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Forfás



**RESEARCH AND
DEVELOPMENT
STATISTICS**

in Ireland, 2009
- at a glance

Introduction

Forfás has responsibility for the collection and publication of research and innovation statistics for Ireland. To this end, Forfás monitors research and development activity in the government, academic and private sectors and publishes the relevant statistical information in the regular publications: *The Science Budget*; *Survey of Research and Development in the Higher Education Sector* and *Business Expenditure on Research and Development*.

This publication brings together the key facts and figures from these three sectors (government, academic and private) and provides a statistical compilation of Ireland's science and technology activity. This information is based on the latest available data in 2008.

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Foreword

Gross R&D spending in the government, higher education and business sectors of the economy is estimated to have increased by 6.4% in current prices in 2008¹. The overall R&D intensity ratio is expected to reach 1.68% of GNP in 2008 up from 1.51% in 2007. This increase in the R&D intensity ratio is expected to bring Ireland closer to the OECD and the EU27 averages, although this ratio improvement has been assisted by the rapid decline in Gross National Product throughout the year.

Overall improvements in R&D spending continue to be a strong driver of innovation performance in the business sector. Between 2004 and 2006 over 47.2% of firms were engaged in innovation activities, with 56.7% of industrial firms and 41.3% of service industry firms being active in innovation of some kind. In monetary terms product innovation activities contributed an estimated €33.5bn to company turnover in Ireland (12.6% of the total turnover of businesses), much of which was underpinned by research and other knowledge investments.

In 2008 the share of gross R&D financed by the public sector increased marginally to 34.5%, while the percentage of gross R&D financed by industry decreased to 63.2%. The percentage of gross R&D performed by industry in 2008 is expected to be 65%, with the higher education sector accounting for 26% and the public sector 8%.

¹ Final data will be released in December 2009.

Looking at the individual sectors of R&D performance, business sector performed R&D (BERD) expenditure is estimated to rise to €1.7 billion in 2008 with the BERD intensity ratio expected to grow to 1.09% of GNP in 2008 from 0.96% in 2006 bringing it close to the EU27 average of 1.12%. The rate of growth in business sector performed R&D eased somewhat though to 5.4% in 2008 from the 9.6% annual growth posted in the previous year. The business sectors performing the largest percentage of R&D are the computer and related sectors and the chemicals, chemical products and man-made fibres sector with 24.5% and 20% respectively of the total.

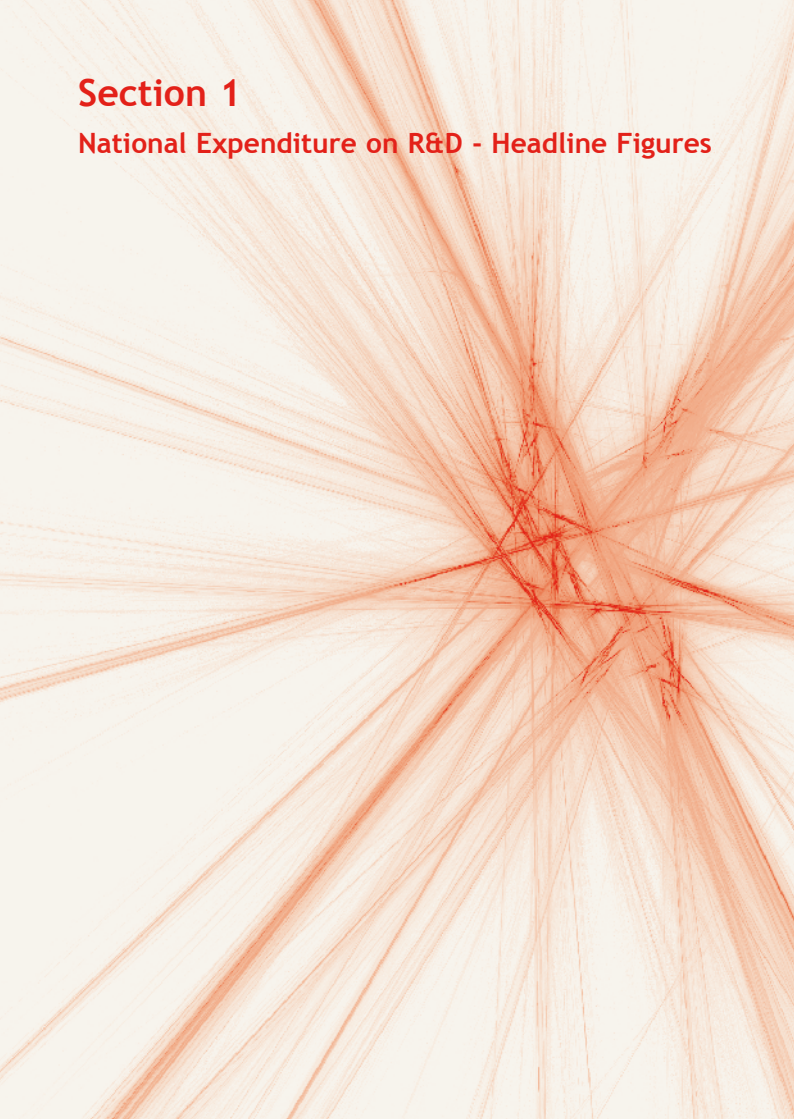
Expenditure on R&D in the higher education sector (HERD) rose to an estimated €713 million in 2008. The HERD intensity ratio (HERD as a % of GNP) is therefore 0.46% which is above the OECD and EU 27 averages of 0.39%.

Total expenditure on R&D performed in the State sector (GOVERD) is expected to increase to €200 million in 2008 (including R&D performed in hospitals). The anticipated GOVERD intensity ratio for 2008 is 0.13%, and this remains below the EU and OECD averages.

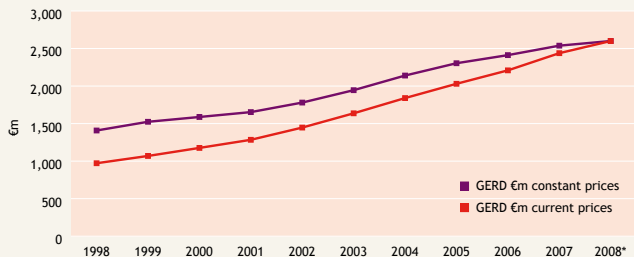
The total number of researchers engaged in R&D in all sectors in 2007 was 19,915 with the number of support staff and technicians totalling 11,777. The number of full-time equivalent (FTE) researchers employed per thousand population in Ireland in 2007 was 6.4.

Section 1

National Expenditure on R&D - Headline Figures



1 Gross Expenditure on R&D (GERD) - Ireland 1998-2008

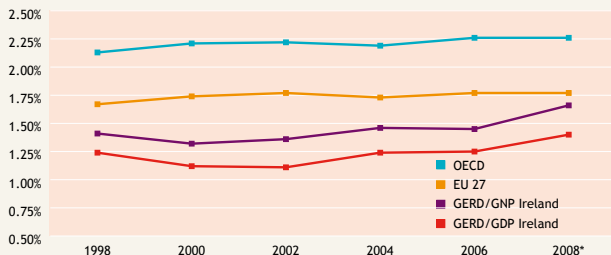


	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008*
GERD €m current prices	972	1,069	1,176	1,284	1,447	1,637	1,840	2,029	2,209	2,443	2,600
% annual change		10.0%	10.0%	9.2%	12.7%	13.1%	12.4%	10.3%	8.9%	10.6%	6.4%

* Estimate

Sources: Derived from the Survey of R&D in the Business Sector, 2007/8 (CSO/Forfás); Survey of R&D in the Higher Education Sector, 2006 (Forfás); The Science Budget 2007/2008 (Forfás)

2 Gross Expenditure on R&D (GERD) as a percentage of GDP/GNP - Ireland, EU and OECD

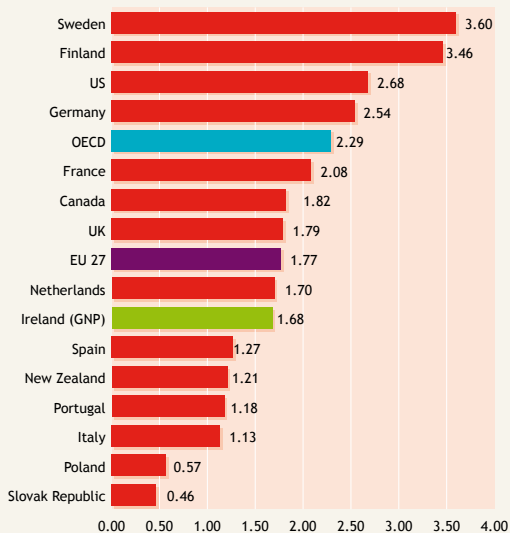


	1998	2000	2002	2004	2006	2008*
OECD	2.13%	2.21%	2.22%	2.19%	2.26%	2.29%
EU 27	1.67%	1.74%	1.76%	1.73%	1.76%	1.77%
GERD/GNP Ireland	1.41%	1.32%	1.36%	1.46%	1.45%	1.68%
GERD/GDP Ireland	1.24%	1.12%	1.11%	1.23%	1.25%	1.43%

* Estimate

Sources: Derived from the Survey of R&D in the Business Sector, 2007/8 (CSO/Forfás); Survey of R&D in the Higher Education Sector, 2006 (Forfás); The Science Budget 2007/2008 (Forfás); Main Science & Technology Indicators, 2009/1(OECD).

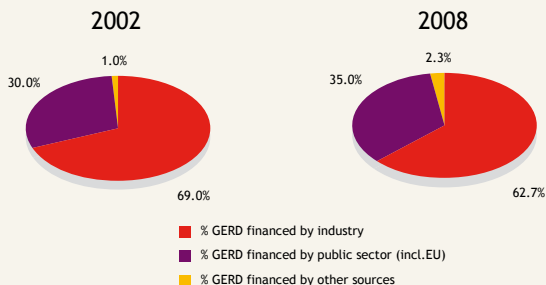
3 Gross Expenditure on R&D (GERD) as a % of GDP/GNP - Ireland and Selected Countries*



* 2008 or latest available data

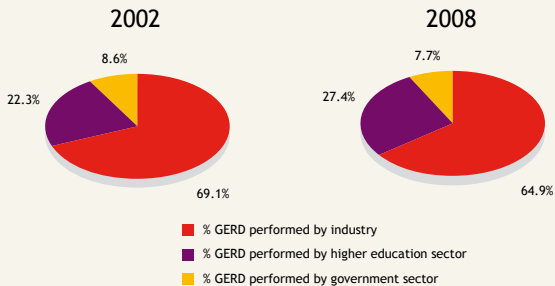
Sources: Derived from the Survey of R&D in the Business Sector, 2007/8 (CSO/Forfás); Survey of R&D in the Higher Education Sector, 2006 (Forfás); The Science Budget 2007/2008 (Forfás); Main Science & Technology Indicators, 2009/1 (OECD).

4 Funding sources of national R&D



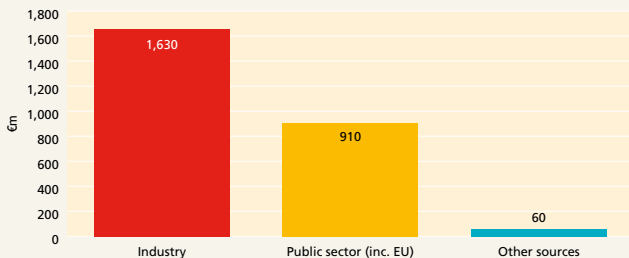
Sources: Derived from the Survey of R&D in the Business Sector, 2007/8 (CSO/Forfás); Survey of R&D in the Higher Education Sector, 2006 (Forfás); The Science Budget 2007/2008 (Forfás).

5 Performance of national R&D by sector

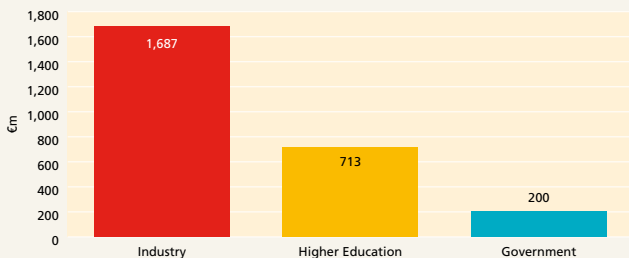


Sources: Derived from the Survey of R&D in the Business Sector, 2007/8 (CSO/Forfás); Survey of R&D in the Higher Education Sector, 2006 (Forfás); The Science Budget 2007/2008 (Forfás).

6(i) Gross Expenditure on R&D (GERD) - sources of funding, 2008

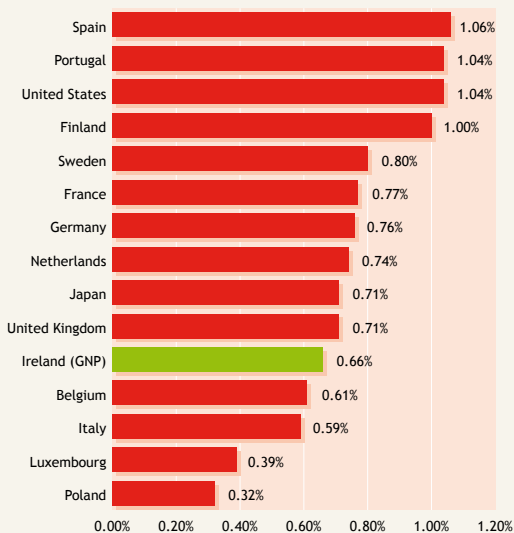


6(ii) Gross Expenditure on R&D (GERD) - performers, 2008



Sources: Derived from the Survey of R&D in the Business Sector, 2007/8 (CSO/Forfás); Survey of R&D in the Higher Education Sector, 2006 (Forfás); The Science Budget 2007/2008 (Forfás).

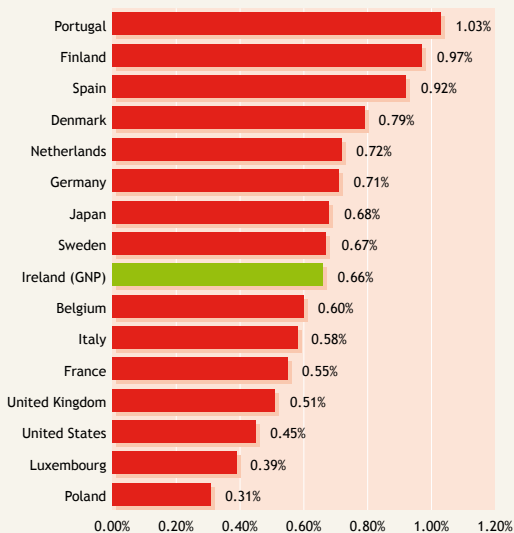
7(i) Government Budget Outlays or Appropriations of R&D (GBOARD) as a percentage of GDP/GNP *



* 2008 or latest available data

Sources: Derived from *The Science Budget 2007/2008 (Forfás)*; *Main Science & Technology Indicators, 2009/1 (OECD)*

7(ii) Government Budget Outlays or Appropriations of R&D (GBOARD) as a percentage of GDP/GNP less defence *



* 2008 or latest available data

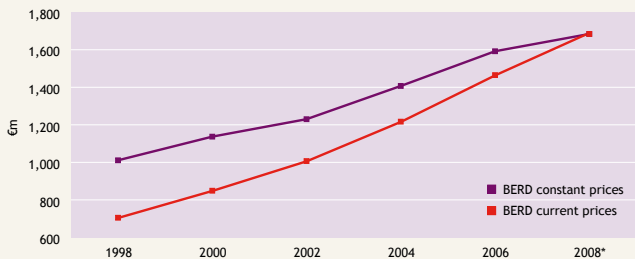
Sources: Derived from *The Science Budget 2007/2008 (Forfás)*; *Main Science & Technology Indicators, 2009/1 (OECD)*

Section 2

Expenditure on R&D by Sector:
Business, Higher Education and Public

The background of the page is a complex, abstract pattern of thin, overlapping purple lines. These lines radiate from a central point, creating a starburst or web-like effect. The lines vary in thickness and density, with some areas appearing more concentrated than others. The overall color is a muted, dusty purple, and the pattern fills the entire page.

8 Business sector performed R&D (BERD) in current and constant prices

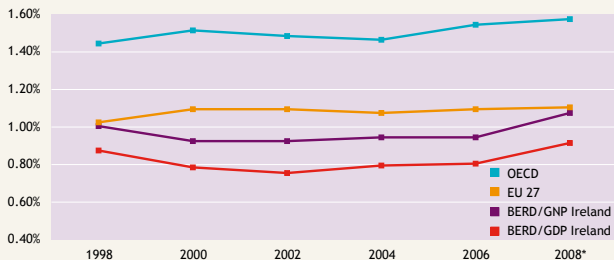


	1998	2000	2002	2004	2006	2008*
BERD €m current prices	698	842	1,000	1,210	1,458	1,687
BERD €m. constant prices	1,011	1,137	1,230	1,407	1,592	1,687

* Estimate

Source: Derived from the Survey of R&D in the Business Sector, 2007/8 (CSO/Forfás)

9 Business sector performed R&D (BERD) as a percentage of GDP/GNP

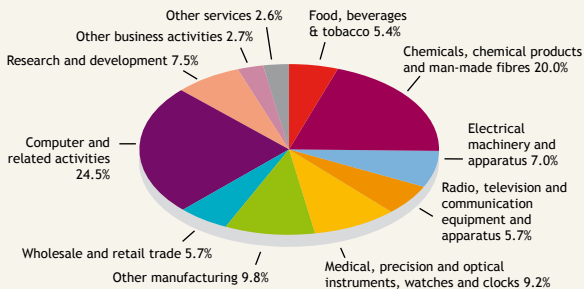


	1998	2000	2002	2004	2006	2008*
OECD	1.46%	1.53%	1.50%	1.48%	1.56%	1.59%
EU 27	1.04%	1.11%	1.11%	1.09%	1.11%	1.12%
BERD/GNP Ireland	1.02%	0.94%	0.94%	0.96%	0.96%	1.09%
BERD/GDP Ireland	0.89%	0.80%	0.77%	0.81%	0.82%	0.93%

* Estimate

Sources: Derived from the Survey of R&D in the Business Sector, 2007/8 (CSO/Forfás); Main Science & Technology Indicators, 2009/1 (OECD).

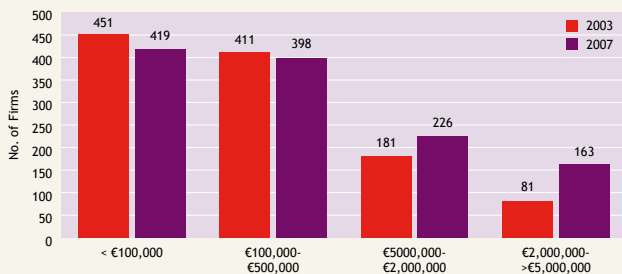
10 Business sector performed R&D (BERD) by industrial sector, 2007



Sector	2007	
	€m.	%
Chemicals, chemical products and man-made fibres	320.4	20.0%
Medical, precision and optical instruments, watches and clocks	147.0	9.2%
Electrical machinery and apparatus	112.1	7.0%
Radio, television and communication equipment and apparatus	91.8	5.7%
Food, beverages & tobacco	85.9	5.4%
Other manufacturing	156.6	9.8%
Computer and related activities	392.8	24.5%
Research and development services	119.8	7.5%
Wholesale and retail trade	91.8	5.7%
Other business activities	43.3	2.7%
Other services	41.6	2.6%
Total - all enterprises	1,603.2	100.0%

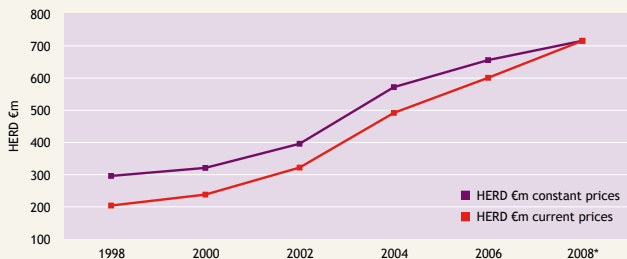
Source: Derived from the Survey of R&D in the Business Sector, 2007/8 (CSO/Forfás)

11 Distribution of business sector R&D (BERD) expenditure by size of spend



Source: *Business Expenditure on R&D 2007/2008 (CSO/Forfás)*

12 Higher education sector performed R&D (HERD) in current and constant prices - Ireland 1998-2008

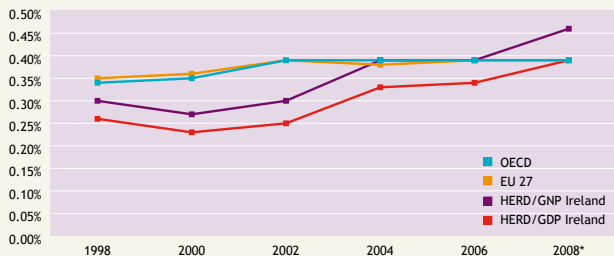


	1998	2000	2002	2004	2006	2008*
HERD €m current prices	204	238	322	492	601	713
HERD €m constant prices	296	321	396	572	656	713

* Estimate

Source: Derived from the Survey of R&D in the Higher Education Sector, 2006 (Forfás) and other estimates

13 HERD as a percentage of GDP/GNP

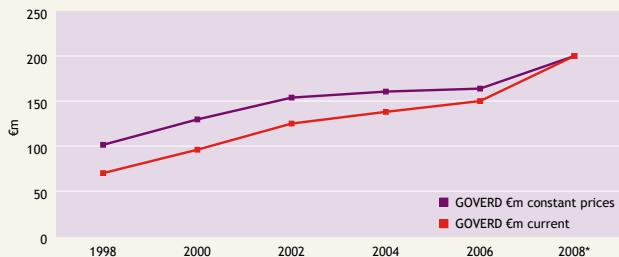


	1998	2000	2002	2004	2006	2008*
OECD	0.34%	0.35%	0.39%	0.39%	0.39%	0.39%
EU 27	0.35%	0.36%	0.39%	0.38%	0.39%	0.39%
HERD/GNP Ireland	0.30%	0.27%	0.30%	0.39%	0.39%	0.46%
HERD/GDP Ireland	0.26%	0.23%	0.25%	0.33%	0.34%	0.39%

* Estimate

Sources: Derived from the Survey of R&D in the Higher Education Sector, 2006 (Forfás); Main Science & Technology Indicators, 2009/1 (OECD)

14 Government sector performed R&D (GOVERD) - in current and constant prices

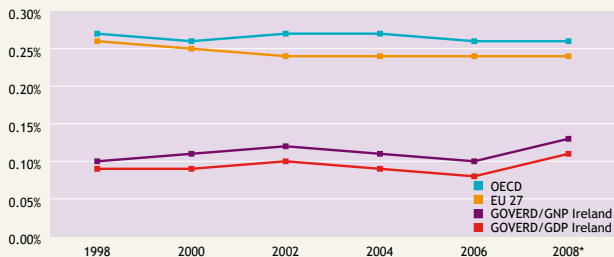


	1998	2000	2002	2004	2006	2008*
GOVERD €m current prices	70.0	96.0	125.0	138.0	150.0	200.0
GOVERD €m constant prices	101.4	129.6	153.8	160.5	163.8	200.0

* Estimate

Source: Derived from *The Science Budget 2007/2008 (Forfás)*

15 Government sector performed R&D (GOVERD) as a percentage of GNP/GDP



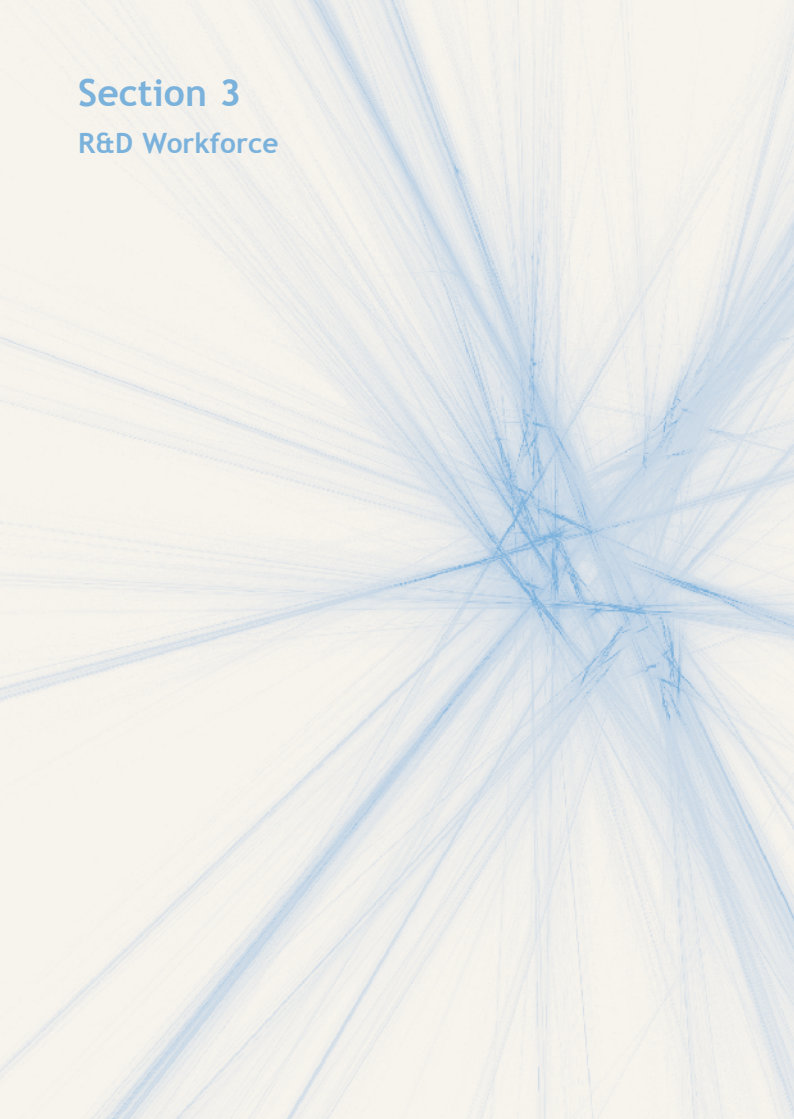
	1998	2000	2002	2004	2006	2008*
OECD	0.27%	0.26%	0.27%	0.27%	0.26%	0.26%
EU 27	0.26%	0.25%	0.24%	0.24%	0.24%	0.24%
GOVERD/ GNP Ireland	0.10%	0.11%	0.12%	0.11%	0.10%	0.13%
GOVERD/ GDP Ireland	0.09%	0.09%	0.10%	0.09%	0.08%	0.11%

* Estimate

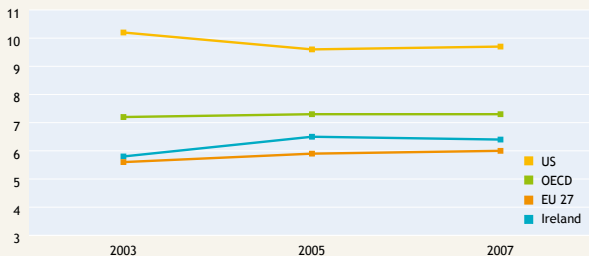
Sources: Derived from *The Science Budget 2007/2008 (Forfás)*; *Main Science & Technology Indicators, 2009/1 (OECD)*.

Section 3

R&D Workforce



16 Total researchers (FTE) per 1,000 total employment (Ireland, EU, OECD & US)*

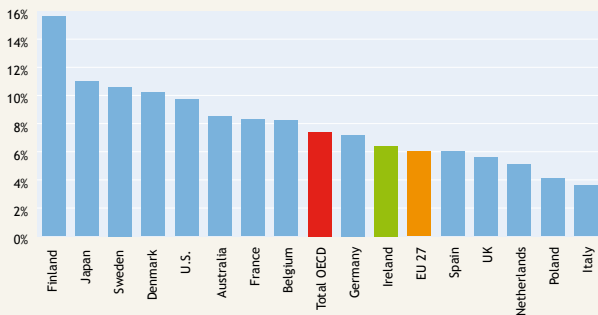


* 2007 or latest available data

	2003	2005	2007
US	10.2	9.6	9.7
OECD	7.2	7.3	7.3
EU 27	5.6	5.9	6.0
Ireland	5.8	6.5	6.4

Sources: Derived from the Survey of Business Expenditure on R&D 2007/2008 (CSO/Forfás); Survey of R&D in the Higher Education Sector 2006 (Forfás); The Science Budget 2007/2008 (Forfás); Main Science & Technology Indicators, 2009/1 (OECD).

17 Total researchers (FTE) per 1,000 total employment (Ireland and selected countries)*

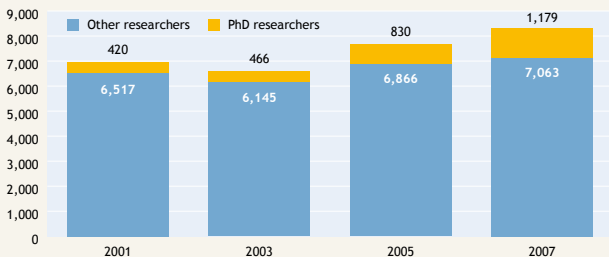


* 2007 or latest available data

2007 (or latest available data)	
Finland	15.6
Japan	11.0
Sweden	10.6
Denmark	10.2
U.S.	9.7
Australia	8.5
France	8.3
Belgium	8.2
Total OECD	7.4
Germany	7.2
Ireland	6.4
EU-27	6.0
Spain	6.0
UK	5.6
Netherlands	5.1
Poland	4.1
Italy	3.6

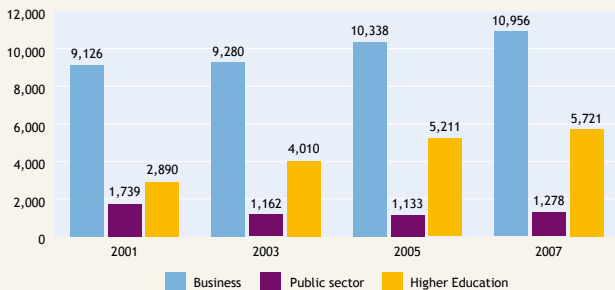
Sources: Derived from the Survey of R&D in the Business Sector, 2007/8 (Forfás); Survey of R&D in the Higher Education Sector, 2006 (Forfás); Science Budget 2007/2008 (Forfás); Main Science & Technology Indicators, 2009/1(OECD).

18 Headcount of PhD and other researchers in the business sector

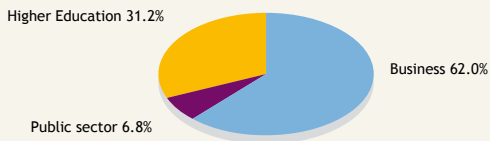


Source: *Business Expenditure on R&D 2007/2008 (CSO/Forfás)*

19(i) R&D FTE personnel (researchers plus support staff) by sector of employment

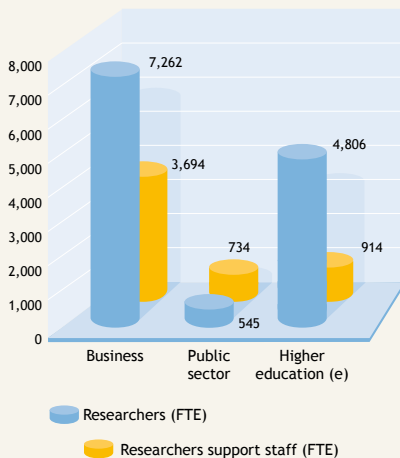


19(ii) R&D FTE personnel (researchers plus support staff) by sector of employment - share of total, 2007



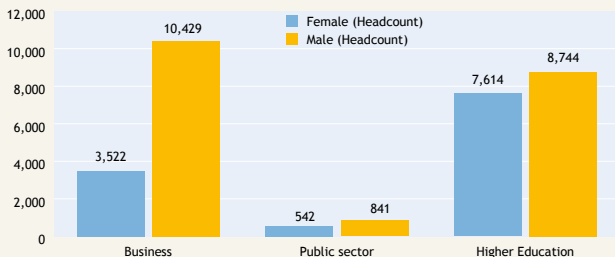
Sources: Derived from the Survey of R&D in the Business Sector, 2007/8 (CSO/Forfás); Survey of R&D in the Higher Education Sector, 2006 (Forfás); The Science Budget 2007/2008 (Forfás).

20 R&D FTE personnel by sector of employment and category of employment - 2007



Sources: Derived from the Survey of R&D in the Business Sector, 2005/6 (CSO/Forfás); Survey of R&D in the Higher Education Sector, 2006 (Forfás); The Science Budget 2007/2008 (Forfás).

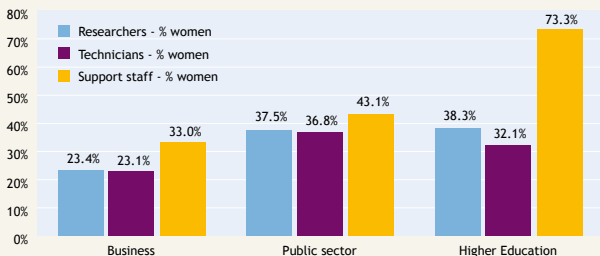
21(i) Male/female research personnel (headcount) by sector - 2007



		Female headcount	Male headcount	Total
BERD	Business	3,522	10,429	13,951
GOVERD	Public sector	542	841	1,383
HERD	Higher education	7,614	8,744	16,358

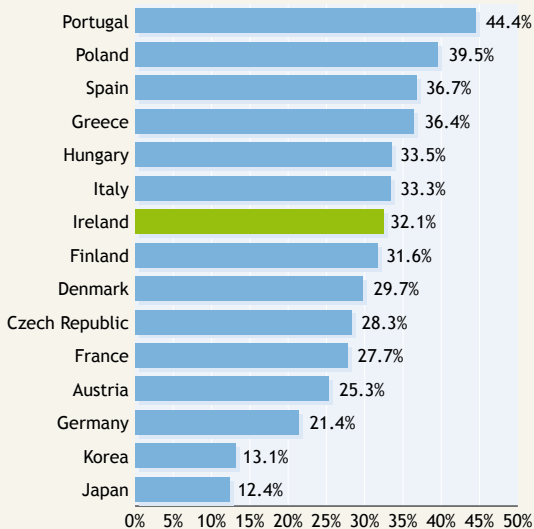
Sources: Derived from the Survey of R&D in the Business Sector, 2007/8 (CSO/Forfás); Survey of R&D in the Higher Education Sector, 2006 (Forfás); The Science Budget 2007/2008 (Forfás)

21(ii) Female research personnel (headcount) by sector of performance and occupation 2007



Sources: Derived from the Survey of R&D in the Business Sector, 2007/8 (CSO/Forfás); Survey of R&D in the Higher Education Sector, 2006 (Forfás); Science Budget 2007/2008 (Forfás); Main Science & Technology Indicators, 2009/1 (OECD).

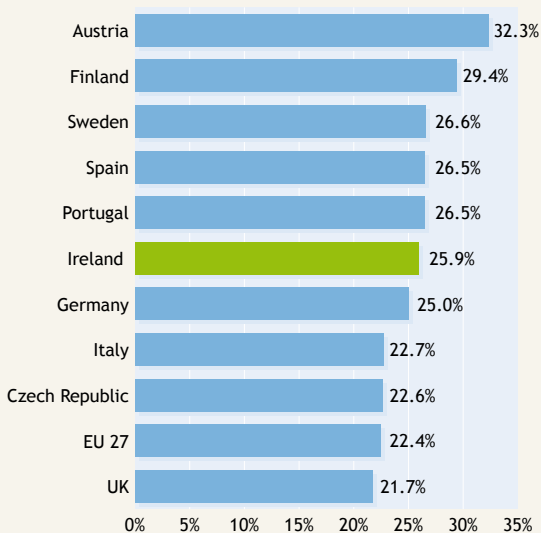
21(iii) International comparison of women researchers as a percentage of total researchers (headcount)*



* 2007 or latest available data

Source: Main Science and Technology Indicators, 2009/1 (OECD)

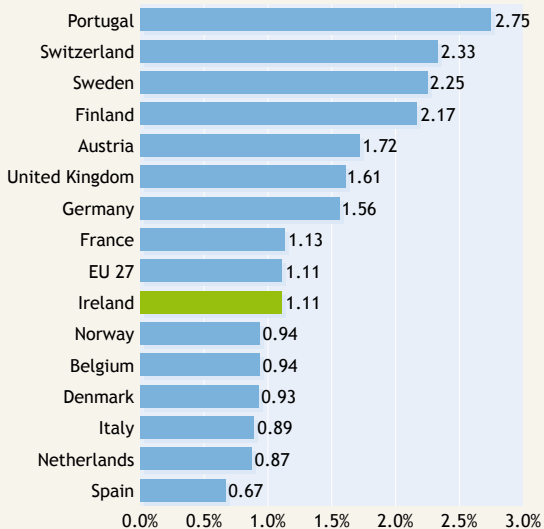
22(i) Science and engineering new graduates as a percentage of total graduates *



* 2006 or latest available data

Source: Eurostat

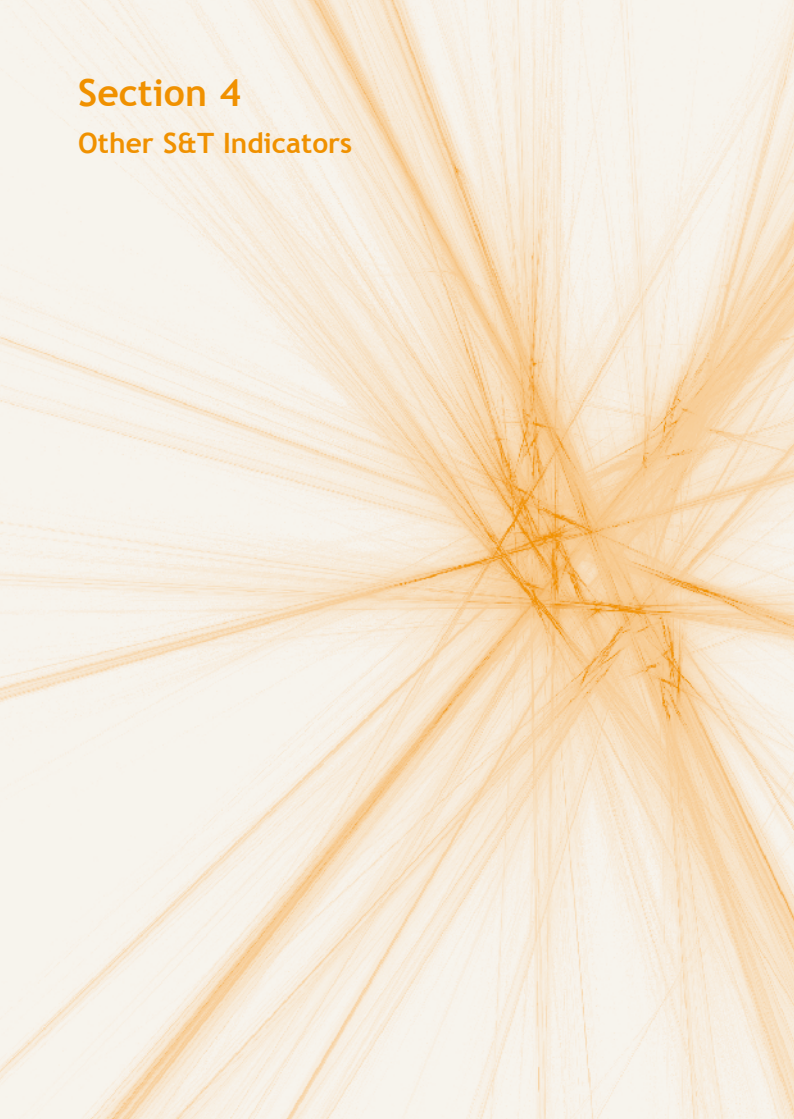
22(ii) PhD science and engineering and humanities and social science graduates per 1,000 population



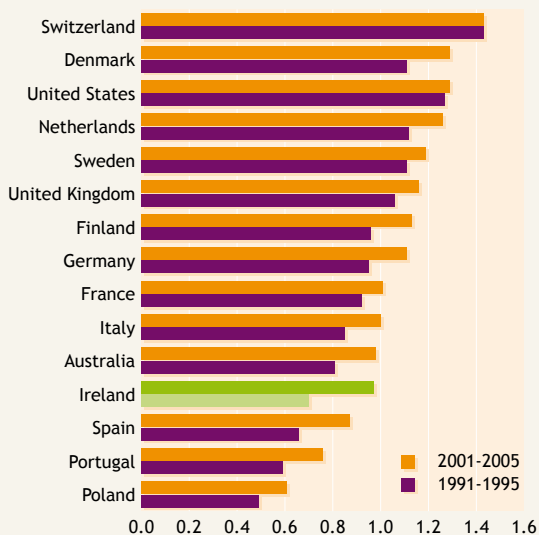
Source: Eurostat: European Innovation Scoreboard 2008

Section 4

Other S&T Indicators

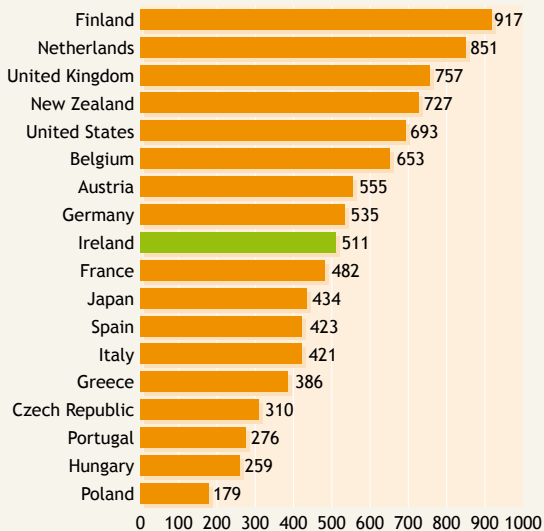


23(i) OECD countries' relative citation impacts in 1991-1995 and 2001-2005



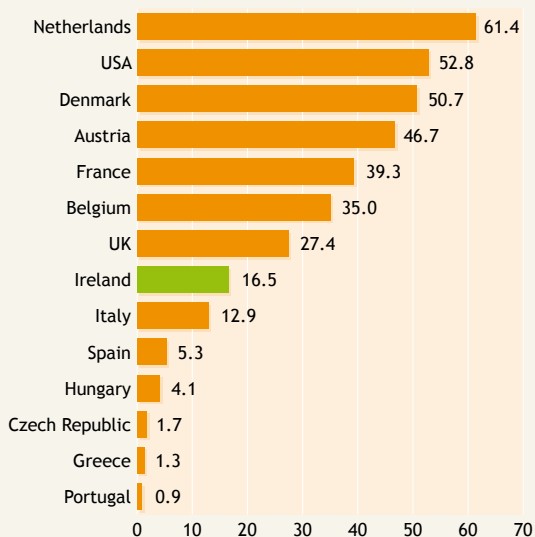
Sources: Thompson Scientific, NSI 1981-2005

23(ii) Science and engineering articles in all fields, by country: 2005



Sources: *Science and Engineering Indicators 2008*

24(i) Triadic patent families* per million population**

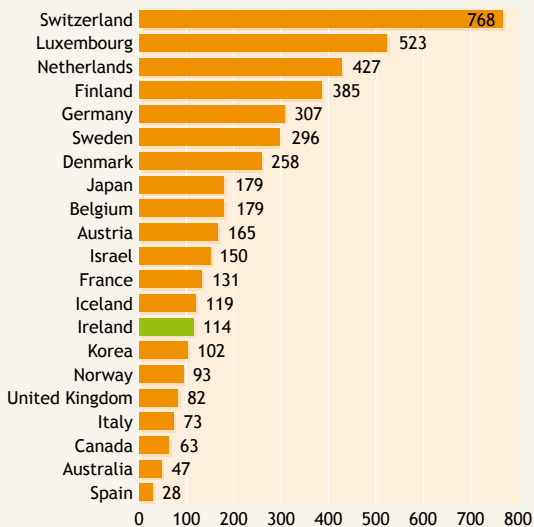


* A member of the triadic patent family is established when the patent is filed at the European Patent Office and the Japanese Patent Office and is granted by the United States Patent Office (USPTO)

** 2006 or latest available data

Source: Main Science and Technology Indicators, 2009/1 (OECD)

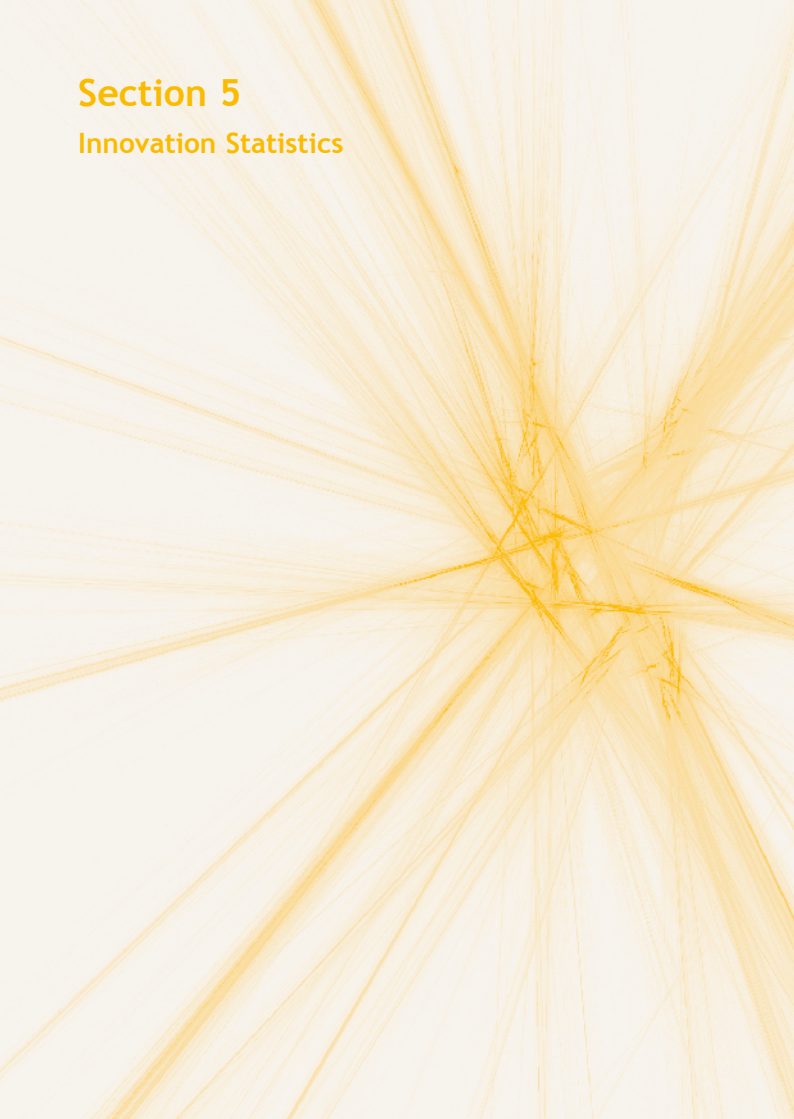
24(ii) Patents applications per million population to the EPO



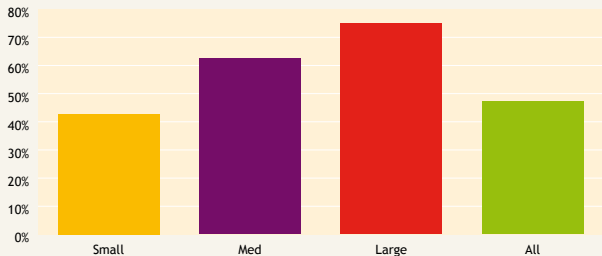
Source: European Patent Office

Section 5

Innovation Statistics

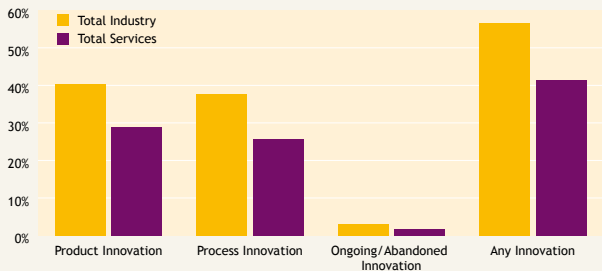


25(i) Innovation activity rate by size of enterprise, 2004-2006



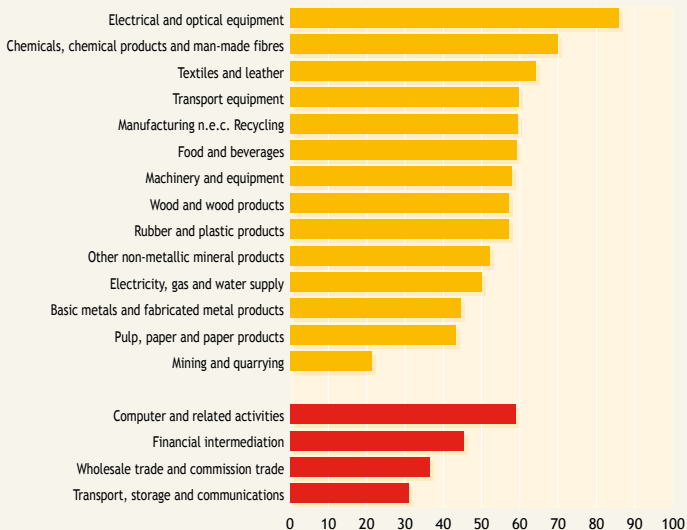
Source: Community Innovation Survey 2004-2006 - First Findings (CSO/Forfás)

25(ii) Innovation types by sector and size, 2004-2006



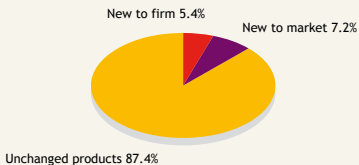
Source: Community Innovation Survey 2004-2006 - First Findings (CSO/Forfás)

26 Sectoral innovation activity rates 2004-2006



Source: *Community Innovation Survey 2004-2006 (CSO)*

27(i) Percentage of total turnover attributed to product innovation activities



Source: *Community Innovation Survey 2004-2006 (CSO)*

27(ii) Innovation hampering factors as a percentage of totals



Source: Community Innovation Survey 2004-2006 (CSO)