



University of
Strathclyde
Business
School



Fraser of Allander Institute
The Economic Contribution of the
Pharmaceuticals Sector in Northern
Ireland
May 2022

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Disclaimer

The analysis in this report has been conducted by the Fraser of Allander Institute (FAI) at the University of Strathclyde. The FAI is a leading academic research centre focused on the Scottish economy.

The report was commissioned in June 2021 by The Association of the British Pharmaceutical Industry (ABPI) Northern Ireland.

The analysis and writing-up of the results was undertaken independently by the FAI. The FAI is committed to providing the highest quality analytical advice and analysis. We are therefore happy to respond to requests for technical advice and analysis. Any technical errors or omissions are those of the FAI.

CONTRIBUTION OF THE PHARMACEUTICAL SECTOR NORTHERN IRELAND

Life Sciences sector supports

19,500
FTE jobs



across the
Northern Ireland economy

£530m
of Gross
Value Added
directly
supported by
the *Life Sciences* sector



Wider pharmaceuticals
sector generates more
than **£2.4bn of output**
and supports
15,150 FTE jobs



For every **one** job created
in the Manufacturing of
Pharmaceuticals sector,
3 jobs
are created elsewhere in
Northern Ireland



Manufacturing of the
pharmaceuticals sector
**has lower direct
emissions
factor** relative to the
value of goods and
services it sells, contributing to the
Northern Ireland **net-zero agenda**



Pharmaceutical spend on
R&D was around **£25m**
or **4% of total BERD** in
Northern Ireland in 2019



Life Sciences accounts for
7% of all international exports
from Northern Ireland



For every **one** job created
in the Life Sciences sector,
1.8 jobs
are created
elsewhere in
Northern Ireland



Executive Summary

The pharmaceutical sector is critical to the life sciences ecosystem in Northern Ireland, and the economy as a whole.

This is recognised in a wide range of government strategies including [New Decade, New Approach](#), the [Rebuilding a Stronger Economy](#) recovery plan and in the wider economic vision for innovation, the [10X Economy Strategy](#), where Life and Health Sciences is identified as a priority cluster in Northern Ireland.

As the Northern Ireland economy continues its recovery from the Covid-19 pandemic, the government is now looking further ahead and implementing frameworks that aim to put Northern Ireland in a stronger position to withstand crises like the current one in the future.

The pharmaceutical sector therefore has a key part to play in achieving the four ambitions of the Northern Ireland Government's 2021 [Economic Recovery Action Plan](#), which include:

Supporting a highly skilled and agile workforce

- Around 70% of jobs in pharmaceuticals¹ were in occupations classified under the two highest skill levels, which typically demand a salary three times greater than lower-skilled occupations.
- We estimate the Life Sciences sector, identified as a key growth sector over the coming decade for skills and qualifications, supports more than 19,500 Full-time Equivalent (FTE) jobs across the entire Northern Ireland economy.

Stimulating R&D and innovation

- We estimate that pharmaceutical firms spend on R&D in Northern Ireland was around £25 million in 2019 or 4% of total Business Expenditure on Research and Development (BERD) in Northern Ireland.
- Accounting for the pharmaceuticals industry's manufacturing, wholesale, and research elements, we estimate the wider pharmaceuticals sector generates more than £2.4bn of output and supports 15,140 FTE jobs across the whole Northern Ireland economy.
- For every one job created in the wider life sciences sector, 1.8 jobs are created elsewhere in the economy, boosting employment across the entire Northern Ireland economy.

Promoting investment, trade, and exports

- The life sciences industry has a strong international reputation for trade as the 5th highest value international exporter in 2017. This accounted for 7% of all international exports from Northern Ireland.
- This has established the industry as a key driver of inward investment. Our estimates suggest the life sciences sector directly generates £530m in Gross Value Added, which rises to more than £1.2bn across the whole Northern Ireland economy.

¹ Manufacturing of Pharmaceuticals.

Building a greener economy

- The manufacturing of pharmaceuticals sector has a low direct emissions factor i.e. it produces lower levels of carbon in relation to the value of goods and services it sells, meaning the industry contributes significantly to the net-zero targets of Northern Ireland.

The [Association of the British Pharmaceutical Industry](#) (ABPI) has representation from 36 member companies in Northern Ireland, and they, alongside the pharmaceuticals sector as a whole, play an important role in Northern Ireland's life and health sciences cluster.

In the 2020 [Contribution of the pharmaceutical sector to the Northern Ireland economy report](#) we referred to the economic contribution of three different sectoral groups using standard industrial classifications (SIC) codes.

To reflect the commercial and wholesale nature of pharmaceuticals in Northern Ireland we have updated the sectoral definition in this report by including the Wholesale of Pharmaceutical Goods (SIC46.46) subsector. This means that the results in this report are ***not directly*** comparable to our previous report, to overcome this, we provide a direct comparison on ***Page 18***.

This report has therefore been commissioned as an update to the previous report published in 2020 and demonstrates the continued importance of the pharmaceutical industry to the Northern Ireland economy.

Introduction

The Northern Ireland economy has undergone significant change over the past two years, first with the re-establishment of the Northern Ireland Assembly in January 2020, and, within a matter of months, the impact of Brexit and COVID-19.

The end of the transition period and the ongoing Coronavirus pandemic have exacerbated longstanding economic challenges in Northern Ireland.

The Department for the Economy (DfE) highlighted life and health sciences as a key sector in its [Rebuilding a Stronger Economy](#) recovery plan, outlining the opportunities that this sector offers in tackling the above challenges.

Whilst the current priority is the recovery of the Northern Ireland economy, the government is now looking further ahead and implementing frameworks that aim to put Northern Ireland in a stronger position to withstand crises like the current one in the future.

Northern Ireland's [Economic Recovery Action Plan](#) sets out ambitions to rebuild a stronger economy, through:

- Supporting a highly skilled and agile workforce;
- Stimulating R&D and innovation;
- Promoting investment, trade, and exports; and,
- Building a greener economy.

Throughout this report the pharmaceutical sector is assessed against these four ambitions, modelling the economic contribution of the industry, and the wider life sciences ecosystem, to the Northern Ireland economy.

This report is structured as follows:

- **Section 1** to **Section 4** examine the role that the pharmaceuticals industry has to play within the 4 pillars of the Northern Ireland economy recovery plan.
- **Section 5** summarises the modelling results, with contextualisation of results.

Throughout this report three types of economic impacts are examined: direct, indirect and induced effects. See **Diagram 1**.

Supporting a highly skilled and agile workforce

High-skilled jobs

Northern Ireland's [Skills Strategy](#) for a '10 X Economy' sets out an ambition for collaboration between government, business, and academia.

This strategy highlights that Northern Ireland's key strategic clusters – one of which is life and health sciences – will drive the formation of a strong knowledge economy.

Addressing skills imbalances from education right through to employment can support the success of this strategy and creating a culture of lifelong learning has the potential to not only increase the employment opportunities in Northern Ireland but also boost longer-term productivity and economic growth.

Supporting a highly skilled and agile workforce is recognised within ABPI Northern Ireland's vision where Northern Ireland can become a pro-innovation, connected place of opportunity - with a healthier population and significantly greater ability to attract life sciences investment and deliver economic growth.

In support of this, the [ABPI Northern Ireland Manifesto 2022](#) set out recommendations for the Northern Ireland Assembly to consider in the workforce planning for the life sciences sector.

- Focus on local strengths, i.e., in big data, clinical trials, and data analytics.
- Address skills deficit using the Northern Ireland Skills Strategy as a vehicle to drive recommendations from the 2022 ABPI Skills Report '[Bridging the skills gap in the biopharmaceutical industry](#)'.
- Invest in training across health and social care and encourage networks of research-active professionals within these industries.
- Attract and retain leaders in the life sciences sector.

The [Belfast City Region Deal \(BCRD\)](#) also sets out local ambitions for employability and skills in Northern Ireland, detailing the need to rebalance the local economy by building on competitive advantages, increasing productivity, and supporting the creation of new jobs.

As part of the deal, the BCRD Employability and Skills Programme has been created, to address the needs of individuals entering the workforce and the need for upskilling and reskilling to boost the overall skill level of the workforce in Northern Ireland.

The skill levels of roles that make up the pharmaceutical sector can be analysed given that occupations can be categorised into skill levels 1-4¹ based on [Standard Occupational Classifications](#), see **Appendix 1**.

Using occupational data, by sector, for the UK², the estimates suggest that around 70% of jobs in the manufacturing of pharmaceuticals sector belong in occupations in the highest two skill levels, levels 3 and 4.

¹ See [NISRA](#)

² See [ONS](#)

Workers in high-skilled jobs in Northern Ireland earn hourly pay around 1.5 times more per hour than those in low-skilled jobs. In terms of annual gross pay, the highest skilled occupations can earn more than 3 times that of low skilled occupations.

The modelling suggests that the manufacturing of pharmaceuticals directly supports over 2,800 FTE jobs, growing to over 11,500 jobs once spill over effects into the wider economy are accounted for.

Further to this, if wider pharmaceuticals industry is considered, including both the wholesale and research components of the pharmaceuticals sector, the number of jobs directly supported by the sector grows to over 4,400 FTE jobs. Across the entirety of the Northern Ireland economy, the wider pharmaceuticals sector supports more than 15,100 jobs.

As a result of this strong performance, pharmaceutical and science related jobs are some of the most sought after in Northern Ireland.

The 2019 Northern Ireland skills barometer³ highlighted biological sciences as one of the most in demand university degrees. The report also highlights that people with foundational skills in science, mathematics, health, public services, and care are high in demand.

These skills were also projected to translate directly into the labour market, with Professional, Scientific and Technical identified as the sector with the biggest employment growth potential over the coming decade.

The modelling estimates suggest that the Life Sciences sector in Northern Ireland directly supports over 6,900 jobs, which increases to more than 19,500 FTE jobs across the entire economy once spill over effects are accounted for.

In simple terms, this means that for every 1 job supported in the life sciences ecosystem, 1.8 jobs are supported elsewhere in the economy.

Equality of the workforce

As part of their [2021 New Decade, New Approach](#), the Northern Ireland Executive have highlighted the need to prioritise their [Gender Equality Strategy](#) among a number of other social inclusion strategies.

The recommendations within the strategy highlight the need for policy measures that address gender budgeting, the elimination of all sex-based discrimination and the importance of intersectionality to reduce the imbalance between men and women in the Northern Ireland labour force.

Across the whole economy, Northern Ireland has a gender pay gap of around 8% in terms of gross hourly pay, meaning men, on average, are paid 8% more than their female counterparts⁴.

In the manufacturing of pharmaceuticals sector, males were paid 16% more than females in 2019, 8-percentage points higher than the Northern Ireland average. However, this was lower than the overall manufacturing sector, with a gender pay gap of 21% across the whole sector.

³ See [NISRA](#)

⁴ See [ONS](#)

The modelling estimates that males occupy most FTE jobs supported by life sciences and pharmaceuticals in Northern Ireland, both directly and indirectly. This means that a higher share of FTE jobs, both in the pharmaceutical sector itself and its wider suppliers, are occupied by males than females.

This suggests that the pharmaceuticals sector in Northern Ireland may have a higher gender pay gap given that a large share of occupations in the sector are highly skilled, therefore demand higher wages. Therefore, given that proportionally more men than women are employed in these roles, the gender pay gap will likely be higher as a result.

However, this gender imbalance is not unique to the pharmaceutical sector. Bodies such as the [Equality Commission for Northern Ireland](#) and the Northern Ireland Science Industry panel have previously highlighted the under representation of women in STEM roles across the economy.

In an attempt to tackle this, the [Women in STEM Vision and Action Plan](#) was drawn up by the Northern Ireland WISE Hub and DfE Women in STEM Steering Group's.

The report, published by the Northern Ireland Science Industry panel, identifies that in 2018 only 14.8% of women pursued further study in core STEM subjects beyond secondary school, compared to 35.6% of men.

As well as this, only 7.8% of girls pursued careers in STEM subjects, a proportion that had not changed over the preceding decade.

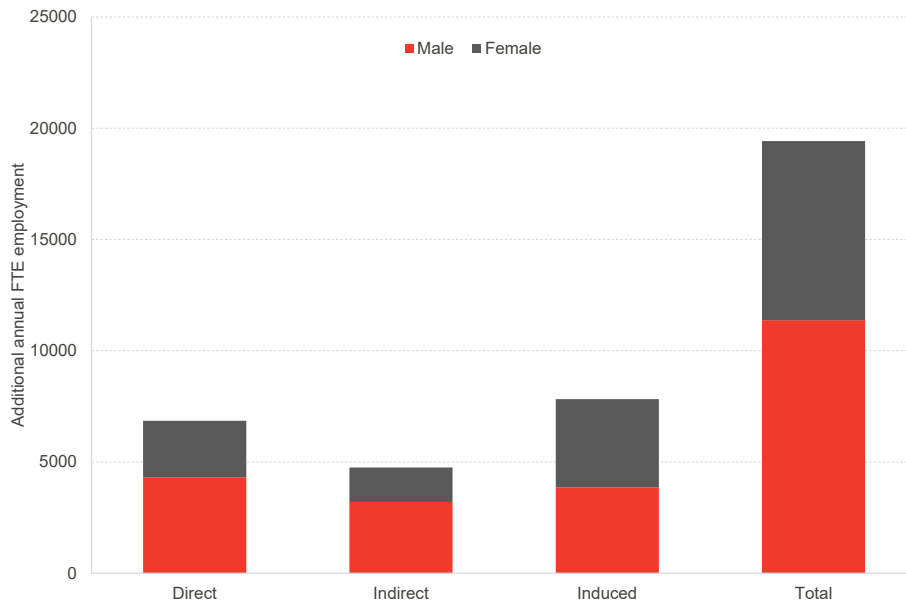
The report highlights a vision for the Northern Ireland workforce to become strong and resilient but with equality at its core. It sets out goals for the coming decade and how they aim to boost female representation in STEM roles, which include:

- Having 33% of young people moving into STEM roles being female,
- Improving the awareness of children leaving school to understand what an engineer is and how to become one,
- Improving senior management teams in STEM to promote full inclusivity and representation of a diverse workforce.

The modelling also suggests that the pharmaceuticals and life sciences sectors support a far more equal proportion of women across the supply chain, with marginally higher FTE employment of females supported than males, **Chart 1**.

This means that females are more likely to occupy roles in sectors across the wider economy that benefit from the output of the pharmaceutical sector. This may include roles that utilise medicines or equipment provided to the human health and social care sector, or, employees of retail premises, selling pharmaceutical products and medicines.

Chart 1: Direct, Indirect, and Induced impacts by gender, 2017



Source: FAI Calculations

In the recent report, [Bridging the skills gap in the biopharmaceutical industry](#), the ABPI made a number of commitments to support STEM education to inspire young people to develop in-demand skills and knowledge and to make informed career choices.

This includes through the launch of an updated, dedicated platform of free, high quality, up-to-date STEM resources supporting all key stages for UK curricula. This will help develop young people's foundational STEM skills, support long-term attainment and drive achievement, as well as provide support for teachers.

Simultaneously, ABPI also commits to continue supporting and enhancing specific initiatives including the Enthuse Partnership, CREST Awards, and both the Science Industry Partnership and STEM Ambassador schemes.

Case Study: *ENTHUSE Partnership*

ABPI NI currently partner with Armagh, Banbridge & Craigavon Borough Council and STEM Learning Ltd to support an ENTHUSE Partnership which enables 6 schools in the Borough to work together on a two-year, intensive, bespoke programme to raise aspiration and achievement in STEM subjects, now in its second year, the results from Year 1 included:

- A 20% increase in the proportion of students believing that they have a good knowledge of STEM career opportunities.
- A 10% increase in the proportion of students who believe they could have a STEM career.
- An 11% increase in the proportion of students actually pursuing a STEM career.
- An increase in almost all areas of teacher confidence when it comes to teaching STEM and discussing STEM careers (despite COVID challenges).
- A 20% reduction in the number of students achieving below expected levels in STEM.

Stimulating R&D and innovation

Fostering more innovation and research and development is one of the main pillars of the DfE's economic recovery strategy.

The DfE aims to support local innovation ecosystems to develop new products and services and to maximise the impact of innovation. InterTradeIreland is a new agency which has been set up to explore new cross-border markets, new products, and services which are investor ready.

Additionally, [Invest Northern Ireland](#), the Economic Development Agency for Northern Ireland has an important role to play in supporting the Government's economic development strategies, offering direct support to businesses for innovation and R&D.

Collaborations like the [US-Ireland R&D Partnership](#) support the speed of innovation in Northern Ireland, particularly in areas such as health. The DfE, in its '[10x Economy](#)' innovation strategy lists life and health sciences as one of five clusters in Northern Ireland that is ready to adopt enabling technologies.

Life and health sciences can clearly play an important role in both driving Northern Ireland's economic recovery from COVID-19 and supporting the country's innovation ecosystem, driving longer-term economic growth.

The DfE acknowledges the innovative capacity of the pharmaceutical sector, recognising that innovation within this industry throughout the pandemic led to vaccinations against COVID-19, and has subsequently created a Chief Scientific & Technology Officer to advise and guide on science, technology, R&D, and innovation.

ABPI Northern Ireland's manifesto includes recommendations for the Northern Ireland Assembly in adopting innovative solutions in health care.

- Actively encourage health and care industries to adopt innovative solutions to tackle patient waiting lists
- Promote the use of innovative medicines in preventing or slowing disease progression.

Despite R&D being at the forefront of Northern Ireland's economic strategy, in recent years, total spend on R&D in Northern Ireland has fallen.

Most recent statistics estimate that between 2019 and 2020, R&D in Northern Ireland fell around 2.6% in real terms.

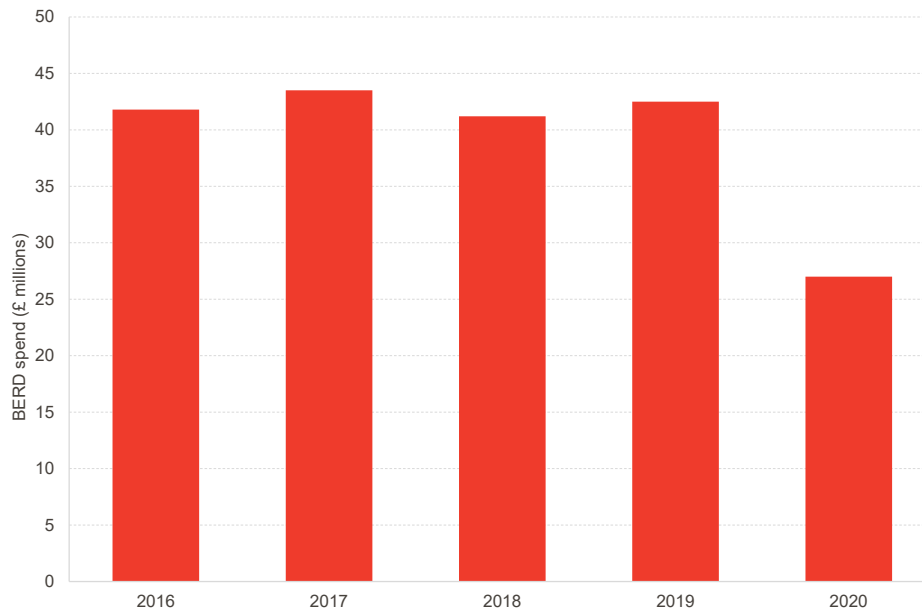
One of the contributing factors to this has been the fall in business R&D which contracted by 1% between 2019 and 2020.

However, 2020 was an unprecedented year for most sectors of the economy.

Most operations ceased in customer-facing sectors, and financial restrictions imposed within firms meant R&D investment contracted. Research and development in the pharmaceutical and chemical products sector fell by more than 35% in 2020, compared to 2019 expenditure levels, **Chart 2**.

In 2019, Business R&D spend in pharmaceuticals and chemical products was £43 million in Northern Ireland, around 12% of total Business R&D spend in Northern Ireland.

Chart 2: Business expenditure on research and development, manufacture of chemicals and chemical products, basic pharmaceutical products and pharmaceutical preparations, 2016 - 2020



Source: NISRA

Using historical data on business R&D spend, the proportion of spend in the aggregated 'Manufacture of chemicals and chemical products, basic pharmaceutical products and pharmaceutical preparations' sector that is solely pharmaceuticals spend can be calculated.

In 2017, pharmaceutical spending on R&D accounted for 60% of total expenditure in the aggregated sector. If this proportion is applied to the 2019 value, the estimates suggests that pharmaceutical spend on R&D in Northern Ireland was around £25 million in 2019 or 4% of total business R&D spend in Northern Ireland.

As new technologies are discovered, the knowledge spill-overs help expand drive improvements in productivity across the economy.

Case Study: HydRegen

HydRegen, the revolutionary bioscience company, enables sustainable chemical manufacturing using their proprietary enzyme based redox platform. The company has received £385,000 in new funding from the UK Innovation & Science Seed Fund (UKI2S), alongside private investors, to work in collaboration with pharmaceutical and fine chemical companies that want to reduce their costs and environmental impact.

One collaborator is Northern Ireland's Almac Sciences who together will evaluate a joint technology development project for large-scale manufacture of a commodity chemical. The project will use enzyme technologies from both companies, in a multi-enzyme system, to develop a low-cost manufacturing process, producing cost effective green alternatives to commodities.

Read the full story [here](#).

The pharmaceuticals sector already produces a significant amount of economic output for the Northern Ireland economy.

This analysis estimates that pharmaceuticals directly support £1bn in output in the Northern Ireland economy and, once spill over effects are accounted for, a total of £2bn in economic output.

Once both the wholesale and research elements of pharmaceuticals are accounted for, the estimates suggest that the wider pharmaceuticals sector directly supports more than £1.3bn of economic output, which rises to £2.4bn once spill over effects are considered.

The scientific R&D sector also significantly contributes to the life sciences sector. The estimates suggest that the life sciences sector supports over £1.5bn directly, and over £2.8bn in output across the whole economy given spill over effects.

These results highlight the significant contribution that research and development in the pharmaceutical and life sciences sectors make to the Northern Ireland economy.

Promoting investment, trade and exports

Attracting inwards investment and securing global trade opportunities will be crucial for Northern Ireland's recovery and long-term growth.

The [Health Innovation Research Alliance Northern Ireland \(HIRANI\)](#) supports Northern Ireland's life & health sciences sector with ambitions of increasing investment into this ecosystem, allowing it to grow to its full potential.

However, HIRANI's work goes beyond supporting collaboration within life and health sciences. It also acts as a voice for the sector.

The alliance provided [evidence](#) to the [Investment in Northern Ireland Inquiry](#) in January 2022. This evidence highlighted three areas, within the UK Government's jurisdiction, that could improve investment into Northern Ireland's life and health sciences sector:

- Regulatory advocacy to mitigate losses due to divergence of Great Britain from Northern Ireland;
- Encourage investment through Trusted Health Innovation Networks (similar to those in England); and,
- A strength in Places Diagnostics Cluster to build on strengths, promote collaboration and create skilled jobs.

ABPI Northern Ireland in [response](#) to the same enquiry highlighted areas of investment opportunity:

- Broadening opportunities for patients to participate in research will significantly enhance Northern Ireland's attractiveness as a place to conduct clinical research. Health research is a global endeavour, generating substantial return on investment.
- A structured and defined path to access health data for academia and business would create an engine for major scientific investment and advancement.

Further to this, the various City Region deals across Northern Ireland highlight the need for anchors in local economies to provide an attractive base for new investment.

The [Derry City & Strabane Districts Inclusive Strategic Growth Plan](#) details the need for highly skilled jobs, infrastructure and high value goods and services, amongst others, to drive inward investment in Northern Ireland.

The [Belfast City Region Deal](#) also aims to deliver projects that help support economic recovery, but also facilitate investment in a business base with the greatest long term growth potential that can improve infrastructure and drive trade and tourism in Northern Ireland.

In terms of trade, there remain significant challenges caused by the Northern Ireland Protocol.

From the 1st January 2021, the New Protocol began influencing the regulation of Northern Ireland's trade with the European Union and Great Britain, leading to trade friction between Northern Ireland and its largest trading partner, Great Britain.

The [Fraser of Allander Institute](#) found that chemicals and pharmaceuticals are among the most impacted industries in Northern Ireland by the new trade arrangements.

Over the past decade, pharmaceuticals have been one of the top 10 most traded items globally.

In 2020, pharmaceutical goods were the 3rd most exported product in Northern Ireland, with £500m worth of exports. They were also the 4th most imported good, with £300m in medicinal and pharmaceutical products imported⁵.

Using the 2017 supply and use tables, exports by destination for Northern Ireland can be analysed.

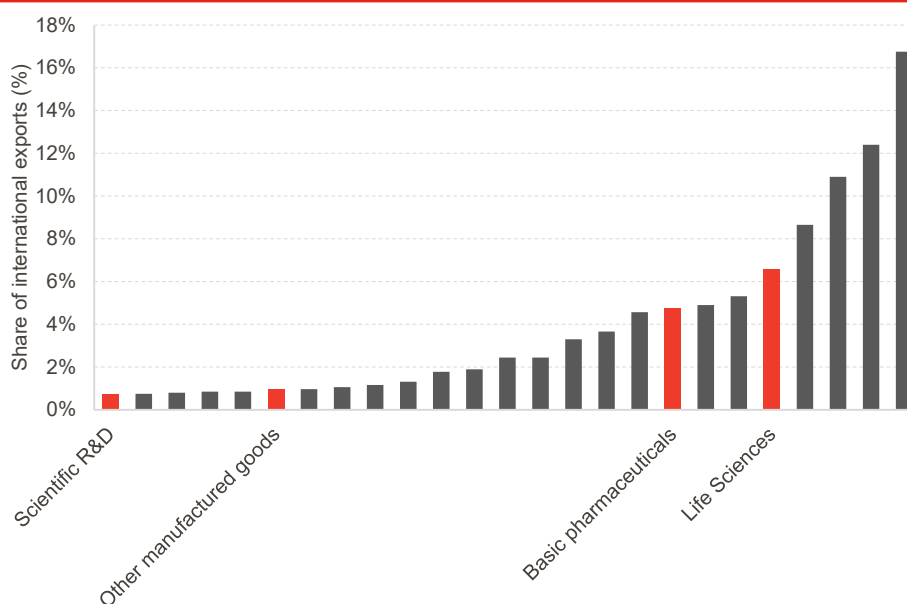
In general, Northern Ireland tends to export more goods to the Republic of Ireland and the other nations of the United Kingdom than internationally, with 72% of exports going to the ROI and rUK.

On the other hand, the estimates suggest that both the manufacturing of pharmaceuticals and the wider life sciences⁶ sectors have a strong international presence, given that they export a higher value of goods and services internationally, than to ROI and rUK.

In 2017, the manufacturing of pharmaceuticals sector was the 8th highest international exporter of goods and services in value terms, and exports from the sector accounted for 5% of all international exports from Northern Ireland, and 1.3% of total exports.

Exports from the life sciences sector also contributed significantly to Northern Ireland's international presence, coming in as the 5th highest international exporting sector. Aggregated exports from the component sectors accounted for 7% of all international exports, and 1.8% of total exports from Northern Ireland, **Chart 3**.

Chart 3: Share of international exports by IO sector, Northern Ireland, 2017



Source: NISRA, FAI calculations

Commercial clinical research also contributes significant economic benefits, generating an estimated income of £355 million for the NHS in England in 2018/2019, as stated in the [September 2021 ABPI clinical research report Clinical research in the UK: an opportunity for growth](#).

The [Institute of Research Excellence for Advanced Clinical Healthcare](#) (iREACH) aspect of the Belfast Region City Deal presents an opportunity to enhance commercial clinical research in

⁵ See [NISRA Trade Analysis](#)

⁶ The value of exports figures for SIC21, SIC72 and SIC32 have been aggregated to estimate life science exports.

Northern Ireland. This will bring the dual benefits of increased engagement of the Northern Ireland population in clinical trials and attracting industry collaboration and investment.

In turn this should enhance productivity and create high-value jobs/skills in clinical trial operations. This will help provide the ecosystem for development of spinout companies and attracting investment into the health and life sciences sector in Northern Ireland.

As well as a strong international trade presence, two key factors in attracting inward investment to an economy are the state of technology and strong economic growth.

Our estimates suggest that the manufacturing of pharmaceuticals directly supports over £280m in gross value added, which increases to over £490m once spill-over effects into the wider economy are accounted for.

When accounting for R&D, the wider pharmaceuticals sector directly supports £400m in GVA, which rises to £1bn across the whole economy after considering knock on effects.

As discussed, health and life sciences has been identified as a key sector at the forefront of Northern Ireland's economic recovery plan. The estimates suggest that life sciences directly generates £530m in GVA, which rises to £1.3bn across the whole Northern Ireland economy.

These results suggest that the pharmaceuticals and wider life sciences sectors not only contribute heavily to the economy of Northern Ireland, but also have strong international reputations. The output generated and jobs supported by the sector can support Northern Ireland in attracting inward investment and boost the already strong presence Northern Ireland has in the global economy.

Case Study: *Bristol Myers Squibb*

Bristol Myers Squibb (BMS) is a research based global bio-pharmaceutical company with research investments made within the health service, academia and local business in Northern Ireland.

BMS Product Development and Clinical Supply Chain groups have a long-established relationship with the Almac Group site in Craigavon. BMS and Almac Clinical Services have collaborated extensively to support multiple clinical studies. They are presently providing support to at least 14 clinical development programmes across the BMS portfolio.

This support ranges from packaging of investigational medicinal product and repackaging of commercial drug product for use in clinical trials, QP Certification and subsequent shipment to clinical trial sites and depots. In 2021 BMS invested nearly £10m with Almac to deliver 10,000 shipments to support BMS trial protocols, combined with 150 QP certifications.

In addition, BMS has also worked with Almac Sciences to optimise the chemistry and yields of chemical processes of new active pharmaceutical ingredients, and on specialist manufacturing procedures for new drugs.

Building a greener economy

In rebuilding a better economy, Northern Ireland should ensure that economic growth is sustainable and acts to tackle the ongoing climate crisis.

Northern Ireland's Department for Agriculture, Environment and Rural Affairs (DAERA) [Draft Green Growth Strategy](#) outlines Northern Ireland's ambitions to grow the economy in a sustainable way, balancing climate action, the quality of the environment and green jobs.

The Green Growth Strategy highlights the opportunities that City Deals^{7,8}, will present in the coming years in tackling the climate crisis, noting the significant contribution from sectors like life sciences, given that sustainability is a key priority for the industry.

The DfE also aims to support a green recovery from COVID-19 through:

- a circular economy, and
- a low carbon workforce.

In the wake of COP26, the commitment to reducing global greenhouse gas emission has also intensified.

A significant number of firms have now made commitments to achieving net zero to support a just transition to clean energy, in line with the UK governments target of a net zero carbon economy by 2050. The contribution by the Pharmaceutical Sector is captured on the [ABPI website](#), detailing company case studies.

Case Study: Novartis

Global pharmaceutical company Novartis uses innovative science and technology to address some of society's most challenging healthcare issues.

Novartis also holds itself to the highest standards of sustainability and ethical business practices. The organisation takes bold steps to increase access to medicines, tackle complex global health challenges and play their part as a responsible corporate citizen. This includes a clear commitment to using resources efficiently and reducing greenhouse gas emissions. As a result, Novartis has [pledged to achieve net-zero carbon emissions across the value chain by 2040](#). This bold and ambitious target calls for similar commitments to be made by their suppliers.

In 2020, Novartis launched a revised version of their '[Third Party Code](#)' that strengthens their environmental sustainability focus and outlines the need to act beyond legal compliance to actively minimise the environmental impact of supply operations and products over their lifecycle.

In 2021, Novartis introduced a '[Novartis Green Expectations from Suppliers](#)' framework, which outlines supplier requirements to support the journey to carbon neutrality. This framework established clear objectives and deliverables, whilst also detailing how these will be monitored over time.

7 [Derry~LondonDerry and Strabane City Region Deal](#)

8 [Belfast City Region Deal](#)

Total greenhouse gas (GHG) emissions⁹ in the manufacturing of pharmaceuticals sector was 745 thousand tonnes in 2019 in the UK, with the sector placing 66th amongst the 131 sectors of the UK economy.

We can also estimate a greenhouse gas intensity for the manufacturing of pharmaceuticals sector i.e. the tonnes of GHG emissions emitted relative to the GVA of the sector.

The estimates suggest that whilst the sector has greenhouse gas emissions in line with UK average, it has a lower emissions intensity given the high gross value added it generates i.e., for every £1m of GVA, the sector produces relatively low levels of GHG emissions in comparison to other sectors.

However, one of the drawbacks of analysing just direct emissions factors is that it accounts for only the emissions produced directly by the sector and not for the full life cycle of the products and services produced in the sector.

Embodied carbon is the more accurate measure of emissions given that it captures the CO₂ produced during the entire production of goods and services by a sector, such as the extraction and storage of materials etc.

For example, if we consider a construction firm building a new road, direct emissions factor may only account for emissions produced in paving the road, and so emissions may appear lower. If we count for the embodied carbon, this will calculate the emissions during the extraction of the materials, the transportation of it to the site and then actual paving of the road¹⁰.

Whilst data for Northern Ireland currently doesn't exist, the Scottish Government currently produce estimates¹¹ for tonnes of CO₂ equivalent per £1m final demand e.g. household spending, government spending, exports etc., which give insight to the amount of embodied carbon produced by sector.

Using economic multipliers for Scotland and UK-wide emission-output factors, the estimates provide direct effects as well as indirect and induced effects by IO sector, **Chart 4**.

Box 1: Definition of effects

Direct effects relate to the carbon emitted by the sectors own activities, similar to our definition in Section 3. Put simply the direct effect relates to the carbon produced from the actual manufacturing of pharmaceutical products.

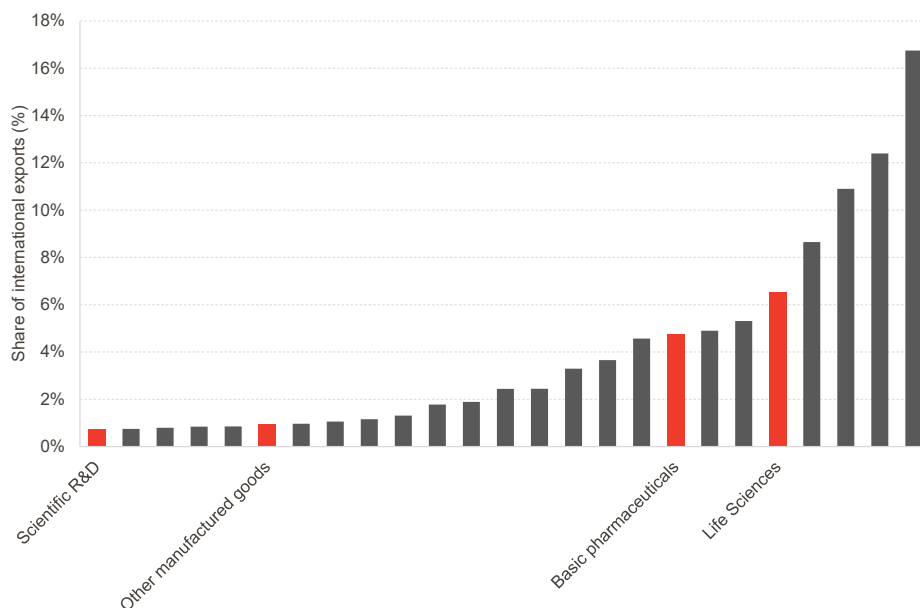
The indirect effects capture the wider carbon emitted from pharmaceuticals activities. These capture the carbon produced from supply chains of the sector, for example, the carbon produced by the extraction of a mineral that is eventually purchased by the sector to produce a new drug. This includes both domestic carbon produced i.e., carbon produced throughout the supply chain in Scotland (Northern Ireland), and imported carbon i.e., purchasing from a sector outside Scotland (Northern Ireland) which produces carbon.

⁹ GHG emission are defined as mass of air emissions per annum in thousand tonnes of carbon dioxide equivalent

¹⁰ It is important to note, however, that this measure accounts only for the construction of the road and would not capture the carbon produced from the actual usage of it.

¹¹ See [Scottish Government](#)

Chart 4: Tonnes of Carbon Dioxide equivalent per £1m final demand in 2022/23 prices, Scotland



Source: Scottish Government

Whilst these results are for Scotland, they give some indication as to the embodied carbon produced by the manufacturing of pharmaceuticals and other associated sectors' activities i.e., the carbon emitted across the whole economy because of pharmaceuticals activity.

The estimates suggest that the overall manufacturing of pharmaceuticals sector produces lower levels of carbon when compared to the other sectors of the Scottish economy. Put simply, this means that the actual production and manufacturing of pharmaceuticals produces relatively low levels of carbon in relation to value of goods and services it sells.

The sector incurs the majority of its 'carbon cost' through its supply chain, both domestically and international. With an indirect effect over 4 times higher than its direct effect.

Summarising the results

Table 1 to Table 3 summarise the modelling results for the 3 sector groups of interest.

As mentioned throughout, these results are not directly comparable to that of the previous report given the definition of both the wider pharmaceuticals and life sciences sector have been updated to include the wholesale element of pharmaceuticals.

Including the wholesale of pharmaceutical goods sector not only helps to give a better reflection of pharmaceutical activities in Northern Ireland, but also helps to improve the economic contribution of the sector to the economy of Northern Ireland.

Table 1: Economic impact of the manufacturing of pharmaceuticals industry, 2017

	Output (£m)	Employment (FTE)	GVA (£m)
Direct	1,075	2,875	290
Indirect	425	3,550	200
Induced	500	5,075	300
Total	2,000	11,500	790

Source: FAI Calculations

*totals may not sum due to rounding

Table 2: Economic impact of the wider pharmaceuticals industry, 2017

	Output (£m)	Employment (FTE)	GVA (£m)
Direct	1,300	4,475	400
Indirect	500	4,200	225
Induced	625	6,450	375
Total	2,450	15,150	1,025

Source: FAI Calculations

*totals may not sum due to rounding

Table 3: Economic impact of the life sciences industry, 2017

	Output (£m)	Employment (FTE)	GVA (£m)
Direct	1,500	6,900	525
Indirect	550	4,775	275
Induced	775	7,875	450
Total	2,850	19,500	1,250

Source: FAI Calculations

*totals may not sum due to rounding

These results suggest that the Manufacturing of pharmaceutical sector directly 2,875 FTE jobs, which rises to 11,500 across the entire Northern Ireland economy once spill-over effects are accounted for.

Further to this, we estimate once we account for the wholesale and research nature of pharmaceuticals, the wider pharmaceuticals sector directly supports £1.3bn of economic output, which rises to £2.45bn across the whole economy.

The Life Sciences sector also contributes significantly to the Northern Ireland economy, with over £500m in GVA supported by the sector, which rises to £1.25bn once spill over effects into the wider economy are accounted for.

The results also suggest:

- For every 1 job supported in the manufacturing of pharmaceuticals sector, **3 jobs** are supported elsewhere in the economy.
- For every 1 job supported in the wider pharmaceuticals sector, **2.4 jobs** are supported elsewhere in the economy.
- For every 1 job supported in the life sciences ecosystem, **1.8 jobs** are supported elsewhere in the economy.

Contextualising the results

To further understand these results and contextualise the size of the economic contribution of the pharmaceutical sector, we can compare the manufacturing of pharmaceuticals sector to the accommodation sector¹² of Northern Ireland, **Table 4**.

The comparison suggests that the accommodation sector supports more FTE employment directly than the manufacturing of pharmaceuticals (**SIC21**) sector.

However, the pharmaceutical sector has much higher spillover effects into the wider economy, supporting more output, employment and GVA across the wider economy.

Table 4: Economic impact of the *manufacturing of pharmaceuticals* and *accommodation* sectors, 2017

	Output (£m)		Employment (FTE)		GVA (£m)	
	<i>SIC21</i>	<i>Accommodation</i>	<i>SIC21</i>	<i>Accommodation</i>	<i>SIC21</i>	<i>Accommodation</i>
Direct	1,080	500	2,875	9,400	290	350
Indirect	425	175	3,550	1,475	200	80
Induced	500	400	5,075	3,975	300	225
Total	2,000	1,075	11,500	14,850	790	650

Source: FAI Calculations

¹² The accommodation industry is defined as SIC55 and includes the provision of short-stay accommodation for visitors and tourists, as well as longer term accommodation for students, workers and other similar individuals.

Methodology

The results in this report are estimated using a model built on Northern Ireland's Input-Output (IO) tables for the latest year, 2017. IO tables outline the flow of goods and services in the economy for a given year. Similar to the previous report, the impact of Coronavirus in 2020 will not be known until tables covering the year 2020 are published.

Using the IO tables, we applied a Hypothetical Extraction Model (HEM). This can be seen as "shutting down" the sectors, or proportions of sectors to examine the resulting impact on the economy. The HEM extracts the sectors in which ABPI members operate from the Northern Ireland economy. This results in a reduction in economic activity across the whole economy.

By hypothetically removing the pharmaceutical sector from the Northern Ireland economy, we can then estimate the size of the remaining economy and calculate the difference between the original economy and the newly extracted economy as the contribution of the pharmaceutical sector.

Throughout this report we discuss the economic contribution of three different sectors using their standard industrial classifications (SIC) codes. These sectoral definitions differ on the previous report, given that we have added the Wholesale of Pharmaceutical Goods (SIC46.46) to better reflect the activities of pharmaceuticals in Northern Ireland, highlighted in **red**.

Basic pharmaceuticals:

- SIC21: Manufacturing of basic pharmaceuticals products and pharmaceutical preparations

Wider pharmaceuticals:

- SIC21: Manufacturing of basic pharmaceuticals products and pharmaceutical preparations
- **+SIC 46.46: Wholesale of pharmaceutical goods**
- SIC72: Scientific research and development

In 2017, the manufacturing of pharmaceuticals conducted 8% of total research and development in Northern Ireland therefore within this definition we assume the same proportion of the overall scientific R&D sector (SIC72) is made up by pharmaceuticals.

Life Sciences:

- SIC21: Manufacture of Basic Pharmaceutical Products and Pharmaceutical Preparations
- SIC32.5: Manufacture of medical and dental instruments and supplies
- **+SIC46.46: Wholesale of pharmaceutical goods**
- SIC72: Scientific research and development

Interpreting the results

We discuss economic impact figures, which are presented using output, GVA and FTE job estimates. These can be defined as:

Output: The value of sales of all goods and services produced in an economy. This is most easily thought of as similar to the turnover of firms. However, output is selected over turnover because a large amount of activity is not undertaken by just firms (e.g. Public Sector Spending).

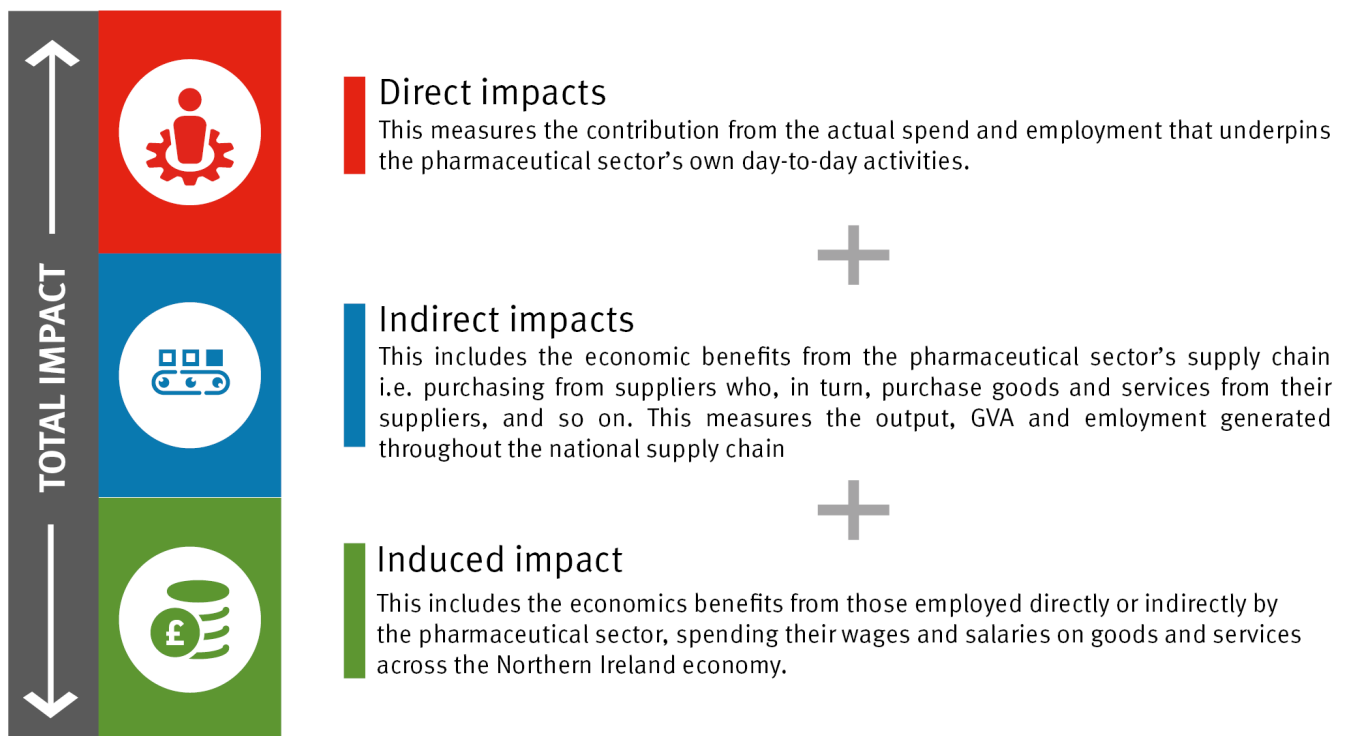
GVA: Gross value added (GVA) is the value of all final goods and services produced, and is a measure of the contribution to an economy.

GVA is a preferred measure to output as a firm could buy £1m of goods and sell these on for a further £1m – clearly no additional value has been created. GVA can be expressed generally as the difference between revenue from sales and the cost of inputs.

Full-time Equivalent (FTE) Jobs: a full-time job equals one FTE while a part-time job equals half an FTE.

Throughout this report we examine three types of economic impacts: direct, indirect and induced effects. **See Diagram 1.**

Diagram 1: Direct, Indirect and Induced effects definition



Source: Fraser of Allander Institute

Comparison of results

In the [previous report](#) we modelled the contribution of 3 variations of the pharmaceutical sector: the manufacturing of pharmaceuticals, wider pharmaceuticals and wider life sciences industry.

The definition of the wider pharmaceutical and life sciences sector in our previous report accounted for only the manufacturing and research elements associated with pharmaceuticals.

However, after discussions with ABPI Northern Ireland, it became clear that the majority of pharmaceuticals activities in Northern Ireland centred on the wholesale of these goods. Therefore we updated the definition to capture the activities of the sector responsible for the wholesale of pharmaceutical and medical goods, SIC46.46.

By updating the definitions of this sector to include the wholesale of pharmaceutical goods for this report, we are then unable to directly compare the results of that report to the estimates reported later in this report.

Tables 5 to 7 therefore compare the results of the 2020 report to the results produced by the updated model, using the **same** original sector definitions i.e., without the wholesale of pharmaceutical goods.

Table 5: Economic impact of the *manufacturing of pharmaceuticals* industry (2017 prices)

	Output (£m)		Employment (FTE)		GVA (£m)	
	Previous	Updated	Previous	Updated	Previous	Updated
Direct	1,150	1,075	2,750	2,875	300	290
Indirect	550	425	4,725	3,550	250	200
Induced	575	500	6,275	5,075	350	300
Total	2,250	2,000	13,750	11,500	925	800

Source: FAI Calculations

*totals may not sum due to rounding

Table 6: Economic impact of the *wider pharmaceuticals* industry (2017 prices)

	Output (£m)		Employment (FTE)		GVA (£m)	
	Previous	Updated	Previous	Updated	Previous	Updated
Direct	1,150	1,100	2,900	3,025	350	300
Indirect	550	425	4,775	3,600	250	200
Induced	575	500	6,350	5,150	350	300
Total	2,250	2,025	14,000	11,750	950	850

Source: FAI Calculations

*totals may not sum due to rounding

Table 7: Economic impact of the *life sciences* industry (2017 prices)

	Output (£m)		Employment (FTE)		GVA (£m)	
	Previous	Updated	Previous	Updated	Previous	Updated
Direct	1,350	1,300	5,000	5,400	425	425
Indirect	600	475	5,375	4,150	300	225
Induced	675	650	7,675	6,525	425	375
Total	2,625	2,425	18,050	16,050	1,150	1,025

Source: FAI Calculations

*totals may not sum due to rounding

Explaining these results

There can be a number of reasons for the change in results between the 2020 report and current report.

It could relate to changes employment by the sector and wider supply chain. FTE employment fell by around 2.5% across the whole Northern Ireland economy between 2016 (the base year of modelling in the previous report) and 2017.

However, it is more likely that the fall in economic contribution relates to changes in the Input-Output tables (IOTs), which describe the sales and purchase relationships between producers and consumers in an economy.

In particular, the purchasing composition of the sector has likely changed given the fall in the indirect effects. Put simply, this means that the pharmaceutical related sectors have changed the sectors in which they purchase their goods and services from between 2016 and 2017.

This would likely lead to the fall in the indirect effect, and as a result of knock on effects, reducing the induced effects, therefore the contribution of the sector has fallen.

Appendices

Appendix 1: Level of skill by occupation, Northern Ireland

Skill Level	SOC Codes	Description
4 (Highest Skilled)	11	Corporate managers and directors
	21	Science, research, engineering and technology professionals
	22	Health professionals
	23	Teaching and educational professionals
	24	Business, media and public service professionals
3	12	Other managers and proprietors
	31	Science, engineering and technology associate professionals
	32	Health and social care associate professionals
	33	Protective service occupations
	34	Culture, media and sports occupations
	35	Business and public service associate professionals
	51	Skilled agricultural and related trades
	52	Skilled metal, electrical and electronic trades
	53	Skilled construction and building trades
2	54	Textiles, printing and other skilled trades
	41	Administrative occupations
	42	Secretarial and related occupations
	61	Caring personal service occupations
	62	Leisure, travel and related personal service occupations
	71	Sales occupations
	72	Customer service occupations
	81	Process, plant and machine operatives
1 (Lowest Skilled)	82	Transport and mobile machine drivers and operatives
	91	Elementary trades and related occupations
	92	Elementary administration and service occupations

Source: NISRA

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