of all foreign R&D (up from 13% in 2009). At the same time Dutch firms have followed an opposite trend with their share declining from 34% to 19%. Companies based in Germany have also increased in relative importance. The other trend to note is the decline in the share of US firms from 21% in 2007 to 12% in 2011. The same downward trend can be observed in Swiss firms.

Figure 2: Inward BERD - country of origin, Spain, 2007 to 2013



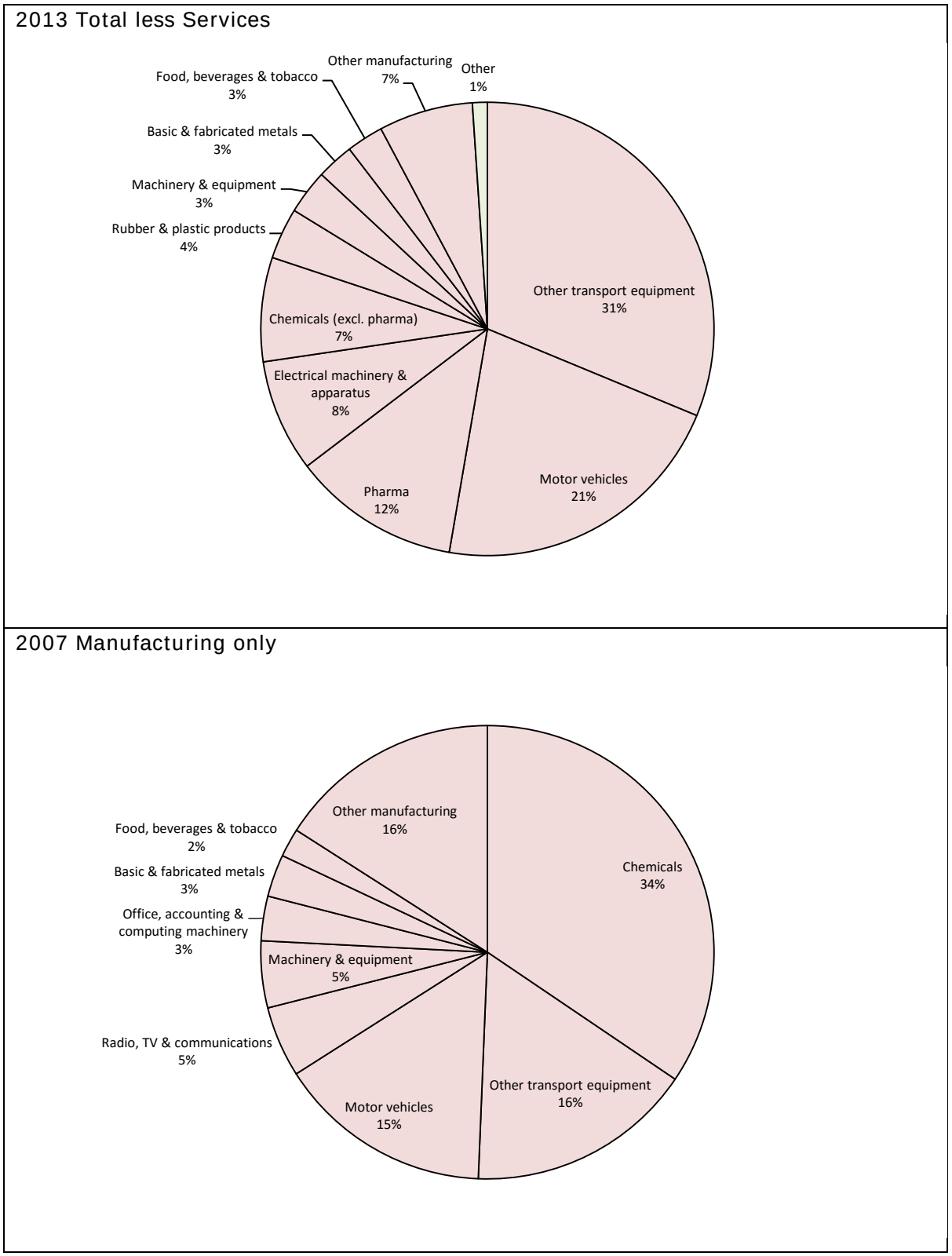
Source: OECD, Eurostat
Note: 2007 is Manufacturing BERD Only and 2009-13 Total BERD less Services

The sectoral perspective

There are some problems in making detailed sectoral comparisons of Inward BERD due to the lack of consistency in the sectoral definitions. Nevertheless the data presented in Figure 3 shows that three sectors dominate foreign R&D in Spain: Chemicals, Other Transport and Motor Vehicles. Together these 3 account for between 65% and 71% of the total. This concentration has also increased over time. The relative importance of these three sectors has changed from 2007 to 2013. The share of Chemicals (including Pharmaceuticals) has declined dramatically (from 34% to 19%) and that of Other Transport has increased equally dramatically (from 16% of total foreign BERD to 31%). The relative position of the Motor Vehicles sector has also improved over time.

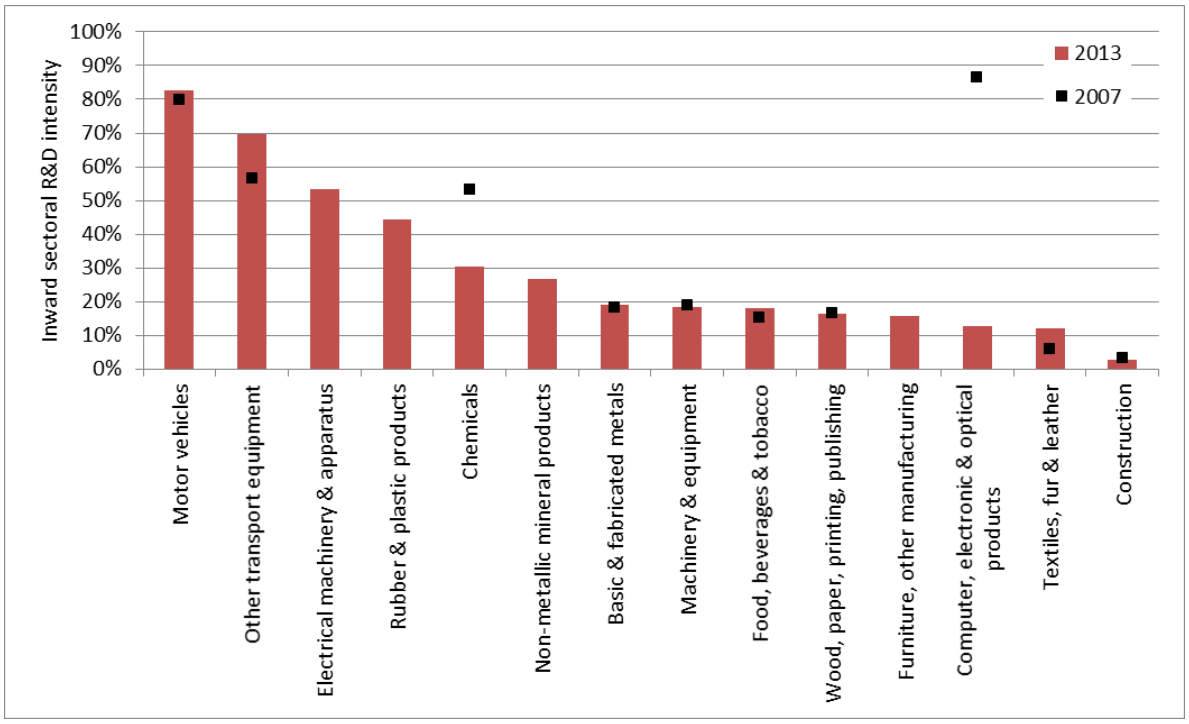
A measure of foreign penetration in a sector is the inward R&D share: the ratio of inward BERD to total BERD within a sector. According to this measure, two of the most important sectors identified above also are heavily dependent on foreign firms: Motor Vehicles and Other Transport. In the case of the former foreign firms account for nearly 80% of total BERD, and in the case of the latter this proportion is 70%. In the third sector highlighted above, Chemicals, foreign firms are relatively less important but still account for upwards of 30% of total R&D.

Figure 3: Shares of various industries on total inward BERD, Spain, 2007 and 2013



Source: Eurostat, OECD
Total Chemicals only in 2007 (No breakdown for Pharmaceuticals)

Figure 4: Inward sectoral R&D share (2007, 2013)



Source: Eurostat, OECD
Note: The inward sectoral R&D share is defined as inward BERD in sector Y / total BERD in sector Y
Computer, electronics and optical products was matched with 'office, accounting and computing machinery'

Country Profile: Sweden

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Country Summary

Compared to other Scandinavian countries, foreign firms are an important component of Industrial R&D in Sweden, accounting for around 40% of the total. However their relative importance has declined since 2003. This is due to a reduction in nominal expenditures between 2003 and 2009. Inward R&D has increased has increased since then. However this is in contrast to Domestic expenditures which have risen by 40% from 2003 to 2013.

The country distribution of Inward BERD for Sweden has changed greatly between 2003 and 2013. While firms from the UK remain the largest investors there has been a significant reduction in their expenditures. In the case of US firms the decline has been even greater, resulting in their share of total foreign expenditures going from 32.7% in 2003 to 12.7% in 2013. In contrast firms from Germany, Netherlands and Switzerland have greatly increased their expenditures in Sweden, especially since 2007.

The limited data available for Inward BERD by industry shows that the most important sectors for Sweden are: Pharmaceuticals, Motor Vehicles and Machinery and Equipment. Together they accounted for nearly three-quarters of all foreign expenditures. They are also the industries with the highest rate of foreign penetration. For example in Pharmaceuticals, more than 80% of total BERD is conducted by foreign firms. In the case of Machinery and Equipment their share is just above 50%, and in Motor Vehicles it is 48%.

Background

Sweden is classed as *Innovation Leader* in the 2016 EU Innovation Union Scoreboard.[1] Its performance is above the EU average for most indicators of innovation. However there are some signs that innovation performance has declined slightly in the last few years. Industrial R&D expenditures have been consistently high, with BERD intensity exceeding 2% over the period since 2003, and standing at 2.12% in 2014. Total R&D (GERD) intensity is also consistently high, with a value of 3.16% of GDP in 2014.

Although more than two-thirds of BERD is performed by Manufacturing industries, Services have become more important over time. Within the former, the most significant industries conducting R&D are Computers, Electronic and Optical Products, Pharmaceuticals and Machinery and Equipment. R&D services, Wholesale and Retail Trade and ICT services have become relatively more important over time. R&D is dominated by large multinational corporations.

Inward Perspective

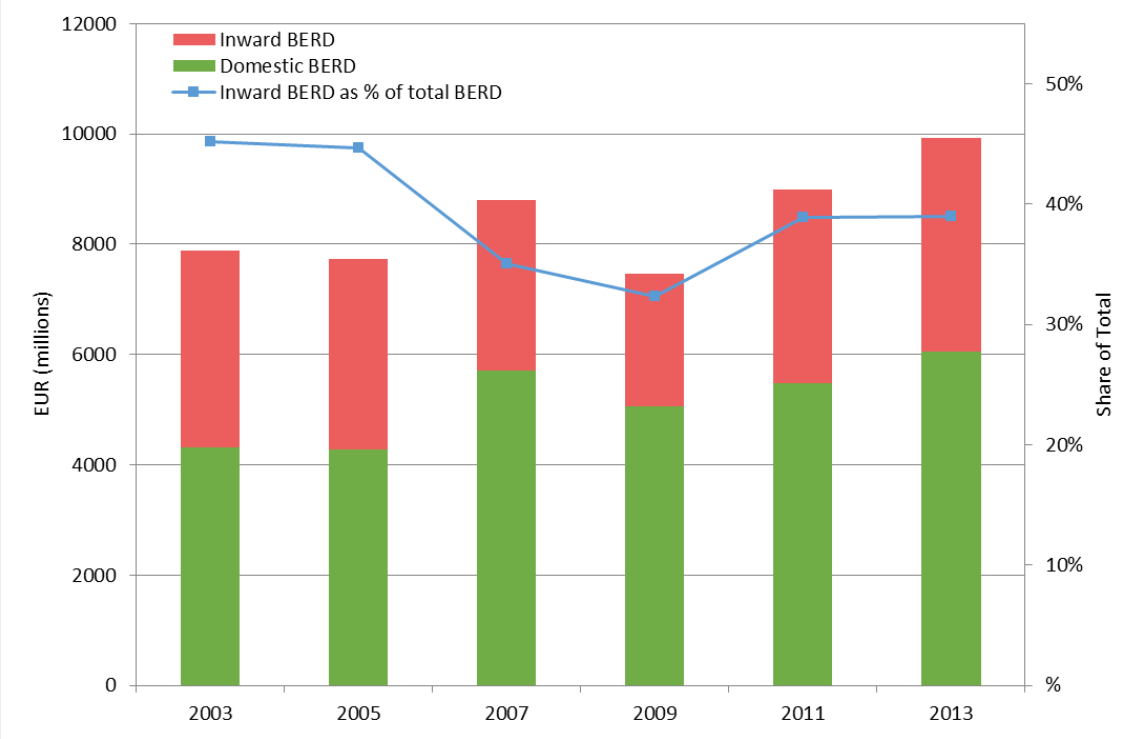
Figure 1 shows that overall BERD increased by 26% from 2003 to 2013. Underlying this change are two contrasting trends. First is a decline in foreign R&D and the second is an increase in domestic spending. The result is that the share of foreign firms in overall BERD has declined from 45% in 2003 to 39% in 2013. However this is still higher than that in other Scandinavian countries, Denmark, Finland and Norway.

Foreign R&D spending decreased from €3,564 million in 2003 to €2,416 million in 2009, a decline of 32%. Since then it has recovered to €3,875 million in 2013. However

[1] http://ec.europa.eu/DocsRoom/documents/17858

Domestic expenditures grew by 40% in the period 2003 to 2013 from €4,322 million to €6,058 million.

Figure 1: Inward BERD, domestic BERD and inward BERD as % of Total BERD (2003-2013)



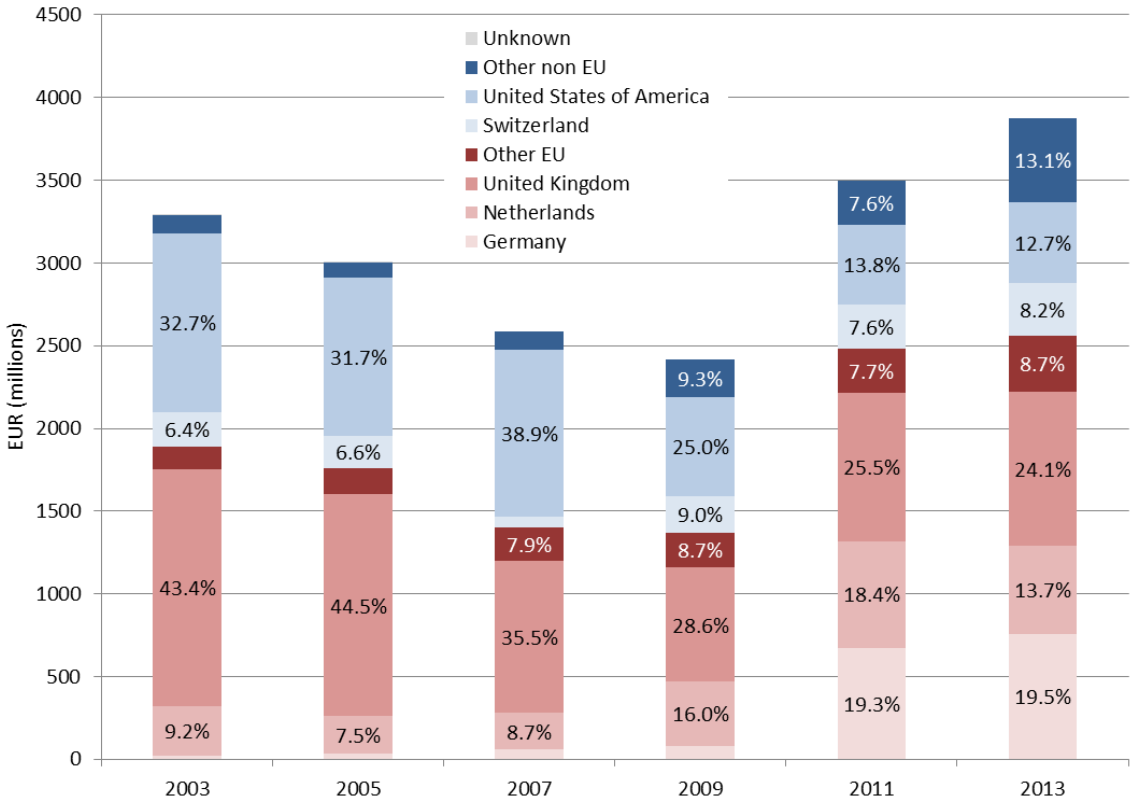
Source: Statistics Sweden, OECD, Eurostat

The country perspective

There has been a number of changes in the country distribution of Inward BERD between 2003 and 2007 (Figure 2). Firms from the UK remain the most important R&D investors in Sweden. However they have reduced their expenditures from €1,432 million in 2003 to €932 million in 2013, resulting in their share of all foreign spending going from 43% to 24%. The reduction in the activities of US firms is even steeper, going from €1,079 million in 2003 to €491 million in 2013, resulting in their share of total foreign R&D going from 32.7% to 12.7%. These two trends explain the decline in the relative importance of Inward BERD noted in the section above.

In contrast there has been a strong upsurge in the activities of firms from 3 countries, especially since 2007. German firms increased their spending from €58 million in 2007 to €757 million in 2013, an increase of 1300%. In the same period Swiss firms saw a rise of nearly 500% and Dutch firms of 237%. The result is that the collective share of firms from these 3 countries has gone up from 16% of Inward BERD in 2003 to 41% in 2013.

Figure 2: Inward BERD - country of origin, Sweden, 2003 to 2013*



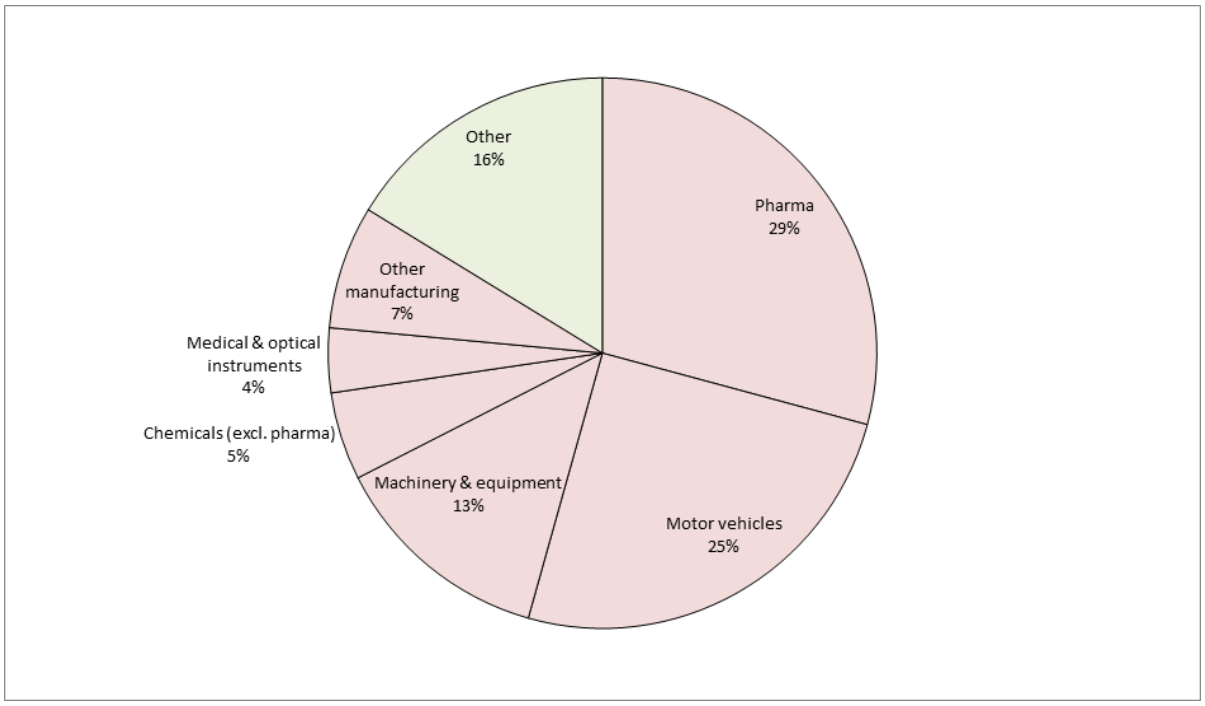
*2003 and 2005 are manufacturing only
Source: Statistics Sweden, OECD

The sectoral perspective

There are significant problems in analysing the sectoral composition of Inward BERD as there are no data available after 2007. Figure 3 shows that in 2007 the 3 most important industries in terms of foreign R&D were Pharmaceuticals, Motor Vehicles and Machinery and Equipment. Together they account for nearly two-thirds of total Inward BERD.

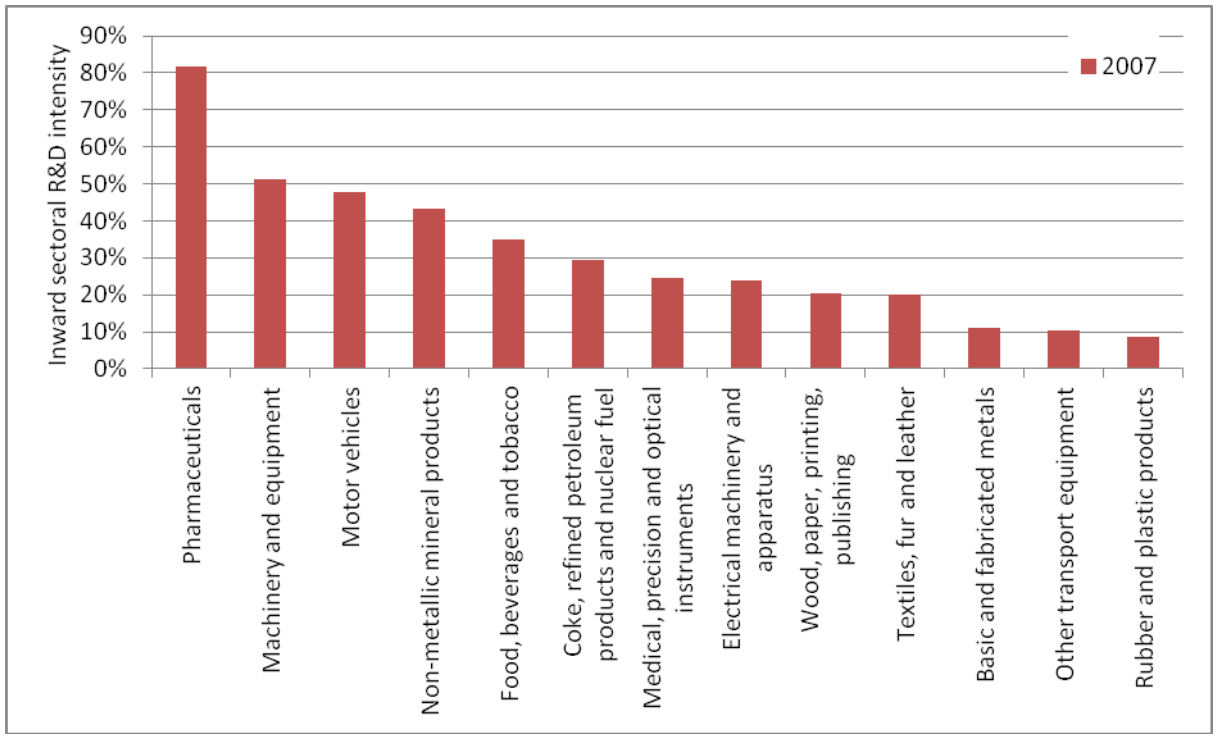
A measure of foreign penetration in a sector is inward R&D share: the ratio of inward BERD to total BERD within a sector. According to this measure the most internationalized sectors for Sweden are the three mentioned above (Figure 4). In Pharmaceuticals, more than 80% of total BERD is conducted by foreign firms. In the case of Machinery and Equipment the share is just above 50%, and in Motor Vehicles 48%.

Figure 3: Shares of various industries in Inward BERD, Sweden, 2007*



Source: OECD
**No Service Breakdown*

Figure 3: Inward sectoral R&D Share2007



Note: The inward sectoral R&D Share is defined as inward BERD in sector Y / total BERD in sector Y
Source: OECD

Country Profile: Switzerland

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Country Summary

Data availability on Inward BERD for Switzerland is severely limited. There is no country breakdown and sectoral data are only available for one year (2012).

Notwithstanding theses caveats, one of the conclusions is that foreign firms play a relatively limited role in Industrial R&D. They accounted for around 20% of total BERD in 2012. This proportion has risen from 14% in 2008. Manufacturing industries account for a very large proportion of total inward BERD in Switzerland (just under 75% in 2012). Two sectors of relative importance are Computer, Electronic and Optical products, Chemicals (i.e. including Pharmaceuticals).

Background

Switzerland is often referred to as the one of the leading countries in the world in terms of Science, Technology and Innovation. It also has very strong international linkages both in terms of trade and in R&D. For a small country Switzerland has high levels of R&D. Its BERD intensity is amongst the highest amongst the OECD countries: 2% of GDP in 2012. Total R&D (GERD intensity is also high with a value of 2.97% in 2012.

The structure of business R&D is dominated by manufacturing (80% of BERD in 2012). Electronic and Optical equipment is relatively the most important sector in terms of BERD, accounting for 28% of the total in 2012. Other sectors of note are Chemicals (including Pharmaceuticals) and Non-Electrical machinery.

Inward Perspective

Data availability on Inward BERD for Switzerland is severely limited. For example there is no country breakdown and the sectoral data are limited to one year.

Foreign firms play a relatively limited role in Industrial R&D. They account for around 20% of total BERD in 2012. This proportion has risen from 14% in 2008.

The country perspective

Data by country for Inward BERD are not available.

The sectoral perspective

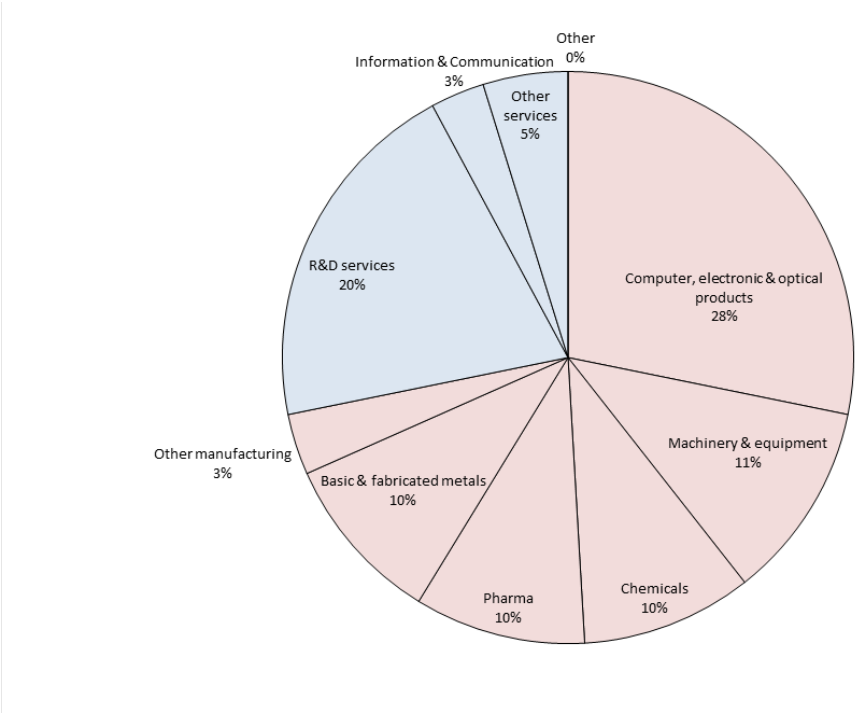
Manufacturing industries account for a very large proportion of total inward BERD in Switzerland: just under 75% in 2012. Within this category the largest contributor is Computer, electronic and optical products, with 28% of total Inward BERD. Chemical industry as a whole (i.e. including Pharmaceuticals) is also important, accounting for 20% of the total. Another sector with a similarly high share is R&D services.

A measure of foreign penetration in a sector is the inward R&D share: the ratio of inward BERD to total BERD within a sector. According to this measure the most internationalized sectors in Switzerland are Computer, electronic and optical products and Basic and fabricated metals. In the case of the former more than 70% of total BERD is accounted for by foreign firms, while in the latter the proportion is over 50%.

Figure 1: Inward, domestic BERD and inward BERD as % of total BERD, 2008 and 2012

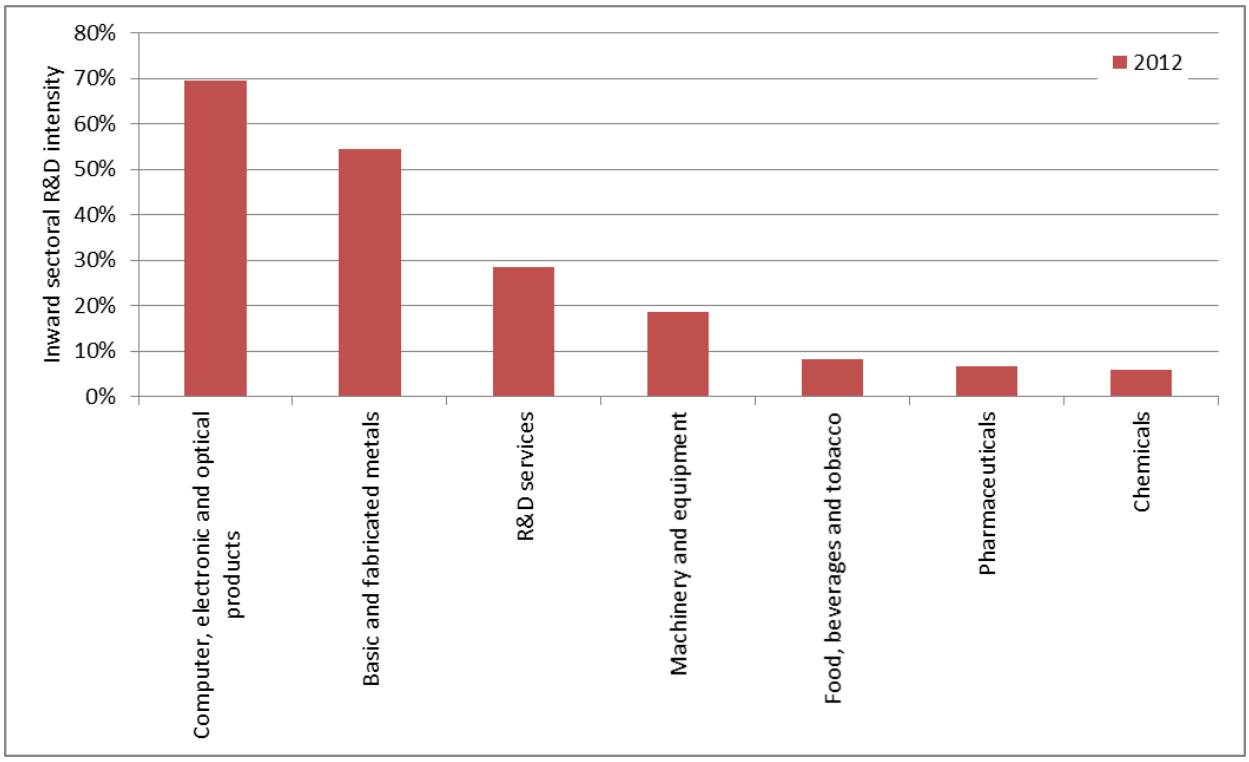
Source: OECD, Swiss Federal Statistical Office

Figure 2: Shares of various industries on total inward BERD, Switzerland, 2012



Source: OECD, Swiss Federal Statistical Office

Figure 3: Inward sectoral R&D Share, 2012



Note: The inward sectoral R&D share is defined as inward BERD in sector Y / total BERD in sector Y
Source: OECD

Country Profile: United Kingdom

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Country Summary

Foreign firms have been a very significant part of UK Industrial R&D since 2003. In 2013 they accounted for 54% of total BERD. Their expenditures have grown by more than 50% since 2010. In contrast Domestic firms have reduced their spending by 10% in the same period. Thus the share of foreign firms in total BERD has gone from 41% in 2010 to 54% in 2013.

American firms continue to play a dominant role in UK BERD. However their share of the total has declined from 56% in 2003 to 41% in 2013. The steepest decline in their expenditures was from 2003 to 2010. The relative importance of firms from outside EU (unspecified due to confidentiality) has increased greatly, with their share of the total standing at 24% in 2013. German and Japanese firms have more than doubled their expenditures and those of French firms have declined.

The 3 most important sectors in Inward BERD are Pharmaceuticals, Motor Vehicles, and Computer Services, together accounting for half the total. There has been very little change in the sectoral distribution since 2007. However the relative importance of foreign R&D within some sectors has changed dramatically. For example in Pharmaceuticals foreign firms are dominant with more than 70% of total R&D in 2011, up from 37% in 2006. On the other hand in Motor Vehicles the opposite has happened with a decline in foreign spend, and hence its share going from 87% in 2006 to 45% in 2011.

Background

The UK is a classed as a *Strong Innovator* in 2016 EU Innovation Union Scoreboard[1], with steady improvement in performance since 2008. It performs better than the EU average for most dimensions of innovation. Industrial R&D has grown steadily over time and there has been little change in BERD intensity, which has fluctuated around 1% since 2003, and stands at 1.1% in 2014. Similarly Total R&D (GERD) intensity has stayed between 1.6% and 1.7% of GDP, with a value of 1.71% in 2014.

Although UK economic structure is dominated by Services, more than two-thirds of total BERD is performed by Manufacturing industries. However Services have become more important over time. The sectors that dominate industrial R&D are Pharmaceuticals, Motor vehicles and Computers, Electronic and Optical Products. R&D services and ICT services have grown in importance over time. Large firms are a very important component of BERD.

Inward Perspective

Foreign firms play a very important part in Industrial R&D in the UK, accounting for more than 50% of total spend since 2011. From 2003 to 2010 their expenditures changed very little. However since then there has been a step change in Inward BERD, going from €7,680 million in 2010 to €11,683 million in 2013, a growth rate of over 50%. In the same period Domestic firms have decreased their R&D expenditures by 10%. The result is that the share of foreign R&D in total BERD has gone from 41% in 2010 to 54% in 2013.

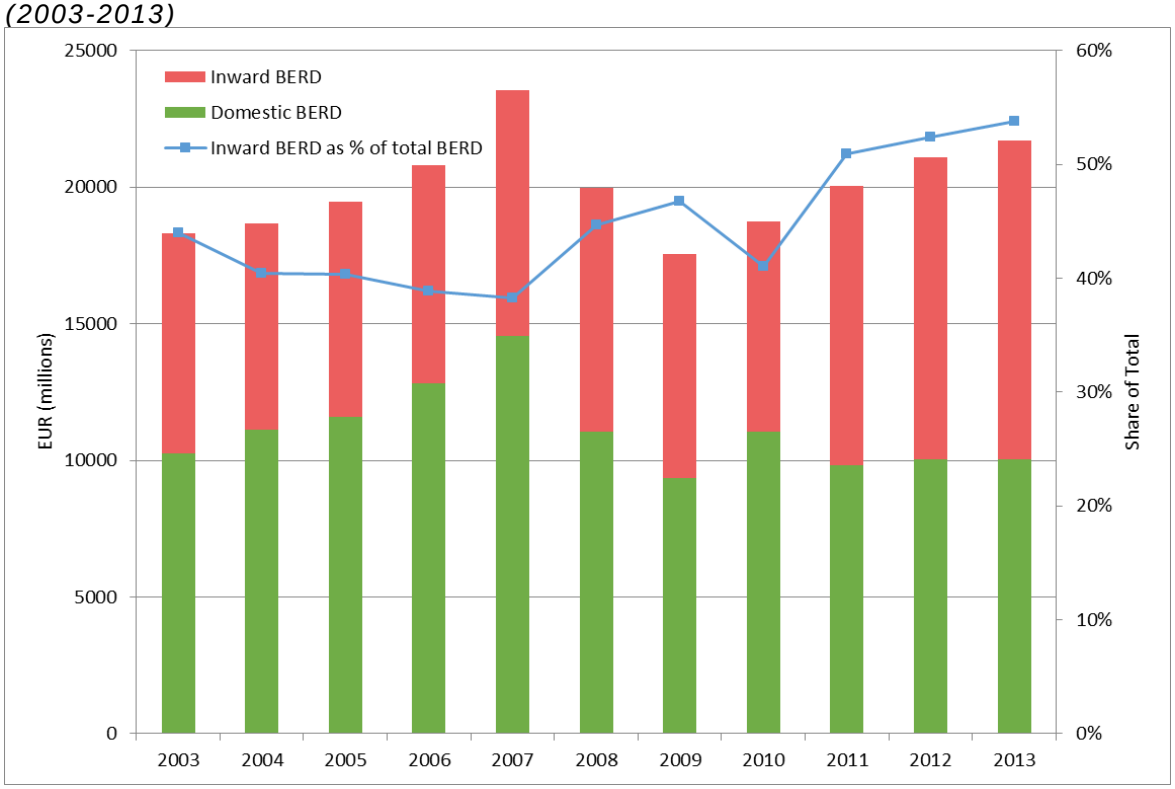
[1] http://ec.europa.eu/DocsRoom/documents/17861

The country perspective

The most important foreign investors in the UK are firms from the US. In 2013 they accounted for 41% of Inward BERD. In the period 2003 to 2010 their expenditures declined by 19% from €4,483 million to €3,617 million. However since then they have increased their spending to €4,734 million in 2013. The result is that the dominance of American firms has declined, going from 56% of the total foreign expenditures in 2003 to 41% in 2013. The largest beneficiaries have been Other non-EU firms, who now account for 24% of Inward BERD. Due to confidentiality the nationality of these firms is not clear.

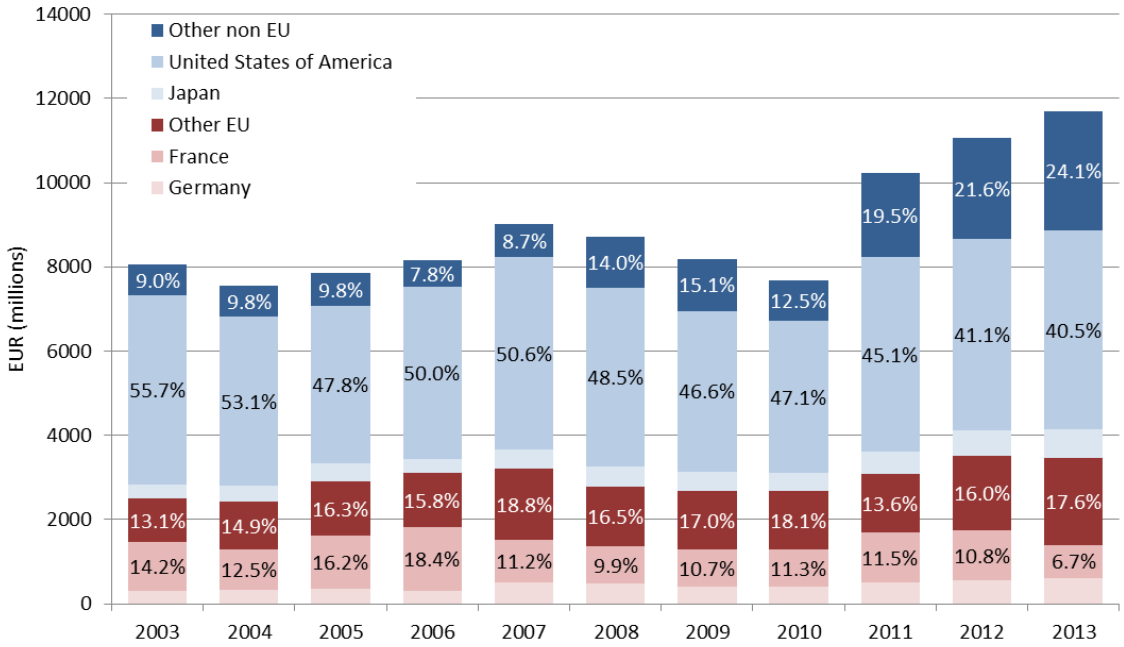
The other important players are firms from France, Germany and Japan. In particular both German and Japanese firms have doubled their R&D spend from 2003 to 2013. In contrast, during that same period, French firms decreased their expenditures €1,145 million to €781 million. Other EU firms (again not specified due to confidentiality) have also increased their share from 13.1% in 2003 to 17.6% in 2013.

Figure 1: Inward BERD, domestic BERD and inward BERD as % of Manufacturing BERD (2003-2013)



Source: Office for National Statistics (UK), Eurostat, OECD

Figure 2: Inward BERD - country of origin, UK, 2003 to 2013



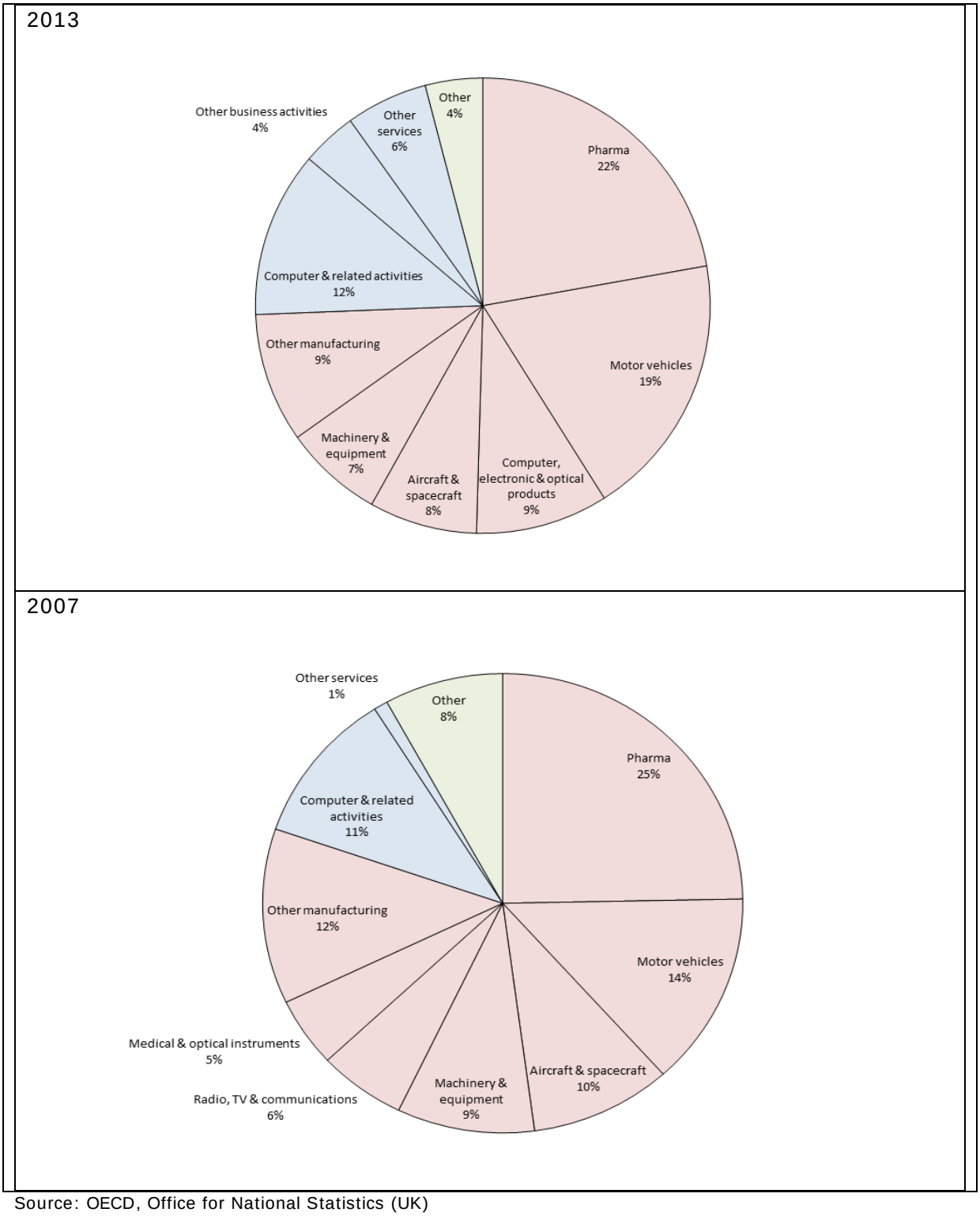
Source: Office for National Statistics (UK)
France, Germany, Japan and the US are the only countries represented (all the other country data are missing).

The sectoral perspective

The sectoral distribution of Inward BERD is dominated by 3 sectors: Pharmaceuticals, Motor Vehicles, and Computer Services. Together they account for around half of all foreign R&D. The other important sectors are Machinery and equipment and Aircraft. There has been very little structural change in sectoral composition over time. Pharmaceuticals has become relatively less important in Inward BERD and Motor Vehicles has increased in relative importance.

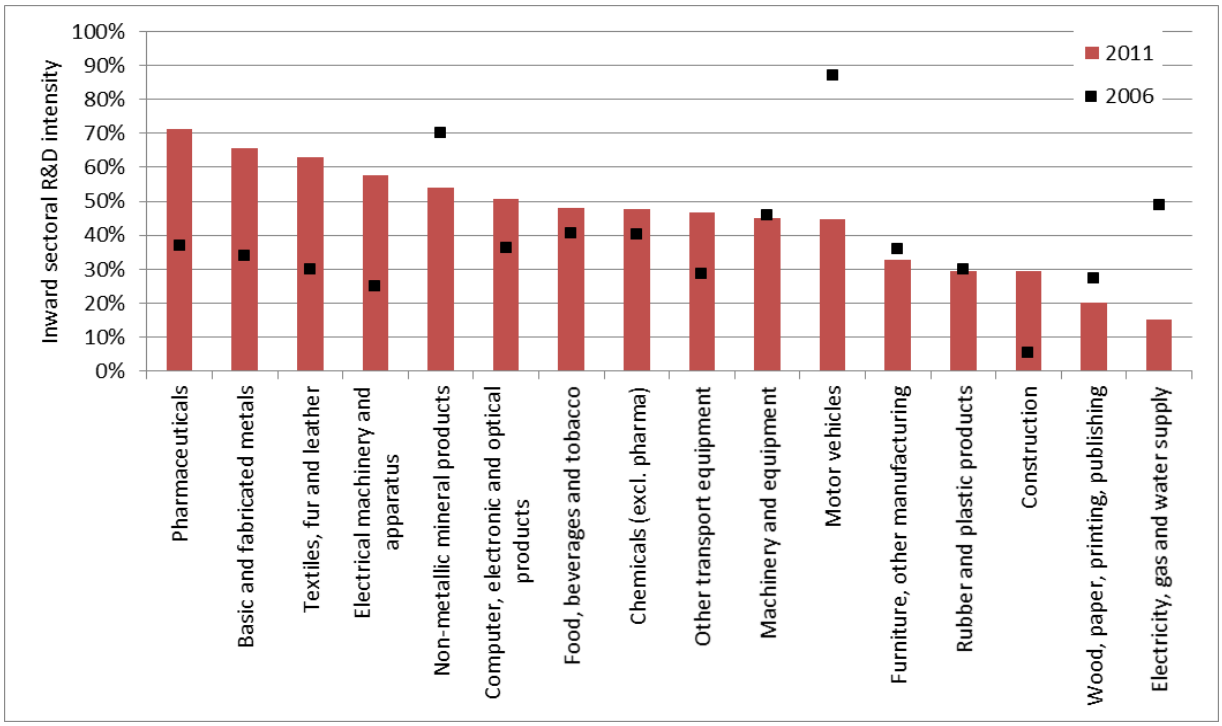
A measure of foreign penetration in a sector is inward R&D share: the ratio of inward BERD to total BERD within a sector. According to this measure the most internationalized sector for the UK is Pharmaceuticals (Figure 4), where foreign firms now account for more than 70% of all R&D. This is also a sector where the influence of foreign firms has increased rapidly, from 37% in 2006 to 71% in 2011. On the other hand in Motor Vehicles foreign R&D has declined, going from €962 million in 2006 to €668 million in 2011. This has resulted in its share of BERD declining from 87% to 45%.

Figure 3: Shares of various industries in Inward BERD, UK, 2007 and 2013



Source: OECD, Office for National Statistics (UK)

Figure 4: Inward sectoral R&D Share (2006 and 2011)*



Note: The inward sectoral R&D share is defined as inward BERD in sector Y / total BERD in sector Y
*Manufacturing Only
Source: Eurostat, OECD

Missing Country Profiles:

Brazil, China, India, Iceland, South Korea, Liechtenstein, Turkey, FYR Macedonia, Montenegro, and Serbia

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Summary

The basis of the country reports is shaped by availability of core-data in the post 2008 period. In a number of European countries and in a number of other potentially interesting countries, there is no core-data. In the case of the five EU countries where this is the case (Cyprus, Greece, Lithuania, Luxembourg, Malta) the country reports are based on patent statistics.

In addition, there are 10 non-EU countries without any inward BERD data. In this category we find the following six European countries: Iceland, Liechtenstein, Turkey, FYR Macedonia, Montenegro, and Serbia. In addition, four third countries are included. They are: Brazil, China, India and South Korea.

In the case of China, there is a special country report based on secondary data. Furthermore, an account of India as well as China are found in Chapter 3 of the Final Project Report.