

---

**Survey of Research &  
Development in the Higher  
Education Sector  
2012/2013**



**An Roinn Post, Fiontar agus Nuálaíochta  
Department of Jobs, Enterprise and Innovation**

**Strategic Policy Division**

---

# Table of Contents

<b>Executive Summary</b>	<b>4</b>
Table 1: Summary of key results, 2002-2012	4
<b>Caveats</b>	<b>5</b>
<b>Chapter 1: General trends in higher education R&amp;D expenditure</b>	<b>6</b>
Figure 1: Trend in HERD expenditure, 2002-2012, in current prices	6
Figure 2: Research expenditure by Universities 2002-2012	6
Figure 3: Research expenditure by Institutes of Technology, 2002-2012	7
Figure 4: Research expenditure by Universities and Institutes of Technology 2012	7
Figure 5: HERD as a percentage of economic activity, 2002-2012, Ireland, OECD and the EU28	8
Figure 6: HERD as a % of economic activity - Ireland's ranking in the OECD, 2002-2012	8
Figure 7: HERD as a percentage of GDP (& Ireland GNP) - 2012	9
<b>Chapter 2: Human resources allocated to higher education research</b>	<b>10</b>
Table 2a: Total researchers by performer, 2008-2012 (headcount)	10
Table 2b: Total research personnel analysed by performer, 2008-2012 (headcount)	10
Figure 8: Researchers by qualification, 2008-2012 (headcount)	11
Figure 9: Total researchers in the higher education sector, 2002-2012 (FTE)	11
Table 3a: Researchers by occupation and field of science in the higher education sector, FTEs, 2012	12
Table 3b: Researchers by occupation and field of science in the higher education sector, headcount, 2012	13
Figure 10: Ireland's ranking, higher education researchers (headcount) per 1,000 of the labour force, 2002 -2012 (or latest available data)	14
Figure 11: Higher education researchers (headcount) per 1,000 of the labour force, 2012	14
Figure 12: Female researchers as a % of total researchers (headcount), 2002-2012	15
Figure 13: Female researchers as a % of total researchers (headcount), 2012	15
Figure 14: Female and male FTE researchers, 2012	16
<b>Chapter 3: Source of funding of HERD expenditure</b>	<b>17</b>
Figure 16: Sources of direct government research funding (€ millions) 2012 and 2013(estimate)	18
Figure 17: Percentage of HERD financed by industry in Selected OECD Countries, 2012	19
Table 4: Sources of research funding by field of science (€ millions), 2012	20

<b>Chapter 4: HERD Expenditure by Field of Science</b>	<b>21</b>
Figure 18: Higher education expenditure on R&D by field of science in current prices, (€millions), 2004-2010	21
Figure 19: Share of total R&D expenditure by field of science, 2004 and 2012	22
<b>Chapter 5: Types of research</b>	<b>23</b>
Figure 20: Percentage of total HERD budget by research type, 2012	23
Figure 21: Type of research carried out by field of science, Universities and IoTs, 2012	23
<b>Chapter 6: Type of Costs</b>	<b>24</b>
Figure 22: Distribution of research spend by type of costs, 2002-2012	24
Figure 23: Percentage share of type of costs, 2008 and 2012	24
Figure 24: Percentage share of type of costs by Universities and IoTs, 2012	25
Table 5: Types of costs by new fields of science, 2012	25
<b>Appendix 1: Methodology</b>	<b>25</b>
<b>Appendix 2: Acronyms</b>	<b>28</b>
<b>Appendix 3: Detailed Fields of Science Tables</b>	<b>29</b>
Total HERD expenditure by old and new Fields of Science, 2012	29

## Executive Summary

This report presents the results of the survey of research and development (R&D) activities in the higher education sector - the Higher Education R&D Survey (HERD) - for the academic year 2012/13. Expenditures and human resources devoted to research work in the higher education sector are measured biennially in the HERD survey. The sector includes the universities, institutes of technology, and other institutes that are in receipt of public funding and engaged in research and development activities.

The main findings of the HERD 2012 survey are now summarised.

**Table 1 - Summary of key results, 2002-2012, current prices**

	2002	2004	2006	2008	2010	2012
Higher education expenditure on R&D (HERD)	€322.3m	€492.0m	€600.5m	€749.8m	€708.3m	€640.2m
HERD as a % of GNP	0.29	0.37	0.37	0.47	0.51	0.45
Ireland's rank out of 41 OECD countries	23	19	19	15	15	19
Total researchers (FTE) in HE sector	2,797	4,151	4,672	6,174	5,729	6,002
Researchers (FTEs) per 1,000 labour force - Ireland's rank out of 37 OECD countries	13	14	15	15	17	17

Source: OECD, Main Science and Technology Indicators, February 2015

- Total expenditure on R&D in the higher education sector in 2012 amounted to €640.2m. HERD more than doubled between 2002 and 2008 reaching its peak in 2008 at €749.8m. Since 2008 HERD has declined by €110m, a decrease of 14.6%.
- HERD as a percentage of GNP has fallen from 0.51% in 2010 to 0.45% in 2012.
- Ireland's rank out of 41 OECD countries for HERD as a percentage of GNP has declined from 15<sup>th</sup> place in 2010 to 19<sup>th</sup> place in 2012.
- While the total number of research personnel in the higher education sector in 2012 has remained broadly the same since 2008 at 15,484, the total number of researchers (excluding technical and admin support staff) has declined by 3.3% to 11,222 and increased by 5% on a full time equivalent basis since 2008 to 6,002 (FTEs) in 2012.
- Ireland's rank out of 37 OECD countries on researchers per 1,000 of the labour force was 17 in 2010.
- NUIG has the largest spend on R&D in the country at €120m in 2012, followed by UCD at €113m, TCD at €104.2m and UCC at €89.1m. These four institutions together account for two-thirds of HERD in 2012.

## Caveats

- For the current HERD survey the Universities and the Institutes of Technology were asked to code the Field of Science for the relevant Departments/Schools. In previous years the Department classified the Field of Science based on the Department/School. Some differences in classification have occurred this year and as a result the Field of Science codes for 2012 are not directly comparable with previous years.
- A 'Not Classified' category was added to the Field of Science breakdowns in the current report. A Department/School not readily classified into a field of science was left unclassified e.g. Research Office, Office of VP for Research, President's Office, Admin and Support, Research and Commercialisation Support, etc. In previous surveys these offices were coded under Social Sciences.
- The Institutes of Technology are in receipt of the Block Grant from the HEA since 2008. A question was added to the current questionnaire to capture these data; however, the majority of Institutes of Technology did not provide this information. As the data were very incomplete, a decision was taken to omit Block Grant data for the Institutes of Technology from the complete time series.

The Department of Jobs, Enterprise and Innovation would like to thank all the respondents to this survey who have taken the time to gather information and complete the data requests for this key area of Government policy.

For further information on this survey please contact:

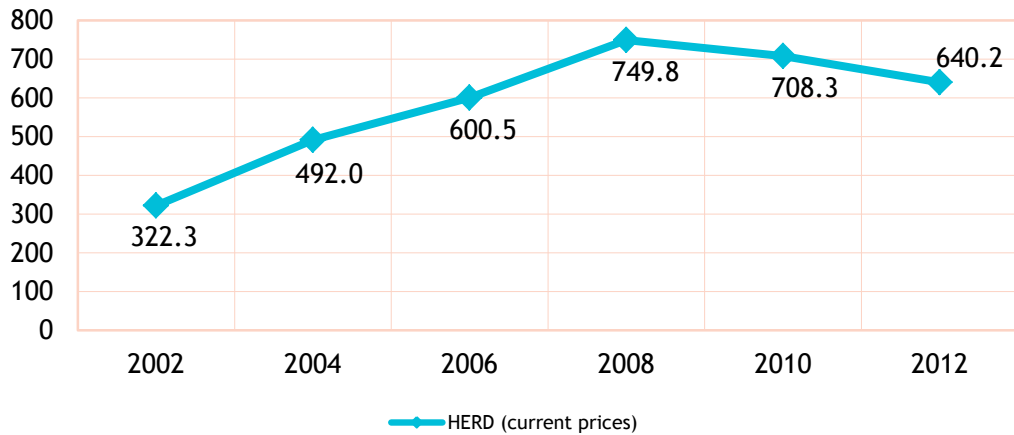
Helena Connellan,  
Strategic Policy Division,  
Department of Jobs, Enterprise and Innovation,  
23 Kildare Street,  
Dublin 2.

Tel: 353 (01) 631 2852

Email: [helena.connellan@djei.ie](mailto:helena.connellan@djei.ie)

# Chapter 1: General trends in higher education R&D expenditure

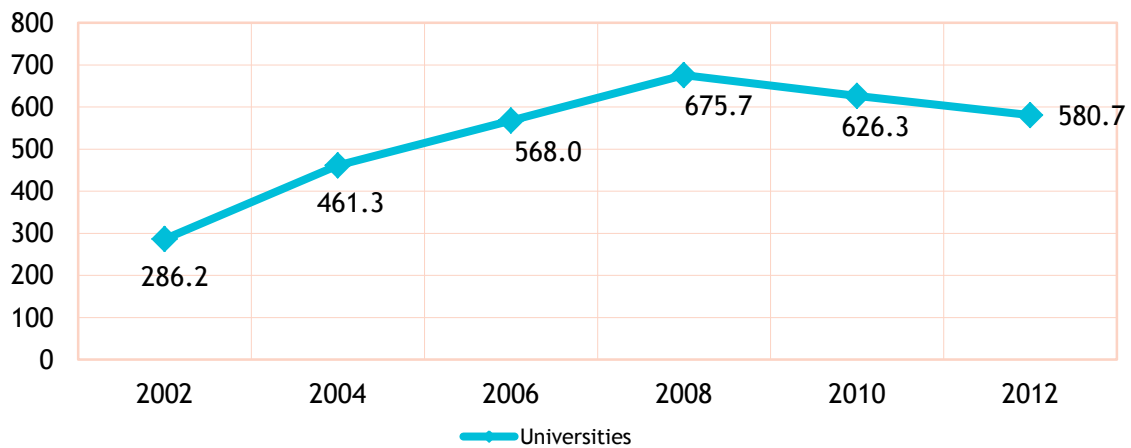
Figure 1: Trend in HERD expenditure, 2002-2012, in current prices, (€ million)



Source: DJEI HERD data

- Total expenditure on R&D in the Higher Education sector (HERD) increased by 133% between 2002 and 2008, from €322.3m to €749.8m respectively, reaching a peak over the 10 year period in 2008 and declining by 14.6% to €640.2m in 2012.
- HERD has approximately doubled between 2002 and 2012.

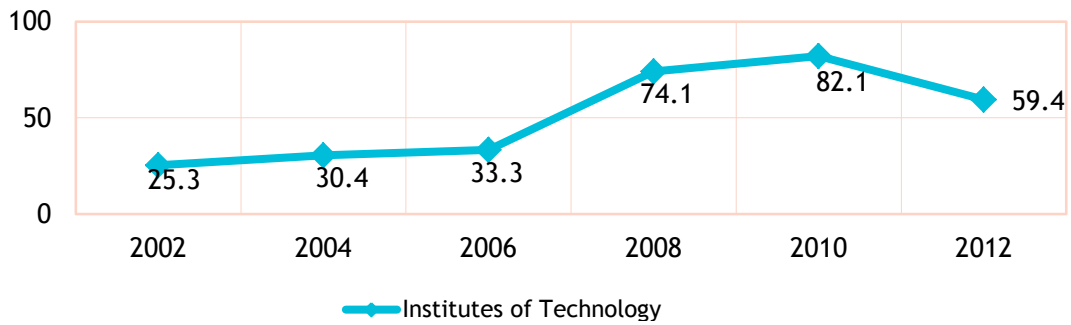
Figure 2: Research expenditure by Universities 2002-2012, in current prices, (€millions)



Source: DJEI HERD data

- Expenditure on R&D in the university sector increased from €286.2m in 2002 to €675.7m in 2008, an increase of 136%. HERD in this sector was at its highest point over the 10 year period in 2008 and declined by 14.1% to €580.7m in 2012.
- Spend on R&D in the university sector has doubled over the 10 year period.
- The university sector accounted for 91% of total HERD in 2012.

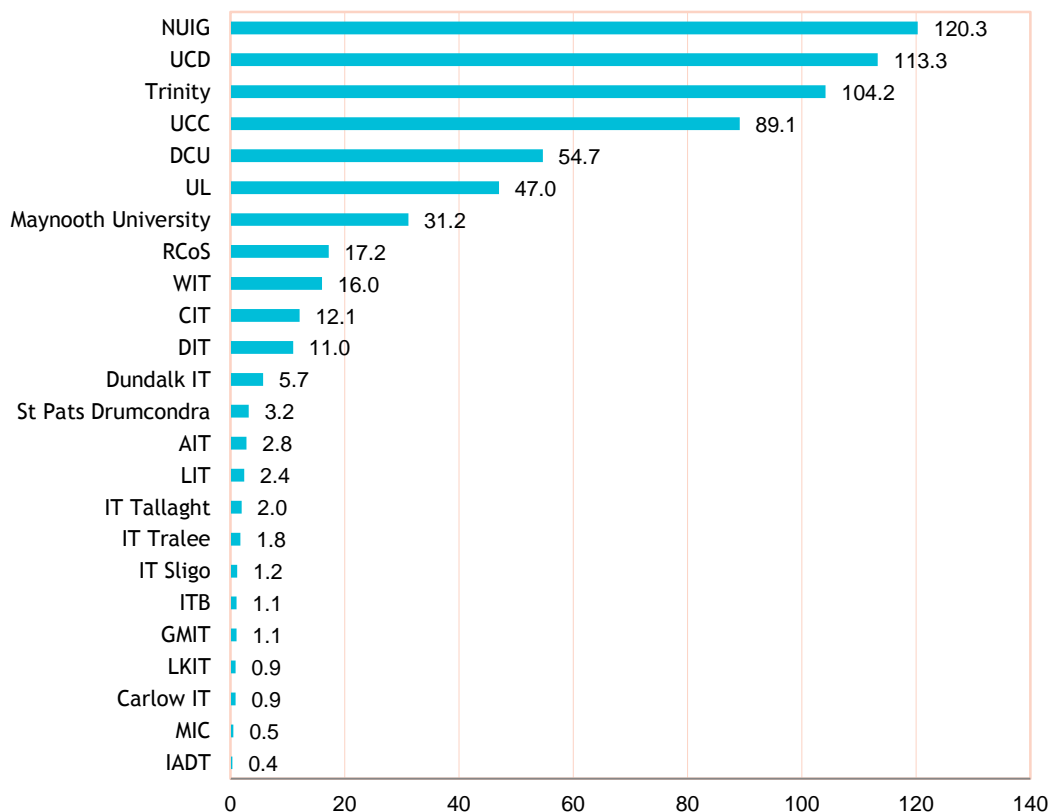
**Figure 3: Research expenditure by Institutes of Technology, 2002-2012, in current prices, (€ millions)**



Source: DJEI HERD data

- R&D expenditure in the Institutes of Technology increased from €25.3m to €82.1m (more than a threefold increase) between 2002 and 2010 respectively.
- Over the 10 year period, R&D expenditure in this sector was highest in 2010 and declined by 28% to €59.4m in 2012
- Expenditure on R&D in this sector increased by 135% between 2002 and 2012.
- The Institutes of Technology sector accounted for 9% of total HERD in 2012.

**Figure 4: Research expenditure by Universities and Institutes of Technology 2012, (€ millions)**



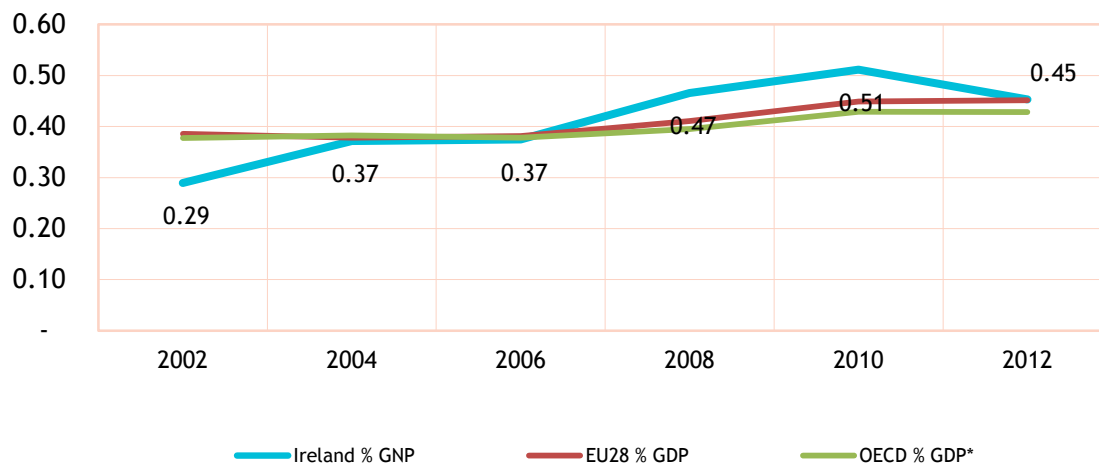
Source: DJEI HERD data

- NUIG spent €120.3m on in-house R&D in 2012, making NUIG the higher education institute with the highest spend on R&D in 2012. NUIG also had the highest capital

spend on R&D in 2012, amounting to €38.6m and accounting for 57% of total capital expenditure in all HEIs on R&D in 2012.

- UCD and Trinity College also had R&D expenditures in excess of €100m in 2012.
- In the case of the Institutes of Technology, expenditure on R&D for WIT, CIT and DIT amounted to €16m, €12.1m and €11m respectively in 2012.

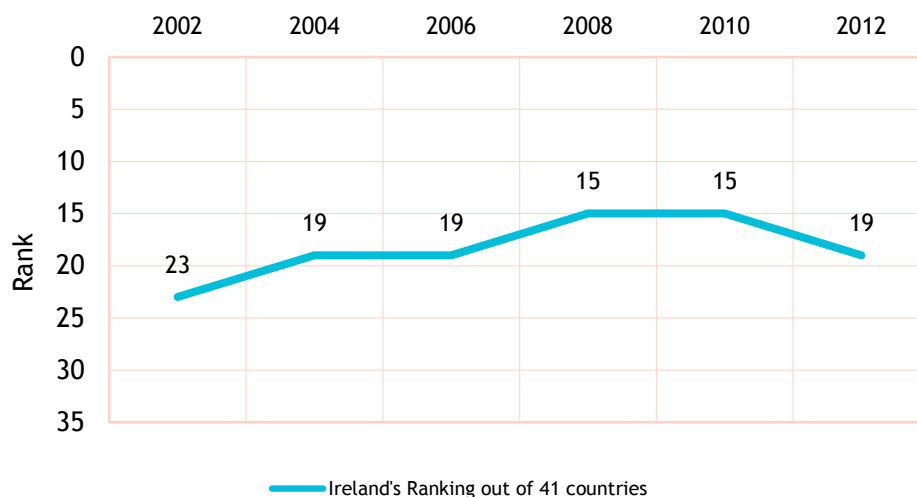
**Figure 5: HERD as a percentage of economic activity, 2002-2012, Ireland, OECD and the EU28**



Source: OECD, Main Science and Technology Indicators, February 2015

- HERD as a percentage of GNP for Ireland increased from 0.29% in 2002 to a high of 0.51% in 2010 and declining to 0.45% in 2012. This is on a par with the EU28 average in 2012 and above the OECD average of 0.43%.

**Figure 6: HERD as a % of economic activity - Ireland's ranking in the OECD, 2002-2012**

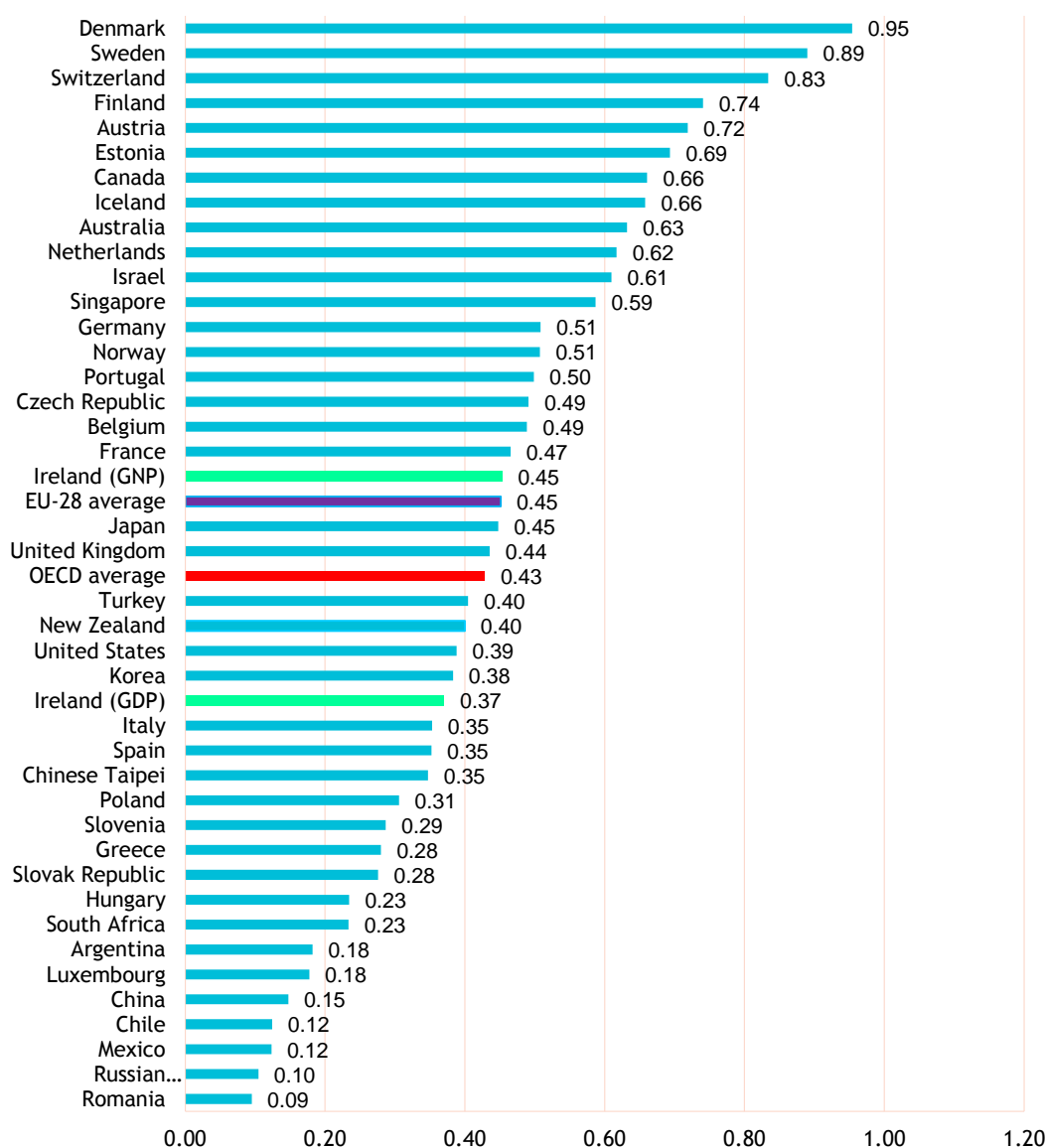


Source: OECD, Main Science and Technology Indicators, February 2015

- Ireland scored 19<sup>th</sup> out of 41 countries on HERD as a percentage of economic activity in 2012, dropping from 15<sup>th</sup> place in 2010.



Figure 7: HERD as a percentage of GDP (&amp; Ireland GNP) - 2012 or latest available data



Source: OECD, Main Science and Technology Indicators, February 2015

- In 2012, the top peer performers were Denmark and Sweden, spending 0.95% and 0.89% of their respective GDP on R&D in the higher education sector. Switzerland at 0.83% scored 3<sup>rd</sup> place. The UK spends 0.44%, close to the Irish level of HERD intensity, while the USA spends 0.39%.

## Chapter 2: Human resources allocated to higher education research

Table 2a: Total researchers by performer, 2008-2012 (headcount)

Sector	Academic Staff	Principal Investigators	Post-doctoral Fellows	Contract Lecturers	Contract Researchers	Total Researchers
	A	B	C	D	E	(A+B+C+D+E)
Institutes of Technology	2,537	86	77	249	219	3,168
Universities	3,105	1,179	1,741	825	1,205	8,055
<b>Total - 2012</b>	<b>5,642</b>	<b>1,265</b>	<b>1,818</b>	<b>1,074</b>	<b>1,423</b>	<b>11,222</b>
Total - 2010	6,155	951	1,771	783	1,398	11,058
Total - 2008	5,994	1,032	2,278	1,396	911	11,610

Source: DJEI HERD data

- There were 11,222 researchers in the higher education sector (headcount) in 2012, a small increase of 1.5% since 2010 and a decline of 3.3% since 2008.
- There were 8,055 researchers in the university sector in 2012 (accounting for 72% of total researchers in the higher education sector) and 3,168 researchers in the Institutes of Education.

Table 2b: Total research personnel analysed by performer, 2008-2012 (headcount)

Sector	Total Researchers	Research Technicians	Other Technicians	Admin Staff	Other staff	Total Research Personnel
	F	G	H	I	I	(F+G+H+I)
Institutes of Technology	3,168	18	89	223	52	3,549
Universities	8,055	156	743	2,120	861	11,935
<b>Total - 2012</b>	<b>11,222</b>	<b>174</b>	<b>832</b>	<b>2,342</b>	<b>913</b>	<b>15,483</b>
Total - 2010	11,058	229	886	3,007	1,233	16,413
Total - 2008	11,610	1,079		2,242	556	15,487

Source: DJEI HERD data

- There were 15,483 research personnel in the higher education sector in 2012, a decline of 5.7% since 2010.

- While the number of researchers has increased slightly since 2010, the number of support staff (technicians, administration and other staff) has dropped by 20%, from 5,355 in 2010 to 4,261 in 2012.

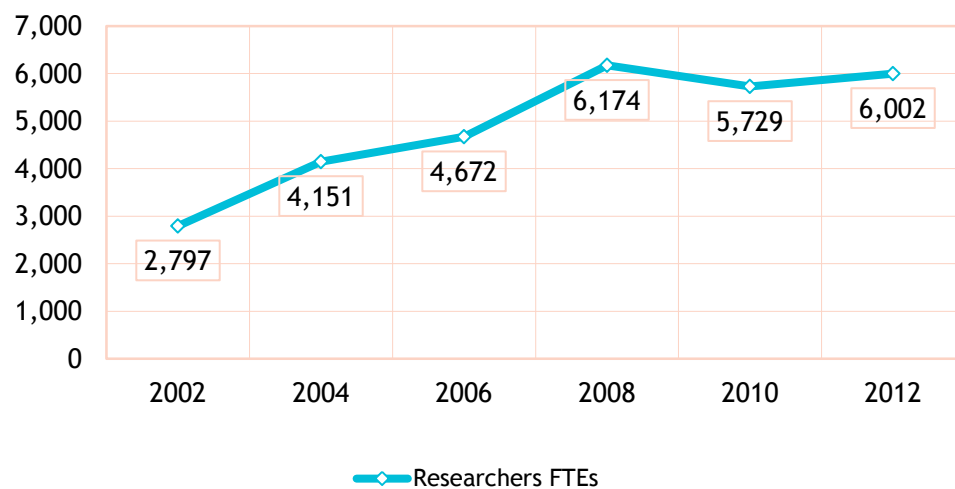
**Figure 8: Researchers by qualification, 2008-2012 (headcount)**



Source: DJEI Data

- 6,777 researchers were doctorate holders in 2012 in the higher education sector, a decline of 12% since 2008.
- 4,445 other qualified researchers (with educational attainment below doctorate level) were employed in 2012, an increase of 14% since 2008.

**Figure 9: Total researchers in the higher education sector, 2002-2012 (FTE)**



Source: DJEI HERD Data

- There were 6,002 FTE researchers in the higher education sector in 2012, a 4.8% increase since 2010.
- In 2008, 6,174 FTE researchers were recorded, the highest over the 10 year period.

**Table 3a: Researchers by occupation and field of science in the higher education sector, FTEs, 2012**

Sector	Total Researchers	Total Support Staff	Total Research Personnel
Natural Sciences	1,926	280	2,205
Engineering and Technology	1,108	181	1,289
Medical and Health Science	1,362	167	1,529
Agricultural Sciences	125	31	157
Social Sciences	1,013	113	1,125
Humanities	427	78	505
Not classified	41	84	124
<b>Total - 2012</b>	<b>6,002</b>	<b>933</b>	<b>6,935</b>
Total - 2010	5,729	771	6,500
Total - 2008	6,174	967	7,141

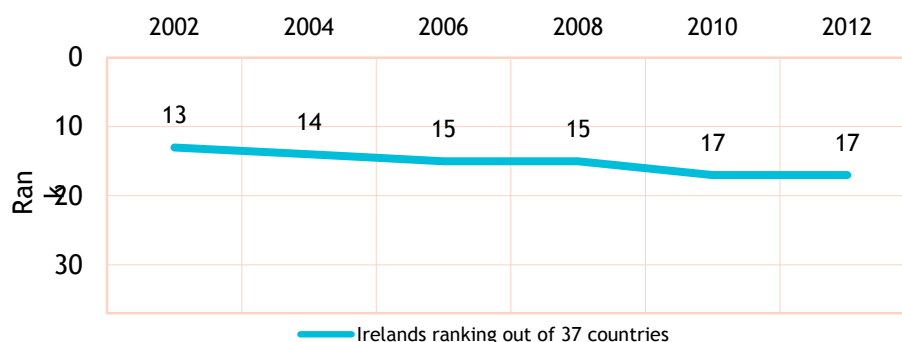
Source: DJEI HERD Data

- There were 6,935 FTE research personnel in the higher education sector in 2012, an increase of 7% since 2010.
- 2,205 FTE research personnel were employed in Natural Sciences in 2012. This field of science accounts for almost one-third of all research personnel.
- Medical and Health Sciences accounted for 23% of the total FTE research personnel, with 1,529 employed in 2012.
- There were 1,289 FTE research personnel employed (18% of total) in Engineering and Technology, and 1,125 (17% of total) employed in Social Sciences in 2012.
- Table 3b gives the equivalent information by headcount and indicates a total of 15,483 research personnel in the higher education sector in 2012, down from 16,413 in 2010 and at about the same level as 2008.

**Table 3b: Researchers by occupation and field of science in the higher education sector, headcount, 2012**

Sector	Total Researchers	Total Support Staff	Total Research Personnel
Natural Sciences	2,796	884	3,679
Engineering and Technology	2,003	550	2,553
Medical and Health Science	2,185	628	2,813
Agricultural Sciences	218	137	356
Social Sciences	2,802	789	3,591
Humanities	1,163	366	1,529
Not classified	55	907	962
<b>Total - 2012</b>	<b>11,222</b>	<b>4,261</b>	<b>15,483</b>
Total - 2010	11,058	5,355	16,413
Total - 2008	11,610	3,877	15,487

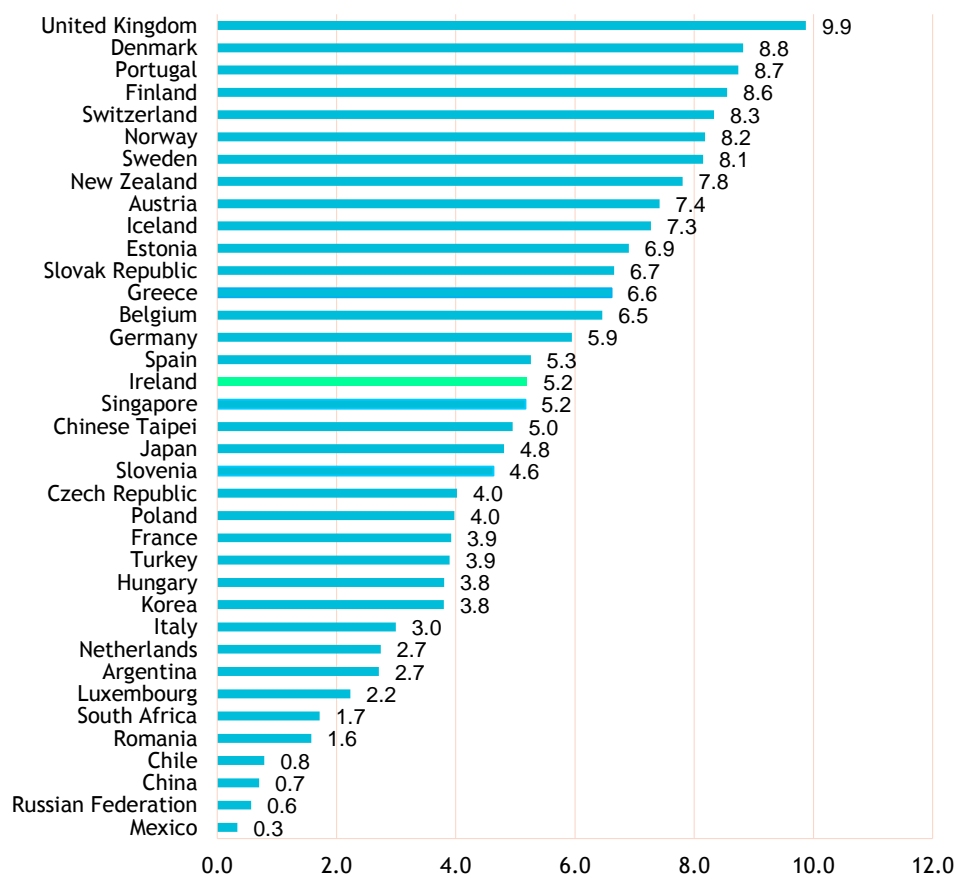
**Figure 10: Ireland's ranking, higher education researchers (headcount) per 1,000 of the labour force, 2002 -2012 (or latest available data)**



Source: OECD, Main Science and Technology Indicators, February 2015

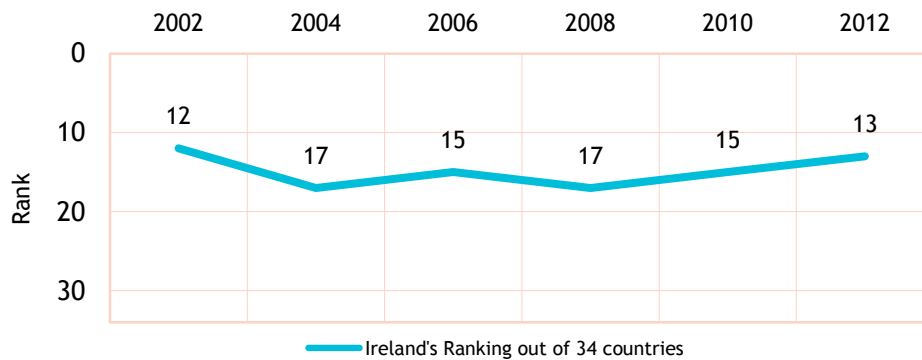
Figures 10 and 11 illustrate Ireland's ranking against other OECD countries when comparing the number of researchers in the higher education sector per 1000 of the labour force. In 2002, Ireland was ranked 13th out of 37 countries and over the decade Ireland has fallen to 17th place in 2012. The UK reported the highest number of researchers per thousand of the labour force at 9.9.

**Figure 11: Higher education researchers (headcount) per 1,000 of the labour force, 2012 (or latest available data)**



Source: OECD, Main Science and Technology Indicators, February 2015

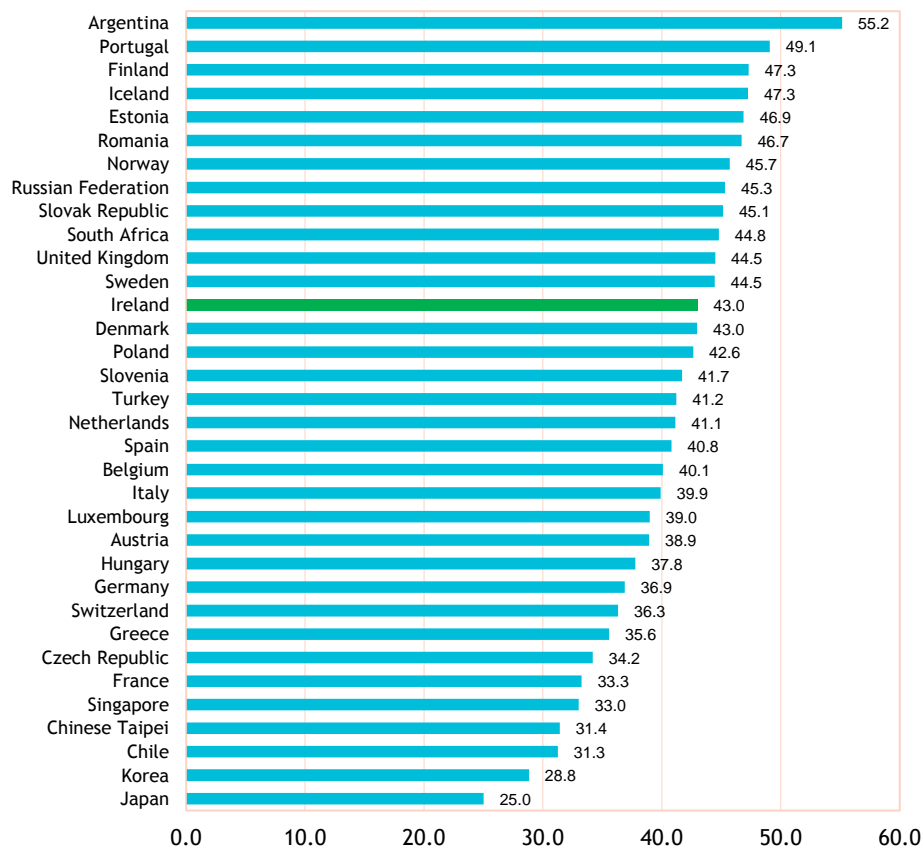
Figure 12: Female researchers as a % of total researchers (headcount), 2002-2012



Source: OECD, Main Science and Technology Indicators, February 2015

Figures 12 and 13 capture Ireland's place internationally with respect to female researchers as a percentage of total researchers. Ireland performs well, ranking 13th out of 34 countries on this indicator. Some 43 per cent of all researchers in Ireland are female. Argentina and Portugal are the current leaders with female researchers accounting for 55.2 per cent and 49.1 per cent of all researchers in 2012 respectively.

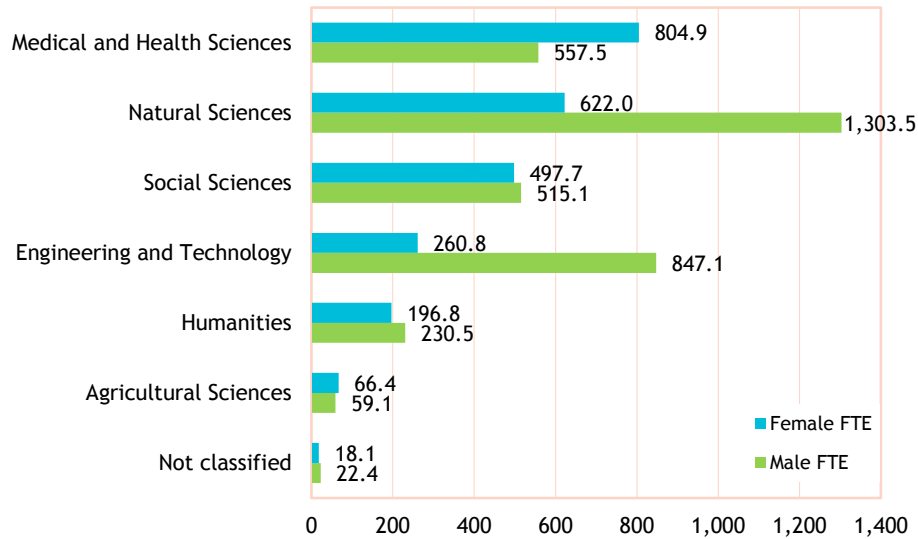
Figure 13: Female researchers as a % of total researchers (headcount), 2012 or latest available data



Source: OECD, Main Science and Technology Indicators, February 2015

Figure 14 below shows the number of FTE male and female researchers by field of science in 2012. In the field of medical and health sciences, female researchers account for 59 per cent of total researchers contrasting with the field of engineering and technology where male researchers account for 76 per cent of total researchers.

**Figure 14: Female and male FTE researchers, 2012**

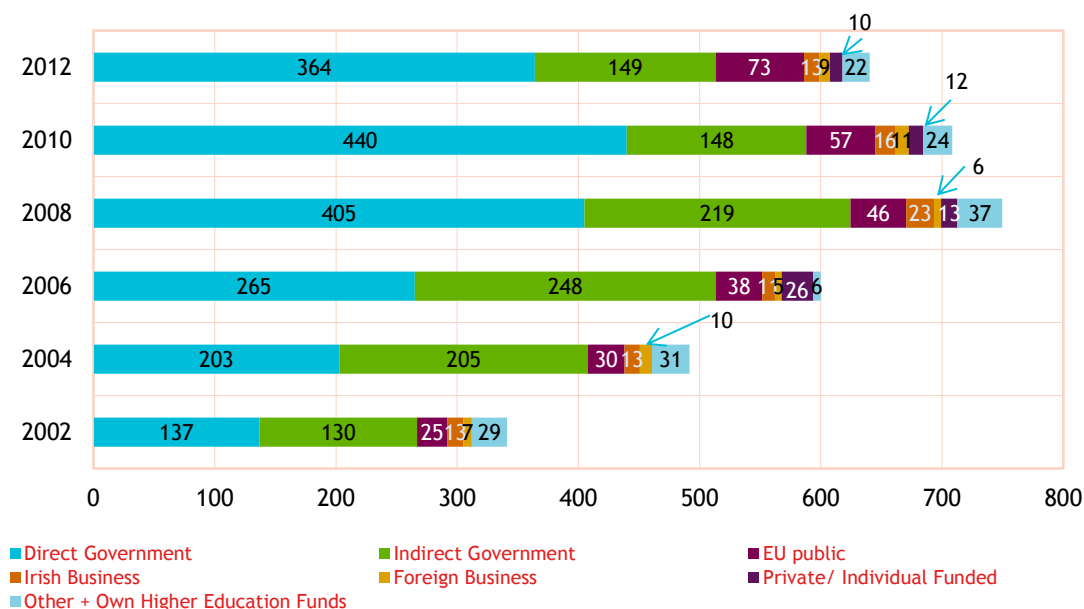


Source: DJEI HERD Data



## Chapter 3: Source of funding of HERD expenditure

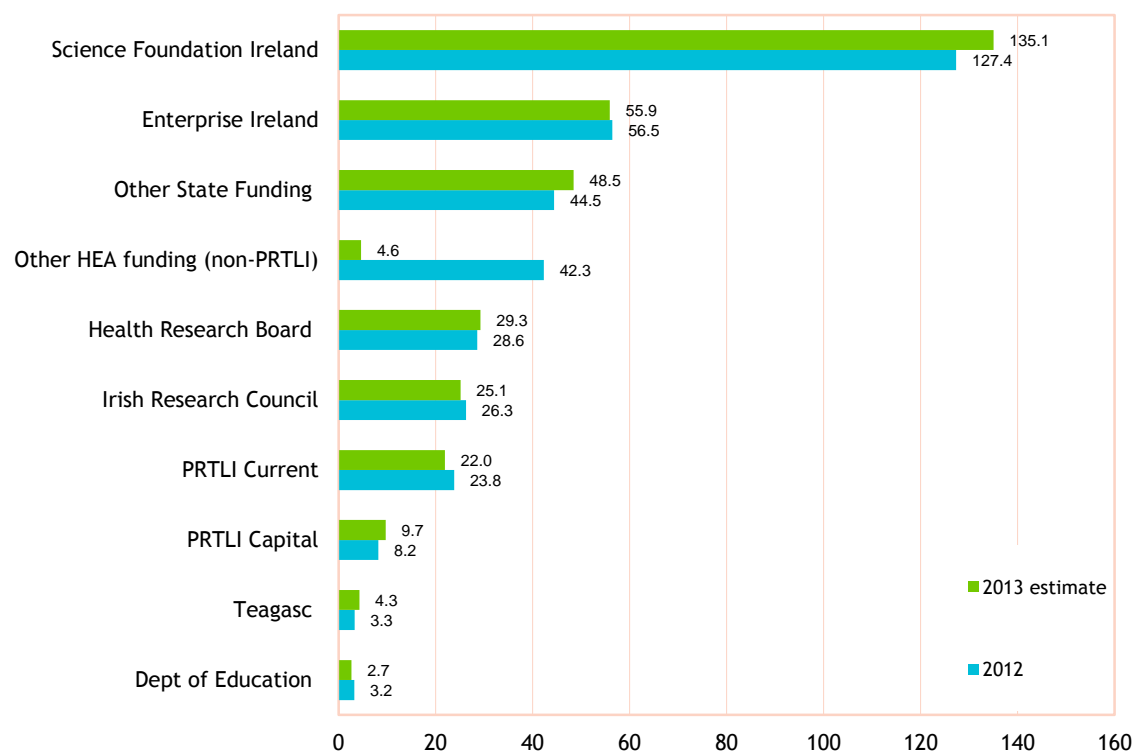
Figure 15: Sources of research funding, 2002-2012, in current prices (€ millions)



Source: DJEI Data

- Direct government funding amounted to €364m in 2012 accounting for 57% of total HERD in 2012. Since 2010 there has been a significant reduction of €76m (-17%).
- The most significant reductions in direct government funding since 2010 were:
  - €42.4m - PRTL capital funding
  - €20.7m - other state funding
  - €8.8m - other HEA funding
  - €8.5m - SFI funding
- These reductions were offset somewhat by increased funding from Enterprise Ireland of €7.4m since 2010
- Since 2002, however, direct government funding increased by 166%, from €137m to €364m.
- The portion of the block grant allocated to research (indirect Government funding) remained approximately the same in 2012 as in 2010, at €149m, and accounts for 23% of total funding for HERD in 2012.
- EU funding increased significantly, from €57m to €73m between 2010 and 2012 (a 32% increase), and has increased threefold since 2002.
- Funding by Irish and foreign business amounted to €13m and €9m respectively in 2012, cumulatively accounting for 3.4% of total HERD.
- Private funding and other and own funds accounted for €10m and €22m respectively in 2012.

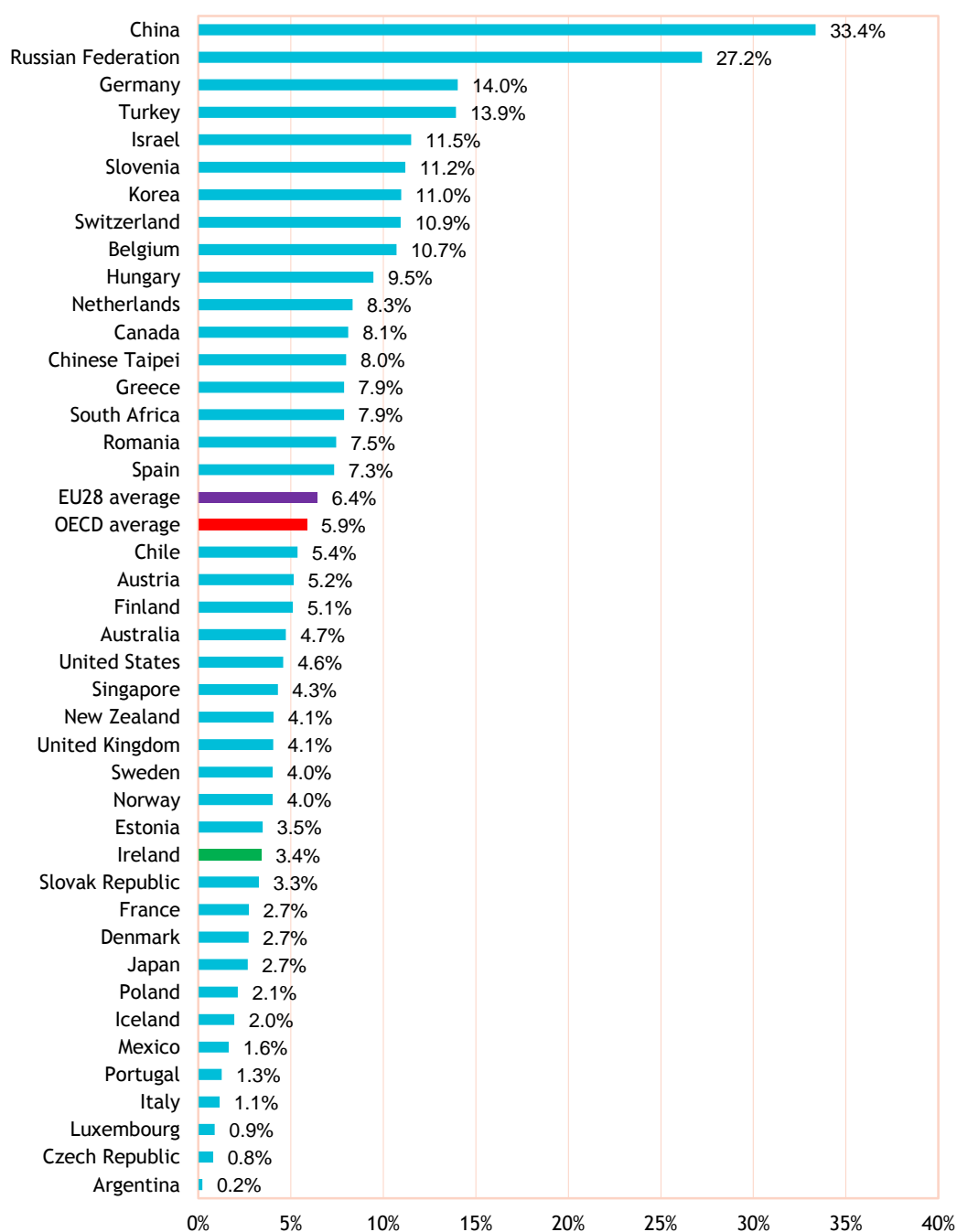
**Figure 16: Sources of direct government research funding (€ millions) 2012 and 2013(estimate)**



Source: DJEI Data

- SFI accounted for 35% of total direct government funding (€127.4m) and the HEIs expected funding of €135.1m in 2013.
- Funding from Enterprise Ireland to the higher education sector amounted to €56.5m in 2012, accounting for 16% of total direct Government funding, and the HEIs estimated funding of €55.9m in 2013.
- Other HEA funding amounted to €42.3m in 2012, €35.9m of which was capital funding of R&D in NUIG (the estimate for 2013 was €4.6m).
- The Health Research Board funded R&D to the value of €28.6m in 2012 and the 2013 estimate was €29.3m.
- PRTLl current funding amounted to €23.8m in 2012 and was expected to fall slightly to €22m in 2013.
- Research funded by the Irish Research Council amounted to €26.3m in 2012 and is estimated to drop to 25.1m in 2013.
- Funding from Teagasc and the Department of Education made up €6.5m in 2012.

**Figure 17: Percentage of HERD financed by industry in Selected OECD Countries, (2012 or latest available data)**



Source: OECD, Main Science and Technology Indicators, February 2015

- 3.4% of total HERD in 2012 was financed by industry in Ireland, significantly below the EU28 average of 6.4% and the OECD average of 5.9%. The countries with the highest proportion of R&D in the higher education sector financed by industry were China at 33.4%, the Russian Federation at 27.2%, Germany at 14%, and Turkey at 13.9%.

**Table 4: Sources of research funding by field of science (€ millions), 2012**

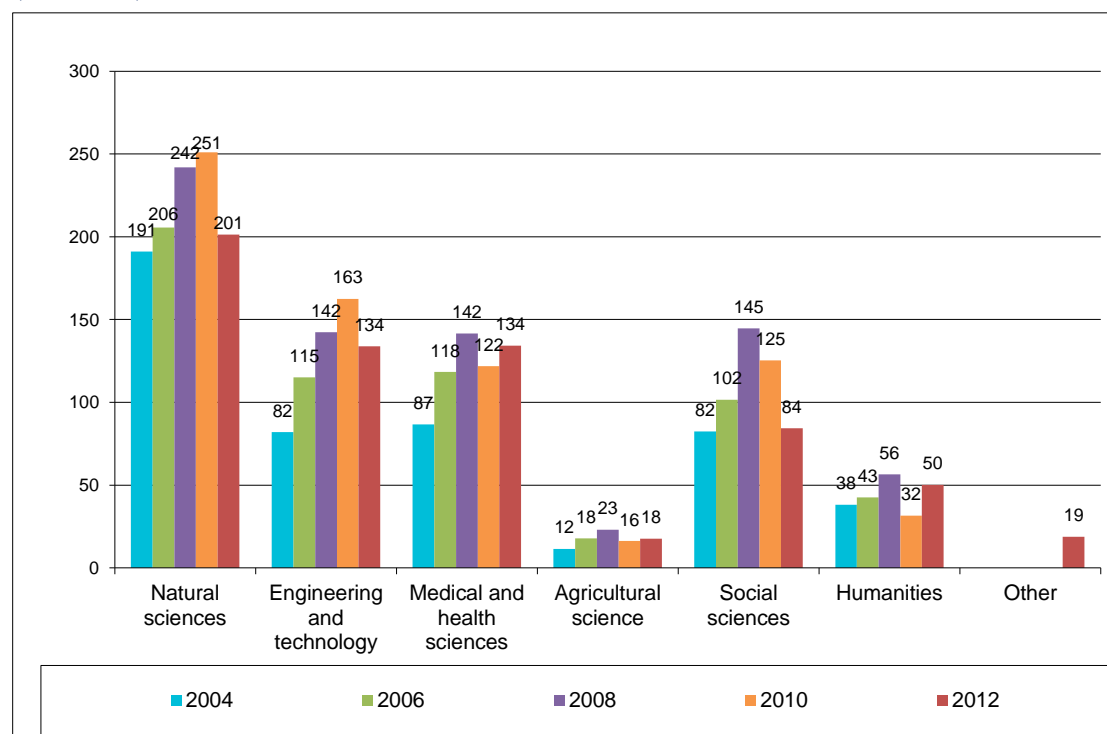
Field of Science	Direct Sources of Funds			Indirect Government	Total
	Irish Public Research	EU	Industry & Other		
Natural Sciences	124.0	30.5	13.4	30.8	198.7
Engineering and Technology	88.4	20.7	9.4	15.4	133.9
Medical and Health Sciences	72.0	10.2	19.6	33.0	134.7
Agricultural Sciences	9.3	1.2	0.5	6.5	17.5
Social Sciences	28.3	7.7	7.6	40.4	84.0
Humanities	25.1	1.6	1.2	22.4	50.3
Not classified	16.9	0.9	2.5	0.9	21.2
<b>Total</b>	<b>364.0</b>	<b>72.8</b>	<b>54.2</b>	<b>149.3</b>	<b>640.3</b>

Source: DJEI Data

- For most fields of science the majority of funding for R&D was from Irish public research sources in 2012. The majority of R&D funding for social sciences was from the HEA block grant (48%), a high proportion of block grant funding is also used to fund R&D in the Humanities (44%).
- Some 15% of total funding for R&D in both the Natural Sciences and Engineering and Technology was EU funding.
- €19.6m of funding for R&D in Medical and Health Science (15%) were from Industry and Other Sources in 2012.
- Overall, 57% of total HERD is funded from direct Government sources, 11% from EU funds, 8% from Industry and Other Sources and 23% from the HEA Block Grant.

## Chapter 4: HERD Expenditure by Field of Science

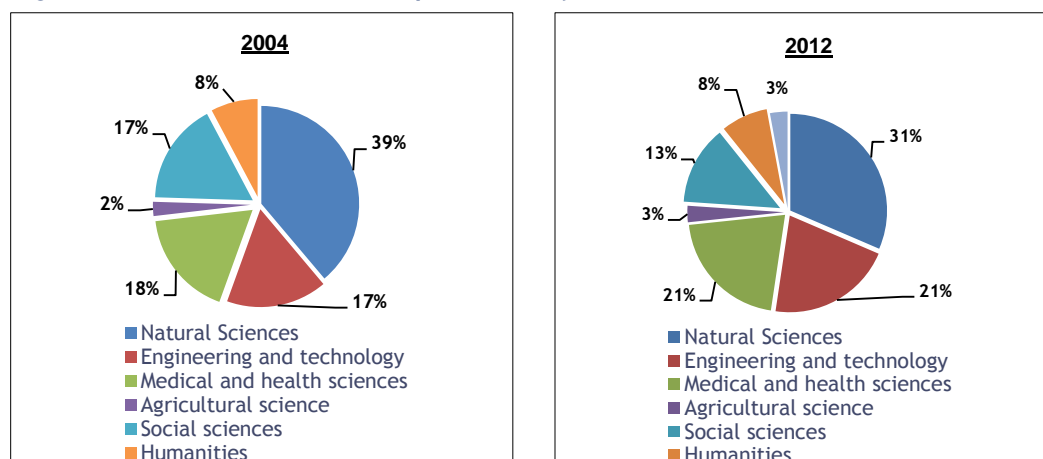
Figure 18: Higher education expenditure on R&D by field of science in current prices, (€millions), 2004-2010



Source: DJEI Data

- The largest proportion of R&D expenditure was in the field of natural sciences in 2012, a constant trend since 2004. R&D expenditure declined from €251m in 2010 to €201m in 2012.
- Engineering and technology was the field of science with the next largest R&D expenditure in 2012, although expenditure declined by almost €30m in 2012 over 2010. Spend on R&D had been consistently increasing in the engineering and technology field up to 2010.
- Medical and Health Sciences accounted for the next highest proportion of total R&D expenditure in 2012, with an increased spend of €12m in 2012. The level of R&D expenditure in the Medical Sciences has been relatively stable since 2006.
- Agricultural Sciences recorded an increase of €2m on R&D expenditure since 2010, and €6m since 2004. In 2008 R&D expenditure in the agricultural sciences peaked at €23m.
- R&D expenditure in the field of social science steadily increased up until 2008 (€145m) but has been declining since. This should be regarded with caution (see caveats on Page 3), as previously the 'other' or 'not classified' category was coded under 'Social Sciences'.
- Expenditure on R&D in the Humanities field amounted to €50m in 2012, up from €32m in 2010.

**Figure 19: Share of total R&D expenditure by field of science, 2004 and 2012**

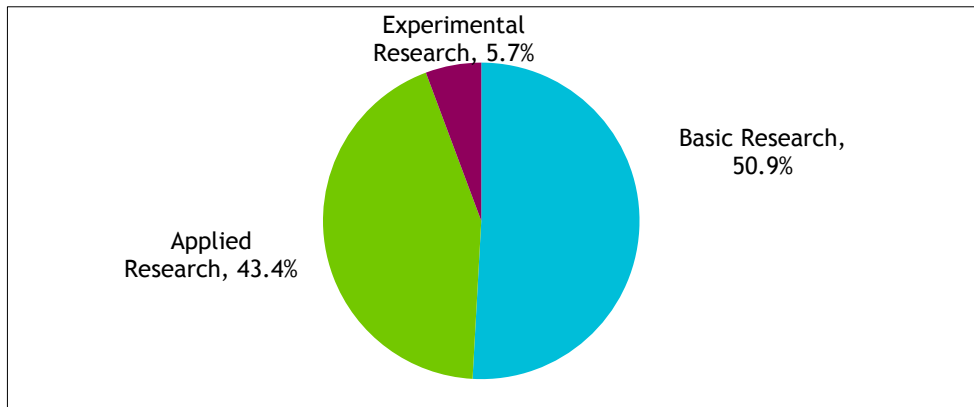


Source: DJEI Data

- In absolute terms HERD has increased from €492m in 2004 to €640m in 2012, and expenditure is higher for every field of science in 2012 than in 2004
- When comparing the share of HERD by field of science in 2004 and 2012:
  - Natural Sciences dropped from 39% to 31%;
  - Engineering and Technology increased from 17% to 21%;
  - Medical and Health Sciences increased from 18% to 21%;
  - Agricultural Science increased from 2% to 3%; and
  - Social Sciences decreased from 17% to 13% (this should be regarded with caution, as previously the 'other' or 'not classified' category was coded under 'Social Sciences');
  - Humanities maintained the same share of HERD in 2004 and 2012 at 8%;
  - The 'other' category refers to Department/Schools that were not readily classified into a field of science (refer to Caveats on page 3).

## Chapter 5: Types of research

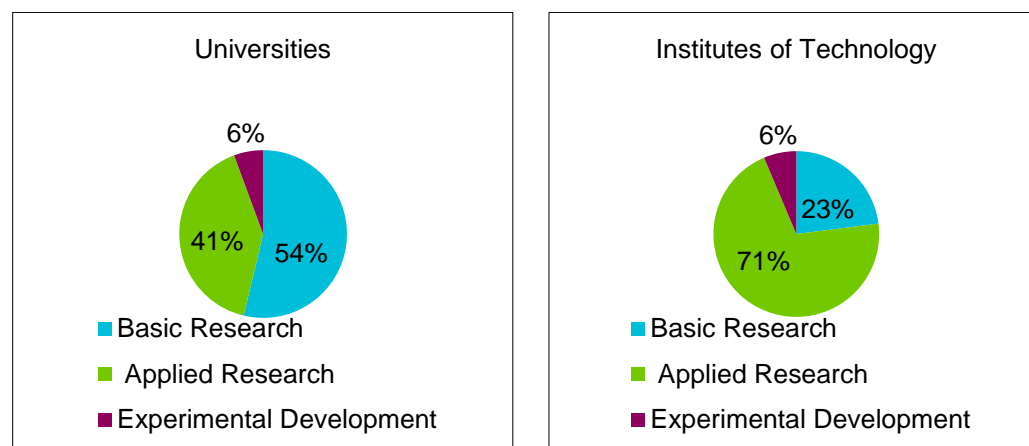
Figure 20: Percentage of total HERD budget by research type, 2012 (Total = €640m)



Source: DJEI Data

- In 2012 basic research accounted for 50.9% of all research spend in the higher education sector, 43.4% was spent on applied research activities, while experimental research accounted for 5.7% of the total HERD budget.

Figure 21: Type of research carried out by field of science, Universities and IoTs, 2012

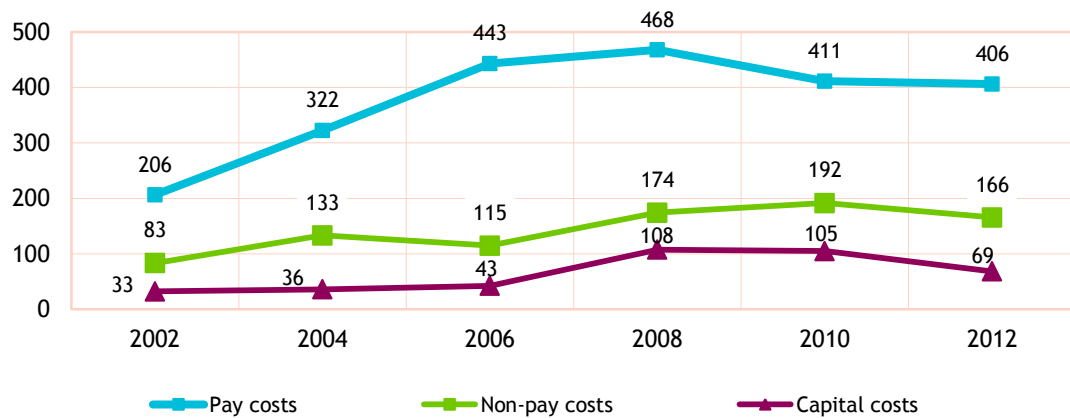


Source: DJEI HERD data

- Figure 21 clearly shows that the main focus of research for the universities is basic research (54%) with the Institutes of Technology focusing on applied research (71%).

## Chapter 6: Type of Costs

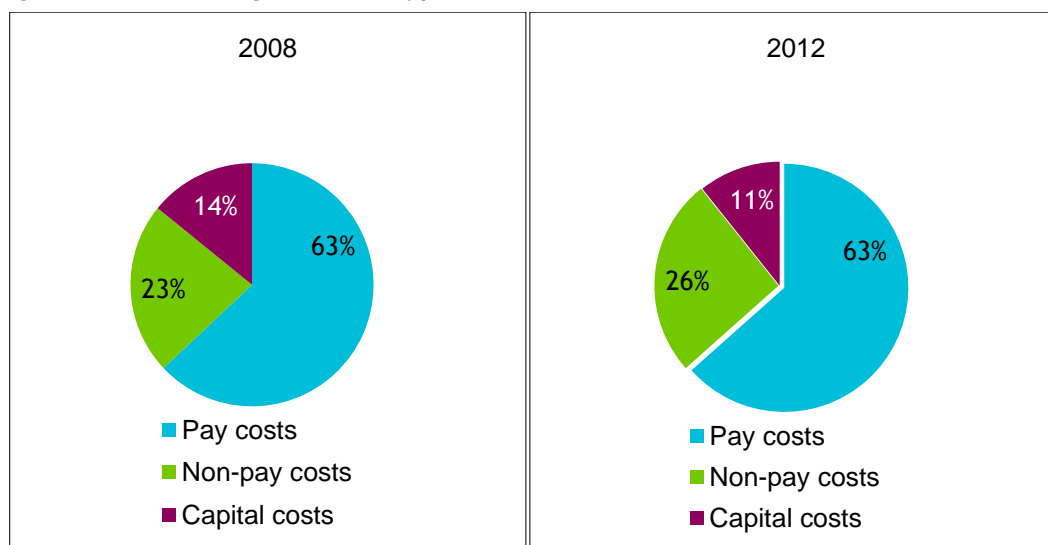
Figure 22: Distribution of research spend by type of costs, 2002-2012 (€ million)



Source: DJEI Data

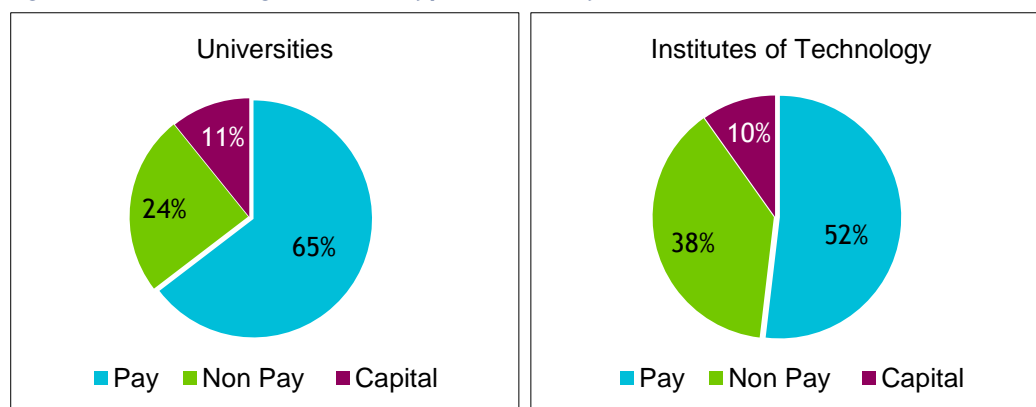
- Figure 22 and 23 shows that the majority of research expenditure goes towards labour costs, accounting for €406m in 2012 (63% of total costs in 2012).
- Pay expenditure declined by 13% from 2008, while other non-pay costs reduced by 5%, resulting in a combined decrease of 11%.
- Non-pay costs refer to non-capital purchases of materials, supplies and equipment to support R&D, and accounted for €166m (26% of total costs in 2012).
- Capital expenditure on R&D peaked in 2008.

Figure 23: Percentage share of type of costs, 2008 and 2012



Source: DJEI Data



**Figure 24: Percentage share of type of costs by Universities and IoTs, 2012**

Source: DJEI Data

- Figure 24 allows a more detailed examination of the three different types of costs, broken down for universities and Institutes of Technology, with universities spending a greater portion of their budget on pay (65%) compared with 52% for the Institutes of Technology in 2012.

**Table 5: Types of costs by new fields of science, 2012 (€ million)**

	Pay Costs	% of Total	Non-pay Costs	% of Total	Capital Costs	% of Total	Total
Natural Sciences	121	60%	51	25%	29	15%	201
Engineering and Technology	82	62%	39	29%	12	9%	134
Medical and Health Sciences	87	65%	38	29%	8	6%	134
Agricultural Sciences	14	78%	4	21%	0	1%	18
Social Sciences	62	73%	22	26%	1	2%	85
Humanities	30	61%	5	10%	15	30%	50
Not classified	10	53%	7	36%	2	11%	19
Total	406	63%	166	26%	69	11%	640

Source: DJEI Data

- Within each field of science pay costs account for the largest proportion of R&D cost in 2012; ranging from 78% for Agricultural Sciences to 61% for Humanities.
- Excluding the 'Not Classified' category, the fields of Engineering & Technology and Medical and Health Sciences accounted for the highest proportion of non-pay costs (29%).
- The field of Humanities had the highest proportion of capital costs, accounting for 30% of the R&D spend in 2012.

## Appendix 1: Methodology

The survey was carried out following the OECD Frascati Manual (2002) guidelines for estimating levels of research and development in the higher education sector and the results for Ireland are comparable to those from other OECD countries. Data captured in the survey relates to the 2012 academic year (Sep 2012 to Sep 2013).

There were two elements to this survey of research and development in higher education colleges:

1. An analysis of financial data from each institution;
2. An analysis of personnel data and time-use data based on the amount of research per person employed from each institution.

The coverage included all academic departments in seven universities\*, fourteen institutes of technology\*\*, and the Royal College of Surgeons, Mary Immaculate College and St Patrick's College, Drumcondra.

*\*Universities: Dublin City University, NUI Galway, Maynooth University, University College Cork, University College Dublin, University of Dublin (Trinity College) and University of Limerick.*

*\*\* Institutes of Technology (IT): Athlone IT, Cork IT, Dublin IT, Dundalk IT, Dun Laoghaire Institute of Art, Design and Technology, Galway-Mayo IT, Letterkenny IT, Limerick IT, Waterford IT, IT Blanchardstown, IT Carlow, IT Sligo IT Tallaght and IT Tralee.*

Questionnaires were sent out in April 2014 to the various colleges and institutes. There was intensive follow-up of non-respondents by telephone until September 2014 when final outstanding information was received.

Detailed departmental income and expenditure was obtained from the finance office in each university. Industrial liaison offices provided similar information for the institutes of technology.

This information comprised total capital and current expenditure from the colleges' block grant for all departments, from which a research proportion was derived, based on the amount of research-time reported by the respondents.

Research income for each department was provided by source of funds and types of costs.

## Personnel Data

Detailed departmental headcounts were obtained from the personnel offices, categorised by research academic staff and research support staff. In order to calculate full-time equivalent totals the percentage of time spent on research was also obtained. In addition, the headcounts were split between male and female to allow gender comparisons.

Each academic department was also asked to estimate the time spent on research activities by each member of staff in his/her department. Strict guidelines and instructions were sent to each head of department outlining a single agreed methodology which identified comparable time spent on research activities. This methodology is as recommended by the international OECD Frascati Manual.

The following matrix was used to determine the percentage of time spent on research activities by people employed in the higher education sector.

<p>The following activities are deemed as “research activities” for the purpose of this survey:</p> <p style="text-align: center;">✓</p>	<p>The following activities are not deemed as “research activities” for the purpose of this survey:</p> <p style="text-align: center;">X</p>
<ul style="list-style-type: none"> <li>▪ Personal research</li> <li>▪ Team research</li> <li>▪ Writing research proposals</li> <li>▪ Writing research reports</li> <li>▪ Supervision of PhD students</li> <li>▪ Other research based activities including admin and planning</li> </ul>	<ul style="list-style-type: none"> <li>▪ Teaching</li> <li>▪ General Admin</li> <li>▪ Supervision of non-PHD students</li> <li>▪ Other non-research based activities</li> <li>▪ External activities</li> </ul>

## Appendix 2: Acronyms

BERD	Business Expenditure on Research & Development
EI	Enterprise Ireland
EU	European Union
FOS	Field of Science
FTE	Full-time equivalent (1 FTE = R&D 40 hours per week)
GDP	Gross Domestic Product
GERD	Gross expenditure on Research & Development
GNP	Gross National Product
HE	Higher Education
HEA	Higher Education Authority
HERD	Higher Education Expenditure on R&D
HRB	Health Research Board
HSE	Health and Safety Executive
ICT	Information and Communications Technology
IoTs	Institutes of Technology
IRC	Irish Research Council
OECD	Organisation for Economic Co-operation and Development
OPW	Office of public Works
PRTL	Programme for Research in Third Level Institutes
R&D	Research and Development
SFI	Science Foundation Ireland
STI	Science, Technology & Innovation

## Appendix 3: Detailed Fields of Science Tables

Total HERD expenditure by old and new Fields of Science, 2012 (€ millions)

	New - Fields of Science	2012 (€m)
<b>Natural Sciences</b>	Mathematics	12.5
	Computer and information sciences	41.2
	Physical sciences	22.5
	Chemical sciences	30.0
	Earth and related environmental sciences	41.5
	Biological sciences	47.3
	Other natural sciences	6.5
		<b>201.4</b>
<b>Engineering and Technology</b>	Civil engineering	10.6
	Electrical, electronic and information engineering	40.7
	Mechanical engineering	14.1
	Chemical engineering	3.0
	Materials engineering	8.8
	Medical engineering	0.2
	Environmental engineering	4.4
	Environmental biotechnology	4.1
	Industrial biotechnology	4.1
	Nano-technology	35.6
	Other engineering and technologies	8.2
		<b>133.8</b>
<b>Medical and Health Sciences</b>	Basic medicine	69.6
	Clinical medicine	30.2
	Health sciences	22.6
	Health biotechnology	4.0
	Other medical sciences	7.9
		<b>134.3</b>

<b>Agricultural Sciences</b>	Agriculture, forestry and fisheries	10.2
	Animal and dairy science	
	Veterinary science	7.3
		<b>17.5</b>
<b>Social Sciences</b>	Psychology	6.0
	Economics and business	35.6
	Educational sciences	11.3
	Sociology	5.9
	Law	7.0
	Political science	2.2
	Social and economic geography	10.6
	Media and communications	4.7
	Other social sciences	0.9
		<b>84.3</b>
<b>Humanities</b>	History and archaeology	7.6
	Languages and literature	14.0
	Philosophy, ethics and religion	1.8
	Art (arts, history of arts, performing arts, music)	3.9
	Other humanities	22.8
		<b>50.1</b>
<b>Not classified</b>		<b>18.7</b>
<b>HERD</b>		<b>640.2</b>