NISRA
Northern Ireland Statistics and Research Agency
Gníomhaireacht Thuaisceart Éireann um Staitistící agus Taighde

Department of Finance
An Roinn Airgeadais
www.finance-ni.gov.uk

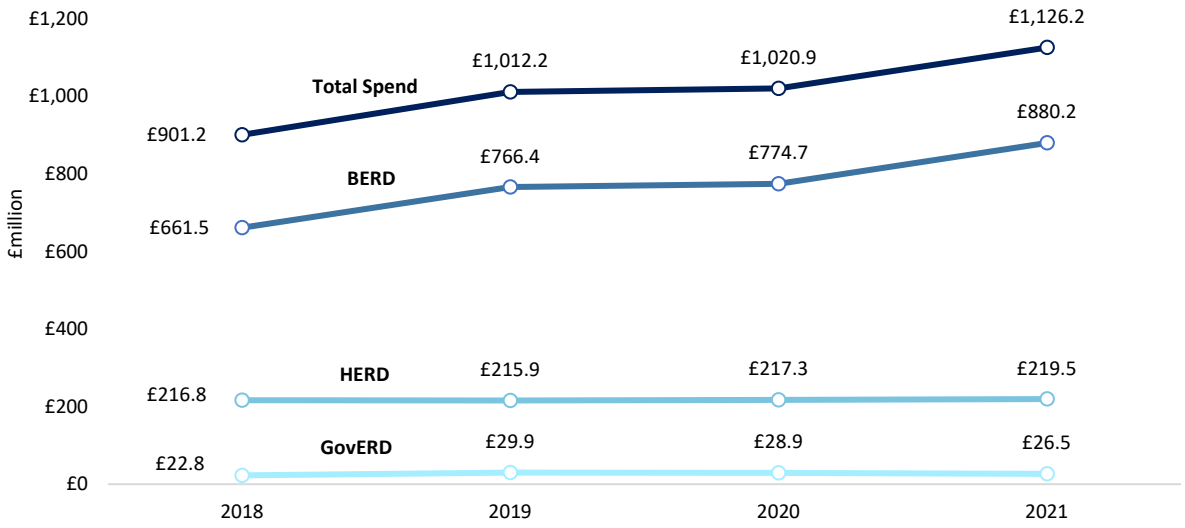
Statistical Bulletin

# Research and Development Activity in Northern Ireland

## Findings from the 2021 Northern Ireland Research and Development Survey

**Total R&D spend in 2021 is estimated at £1,126.2m, representing an annual increase of 10.3%.**

Chart 1: Research and Development (R&D) spend in Northern Ireland, 2018-2021 (cash terms, £millions)




| Total R&D Spend 2021 | Increase in total R&D spend from 2020 | Total Business R&D Spend 2021 |
|---|---|---|
| **£1,126.2m** | **£105.3m (10.3%)** | **£880.2m** |

### Key points

- In 2021 some £1,126.2 million (m) was spent on R&D by Businesses (BERD), Higher Education establishments (HERD) and Government departments (GovERD) in Northern Ireland (10.3% more than in 2020). Of this £1,126.2m, 78.2% was spent by Businesses, 19.5% by Higher Education establishments and 2.4% by Government departments.
- The methodology employed to produce Business R&D spend estimates has been improved to better represent smaller businesses. This improvement has produced figures which provide the best current estimate of Business level R&D spend at the Northern Ireland (NI) level and has been validated against other available data[1].
- Since 2018 (the first BERD survey results produced using the improved methodology), Business R&D spend has increased by 25.0% in cash terms (15.1% in real terms).
- Revised expenditure on R&D by NI businesses in 2018, 2019 and 2020 were £137.7 million, £159.6 million, and £161.3 million higher than previously estimated, in cash terms.

[1]Further information on the methodology can be found on pages 11-17 of this report.

**Published 15th December 2022**

## Contents

## National/Official Statistics Designation of Northern Ireland BERD Statistics

The figures included in this bulletin detail the best current estimates of R&D spend at a Northern Ireland level, which have been validated against other available data. However, there is less certainty in the estimates below the total Northern Ireland level.

To maintain the quality of the Northern Ireland R&D statistics, this publication will feature a reduced number of detailed breakdowns compared with previous releases. While the existing National Statistics designation for the Northern Ireland level R&D figures will remain, to help convey the uncertainty, the Northern Ireland Statistics and Research Agency (NISRA) has asked the Office for Statistics Regulation (OSR) to temporarily pause the National Statistics status of more detailed breakdowns. The OSR confirmed their agreement to this approach in their letter published on 8th December 2022. This is until further redevelopment takes place and there is more certainty on the distribution below the Northern Ireland level.

NISRA has worked closely with Office for National Statistics (ONS) colleagues over the last nine months as part of their work around the transformation of the annual UK Business Enterprise Research and Development data to give better coverage of small businesses undertaking Research and Development. This has ensured that there is consistency in approach and coherence with the methodological improvements implemented by the ONS for the UK equivalent figures. Further information on this work can be found at the below links.

Options for Transformation of Business Enterprise Research and Development Statistics - Office for National Statistics

Business enterprise research and development, UK - Office for National Statistics (ons.gov.uk)

Gross domestic expenditure on research and development, UK: 2020 - Office for National Statistics (ons.gov.uk)

The methodological improvements have been implemented at the Northern Ireland level from 2018-2021, meaning that comparisons of detailed estimates before 2018 are not possible.

In collaboration with Office for National Statistics, ongoing work will result in improvements to the methodology, including the sampling methods of the Research & Development Survey for 2022 and beyond.

# Introduction

**Research and Development Explained**

Research and Development is broadly characterised by investigation or experimentation, the intended outcome of which is new knowledge including knowledge of culture and society (with or without a specific practical application), enhanced materials, products, devices, processes or services. R&D covers three types of activity:

1. **Basic research** – Work undertaken to acquire new knowledge without a specific application in mind;
2. **Applied research** – Work undertaken to acquire new knowledge with a specific application in mind; and
3. **Experimental development** – Work using the results from basic and/or applied research for the purpose of creating new or improved products / processes.

Northern Ireland's R&D activity is measured by the amount of money spent performing R&D by an organisation, either in-house or purchased from another source, and must involve elements of the five criteria below:

1. **Novel** - To be aimed at new findings;
2. **Creative** – To be based on original, not obvious, concepts and hypotheses;
3. **Uncertain** – To be uncertain about the final outcome;
4. **Systematic** – To be planned and budgeted; and
5. **Transferable/reproducible** – To lead to results that could possibly be reproduced.

**Measuring R&D Data**

1. **Business Expenditure on R&D (BERD)**

Business Expenditure on R&D (BERD) constitutes the largest component of total R&D activity and the data to inform this component are collected in the Northern Ireland Research & Development Survey administered by NISRA Economic & Labour Market Statistics Branch. 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 the 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 questionnaire used follows the same structure and includes the same questions as that used by the ONS to collect R&D data from GB businesses, although there were some modifications to tailor the questions asked for use in NI. The 2021 ONS Report is available here.

The survey covers expenditure in the year ending 31st December 2021, although companies were given the option of supplying data for a business year ending on any date between 6th April 2021 and 5th April 2022.

Variations may occur in NI R&D data from year to year due to the influence of one or two large-scale projects. Spend as it is presented also varies due to a range of factors including company size, ownership of the company and whether it is externally or internally owned, and what sector it falls into.

Results in this bulletin are provisional and may be subject to revision to take account of any additional information received subsequent to publication and future developments around the sampling methodology to be carried out during 2023. Throughout, totals may not sum due to rounding (to 1 decimal place). All annual changes and percentages detailed in the text have been calculated using raw figures prior to rounding.

### 1.1 Change to reporting of total BERD expenditure

For the 2021 NI R&D release and future releases, the total BERD figure (£880.2m) refers to in-house BERD, rather than in-house plus purchased BERD as published in previous Northern Ireland Research and Development releases. This is being done to harmonise the NI BERD figures with BERD data published by the ONS, ensuring coherence and comparability between the two sources. This change has also been applied to previous years' data in this release.

## 2. Higher Education Expenditure on R&D (HERD)

NISRA carries out an annual survey of R&D expenditure among Higher Education Establishments in Northern Ireland. The figures shown in Chart 9 provide combined results from the two Northern Ireland universities - Queen's University Belfast (QUB) and the Ulster University (UU). The data collected refers to the academic year i.e. 2020/2021 ending 31/7/2021. The universities have made data available for this period on the basis of Transparency Review data collected within each respective institution.

## 3. Government Expenditure on R&D (GovERD)

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 collecting Government Department R&D data in conjunction with the results from the NISRA BERD and HERD surveys, it has been possible to compile a more complete picture of total expenditure on R&D in NI. The figures described in Charts 2 and 3, expenditure by Businesses, Higher Education establishments and Government departments complement each other; i.e. there is no double counting.

**Analysis of R&D spend throughout the report is detailed in cash terms unless otherwise stated.**

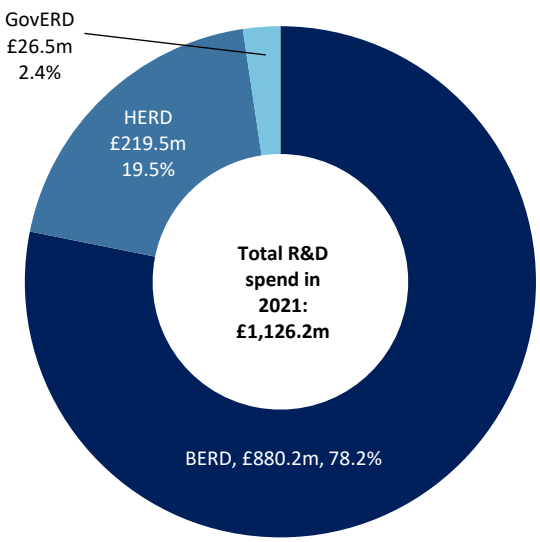
## Overall R&D spend in Northern Ireland

### Cash Terms

In 2021, the total expenditure on R&D in Northern Ireland (NI) in cash terms was £1,126.2 million (m). The majority of this, (78.2%) was carried out by Businesses (BERD), while 19.5% was undertaken by Higher Education establishments (HERD) and 2.4% by Government departments (GovERD).

There was an increase of £105.3m in total R&D expenditure between 2020 and 2021. This overall increase was driven by an increase of £105.5m in Business spend. Higher Education spend increased by £2.2m since 2020 whereas Government spend decreased by £2.4m across the year.

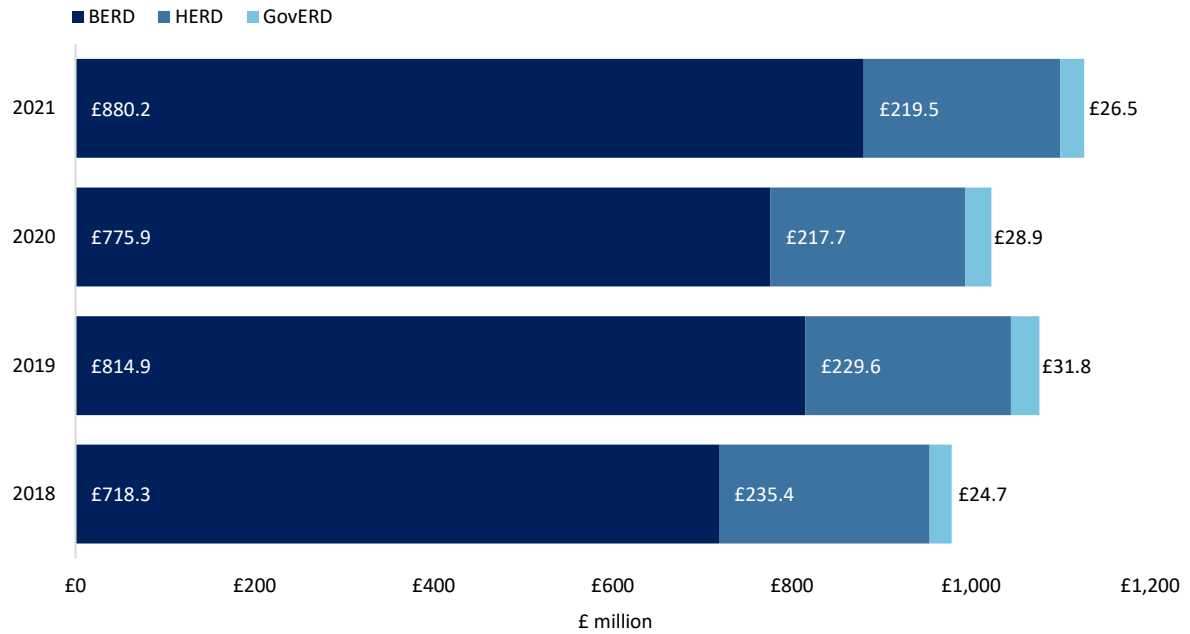
**Chart 2: NI R&D spend in cash terms (£millions), 2021**




### Real Terms*

Total R&D spend in Northern Ireland increased by 10.1% in real terms between 2020 and 2021 and by 15.1% since 2018.

**Chart 3: Northern Ireland R&D spend in real terms, 2018-2021**



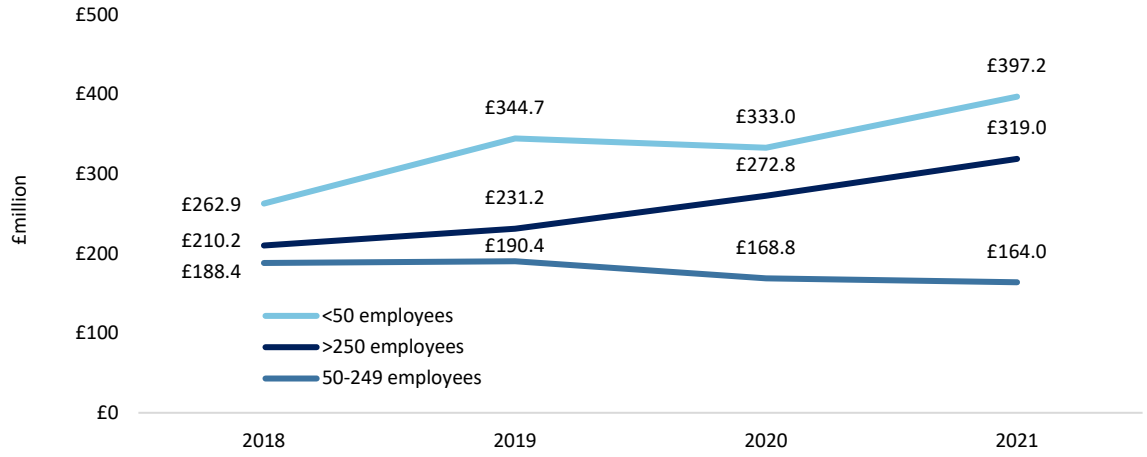

*GDP deflator used to convert cash terms to real terms: 2018 (92.1), 2019 (94.0), 2020 (99.8), 2021 = 100. Source: ONS deflators at market prices, September 2022 (Quarterly National Accounts)

## Business R&D activity in Northern Ireland - Company size

Users should note that the figures in this section are classified as Official Statistics as per the note on page 3.

In cash terms, small companies (<50 employees) accounted for 45.1% of BERD in 2021. Large firms (250+ employees) accounted for 36.2% of BERD. Chart 4 below shows that the amount of expenditure on R&D increased between 2020 and 2021 for businesses categorised as small and those categorised as large (<50 employees, +£64.2m; 250+ employees, +£46.1m). In contrast, expenditure on R&D decreased for businesses with 50-249 employees, falling by £4.8m over the period in question.

**Chart 4: Business R&D expenditure by company size (persons on payroll)*, 2018-2021 (cash terms, £millions)**

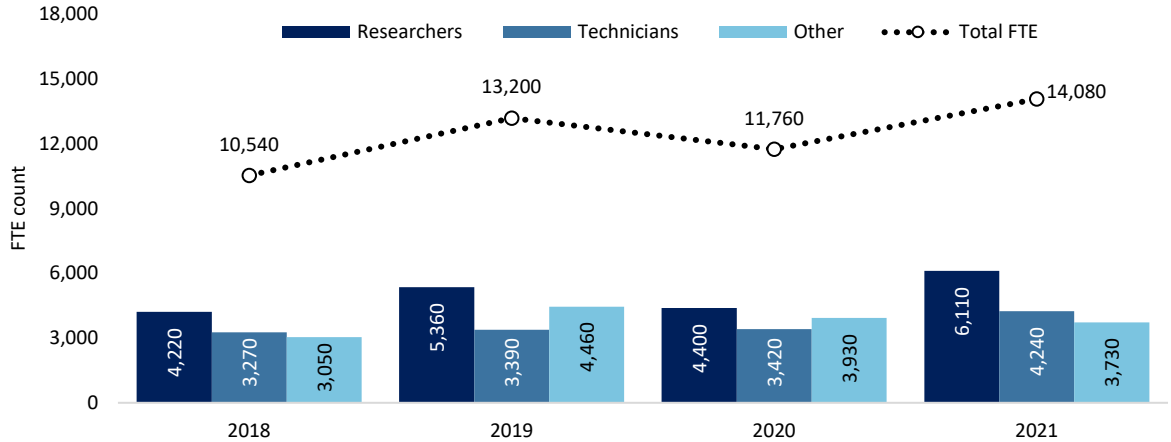



*The European Commission definition of Small Medium Enterprises (SME) used is defined as being enterprises with less than 250 employees and large companies as being enterprises with more than 250 employees.

## Business R&D activity in Northern Ireland – Employment

There were 14,080 FTEs working in an R&D role in 2021, 19.7% higher than in 2020 (11,760 FTEs). Those working in a research role (PhD students, graduates and scientists) accounted for 43.4% of FTEs in 2021, technicians (those who perform scientific and technical tasks under the supervision of researcher) accounted for 30.1% and 26.5% were "other" staff (support, secretarial and clerical staff involved in R&D).

**Chart 5: Business R&D FTE employment in NI, 2018-2021**

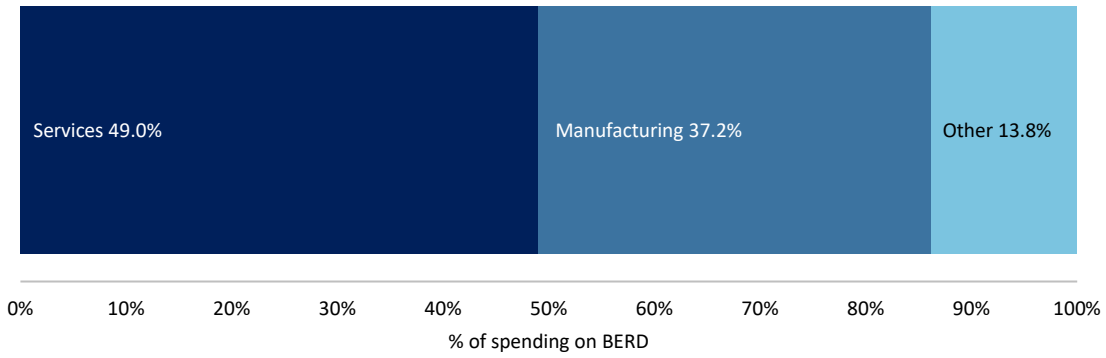



Estimates of employment in R&D are best produced on a full-time equivalent (FTE) basis where businesses convert employee hours working on R&D into FTE figures, providing a better indication of total labour input than a simple headcount.

## Business R&D activity in Northern Ireland – Sectoral breakdown

Around half of all business expenditure on R&D can be attributed to the services sector (£431.6m; 49.0%). The Information and Communication sector was the largest sub-sector in 2021, accounting for £213.8m (24.3%) of BERD spend. Just under two-fifths of all business expenditure on R&D can be attributed to the manufacturing sector (£327.3m; 37.2%). Over two-fifths (£144.7m; 44.2%) of R&D spending in the manufacturing sector was accounted for by companies involved in Engineering & Allied Industries.

**Chart 6: Sector percentage share of BERD Spend, 2021**




## Business R&D activity in Northern Ireland – UK regional comparisons

BERD spend across the UK as a whole totalled £46,929m in 2021. The vast majority of this spend (89%) occurred in England (£41,771m). Almost three-fifths of the spend in England occurred within the East of England, London and the South East. Companies in Northern Ireland spent £880m on R&D in 2021, this equates to 1.9% of the total UK BERD figure.

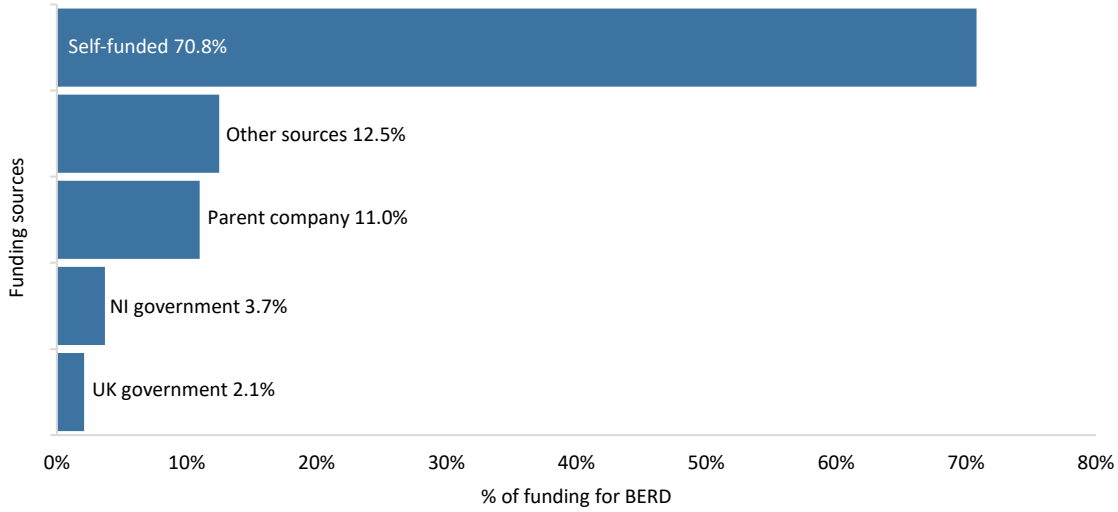
**Chart 7: BERD spend of UK businesses by country or region, 2021 (£millions)**

## Business R&D activity in Northern Ireland - Funding

The funding of business R&D expenditure comes from a number of sources: the companies' own funds, NI government departments including Invest NI, other UK Government bodies, overseas funding (e.g. EU), higher education establishments and other organisations.

The majority of funding for BERD in 2021 was self-funded by the companies carrying out the R&D work (70.8%). Just over one-tenth of funding came from a parent company (11.0%), while NI and UK government sources each contributed 3.7% and 2.1% respectively to BERD funding. Other sources accounted for the remaining 12.5% of BERD funding.

**Chart 8: Percentage share of funding sources for in-house expenditure, 2021**



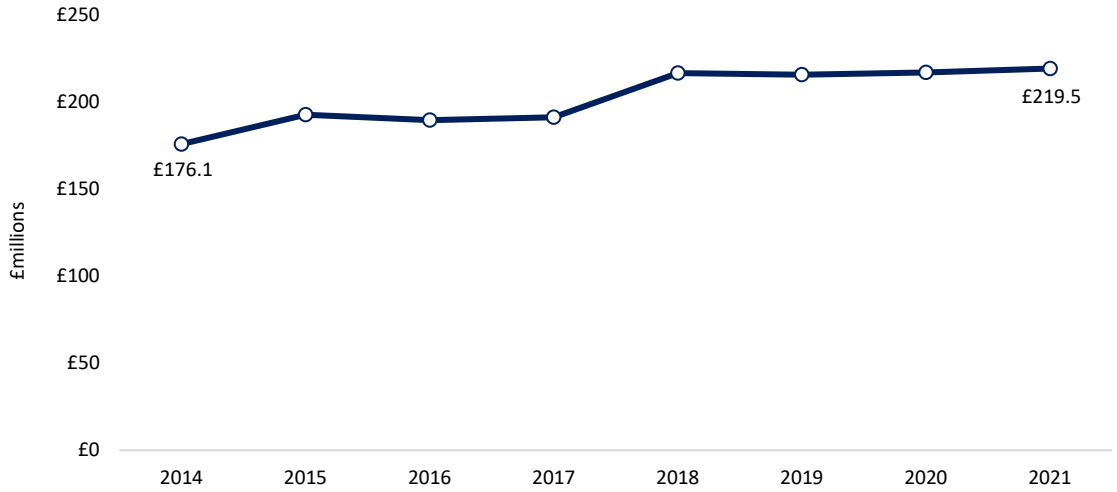
## Higher Education Expenditure on R&D (HERD)

Users should note that the statistics in this section have not been impacted by any of the redevelopment work undertaken for the BERD data and as such are classified as National Statistics.

HERD expenditure remained relatively stable over the year at £219.5m (up 1.0%; £2.2m from 2020).

Block grants remained the largest source of funding for HERD work, accounting for 46.4% of total HERD funding.

**Chart 9: R&D Expenditure among Higher Education Establishments in NI, 2014-2021 (cash terms, £millions)**



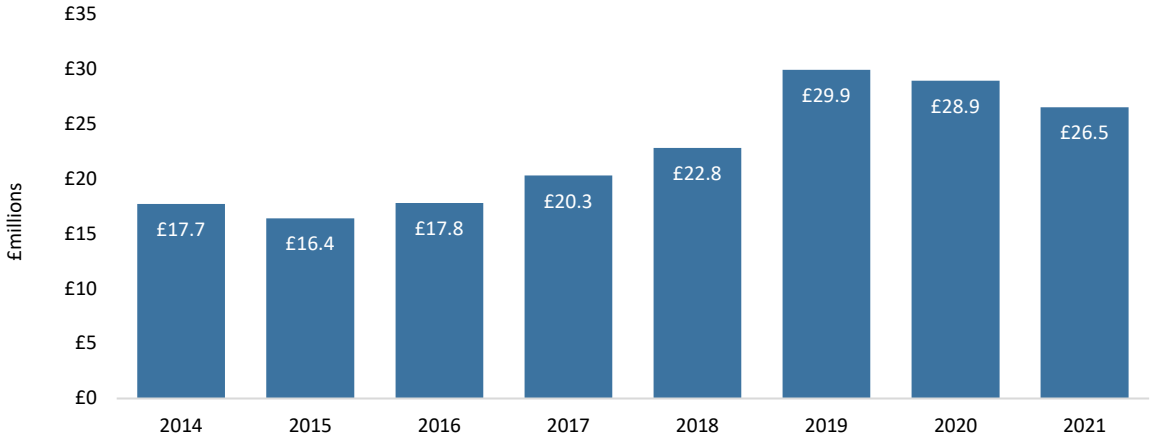

## Government Expenditure on R&D (GovERD)

Users should note that the statistics in this section have not been impacted by any of the redevelopment work undertaken for the BERD data and as such are classified as National Statistics.

The UK Office for National Statistics (ONS) collects data on R&D expenditure within government establishments. Combining these data with BERD and HERD data provides a more complete picture of R&D expenditure in Northern Ireland.

There was a decrease of £2.4m (8.3%) in GovERD spend in Northern Ireland over the year to £26.5m in 2021.

**Chart 10: R&D Expenditure among Government Departments in NI, 2014-2021 (cash terms, £millions)**



## Methodology

### Survey Design

As with previous years, the annual Business Enterprise Research and Development (BERD) Survey remains the main source of information for this report. This survey collects annual data on the nature and scale of R&D spend among NI businesses.

The BERD survey sample was developed using 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 2020 survey) and extra information from various sources such as the Office for National Statistics (ONS), Invest NI and a filter question on the Annual Business Inquiry which asks businesses whether or not they completed R&D during the year. For the purposes of the 2021 survey, businesses were stratified into 4 groups:

(i) Businesses responding to the 2020 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 (ABI); other identified potential R&D performers (principally those companies who had received assistance from Invest NI during 2021); SIC 72 companies drawn from the annual Business Register and Employment Survey (BRES) and Quarterly Employment Survey (QES); and companies newly identified to the 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 NI businesses.

The businesses making up stratas (i) and (ii) formed a register of R&D performers and the sample for the 2021 survey was derived from this register – each of these businesses was issued a questionnaire. Stratas (iii) and (iv) were not included as they were assumed to have zero R&D expenditure.

Further work is on-going to improve sampling methods for the BERD 2022 survey.

### Methodological Improvements to Northern Ireland BERD Data

Although our best available estimates at the time, it has been established that there is under-coverage of small businesses in previously published Business Research and Development (BERD) statistics.

Historically, the sampling method outlined above has been used to identify NI businesses that perform research and development (R&D). The returns from businesses sampled by the BERD survey are then used to produce estimates of BERD spend for Northern Ireland.

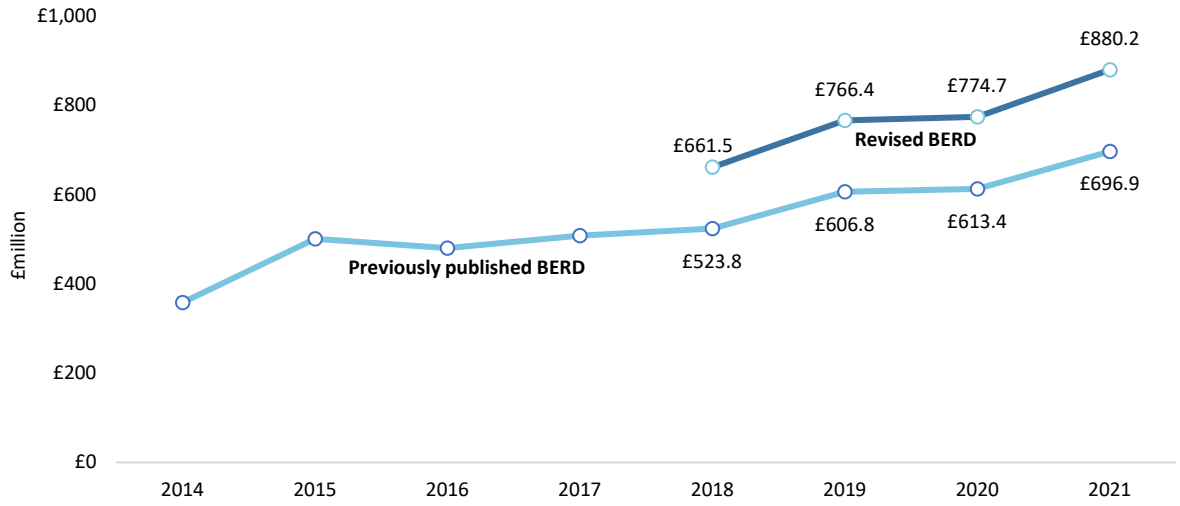
This process has resulted in under-coverage of small businesses. This approach is unlike other business surveys that draw their sample directly from the Inter-Departmental Business Register (IDBR) and use their survey responses to estimate for all businesses on the IDBR.

The ABI survey for example, which assists the development of the BERD sample via a R&D filter question carries out a census of all businesses with 50+ employees, or 20+ employees and more than one local unit, manufacturing businesses with 6+ employees or if a company has a turnover greater than £10 million or wholesale greater than £5 million, other smaller businesses are randomly sampled. Therefore, it is possible that some small businesses will, historically, not have been sampled by surveys

such as the ABI. These businesses could potentially perform R&D but have not been identified as R&D performers and added to the BERD sample, meaning they are not accounted for in BERD statistics.

In this release, methodological improvements have been made to address this under-coverage from the 2018 survey period onwards, so that the BERD survey results include a better representation of small businesses performing R&D. This improvement has produced figures which provide the best current estimate of Business level R&D spend at the Northern Ireland level. As shown in Chart 11 below, revised NI BERD estimates for 2018, 2019, 2020 and 2021 are £137.7 million, £159.6 million, £161.3 million and £183.2 million higher than previously estimated (the difference in unweighted and weighted BERD spend values sits at +26.3% for each year from 2018 to 2021, see Table 1).

**Chart 11: Difference in previously published and revised BERD spend, 2014/2018-2021 (£millions)**




As the methodological improvements have been implemented from 2018 onwards at the NI level, users should consider comparisons between pre-2018 BERD data and post-2018 BERD data with caution.

For the 2021 NI R&D release and future releases, the total BERD figure (£880.2m) refers to in-house BERD, rather than in-house plus purchased BERD as published in previous Northern Ireland Research and Development releases. This is being done to harmonise the NI BERD figures with BERD data published by the ONS, ensuring coherence and comparability between the two sources. This change has also been applied to previous years' data in this release.

### Uplift Factor Approach

The NI BERD sample list may be missing some R&D performers because of the design of the other relevant NI surveys, for example the ABI, that are used to update it. These surveys are comprised of samples lifted from the Inter Departmental Business Register (IDBR), which is a list of all NI businesses which are VAT registered and/or operating a PAYE scheme. They sample a portion of IDBR businesses, from which NI-wide totals are estimated. All IDBR businesses that are not sampled have no potential to be added to the BERD sample list, so need to be estimated for. This has been done by estimating

the number of R&D businesses using information from the ABI – the largest of the surveys used to create the BERD sample list.

To improve estimates of R&D businesses sampled from the ABI, uplift factors have been created for each BERD industry group (21 groups), for small (0-49 employees), medium (50-249 employees) and large (250 employees or over) businesses, separately. This created 63 BERD uplift factors in total (see Annex within the accompanying excel spreadsheet for the full list of uplift factors). As the ABI carries out a census of all large businesses the vast majority of uplift factors for businesses in the large business grouping were 1.0 or less. Effectively, large businesses only represent themselves, and are not part of the process of estimating for other non-sampled large businesses.

**Steps Taken to Calculate Uplift Factors**

1. ABI sourced R&D businesses and their pre-existing ABI weight values were split by industry group (21 groups) and company size band (three bands) variables to get the total number of weighted ABI sourced R&D companies within each of the 63 strata for the 2018 survey period.
2. The full 2018 R&D sample was split by all 21 industry groupings and three size bands to generate the total number of unweighted R&D companies within each of the 63 strata.
3. The weighted ABI sourced R&D business counts as detailed in Step 1 were divided by the unweighted R&D sample business counts (Step 2) to calculate uplift factors for all 63 groupings.
4. The full (unweighted) 2018 R&D sample was split into businesses that were:
    a. Placed on the sample due to responding ''Yes'' to the ABI R&D filter question (excluding all Invest NI sourced businesses*); and
    b. All other businesses (including all Invest NI sourced businesses).
5. Businesses as detailed in Step 4(a) above were split by the 21 industry groups and three size bands and descriptive (sum of) statistics were carried out on the **Total In-house BERD Spend** variable (unweighted).
6. The unweighted **Total In-house BERD Spend** values for each of the 63 groupings as detailed in Step 5 were multiplied by the uplift factors created in Step 3 to calculate a weighted spend total for the ABI sourced portion of the 2018 BERD sample.
7. The weighed total for ABI sourced R&D companies was then added to the total unweighted spend for the rest of the 2018 R&D sample (Step 4(b)) to calculate the total revised spend for 2018.

*Invest NI provide NISRA's ELMS branch with a full R&D client list on an annual basis. Therefore, no uplift is required for these companies.

As the 2018 period is the most robust recent period prior to the coronavirus (COVID-19) pandemic, the uplift factor process as detailed in Steps 1-7 was applied to the 2018 survey period only. Year on year growths in the underlying (unweighted) survey results were then applied to the 2018 uplifted estimates to calculate the annual BERD results for 2019, 2020 and 2021 (see Table 1).

**Table 1: Year on year growth comparisons between unweighted and weighted BERD, 2018-2021 (£millions)**

| | 2018 | 2019 | 2020 | 2021 |
|---|---|---|---|---|
| Previous unweighted BERD spend value | £523.8m | £606.8m | £613.4m | £696.9m |
| Revised weighted BERD spend value | £661.5m | £766.4m | £774.7m | £880.2m |
| % Difference in unweighted and weighted BERD spend values | +26.3% | +26.3% | +26.3% | +26.3% |

The new figures developed using the uplift factors provide the current best estimate of NI-level BERD, which have been validated against other available data. However, as the uplift factors have been applied to the results after the survey has run in the usual way, the estimates are subject to some uncertainty. This uncertainty increases below the NI level and there is also less data for validation. For this reason, and to maintain the quality of the statistics, this release features fewer detailed breakdowns than usual. We plan on reinstating these breakdowns in the next publication, once further development work to improve the quality of NI BERD statistics has been implemented.

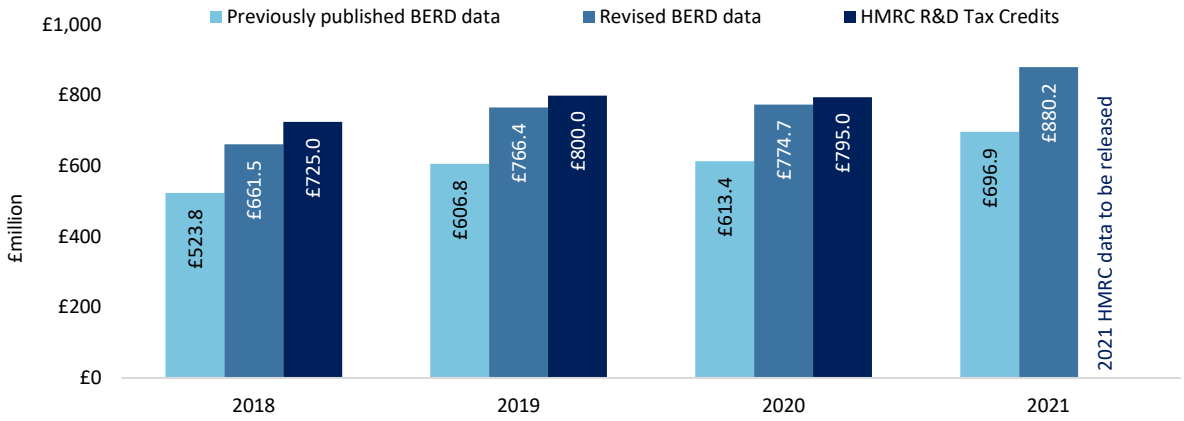
### NISRA's Revised NI BERD Data in Comparison to HMRC R&D Tax Credit Data

Another source of data on R&D expenditure is HMRC's annual publication of R&D Tax Credits, both sources are compiled differently and for different purposes but both capture data in line with internationally recognised guidelines outlined in the Frascati Manual. NISRA's BERD estimate is taken from an annual survey of known R&D performers. HMRC's R&D statistics are based on administrative data where businesses have applied for and received R&D tax credits. The two sources are similar but not exactly the same and there will always be some element of difference between them, there are known reasons for this, and these are outlined in more detail in ONS's article from September 2022.

ONS's analysis of the two data sources found that there has been a significant increase in the number and value of claims under HMRC's small and medium-sized enterprise scheme. The current R&D methodology is structured in a way that could potentially overlook newer, smaller sized companies that have only started carrying out R&D activities within the past couple of years.

The difference between previously published BERD figures and HMRC's Tax Credits data for NI was in the region of £200m for 2018-2020. The revised BERD figures are closer to HMRC's data, giving a gap between the two sources in the range of £20-60m for each year.

**Chart 13: Difference in previously published BERD, revised BERD and HMRC R&D Tax Credits data (£millions), 2018-2021 (NISRA) and 2018/2019-2021/2022 (HMRC)***




*NISRA BERD data refers to calendar year; HMRC R&D Tax Credits data refers to financial year.

### Further Methodological Development Work

The methodological changes implemented in this release should be regarded as interim improvements. Further work is underway to improve how the BERD statistics are compiled, including developing better sampling methods in the future. This new sample design will be used for the 2022

BERD survey. The new approach aims to account for businesses that previously would not have been identified as R&D performers, and therefore would not have been added to the BERD sample.

**National Statistics and Official Statistics Designation of NI BERD statistics**

To maintain the quality of the Northern Ireland R&D statistics, this publication features a reduced number of detailed breakdowns compared with previous releases. While the existing National Statistics designation for the Northern Ireland level R&D figures will remain, to help convey the uncertainty, the Northern Ireland Statistics and Research Agency (NISRA) has asked the Office for Statistics Regulation (OSR) to temporarily pause the National Statistics status of more detailed breakdowns. OSR confirmed their agreement to this approach in their letter published on 8th December 2022. This is until further redevelopment takes place and there is more certainty on the distribution below the headline level.

All data tables used to inform this release are available in Excel and ODS format here.

The following NI R&D data tables have maintained their National Statistics status:

- Table 1: In-house BERD, HERD and GovERD Spend by Year in Cash Terms, 2014-2021 (£millions)
- Table 2: In-house BERD, HERD and GovERD Spend by Year in Real Terms**, 2014-2021 (£millions)

The following NI BERD data tables have been temporarily assigned Official Statistics status:

- Table 3: In-house BERD spend among small, medium and large companies (persons on payroll), 2018-2021 (£millions)
- Table 4:In-house BERD spend by manufacturing, services and other subsections*, 2020-2021 (£millions)
- Table 5: Share of manufacturing expenditure by SIC 2007 subsections, 2021 (£millions)
- Table 6: R&D full-time equivalent (FTE) employment*, 2018-2021 (rounded to the nearest 10)
- Table 7: R&D employee headcount, 2018-2021 (rounded to the nearest 10)
- Table 8: In-house expenditure of UK businesses by country or region, 2018-2021 (£millions)
- Table 9: Proportion of in-house BERD funding by source, 2018-2021 (£millions)
- Table 10: In-house expenditure by ownership of company, 2020-2021 (£millions)
- Table 11: Number of R&D performing companies, 2018-2021

Other NI R&D statistics available in Excel and ODS format:

- Table 12: HERD spend by year, 2011-2021 (£millions)
- Table 13: HERD spend breakdowns, 2019-2021 (£millions)
- Table 14: GovERD spend by year, 2011-2021 (£millions)
- Table 15: Size of revisions to previously published data, 2018-2021 (£millions)
- Table 16: Calculated Uplift Factors for 2018 BERD data

**Impact of methodological improvements on GDP**

The estimated percentage of gross domestic product (GDP) that was spent on R&D performed by businesses in NI is not available in this release. This is because ONS have not yet incorporated the improvements to the measurement of R&D among UK businesses into the calculations of GDP. The earliest opportunity to add the revised business R&D estimates into the UK national accounts will coincide with the completion of the next stage of development towards the end of 2023. Further work will be required by ONS to filter this through to the Regional Accounts which calculates the NI GDP estimates.

While R&D is a small component of NI GDP, we are currently unable to quantify the impact of these changes on GDP. We will implement our improved R&D estimates at the earliest opportunity into the economic accounts.

**BERD Survey Response Rate**

For the 2021 survey, 1,488 forms were sent out to businesses believed to be performing R&D. Completed forms were returned by 887 businesses representing a response rate of 60%. Due to non-response, spend was imputed for 472 companies based on their most recent return.

**Table 2: Comparison of response rates and spend coverage for 2018, 2019, 2020 and 2021 survey periods**

| | 2018 | 2019 | 2020 | 2021 |
|---|---|---|---|---|
| Percentage of sample that returned a form | 71% | 55% | 60% | 60% |
| Spend coverage by receipted businesses | 83% | 80% | 76% | 72% |

Data collection for the 2019, 2020 and 2021 surveys occurred during and post-pandemic, this may have resulted in lower response rates in comparison to pre-COVID-19 surveys.

Efforts were made to reduce the impact of a lower response rate. Namely, larger R&D contributors received more contact than usual to encourage a response and the survey response window was extended. As a result, 72% of total R&D spend in 2021 is covered by receipted businesses.

**Estimates**

Overall, estimates make up 28% of total BERD spend for 2021 (compared with 24% in 2020)**.** Most of the imputations are calculated using the median change in total R&D spend across the year among responders within a given SIC code and applying this change to estimate spend for those businesses in the same SIC code that failed to reply to the survey. The remainder were based on historical information and other administrative surveys within NISRA's Economic and Labour Market Statistics Branch. Non-responding companies which reported zero R&D spend the previous year are imputed to have zero spend for the current year.

Estimates for Invest NI companies were based on the value of offers made to promote R&D investment and the contribution of Invest NI's assistance to total planned R&D expenditure. Estimates for Invest NI companies make up 1% of the total non-responding company spend in 2021. The remaining 99% are non-Invest NI estimates.

## Revisions

These results are provisional and are subject to revision should additional information become available. In addition to the uplifting of the 2018-2021 BERD data as part of this release, business estimates of R&D performance for 2019 and 2020 have been revised to take account of late returns.

**Table 3: Size of revisions to previously published 2018-2020 data (£millions)**

| **2018** | | | |
|---|---|---|---|
| R&D Spend Category | Previous value | Revised value | Difference |
| In-house BERD Spend | £523.8m | £661.5m | £137.7m |
| HERD Spend | £216.8m | £216.8m | £0.0m |
| GovERD Spend | £22.8m | £22.8m | £0.0m |
| Total R&D Spend | £763.4m | £901.2m | £137.7m |
| **2019** | | | |
| R&D Spend Category | Previous value | Revised value | Difference |
| In-house BERD Spend | £606.8m | £766.4m | £159.6m |
| HERD Spend | £215.9m | £215.9m | £0.0m |
| GovERD Spend | £29.9m | £29.9m | £0.0m |
| Total R&D Spend | £852.6m | £1,012.2m | £159.6m |
| **2020** | | | |
| R&D Spend Category | Previous value | Revised value | Difference |
| In-house BERD Spend | £613.4m | £774.7m | £161.3m |
| HERD Spend | £217.3m | £217.3m | £0.0m |
| GovERD Spend | £28.9m | £28.9m | £0.0m |
| Total R&D Spend | £859.6m | £1,020.9m | £161.3m |

## Definition of Terms

- In-house R&D - This is R&D carried out within the company and was previously referred to as intramural expenditure.
- Purchased R&D - This is R&D which has been purchased by a business from another source, for example another business.
- Cash terms - R&D spending without the effects of inflation removed.
- Real terms - R&D spending with the effects of inflation removed. Real earnings are calculated by adjusting historical R&D spend using the ONS deflators at market prices, September 2022 (Quarterly National Accounts).

**Quality Reporting**

The quality report for the R&D survey and analysis can be found here.

**Next Publication**

Analysis of the 2022 results will be published in December 2023, and will be available here.

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