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EUROPE'S R&D: MISSING THE WRONG TARGETS?

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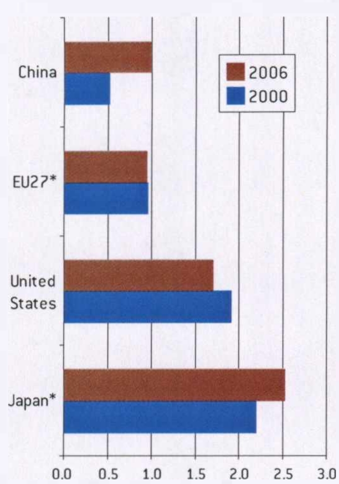
SUMMARY Europe is not delivering on its Lisbon agenda commitment to increase its R&D-to-GDP ratio to three percent by 2010. This is worrying, not only because Europe seems unable to reach an objective it has publicly set itself, but mainly because in 2006 its R&D intensity was still below two percent, having flatlined for more than two decades. As far as business-funded R&D is concerned, the Chinese business sector has even outperformed European firms. The Lisbon-inspired national R&D targets are equally overambitious. The European Commission's benchmarking of member states against the headline three percent figure is questionable because such comparisons rarely take into account the effect of industrial specialisation. For most countries, R&D intensity is a by-product of specialisation. However, Swedish and US R&D intensity is higher than their industrial structure would suggest, implying that other factors are at work, such as a large integrated technology market and a superior academic research environment.

Business-funded R&D as % of GDP, 2000 and 2006 (or closest)



Source: OECD MSTI, 2007. Industry-financed GERD as a % of GDP; * indicates the year 2005 instead of 2006.

POLICY CHALLENGE

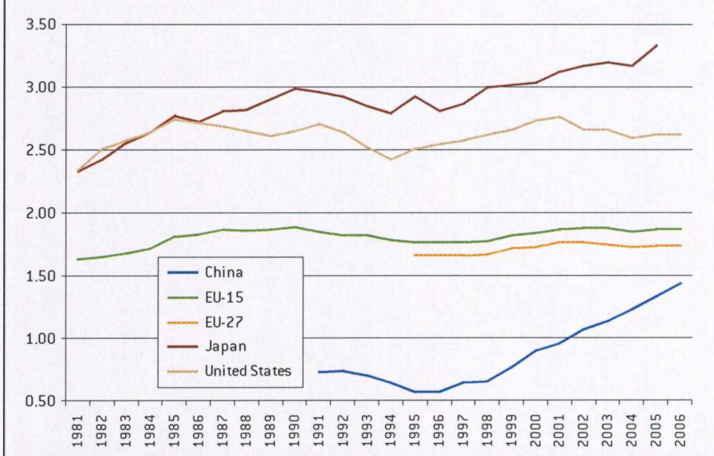
At EU level, the aggregate government sector should first correct its own failure and support research activities up to a threshold of one percent of GDP. Setting targets for private R&D is ineffective. The drivers of private R&D call for a more integrated European market for technology, notably an EU patent in lieu of the current system, which involves prohibitive costs. Also, more funding is needed for academic research, as a magnet for local and foreign business R&D activity in Europe.

ONE OF THE MAIN GOALS of the EU's Lisbon agenda is to achieve a higher level of research and development (R&D) spending. Two sub-targets for R&D spending were clearly defined in 2002: EU R&D intensity (R&D expenditure divided by GDP) was to increase from about 1.8 percent in the late 1990s to about three percent by 2010; and two-thirds of this spending was to be funded by the business sector, the rest being funded by governments.

As illustrated in Figure 1, R&D intensity in the EU has been stable since the early 1980s, fluctuating between 1.6 percent and 1.8 percent. In 2006, R&D intensity in the EU was still under 1.8 percent. The relative spend on research activities in the US has also been stable, but on average above 2.5 percent. Japan exhibits an impressive performance, with a constantly increasing R&D intensity that has remained well above three percent since the early 2000s. Figure 1 also illustrates the dramatic increase in China's total R&D expenditure relative to GDP, from about 0.5 percent 10 years ago to 1.5 percent in 2006. Bottom line: the EU is not really catching up with the US or Japan in terms of research spend, while China is catching up with the EU.

The objective of this Policy Brief is to provide a critical assessment of the R&D component of the Lisbon agenda. Section one underlines the considerable gap between the current levels of R&D intensity and the national objectives that were announced as part of the relaunch of the Lisbon agenda. This section also illustrates governments' sluggish, and in certain cases

Figure 1: R&D intensity of selected EU and non-EU countries, 2006



Source: OECD, MSTI, 2007. The figures are gross expenditures on R&D as a percentage of GDP. The 2006 figures for the EU have been extrapolated from Eurostat figures. OECD sources are used because they provide comparable figures for China, Japan and the US.

counter-intuitive, behaviour with regard to their own self-set agenda. In section two we explain why common R&D targets make little economic sense in an EU where industrial specialisation differs substantially across countries. Failing to account for national industrial structures may actually lead to skewed country benchmarks. Section three investigates what can be done to improve the expected return to R&D in Europe, and hence the propensity to invest in R&D. It sets out two broad policy recommendations which would improve Europe's R&D prospects.

'Europe's R&D effort has been flatlining for two decades.'

1. DELIVERY FAILURE

The intensity of R&D spending across EU member states varies considerably. Figure 2 shows that some countries have reached relatively high levels, especially Finland and Sweden, which several years ago leapfrogged the three percent threshold. Sweden's performance lies close to four percent. Denmark, Austria and Germany are around the 2.5 percent threshold, whereas France is just above two percent. However, the vast majority of countries has an R&D intensity of well below two percent, fluctuating between 0.5 percent and two percent of GDP, with a median of 1.2 percent. This broad range of intensities is also observed within the US, but with a median R&D intensity that is much higher than in Europe, as illustrated in Table 1. The best European performer, Sweden, has an R&D intensity which is less than half that of the top US performer, New Mexico[1]. Seven US states have an R&D intensity higher than four percent, against none for the EU.

Trends in the R&D-to-GDP ratio provide an interesting insight into how active countries have been in

[1] New Mexico is a relatively small state, which has a remarkably high level of R&D intensity. This is largely attributable to federal support to federally funded R&D centres (FFRDCs) provided by the US Department of Energy.

Table 1

Structure of R&D intensity across the EU and US states, most recent data

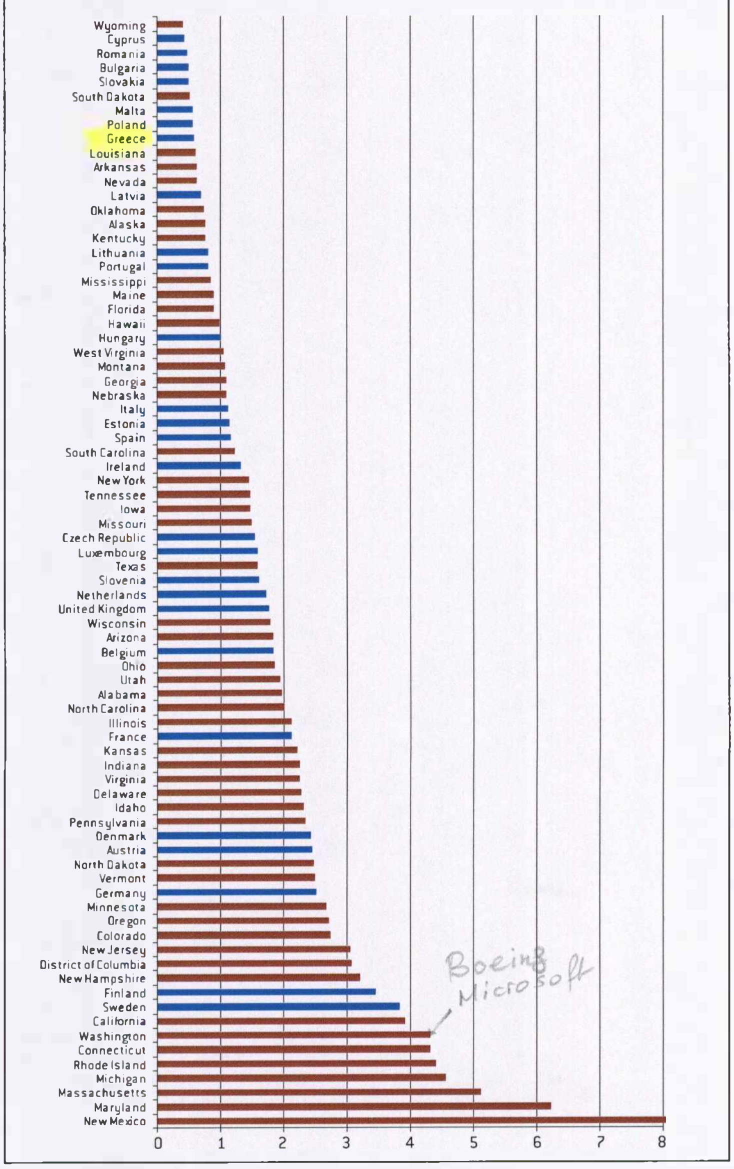
	EU27, 2006	US, 2004
Maximum	Sweden 3.8%	New Mexico 8.0%
Minimum	Cyprus (0.42%) Romania (0.46%)	Wyoming (0.40%) South Dakota (0.50%)
Median across states	1.2%	1.9%
Average across states	1.4%	2.2%
90th percentile	2.5%	4.3%

Source: Bruegel based on Eurostat, US National Science Foundation, Division of Science Resources Statistics, National Patterns of R&D Resources (annual series), Science and Engineering Indicators 2007. The full state-level data is presented in Figure 2.

seeking to improve their relative performance. From 1996 to 2006 the median R&D intensity in Europe increased only slightly. In absolute terms, the most dynamic countries have been Finland (+1.2 percent), Austria (+0.9 percent), Denmark (+0.6 percent) and Sweden (+0.5 percent). These four countries already had a very high level of R&D intensity in 1995, and have made the most marked improvement over the subsequent decade. It is worth mentioning that three countries have seen a drop in their levels of R&D intensity: France (-0.1 percent), the United Kingdom (-0.2 percent), and the Netherlands (-0.2 percent). Their levels of R&D expenditure play an important part in aggregate EU R&D intensity. As illustrated in Table 2 (overleaf), this drop may be explained in part by a drop in government-funded R&D observed in the three countries, which has not been offset by an increase in business R&D expenditure. Table 2 presents government-financed and industry-financed R&D as a percentage of GDP, in 1995 and 2006. Three main observations can be made about these figures:

- First, none of the EU member states has fulfilled its self-set commitment, as no country actually devotes one percent of its GDP to funding public (higher education, laboratories) or business-channelled (subsidies and procurement) research activities. The only countries that are close to the one percent target are Sweden, Austria and Finland.
- Second, despite the Lisbon agenda, a large number of countries have actually

Fig 2. R&D intensity of US federated states (2004), and EU member states (2006)



Source: Bruegel based on Eurostat, National Science Foundation, Division of Science Resources Statistics, *National Patterns of R&D Resources* (annual series), Science and Engineering Indicators 2007 reduced their government funding of R&D as a percentage of GDP. The aggregate EU27 government-funded R&D intensity fell between the mid 1990s and 2005. Interestingly, a drop also occurred in the US and Japan over the same period, but it was largely compensated for by a more than proportional increase in business-funded R&D, which was not the case for EU27.

- Third, the Chinese business-funded R&D intensity is at the same level, in fact a little higher, than that of Europe, bearing witness to the dramatic increase in private R&D activity in China.

In addition to this counter-intuitive behaviour whereby the 'average' EU government has actually reduced its support to R&D activity over the past ten years, the spending targets which individual countries have chosen to set themselves were overly ambitious. Indeed, Figure 3 illustrates a clear positive relationship between a country's distance from the three percent target in 2004 and the target it has set itself for 2010. The further away from the Lisbon target a country was, the bigger the increase projected in the national programme implementing the Lisbon agenda. Although this could be seen as expressing political will to catch up with the best performers, many of the targets set are clearly unrealistic. They appear to represent wishful thinking rather than political momentum. The right-hand side of Figure 3 shows that some countries have set 2010 targets that are between two and four times higher than their level of R&D intensity in 2004.

Table 2

Industry and government-financed gross expenditure on R&D (GERD), as a percentage of GDP (1995 and 2006, or closest date)

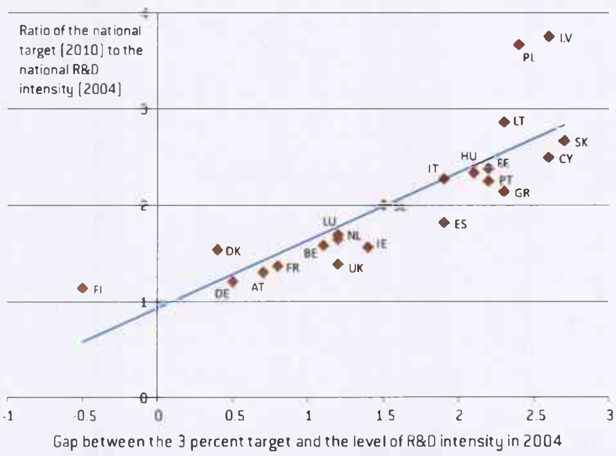
	Industry-funded GERD			Government-funded GERD		
	2006	1995	Difference	2006	1995	Difference
Sweden	2.55	2.17	0.38	0.91	0.96	-0.05
Finland	2.30	1.35	0.95	0.87	0.79	0.08
Germany	1.68	1.31	0.37	0.70	0.83	-0.13
Denmark	1.46	0.82	0.64	0.67	0.72	-0.05
Luxembourg	1.28	na	na	0.27	na	na
Austria	1.14	0.70	0.44	0.90	0.72	0.18
France	1.12	1.10	0.02	0.82	0.96	-0.14
Belgium	1.11	1.12	-0.01	0.46	0.39	0.07
Netherlands	0.90	0.90	0.00	0.64	0.83	-0.19
Czech Republic	0.88	0.60	0.28	0.60	0.31	0.29
Slovenia	0.82	0.72	0.10	0.56	0.64	-0.08
Ireland	0.79	0.85	-0.06	0.40	0.28	0.12
United Kingdom	0.75	0.94	-0.19	0.58	0.64	-0.06
Spain	0.52	0.35	0.17	0.48	0.35	0.13
Italy	0.43	0.41	0.02	0.56	0.52	0.04
Hungary	0.43	0.27	0.16	0.45	0.38	0.07
Portugal	0.29	0.11	0.18	0.45	0.35	0.10
Poland	0.18	0.23	-0.05	0.32	0.38	-0.06
Slovak Republic	0.17	0.55	-0.38	0.27	0.35	-0.08
Greece	0.16	0.10	0.06	0.24	0.20	0.04
Romania	0.14	0.31	-0.17	0.29	0.46	-0.17
Median	0.82	0.70	0.10	0.56	0.46	0.00
EU27	0.94	0.86	0.08	0.61	0.66	-0.05
United States	1.70	1.51	0.19	0.77	0.89	-0.12
Japan	2.53	1.96	0.57	0.56	0.67	-0.11
China	0.99	na	na	0.35	na	na

Source: OECD, MSTI, 2007.

2. SKEWED COUNTRY BENCHMARKING

In addition to the relative government spend on research activities, a second issue that must be examined when evaluating countries' R&D performance is industrial specialisation. A country specialised in finance (eg Luxembourg) would not need a high level of R&D expenditure in order to ensure growth – at least as commonly measured (the innovative efforts that are required to introduce new financial products are not included in R&D statistics). Similarly, a country specialised in tourism, fashion, services or food would logically have lower R&D intensity than a country specialised in the pharmaceuticals, engineering or biotech industries. Interpretations drawn from Figure 2 and Figure 3 are therefore to be treated with a substantial degree of caution. For instance, Finland has a reputation for specialisation in information and communication technologies, an industry which is very intensive in R&D. Taking into account this specialisation, the Finnish R&D

Figure 3: R&D intensity targets for 2010 compared 'the Lisbon gap' in 2004

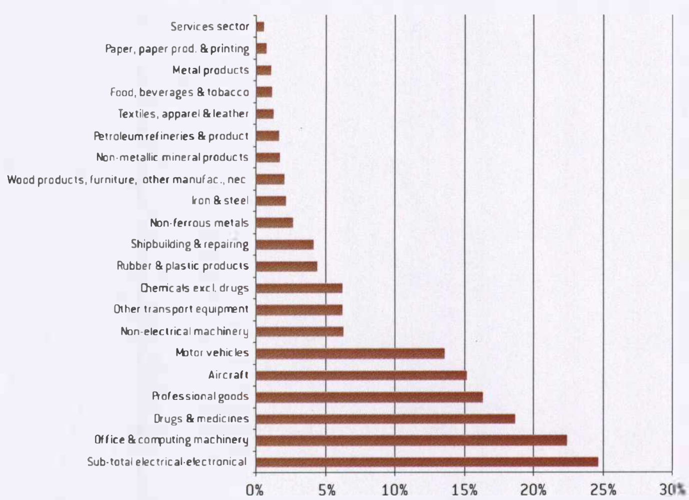


Source: Bruegel based on European Commission, National Reform Programmes and annual reports on implementation. Bulgaria, the Czech Republic, Romania and Sweden not included as we were not able to find an explicit R&D target in the National Reform Programmes of those countries.

intensity may be perceived as not being particularly high.

The role of specialisation has received increased attention in recent European reports on innovation (see the Aho Group report (2006), the second report of the Knowledge for Growth Group (2007) and the Commission's Key Figures 2007). This is important, as some countries generally praised for their above-average R&D intensity may actually not be performing particularly well given their specialisation in R&D-intensive industries. Figure 4 shows the R&D intensity of most manufacturing industries averaged over ten OECD countries. It is clear that there are very considerable differences between sectors. This confirms that international comparisons of R&D intensities should take account of the particular specialisation of each country.

Figure 4: R&D intensity by industry, average across ten countries



Source: Mathieu and van Pottelsberghe based on OECD, ANBERD and STAN databases (2005).

In order to evaluate the extent to which industrial specialisation may affect our assessment of national R&D performance we rely on the estimates provided by Mathieu and van Pottelsberghe (2008), which seek to shed light on the drivers of business-funded R&D at the industry level. They use panel data of industry-specific R&D spending for about 20 industrial sectors in 10 countries over the period 1991-2002. Their results lead to three observations:

- Technological specialisation explains the variation in R&D intensity much better than any other country specificities.
- Not taking into account industrial specialisation may lead to a highly skewed ranking of countries.
- When industrial specialisation is taken into account, only Sweden and the US still outperform other countries. Neither Japan nor Finland has a particularly high R&D intensity in relation to what their industrial structures would suggest.

In a nutshell, business R&D intensity is endogenous, not exogenous. Governments should therefore go beyond traditional incentive policies such as direct R&D subsidies or tax credits. To set a business-funded R&D target at the country level is thus either wishful thinking or an implicit industrial policy – a way to alter the country's industrial structure. In other words, there is no basis for the setting of EU-wide or country targets in the Lisbon programmes unless the EU's intention is to determine member states' industrial structure. Pouring R&D money into low-tech sectors would clearly have only a very small impact on aggregate efficiency.

The strong increase observed in the R&D intensity of Finland, Denmark and Sweden is attributable in large measure to the trend in their technological specialisation towards R&D intensive industries, as illustrated in European Commission's Key Figures 2007. At EU level, technological specialisation has not evolved much towards R&D intensive industries, which explains the lack of 'visible progress' over the past few years[2]. This technological specialisation factor is taken by the Commission to explain both the European R&D 'inertia' (the business R&D intensity has been very stable over the past twenty years) and the EU gap with respect to the business R&D intensity of the US[3].

However, the results obtained by Mathieu and van Pottelsberghe (2008) suggest that when the technological specialisation of countries is taken into account, Sweden and, to a lesser extent, the US still display above-average R&D intensity. Something other than technological specialisation thus seems to drive R&D intensity in Sweden and the US. The next section puts forward tentative explanations for the US and Swedish exceptions and draws lessons for EU and national policy.

'The 'average' EU government has actually reduced its support to R&D activity over the past ten years.'

3. HOW CAN EUROPE STIMULATE BUSINESS R&D?

One important driver of business R&D expenditure is the expected return on the investment. What would improve this expected return? Beside fashionable R&D tax credit or direct subsidisation policies designed to reduce the cost of carrying out R&D, two specific policy areas deserve particular attention in Europe[4]:

An integrated market for innovation

Larger markets would logically result in a higher expected return on investment in R&D. The market size hypothesis may explain why the US has an above-average R&D intensity (larger than its industrial structure would suggest). The US benefits from a huge and homogeneous market, with one main language and one regulation[5]. In Europe, sending a product from Amsterdam for sale in Brussels is still considered an 'export', whereas in the US a product made in New York and sold in Los Angeles is labelled 'distribution'. Besides these proverbial examples, a large body of evidence has been published on the lack of European integration. And an additional key growth ingredient is still missing: an EU-wide financing solution for emerging companies[6].

Emblematic of the lack of market integration is the way the innovation system works in Europe. The European patent system, and hence the European market for technology, is highly fragmented. Once a patent has been granted by the European Patent Office (EPO), it must be validated, translated, monitored and enforced in all relevant national patent offices. For that reason, a patent examined by the EPO and then enforced in 13 European countries costs about 11 times more than a patent granted by the United States Patent and Trademark Office (USPTO), and 14 times more than a patent granted by the Japanese Patent office (JPO)[7]. The gap is still considerable for 20-year protection. In 2004, a European patent examined by the EPO and validated in 13 member states cost more than €20,000, against €1,800 in the US and €1,500 in Japan.

Table 3
European patent costs (enforced in 13 countries) relative to the US and Japan

	Cumulated fees and translation costs (*)	Total cost for 20 years (**)
US	11	9
Japan	14	7

Source: Adapted from van Pottelsberghe and François (2006). These figures represent the simulated costs of a European patent divided by the simulated cost of an average patent in the US and in Japan. (*) The costs include the expenses (fees and translation costs) for a patent examined by the European Patent Office (EPO) and validated in 13 European countries after granting. (**) The total cost for 20 years also includes the renewal fees for 20 years in 13 European countries. These costs are related to the absolute cost of an average patent. The recently ratified London Protocol will reduce translation costs somewhat.

These costs only include the filing examination, validation, translation and renewal fees. They do not reflect the managerial complexity of enforcing patent portfolios in several European countries, nor do they include the litigation costs in case of infringement. The policy implication is straightforward. The

[2] "The lack of visible progress between 2002 and 2005 is largely due to the fact that business research expenditures depend on the structure of industry, which evolves slowly", European Commissioner Potocnik, December 2007, 'Towards an open and competitive European Research Area', in 'The future of Science and Technology in Europe', MCTES.

[3] "..The EU/US BERD deficit cannot be attributed to the fact that individual European companies perform less R&D than their US counterparts in the same sector: the main reason for the deficit is linked to differences between the European and American industrial structures." (Key Figures 2007, p. 35)

[4] In addition to the numerous innovation-related policy recommendations proposed by expert groups, such as the Aho Group report (2006) and the second report of the Knowledge for Growth Group (2007) mentioned in section 2 of this Policy Brief.

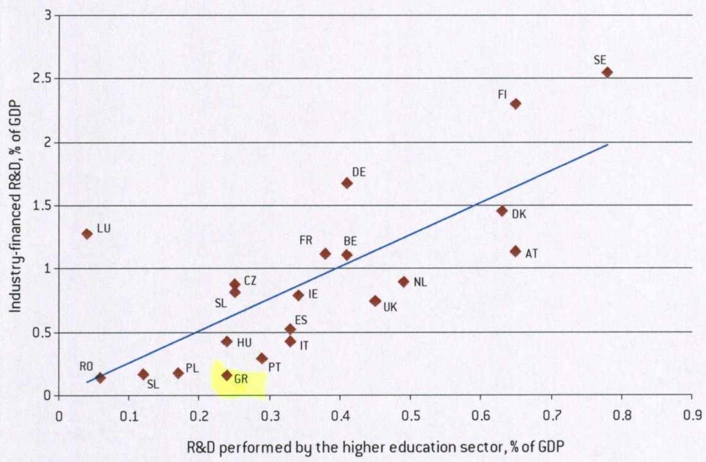
failure to create an EU patent places a heavy burden on the shoulders of European innovators and entrepreneurs at the very beginning of the innovation process - a clear comparative disadvantage for Europe with respect to the US and Japan.

More and better academic research

Market size may explain US performance with regard to R&D intensity, but it does not explain the performance of Sweden. The explanation here is probably linked to the relatively very high level of spending on academic research, the highest (as a percentage of GDP) in the whole OECD area, as illustrated by Figure 5. This strong emphasis on academic research is also a stimulus for business R&D: universities generate new ideas which are then transferred to the private sector. The transformation of these ideas into products or processes requires further applied research activity and development. Not surprisingly, the four countries in Figure 5 with the highest academic R&D intensities are also the four countries with the highest business R&D intensities. Provided effective technology transfer systems are put in place, academic research is probably the most effective source of new ideas, which in turn induce further research in the business sector[8]. In this respect, the European Research Council (ERC), which provides merit-based fundamental research grants, is a recent positive example of what the EU can achieve.

'The European patent system, and hence the market for technology, is highly fragmented.'

Figure 5: Business-funded R&D and R&D carried out in institutions of higher education as a percentage of GDP, 2006 or closest



Source: OECD, MSTI, 2007.

Not only does academic research feed ideas to the market, but it also attracts more funding from the business sector and promotes the setting up of scientific clusters. For instance, Abramovsky *et al* (2007) show that, in the UK, universities with a high scientific output attract significantly more local and foreign research laboratories to their neighbourhood. This question is key because gaining a technological edge is the main driving force behind foreign business R&D investment, be it in the US, in Europe, or elsewhere. In fact, large firms nowadays increasingly invest in emerging markets, which provide a high-quality labour force at much lower cost than in Europe[9]. As shown by Thursby and Thursby (2006) in their survey of US and European firms, a majority of respondents expect to increase their technical staff in China and India, while they anticipate a substantial decrease in such staff in Europe.

'High academic research spend correlates with high business R&D spend.'

The important role played by academic research as provider of ideas to the business sector and as a driver of foreign R&D expenditure implies a need for relatively more resources to be devoted to higher education research activities. Indeed the recent Bruegel Policy Brief on European universities underlines that Europe invests too little in higher education and that 'European universities suffer from poor governance, insufficient autonomy and often perverse incentives'[10]. In addition to remedying these three failings, governments should also provide more funding for universities' research activities. The alternative for Europe will be to lose related business research, and ultimately to lose business.

[5] The idea that there is a positive relationship between the size of a country and its propensity to invest in R&D is empirically and theoretically supported by Guellec (1999) and Desmet and Parente (2006).

[6] See Philippon and Véron (2008), Bruegel Policy Brief 2008/1 'Financing Europe's fast movers'.

[7] See van Pottelsberghe and François (2006).

[8] Guellec and van Pottelsberghe (2004) provide evidence suggesting that the social return to academic research is higher than the social return to business R&D.

[9] Walsh (2007) documents evidence on more than 750 foreign-owned R&D centres in China in 2005.

[10] Philippe Aghion, André Sapir, Mathias Dewatripont, Caroline Hoxby and Andreu Mas-Colell, Bruegel Policy Brief, 2007/4, 'Why Reform Europe's Universities?'.

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The quality challenge in the European patent system

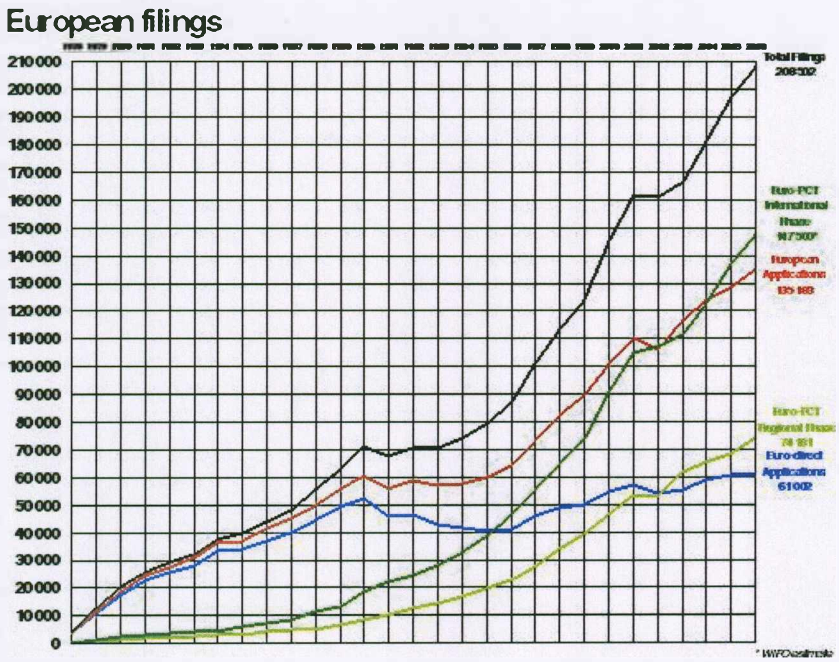
Bruno van Pottelsberghe de la Potterie
10 December 2007

Patent applications are booming, but many seem to be of low quality and/or strategically manipulated to hide the real invention within a myriad of claims. This delays the patent-granting process and hinders the system's ultimate goal of balancing incentives for knowledge creation with knowledge dissemination. Here are some ideas on how to fix the problem.

For the European patent office, the year 2006 was marked by a new record in the number of patent filings, which was well above 200,000 applications: a 150% increase since 1995 (cf. figure on European filings). Concomitant to this boom in the number of filings is the constant increase in the average size of patent applications. For instance, Archontopoulos et al. (2006) show that every year patent applications at the EPO are enlarged on average by two additional claims. The number of pages per patent follows a similar trend. This evolution puts major patent offices around the world under such a heavy workload that huge backlogs are being formed with increased delay in the granting process, hence a longer uncertainty on the market.

Burn out symptoms...

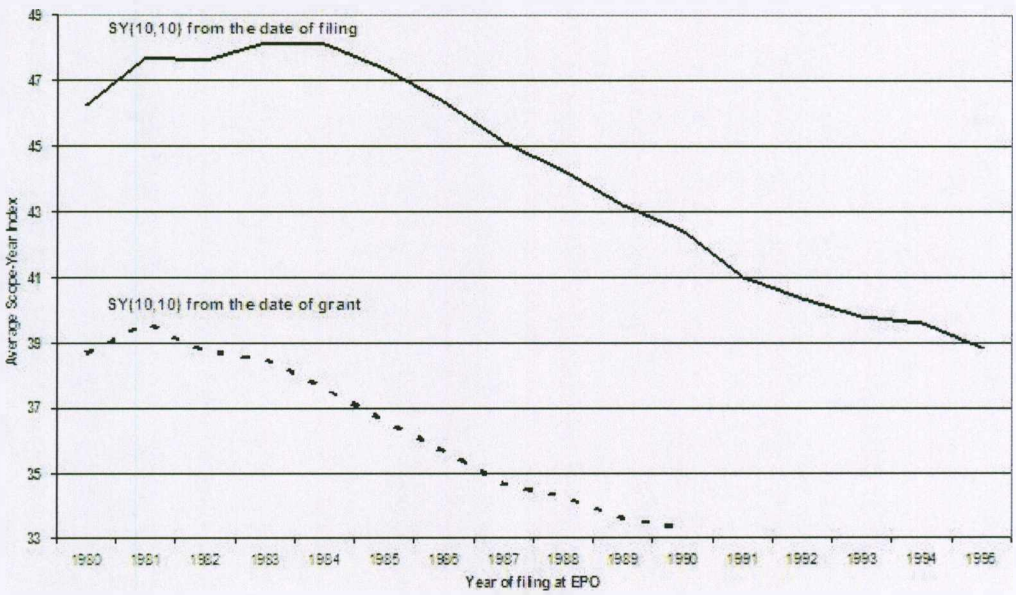
A worrying aspect of this trend is that it seems to be associated with a significant drop in the quality of applications, as witnessed by several factors.



Data source : EPO

First, anecdotal evidence on increased numbers of low-quality patent is flourishing [cf. Jaffe and Lerner (2004) and Guellec and van Pottelsberghe (2007) for examples of very low quality patents filed at the USPTO and at the EPO, respectively]. Second, global R&D expenses have increased at a much slower pace over the past twenty years (R&D intensity within the OECD area has slightly grown), suggesting that a larger number of patents is filed for a given invention, or that the propensity to file an application for lower-quality inventions has increased. Third, van Pottelsberghe and van Zeebroeck (2008) provide a first empirical evidence of a substantial downward trend in the potential value of the patents granted by the EPO. The authors show that the scope-year index, based the average number of country-year of protection within the European patent convention has constantly decreased since 1985 (cfr. Figure on the scope-year index).

The Scope-Year index, 1980-1995



Source: van Pottelsberghe and van Zeebroeck (2008).

Diagnostic: new strategies

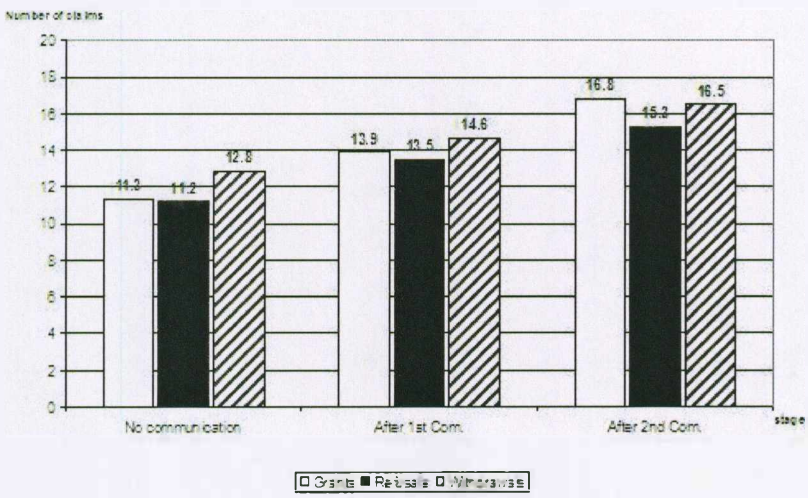
This boom in both the number and size of patent filings is due to several factors, including emerging technological fields (e.g., nanotechnologies, biotechnologies), new actors (e.g., China, India) and new types of institutions who entered the patent arena (e.g., universities, and SMEs).

These factors may actually induce more patent filings, but may not be taken as the cause of a quality drop. The main reason underlying the increase in both the number and the size in patent filing, and the drop in their average quality, is most probably related to the new filing strategies adopted by firms. Harhoff (2006) provide evidence on new 'constructionism' strategies (firms merge several patents to file a single application, or increasingly file divisional applications, which consist in splitting a patent into several smaller subsequent patents). Stevnsborg and van Pottelsberghe (2007) list a vast number of filing strategies (including drafting styles and filing routes) that firms increasingly use when prosecuting their patent at the EPO. The authors put forward a typology of these filing strategies that range from 'fast track and fair' to 'slow track and abusive' behaviours.

The ultimate effect of these 'new' behaviours is to delay the granting process and/or hide the real invention within a myriad of claims and pages: in other words a more intense uncertainty is held for a longer period of time).

The following figure, from Lazaridis and van Pottelsberghe (2007), illustrates one dimension of the effect of larger patents. It clearly shows that smaller patents have a much smaller probability to induce a communication between the examiner and the applicant (from an average of 11 claims per patent, two additional claims lead to an additional communication). The authors show that each additional communication in turn leads to a delay of about one year in the grant process. That is, applicants who file excessively large applications deliberately induce a substantial delay in the granting process. Van Zeebroeck (2007) further shows that several filing strategies not only delay the granting process but extend the entire life of a patent as well.

The impact of the number of claims on the grant process



Source: Lazaridis and van Pottelsberghe (2007).

Temporary cure vs lifelong vaccine?

Such evolution does not fit the objective of a patent system. Keeping in mind that it was created to stimulate innovation – the effective use and diffusion of an invention – having a patent system that induces the granting of 'obvious' inventions, with very low inventive steps, would rather induce legal and economic uncertainty. It would simply make it easier to protect existing product and more difficult to avoid imitation by firms who would easily 'invent around'. The current patent system was certainly not designed for operating in such a world of booming applications and huge backlogs.

What is at stake is the ability of the patent system to continue fulfilling its mission in Europe, i.e. encouraging innovation and the diffusion of technology. While the mission has not changed, the context is different, hence the constraints faced by the system and the means through which it can operate.

Patent offices have reacted at different speed and with different strategies. The USPTO has for instance intensified its recruitment of examiners (1,193 new examiners in 2006 and another 1,200 in 2007) and has started a new project that consists in opening the identification of prior art to third parties (hence improving the novelty test). The EPO has further engaged into a "raising the bar" strategy.

Conclusion

A direct response to such an evolution is indeed to strengthen the selection process, in order to ensure that patents are granted only for high quality inventions and that bad or low quality applications enter the patent system as little as possible. In Guellec and van Pottelsberghe (2007) the following steps, amongst others, are suggested:

- Make it easier for examiners to refuse/reject patent applications (e.g. reducing the paperwork and lengthy correspondence), for instance through the suppression of the implicit presumption of validity associated with all patent filings;
- Reduce the possibility for the applicants to modify applications once they are filed, as such a tactic is often used to delay the process (divisionals could be allowed only once for instance, as opposed to the numerous generations of divisionals currently observed);
- Increase incentives for applicants to file high quality applications – clear enough, not too long etc. This could be done by adapting the fee schedule (steep increase with the length of the application) or establishing sanctions (e.g. immediate refusal) for bad applications;
- Open the examination process to external contributions, notably in areas where much of the prior art is widespread in the public instead of patent data bases. There is an ongoing experience in the US in the area of software that should be carefully observed;
- Diffuse among the public the tools used by the EPO to access prior art, so that competitors (especially SMEs) could track more efficiently the ocean of existing prior art, and when relevant could oppose patent applications that relate to their own patented technologies;
- Increase the inventive step, notably in emerging technological fields (information technology, biotechnology).

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Topics: Productivity and Innovation
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Europe's R&D: missing the wrong targets?

By: Bruno van Pottelsberghe

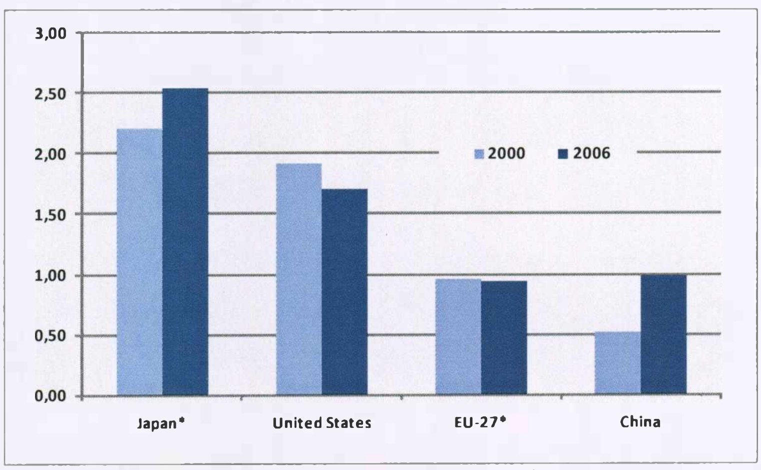
Bruegel Policy Brief 2008/03

Questions and answers for media

What is the background to this Policy Brief?

Europe is not living up to the perhaps most well-known target in the Lisbon agenda, to increase its investment in R&D to 3 percent of GDP. This is worrying, not only because Europe seems unable to reach such a high profile objective, but foremost because in 2006 investment in R&D was still below 2 percent. The EU's investment in R&D has been stable between 1,6 percent and 1,8 percent since the early eighties, while the USA has had an average above 2,5 percent. At the same time Japan has constantly increased its R&D intensity and has now overtaken the 3 percent threshold. Even China has, with dramatic increases over the last ten years, almost caught up with the EU.

Figure 1: Business funded R&D as a percentage of GDP, 2000 and 2006 (or closest)



Source: OECD MSTI, 2007. Industry-financed GERD as a percentage of GDP; * indicates the year 2005 instead of 2006.

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What is the focus of this Policy Brief?

This Policy Brief is a critical assessment of the R&D component of the Lisbon agenda. The Policy Brief:

1. Discusses the gap between the actual levels of investment in research and development and the national targets that were announced under the Lisbon agenda.
2. Explains why targets for research and development investment at an EU level make little economic sense, since countries have different industrial specialisations.
3. Investigates what can be done to improve the expected return to investment in R&D in Europe.

How far from the target are the actual levels of investment in R&D?

In 2006, R&D intensity in the EU remained under 1,8 percent, which means that it has remained unchanged since the Lisbon Agenda's launch. There are major differences between the EU member states. Finland and Sweden have exceeded the 3 percent target for several years. Denmark, Austria and Germany are around 2,5 percent. But the vast majority of countries are still well below 2 percent.

The countries that have improved their levels of investment in R&D most in the last ten years (Finland, Austria, Denmark and Sweden) were countries that already had high levels in 1995. And three countries have seen a drop in their R&D intensity: France, United Kingdom and the Netherlands.

None of the EU member states currently fulfils the commitment that government should devote one percent of GDP to funding investment in R&D. A large number of countries have actually reduced their government funding as a percentage of GDP.

Is there a problem with the target?

The need for a high level of investment in R&D depends on the industrial specialisation of a country. Countries specialised in tourism, fashion, services or food industries would logically have a lower R&D intensity than a country specialised in pharmaceuticals, engineering or biotech industries. This Policy Brief shows that much of the variation in R&D intensity across countries can be explained by different country specialisations. To set a target for total R&D investment at an EU or country level is, therefore, problematic since research activity is dependent to a large extent on a member state's industrial structure.

What can be done to stimulate R&D?

Even when taking the industrial specialisation of countries into account Sweden and the US have an R&D intensity which is above average. This suggests that there are factors other than technological specialisation that stimulate R&D investments in these countries. This Policy Brief suggests that an important driver of business R&D investment is the economic benefit businesses can expect from engaging in research projects and innovation. Looking at the examples of Sweden and the US, the Policy Brief identifies two policy recommendations:

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1. Integrate the market for innovation.
   Access to a large market logically brings higher expectations of return. Companies in the US benefit from a large and homogeneous market, with one main language and one set of regulation. R&D investment in Europe is hampered by a lack of European integration. For example, there are insufficient EU-wide financing solutions for emerging companies and the fragmented patent system drives up the cost of innovation.
2. More and better academic research.
   The explanation for the high R&D intensity in Sweden is probably related to the high level of spending on academic research. Strong emphasis on academic research is a stimulus for business R&D: universities generate new ideas which are then transferred to the private sector. Not surprisingly, the four countries in with the highest academic R&D intensities are also the four countries with the highest business R&D intensities.

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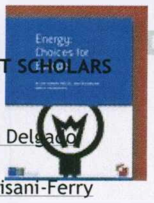

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Bruno van Pottelsberghe joined Bruegel as a senior research fellow in November 2007. His research for Bruegel focuses on the effectiveness of several policy tools (R&D subsidies, R&D tax credits, intellectual property, public research and regulatory policies) aiming at stimulating innovation in Europe.

Previously he has been Chief Economist of the European Patent Office (EPO) from November 2005 to the end of 2007. Since 1999 he has been professor at the Brussels' University (U.L.B.). As holder of the Solvay S.A. Chair of Innovation he teaches courses related to the economics and management of innovation and intellectual property. He is also advisor of the President and the Rector of the U.L.B. for technology transfer issues.

Bruno's latest publications

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