

Characteristics and performance of businesses reporting Research and Development expenditure

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Summary

This paper explores cohorts of business that carried out Research and Development over the periods 2015-17 and 2016-18. By linking data from the Northern Ireland Statistics and Research Agency's Research and Development survey (R&D) and the Broad Economy Sales and Exports Statistics (BESES) a fuller and more detailed analytical picture of R&D businesses, their characteristics and level of growth was made possible.

Due to similarities between R&D business characteristics in both periods this paper focusses on developing two cohorts for the latest period, 2016-18. The first cohort was the R&D panel which contained businesses who carried out R&D in the R&D annual data in 2016 and were in the linked R&D/BESES dataset in 2018. For comparison, the second cohort was the BESES panel which consisted of all businesses in BESES in both 2016 and 2018.

There has been an element of trade off from using the linking and matching methodology. Whilst using the methodology has reduced the coverage of businesses, with the largest impact being on the coverage for small businesses and the services sector, the businesses present in the R&D panel accounted for the majority of employment, turnover and R&D expenditure reported in the annual data, as well as the linkage providing the opportunity to delve in to the available business information offered by the BESES.

The main findings show that:

- Exploring the performance of the businesses in the R&D panel against the BESES panel, shows that levels of growth were higher for businesses in the R&D panel for sales of goods and services, service

exports, turnover¹, employment and purchases. That is, businesses reporting business expenditure on R&D appear to outperform businesses in the wider economy.

- Businesses in the R&D panel that sold services had higher levels of growth than those that sold goods. Just over half of services businesses had growth in the sale of services of 20% or more, compared to 46% of R&D businesses who sold goods. Both these figures were higher than the corresponding businesses in the BESES panel (39% who had growth in sales of services of 20% or more; 37% who had growth in sale of goods of 20% or more).
- Growth in exports showed that the level of growth was higher for businesses that exported services in the R&D panel with 55% having 20% or more growth in service exports compared to 46% of businesses that exported services in the BESES panel, and 50% of businesses that exported goods in the R&D panel.
- Services businesses in the R&D panel had the highest proportion of businesses with 20% or more growth in turnover (55%), considerably higher than those in the services sector in the BESES panel (34%) or in the Manufacturing sector in both panels (both 41%).
- The levels of contraction in sales, exports, turnover, employment and purchases were lower within businesses in the R&D panel compared to the BESES wider economy panel.

Taken in the round, the results of this novel approach to the linkage of data cross source and longitudinally reflects a beneficial relationship between business performance and R&D albeit, for some businesses, increased performance may act as a stimulus for R&D whilst for others, R&D is a driver for improved business performance.

¹ Turnover is defined as total sales and work done. This is calculated by adding to the value of sales of goods produced, goods purchased and resold without further processing, work done and industrial and non-industrial services rendered.

Introduction

The '[10x Economy – an economic vision](#)' was launched on the 11 May 2021 by the Department for the Economy, it sets out the vision for Northern Ireland's decade of innovation, which will encourage greater collaboration and innovation to deliver a ten times better economy intended to provide inclusive benefits for both people and place.

Innovation is one of the primary drivers of economic growth, underpinning the growth of the best performing regional and national economies across the world. Innovation enables firms to stay ahead of competitors, and with global economic conditions remaining challenging. In that context, work was taken forward to develop a novel linkage approach to maximise the analytical potential of available data sources.

One area of Innovation that has been measured for some time is business expenditure on Research and Development. The Northern Ireland Statistics and Research Agency (NISRA) Research and Development survey (R&D) measures total R&D expenditure and the number of companies identified as carrying out research and development each year.

Separately, NISRA also reports on the value of sales and purchases by NI businesses in the Broad Economy Sales and Exports Statistics (BESES). Utilising a novel approach, it was hoped that by linking businesses within the BESES trade data to businesses in the R&D survey, the characteristics and performance of businesses reporting expenditure on R&D could be compared to the characteristics and performance of other businesses in the economy over time.

Method

R&D 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.

Business expenditure on R&D (commonly referred to as BERD) constitutes the largest component of total R&D activity and the data to inform this component of R&D are collected in the NI Research & Development Survey administered by the Economic & Labour Market Statistics Branch of NISRA.

The definition of R&D adopted for the purposes of the NI R&D survey 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 R&D survey is issued as an annual census of R&D businesses identified from previous surveys who had returned or had estimated a total R&D expenditure greater than zero or businesses reporting positively to the R&D filter question in the Annual Business Inquiry survey; other identified potential R&D performers (principally those companies who had received assistance from Invest NI during the previous year); and companies newly identified to ONS as R&D spenders. Further information and outputs for the R&D survey can be found at [Research and Development | Northern Ireland Statistics and Research Agency \(nisra.gov.uk\)](https://www.nisra.gov.uk/research-and-development).

The Broad Economy Sales and Exports Statistics (BESES) is an annual measure of local businesses' sales to markets both inside and outside NI including external sales to Great Britain and exports.

BESES data is gathered through the Northern Ireland Annual Business Inquiry (ABI) and has been running since 2011. The ABI surveys all businesses with 50 or more employees; all multi-site businesses with 20-49 employees; all manufacturing businesses with more than 5 employees; and a representative sample of other smaller businesses. In all, the ABI samples about 20% of the eligible business population each year. The BESES is weighted to provide population level estimates, and includes² the production, distribution and services industries in Northern Ireland but excludes public sector activity for the most part.

To explore the characteristics of business that carry out R&D and their level of growth compared to other businesses in the economy, two business cohorts were identified, referred to here as the R&D panel and the BESES panel.

To create the panels for comparison for this study, the R&D data and BESES data were linked by their unique reporting unit identifier for each year. Businesses that carried out R&D and were present in both the start and end years of a 3 year period comprised two separate R&D panels. That is, businesses who reported R&D expenditure in both 2015 and 2017 and in both 2016 and 2018 were identified for two separate R&D panels. The same approach was taken with businesses in the BESES data regardless of whether the business had carried out R&D and comprised two separate comparative BESES panels for the periods 2015-17 and 2016-18.

²The ABI covers roughly two thirds of the total NI economy. Details of the sample coverage of BESES/ABI can be found at [ABI sample coverage | Northern Ireland Statistics and Research Agency \(nisra.gov.uk\)](https://www.nisra.gov.uk/abi-sample-coverage)

Linking the R&D businesses to BESES data both across source and longitudinally provided the opportunity to expand the amount of analyses that could be done. The key strength to cross-source linkage is to allow for the information in each source to be combined expanding the information available and to offer the opportunity to investigate the data in an innovative way.

Inevitably, not all businesses within both the R&D data and the BESES data could be linked longitudinally. On that basis, it was possible that the characteristics of the R&D and BESES panels might differ from the unlinked annual data due to the data linkage approach taken and could introduce bias into the analyses. To assess the similarity of the business characteristics of the linked R&D and BESES panels to their respective annual data, the business characteristics in the base year for the linked R&D and BESES panels were compared to the characteristics of the annual R&D and BESES base year data. Differences over time in the performance of those businesses reporting R&D expenditure were compared to the same performance measures for businesses in the BESES data, reflecting the economy as a whole regardless of whether the business reported expenditure on R&D or not.

Results

R&D survey overview

The overriding picture from the annual R&D survey results is that Northern Ireland is dependent on a relatively small number of companies for a significant proportion of R&D expenditure. In 2016 three quarters of total R&D spend was by the highest spending 10% of R&D companies, with the ten biggest spending companies accounting for 39% of all business R&D spend.

Large businesses, businesses that are externally owned and those businesses in the Manufacturing sector, by themselves and combined, also account for a considerable amount of R&D expenditure.

In 2016, companies with 250 or more employees represented 8% of all R&D performing companies but accounted for 50% of business R&D expenditure (BERD) with the majority of spending by externally owned firms (76%).

A small number of externally-owned businesses (17%), accounted for the majority of R&D expenditure (60%).

In 2016 the majority of R&D expenditure was in the Manufacturing sector (59%), with the bulk of it carried out by externally-owned companies (71%).

Comparing the characteristics of all R&D businesses to those in the R&D panels

The novel linkage and matching methodology deployed here will inevitably result in differences in coverage of businesses within the panels and their comparative annual data. The following analyses examines the similarities and differences in the characteristics of those R&D businesses linked and matched in the R&D panels with those businesses in the comparator annual data.

Table 1 compares key characteristics of the two R&D panels (1: businesses who carried out R&D in 2015 and were in the linked file in 2017, 2: businesses who carried out R&D in 2016 and were in the linked file in 2018) to all R&D businesses in 2015 or 2016 as reported in the R&D annual data.

Although, the number of businesses in the R&D panels accounted for just under half of all R&D businesses in both years, their share of the total number of employees and turnover accounted for over 80% of all R&D businesses for both annual comparator years. Some variability was seen in relation to BERD, with the R&D panels making up 81% of the BERD in the 2015 annual data and 73% with the 2016 annual data.

On that basis, whilst the number of businesses reporting R&D in the panels were just under half of all R&D businesses in the comparator annual data, those businesses present in the two R&D panels accounted for the majority of employment, turnover and R&D expenditure reported in the annual data.

Table 1: The number of businesses, total employees, total turnover and BERD in the R&D panels and in all R&D businesses in 2015 and 2016

Base Year	Number of businesses		Total number of employees		Total Turnover (£m)		Total BERD (£m)	
	R&D panel	All R&D	R&D panel	All R&D	R&D panel	All R&D	R&D panel	All R&D
2015	335	713	56,674	66,426	10,026	11,768	435	539
2016	342	748	56,957	69,976	10,314	12,732	385	524

Given the similar characteristics and results between the 2015 and 2016 years and their respective R&D panels, the following analyses focus on 2016 as the comparator annual data and the corresponding 2016-18 R&D panel.

Table 2 explores the share of the total number of employees, turnover and BERD by businesses size. For both the 2016-18 R&D panel and all R&D businesses in 2016, the largest number of businesses fall into

the 0-49 business size group, however the proportion of businesses in this group is lower in the R&D panel (54% compared to 70%).

There was a greater proportion of large businesses in the 2016-18 panel than all R&D businesses in 2016 (15% compared to 8%) and the relatively smaller number of larger businesses in the R&D panel account for more turnover (61%) and BERD (63%) compared to R&D businesses in 2016 (54% and 50% respectively).

As the R&D panel is linked to the BESES, differences between the R&D 2016-18 panel and the 2016 annual data in coverage, can be explained by the sample coverage of BESES. Larger businesses are more likely to be included in the BESES over time, whilst smaller businesses, being more numerous, are sampled. Smaller businesses are therefore less likely to be in the BESES over two separate years whilst the larger businesses with more employment and higher turnover will be more likely to be captured in each year's BESES data.

Table 2: The proportion of businesses, total employees, total turnover and BERD spend by business size for the 2016-18 R&D panel and 2016 annual R&D

Business size	% of total number of businesses		% of total number of employees		% of total Turnover (£m)		% of total BERD (£m)	
	R&D panel	All R&D	R&D panel	All R&D	R&D panel	All R&D	R&D panel	All R&D
Small 0-49	54%	70%	7%	11%	21%	22%	15%	21%
Medium 50-249	32%	22%	20%	25%	18%	24%	22%	29%
Large 250+	15%	8%	73%	64%	61%	54%	63%	50%
Total	100%	100%	100%	100%	100%	100%	100%	100%
Total number/value	342	748	56,957	69,976	10,314	12,732	385	524

Table 3 looks at the coverage of the 2016-18 R&D panel compared to all R&D businesses in the 2016 R&D annual data. Businesses in the small 0-49 band in the 2016-18 R&D panel comprise a third of the number of small R&D businesses in the 2016 R&D annual data. However, the small businesses in the 2016-18 R&D panel account for over half of the total number of employees and BERD and 79% of total turnover seen in the small R&D businesses in the 2016 annual data. Most large businesses (88%) are captured within the 2016-18 R&D panel, with 91% of turnover and 93% of BERD of large businesses in the 2016 R&D annual data being captured.

Despite the lower number of businesses seen within the 2016-18 R&D panel when compared to the businesses in the annual 2016 data, the majority of employment, turnover and BERD in the annual data is being captured within the matched and linked R&D panels.

Table 3: The percentage coverage of the R&D panel for 2016-18 compared to all R&D businesses in 2016 for the number of businesses, employees, total turnover and BERD by business size

Business size	Number of businesses % coverage of R&D panel to all R&D	Total number of employees % coverage of R&D panel to all R&D	Total Turnover % coverage of R&D panel to all R&D	Total BERD % coverage of R&D panel to all R&D
Small 0-49	35%	54%	79%	52%
Medium 50-249	65%	64%	59%	56%
Large 250+	88%	93%	91%	93%
Overall	46%	81%	81%	73%

In relation to industrial sector composition, Table 4 shows that the majority of businesses in the 2016-18 R&D panel are in the Manufacturing sector (63%), accounting for around two thirds of turnover and BERD. The makeup of the number of the 2016 annual R&D businesses is more evenly split between Manufacturing (48%) and Services (46%), but Manufacturing does (again) account for the greatest proportion of turnover (64%) and BERD (59%).

Table 4: The proportion of businesses, total employees, total turnover and BERD spend by sector for the 2016-18 R&D panel and 2016 annual R&D

Industry sector	% of total number of businesses		% of total number of employees		% of total Turnover (£m)		% of total BERD (£m)	
	R&D panel	All R&D	R&D panel	All R&D	R&D panel	All R&D	R&D panel	All R&D
Manufacturing	63%	48%	74%	70%	66%	64%	67%	59%
Services	32%	46%	22%	25%	28%	29%	32%	40%
Other	5%	5%	4%	5%	6%	7%	1%	2%
Total	100%	100%	100%	100%	100%	100%	100%	100%
Total number/value	342	748	56,957	69,976	10,314	12,732	385	524

Comparing the coverage of the 2016-18 R&D panel to the 2016 annual R&D businesses; Table 5 shows that the manufacturing businesses in the 2016-18 R&D panel are 60% of the number of all 2016 annual R&D manufacturing business. However, the 2016-18 R&D panel accounts for over 80% of the total number of employees, turnover and BERD of those R&D businesses in the 2016 annual data.

In relation to services businesses, the 2016-18 R&D panel accounts for a third of the number of businesses in the 2016 annual R&D data, however, they account for around three quarters of the total number of employees and turnover, and 59% of BERD of services businesses in the 2016 annual R&D data.

Table 5: The percentage coverage of the R&D panel for 2016-18 compared to all R&D businesses in 2016 for the number of businesses, employees, total turnover and BERD

Industry sector	Number of businesses % coverage of R&D panel to All R&D	Total number of employees % coverage of R&D panel to All R&D	Total Turnover % coverage of R&D panel to All R&D	Total BERD % coverage of R&D panel to All R&D
Manufacturing	60%	86%	83%	84%
Services	32%	72%	78%	59%
Other	43%	63%	75%	54%
Overall	46%	81%	81%	73%

The novel matching and linking methodology deployed with the R&D survey data resulted in R&D data which was supplemented with additional business information derived from the BESES data. However, and inevitably, the matching and linkage resulted in a smaller number of businesses in the R&D panels than are present in the annual R&D data. As seen above however, the majority of the employment, turnover and BERD has been captured within the R&D panels as compared to the annual R&D data.

Comparing the characteristics of all BESES businesses and BESES panel in 2016

To create an appropriate economy-wide comparator that was as similar as possible to the construction of the R&D panels, the same panel construction utilising the same matching and linkage approach was performed separately with BESES data.

Table 6 compares the two BESES panels (businesses who were in the BESES in 2015 and 2017 and in both 2016 and 2018) and all businesses included in the BESES for 2015 and 2016, which represents two thirds of the whole economy. In 2016, businesses in the BESES panel accounted for a just under a quarter of all businesses within the economy, however they accounted for six in ten employees and just under two thirds of turnover. This reflects the sample coverage of the BESES in that larger businesses are more likely to be included in the BESES each year whilst smaller businesses, being more numerous, are sampled. Smaller businesses are therefore less likely to be included in the BESES over two separate years whilst the larger businesses with higher levels of employment and turnover will be more likely to be captured in each year's data.

Table 6: The number of businesses, total employees, and total turnover in the BESES panels and all BESES businesses for 2015 and 2016

Base Year	Number of businesses		Total number of employees		Total Turnover (£m)	
	BESES panel	All BESES	BESES panel	All BESES	BESES panel	All BESES
2015	14,034	50,587	358,728	555,381	48,115	67,085
2016	12,234	52,050	344,678	560,784	43,453	67,742

Looking specifically at the 2016-18 BESES panel and the annual 2016 BESES data, Table 7 explores the share of the total number of employees and turnover by businesses size. The majority of businesses in both the BESES panel and all BESES businesses fall in the 0-49 business size group (91% and 97% respectively). In the BESES panel these small businesses account for around a quarter of the total number of employees and turnover, but in the whole economy reflected by the BESES 2016 annual data, they account for a larger share of the total number of employees (44%) and turnover (38%).

Although large businesses (250+) comprise a small percentage of all businesses, as a group, they account for the largest proportion of turnover in the 2016-18 BESES panel (47%) and joint largest in the annual 2016 BESES (39%).

Table 7: The proportion of businesses, total employees and total turnover by business size in the 2016-18 BESES panel and 2016 annual BESES

Business size	% of total number of businesses		% total number of employees		% of total Turnover (£m)	
	BESES panel	All BESES	BESES panel	All BESES	BESES panel	All BESES
Small 0-49	91%	97%	23%	44%	25%	38%
Medium 50-249	7%	2%	26%	22%	29%	23%
Large 250+	2%	0%	51%	34%	47%	39%
Total	100%	100%	100%	100%	100%	100%
Total number/value	12,234	52,050	344,678	560,784	43,453	67,742

Compared to small and medium-sized businesses, large businesses in the 2016-18 BESES panel have the highest overlap with the 2016 annual BESES data in terms of business numbers (88%) and employees (92%) whilst medium sized businesses have the highest overlap in turnover (81%) (Table 8).

Table 8: The percentage coverage of the BESES panel for 2016-18 and the 2016 annual BESES for the number of businesses, employees and total turnover by business size

Business size	Number of businesses	Total number of employees	Total Turnover
	% coverage of BESES panel to all BESES	% coverage of BESES panel to all BESES	% coverage of BESES panel to all BESES
Small 0-49	22%	32%	42%
Medium 50-249	68%	72%	81%
Large 250+	88%	92%	76%
Total	24%	61%	64%

Table 9 shows that the majority of businesses in both the 2016-18 BESES panel (62%) and 2016 annual BESES (71%) are in the Services sector which accounts for the largest proportion of turnover (60% and 59% respectively).

Table 9: The proportion of businesses, total employees and total turnover by Industry sector in the 2016-18 BESES panel and 2016 annual BESES

Industry sector	% of total number of businesses		% total number of employees		% of total Turnover (£m)	
	BESES panel	All BESES	BESES panel	All BESES	BESES panel	All BESES
Manufacturing	18%	8%	20%	15%	25%	27%
Services	62%	71%	74%	76%	60%	59%
Other	20%	21%	6%	9%	15%	15%
Total	100%	100%	100%	100%	100%	100%
Total number/value	12,234	52,050	344,678	560,784	43,453	67,742

Table 10 compares the coverage of 2016-18 BESES panel to the whole economy reflected by the 2016 annual BESES data. The 2016-18 BESES panel makes up 21% of the number of services businesses in the whole economy in the annual 2016 BESES data, but accounts for 60% of their total number of employees and 66% of their turnover. For the manufacturing sector, the 2016-18 BESES panel accounts for just over half of all manufacturing businesses in the annual 2016 BESES data, but 80% of total employees and 61% of turnover.

Table 10: The percentage coverage of the BESES panel for 2016-18 and the 2016 annual BESES for the number of businesses, employees and total turnover by business size

Industry sector	Number of businesses	Total number of employees	Total Turnover
	% coverage of BESES panel to All BESES	% coverage of BESES panel to All BESES	% coverage of BESES panel to All BESES
Manufacturing	54%	80%	61%
Services	21%	60%	66%
Other	22%	43%	63%
Overall	24%	61%	64%

Utilising the same matching and linkage approach as used with the R&D data gives similar findings. The coverage of businesses in the BESES panel 2016-18 has been reduced to only one quarter of the whole economy in the annual 2016 BESES data, with the largest impact being on the coverage for small businesses and the services sector. However, the businesses present in the BESES panel accounted for

the majority of employment and turnover of the whole economy in the annual 2016 BESES data as well as creating an appropriate and consistently created economy-wide comparator for the R&D panel.

Comparisons between businesses in R&D and BESES in 2016

Businesses in the annual 2016 R&D survey accounted for just 1% of the total number of businesses in the annual 2016 BESES data but accounted for a disproportionate amount of employees (12%) and turnover (19%).

Looking at the characteristics of both, shows that a small proportion of large businesses in the 2016 R&D survey (8%) accounted for the majority of employees (64%) and turnover (54%) of the 2016 R&D survey, with the manufacturing sector accounting for the largest proportion of employees (70%) and turnover (64%).

On the other hand in the 2016 BESES data only 0.5% of businesses were large with less employees (22%) than small businesses (44%), but with a similar proportion of turnover (39%) as that of small businesses (38%). The services sector dominated the 2016 BESES data both in number of businesses (71%), number of employees (76%) and turnover (59%).

Results of the comparisons between the R&D panel and BESES panel 2016 to 2018

Comparing the characteristics of the R&D and BESES panels for 2016 to 2018

Comparing the R&D and BESES panels for 2016-18, utilises the matching and linkage approach and gives the opportunity to compare R&D businesses to an appropriate economy-wide comparator.

The businesses in the 2016-18 R&D panel accounted for just 3% of the number of businesses in the 2016-18 BESES panel, however they accounted for 17% of the total number of employees and 24% of turnover.

While most businesses in the BESES panel were small (0-49 employees) (91%), it was the small proportion of large (250+ employees) businesses (2%) that accounted for the largest proportion of employees (51%) and turnover (47%) in the BESES panel.

In the R&D panel 15% of businesses were large and they accounted for a considerably larger proportion of employees (73%) and turnover (61%) of the R&D panel 2016-18.

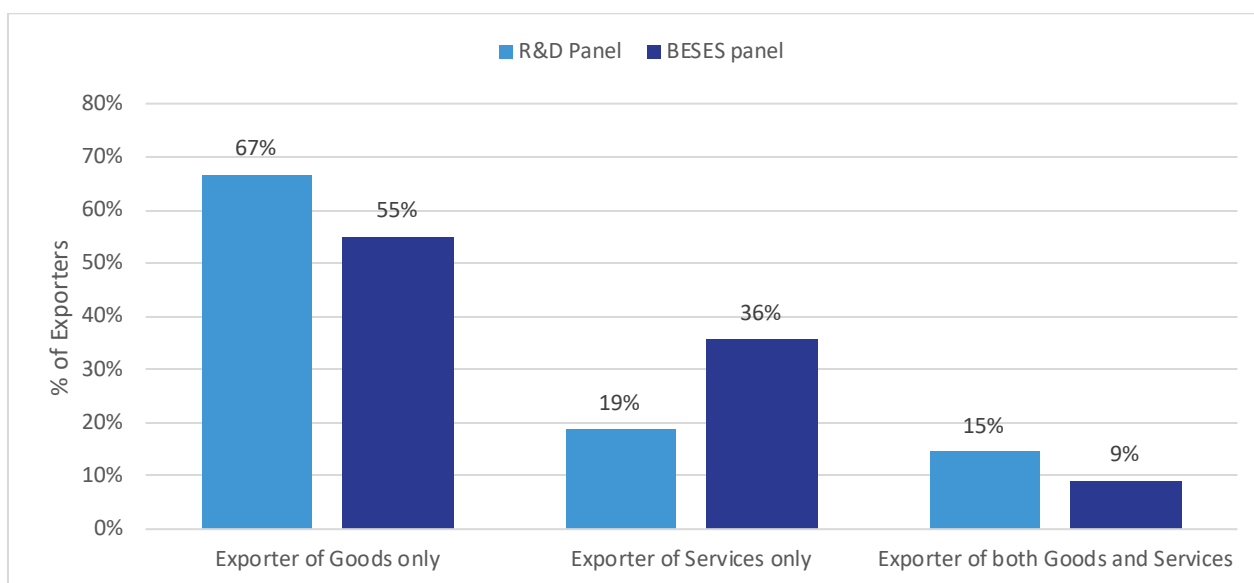
The majority of businesses in the R&D panel were made up of businesses in the manufacturing sector (63%), however the BESES panel was dominated by businesses in the services sector (62%), with only 18% of businesses in the manufacturing sector.

When looking at the coverage of the R&D panel to the BESES panel for 2016-18, manufacturing businesses in the R&D panel accounted for only 10% of manufacturing businesses in the BESES panel, but they accounted for 62% of the total number of employees and 61% of the total turnover of manufacturing businesses in the BESES panel.

Looking specifically at exporters³, just under 9 in 10 businesses in the R&D panel were exporters; over three times the proportion of businesses in the BESES panel (27%).

Figure 1 illustrates the different makeup of Exporters in each panel. The highest proportion of exporters in both panels exported goods only, however a larger proportion of the exporters in the R&D panel exported goods (67%) compared to the BESES panel (55%). Just over one in three exporters (36%) in the BESES panel exported services, considerably more than in the R&D panel (19%).

Figure 1: Type of exporters in the R&D and BESES panels



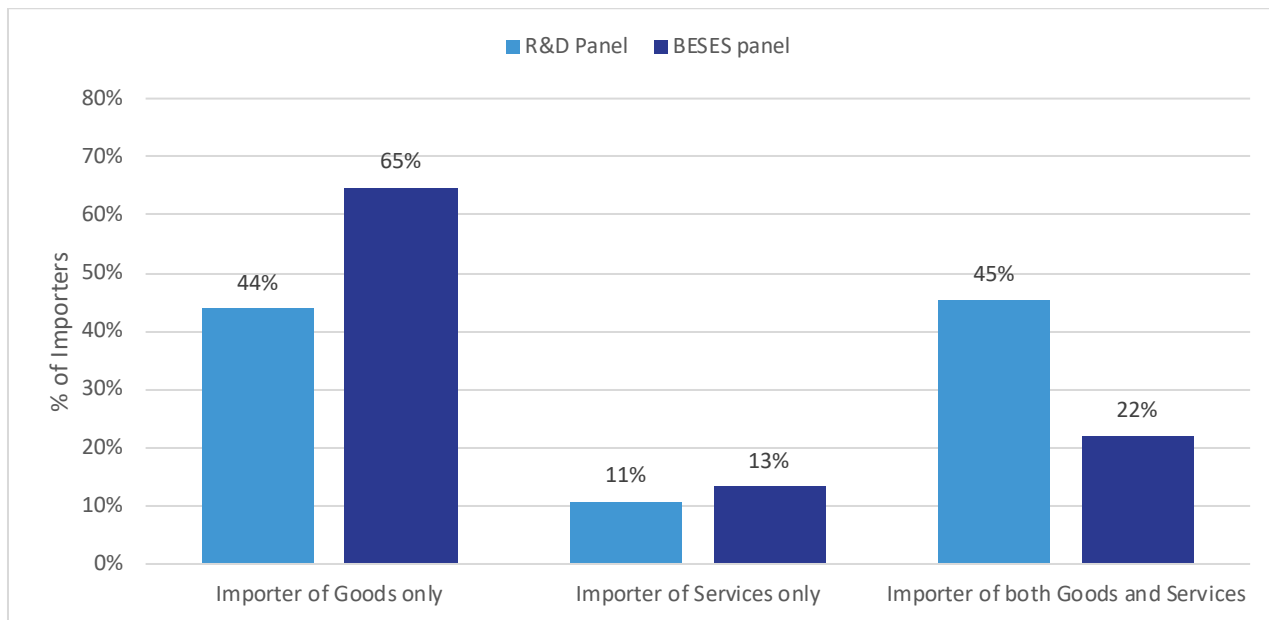
Three quarters of the R&D panel were importers⁴; three times the proportion of businesses in the BESES panel (25%). For all importers in the BESES panel, a higher proportion imported goods only

³ Exporters refers to businesses that sell goods and services outside NI and GB

⁴ This refers to the businesses that purchase goods and services from outside NI and GB

(65%), with 22% importing both goods and services. In the R&D panel a similar proportion of importers imported both goods and services (45%) and goods only (44%) (Figure 2).

Figure 2: Type of importers in the R&D and BESES panels

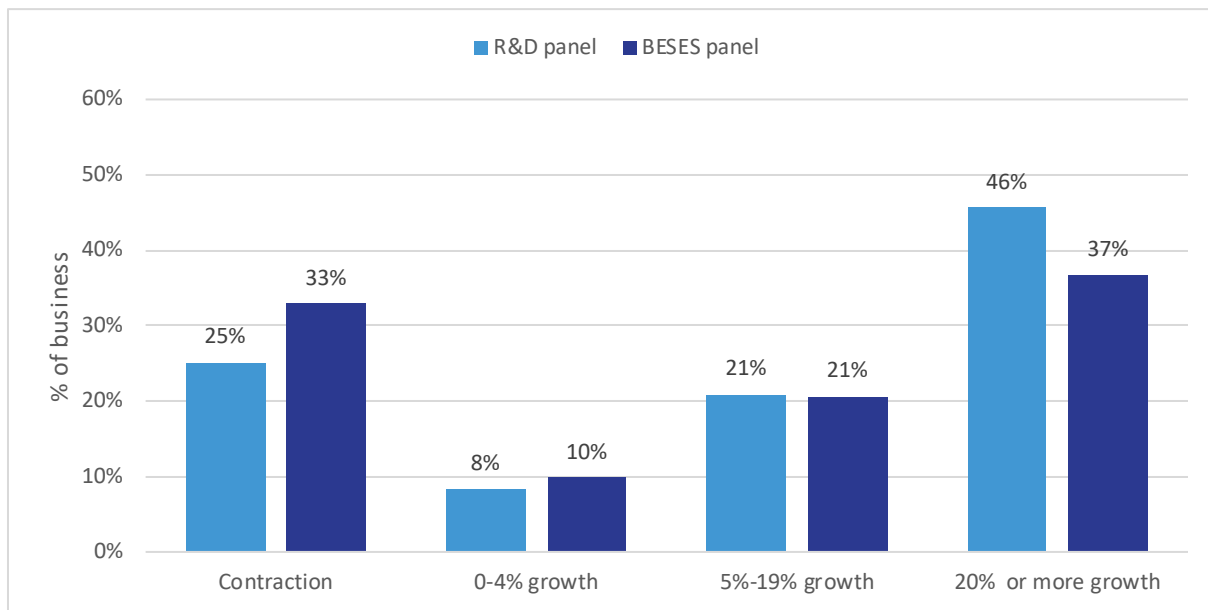


Sales outcomes comparisons between the R&D and BESES panels 2016 to 2018

Figure 3 shows the levels of growth between 2016 and 2018 in the sale of goods for each panel while figure 4 shows levels of growth in the sales of services for each panel.

Around two thirds of businesses in the R&D panel who sold goods or services had growth in the sale of goods or services respectively of 5% or more (Figures 3 and 4). This level of growth in sales was higher than that for businesses who sold goods in the BESES panel (57% growth in the sale of goods) and businesses who sold services in the BESES panel (58% growth in the sale in services).

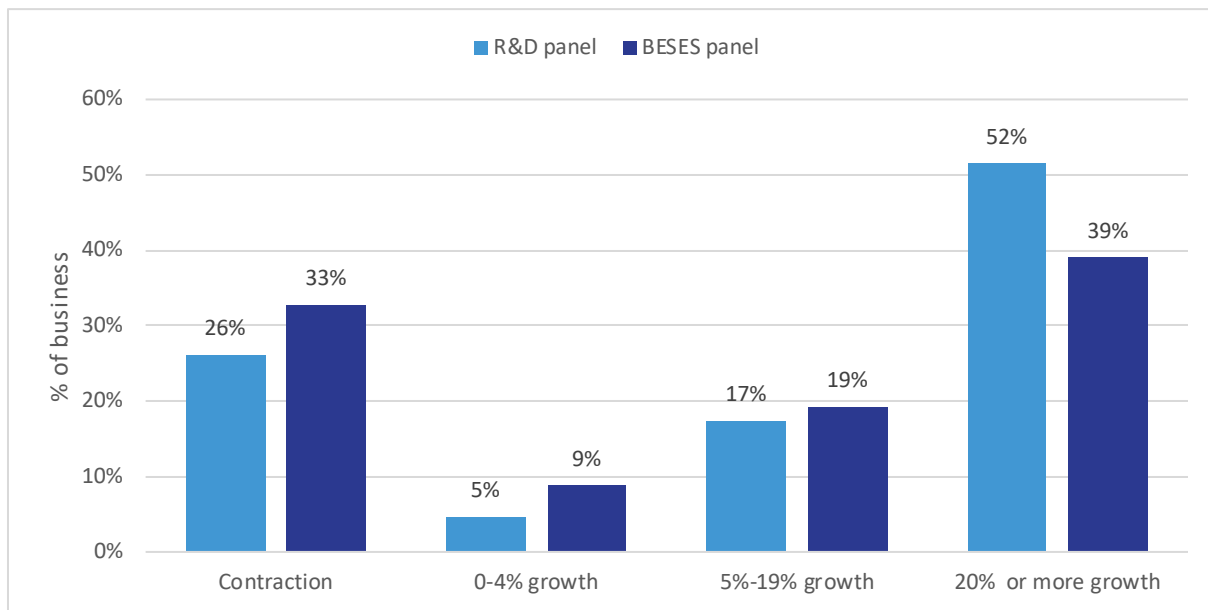
Figure 3: Levels of growth in sales of goods from 2016 to 2018 for businesses in the R&D and BESES panels



Noticeable differences can be seen at the level of 20% or more growth. Just over half (52%) of businesses who sold services in the R&D panel had growth in the sale of services of 20% or more, higher than businesses who sold goods in the R&D panel (46%). Both these figures for businesses in the R&D panel, were higher than the corresponding businesses in BESES panel where there was 39% of businesses demonstrating growth in the sale of services of 20% or more, and 37% of businesses demonstrating growth in sale of goods of 20% or more.

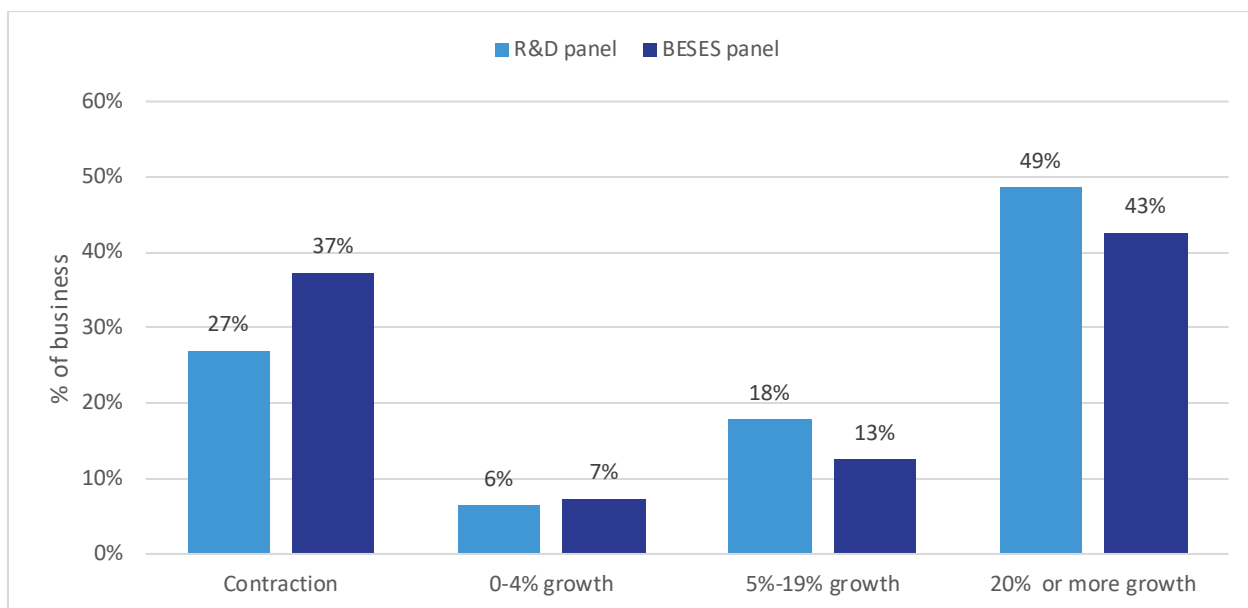
There were higher levels of contraction for businesses in the BESES panel who sold goods or services than in the R&D panel.

Figure 4: Levels of growth in sales of services from 2016 to 2018 for businesses in the R&D and BESES panels



Growth in purchases follows the same pattern as seen above in the growth in sales, with growth of 20% or more the most dominant level for both panels and also higher growth levels in the R&D panel than the BESES panel (Figure 5). Levels of contraction were again higher in the BESES panel (37%) than the R&D panel (27%).

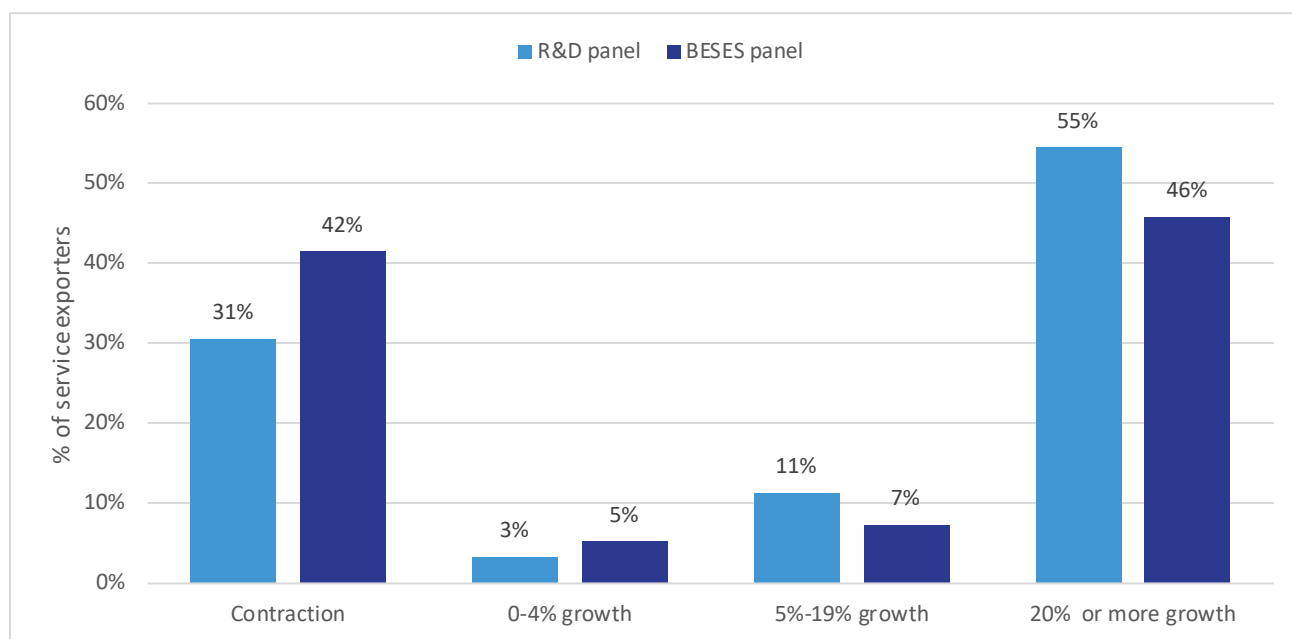
Figure 5: Levels of growth in purchases from 2016 to 2018 for businesses in the R&D and BESES panels



A deeper dive into growth in exports and imports, showed that there was no real differences between the panels for growth in exports overall, in the export of goods or growth in imports overall. However,

there was a difference in the growth rates in service exports, where 55% of businesses that exported services in the R&D panel had 20% or more growth in service exports compared to 46% of businesses that exported services in the BESES panel (Figure 6). A higher level of businesses in the BESES panel saw a contraction in service exports than in the R&D panel, however, and by contrast, there was no difference in the levels of contraction for businesses who exported goods.

Figure 6: Levels of growth in service exports from 2016 to 2018 for businesses in the R&D and BESES panels



Turnover and employment growth comparisons between the R&D and BESES panels 2016 to 2018

Figure 7 illustrates the differences in turnover growth between the two panels. Just under seven in ten businesses in the R&D panel had growth in turnover of 5% or more, higher than the BESES panel (59%). 45% of R&D businesses had growth in turnover of 20% or more, again higher than the BESES panel (37%). As reflected in sales of goods and services, there were higher levels of contraction in turnover for businesses in the BESES panel (31%) than the R&D panel (24%).

Figure 7: Levels of turnover growth from 2016 to 2018 for businesses in the R&D and BESES panels

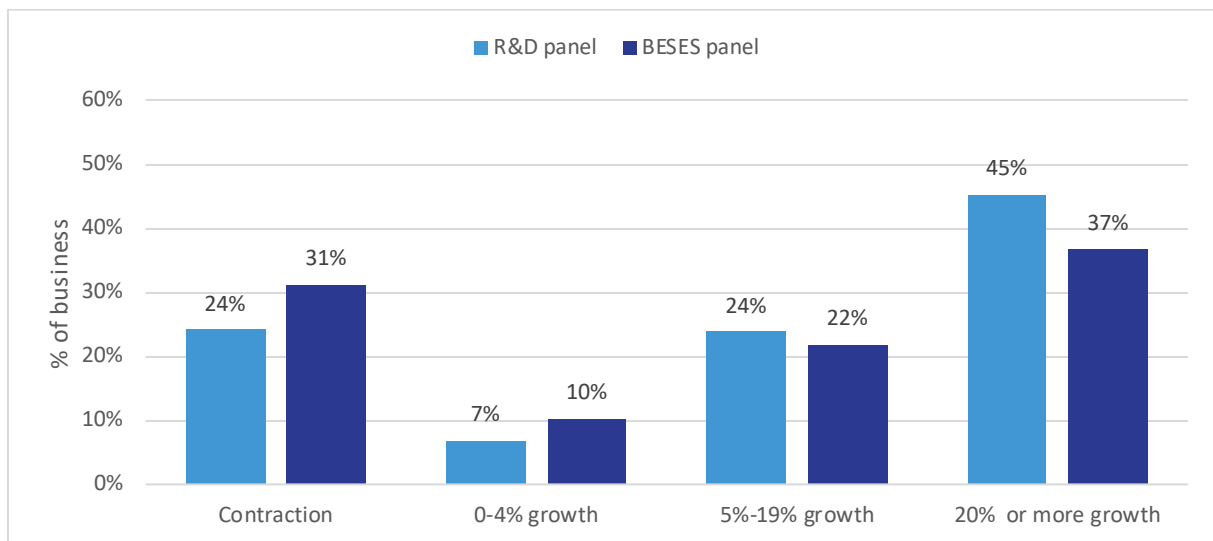
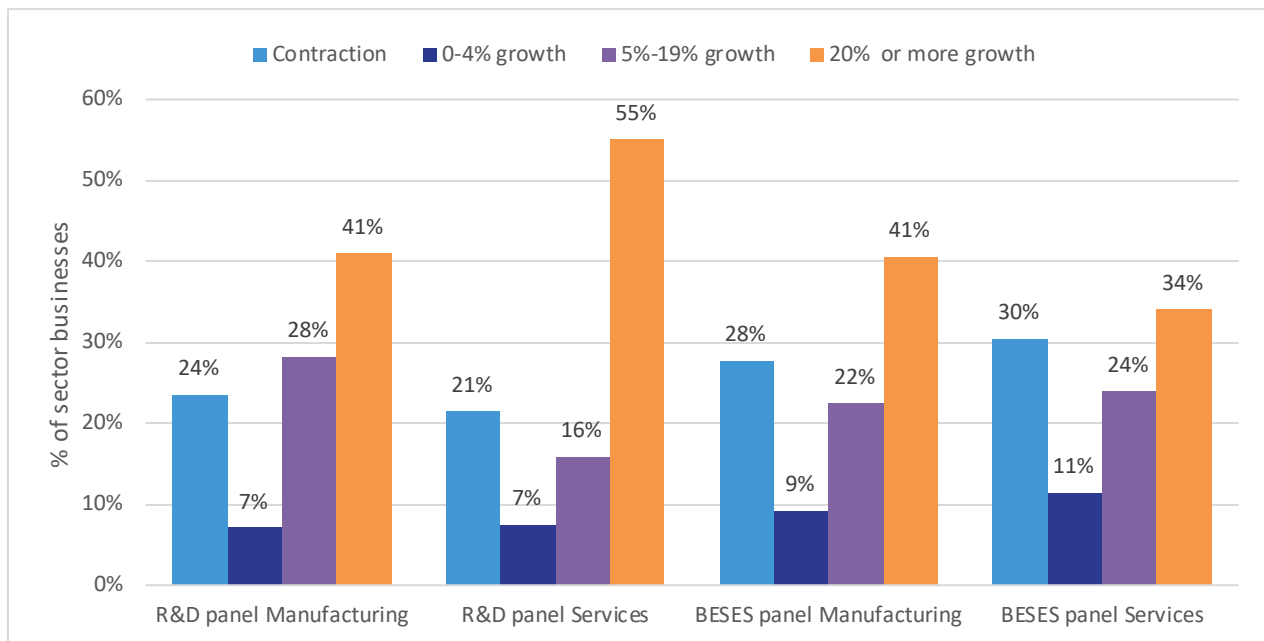


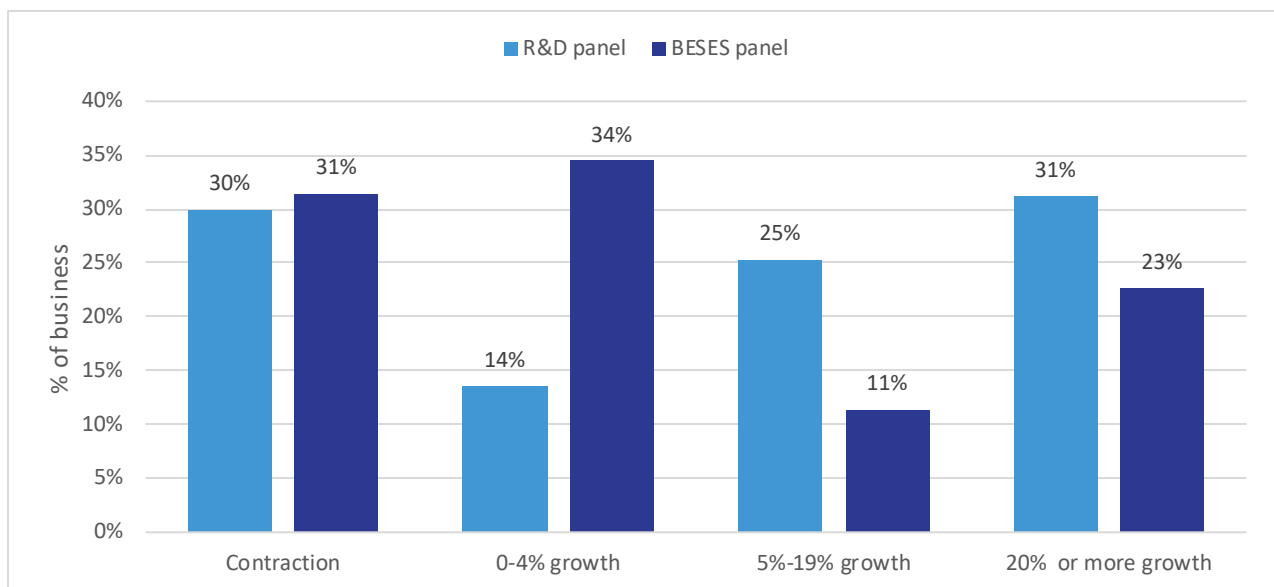
Figure 8 shows the level of turnover growth for the Manufacturing and Services sectors in both panels. Services businesses in the R&D panel had the highest proportion of businesses with 20% or more growth in turnover (55%), considerably higher than those in the services sector in the BESES panel (34%) or in the Manufacturing sector in both panels (both 41%). Business in the BESES panel had higher levels of turnover contraction in both sectors than the R&D panel.

Figure 8: Turnover growth from 2016 to 2018 by manufacturing and services businesses in the R&D and BESES panels⁵



Growth in employment at 5% or above was much higher for businesses in the R&D panel (56%) than in the BESES panel (34%), with the levels of employment contraction similar. The BESES panel had much more employment growth in the 0-4% range. (Figure 9).

Figure 9: Employment growth from 2016 to 2018 for businesses in the R&D and BESES panels

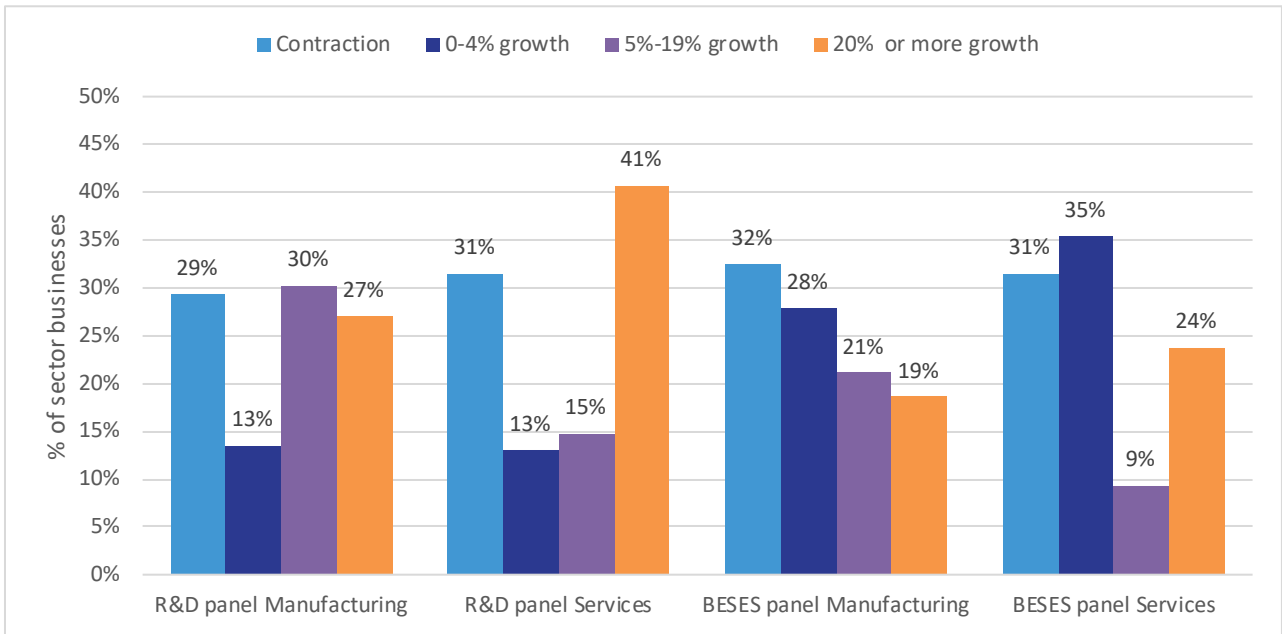


⁵ The sectoral analyses are based on the Standard Industrial Classification 2007 (or SIC 2007). Services includes: G Wholesale and retail as well as groups H-U. Other includes groups A, B, D, E and F. See Annex 1 for a full list of Standard Industrial Classification (SIC) main sectors and their mapping to grouped SIC.

Figure 10 shows the levels of growth in employment for businesses in the R&D and BESES panels for the Manufacturing and Services sectors separately.

For both sectors the R&D panel outperformed their BESES counterparts. The services sector in the R&D panel specifically stood out, with 41% of its businesses having 20% or more growth in employment, considerably higher than the manufacturing sector in the R&D panel (27%), the services sector in the BESES panel (24%) and the manufacturing sector in the BESES panel (19%). For the BESES panel there was much more growth in the 0-4% range for both sectors than in the R&D panel.

Figure 10: Levels of growth in Employment from 2016 to 2018 for businesses in the R&D and BESES panels for the Manufacturing and Services sector⁶



Conclusion

Utilising the same matching and linkage approach for both R&D survey data and BESES data has given the opportunity to compare R&D businesses over time against the rest of the economy and to delve in to the available business information offered by the BESES. There has, however, been an element of trade off with a resulting reduction in coverage of businesses, with the largest impact being on the coverage for small businesses and the services sector.

⁶ The sectoral analyses are based on the Standard Industrial Classification 2007 (or SIC 2007). Services includes: G Wholesale and retail as well as groups H-U. Other includes groups A, B, D, E and F. See Annex 1 for a full list of Standard Industrial Classification (SIC) main sectors and their mapping to grouped SIC.

This is reflected to some extent by the sample coverage of the BESES, in that larger businesses are more likely to be included in the BESES whilst smaller businesses, being more numerous, are sampled. Smaller businesses are therefore less likely to be in the BESES over two separate years whilst the larger businesses with more employment and higher turnover will be more likely to be captured in each year's data.

It is important to note that the businesses present in both panels account for the majority of employment and turnover reported annually by both sources.

Businesses that carried out R&D only made up 3% of the number of businesses in the BESES panel 2016-18, however they accounted for a disproportionate share of the total number of employees (17%) and turnover (24%).

Although we cannot determine causality and direction between R&D and growth, the results show that levels of growth were higher for businesses that carried out R&D for sales of good and services, service exports, turnover, employment and purchases than for businesses in the BESES panel. In addition, the levels of contraction in sales, exports, turnover, employment and purchases were lower within businesses in the R&D panel compared to the BESES panel.

Service sector businesses in the R&D panel, stood out, although they only accounted for a third of businesses in the R&D panel, the levels of growth in the sale of services, the export of services and turnover of service sector businesses was higher than those of businesses in the R&D panel which sold or exported goods or in the manufacturing sector or those in the wider economy.

Annex 1: Standard Industrial Classifications (SIC) and Grouped SIC used in analysis

Standard Industrial Classification	Grouped Classification
C Manufacturing	Manufacturing
A Agriculture, Forestry and Fishing	Other
B Mining and quarrying	
D Electricity, gas, steam and air conditioning supply	
E Water supply, sewerage, waste management and remediation activities	
F Construction	
G Wholesale and retail trade, repair of motor vehicles and motorcycles	
H Transportation and storage	
I Accommodation and food service activities	
J Information and communication	
K Financial and insurance activities	
L Real estate activities	
M Professional, scientific and technical activities	
N Administrative and support service activities	
O Public administration and defence; compulsory social security	
P Education	
Q Human health and social work activities	
R - U Other services	