

November 2017

Northern Ireland Research and Development Headline Statistics 2016

Geographical Area: Northern Ireland
Theme: Business Statistics
Frequency: Annual

Key points

- In 2016 £739.3m was spent on Research & Development (R&D) by Businesses, Higher Education and Government in Northern Ireland (NI). This is a decrease of £9.4m (1.3%) in cash terms compared to the previous year. Over the year, Business R&D spend decreased by £15.3m, whereas Higher Education and Government R&D spend increased by £0.9m and £5.0m respectively from 2015 to 2016.
- Of the £739.3m spent on total R&D, £523.8m (70.9%) was spent by Businesses, £193.8m (26.2%) by the Higher Education sector and the remainder (£21.7m or 2.9%) was Government expenditure.
- The decrease in total expenditure was primarily due to a decrease of £15.3m (2.8% over the year) in Business expenditure. There was however, increases of £0.9m in Higher Education expenditure (0.5%) and £5.0m in Government expenditure (29.9%).
- Of the twelve United Kingdom (UK) regions, Northern Ireland reported the largest annual decrease in (in-house) R&D expenditure over the year (-4.0%).
- The ten biggest spending companies accounted for 38.8% of the total R&D spend in Northern Ireland in 2016, lower than in 2015 (46.6%).
- There was a 4.7% increase (from 713 in 2015 to 748 in 2016) in the number of local and externally owned companies engaged in R&D over the year. Externally owned companies accounted for 59.8% of R&D expenditure compared to 40.2% of locally owned companies in 2016. R&D spend by locally owned companies reported an annual increase of 10.2% in cash terms.
- R&D expenditure by Small and Medium-sized companies (SMEs) increased by 2.9% (£7.4m) from 2015 to 2016. In cash terms, since 2011 SME expenditure has increased by 85.3% (£120.0m) from £140.6m to £260.6m.

Contents

1	Summary and commentary	Page 3
1.1	Introduction	Page 3
1.2	Total expenditure on R&D in cash terms	Page 3
1.3	Total expenditure on R&D in real terms	Page 4
1.4	Business R&D: Company size	Page 5
1.5	Business R&D: Ownership & scale of expenditure	Page 6
1.6	In-house Business R&D: UK and regional comparisons	Page 7
1.7	R&D Investment rate	Page 8
2	Background notes	Page 9
2.1	Survey design	Page 9
2.2	Survey response rate	Page 10
2.3	Definition of terms	Page 11

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1 Summary & commentary

1.1 Introduction

This release provides information on the level of R&D activity in Northern Ireland (NI). R&D activity is defined as research or technological development with an appreciable element of novelty or innovation in line with international criteria (the Frascati manual). R&D activity contributes to the development of new technologies, products and processes and is a key driver of productivity growth. The NI R&D survey covers the Business Sector, Higher Education and Other Government financed activities. It provides important indicators of the extent to which Northern Ireland companies and higher education establishments are investing in the activities that underlie future economic development.

1.2 Total expenditure on R&D in cash terms

Total expenditure on R&D in NI in cash terms was £739.3 million (m) in 2016. Of this, £523.8m (70.9%) was spent by Businesses, £193.8m (26.2%) by the Higher Education sector and £21.7m (2.9%) was Government expenditure (Table 1).

There was a decrease of £9.4m (1.3%) in cash terms in NI total R&D expenditure between 2015 and 2016. Specifically, business R&D spend dropped by £15.3m (2.8%), with Higher Education and Government R&D spend increasing by £0.9m (0.5%) and £5.0m (29.9%) respectively from 2015 to 2016.

Since 2014 total R&D spending in cash terms in NI has risen by £133.5m (22%), and by 30.3% (£171.8m) since 2011.

Table 1: Total NI R&D expenditure in cash terms 2014-2016 (£m)

	2014	2015	2016
Expenditure by Business	£410.4	£539.1	£523.8
Expenditure by Higher Education ¹	£177.7	£192.9	£193.8
Other Expenditure by Government	£17.7	£16.7	£21.7
Total Expenditure on R&D	£605.8	£748.7	£739.3

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¹To avoid double counting, this figure excludes £0.95m in 2016, £0.9m in 2015 and £1.3m in 2013 of expenditure on R&D by business that was undertaken by universities or higher education establishments.

1.3 Total Expenditure on R&D in real terms

In addition to the measure of R&D activity in cash terms provided in the key points section and in section 1.2, it is also of interest to examine change in spend in real terms. This takes out the effect of price changes over time through the use of deflators, enabling a more consistent measure of investment in R&D activity.

In real terms², total expenditure decreased by £26.2m or 3.4% from £765.5m in 2015 to £739.3m in 2016. In 2016, R&D expenditure was £115.4m or 18.5% above the level of such expenditure in 2014, and £123.8m or 20.1% above the level of expenditure in 2011.

In 2016 the Northern Ireland Business sector again accounted for a much greater share of total R&D expenditure (70.9%) than the Higher Education sector (26.2%). In real terms, the 2015 figures were 72% and 25.8% respectively. Government R&D expenditure accounted for 2.9% and 2.2% of total R&D expenditure in 2016 and 2015 respectively.

Figure 1: Total NI expenditure in real terms 2014-2016 (£m)



On a real terms basis Business R&D expenditure decreased by 5% over the year (£27.4m), increased by 23.9% (£101.1m) over the two year period from 2014 to 2016 and increased by 24.2% (£102.2m) since 2011.

In real terms, expenditure by Higher Education decreased over the year by £3.4m (1.7%). Government expenditure however, increased by £4.6m (26.9%) over the year. Since 2014, Higher Education R&D expenditure has increased by £10.8m (5.9%) while Government spending has increased by £3.5m (19.2%) in real terms. Since 2011, Higher Education R&D expenditure has increased by £15.6m (8.6%) while Government spending has increased by £6.1m (39.1%) in real terms.

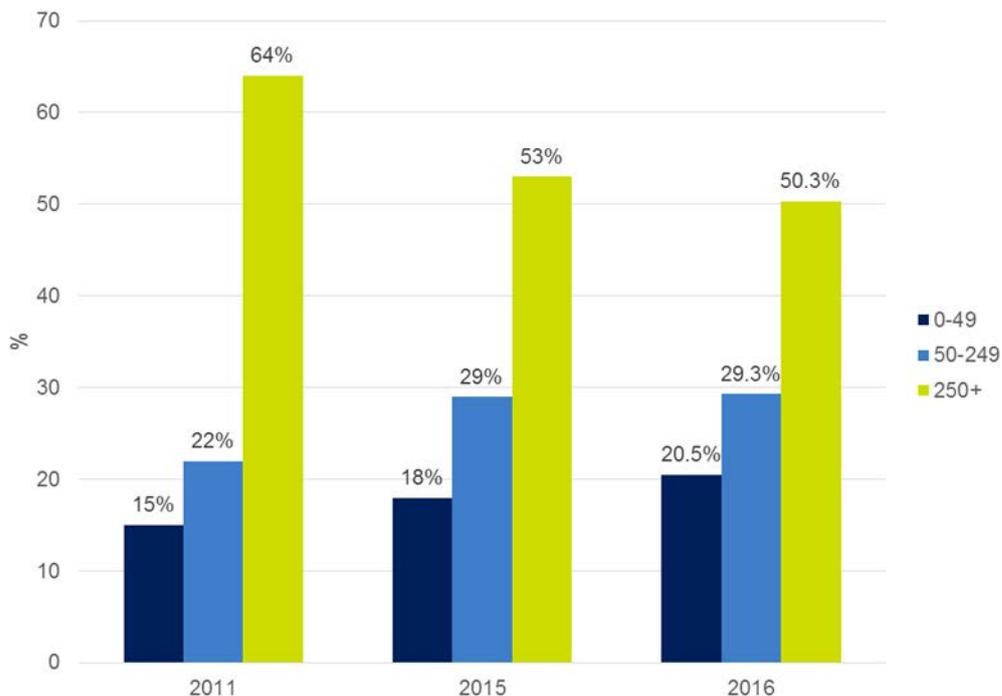
Detailed analysis of company spend throughout the remainder of the survey is undertaken in cash terms.

²GDP deflator used to convert cash terms to real terms: e.g. 2009 (89.3), 2010 (90.9), 2011 (92.2), 2012 (94.1), 2013 (95.8), 2014 (97.1), 2015 (97.8), 2016 = 100.

1.4 Business R&D: Company size

Companies with 250 or more employees accounted for 50.3% of business R&D expenditure (BERD) in 2016, although they represented only 7.8% of all R&D performing companies. Small firms (i.e. those with less than 50 employees) represented 69.8% of R&D performing companies and accounted for 20.5% of total business R&D expenditure.

Figure 2: Percentage of total BERD expenditure by company size 2011, 2015 – 2016 (by total employees)

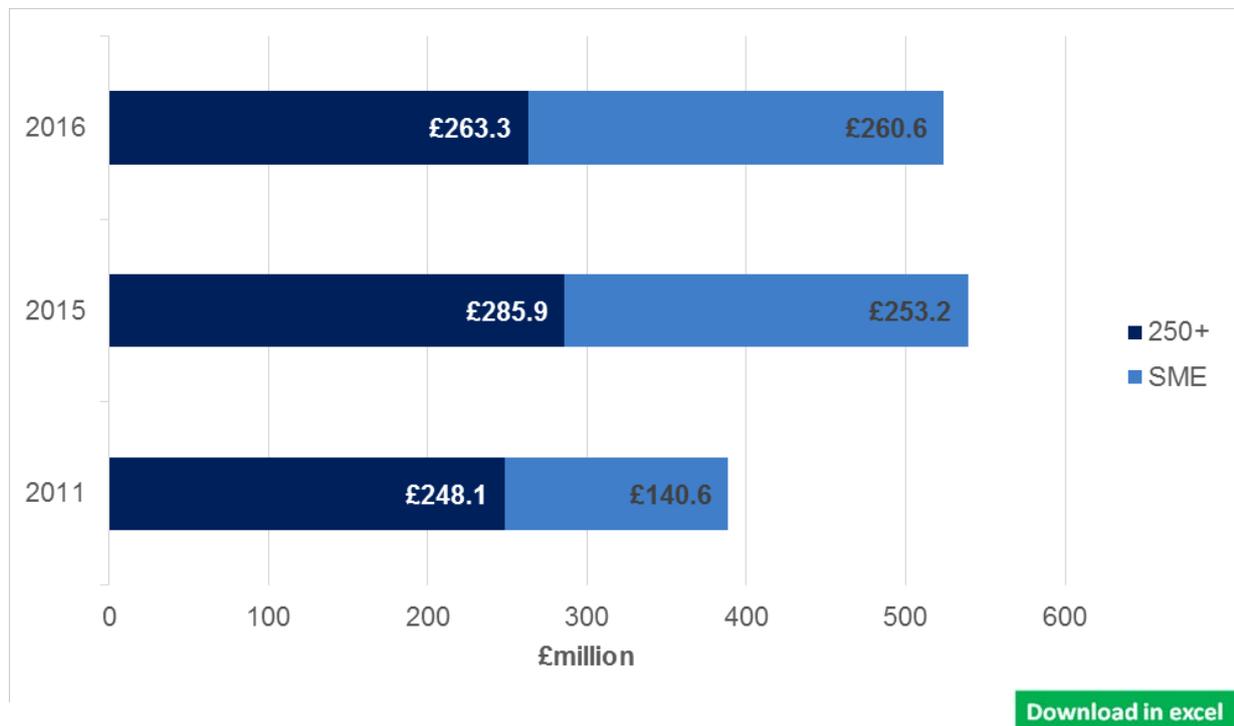


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R&D expenditure by Small and Medium-sized companies (SMEs)³ accounted for 49.7% (£260.6m) of the total business expenditure in 2016. Total SME expenditure increased in cash terms by £7.4m (2.9%) from 2015 to 2016. Since 2011, SME expenditure has increased by 85.3% (£120.0m) in cash terms, from £140.6m in 2011 to £260.6m in 2016. The contribution of large companies (250 or more employees) to total R&D business expenditure saw a decrease over the year (53% in 2015 and 50.3% in 2016).

³ The European Commission definition of Small Medium Enterprises (SME) used is defined as being enterprises with less than 250 employees and large companies as being enterprises with more than 250 employees.

Figure 3: Total BERD expenditure by SMEs and large companies 2011, 2015-2016 (by total employees, £m)



1.5 Business R&D: Ownership and scale of expenditure

The total number of NI companies spending on R&D has increased – from 713 in 2015 to 748 in 2016.

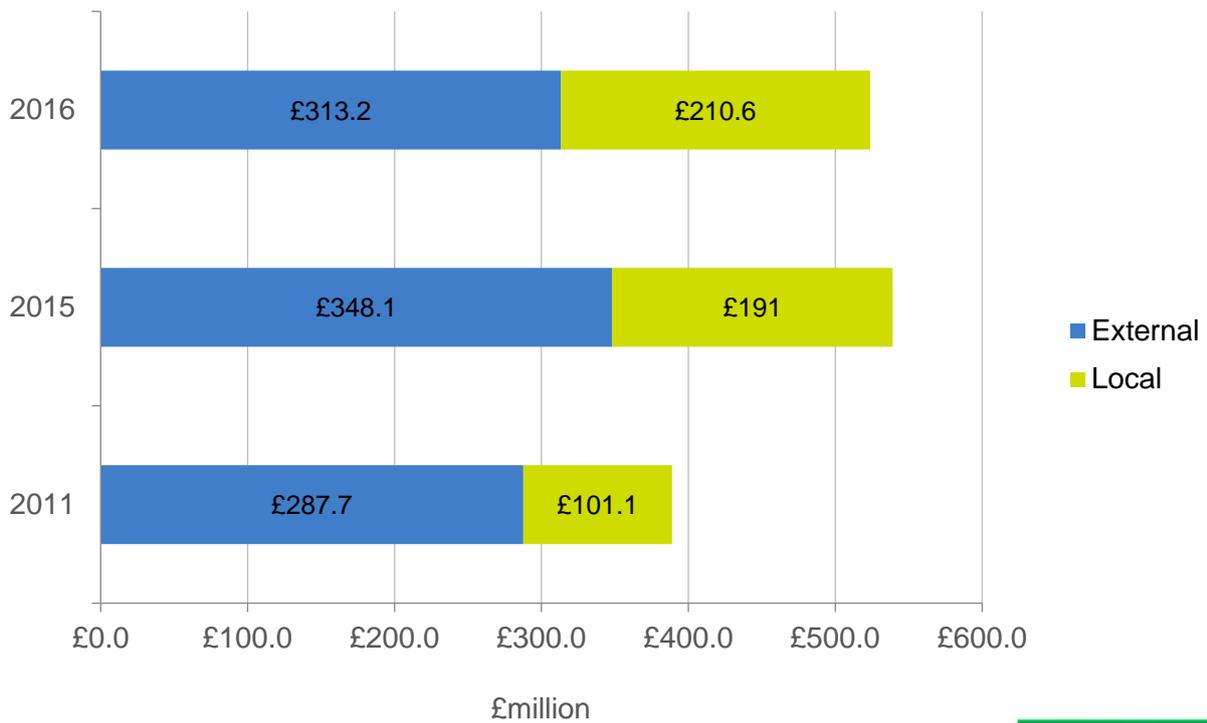
Northern Ireland is dependent on a relatively small number of companies for a significant proportion of R&D expenditure. The ten biggest spending companies accounted for 38.8% (£203.5m) of the total R&D spend in Northern Ireland in 2016. In cash terms, this figure is lower than in 2015 (£251.1m). Proportionally, it is also lower than in 2015 (46.6%).

It should be noted that variations may occur in NI R&D data from year to year due to the influence of one or two large scale projects, either starting or finishing. It is likely this contributed to the fluctuation in Business R&D expenditure over the year.

In 2016, 83% of businesses that engaged in R&D expenditure were locally owned (620 businesses). The expenditure of such locally owned companies increased by 10.2% (£19.6m) over the year, from £191m in 2015 to £210.6m in 2016. Compared to 2011, locally owned companies share of business expenditure increased from 26.0% to 40.2%.

During the year, 17% of businesses that engage in R&D expenditure were externally owned (128 businesses). These companies accounted for 59.8% (or £313.2m) of Business R&D expenditure in 2016. The expenditure of such externally owned businesses decreased by 10% (£34.9m) over the year, from £348.1m in 2015 to £313.2m in 2016.

Figure 4: Total BERD expenditure by local and externally owned companies 2011, 2015-2016 (£m).



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1.6 In-house Business R&D: UK and regional comparisons

Spending carried out within NI companies (in-house), accounted for (£481m) of total business expenditure in 2016, 4% lower than in 2015 (£501m in-house expenditure).

Table 2: In-house expenditure by UK businesses by country or region, 2015-2016 (£m)

Region	Expenditure (£million) ⁴		% Change 2015-2016
	2015	2016	
UK	21,038	22,224	5.6
England	19,214	20,238	5.3
North East	306	302	-1.3
North West	2,116	2,346	10.9
South East	4,765	4,693	-1.5
South West	1,476	1,500	1.6
East of England	4,200	4,393	4.6
East Midlands	1,531	1,655	8.1
West Midlands	2,159	2,303	6.7
Yorkshire & the Humber	769	750	-2.5
London	1,892	2,296	21.4
Wales	368	435	18.2
Scotland	953	1,072	12.5
Northern Ireland	501	481	-4.0

⁴Source: Office for National Statistics

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Of the twelve UK regions, eight showed an increase in in-house business R&D expenditure in cash terms over the year to 2016. Northern Ireland decreased by 4.0%, which was the largest percentage decrease across all the UK regions. The change in R&D expenditure in NI is the result of several factors, including companies beginning new projects, resulting staff increases and spending on new equipment and materials. This can have a large impact on annual NI estimates, particularly where larger companies have commenced a significant R&D project.

In the UK as a whole, such expenditure increased by 5.6%. Regional changes varied from a decrease of 4.0% in NI, to an increase of 21.4% in London.

1.7 R&D Investment rate

Regional Gross Value Added (GVA) for 2015, released by the Office for National Statistics (ONS) on the 15th December 2016 shows that Northern Ireland 2016 in-house R&D as a proportion of GVA was 1.4% and the sixth highest of the twelve UK regions. A higher proportion was recorded in the East of England (3.0%), the South East (1.9%), the West Midlands (1.9%), the East Midlands (1.7%) and the North West (1.5%). Northern Ireland in-house R&D as a proportion of GVA is higher than the UK average rate (1.3%). Regional GVA figures for 2016 are expected to be released by the ONS in December 2017.

Table 3: In-house R&D expenditure by UK business as a proportion of GVA (£m)

Region	Total GVA ⁵ £m	In-house BERD £m	BERD as % GVA
	2015	2016	
UK	1,666,342	22,224	1.3%
England	1,433,164	20,238	1.4%
North East	49,677	302	0.6%
North West	156,872	2,346	1.5%
South East	249,174	4,693	1.9%
South West	126,007	1,500	1.2%
East of England	145,651	4,393	3.0%
East Midlands	97,887	1,655	1.7%
West Midlands	119,769	2,303	1.9%
Yorkshire & the Humber	109,704	750	0.7%
London	378,424	2,296	0.6%
Wales	55,788	435	0.8%
Scotland	127,260	1,072	0.8%
Northern Ireland	34,410	481	1.4%

⁵Source: Office for National Statistics, NUTS1 regional GVA

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UK Business Expenditure on Research and Development (BERD) results are released on 21 November 2017 and can be found at the following link:

<http://www.ons.gov.uk/businessindustryandtrade/business/businessinnovation>

2 Background notes

The survey of NI BERD during 2016 was undertaken by the Northern Ireland Statistics and Research Agency (NISRA). The sample and survey results only cover business enterprises as defined in the "Frascati" manual. This excludes government organisations, higher education establishments and charities.

The definition of R&D adopted for the purposes of the NI inquiry is the same as that used by ONS for the equivalent GB survey:

"The guiding line to distinguish between research and technological development activity (R&D) from non-research activity is the presence or absence of an appreciable element of novelty or innovation. If the activity departs from routine and breaks new ground it should be included; if it follows an established pattern it should be excluded".

The NI questionnaire follows the same structure and includes the same questions as the GB questionnaire, although there were some modifications to tailor the questions asked for use in NI.

The survey covers expenditure in the year ending December 2016, although companies were given the option of supplying data for a business year ending on any date between 6 April 2017 and 5 April 2016.

It is worth noting that a number of NI companies are part of national and international companies. Many concentrate their R&D at particular sites, not necessarily in NI, although all of their plants, including those in NI, will share in the benefits of research. **Variations may occur in NI R&D data from year to year due to the influence of one or two large-scale projects.**

2.1 Survey Design

R&D surveys pose special problems for survey design – R&D takes place in only a small proportion of businesses but a comprehensive list of these businesses does not exist. A simple random sample of the business population would not be suitable for an R&D survey because many of the sample businesses would not undertake R&D and many significant R&D performers would be missed in such a sample.

The solution is to implement a stratified sample design. The stratification variable was the known level of R&D performance of the businesses. This information was gained from previous surveys (mainly the 2015 survey) and extra information from various sources such as the Office for National Statistics (ONS), Invest NI and filter questions on the Annual Business Inquiry and Community Innovation Survey. For the purposes of the 2016 survey, businesses were stratified into 4 groups:

- (i) Businesses responding to the 2016 survey who returned or had estimated a total R&D expenditure value greater than zero;
- (ii) Businesses reporting positively to the R&D filter question in the Annual Business Inquiry and Community Innovation Survey; other identified potential R&D performers (principally, those companies who had received assistance from Invest NI during 2016); and companies newly identified to ONS as R&D spenders;
- (iii) Companies who have been identified as 'not R&D performers' when selected for past surveys;
- (iv) The remainder of Northern Ireland businesses.

The businesses making up strata (i) and (ii) formed a register of R&D performers and the sample for the 2016 survey was derived from this register. Indeed, each of these businesses was issued a questionnaire – in effect, therefore, a census of R&D performers was carried out. Strata (iii) and (iv) were not included as they were assumed to have zero R&D expenditure.

2.2 Survey response rate

For the 2016 survey 1,397 forms were sent out to business believed to be performing R&D. Completed forms were returned by 1,115 businesses representing a response rate of 80%. The total number of companies spending on R&D is relatively small – 748 in 2016 (up from 713 in 2015). Estimates for Invest NI companies were based on the value of offers made to promote R&D investment, the amount remaining to be claimed against these offers, the frequency of claims and the contribution of Invest NI's assistance to total planned R&D expenditure. Estimates for Invest NI companies make up 12.1% of the total non-respondent companies. The remaining 87.9% - non Invest NI estimates - were based on historical information and other administrative surveys within the Economic and Labour Market Statistics Branch.

Overall, estimates make up 12.1% of total BERD spend for 2016 (compared to 8% in 2015). Estimates for Invest NI accounts for 0.4% of total BERD spend in 2016, and non-Invest NI companies account for 11.7%.

These results are provisional and are subject to revision should additional information become available. As part of this release, business, government and higher education estimates of R&D performance for 2014 and 2015 have been revised to take account of late returns and misreporting.

Figures contained within all tables in this release may not add due to rounding. Percentages calculated on these rounded figures may differ from those detailed in the text.

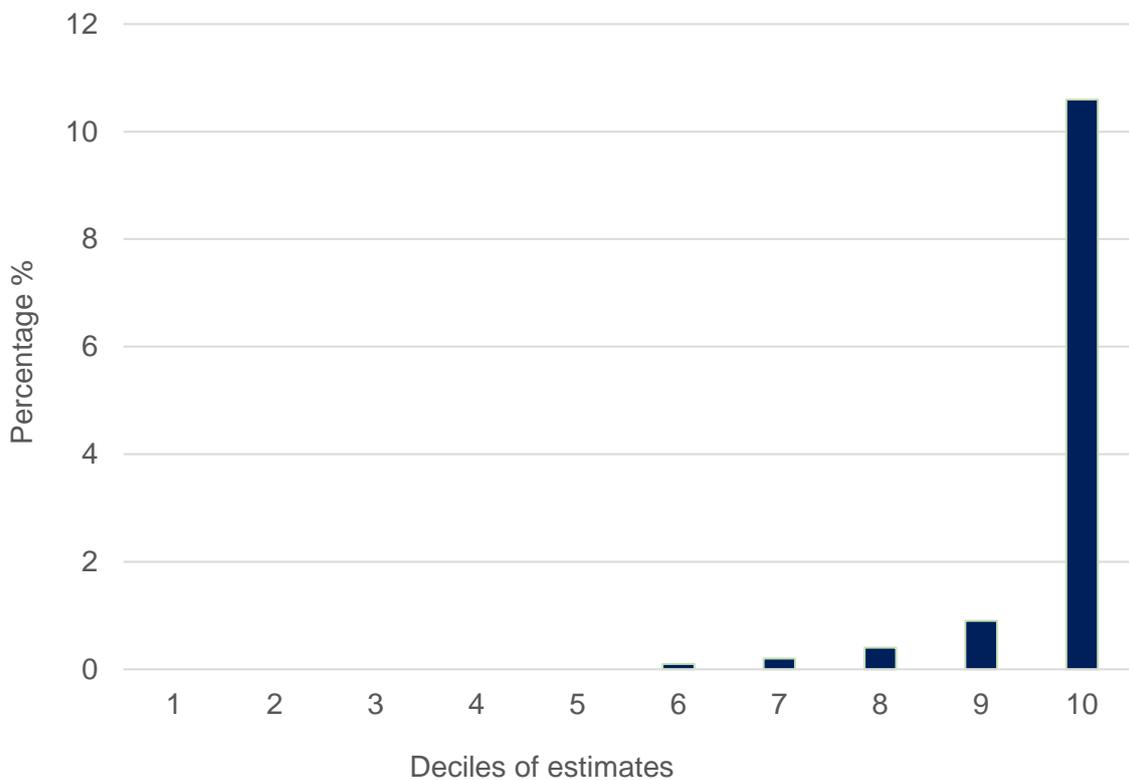
Table 4: Size of revisions to previously published data, 2014 – 2015 (£m)

	2014			2015		
	Published £m	Revised £m	Difference £m	Published £m	Revised £m	Difference £m
Expenditure by Businesses	£403.5	£410.4	£6.9	£540.0	£539.1	-£0.9
Expenditure by Higher Education	£177.7	£177.7	£0.0	£192.9	£192.9	£0.0
Other Expenditure by Government	£21.1	£17.7	-£3.4	£16.7	£16.7	£0.0
Total Expenditure R&D	£602.3	605.8	£3.5	£749.6	£748.7	-£0.9

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A summary quality report for R&D can be found at the following link: <https://www.nisra.gov.uk/statistics/business-statistics/research-and-development#toc-1>

Figure 5: Deciles of estimates as a percentage of 2016 BERD



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Figure 5 shows that all estimates made up 12.1% of total 2016 BERD spend. When estimates are ranked according to ascending size of spend, the last two deciles (i.e. the top 20% of companies) accounted for 95% of the total BERD estimated spend, indicating that most of the estimates were small in magnitude. The bulk of the value of the estimates has been accounted for by a relatively small number of companies.

2.3 Definition of Terms

Type of R&D Expenditure

Total Expenditure on R&D - This covers expenditure by businesses, expenditure by higher education and other expenditure by Government.

Expenditure by Higher Education – NISRA carries out an annual survey of R&D expenditure in Higher Education Establishments in Northern Ireland. The figures shown in Table 1 provide combined results from the two Northern Ireland universities - i.e. Queen's University Belfast (QUB) and the University of Ulster (UU). The data collected refers to the academic year i.e. 2015/2016 ending 31/7/2016. The universities have made data available for this period on the basis of Transparency Review data collected within each respective institution.

Other Expenditure by Government - The ONS collects annual data on total UK government expenditure on science, engineering and technology (SET). SET expenditure by the UK government includes expenditure by government departments, Research councils and Higher Education Funding Councils (HEFCs). It also includes expenditure on R&D conducted within Government Departments.

By utilising this data in conjunction with the results from the NISRA survey, it has been possible to compile a more complete picture of total expenditure on R&D in NI. The figures shown in Table 1, expenditure by businesses, higher education and other expenditure by Government complement each other; i.e. is no double counting.

The 2015 ONS Report is available at the following link:

<https://www.ons.gov.uk/economy/governmentpublicsectorandtaxes/researchanddevelopmentexpenditure/bulletins/ukgovernmentexpenditureonscienceengineeringandtechnology/2015>

In-house R&D - This is R&D carried out within the company and was previously referred to as intramural expenditure.

Next Publication

Detailed analysis of the 2016 results including sectoral breakdowns and R&D employment estimates will be published online on 19th December 2017, and will be available at:

<https://www.nisra.gov.uk/statistics/business-statistics/research-and-development>

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