

Research and Development Statistics

in Ireland, 2006
- at a glance



Forfás

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 state, higher education and private sectors and publishes the relevant statistical information in the regular publications: State Expenditure on Science and Technology and Research and Development; 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 (state, higher education and private) and provides a statistical compilation of Ireland's science and technology activity. This information is based on the latest available data in 2006.

Author: **Monica Roche**

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For further information please contact:

Andrew Stockman

S&T Indicators Unit

Science & Technology Division

Forfás, Wilton Park House

Wilton Place, Dublin 2

Ireland.

Foreword

Good progress continues to be made in improving Ireland's knowledge economy performance. Total R&D spending across all sectors of the economy increased by 14.3% to €2.33 billion in 2006. With robust R&D spending gains outpacing economic growth, the overall R&D intensity ratio climbed to 1.56% of GNP in 2006, compared to the 1.48% intensity ratio recorded in 2005. This rising R&D intensity allowed for a further narrowing of the R&D spending gap between the European and OECD averages. Rapid increases in Government funding of R&D activities continues to be a strong driver of the rising R&D intensity, supported by increased funding from private sources. The share of total R&D performance funded by the public sector rose to 32.8% in 2006, compared to the 26.9% share posted in 2000.

Research and development (R&D) performance in the Irish business sector remained strong in 2005 and 2006. R&D spending in the business sector (BERD) rose by almost 10% from 2004 to 2005 to €1.33 billion and is expected to increase by a further 17.3% in 2006. This reflects a robust R&D spending performance by both Irish and foreign owned firms. R&D performed in the higher education sector also grew strongly in 2005 and 2006, boosted by continued strong funding increases by government.

Finally on the R&D side, the numbers of researchers employed in R&D activities in the State continued to push ahead, with 6.0 researchers employed per thousand in employment. This level of human capital now matches the EU average, though lags behind other major competitors.

Other statistical evidence points to improving R&D conditions. Numbers of Science and Engineering graduates continues to grow strongly, alongside sharp rises in PhD qualified numbers. Innovation performance in the business sector is also strong, with 52% of all firms operating in Ireland classified as active innovators in 2004, which is close to the EU average.

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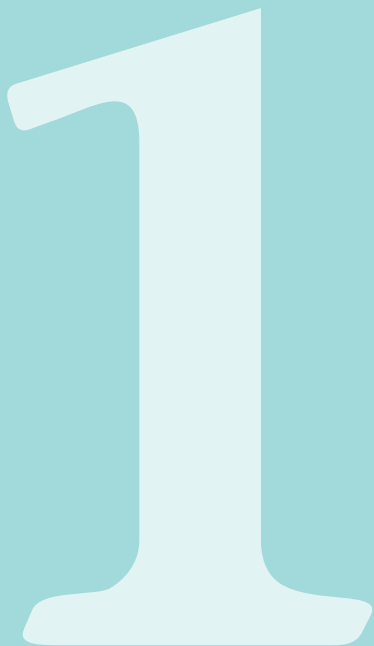
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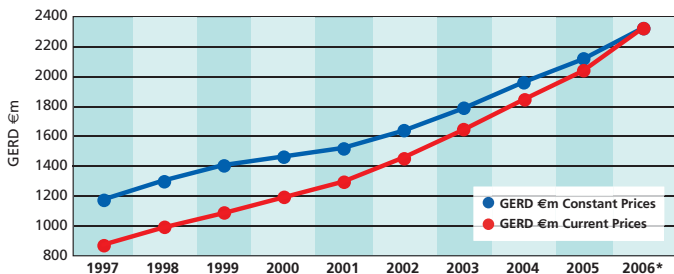
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Section 1

National Expenditure on R&D – Headline Figures



1 Gross Expenditure on R&D (GERD) - Ireland 1997 - 2006 (2006 estimates) (€m)

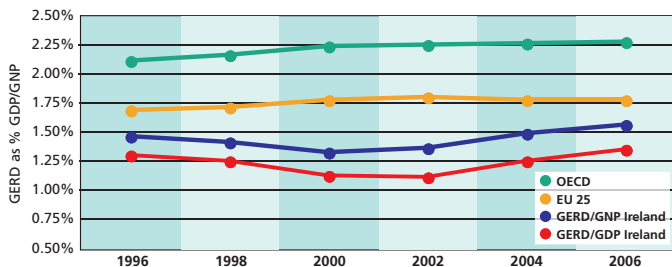


	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006(e)
GERD €m										
Current Prices	855	972	1,069	1,176	1,284	1,447	1,637	1,840	2,037	2,329
% Annual Change		13.7%	10.0%	10.0%	9.2%	12.7%	13.1%	12.4%	10.7%	14.3%

*2006 figures are Forfás estimates

Sources: Derived from the Survey of Business Expenditure on R&D 2005/6 (Forfás); Survey of R&D in the Higher Education Sector, 2004 (Forfás); State Expenditure on Science & Technology and Research & Development, 2005 and 2006 (Forfás)

2 Gross Expenditure on R&D (GERD) as a Percentage of GDP/GNP* - Ireland, EU and OECD 1996 to 2006



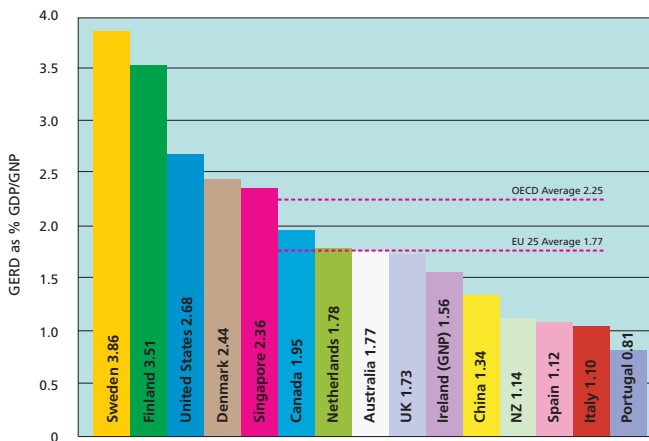
	1996	1998	2000	2002	2004	2006(e)
OECD	2.10%	2.15%	2.23%	2.24%	2.25%	2.26%**
EU 25	1.68%	1.70%	1.77%	1.79%	1.77%	1.77%**
GERD/GNP Ireland	1.46%	1.41%	1.32%	1.36%	1.48%	1.56%
GERD/GDP Ireland	1.29%	1.24%	1.12%	1.11%	1.25%	1.34%

* GDP data in Ireland are inflated by the transfer pricing policies of large multinationals, therefore, the use of GNP as a base is the more relevant measure of economic activity for international benchmarking purposes.

** Latest EU/OECD data is 2004/2005 using GDP PPP Methodology

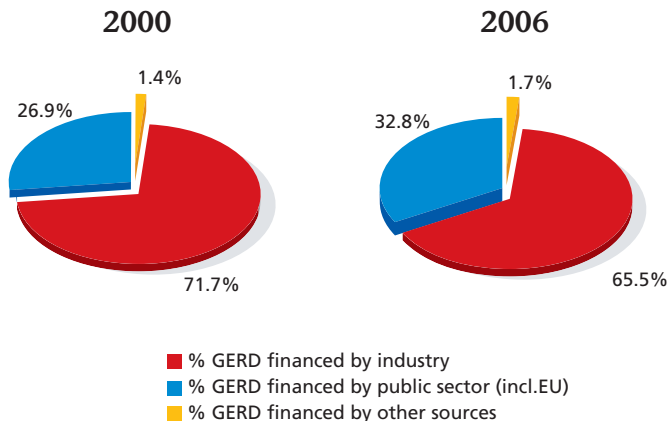
Sources: Derived from the Survey of Business Expenditure on R&D 2005/6 (Forfás); Survey of R&D in the Higher Education Sector, 2004 (Forfás); State Expenditure on Science & Technology and Research & Development 2005 and 2006 (Forfás) and the Main Science & Technology Indicators, 2006/2 (OECD).

3 Gross Expenditure on R&D (GERD) as a Percentage of GDP/GNP - Ireland and Selected Countries, 2006 (or latest available data)



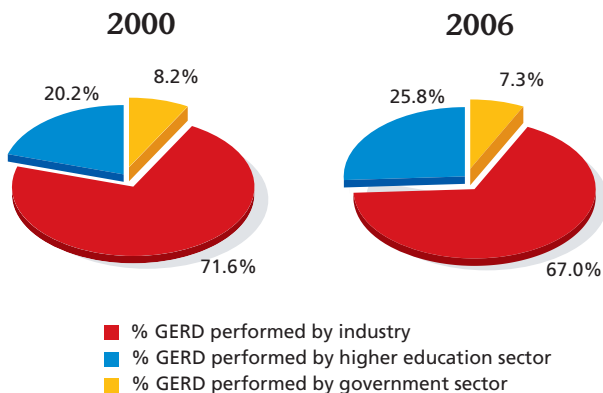
Sources: Derived from the Survey of Business Expenditure on R&D 2005/6 (Forfás); Survey of R&D in the Higher Education Sector, 2004 (Forfás); State Expenditure on Science & Technology and Research & Development 2005 and 2006 (Forfás) and the Main Science & Technology Indicators, 2006/2 (OECD)

4 Funding Sources of National R&D - Ireland 2000 and 2006 (% total)



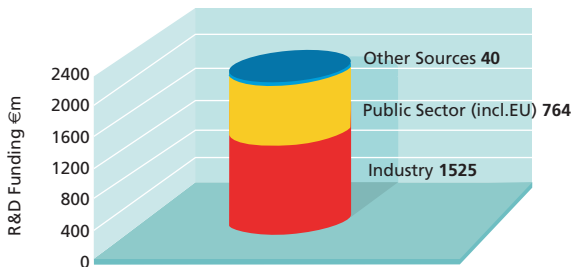
Sources: Derived from the Survey of Business Expenditure on R&D 2005/6 (Forfás); Survey of R&D in the Higher Education Sector, 2004 (Forfás); State Expenditure on Science & Technology and Research & Development 2005 and 2006 (Forfás).

5 Performance of National R&D by Sector - Ireland 2000 and 2006 (% total)

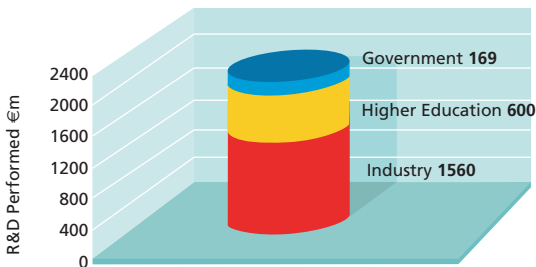


Sources: Derived from the Survey of Business Expenditure on R&D 2005/6 (Forfás); Survey of R&D in the Higher Education Sector, 2004 (Forfás); State Expenditure on Science & Technology and Research & Development 2005 and 2006 (Forfás).

**6 (i) Gross Expenditure on R&D (GERD)
- Sources of Funding, 2006 €m**

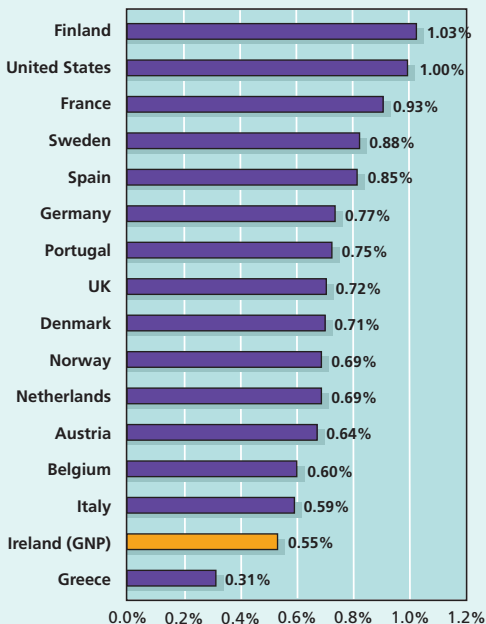


**(ii) Gross Expenditure on R&D (GERD)
- Performers, 2006 €m**

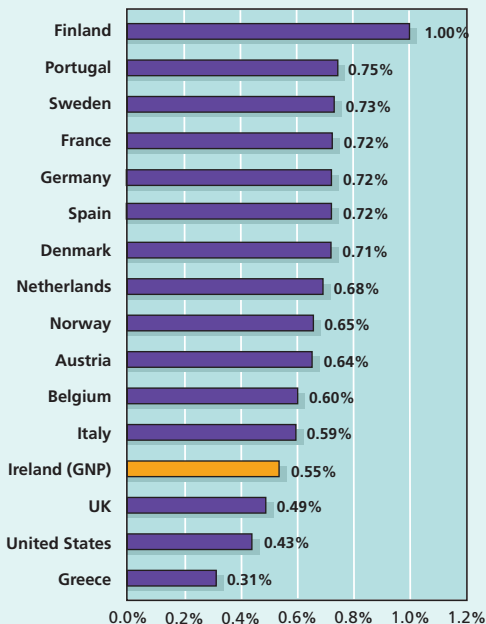


Sources: Derived from the Survey of Business Expenditure on R&D 2005/6 (Forfás); Survey of R&D in the Higher Education Sector, 2004 (Forfás); State Expenditure on Science & Technology and Research & Development 2005 and 2006 (Forfás).

7 (i) Government Budget Outlays or Appropriations of R&D (GBOARD) as a Percentage of GDP/GNP, 2006



7 (ii) Government Budget Outlays or Appropriations of R&D (GBOARD) as a Percentage of GDP/GNP less Defence, 2006



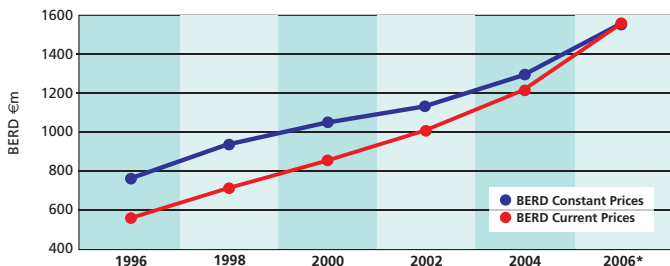
Sources: Derived from the survey of State Expenditure on Science & Technology and Research & Development 2005 and 2006 (Forfás) and the Main Science & Technology Indicators, 2006/2 (OECD).

Section 2

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



8 Business Sector Performed R&D (BERD) in Current and Constant Prices - Ireland 1996-2006 €m

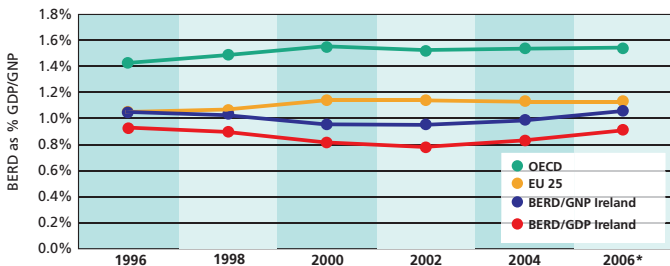


	1995	1997	1999	2001	2003	2005	2006(e)
BERD €m							
current prices	470	612	784	900	1105	1329	1560
% annual average change		14.2%	13.5%	7.0%	11.0%	9.7%	17.3%

*2006 figures are Forfás estimates

Sources: Derived from the survey of Business Expenditure on R&D 2005/6 (Forfás)

9 Business Sector Performed R&D (BERD) as a Percentage of GDP/GNP - Ireland, EU & OECD, 1996-2006

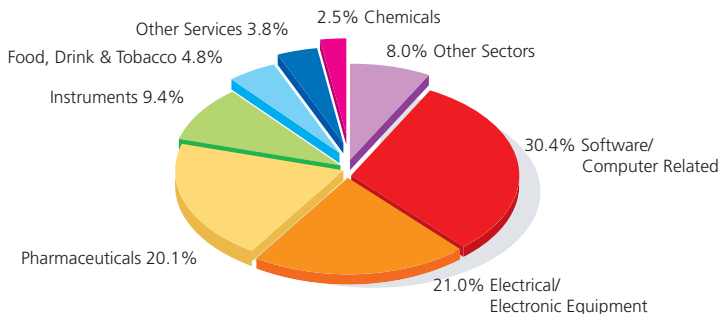


	1996	1998	2000	2002	2004	2006(e)
● OECD	1.42%	1.48%	1.55%	1.52%	1.53%	1.54%
● EU 25	1.04%	1.06%	1.13%	1.13%	1.12%	1.12%
● BERD/GNP Ireland	1.04%	1.02%	0.95%	0.94%	0.97%	1.05%
● BERD/GDP Ireland	0.92%	0.89%	0.81%	0.77%	0.82%	0.90%

*2006 figures are Forfás estimates

Sources: Derived from the survey of Business Expenditure on R&D 2005/6 (Forfás) and the Main Science & Technology Indicators, 2006/2 (OECD).

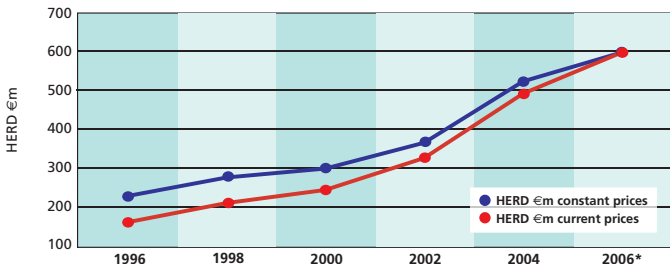
10 Business Sector Performed R&D (BERD) by Industrial Sector, 2005 % total



Sectoral BERD 2005	€m	%
Software/Computer Related	404.1	30.4%
Electrical/Electronic Equipment	279.0	21.0%
Pharmaceuticals	267.1	20.1%
Instruments	124.3	9.4%
Food, Drink & Tobacco	63.6	4.8%
Other Services	50.8	3.8%
Chemicals	33.2	2.5%
Other Sectors	106.6	8.0%
Total BERD	1328.7	100%

Source: Derived from the Survey of Business Expenditure on R&D 2005/6 (Forfás)

11 Higher Education Sector Performed R&D (HERD) in Current and Constant Prices - Ireland 1996 - 2006 €m

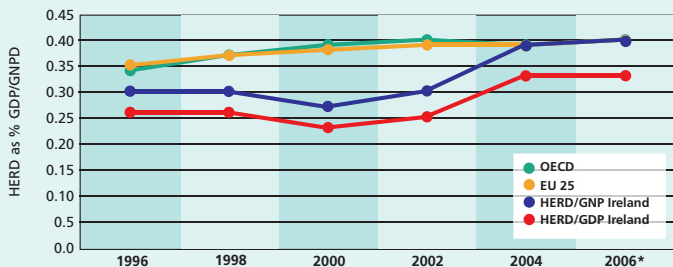


	1996	1998	2000	2002	2004	2006(e)
HERD €m current prices	153.1	203.7	238.1	322.3	491.7	600.0
% annual change		15.3%	8.1%	16.4%	23.5%	10.5%

*2006 figures are Forfás estimates

Sources: Derived from the Survey of R&D in the Higher Education Sector, 2004 (Forfás) and other estimates.

12 Higher Education Sector Performed R&D (HERD) as a Percentage of GDP/GNP - Ireland, EU and OECD, 1996-2006

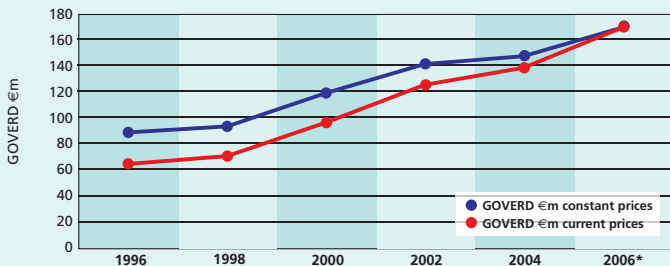


	1996	1998	2000	2002	2004	2006(e)
OECD	0.34%	0.37%	0.39%	0.40%	0.39%	0.40%
EU 25	0.35%	0.37%	0.38%	0.39%	0.39%	0.40%
HERD/GNP Ireland	0.30%	0.30%	0.27%	0.30%	0.39%	0.40%
HERD/GDP Ireland	0.26%	0.26%	0.23%	0.25%	0.33%	0.33%

*2006 figures are Forfás estimates

Sources: Derived from the Survey of R&D in the Higher Education Sector, 2004 (Forfás); Main Science & Technology Indicators, 2006/2 (OECD) and other estimates.

13 Government Sector Performed R&D (GOVERD) - in Current and Constant Prices - Ireland 1996-2006 €m

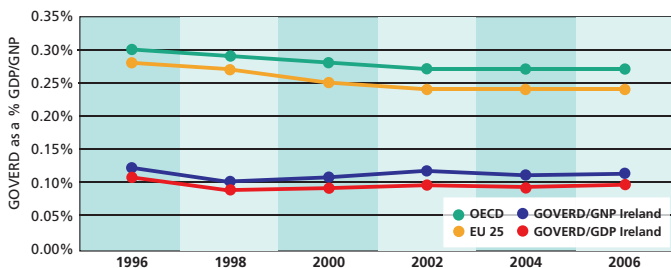


	1996	1998	2000	2002	2004	2006
GOVERD €m current prices	64.0	70.0	96.0	125.0	138.0	169.0
% Annual average change		4.6%	17.1%	14.1%	5.1%	10.7%

*2006 data includes R&D performed in hospital sectors

Sources: Derived from State Expenditure on Science & Technology and Research & Development 2005 and 2006 (Forfás).

14 Government Sector Performed R&D (GOVERD) as a Percentage of GNP/GDP - Ireland, EU & OECD 1996 - 2006



	1996	1998	2000	2002	2004	2006
OECD	0.30%	0.29%	0.28%	0.27%	0.27%	0.27%
EU 25	0.28%	0.27%	0.25%	0.24%	0.24%	0.24%
GOVERD/GNP Ireland	0.12%	0.10%	0.11%	0.12%	0.11%	0.11%
GOVERD/GDP Ireland	0.11%	0.09%	0.09%	0.10%	0.09%	0.10%

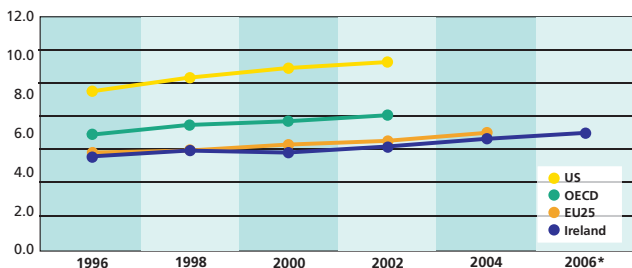
Sources: Derived from *State Expenditure on Science & Technology and Research & Development 2005 and 2006 (Forfás)* and the *Main Science & Technology Indicators, 2006/2 (OECD)*

Section 3

R&D Workforce

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15 Total Researchers (All sectors - FTE) per 1000 Total Employment - Ireland, EU, OECD & US, 1996 - 2006 (or latest available data)

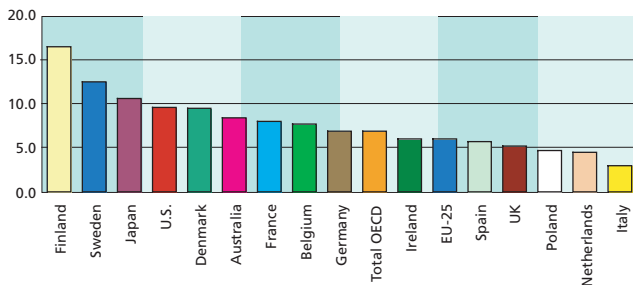


	1996	1998	2000	2002	2004	2006
US	8.1	8.8	9.3	9.6	N/A	N/A
OECD	5.9	6.4	6.6	6.9	N/A	N/A
EU25	5.0	5.1	5.4	5.6	6.0	N/A
Ireland	4.8	5.1	5.0	5.3	5.7	6.0

*2006 figures are Forfás estimates

Sources: Derived from Survey of Business Expenditure on R&D 2005/6 (Forfás); Survey of R&D in the Higher Education Sector 2004 (Forfás); State Expenditure on Science & Technology and Research & Development 2005 and 2006 (Forfás) and the Main Science & Technology Indicators, 2006/2 (OECD).

16 Total Researchers (All Sectors - FTE) per 1000 Total Employment - Ireland and Selected Countries, 2006 (or latest available data)

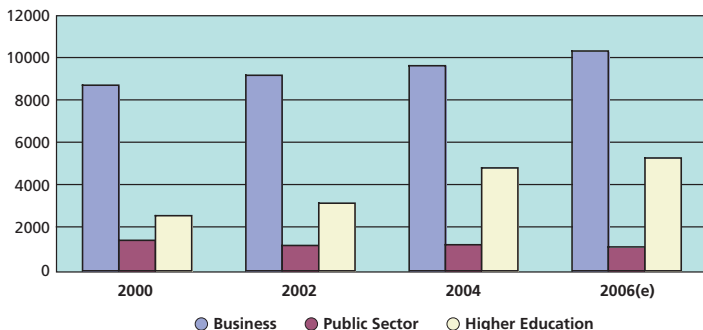


2005 (or latest available data)

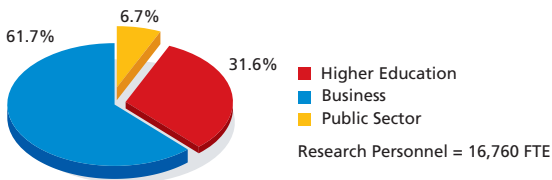
Finland	16.5	Total OECD	6.9
Sweden	12.5	Ireland	6.0
Japan	10.6	EU-25	6.0
U.S.	9.6	Spain	5.7
Denmark	9.5	UK	5.2
Australia	8.4	Poland	4.7
France	8.0	Netherlands	4.5
Belgium	7.7	Italy	3.0
Germany	6.9		

Sources: Derived from the survey of Business Expenditure on R&D 2005/6 (Forfás); Survey of R&D in the Higher Education Sector, 2004 (Forfás); State Expenditure on Science & Technology and Research & Development 2005 and 2006 (Forfás) and the Main Science & Technology Indicators, 2006/2 (OECD).

17 (i) R&D Personnel (Researchers plus Support Staff) (FTE) by Sector of Employment - Ireland 2000-2006

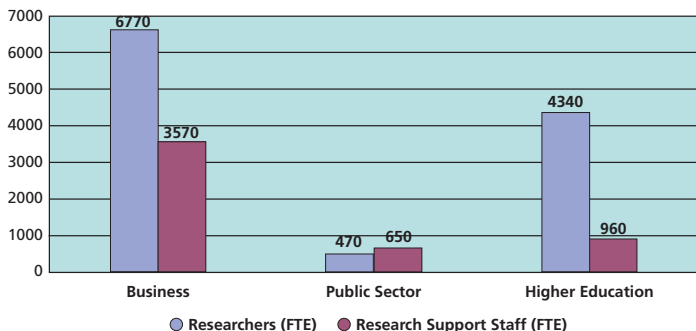


(ii) R&D Personnel (Researchers plus Support Staff) (FTE) by Sector of Employment - Share of Total, 2006



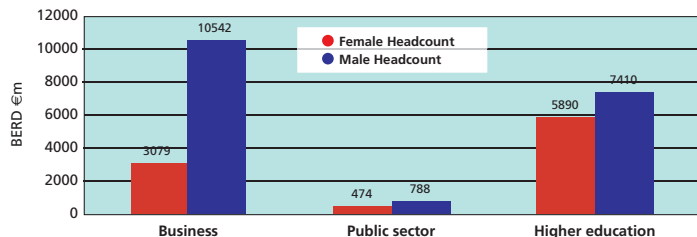
Sources: Derived from the survey of Business Expenditure on R&D 2005/6 (Forfás); Survey of R&D in the Higher Education Sector, 2004 (Forfás); State Expenditure on Science & Technology and Research & Development 2005 and 2006 (Forfás).

18 R&D Personnel (FTE) by Sector of Employment and Category of Employment - Ireland 2006



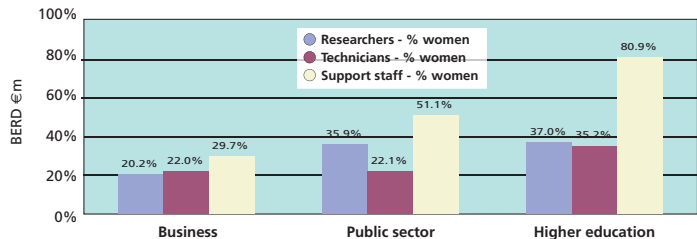
Sources: Derived from the survey of Business Expenditure on R&D 2005/6 (Forfás); Survey of R&D in the Higher Education Sector, 2004 (Forfás); State Expenditure on Science & Technology and Research & Development 2005 and 2006 (Forfás).

19 (i) Male/Female Research Personnel (headcount) by Sector - 2005



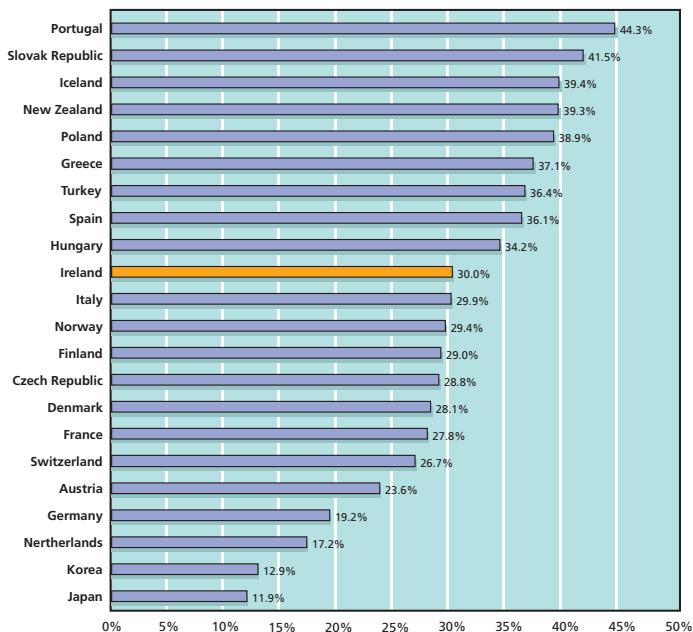
	Research Personnel	Female Headcount	Male Headcount	Total
BERD	Business	3079	10542	13621
GOVERD	Public sector	474	788	1262
HERD	Higher education	5890	7410	13300

(ii) Female Research Personnel by Sector of Performance and Occupation (% headcount) - 2005



Sources: Derived from the Survey of Business Expenditure on R&D 2005/6 (Forfás); Survey of R&D in the Higher Education Sector, 2004 (Forfás); State Expenditure on Science & Technology and Research & Development 2005 and 2006 (Forfás) and the Main Science & Technology Indicators, 2006/2 (OECD)

(iii) Female Researchers as a Percentage of Total Researchers, 2005



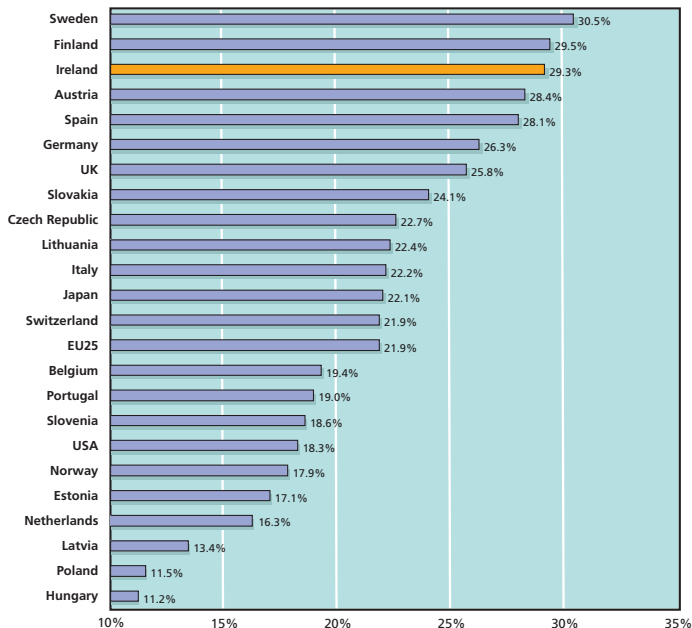
Sources: *Main Science and Technology Indicators 2006/2* (OECD)

Section 4

Other S&T Indicators

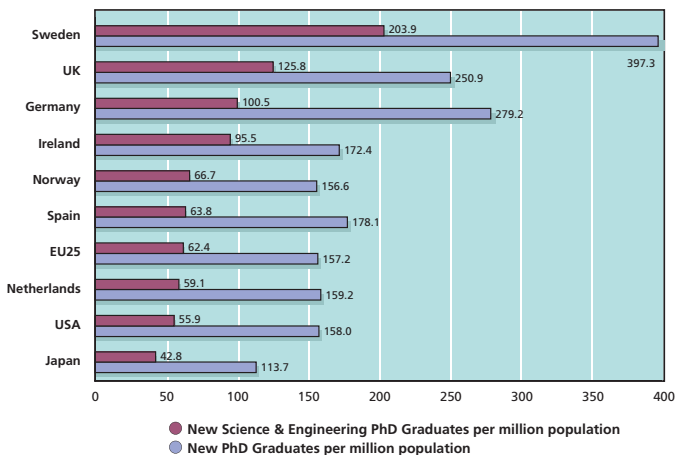
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20 (i) Science and Engineering Flow of New Graduates as a Percentage of Total Graduates - Ireland and Selected Countries 2003 (or latest available data)



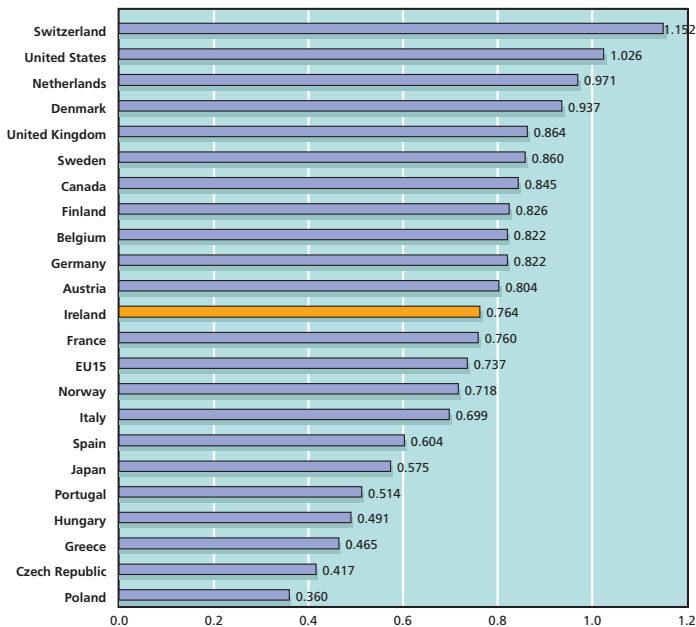
Sources: *Science, Technology and Innovation in Europe 2006* (Eurostat)

(ii) New PhD Graduates per Million Population, 2003



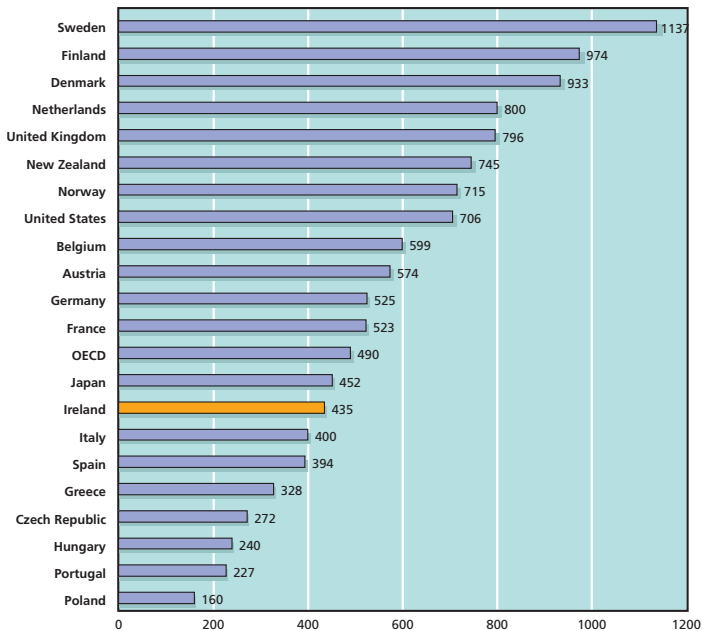
Sources: Science & Engineering Indicators, 2006 (National Science Foundation), Thomson ISI.

21 (i) Scientific Citations and Publications - Relative Citation Index 2003



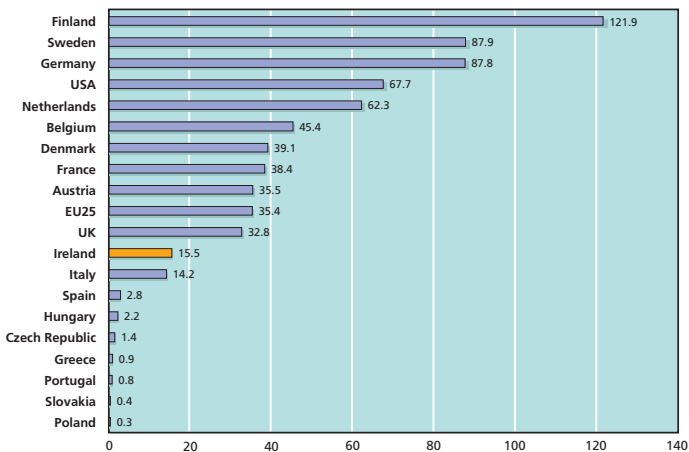
Sources: *Science & Engineering Indicators, 2006 (National Science Foundation), Thomson ISI.*

(ii) Science & Engineering Scientific Articles per Million Population, 2003



Sources: Science & Engineering Indicators, 2006 (National Science Foundation), Thomson ISI.

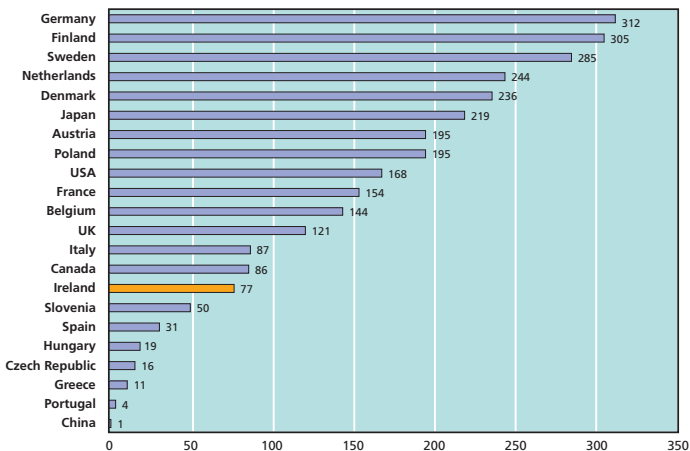
22 (i) Triadic Patent Families* Granted per Million Population - 2003



* 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)

Source: OECD Main Science and Technology Indicators 2006/2 (OECD)

(ii) Patent Applications per Million of Population to the EPO - 2003



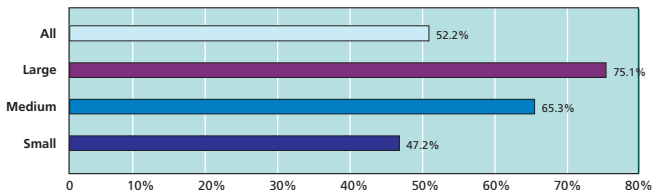
Source: Eurostat Statistics in Focus

Section 5

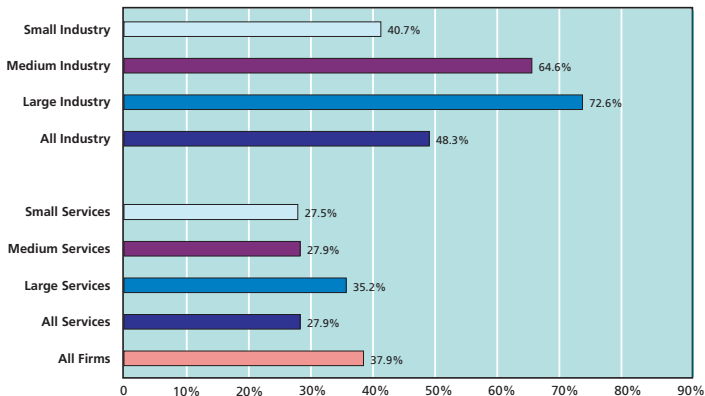
Innovation Statistics

5

23 (i) Innovation Activity Rate by Size of Firm (% total firms) - 2004

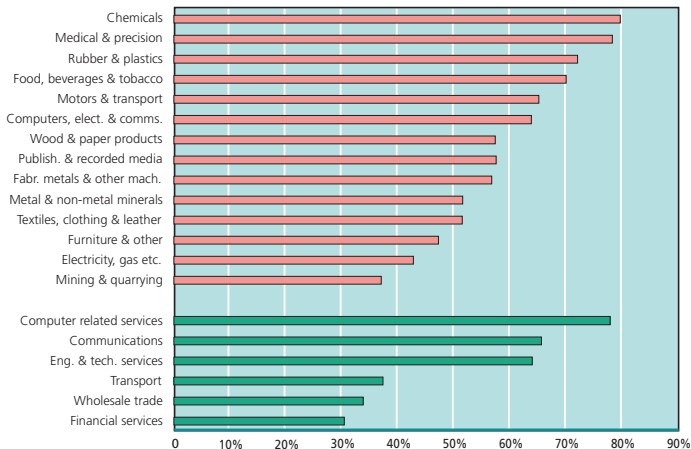


(ii) Product Innovation Activity Rate by Size and Type of Firm (% total firms) - 2004



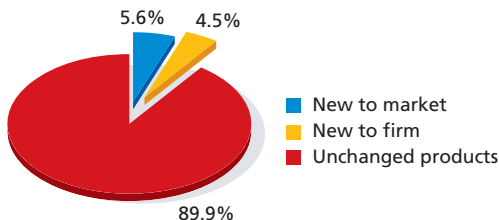
Sources: Forfás Fourth Community Innovation Survey

24 Ireland - Sectoral Innovation Activity Rates - 2004 (% total Firms)



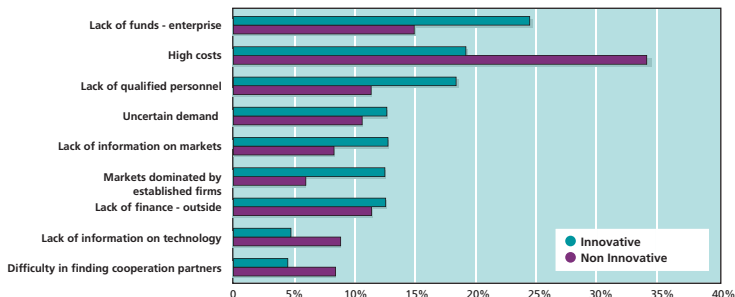
Sources: Forfás Fourth Community Innovation Survey

25 Contribution to Total Turnover from Product Innovation (% total turnover) - 2004



Source: Forfás Fourth Community Innovation Survey

26 Innovation Hampering Factors (Active and Non-Active) as a Percentage of Totals - 2004



Source: Forfás Fourth Community Innovation Survey



Forfás

Wilton Park House,
Wilton Place,
Dublin 2.

Tel: 01-607 3000

Fax: 01-607 3030

Website: www.forfas.ie

E-mail: info@forfas.ie

