

TRENDS IN R&D EXPENDITURES AND GOVERNMENT INTERVENTION

The EU summits at Lisbon and Barcelona have emphasized the importance of a nation's expenditures in research and development (R&D). This is due to the fact that R&D has been proven to be a crucial source to stimulate economic growth and to foster employment in the long run. Policy makers are aware of the fact that there should be substantial contributions of innovations derived from private and public R&D to strengthen the competitiveness of firms and industries. Thus they have decided to increase the R&D intensity target of EU countries from 1.9 percent of GDP to 3 percent by 2010 (EU 2003). However, questions arise as to how R&D policies can stimulate private R&D activities or to what extent government spending on R&D might crowd out private investments.

Looking at EU-15 country trends in total gross domestic expenditure on R&D as a percentage of GDP since 2000, Table 1 reveals substantial differences between EU member states. It shows that only two countries managed to meet the 3-percent target throughout the period of coverage. Those countries are Finland and Sweden with 3.45 and 3.73 percent, respectively.

Outside the EU, only Japan was able to generate comparably high R&D-intensity levels. Countries with a steady R&D percentage of GDP ranging from above 2 but below 3 percent are Denmark, France and Germany. Their average share is at a stagnating 2 to 2.5 percent. Comparably, the US shows a significantly higher R&D-level around 2.6 percent on average across the period of coverage. EU laggards in the development of R&D are Greece, Ireland and Italy, but also in Portugal and Spain. Their percentage share of R&D in GDP amounts to below 1.5 percent. The significant differences in R&D expenditures within the EU constitute the need for action if Europe wants to become the "most competitive and dynamic knowledge-base economy by 2010" (EU 2003).

Regarding the 3-percent target the economic rationale for government involvement in R&D expenditures is more and more at the center of policy concern. For years economists have investigated the influence of public subsidies on private R&D expenditures. However, government policies to subsidize private R&D are limited by the notion that business R&D projects usually generate a higher rate of return than basic R&D. This weakens the justification of public subsidies to private R&D compared with public funding of basic research. However, policies designed to stimulate R&D investment levels should ideally be based on the economic fundamentals of incentives for industry to invest in

R&D as well as how R&D policies can be best adapt to quickly changing R&D environments.

Differentiating between the sources of funding of business enterprise R&D expenditures, Table 2 shows that most of business enterprise R&D is provided by industry itself, while government financing accounts for a substantially smaller share.¹ This share ranges from less than 4 percent of industry R&D in Finland and Netherlands to nearly 14 percent in Spain in 2005. Italy and France both have similarly high government financing in business enterprise R&D in 2005 than Spain.

Table 1

Gross domestic expenditure on R&D as a percentage of GDP

	2000	2001	2002	2003	2004	2005	2006
Austria	1.91	2.04	2.12	2.23	2.22	2.43	2.49
Belgium	1.97	2.08	1.94	1.88	1.87	1.84	1.83
Denmark	2.24	2.39	2.51	2.58	2.48	2.45	2.43
Finland	3.34	3.30	3.36	3.43	3.45	3.48	3.45
France	2.15	2.20	2.23	2.17	2.15	2.12	2.10
Germany	2.45	2.46	2.49	2.52	2.49	2.48	2.53
Greece	n.a.	0.58	n.a.	0.57	0.55	0.58	0.57
Ireland	1.12	1.10	1.10	1.17	1.24	1.26	1.32
Italy	1.05	1.09	1.13	1.11	1.10	1.09	n.a.
Luxemburg	1.65	n.a.	n.a.	1.66	1.63	1.57	1.47
Netherlands	1.82	1.80	1.72	1.76	1.78	1.74	1.67
Portugal	0.76	0.80	0.76	0.74	0.77	0.81	0.83
Spain	0.91	0.91	0.99	1.05	1.06	1.12	1.20
Sweden	n.a.	4.18	n.a.	3.86	3.62	3.80	3.73
United Kingdom	1.85	1.82	1.82	1.78	1.72	1.76	n.a.
Japan	3.04	3.12	3.17	3.20	3.17	3.32	n.a.
United States	2.73	2.74	2.64	2.67	2.58	2.61	2.61

Notes: Countries include EU-15, United States and Japan. Expenditures comprise business enterprises, government, higher education sector and private non-profit sectors. – n.a. = not available.

Source: Eurostat (2008).

¹ Further sources of funding as provided by the OECD database are other national funds and funds from abroad.

Table 2
Business enterprise R&D expenditure by sources of funds
in % of total funds

	2001		2005	
	Business	Government	Business	Government
Austria	64.5 ^{b)}	5.6 ^{b)}	67.2 ^{d)}	6.4 ^{d)}
Belgium	82.1	5.8	81.8 ^{d)}	5.8 ^{d)}
Finland	95.4	3.5	90.9	3.8
France	81.0	9.9	80.7	10.1
Germany	90.8	6.9	92.1	4.5
Greece	90.5 ^{a)}	1.2 ^{a)}	85.7	5.6
Ireland	89.1	3.3	86.1	4.1
Italy	80.5	11.0	77.4 ^{b)}	12.2 ^{b)}
Luxemburg	97.5	1.6	n.a.	n.a.
Netherlands	79.3	5.2	81.6 ^{c)}	3.4 ^{c)}
Portugal	90.8	4.2	91.4	4.2
Spain	86.7	7.2	79.9	13.6
Sweden	91.1 ^{a)}	5.9 ^{a)}	87.1	4.2
United Kingdom	69.7	8.8	63.2 ^{b)}	7.1 ^{b)}
United States	91.4	8.6	91.5 ^{b)}	8.5 ^{b)}

Notes: Countries include EU-15 except for Denmark and United States. – n.a. = not available. – Data coverage: ^{a)} 2001. – ^{b)} 2002. – ^{c)} 2003. – ^{d)} 2004.

Source: OECD (2009).

Most of the EU countries exhibit a stagnating share of government financing in industry R&D over time, except Greece and Spain, which increased their government share dramatically from 2000 to 2005. On the other hand, Germany and the Netherlands cut back their government R&D financing. The predominance in industrial funding as source of R&D efforts may be due to more efficient responses on the part of firms to changing market conditions and increasing competition on international factor markets.

The intention of governments to intervene and to direct R&D activities prompts a discussion of the justification of public intervention. The general argument for public support of R&D is well established on the grounds of market failure. Generally insufficient incentives hamper investments in R&D, which is why firms respond with socially suboptimal underinvestment. The reason for this is based on the public goods characteristics of innovations which generate lower private returns than its social returns (see, for example, Nelson 1959 and Arrow 1962). The argument of market failure has been further developed by introducing different types of market failure. These may arise out of the inability to fully capitalize on a firm's own innovations due to unintended spillover effects to competitors, as well as confronting the investor with uncertainties and risks that need to be completely internalized. Hence, the scope for R&D policies has been widened by encompassing financial

support of industrial R&D but also by public sector research.

Policy means intended to restore a socially desirable level of business R&D focus primarily on increasing private returns from R&D investments or attempt to cushion the negative consequences from sunk costs. While increasing private returns aims to internalize long-term gains from private R&D investments by protecting and strengthening investors' intellectual property rights through appropriate patent systems, the elimination of negative consequences from sunk costs focuses on improvements of the fiscal environment. Subsidizing risky R&D projects with tax incentives, for example, seeks to increase long-term rates of return

and thus render R&D projects more profitable for investors. Establishing appropriate tax systems for risk capital operations within Europe therefore require harmonized tax transparencies as well as reductions in tax obstacles to cross-boarder R&D activities (see EU 2003).

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