The limits to the 3% R&D target in Europe 2020: *the roles of institutions, industries, and business-government complementarities in achieving equitable and stable growth*

In *Europe 2020: A European strategy for smart, sustainable, and inclusive growth*, the European Commission has set a target for 3% of the EU's GDP to be invested in R&D. This target, which is supposed to help place the EU on a par with the United States in the knowledge-based economy, was at the center of the Lisbon Agenda in 2000. Ten years later the target remains elusive. Among EU nations, only Finland and Sweden devote in excess of 3% of their GDP to R&D.

How then should we view the 3% target, and what does it mean for the EU's efforts to achieve its broader socio-economic objectives under Europe 2020? Research in the 7th Framework Project on *Finance, Innovation, and Growth* (FINNOV), has studied the role of R&D in the innovation process, and its impact on equitable and stable economic growth. Based on our research, we view the 3% target as a problematic indicator. It diverts attention from the vast differences in R&D spending across industries and even across firms within an industry.[1] It also can mask significant differences in the complementary levels of R&D investments by governments and businesses that are required to generate superior economic performance. Finally due to its high costs it may even cause negative growth for those firms that do not have the complementary characteristics that are needed for R&D to have any effect on firm growth.[2]

There are many industries, especially in the service sector, that do no R&D. Yet these industries often employ large numbers of knowledge workers to generate, absorb, and analyze information. If, all other things equal, these industries represented a smaller proportion of GDP, it would be easier for an economy to reach the 3% target. But would the performance of the economy be superior as a result? It depends on how these industries contribute to the economy. Are these "low-tech" industries providing important services that enhance the value-creating capabilities of other industries or the welfare of households as consumers? Or are they, as in often the case in financial services, focused on extracting value from the economy, even if that process undermines the conditions for innovation in other industries.

Even when we look at industries that do substantial amounts of R&D investment, we see enormous differences in R&D as a percentage of sales. In the European Commission's 2009 report on industrial research of the top 1,000 European companies by absolute R&D investment in 2008, the industry ratios of R&D to net sales range from 24.07% in biotechnology to 0.17% for food & drug retailers. Only 15 of 45 industrial classifications but with about half of the top 1,000 firms, have ratios above 3%, with the median of these 15 classifications, leisure goods, having a ratio of 6.14%. In pursuit of the 3% target, to what extent and in what ways should European industrial policy be promoting the growth of industries with the highest R&D intensities, namely biotechnology (24.1%), semiconductors (17.7%), pharmaceuticals (15.7%), software (13.1%), telecommunications equipment (13.1%)?

To answer this question, we need studies of the growth trajectories of each of these industries that reveal the extent to which they can generate innovation and sustainable high-wage jobs in the European economy. Moreover, as the FINNOV project stresses, in a highly financialized global economy, there is a danger that companies that receive high levels of R&D investment will use that capital to generate high incomes and capital gains for a small group of executives and financiers rather than the higher quality, lower cost products that form the foundation for economic growth.[3] The analysis of the impact of R&D investment on economic performance must therefore identify the characteristics, including the financial behaviour, of those particular companies that actually transform R&D investment into innovative products.

The 3% R&D target recognizes that the necessary investments cannot come from business alone. Indeed, the target envisages €1 from the government for every €2 from business. Here again, however, the aggregate target ignores wide-ranging variation across industries concerning the requisite government contribution. Across different industries, including the new emerging *clean-tech* sector, public funding is often the precursor for later private equity investments, including venture capital. In fact public investments often occur in the most 'risky' phase of research and development. These government investments are typically made, moreover, without an appropriate proprietary claim to the returns on the commercial products that might eventually emerge from this government-business collaboration, thus denying the state as investor an equitable return on the gains from innovative enterprise.[4] In implementing Europe 2020, a range of studies are needed of the complementarity of government and business R&D investments that innovation requires, and of the institutional conditions, as well as the firm specific conditions, under which these investments will actually result in innovation that supports the objectives of smart, sustainable, and inclusive growth.

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[1] See European Commission, Directorate General Research, Monitoring Industrial Research: The 2009 EU Industrial R&D Investment Scoreboard, Joint Research Centre, Institute for Prospective Technological Studies, November 2009, available at http://iri.jrc.ec.europa.eu/reports.htm.

[2] FINNOV Discussion Paper (2.2), Demirel, P. and Mazzucato, M. (2009), 'Does Market Selection Reward Innovators?'.

[3] FINNOV Discussion Paper (5.6), Lazonick, W. (2010), 'The Explosion of Executive Pay and the Erosion of American Prosperity'

[4] Lazonick, W., and Sakinç, M, (2010), 'Do Financial Markets Support Innovation or Inequity in the Biotech Drug Development Process?' paper presented at the FINNOV/DIME workshop, *Innovation and Inequality: The need for new indicators from Pharma and Beyond*, Pisa, May 15-16, 2010 (http://www.open.ac.uk/ikd/events/innovation-and-inequality/).

R&D intensity, by industry, top 1,000 European companies by R&D investment, 2008

Industry	R&D/Net Sales, %	Number of companies
Biotechnology (4573)	24.07	70
Semiconductors (9576)	17.71	22
Pharmaceuticals (4577)	15.69	57
Software (9537)	13.14	77
Telecommunications equipment (9578)	13.13	27
Electronic office equipment (9574)	7.91	2
Electronic equipment (2737)	6.83	30
Leisure goods (374)	6.14	10
Computer hardware (9572)	5.89	6
Aerospace & defence (271)	5.86	29
Automobiles & parts (335)	5.25	47
Health care equipment & services (453)	4.67	20
Electrical components & equipment (2733)	4.00	23
Commercial vehicles & trucks (2753)	3.61	37
Computer services (9533)	3.18	27
Alternative energy (58)	2.98	6
Chemicals (135)	2.70	47
Industrial machinery (2757)	2.57	18
Household goods & home construction (372)	2.27	25
Media (555)	2.19	14
General industrials (272)	2.02	23
Personal goods (376)	1.66	18
Fixed line telecommunications (653)	1.60	18
Food producers (357)	1.39	35
Banks (835)	1.17	9
Tobacco (378)	1.10	2
Support services (279)	1.01	31
Other financials (877)	1.00	5
Internet (9535)	0.86	4
Oil equipment, services & distribution (57)	0.81	8
Mobile telecommunications (657)	0.77	14
Life insurance (857)	0.69	7
Electricity (753)	0.58	4
Construction & materials (235)	0.54	29
Forestry & paper (173)	0.47	7
Mining (177)	0.46	5
Industrial metals & mining (175)	0.45	13
Industrial transportation (277)	0.31	12
General retailers (537)	0.30	15
Travel & leisure (575)	0.27	14
Oil & gas producers (53)	0.25	10
Gas, water & multiutilities (757)	0.22	16
Nonlife insurance (853)	0.19	26
Beverages (353)	0.19	4
Food & drug retailers (533)	0.17	5

Top 25 R&D Investors in Europe, 2008, with R&D intensity for 2007 and 2008

	Company	Industry	Country	R&D investment	R&D/net sales, %	
				2008 (€m)	2007	2008
1	Volkswagen	Automobiles & parts (335)	Germany	5,926	4.5	5.2
2	Nokia	Telecommunications equipment (9578)	Finland	5,321	10.3	10.5
3	SanofiAventis	Pharmaceuticals (4577)	France	4,608	16.3	16.7
4	Daimler	Automobiles & parts (335)	Germany	4,442	3.8	4.6
5	Robert Bosch	Automobiles & parts (335)	Germany	3,916	7.7	8.7
6	Siemens	Electrical components & equipment (2733)	Germany	3,836	3.7	4.7
7	GlaxoSmithKline	Pharmaceuticals (4577)	UK	3,836	14.3	15.2
8	AstraZeneca	Pharmaceuticals (4577)	UK	3,622	17.1	15.9
9	AlcatelLucent	Telecommunications equipment (9578)	France	3,167	18.7	18.6
10	Ericsson	Telecommunications equipment (9578)	Sweden	2,975	14.6	15.7
11	BMW	Automobiles & parts (335)	Germany	2,864	5.6	5.4
12	EADS	Aerospace & defence (271)	The Netherlands	2,756	6.9	6.4
13	Bayer	Chemicals (135)	Germany	2,725	8.1	8.3
14	Peugeot (PSA)	Automobiles & parts (335)	France	2,372	3.4	4.4
15	Renault	Automobiles & parts (335)	France	2,235	6.2	6.1
16	Boehringer Ingelheim	Pharmaceuticals (4577)	Germany	2,109	15.8	18.2
17	Fiat	Automobiles & parts (335)	Italy	1,986	3.0	3.3
18	Finmeccanica	Aerospace & defence (271)	Italy	1,767	15.2	13.3
19	SAP	Software (9537)	Germany	1,627	14.2	14.1
20	Philips Electronics	Leisure goods (374)	The Netherlands	1,613	5.9	6.1
21	STMicroelectronics	Semiconductors (9576)	The Netherlands	1,545	18.1	21.9
22	Continental	Automobiles & parts (335)	Germany	1,524	5.1	6.3
23	Volvo	Commercial vehicles & trucks (2753)	Sweden	1,479	4.5	5.4
24	BASF	Chemicals (135)	Germany	1,372	2.4	2.2
25	Merck	Pharmaceuticals (4577)	Germany	1,234	13.3	16.3

Source (both tables): European Commission, Directorate General Research, Monitoring Industrial Research: The 2009 EU Industrial R&D Investment Scoreboard, volume 2_1_3.xls, available at http://iri.jrc.ec.europa.eu/reports.htm.

FINNOV

Finance, Innovation & Growth

The FINNOV project is funded under the European Community's Seventh Framework Programme (FP7/2007-2013) under the Socio-economic Sciences and Humanities, grant agreement n° 217466. Duration: March 2009-Feb 2012.

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