

# Northern Irish Trade Performance and External Sales Activity 2014–2020

*using NISRA's BESES and NIABI datasets*



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# Contents

Acknowledgement .....	4
List of tables.....	5
List of figures .....	11
Abbreviations .....	15
Executive summary .....	16
Introduction .....	18
1.1 BESES and NIABI datasets .....	19
1.2 Data review.....	21
Data limitations encountered.....	21
Modifications to the data .....	23
1.3 Summary statistics (dataset exploration) .....	25
1.4 Recommendations to data owners .....	29
1.5 Quality of supporting documentation, metadata and synthetic data.....	31
<b>Statistical Analysis: Northern Ireland</b> .....	<b>33</b>
2.1 Sectors defined.....	34
2.2 Overall business activity .....	41
2.3 Sectoral business activity.....	42
2.4 Business performance .....	44
2.5 External sales .....	48
2.6 Sub-NI regions defined .....	51
<b>Belfast Trade</b> .....	<b>54</b>
3.1 Overall business activity .....	55
3.2 Business performance .....	56
3.3 External sales .....	59
<b>Antrim and Newtownabbey Trade</b> .....	<b>62</b>
4.1 Overall approximate business activity.....	63
4.2 Business performance .....	64
4.3 External sales .....	67
<b>North Down and East Antrim Trade</b> .....	<b>70</b>
5.1 Overall approximate business activity.....	71
5.2 Business performance .....	72
5.3 External sales .....	75
<b>Lisburn and Castlereagh Trade</b> .....	<b>78</b>
6.1 Overall approximate business activity.....	79
6.2 Business performance .....	80
6.3 External sales .....	83

<b>South Down and Armagh Trade</b> .....	86
7.1 Overall approximate business activity .....	87
7.2 Business performance .....	88
7.3 External sales .....	91
<b>Causeway Coast and Glens Trade</b> .....	94
8.1 Overall approximate business activity .....	95
8.2 Business performance .....	96
8.3 External sales .....	99
<b>Derry and Strabane Trade</b> .....	102
9.1 Overall approximate business activity .....	103
9.2 Business performance .....	104
9.3 External sales .....	107
<b>Fermanagh and Mid-Ulster Trade</b> .....	110
10.1 Overall approximate business activity .....	111
10.2 Business performance .....	112
10.3 External sales .....	115
11. Modelling Northern Ireland's trade .....	118
12. Future research .....	121
13. References .....	122



## **Acknowledgement**

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## List of tables

Number	Title
1.1	NIABI sample and returns
1.2	Businesses by destination market(s), 2014–2020
1.3	Businesses by SIC sector, 2014–2020
2.1	Identification of 10X businesses using the SIC system
2.2	Business survey respondents by (combined) sector, 2014–2020
2.3	Businesses by (combined) sub-region, 2014–2020
2.4	Total sales, purchases and GVA (£'000s), 2014–2020
2.5	Total GVA by sector (£'000s), 2014–2020
2.6	Average sales and GVA per employment, 2014–2020
2.7	Change in sales and GVA per employment of sectors in the post-Brexit period (2017–2019) relative to the pre-Brexit period (2014–2016)
2.8	Average sales to external markets, 2014–2020
2.9	Change in the percentage of sales to external markets of sectors in the post-Brexit period (2017–2019) relative to the pre-Brexit period (2014–2016)
2.10	Businesses by (combined) location, 2014–2020
2.11	Total GVA by sub-region (£'000s), 2014–2020
2.12	Changes in total sales, purchases and GVA by sub-region 2014–2019 and total GVA 2019–2020
<b><i>Belfast</i></b>	
3.1	Total GVA by sector (£'000s), 2014–2020
3.2	Average sales and GVA per employment, 2014–2020
3.3	Change in sales and GVA per employment of sectors in the post-Brexit period (2017–2019) relative to the pre-Brexit period (2014–2016)
3.4	Average sales to external markets, 2014–2020
3.5	Change in the percentage of sales to external markets of sectors in the post-Brexit period (2017–2019) relative to the pre-Brexit period (2014–2016)
<b><i>Antrim and Newtownabbey</i></b>	
4.1	Total GVA by sector (£'000s), 2014–2020
4.2	Average sales and GVA per employment, 2014–2020
4.3	Change in sales and GVA per employment of sectors in the post-Brexit period (2017–2019) relative to the pre-Brexit period (2014–2016)
4.4	Average sales to external markets, 2014–2020
4.5	Change in the percentage of sales to external markets of sectors in the post-Brexit period (2017–2019) relative to the pre-Brexit period (2014–2016)
<b><i>North Down and East Antrim</i></b>	
5.1	Total GVA by sector (£'000s), 2014–2020
5.2	Average sales and GVA per employment, 2014–2020
5.3	Change in sales and GVA per employment of sectors in the post-Brexit period (2017–2019) relative to the pre-Brexit period (2014–2016)
5.4	Average sales to external markets, 2014–2020
5.5	Change in the percentage of sales to external markets of sectors in the post-Brexit period (2017–2019) relative to the pre-Brexit period (2014–2016)
<b><i>Lisburn and Castlereagh</i></b>	
6.1	Total GVA by sector (£'000s), 2014–2020
6.2	Average sales and GVA per employment, 2014–2020

6.3	Change in sales and GVA per employment of sectors in the post-Brexit period (2017–2019) relative to the pre-Brexit period (2014–2016)
6.4	Total sales to external markets, 2014–2020
6.5	Change in the percentage of sales to external markets of sectors in the post-Brexit period (2017–2019) relative to the pre-Brexit period (2014–2016)
<b>South Down and Armagh</b>	
7.1	Total GVA by sector (£'000s), 2014–2020
7.2	Average sales and GVA per employment, 2014–2020
7.3	Change in sales and GVA per employment of sectors in the post-Brexit period (2017–2019) relative to the pre-Brexit period (2014–2016)
7.4	Average sales to external markets, 2014–2020
7.5	Change in the percentage of sales to external markets of sectors in the post-Brexit period (2017–2019) relative to the pre-Brexit period (2014–2016)
<b>Causeway Coast and Glens</b>	
8.1	Total GVA by sector (£'000s), 2014–2020
8.2	Average sales and GVA per employment, 2014–2020
8.3	Change in sales and GVA per employment of sectors in the post-Brexit period (2017–2019) relative to the pre-Brexit period (2014–2016)
8.4	Average sales to external markets, 2014–2020
8.5	Change in the percentage of sales to external markets of sectors in the post-Brexit period (2017–2019) relative to the pre-Brexit period (2014–2016)
<b>Derry City and Strabane</b>	
9.1	Total GVA by sector (£'000s), 2014–2020
9.2	Average sales and GVA per employment, 2014–2020
9.3	Change in sales and GVA per employment of sectors in the post-Brexit period (2017–2019) relative to the pre-Brexit period (2014–2016)
9.4	Average sales to external markets, 2014–2020
9.5	Change in the percentage of sales to external markets of sectors in the post-Brexit period (2017–2019) relative to the pre-Brexit period (2014–2016)
<b>Fermanagh and Mid-Ulster</b>	
10.1	Total GVA by sector (£'000s), 2014–2020
10.2	Average sales and GVA per employment, 2014–2020
10.3	Change in sales and GVA per employment of sectors in the post-Brexit period (2017–2019) relative to the pre-Brexit period (2014–2016)
10.4	Average sales to external markets, 2014–2020
10.5	Change in the percentage of sales to external markets of sectors in the post-Brexit period (2017–2019) relative to the pre-Brexit period (2014–2016)
<b>Appendices</b>	
<b>Appendix 1: Summary Statistics at NI level</b>	
A1.1	<a href="#">WQ050</a> : Total employees, 2014–2020 (No.)
A1.2	<a href="#">WQ059</a> : Total employment, 2014–2020 (No.)
A1.3	<a href="#">WQ110</a> : Total exports value, 2014–2020
A1.4	<a href="#">WQ111</a> : Export of goods to the REU
A1.5	<a href="#">WQ112</a> : Export of goods outside the UK
A1.6	<a href="#">WQ113</a> : Export of goods to the ROW
A1.7	<a href="#">WQ114</a> : Export of goods to the ROI
A1.8	<a href="#">WQ115</a> : Export of services to the REU
A1.9	<a href="#">WQ116</a> : Export of services to ROI
A1.10	<a href="#">WQ117</a> : Export of services to ROW

A1.11	<a href="#">WQ118</a> : Freight and insurance costs associated with exports
A1.12	<a href="#">WQ120</a> : Total imports goods and services from outside the UK
A1.13	<a href="#">WQ121</a> : Import of goods from the REU
A1.14	<a href="#">WQ122</a> : Import of goods from outside the UK
A1.15	<a href="#">WQ123</a> : Import of goods from the ROI
A1.16	<a href="#">WQ124</a> : Import of goods from ROI
A1.17	<a href="#">WQ125</a> : Import of services from the REU
A1.18	<a href="#">WQ126</a> : Import of services from the ROI
A1.19	<a href="#">WQ127</a> : Import of services from the ROW
A1.20	<a href="#">WQ128</a> : Freight and insurance costs associated with imports
A1.21	<a href="#">WQ163</a> : Export of services outside the UK
A1.22	<a href="#">WQ164</a> : Import of services from outside the UK
A1.23	<a href="#">WQ321</a> : VAT included in total sales
A1.24	<a href="#">WQ346</a> : Total sales (including VAT)
A1.25	<a href="#">WQ399</a> : Total sales
A1.26	<a href="#">WQ400</a> : Total taxes and levies paid
A1.27	<a href="#">WQ414</a> : Total subsidies from government sources and the EU
A1.28	<a href="#">WQ416</a> : Total excise drawback and allowances from HMRC
A1.29	<a href="#">WQ450</a> : Total employment costs
A1.30	<a href="#">WQ499</a> : Total purchases of goods, material and services
A1.31	<a href="#">WQ500</a> : Total value of all stocks at beginning of period
A1.32	<a href="#">WQ550</a> : Sales excluding VAT
A1.33	<a href="#">WQ599</a> : Total value of all stocks at end of the period
A1.34	<a href="#">WQ710</a> : Total purchases of goods and materials
A1.35	<a href="#">WQ730</a> : Total purchases of services
A1.36	<a href="#">WQ1600</a> : Total goods and services purchased from NI
A1.37	<a href="#">WQ1601</a> : Goods purchased from NI
A1.38	<a href="#">WQ1602</a> : Services purchased from NI
A1.39	<a href="#">WQ1603</a> : Total goods and services purchased from GB
A1.40	<a href="#">WQ1604</a> : Goods purchased from GB
A1.41	<a href="#">WQ1605</a> : Services purchased from GB
A1.42	<a href="#">WQ2010</a> : GVA at market prices
A1.43	<a href="#">WQ2020</a> : GVA at factor cost
A1.44	<a href="#">WQ2030</a> : GVA at basic prices
A1.45	<a href="#">MF5001</a> : Goods sold to NI
A1.46	<a href="#">MF5000</a> : Goods and services sold to NI
A1.47	<a href="#">MF5002</a> : Services sold to NI
A1.48	<a href="#">MF5003</a> : Goods and services sold to GB
A1.49	<a href="#">MF5004</a> : Goods sold to GB
A1.50	<a href="#">MF5005</a> : Services sold to GB
A1.51	<a href="#">MF5008</a> : The value of exports of goods and services to ROI
A1.52	<a href="#">MF5009</a> : The value of exports of goods and services to REU
A1.53	<a href="#">MF5010</a> : The value of exports of goods and services to the ROW
A1.54	<a href="#">MF5013</a> : The value of imports of goods and services from the ROI
A1.55	<a href="#">MF5014</a> : The value of imports of goods and services from the REU
A1.56	<a href="#">MF5015</a> : The value of imports of goods and services from the ROW

<b>Appendix 2: Sample descriptive statistics (cleaned dataset)</b>	
A2.1	Businesses by size (employee numbers), 2014–2020
A2.2	Businesses by legal structure, 2014–2020
A2.3	Businesses by sub-region, 2014–2020
A2.4	Businesses by sub-region, 2014-2020 (unknowns removed)
A2.5	Businesses by (combined) sub-region, 2014-2020 (trade performance)
A2.6	Businesses by (combined) sub-region, 2014-2020 (external sales activity)
<b>Appendix 3: Northern Ireland trade</b>	
A3.1	Total sales by sector (£'000s), 2014–2020
A3.2	Total purchases by sector (£'000s), 2014–2020
A3.3	Total sales by sub-region (£'000s), 2014–2020
A3.4	Total purchases by sub-region (£'000s), 2014–2020
A3.5	Average sales per employment by sector, 2014–2020
A3.6	Average sales per employment by sub-region, 2014–2020
A3.7	Average GVA per employment by sector, 2014–2020
A3.8	Average GVA per employment by sub-region, 2014–2020
A3.9	Average GVA to sales (%) by sector, 2014–2020
A3.10	Average GVA to sales (%) by sub-region, 2014–2020
A3.11	Average GB sales as a % of total sales by sector, 2014–2020
A3.12	Average GB sales as a % of total sales by sub-region, 2014–2020
A3.13	Average ROI sales as a % of total sales by sector, 2014–2020
A3.14	Average ROI sales as a % of total sales by sub-region, 2014–2020
A3.15	Average REU sales as a % of total sales by sector, 2014–2020
A3.16	Average REU sales as a % of total sales by sub-region, 2014–2020
A3.17	Average ROW sales as a % of total sales by sector, 2014–2020
A3.18	Average ROW sales as a % of total sales by sub-region, 2014–2020
<b>Appendix 4: Belfast</b>	
A4.1	Total sales, purchases and GVA (£'000s), 2014–2020
A4.2	Total sales by sector (£'000s), 2014–2020
A4.3	Total purchases by sector (£'000s), 2014–2020
A4.4	Average sales per employment by sector, 2014–2020
A4.5	Average GVA per employment by sector, 2014–2020
A4.6	Average GB sales as a % of total sales by sector, 2014–2020
A4.7	Average ROI sales as a % of total sales by sector, 2014–2020
A4.8	Average REU sales as a % of total sales by sector, 2014–2020
A4.9	Average ROW sales as a % of total sales by sector, 2014–2020
<b>Appendix 5: Antrim and Newtownabbey</b>	
A5.1	Total sales, purchases and GVA (£'000s), 2014–2020
A5.2	Total sales by sector (£'000s), 2014–2020
A5.3	Total purchases by sector (£'000s), 2014–2020
A5.4	Average sales per employment by sector, 2014–2020
A5.5	Average GVA per employment by sector, 2014–2020
A5.6	Average GB sales as a % of total sales by sector, 2014–2020
A5.7	Average ROI sales as a % of total sales by sector, 2014–2020
A5.8	Average REU sales as a % of total sales by sector, 2014–2020
A5.9	Average ROW sales as a % of total sales by sector, 2014–2020
<b>Appendix 6: North Down and East Antrim</b>	



A6.1	Total sales, purchases and GVA (£'000s), 2014–2020
A6.2	Total sales by sector (£'000s), 2014–2020
A6.3	Total purchases by sector (£'000s), 2014–2020
A6.4	Average sales per employment by sector, 2014–2020
A6.5	Average GVA per employment by sector, 2014–2020
A6.6	Average GB sales as a % of total sales by sector, 2014–2020
A6.7	Average ROI sales as a % of total sales by sector, 2014–2020
A6.8	Average REU sales as a % of total sales by sector, 2014–2020
A6.9	Average ROW sales as a % of total sales by sector, 2014–2020
<b>Appendix 7: Lisburn and Castlereagh</b>	
A7.1	Total sales, purchases and GVA (£'000s), 2014–2020
A7.2	Total sales by sector (£'000s), 2014–2020
A7.3	Total purchases by sector (£'000s), 2014–2020
A7.4	Average sales per employment by sector, 2014–2020
A7.5	Average GVA per employment by sector, 2014–2020
A7.6	Average GB sales as a % of total sales by sector, 2014–2020
A7.7	Average ROI sales as a % of total sales by sector, 2014–2020
A7.8	Average REU sales as a % of total sales by sector, 2014–2020
A7.9	Average ROW sales as a % of total sales by sector, 2014–2020
<b>Appendix 8: South Down and Armagh</b>	
A8.1	Total sales, purchases and GVA (£'000s), 2014–2020
A8.2	Total sales by sector (£'000s), 2014–2020
A8.3	Total purchases by sector (£'000s), 2014–2020
A8.4	Average sales per employment by sector, 2014–2020
A8.5	Average GVA per employment by sector, 2014–2020
A8.6	Average GB sales as a % of total sales by sector, 2014–2020
A8.7	Average ROI sales as a % of total sales by sector, 2014–2020
A8.8	Average REU sales as a % of total sales by sector, 2014–2020
A8.9	Average ROW sales as a % of total sales by sector, 2014–2020
<b>Appendix 9: Causeway Coast and Glens</b>	
A9.1	Total sales, purchases and GVA (£'000s), 2014–2020
A9.2	Total sales by sector (£'000s), 2014–2020
A9.3	Total purchases by sector (£'000s), 2014–2020
A9.4	Average sales per employment by sector, 2014–2020
A9.5	Average GVA per employment by sector, 2014–2020
A9.6	Average GB sales as a % of total sales by sector, 2014–2020
A9.7	Average ROI sales as a % of total sales by sector, 2014–2020
A9.8	Average REU sales as a % of total sales by sector, 2014–2020
A9.9	Average ROW sales as a % of total sales by sector, 2014–2020
<b>Appendix 10: Derry City and Strabane</b>	
A10.1	Total sales, purchases and GVA (£'000s), 2014–2020
A10.2	Total sales by sector (£'000s), 2014–2020
A10.3	Total purchases by sector (£'000s), 2014–2020
A10.4	Average sales per employment by sector, 2014–2020
A10.5	Average GVA per employment by sector, 2014–2020
A10.6	Average GB sales as a % of total sales by sector, 2014–2020
A10.7	Average ROI sales as a % of total sales by sector, 2014–2020

A10.8	Average REU sales as a % of total sales by sector, 2014–2020
A10.9	Average ROW sales as a % of total sales by sector, 2014–2020
<b>Appendix 11: Fermanagh and Mid-Ulster</b>	
A11.1	Total sales, purchases and GVA (£'000s), 2014–2020
A11.2	Total sales by sector (£'000s), 2014–2020
A11.3	Total purchases by sector (£'000s), 2014–2020
A11.4	Average sales per employment by sector, 2014–2020
A11.5	Average GVA per employment by sector, 2014–2020
A11.6	Average GB sales as a % of total sales by sector, 2014–2020
A11.7	Average ROI sales as a % of total sales by sector, 2014–2020
A11.8	Average REU sales as a % of total sales by sector, 2014–2020
A11.9	Average ROW sales as a % of total sales by sector, 2014–2020
<b>Appendix 12: Business level regression analysis: NI</b>	
A12.1	Trade performance, 2014–2020 (NI)
A12.2	Sales to external markets, 2014–2020 (NI)
<b>Appendix 13: Business level regression analysis: Belfast</b>	
A13.1	Trade performance, 2014–2020 (Belfast)
A13.2	Sales to external markets, 2014–2020 (Belfast)
<b>Appendix 14: Business level regression analysis: Antrim and Newtownabbey</b>	
A14.1	Trade performance, 2014–2020 (Antrim and Newtownabbey)
A14.2	Sales to external markets, 2014–2020 (Antrim and Newtownabbey)
<b>Appendix 15: Business level regression analysis: North Down and East Antrim</b>	
A15.1	Trade performance, 2014–2020 (North Down and East Antrim)
A15.2	Sales to external markets, 2014–2020 (North Down and East Antrim)
<b>Appendix 16: Business level regression analysis: Lisburn and Castlereagh</b>	
A16.1	Trade performance, 2014–2020 (Lisburn and Castlereagh)
A16.2	Sales to external markets, 2014–2020 (Lisburn and Castlereagh)
<b>Appendix 17: Business level regression analysis: South Down and Armagh</b>	
A17.1	Trade performance, 2014–2020 (South Down and Armagh)
A17.2	Sales to external markets, 2014–2020 (South Down and Armagh)
<b>Appendix 18 Business level regression analysis: Causeway Coast and Glens</b>	
A18.1	Trade performance, 2014–2020 (Causeway Coast and Glens)
A18.2	Sales to external markets, 2014–2020 (Causeway Coast and Glens)
<b>Appendix 19: Business level regression analysis: Derry City and Strabane</b>	
A19.1	Trade performance, 2014–2020 (Derry City and Strabane)
A19.2	Sales to external markets, 2014–2020 (Derry City and Strabane)
<b>Appendix 20: Business level regression analysis: Fermanagh and Mid-Ulster</b>	
A20.1	Trade performance, 2014–2020 (Fermanagh and Mid-Ulster)
A20.2	Sales to external markets, 2014–2020 (Fermanagh and Mid-Ulster)

## List of figures

Number	Title
1.1	Percentage of businesses by employee numbers, 2014–2020
1.2	Number of businesses by legal structure, 2014–2020
1.3	Percentage of businesses by location, 2014–2020
2.1	Number of businesses by sector (combined), 2014–2020
2.2	Percentage of businesses by (combined) location, 2014–2020
2.3	Total sales, purchases and GVA, 2014–2020
2.4	Total GVA by sector, 2014–2020
2.5	Average sales and GVA per employment by sector, 2014–2020
2.6	Sales per employment by sector, 2014–2020
2.7	GVA per employment by sector, 2014–2020
2.8	% sales to GB by sector, 2014–2020
2.9	% sales to ROI by sector, 2014–2020
2.10	% sales to REU by sector, 2014–2020
2.11	% sales to ROW by sector, 2014–2020
2.12	Percentage of businesses by (combined) location, 2014–2020
<b>Belfast</b>	
3.1	Total sales, purchases and GVA, 2014–2020
3.2	Sales per employment by sector, 2014–2020
3.3	GVA per employment by sector, 2014–2020
3.4	% sales to GB by sector, 2014–2020
3.5	% sales to ROI by sector, 2014–2020
3.6	% sales to REU by sector, 2014–2020
3.7	% sales to ROW by sector, 2014–2020
<b>Antrim and Newtownabbey</b>	
4.1	Total sales, purchases and GVA, 2014–2020
4.2	Sales per employment by sector, 2014–2020
4.3	GVA per employment by sector, 2014–2020
4.4	% sales to GB by sector, 2014–2020
4.5	% sales to ROI by sector, 2014–2020
4.6	% sales to REU by sector, 2014–2020
4.7	% sales to ROW by sector, 2014–2020
<b>North Down and East Antrim</b>	
5.1	Total sales, purchases and GVA, 2014–2020
5.2	Sales per employment by sector, 2014–2020
5.3	GVA per employment by sector, 2014–2020
5.4	% sales to GB by sector, 2014–2020
5.5	% sales to ROI by sector, 2014–2020
5.6	% sales to REU by sector, 2014–2020
5.7	% sales to ROW by sector, 2014–2020
<b>Lisburn and Castlereagh</b>	
6.1	Total sales, purchases and GVA, 2014–2020
6.2	Sales per employment by sector, 2014–2020
6.3	GVA per employment by sector, 2014–2020
6.4	% sales to GB by sector, 2014–2020

6.5	% sales to ROI by sector, 2014–2020
6.6	% sales to REU by sector, 2014–2020
6.7	% sales to ROW by sector, 2014–2020
<b>South Down and Armagh</b>	
7.1	Total sales, purchases and GVA, 2014–2020
7.2	Sales per employment by sector, 2014–2020
7.3	GVA per employment by sector, 2014–2020
7.4	% sales to GB by sector, 2014–2020
7.5	% sales to ROI by sector, 2014–2020
7.6	% sales to REU by sector, 2014–2020
7.7	% sales to ROW by sector, 2014–2020
<b>Causeway Coast and Glens</b>	
8.1	Total sales, purchases and GVA, 2014–2020
8.2	Sales per employment by sector, 2014–2020
8.3	GVA per employment by sector, 2014–2020
8.4	% sales to GB by sector, 2014–2020
8.5	% sales to ROI by sector, 2014–2020
8.6	% sales to REU by sector, 2014–2020
8.7	% sales to ROW by sector, 2014–2020
<b>Derry and Strabane</b>	
9.1	Total sales, purchases and GVA, 2014–2020
9.2	Sales per employment by sector, 2014–2020
9.3	GVA per employment by sector, 2014–2020
9.4	% sales to GB by sector, 2014–2020
9.5	% sales to ROI by sector, 2014–2020
9.6	% sales to REU by sector, 2014–2020
9.7	% sales to ROW by sector, 2014–2020
<b>Fermanagh and Mid-Ulster</b>	
10.1	Total sales, purchases and GVA, 2014–2020
10.2	Sales per employment by sector, 2014–2020
10.3	GVA per employment by sector, 2014–2020
10.4	% sales to GB by sector, 2014–2020
10.5	% sales to ROI by sector, 2014–2020
10.6	% sales to REU by sector, 2014–2020
10.7	% sales to ROW by sector, 2014–2020
<b>Appendix 2: Sample descriptive statistics (cleaned dataset)</b>	
A2.1	Businesses by destination markets, 2014–2020
A2.2	Percentage of businesses by destination market, 2014–2020
<b>Appendix 3: Northern Ireland Trade</b>	
A3.1	Total GVA by sector (£'000), 2014–2020
A3.2	Sales per employment by sector, 2014–2020
A3.3	Sales per employment by sub-region, 2014–2020
A3.4	GVA per employment by sector, 2014–2020
A3.5	GVA per employment by sub-region, 2014–2020
A3.6	GVA to sales (%) by sector, 2014–2020
A3.7	GVA to sales (%) by sub-region, 2014–2020
A3.8	GB sales as a % of total sales by sector, 2014–2020

A3.9	GB sales as a % of total sales by sub-region, 2014–2020
A3.10	ROI sales as a % of total sales by sector, 2014–2020
A3.11	ROI sales as a % of total sales by sub-region, 2014–2020
A3.12	REU sales as a % of total sales by sector, 2014–2020
A3.13	REU sales as a % of total sales by sub-region, 2014–2020
A3.14	ROW sales as a % of total sales by sector, 2014–2020
A3.15	ROW sales as a % of total sales by sub-region, 2014–2020
<b>Appendix 4: Belfast</b>	
A4.1	Average sales per employment by sector, 2014–2020
A4.2	Average GVA per employment by sector, 2014–2020
A4.3	Average GB sales as a % of total sales by sector, 2014–2020
A4.4	Average ROI sales as a % of total sales by sector, 2014–2020
A4.5	Average REU sales as a % of total sales by sector, 2014–2020
A4.6	Average ROW sales as a % of total sales by sector, 2014–2020
<b>Appendix 5: Antrim and Newtownabbey</b>	
A5.1	Average sales per employment by sector, 2014–2020
A5.2	Average GVA per employment by sector, 2014–2020
A5.3	Average GB sales as a % of total sales by sector, 2014–2020
A5.4	Average ROI sales as a % of total sales by sector, 2014–2020
A5.5	Average REU sales as a % of total sales by sector, 2014–2020
A5.6	Average ROW sales as a % of total sales by sector, 2014–2020
<b>Appendix 6: North Down and East Antrim</b>	
A6.1	Average sales per employment by sector, 2014–2020
A6.2	Average GVA per employment by sector, 2014–2020
A6.3	Average GB sales as a % of total sales by sector, 2014–2020
A6.4	Average ROI sales as a % of total sales by sector, 2014–2020
A6.5	Average REU sales as a % of total sales by sector, 2014–2020
A6.6	Average ROW sales as a % of total sales by sector, 2014–2020
<b>Appendix 7: Lisburn and Castlereagh</b>	
A7.1	Average sales per employment by sector, 2014–2020
A7.2	Average GVA per employment by sector, 2014–2020
A7.3	Average GB sales as a % of total sales by sector, 2014–2020
A7.4	Average ROI sales as a % of total sales by sector, 2014–2020
A7.5	Average REU sales as a % of total sales by sector, 2014–2020
A7.6	Average ROW sales as a % of total sales by sector, 2014–2020
<b>Appendix 8: South Down and Armagh</b>	
A8.1	Average sales per employment by sector, 2014–2020
A8.2	Average GVA per employment by sector, 2014–2020
A8.3	Average GB sales as a % of total sales by sector, 2014–2020
A8.4	Average ROI sales as a % of total sales by sector, 2014–2020
A8.5	Average REU sales as a % of total sales by sector, 2014–2020
A8.6	Average ROW sales as a % of total sales by sector, 2014–2020
<b>Appendix 9: Causeway Coast and Glens</b>	
A9.1	Average sales per employment by sector, 2014–2020
A9.2	Average GVA per employment by sector, 2014–2020
A9.3	Average GB sales as a % of total sales by sector, 2014–2020
A9.4	Average ROI sales as a % of total sales by sector, 2014–2020

A9.5	Average REU sales as a % of total sales by sector, 2014–2020
A9.6	Average ROW sales as a % of total sales by sector, 2014–2020
<b>Appendix 10: Derry City and Strabane</b>	
A10.1	Average sales per employment by sector, 2014–2020
A10.2	Average GVA per employment by sector, 2014–2020
A10.3	Average GB sales as a % of total sales by sector, 2014–2020
A10.4	Average ROI sales as a % of total sales by sector, 2014–2020
A10.5	Average REU sales as a % of total sales by sector, 2014–2020
A10.6	Average ROW sales as a % of total sales by sector, 2014–2020
<b>Appendix 11: Fermanagh and Mid-Ulster</b>	
A11.1	Average sales per employment by sector, 2014–2020
A11.2	Average GVA per employment by sector, 2014–2020
A11.3	Average GB sales as a % of total sales by sector, 2014–2020
A11.4	Average ROI sales as a % of total sales by sector, 2014–2020
A11.5	Average REU sales as a % of total sales by sector, 2014–2020
A11.6	Average ROW sales as a % of total sales by sector, 2014–2020

## Abbreviations

Abbreviation	Definition
ADR	Administrative Data Research
AI	Artificial intelligence
BDR	Business Data for Research
BEIS	Department for Business, Energy & Industrial Strategy
BESES	Broad Economy Sales and Exports Statistics (now NIETS)
BRES	Business Register and Employment Survey
ELMSB	Economic and Labour Market Statistics Branch
ESRC	Economic and Social Research Council
EU	European Union
GB	Great Britain
GDPR	General Data Protection Regulation
GVA	Gross value added
HMRC	His Majesty's Revenue and Customs
IDBR	Inter-Departmental Business Register
IMF	International Monetary Fund
LGD	Local government district
LLP	Limited liability partnership
NI	Northern Ireland
NIABI	Northern Ireland Annual Business Inquiry
NIETS	Northern Ireland Economic Trade Statistics (formerly BESES)
NIOPA	Northern Ireland Official Publications Archive
NISRA	Northern Ireland Statistics and Research Agency
NUTS	Nomenclature of Territorial Units for Statistics
OECD	Organisation for Economic Co-operation and Development
OLS	Ordinary least squares
ONS	Office for National Statistics
PAYE	Pay as you earn
PLC	Public limited company
REU	Rest of the European Union
ROI	Ireland (Republic of)
ROW	Rest of the world
SD	Standard deviation
SIC	Standard Industrial Classification
UK	United Kingdom
VAT	Value added tax

## Executive summary

As a preliminary research exercise, we provide insights into the trade performance and external sales activity of businesses identified as belonging to the 10X priority sectors relative to other businesses. We also examine whether geography, Brexit and Covid-19 impacted business trading behaviour and economic performance over the period 2014–2020. We focus on four research questions:

1. Is the data provided by NISRA (BESES and NIABI) usable for researching the performance and trading behaviour of Northern Ireland businesses?
2. How has the relative performance and trading behaviour of business sectors in Northern Ireland changed over the period 2014–2020, with particular emphasis on the 10X priority clusters?
3. Are there regional differences in the relative performance and trajectory of business sectors in Northern Ireland over the period 2014–2020, with particular emphasis on the 10X priority clusters?
4. Is it possible to design a model for Northern Ireland trade distinct from the United Kingdom?

The report has the following parts:

- We discuss and summarise the BESES and NIABI datasets and provide feedback on the user experience of using these datasets.
- We summarise trade performance and external sales activity, with perspectives on variation by geography, sector and across time.
- We explore the determinants of business performance and exporting behaviour.
- We provide additional (separate) reports for Northern Ireland sub-regions.
- We discuss the possibility of modelling trade for Northern Ireland.
- We outline possible future research directions.

Some notable findings include the following:

- The percentage of businesses which sold only to the Northern Ireland market declined substantially during 2014–2019.
- In general, the external orientation of businesses increased during that period. This was more marked amongst those businesses identified as within the 10X clusters.
- The pattern of external markets at the NI sub-regional level displayed some notable contrasts. In relative terms, the percentage share going to the Republic of Ireland as compared to Great Britain was higher in, for example, Derry City and Strabane (i.e., closer to the Irish Border) than, say, for either Belfast or Causeway Coast and Glens.
- In general, although there were sectoral and NI sub-regional variations, sales per employment and gross value added (GVA) per employment (i.e., labour productivity indicators) were higher in the years after the Brexit decision (2016) than before. However, in most cases such variations were not statistically significant.



- Although certain infrastructural and agglomeration advantages (e.g., closeness to ports and airports, network effects and a larger pool of labour) might have been expected to favour businesses in Belfast compared to other sub-regions, in fact, the greatest (real terms) growth in GVA occurred in the Lisburn and Castlereagh and Fermanagh and Omagh and Mid Ulster areas.
- In general, during the period 2014–2020, the average size of businesses in our sample increased. (We cannot be sure if this represented a change in the underlying population of businesses or was a result of the sampling).

## Introduction

Policymakers rely on advisors and researchers to provide objective evidence upon which to base their decisions. This requires the availability of appropriate datasets to facilitate analysis and derive policy recommendations. This project responds to an ESRC funding call to expand the use of the “Business Data for Research” (NI) database by researchers, with particular focus on informing the Department for the Economy’s “10X Economy” vision.<sup>1</sup> We present an exploration and review of newly available micro-business data, with specific attention on its usability in evaluating Northern Irish trade.

We use the de-identified Northern Ireland Annual Business Inquiry (NIABI), which is one of three datasets in the Business Data for Research (BDR)(NI) database available as part of this funding call. Until now, this data has been available on a restricted basis, but the intention is to expand its use to ADR UK researchers in approved safe settings. Our project contributes to the beta testing of the BDR database by critically reviewing the quality and usability of the NIABI dataset and providing feedback to inform future data collection and provision.

As a preliminary research exercise, we provide insights into the trade performance and external sales activity of businesses identified as belonging to the 10X priority sectors relative to other businesses. We also examine whether geography, Brexit and Covid-19 impacted business trading behaviour and economic performance over the period 2014–2020. We focus on four research questions:

1. Is the data provided by NISRA (BESES and NIABI) usable for researching the performance and trading behaviour of Northern Ireland businesses?
2. How has the relative performance and trading behaviour of business sectors in Northern Ireland changed over the period 2014–2020, with particular emphasis on the 10X priority clusters?
3. Are there regional differences in the relative performance and trajectory of business sectors in Northern Ireland over the period 2014–2020, with particular emphasis on the 10X priority clusters?
4. Is it possible to design a model for Northern Ireland trade distinct from the United Kingdom?

The remainder of the report proceeds as follows. Firstly, we discuss and summarise the BESES and NIABI datasets, and provide feedback on the user experience of using these datasets. We then provide a statistical review of business activity, performance and trade, with perspectives on variation by geography, sector and across time. Therein, we also explore the determinants of business performance and exporting behaviour. We supplement our Northern Ireland analysis, with additional (separate) reports for Northern Ireland sub-regions. The final part of our report focuses on the possibility of modelling trade for Northern Ireland and discusses possible future research directions.

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<sup>1</sup> <https://www.economy-ni.gov.uk/publications/10x-economy-economic-vision-decade-innovation>.

## 1.1 BESES and NIABI datasets

### The BESES dataset

BESES is the Broad Economy Sales and Export Statistics dataset and has recently been renamed as **Northern Ireland Economic Trade Statistics (NIETS)**. It is an annual dataset focusing on the sales and purchases of goods and services by businesses in Northern Ireland (internally and externally). The dataset is the only source of official data relating to trade between Northern Ireland and Great Britain.<sup>2</sup>

### Data collection

BESES data are gathered through the Northern Ireland Annual Business Inquiry (NIABI). The NIABI is an integrated survey that provides information on the value of the economic activity that businesses generate along with associated expenses in Northern Ireland.

### Sample selection

The NIABI sample is drawn from the Inter-Departmental Business Register (IDBR). A number of sources are used to create the IDBR, including the HMRC register for value added tax (VAT), the HMRC register for pay as you earn (PAYE), the register of incorporated businesses held by Companies House, the business survey data held by the Department of Finance of Northern Ireland and Dun and Bradstreet, a credit rating agency that keeps track of business ownership data.

A targeted and stratified sampling approach is used. The largest businesses based on employee numbers are automatically selected as well as businesses identified as being of interest by the Department for the Economy. The remaining smaller businesses are stratified by location and a sample from each location is selected.

**Table 1.1 NIABI sample and returns**

NIABI Year	Sample	Returns	Percentage
2014	10,000*	7,445	74.45*
2015	9,703	7,091	73.08
2016	8,913	6,223	69.82
2017	9,310	5,946	63.87
2018	9,233	5,550	60.11
2019	9,687	5,092	52.57
2020	9,968	5,870	58.89

**Note:** \*approximate

Though businesses are legally required to complete the NIABI, not all do so. For example, in 2014, approximately 10,000 companies were surveyed and 7,445 submitted their data. As shown in Table 1.1, the response rate declined from approximately 74.45% in 2014 to 52.57% in 2019 before increasing again in 2020 to 58.89%. The reduction in engagement with the data

<sup>2</sup> For further information:

<https://www.nisra.gov.uk/system/files/statistics/BESES-Quick-Reference-Guide.PDF>;

<https://www.nisra.gov.uk/statistics/business-statistics/broad-economy-sales-and-exports-statistics>.

HMRC does provide regional trade data (based on VAT returns), but this relates only to sales from each region beyond the UK.

collection process is a cause for concern. Additional resource may help to increase the response rate.

When survey responses arrive, the data reported are used to update the IDBR. Further checks are also carried out by IDBR maintenance staff within ELMSB, supported by IDBR staff in ONS, before any changes to the IDBR register are made. This helps to validate the IDBR, BRES and NIABI data and triangulates the survey findings to what has been reported in other databases.

### **Limitations of the data collection methods**

Since all businesses are not surveyed in the NIABI, there is the potential for sampling error. The sample is taken from the IDBR. This dataset covers most of the economy in Northern Ireland, but does not include:<sup>3</sup>

- Public sector activities (for the most part)
- Public administration and defence (section O)
- Most of farming (groups 01.1, 01.2, 01.3, 01.4 and 01.5 within section A)<sup>4</sup>
- Local authority and central government bodies in education (section P)
- Human health and social work activities (section Q)
- Medical and dental practice activities (Section Q, 86.2)
- Financial and insurance activities (section K)
- Businesses that are not registered for either PAYE or VAT<sup>5</sup>

NIABI also faces general issues common to survey methods such as respondent bias, human error and omission error.

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<sup>3</sup> As indicated in:  
<https://www.nisra.gov.uk/statistics/annual-business-inquiry/abi-sample-coverage> and  
<https://www.nisra.gov.uk/system/files/statistics/NI-Annual-Business-Inquiry-Reporting-Unit-2021.pdf>.

<sup>4</sup> Includes only hunting, fishing and forestry and agricultural support but excludes the output of crops and animals.

<sup>5</sup> The VAT threshold for 2014 was £79,000, growing to £85,000 by 2020. The Department for Business, Energy and Industrial Strategy (BEIS) estimated that the number of unregistered private sector businesses in Northern Ireland at the beginning of 2019 was 53,075.

## 1.2 Data review

### Data limitations encountered

#### Gaps and imputation

The dataset is presented with no missing data. Gaps in the data would be expected due to incomplete returns. This limits the possibility of imputing data based on previous returns as there is no indication of where a business has been selected but has not responded.

As non-responding businesses are not identified as such or included in the dataset, it is impossible to know whether a business has been selected in a particular year but has not completed the return.

There is also no clarification as to whether the data presented is actual returned data or is imputed. It would be more transparent if imputed data could be marked as such and allow researchers to recognise where data has been imputed for a given business. It would enable researchers to decipher the extent of imputation and to determine whether imputed numbers are being used in subsequent imputation calculations.

It would seem that zeros are entered when a business does not complete an entry in the survey. In many instances, a zero may be the appropriate entry, however, our investigations suggest that, in some instances, a zero entry is incorrect, for example, variables like total turnover (WQ550) and employment (WQ059). This is problematic for making inferences about businesses, sectors and regions, and may influence the weighting allocation calculation. A basic solution may be to require the business to enter a value or an explanation before permitting progress in the survey when a zero is an unlikely entry (for example, total turnover WQ550).

#### Weightings

The dataset includes precalculated weightings to be used in grossing up to Northern Ireland totals. These weights are set to one if the returned data is considered to be an outlier, with all other weights being recalculated. Analysis of these weights shows that up to 32.2% (2017) of observations have been marked as outliers, with an average over the 2014–2020 period of 23.5%. With no means to check or recalculate these weights, they may be subject to suspicion by data users.

A fundamental determinant of the weighting process for size is employment numbers. Our investigations raise concerns about the accuracy of WQ059 (employment numbers). Of the 44,864 original business-by-year returns, 1,781 reported zero employment and an analysis of the outliers for turnover per employment and GVA per employment suggests underreporting of employment numbers. Indeed, we ended up removing the extreme observations.

Particular attention should be directed to ensuring accuracy in the recording of this variable at both the input and checking phases of the data collection process as this variable plays a major

role in weighting values and is also used to derive several performance metrics, such as GVA per employment or turnover per employment.

### **Regional analysis**

As NIABI/BESES data are provided at reporting unit level, returned data for large businesses is attributed to one location (normally their headquarters). This distorts the overall analysis of geographic effects on trade. It would be beneficial if these businesses provided data at the sub-NI regional level to enable the total values to be apportioned by, for example, employee numbers or sales value per region. In addition, for 5,585 observations out of the original 44,864, location is unknown. To reduce the potential for returns to be categorised as unknown, the package used to collect the data should be pre-programmed to recognise Northern Ireland postcodes and to prompt the business to enter the postcode correctly if it is not recognisable by the system. The survey should capture when businesses move location and identify this in the dataset.

### **Covid-19**

Subsidies (WQ414) reported in 2020 increased dramatically, suggesting that Covid-19 related payouts were not distinguished from trade subsidies when collecting data in that year.

### **Negative values**

Some values should not be recorded as negative, for example, stock. The system used to input the data should be designed to flag unusual negative values and to seek reassurance, and perhaps an explanation for a negative number when this arises. In a similar vein, some of the variables are computed by NISRA, for example, GVA. GVA can be negative, but a negative value may also indicate an error in the completion of the return. To provide a check on the relevant entries, the online survey should be designed to calculate the GVA values when the source information is being input and to seek reassurance from the person completing the form, with knowledge of the business, that if a negative GVA is being implied this is a reasonable outcome.

### **Range of variables**

Analysis of trade performance was limited due to the exclusion of capital expenditure, lack of (country specific) detail on export destinations and indicators of innovative activity, such as research and development. The amount of capital expenditure invested by a business would likely contribute to its growth in exports. Also, specific export destination data would enable distance (a proxy for cost) to be determined.<sup>6</sup> This type of data would be important for the design of a Northern Ireland trade model especially in terms of gravity modelling. We recognise that some of these variables are available in NIABI. Their inclusion in this study would perhaps have identified further insights into the drivers of trade performance beyond that reported in our findings.

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<sup>6</sup> More detailed information as to the precise country which is the export market destination.

## **GDPR**

Location data is only available at local government district (LGD) level for GDPR reasons. This restricts the ability to analyse the potential effects of Brexit on trade in border regions. The addition of super output area or postcode data would allow this analysis.

## **Modifications to the data**

### **Deletions for possible errors**

The dataset supplied by NISRA had 44,654 firm-level observations for 16,260 businesses located in Northern Ireland covering the period 2014–2020. Our initial work involved analysing the descriptive statistics including the total, mean, standard deviation, minimum, maximum and number of zeros for each variable across time using both the reported data for the sample of businesses and the weighted data. This process uncovered several issues with the data. First, a visual examination of the maximum values highlighted outliers. To determine if these were errors, we sorted the data by unique identifier code over time and checked their consistency/plausibility. Where we determined data to be erroneous, we elected to (1) keep the observation in the dataset and substitute a zero value for that cell when the other returns reported for that business in other years were zero, or (2) where the business had returned data in the other years (before and after the questionable entry) use imputation to derive a value. This imputation calculated a value for the year by adjusting the prior year's data by growth in the median value of that variable for that particular sector for that year. A check of the resultant value was undertaken relative to the period after the questionable entry to determine if the use of the median approach provided a reasonable response. If not, then the average of the entries in the period before and after the 'questionable entry' was used instead.

We also counted all zeros for each variable. We recognise it is normal for businesses to have no value for several variables, such as subsidies (WQ414), employee costs (WQ450) or certain sub-categories of sales or purchases; however, we deem it highly unlikely that total sales (WQ550) is zero. Indeed, several observations reporting zero sales but making purchases resulted in an unexpectedly high number of businesses with negative GVAs. Given the importance of sales to evaluate trade, we decided to delete these observations. This resulted in 3,450 deletions. In addition, while a business may have negative GVA, we considered it highly unlikely that several businesses would have exactly zero GVA, and so deleted these observations. This resulted in 195 deletions (WQ2030 – GVA). Finally, while businesses may have no employees, all businesses should have employment as an owner must be involved to generate the trade. This is captured by variable WQ059, employment. An analysis of the variable identified a further 100 businesses with a zero value in their return. These observations were deleted.

As a result of these adjustments, the dataset used for our analyses of trade behaviour is made up of 41,036 observations. Trade behaviour is examined using ratios of sales to specific markets relative to overall sales: Great Britain (GB) sales as a percentage of total sales; Republic of Ireland (ROI) sales as a percentage of total sales; Rest of the European Union (REU) sales as a percentage of total sales and Rest of the world (ROW) as a percentage of

total sales.

A final adjustment was made when we investigated performance measured by sales per employment and GVA per employment. An analysis of the extremes of the resultant ratios identified many anomalies. Due to time constraints, and consistent with Wales (2018, 2019), we elected to remove the extreme 1% of observations from the dataset. This resulted in a further 1,368 observations being removed resulting in a final dataset with 39,668 observations. We used this dataset in the regressions that investigated the performance metrics (sales per employment and GVA per employment). A cursory examination of the extreme outliers identified that the problem seemed to arise with the WQ059 employment variable (understated) and not with the reported sales variables; therefore, we elected to keep the dataset with 41,036 observations in the regressions examining external trade behaviour.

### **Data transformation for regression analysis**

Finally, even with the removal of these extremes, the distribution of the data continued to suggest errors/outliers. Therefore, to reduce the impact of these errors/outliers, we transformed the data using the hyperbolic sine function. This caters for negative and zero values, which are prevalent in the dataset and relevant for several of the variables being examined, such as GVA per employee (which may be negative), sales to the rest of the world (ROW) or subsidies received in the period (both may be zero).

### **Inflation adjustment**

We use regional, sector-specific GDP deflators supplied by the ONS (2022) to adjust our dataset for inflation. As a result, the underlying data have been adjusted to 2019 prices. This enables us to examine changes over time after adjusting for a general rising price level.



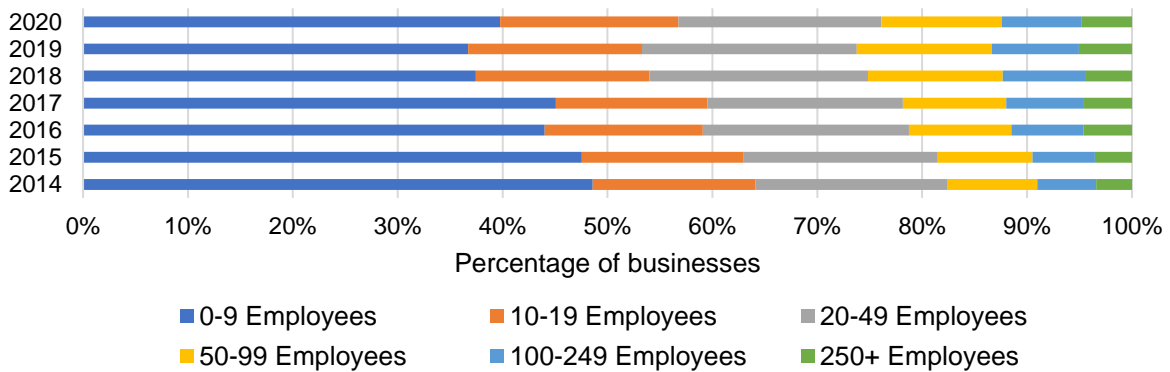
### 1.3 Summary statistics (dataset exploration)

In this section, we summarise the data by year after modifications indicated in the previous section (before trimming).

#### Business size

As shown in Figure 1.1, about 45% of the sample are small (having less than 10 employees), 35% are medium (having between 10 and 49 employees) and just over 20% are large (having 50 employees or more). Notably, the number of larger businesses responding to the survey appears to have increased while the number of smaller businesses has decreased. The latter may reflect limited time and resources available and may warrant incentives to encourage engagement.

**Figure 1.1 Percentage of businesses by employee numbers, 2014–2020**

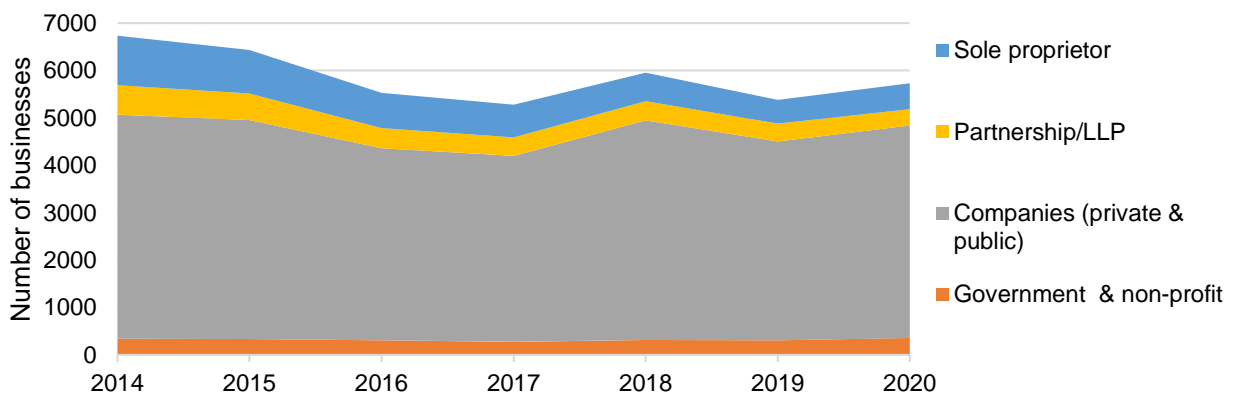


**Note:** Supporting table – Appendix 2, Table A2.1.

#### Business legal structure

Of the respondents in the dataset, between 70.2 and 78.2% are for-profit companies (limited and public), between 5.9 and 9.3% are partnerships or limited liability partnerships, between 9.2 and 15.5% are sole proprietors and between 5.1 and 6.2% are government or non-profit entities.

**Figure 1.2 Number of businesses by legal structure, 2014–2020**



**Note:** Supporting table – Appendix 2, Table A2.2.

The number (and overall proportion) of sole traders and partnerships responding has decreased over the period while the number of companies has increased. This is a consequence of the data sampling approach, where the focus is on larger businesses, which are more likely to be companies.

### Trade behaviour (global reach)

To determine the extent of global reach by businesses in Northern Ireland, we consider the engagement of businesses in internal (NI) and external markets (GB, ROI, REU and ROW). This is shown in Table 1.2.

**Table 1.2 Businesses by destination market(s), 2014–2020**

	2014	2015	2016	2017	2018	2019	2020	Total
	No.(%)	No.(%)	No.(%)	No.(%)	No.(%)	No.(%)	No.(%)	No.(%)
NI only	3,974(59.0)	3,853(59.9)	3,132(56.7)	2,764(52.4)	2,785(46.8)	2,554(47.5)	3,091(53.9)	22,153(54.0)
NI/GB	335(5.0)	324(5.0)	274(5.0)	316(6.0)	307(5.2)	262(4.9)	281(4.9)	2,099(5.1)
NI/ROI	837(12.4)	731(11.4)	616(11.1)	610(11.6)	610(10.2)	539(10.0)	612(10.7)	4,555(11.1)
NI/GB/ROI	576(8.6)	562(8.7)	535(9.7)	565(10.7)	682(11.5)	639(11.9)	551(9.6)	4,110(10.0)
NI/GB/ROI/REU	125(1.9)	128(2.0)	125(2.3)	139(2.6)	209(3.5)	160(3.0)	129(2.3)	1,015(2.5)
NI/GB/ROI/REU/ROW	333(4.9)	305(4.7)	345(6.2)	375(7.1)	870(14.6)	782(14.5)	536(9.3)	3,546(8.6)
Other combinations	407(6.0)	354(5.5)	357(6.5)	377(7.1)	372(6.2)	325(6.0)	379(6.6)	2,571(6.3)
GB only or ROI only	148(2.2)	175(2.7)	143(2.6)	130(2.5)	118(2.0)	119(2.2)	154(2.7)	987(2.4)
<b>Total</b>	<b>6,735(100.0)</b>	<b>6,432(100.0)</b>	<b>5,527(100.0)</b>	<b>5,276(100.0)</b>	<b>5,953(100.0)</b>	<b>5,380(100.0)</b>	<b>5,733(100.0)</b>	<b>41,036(100.0)</b>

Note: Additional analysis provided in Appendix 2, Figures A2.1 and A2.2.

As shown in the total column, over half of businesses included in the sample operate in NI only (54%), 11.1% sell to NI and ROI only, 5.1% sell to NI and GB only, 10% sell to NI, GB and ROI only, 2.5% sell within the rest of the EU (in addition to NI, GB and ROI) and 8.6% sell in all five destinations. A surprising number of businesses (between 118 and 175) sell in GB or ROI only and not in NI.

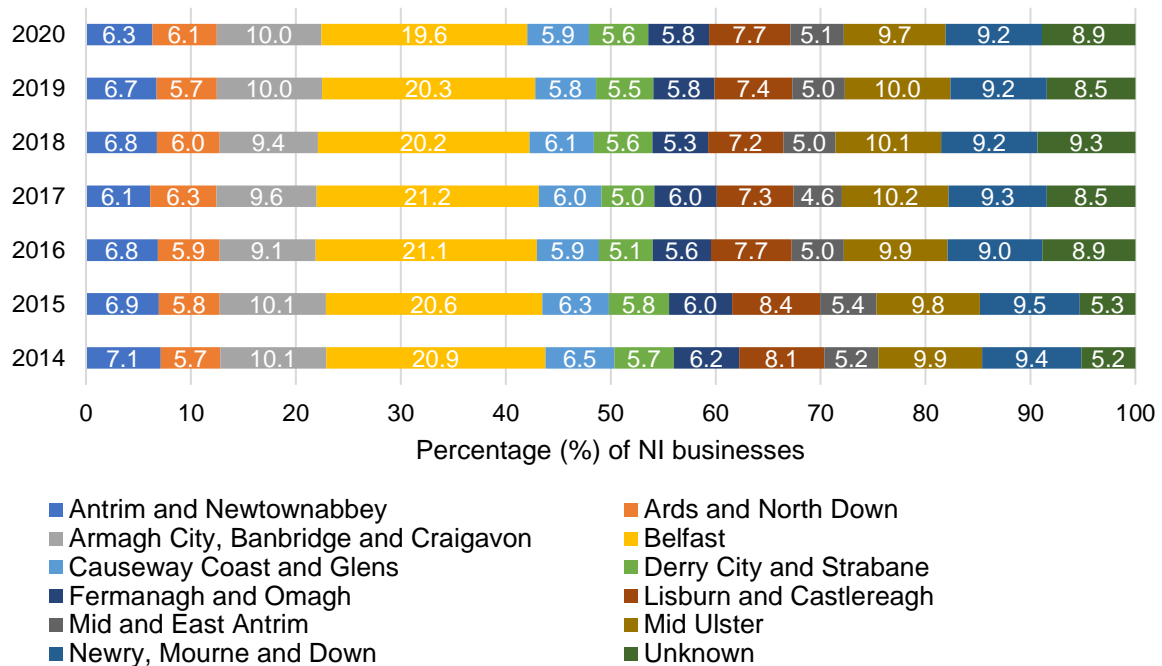
Over time, a smaller proportion of businesses (59% in 2014 to 47.5% in 2019)<sup>7</sup> were trading in NI only with increasing numbers reported in each year trading in other destinations. For example, the number of companies trading in all five destinations increased from 333 in 2014 to 782 by 2019.

### Location

The geographic distribution of the 41,036 business observations across Northern Ireland's 11 local government district (LGD) regions is shown in Figure 1.3. Unsurprisingly, a relatively large proportion of businesses in the sample are from the Belfast region (yellow).

<sup>7</sup> Ignoring 2020 because of the Covid-19 effect.

**Figure 1.3 Percentage of businesses by location, 2014–2020**



Note: Supporting table – Appendix 2, Table A2.3.

The pattern of responses is relatively stable over the period 2014–2020 for each region reflecting NISRA’s targeted sampling approach of ensuring that each location is represented in the survey collection process.

### Sector

The data are analysed by standard industrial classification (SIC) sector in Table 1.3. The largest number of respondents are from manufacturing (21.1%), retail (20.2%), construction (12%) and professional, scientific and technical (9.3%), while the fewest number of respondents are from mining and quarrying (0.6%), power and air conditioning supply (0.8%), water management (1%) and education (1.1%).

The small number of businesses responding under agriculture, forestry and fishing (between 98 and 124 businesses per year) is not reflective of the number of businesses operating within this sector. The low number is a result of the sampling approach which omits farm businesses and businesses under the VAT turnover threshold.

**Table 1.3 Businesses by SIC sector, 2014–2020**

<b>Activities</b>	<b>2014</b>	<b>2015</b>	<b>2016</b>	<b>2017</b>	<b>2018</b>	<b>2019</b>	<b>2020</b>	<b>Total</b>
	No.(%)	No.(%)	No.(%)	No.(%)	No.(%)	No.(%)	No.(%)	No.(%)
Agriculture/forestry/fishing	124(1.8)	98(1.5)	114(2.1)	117(2.2)	100(1.7)	115(2.1)	121(2.1)	789(1.9)
Mining & quarrying	35(0.5)	40(0.6)	35(0.6)	38(0.7)	37(0.6)	35(0.7)	28(0.5)	248(0.6)
Manufacturing	1,186(17.6)	1,154(17.9)	1,151(20.8)	1,093(20.7)	1,427(24.0)	1,311(24.4)	1,354(23.6)	8,676(21.1)
Power/air conditioning supply	65(1.0)	103(1.6)	26(0.5)	34(0.6)	33(0.6)	33(0.6)	25(0.4)	319(0.8)
Water management ...	48(0.7)	56(0.9)	49(0.9)	52(1.0)	67(1.1)	58(1.1)	70(1.2)	400(1.0)
Construction	1,049(15.6)	832(12.9)	663(12.0)	617(11.7)	649(10.9)	524(9.7)	603(10.5)	4,937(12.0)
Wholesale/retail/MV	1,570(23.3)	1,401(21.8)	990(17.9)	937(17.8)	1,177(19.8)	1,055(19.6)	1,152(20.1)	8,282(20.2)
Transport/storage	232(3.4)	207(3.2)	196(3.5)	171(3.2)	237(4.0)	248(4.6)	275(4.8)	1,566(3.8)
Accommodation/food service	257(3.8)	251(3.9)	251(4.5)	250(4.7)	303(5.1)	244(4.5)	272(4.7)	1,828(4.5)
Information & communication	288(4.3)	206(3.2)	250(4.5)	265(5.0)	273(4.6)	221(4.1)	254(4.4)	1,757(4.3)
Real estate	477(7.1)	682(10.6)	280(5.1)	298(5.6)	221(3.7)	189(3.5)	177(3.1)	2,324(5.7)
Professional/scientific	473(7.0)	468(7.3)	648(11.7)	575(10.9)	573(9.6)	553(10.3)	527(9.2)	3,817(9.3)
Administrative/support service	239(3.5)	252(3.9)	235(4.3)	236(4.5)	260(4.4)	234(4.3)	234(4.1)	1,690(4.1)
Education	89(1.3)	128(2.0)	56(1.0)	51(1.0)	50(0.8)	43(0.8)	46(0.8)	463(1.1)
Human health & social work	237(3.5)	235(3.7)	242(4.4)	224(4.2)	289(4.9)	291(5.4)	295(5.1)	1,813(4.4)
Arts & recreation	107(1.6)	97(1.5)	96(1.7)	103(2.0)	104(1.7)	101(1.9)	94(1.6)	702(1.7)
Other service	259(3.8)	222(3.5)	245(4.4)	215(4.1)	153(2.6)	125(2.3)	206(3.6)	1,425(3.5)
<b>Total</b>	<b>6,735(100)</b>	<b>6,432(100)</b>	<b>5,527(100)</b>	<b>5,276(100)</b>	<b>5,953(100)</b>	<b>5,380(100)</b>	<b>5,733(100)</b>	<b>41,036(100)</b>

## **1.4 Recommendations to data owners**

### **Larger sample**

To obtain a more comprehensive dataset, it would be advantageous if more businesses were included as census businesses over all industries and employment bands. Although potentially cumbersome, those businesses willing and able to provide data should be encouraged to do so and possibly incentivised. This would enhance the availability of consecutively reported data for individual businesses over time.

### **Missing observations and labelling of imputed observations**

The current dataset, contrary to expectations, has no missing data as the current approach seems to automatically populate uncompleted fields with zeroes. Whilst this provides a 'clean' dataset, it would be preferable to distinguish true zeroes from missingness. In addition, there is no indication within the dataset whether the data is returned or imputed. An additional variable with this information would enhance transparency.

### **Automated survey**

Better use of automated functionality to check/query data (anomalies) when it is being input by businesses would potentially increase the reliability of the data and reduce errors in the published dataset.

### **Review**

Additional resources should be allocated to checking the validity of the original entries and correcting anomalies. Use of growth and ratio trends over time should be used to highlight errors. In addition, checks against other sources such as HMRC tax data, VAT return data, annual financial statements and PAYE returns may provide assurance over underlying data entries. This resource could also prompt engagement or chasing-up missing entries.

### **Identification of 10X priority cluster businesses**

To gauge the progress of the 10X strategy, it would be helpful if businesses that fall within each of the priority sectors were identified. This is not being done. We recognise such a classification is difficult. SIC codes focus on what the product is, not how it is made, and so distinguishing the constituent companies of 10X is problematic. Nevertheless, better identification is critical to meaningful analysis.

### **Make more data available**

A wider range of data should be available to researchers, with more trust put into the processes that ensure output from the data does not breach confidentiality. Researchers using the data have to become ONS SRS Accredited Researchers. This involves being trained on data presentation and use that protects the identity of data sources. In addition, the SRS Statistical Support Team perform a double review process on all outputs from the data to ensure the data do not contain any disclosive material before being cleared for use. This is a rigorous process. If more data were made available, such as postcode data, then more meaningful analysis would result.

## **Financial services and insurance activities**

As data are not collected/published on financial services and insurance activities, there is a lack of data for the Fintech/ financial services 10X priority cluster. Data on this sector should be collected and published as it is important in the policymaking context for Northern Ireland.

## **Farming**

Farming businesses make up a large part of Northern Ireland trade, yet many are not included in the survey. Consideration of how to track and reflect (on a comparable basis to NIABI/BESES) farm trade to and from GB and ROI would provide a more comprehensive indication of trade for Northern Ireland. These data would be of interest to policymakers.

## **Other data for researchers**

There are several areas of supplementary data that would be helpful for researchers in the analysis of trade, including:

- Financial-type indicators e.g., assets to give an indication of business size and capital expenditure to give an indication of investment propensity.
- Whether a business has started or has failed.
- Information to enable head office combined data to be apportioned to regions (employment numbers or sales figures or proportions per predefined region).<sup>8</sup>
- An indicator of when a business changes regional location, so it is not confused with growth in current business activity.
- It would be beneficial to have HMRC-matched data for certain key variables to provide some confidence on the weighting process (assuming HMRC have data for the population, such as total sales).
- Data at postcode level. This would enable more refined analysis of trade e.g., activity of businesses operating close to the Northern Ireland-Republic of Ireland border. Additional checks to ensure anonymity would be required but we recommend leaving this to the SRS trained researcher. The SRS ONS output audit checks are diligent and, from our experience, are unlikely to allow any issues to pass through.
- Social data e.g., access to data on deprivation.
- An extended dataset to include 2021 and 2022. This (when available) should provide better evidence on the impact of Brexit and Covid-19.
- Detailed data on export destination country, export duty, and distance would help with the design of a trade model for Northern Ireland.
- Separate identification of one-off interventions, such as Covid-19 type supports (notably subsidies).

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<sup>8</sup> It might be argued that this is already provided for in terms of the NIABI data presented at the level of local unit. However, there may remain questions about how accurately data returned for multi-unit businesses are apportioned across various locations.

## 1.5 Quality of supporting documentation, metadata and synthetic data

### Supporting documents

While NISRA staff have been helpful in clarifying the procedures used in the collection and analysis of the NIABI/BESES data, and links to other information were provided within SRS ONS, the provision of more comprehensive written background information would add to the usefulness of the data. We recommend:

- A dedicated support webpage containing links to documents that explain clearly how the sample is selected each year, the response rate, checks carried out on the data to that point and summary descriptive statistics on the returns received.
- A link to a data dictionary that defines the individual variables included within the dataset and how they have been determined (if calculated from the data).
- A detailed summary of the processes involved in calculating weights, identification of outliers and the stratification of businesses within the survey. This would ideally provide access to the weighting formulas adopted and the data used to calculate the weights for each year.
- Details of how the geographical apportioning of returned data from large businesses is performed. This would provide more clarity on both the overall state of the NI economy and geographic variations.
- Reviewing the online provision of comparable resources by the ONS to see if there is any learning that could be used by NISRA (to enhance the usability of the data).
- Links to pages hosting publications that have used the dataset, publications on methodology and complementary datasets that researchers might want to use when analysing the data, such as deflation indices.

### Imputed data variables (“missing data”)

Some gaps in the data are expected due to incomplete returns and non-response. Our problem, as data users, is that these gaps and the nature of the gaps are not clearly identifiable. Moreover, NISRA informed us that they imputed some data for the period post-2018. The problem this presented to us as data users is knowing whether the data as presented is actual data or had been imputed by NISRA.

Due to the way the database is presented, we encountered difficulties when trying to impute data for the period 2014–2018. Identifying prior and future returns for a single business is problematic as there is no information on whether a business has been selected but has not responded or when they are no longer in operation. Though we did attempt imputation, we considered it unreliable, and so did not use it to amend the dataset for our analyses.

We recommend that details of the imputed variables and the underlying methodology used by NISRA be clearly set out. With this information, data users may consider the reliability of any imputation process, or, where imputation has not been undertaken by NISRA, the data user may generate imputed variables.

## **Additional data**

### ***10X identification***

At present, businesses are allocated to industry SIC codes, typically based on a self-assessment by businesses of what is their principal product or service. A problem, however, from the point of view of evaluating aspects of policy in Northern Ireland, is that 10X priority clusters are defined rather more in terms of **how** products and services are produced (the technologies being used) rather than **what** is produced.

This implies a problem in identifying which businesses are within 10X priority areas and which are not. From the point of view of producing metrics to evaluate the implementation of the 10X strategy, the boundaries of what constitutes a 10X priority cluster<sup>9</sup> should be clearly defined and then used to identify businesses from within the population. As these businesses are of strategic importance, they should be surveyed each year, irrespective of size and location. In addition, as the performance of 10X businesses will be closely monitored over the coming decade, there should be clear guidance on how a business starts or stops to qualify as 10X so that shifts in reported statistics are not a consequence of changes to the definition, but the result of changes to trading behaviour and economic performance. Of course, we recognise that a product-based approach to standard industrial classifications is very long-established and so it may not be reasonable to expect ONS/NISRA to provide data consistent with the defined boundaries of the priority clusters in Northern Ireland.

We recommend an additional data entry point in the survey that gathers information on **how** products or services are produced.

### ***Measuring innovation and technological progress***

The dataset we had access to did not have an appropriate measure of innovation and technological progress. Measuring innovation and technological progress is difficult due to variations in definition. Studies examining international or inter-regional competitiveness often use expenditure on research and development as a proxy. However, this is an imperfect proxy because it is an “input” measure. Another possible input measure of innovation and technological progress is the percentage of the labour force with advanced qualifications (e.g., PhDs in science or technology). An alternative and more “output” measure of innovation and technological progress could be the number of patents issued.

Most analyses of the determinants of economic growth (growth accounting) have concluded that technological progress has been the main cause of growth in economies and is more important than additions to the labour force or capital stock. Given this context, we recommend that additional data on the levels of spending on research and development at the business level be collected. Information on this relationship would be of interest to policymakers who could design interventions (such as tax credits or enhanced capital allowances or grants) to promote research and development in priority sectors.

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<sup>9</sup> Agri-tech; life and health sciences; advanced manufacturing and engineering; fintech/ financial services; software (including cyber); screen; low carbon.



# Statistical Analysis: Northern Ireland 2014–2020

*using NISRA's BESES and NIABI datasets*



## 2.1 Sectors defined

The DfE 10X economic vision for Northern Ireland,<sup>10</sup> as of the start of 2023, highlighted seven key priority clusters:

1. Agri-tech
2. Life and health sciences
3. Advanced manufacturing and engineering
4. Fintech/ financial services
5. Software (including cyber)
6. Screen
7. Low carbon

This list of seven represents an extension and elaboration of the thinking and choice of clusters identified in earlier 10X documents. In 2021, five clusters were highlighted:<sup>11</sup>

1. Agri-tech
2. Health and life sciences (e.g., personalised medicine)
3. Advanced manufacturing and engineering (e.g., composites)
4. Fintech/ financial services
5. Digital, ICT and creative industries (e.g., cyber security)

It seems that the final cluster in the 2021 list, Digital, ICT and creative industries has been disaggregated into two parts (i.e., software and screen) and that low carbon has been added (although parts of it would have been contained under agri-tech and advanced manufacturing and engineering).

At present, neither the NIABI/BESES dataset nor the 10X documentation identifies individual businesses according to 10X priority clusters. In the absence of such classification, we chose to align the priority clusters to the Standard Industrial Classification (SIC) 2007 to facilitate analysis.

The task of translating from the DfE key industries or clusters to the SIC is subjective. A particular challenge is that the SIC is a product-based approach, i.e., it classifies businesses according to what is being made or which service is being provided. By contrast, the 10X clusters are more associated with *how* goods or services are made/provided, e.g., food products with an application of technology. In some instances, technologies are specified with specific clusters, e.g., AI and data analytics, but this did not necessarily help with SIC alignment.<sup>12</sup>

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<sup>10</sup> DfE October 2022, "10X Vision- Next Steps for Implementation", and October 2022, "A 10X Economy- An Open Call for Research Proposals".

<sup>11</sup> DfE 2021, "A 10X Economy- A Summary of the Economic Vision for a Decade of Innovation".

<sup>12</sup> In addition to the "problem" that the DfE listing of technologies was more complete for some clusters rather than others it should be noted that this information relates only to the five clusters identified in 2021 rather than the later and longer list. Other, probably online, data sources other than the NIABI such as company financial statements and other information from company websites may shed further light on which businesses are engaged in the type of activities which would probably imply they are part of a cluster. Although that would be subject to the caveat that self-promotional statements may exaggerate technological and other performance.

To align 10X with SIC codes, we proceeded as follows:

- First, Companies House provides an online search facility whereby keywords can be entered to see if they register at any point within the SIC (this service is presumably for use by businesses as they attempt to self-identify their main activity when filling in the Annual Business Inquiry (ABI) return forms). We took the keywords used by DfE in their 2021 summary document (*A 10X Economy: A Summary of the Economic Vision for a Decade of Innovation*) and entered them (or various combinations thereof) into the search box to see which, if any, SIC codes were suggested. For example, in terms of software, we tried “cyber security”, “AI”, “artificial intelligence”, “data analytics” etc. Some judgement was necessary when matching similar but not identical terms, e.g., “data analytics” as it did not appear but “6310 data processing” did. We noted that very few of the exact terms used in the DfE document appear in the SIC. A small number can probably be matched up to other sector names which are reasonably close.
- Second, as a complement and addition to the first method, we went through the actual SIC, at the 4- or 5-digit level, to see if this suggested what might or might not be included within the 10X priority clusters.

**Table 2.1 Identification of 10X businesses using the SIC system**

10X cluster	2-, 4- and 5-digit SIC codes aligned	Limitations to identification
Software (including cyber)	58.29 - Other software publishing 61 - Telecommunications 62 - Computer programming (including, e.g., 62.01/1 Ready-made interactive leisure and entertainment software development) Part 63 - Information services activities i.e., 63.10 - Data processing, etc.	May overlap with clusters fintech/ financial services and life and health sciences. No obvious sub-division of 61 was possible so assumed all. There is a case for including some businesses in 90 - Creative, arts and entertainment activities, however, we decided to exclude as creative arts businesses are predominately service based without much input of technology.
Screen	59 - Motion picture, video and television programme production, sound recording and music publishing activities	Particularly in this case, there were dilemmas about whether it is appropriate to include much of the supply chain feeding into film/TV production, e.g., cafes supplying food, employment agencies supplying extras, farms rearing animals for filming. But, in any case, it is very hard to identify what percentage of the relevant SIC codes would be truly relevant.
Agri-tech	10 - Manufacture of food products 11 - Manufacture of beverages 25.92 - Manufacture of light metal packaging 82.92 - Packaging activities	As a simplification, we have taken the view that the production of the basic food or drink (at the farm level) happens before the application of “agri-tech”, i.e., that input comes at the processing stage. We recognise it is an exaggeration to claim <i>all</i> the 2-digit divisions, i.e., manufacture of food products and manufacture of Beverages as (10X) agri-tech businesses. We have used that assumption as the 4-digit description at the product level gives little indication of the distinctions in use of technologies such as genomics, traceability, advanced packaging, etc. The inclusion of all of 25.92 and 82.92 may also be problematic - <i>some</i> of this will represent advanced packaging but <i>not all</i> .
Advanced manufacturing and engineering (e.g., composites)	20 - Manufacture of chemicals and chemical products 26 - Manufacture of computer, electronic and optical products 27 - Manufacture of electrical equipment 28 - Manufacture of machinery and equipment n.e.c. 29 - Manufacture of motor vehicles, trailers and semi-trailers	The decision was made that the following parts of manufacturing used insufficient of the advanced technologies to be included in advanced manufacturing: 22 - Manufacture of rubber and plastic products (although 22.11 - Manufacture of rubber tyres and tubes; retreading and rebuilding of rubber tyres included)

	<p>30 - Manufacture of other transport equipment  <u>Also including:</u>  22.11 - Manufacture of rubber tyres and tubes; retreading and rebuilding of rubber tyres  25.40 - Manufacture of weapons and ammunition</p> <p>Part of 71 Architectural and engineering activities; technical testing and analysis i.e.,  71.12/1 - Engineering design activities for industrial process and production  71.12/2 - Engineering related scientific and technical consulting activities  71.12/9 - Other engineering activities (not including engineering design for industrial process and production or engineering related scientific and technical consulting activities)</p> <p>Part of 72 - Scientific research and development (but excluding social sciences and humanities and excluding biotechnology - the latter in Life and health sciences), so including 72.19 - Other research and experimental development on natural sciences and engineering</p> <p>Two SIC codes <u>excluded</u> because included under Low carbon, i.e.  28.11 - Manufacture of engines and turbines, except aircraft, vehicle and cycle engines because this includes wind turbines  26.11 and 28.21 Manufacture of electronic components and Manufacture of ovens, furnaces and furnace burners because include components for solar heating devices</p>	<p>23 - Manufacture of other non-metallic mineral products (this could beg the question of whether there any businesses in NI primarily concerned with producing composite materials and, if there were, in which SIC code does this fall?).  24 - Manufacture of basic metals  25 - Manufacture of fabricated metal products, except machinery and equipment (although 25.40 - Manufacture of weapons and ammunition was included)  31 - Manufacture of furniture  32 - Other manufacturing</p> <p>It is unclear what DfE mean when they mention water and consumer products within their list of relevant “technologies”. Although the DfE definition did also mention “construction”, it was decided not to include any data from Section F Construction, the breakdown at the 5-digit level provided little indication of which activities represented more technologically advanced building activities.</p> <p>Note, exclusion of the entirety of 28.11 and 26.11 and 28.21 (because of elements of low carbon in those industries) probably does also exclude some parts of advanced manufacturing.</p>
Fintech/ financial services	64 - Financial service activities, except insurance and pension funding	Undoubtedly, should not be all these divisions <i>if</i> the emphasis is on fintech alone - which DfE defines simply as “technological solutions”

	65 - Insurance, reinsurance and pension funding, except compulsory social security 66 - Activities auxiliary to financial services and insurance activities	- but the 4-digit data was by type of financial activity and so did not really distinguish application of technology to finance, etc. However, DfE did name this sector as fintech/ financial services, so it is acceptable to include the three 2-digit industries in their entirety.
Health and life sciences (e.g., personalised medicine)	21 - Manufacture of basic pharmaceutical products and pharmaceutical preparations 32.50 - Manufacture of medical and dental instruments and supplies 72.11 - Research and experimental development on biotechnology	Likely that <i>some</i> of 86 - Human health activities should be included, given that there will be some personalised care delivered through hospitals, clinics, GP practices, etc., but probably only a very small part. The 4-digit classification gave no basis for dividing the data.
Low carbon	28.11 - Manufacture of engines and turbines, except aircraft, vehicle and cycle engines because wind turbines in that industry 26.11 – Manufacture of electronic components because components for solar energy devices in that industry 28.21 – Manufacture of ovens, furnaces and furnace burners because components for solar energy devices in that industry	Unable to identify how much of construction activity (e.g., retrofitting, insulation, installing renewable forms of energy) relates to low carbon activity. Generation of electricity and heat from renewable sources <i>should</i> be included. Unfortunately, a single code (35.11 - Production of electricity) includes not only electricity generated from renewables but also all the other sources of energy.  Note, the industrial classification definitions used for the industries including wind turbines and solar energy devices probably also include some parts of what is actually advanced manufacturing

**Sources:** Key clusters: DfE 2021, A 10X Economy. SIC classification -

<https://www.ons.gov.uk/methodology/classificationsandstandards/ukstandardindustrialclassificationofeconomicactivities/uksic2007>

While defining priority clusters is challenging, the DfE's (2021) summary document includes forecasts for annual (and decade duration) employment growth for three of the clusters. Such a forecast implies *some* confidence about which activities are included within each cluster.

As detailed in Table 2.2, our classification process resulted in 4,639 business observations out of 40,705 (11.4%) being classified as 10X. There are no fintech businesses in the NIABI and BESES datasets available to us as such financial services businesses are not surveyed. A small number of businesses included in the dataset are categorised as screen and low carbon. Therefore, to enable data presentation that complies with ADR rules on identification, these classifications are merged with others – screen with software and low carbon with advanced manufacturing and engineering. As portrayed in Table 2.2, our final classification has four categories: agri-tech – 1,484 observations; health and life sciences – 236 observations; advanced manufacturing, engineering and low carbon – 1,691 observations; software and screen – 1,228 observations.

**Table 2.2 Business survey respondents by (combined) sector, 2014–2020**

<b>Sectors</b>	<b>2014</b>	<b>2015</b>	<b>2016</b>	<b>2017</b>	<b>2018</b>	<b>2019</b>	<b>2020</b>	<b>Total</b>
	No.(%)	No.(%)	No.(%)	No.(%)	No.(%)	No.(%)	No.(%)	No.(%)
<b>Non-10x</b>								
Other services	1,941(29.2)	2,111(33.0)	1,642(30.0)	1,580(30.2)	1,653(28.0)	1,502(28.1)	1,628(28.5)	12,057(29.7)
Other production	272(4.1)	297(4.6)	224(4.1)	241(4.6)	237(4.0)	241(4.5)	244(4.3)	1,756(4.3)
Manufacturing	732(11.0)	712(11.1)	706(12.8)	665(12.6)	877(14.9)	808(15.1)	835(14.7)	5,335(13.1)
Construction	1,049(15.8)	832(13.0)	663(12.1)	617(11.8)	649(11.0)	524(9.8)	603(10.6)	4,937(12.1)
Wholesale and retail	1,570(23.6)	1,401(21.9)	990(18.1)	937(17.9)	1,177(19.9)	1,055(19.7)	1,152(20.2)	8,282(20.3)
Professional/scientific	459(6.8)	455(7.1)	628(11.5)	555(10.6)	559(9.5)	532(10.0)	511(9.0)	3,699(9.1)
<b>Sub-total</b>	<b>6,023(90.7)</b>	<b>5,808(90.7)</b>	<b>4,853(88.6)</b>	<b>4,595(87.7)</b>	<b>5,152(87.3)</b>	<b>4,662(87.3)</b>	<b>4,973(87.3)</b>	<b>36,066(88.6)</b>
<b>10X</b>								
Agri-tech	196(3.0)	189(3.0)	196(3.6)	198(3.8)	248(4.2)	226(4.2)	231(4.1)	1,484(3.6)
Health/life sciences	28(0.4)	30(0.5)	30(0.5)	33(0.6)	36(0.6)	37(0.7)	42(0.7)	236(0.6)
Adv. Manufacture	237(3.6)	231(3.6)	233(4.3)	214(4.1)	270(4.6)	253(4.7)	253(4.4)	1,691(4.2)
Software/screen	158(2.4)	142(2.2)	167(3.0)	199(3.8)	197(3.3)	168(3.2)	197(3.5)	1,228(3.0)
<b>Sub-total</b>	<b>619(9.3)</b>	<b>592(9.3)</b>	<b>626(11.4)</b>	<b>644(12.3)</b>	<b>751(12.7)</b>	<b>684(12.8)</b>	<b>723(12.7)</b>	<b>4,639(11.4)</b>
<b>Total</b>	<b>6,642(100)</b>	<b>6,400(100)</b>	<b>5,479(100)</b>	<b>5,239(100)</b>	<b>5,903(100)</b>	<b>5,346(100)</b>	<b>5,696(100)</b>	<b>40,705(100)</b>

Note: Sector details for 331 data entries were unknown and are excluded.

Patterns in the number of reported respondents suggest growth in the 10X priority businesses over the period 2014–2020, from 619 in 2014 to 723 in 2020 (16.8% increase). Growth is evident across all four classifications; for example, in 2014 the sample contained 158 software and screen businesses, increasing to 197 by 2020 (a 24.7% increase).

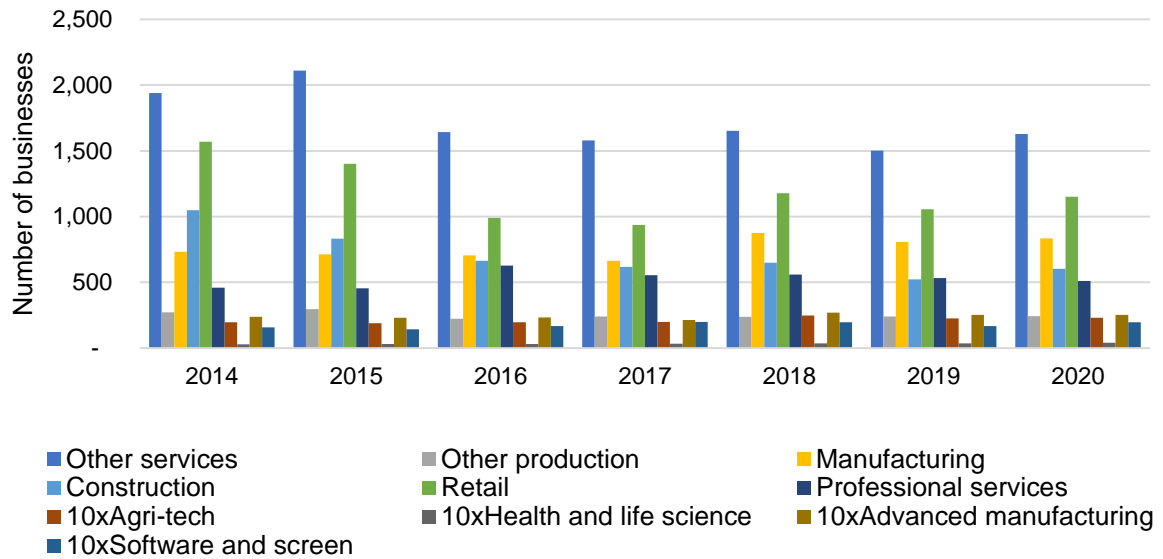
### **Non-10X business sectors (controlling for industry type)**

The dataset analysed each business observation by SIC code to two digits and this produced 17 sectors (see Table 1.3). Such granular slicing of the data causes problems when disclosing information about business behaviour at the sub-NI level (an objective of this study). As a result, it was decided to amalgamate the classifications where the numbers were small. This resulted in six classifications of non-10X businesses as portrayed in Table 2.2: other services (SIC N, P, Q, R and S); other production (SIC A, B, D and E); manufacturing (SIC C); construction (SIC F); wholesale and retail (SIC G); and professional and scientific (SIC M).

Patterns in the number and proportion of businesses taking part in the survey, as portrayed in Table 2.2 and visualised in Figure 2.1, suggest a reduction in the number of businesses in the construction (from 1,049 in 2014 to 603 in 2020), the wholesale and retail (from 1,570 in 2014

to 1,152 in 2020) and other services (from 1,941 in 2014 to 1,628 in 2020) sectors. This may be due to sample selection changes, consolidation, businesses ceasing trading and reductions in business start-ups.

**Figure 2.1 Number of businesses by sector (combined), 2014–2020**

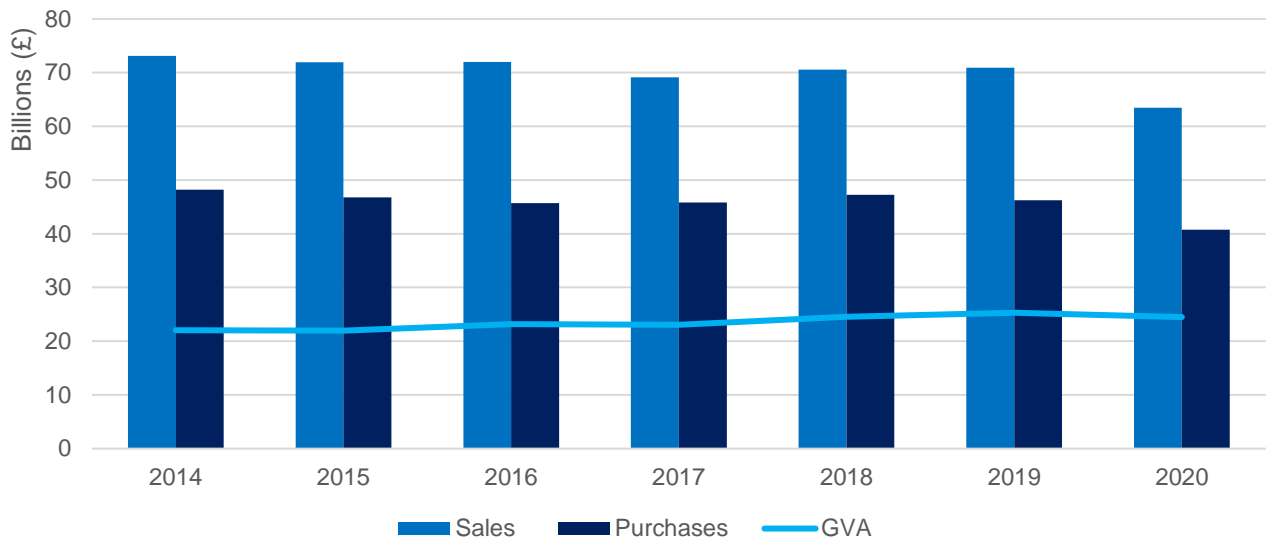




## 2.2 Overall business activity

As shown in Figure 2.2 and Table 2.3, the total inflation adjusted (or real or constant price terms) weighted sales of Northern Irish businesses fell from £73.1 billion in 2014 to £70.9 billion in 2019 (£63.5 billion in 2020). Purchases also fell from £48.2 billion in 2014 to £46.3 billion in 2019 (£40.7 billion in 2020). Despite, the fall in activity levels, overall value-added (GVA at basic prices) increased from £22.0 billion in 2014 to £25.3 billion in 2019 (£24.5 billion in 2020).

**Figure 2.2 Total sales, purchases and GVA, 2014–2020**



**Note:** Data are weighted [NISRA (2023) NIABI] and indexed to 2019 prices [ONS (2022) Regional GVA balanced by industry].

**Table 2.3 Total sales, purchases and GVA (£'000s), 2014–2020**

	2014	2015	2016	2017	2018	2019	2020
Sales	73,116,299	71,932,063	71,974,236	69,100,633	70,541,573	70,922,981	63,452,793
Purchases	48,201,870	46,787,671	45,723,027	45,853,437	47,238,694	46,255,461	40,745,253
GVA	22,017,007	21,962,005	23,178,209	23,044,727	24,542,925	25,296,395	24,472,885

**Note:** Data are weighted [NISRA (2023) NIABI] and indexed to 2019 prices [ONS (2022) Regional GVA balanced by industry].

## 2.3 Sectoral business activity

Weighted data on GVA (Table 2.4), sales (Appendix 3: Table A3.1) and purchases (Appendix 3: Table A3.2) are analysed by sector. The other services and wholesale and retail sectors report the highest total levels of GVA in each period.

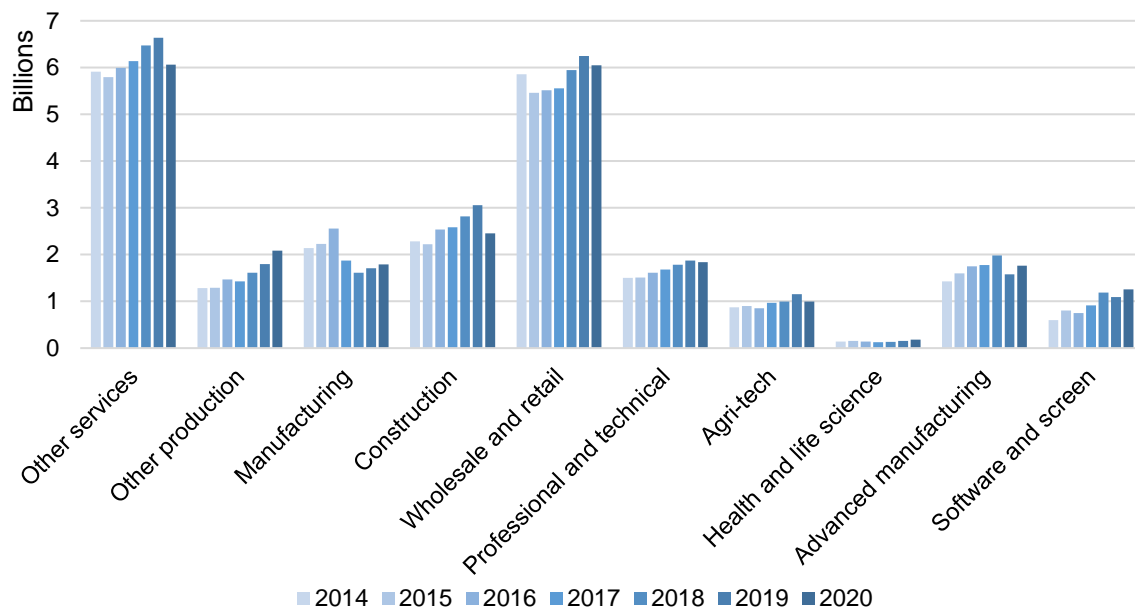
**Table 2.4 Total GVA by sector (£'000s), 2014–2020**

	2014	2015	2016	2017	2018	2019	2020
<b>Non-10x</b>							
Other services	5,912,327	5,795,841	5,993,889	6,137,550	6,472,489	6,639,795	6,062,205
Other production	1,281,808	1,291,004	1,470,484	1,430,085	1,609,310	1,800,169	2,086,640
Manufacturing	2,142,475	2,231,382	2,555,610	1,872,945	1,613,360	1,706,412	1,792,116
Construction	2,283,569	2,218,046	2,538,231	2,583,596	2,813,699	3,058,155	2,454,241
Wholesale and retail	5,855,161	5,461,353	5,511,527	5,555,960	5,946,852	6,247,406	6,045,127
Professional/technical	1,501,443	1,506,169	1,613,504	1,679,884	1,785,127	1,872,515	1,835,995
<b>10X</b>							
Agri-tech	869,874	899,462	852,457	970,358	999,215	1,150,175	996,950
Health & life sciences	142,601	153,560	139,409	125,010	131,387	151,762	181,608
Adv manufacturing	1,425,420	1,600,965	1,751,743	1,776,851	1,982,005	1,575,931	1,761,464
Software & screen	602,329	804,223	751,355	912,488	1,189,481	1,094,075	1,256,539
<b>Total</b>	<b>22,017,007</b>	<b>21,962,005</b>	<b>23,178,209</b>	<b>23,044,727</b>	<b>24,542,925</b>	<b>25,296,395</b>	<b>24,472,885</b>

**Note:** Data are weighted [NISRA (2023) NIABI] and indexed to 2019 prices [ONS (2022) Regional GVA balanced by industry].

A consistent pattern of increased GVA is observed across all sectors for 2014–2019, with the exception of manufacturing, which declined in 2017 (Figure 2.4).

**Figure 2.4 Total GVA by sector, 2014–2020**



More detailed evaluation of the movement in GVA and its key components over the period 2014–2020 is provided in Table 2.5. Due to the disruptive impact of Covid-19, growth rates are calculated between 2014 and 2019 for sales, purchases and GVA for each sector, with the movement in GVA reported separately for the period 2019–2020 (right-hand side of table).

**Table 2.5 Changes in total sales, purchases and GVA by sector 2014–2019, and total GVA 2019–2020**

	2014–2019			2019–2020
	Sales	Purchases	Total GVA	Total GVA
<b>Non-10X</b>				
Other services	↑ 5.04%	↑ 8.71%	↑ 12.30%	↓ 8.70%
Other production	↑ 32.91%	↓ 28.65%	↑ 40.40%	↑ 15.91%
Manufacturing	↓ 47.77%	↑ 13.30%	↓ 20.35%	↑ 5.02%
Construction	↑ 9.42%	↓ 2.27%	↑ 33.92%	↓ 19.75%
Wholesale and retail	↓ 6.85%	↓ 10.60%	↑ 6.70%	↓ 3.24%
Professional & technical	↑ 13.70%	↓ 7.30%	↑ 24.71%	↓ 1.95%
<b>10X</b>				
Agri-tech	↑ 1.30%	↑ 6.79%	↑ 32.22%	↓ 13.32%
Health and life sciences	↑ 27.81%	↑ 48.93%	↑ 6.42%	↑ 19.67%
Advanced manufacturing	↑ 15.55%	↑ 12.19%	↑ 10.56%	↑ 11.77%
Software and screen	↑ 42.57%	↑ 15.61%	↑ 81.64%	↑ 14.85%
<i>Total</i>	↓ 3.00%	↓ 4.10%	↑ 14.89%	↓ 3.26%

**Note:** Data from Tables 2.4, A3.1 and A3.2 (Appendix 3) are used in the calculation of the growth statistics. Underlying data are weighted [NISRA (2023) NIABI] and indexed to 2019 prices [ONS (2022) Regional GVA balanced by industry].

With the exception of manufacturing, the absolute amount of basic GVA increased for all sectors. The greatest increases were observed in the software and screen (81.64%), other production (40.40%), construction (33.92%) and agri-tech (32.22%) sectors. Sales fell overall in the period 2014–2019 by 3.00%. This drop is predominately driven by the reduction in manufacturing sales (fell by 47.77%). Wholesale and retail sales also fell in real terms by 6.85%. Growth in sales was reported in all other sectors, with the highest real growth rates reported for software and screen (42.57%), other production (32.91%) and health and life sciences (27.81%).

The drop in total sales was offset by a larger drop in total purchases of 4.10%, predominately driven by a drop in purchases by businesses within the other production (28.65%) and wholesale and retail (10.60%) sectors. Of note is that manufacturing sales fell by 47.77%, yet purchases increased by 13.30%.

As expected, many sectors experienced a fall in total GVA over the period 2019–2020, with the construction (19.75%) and agri-tech (13.32%) sectors reporting the largest drop in real GVA. Of note is that three of the four sectors identified as 10X, as well as other production and manufacturing, had increased real GVA over the period 2019–2020. This suggests the services sectors were hit hardest by the pandemic.

## 2.4 Business performance

Our results are based on the returns of approximately 5,000 Northern Irish businesses each year (as shown in Table 2.6). The sample is skewed towards larger businesses as reflected in the high overall average employment figure of 61.29 individuals. The size distribution characteristics of the sample have changed over the period; in 2014 the average employment was 50.6 individuals, increasing to 70.7 by 2019. This needs to be considered when analysing the descriptive statistics. Size is controlled for in the regression analysis. Two indicators are used to evaluate performance: *sales per employment* and *GVA per employment*.

### Sales per employment

This is calculated as sales divided by the total number in employment for each business. As shown in Table 2.6, the average *sales per employment* for the period 2014–2020 is £145,650, increasing by 5.2% in real terms, from £143,780 in 2014 to £151,230 in 2019. As the underlying data have been adjusted for inflation, this increase may be attributed to increased productivity (or changes in the characteristics of the underlying sample). *Sales per employment* fell to £138,390 in 2020, coinciding with the negative impact of the Covid-19 pandemic on the Northern Ireland economy.

**Table 2.6 Average sales and GVA per employment, 2014–2020**

	2014	2015	2016	2017	2018	2019	2020	Total
Number of businesses	6,115	5,870	4,852	4,627	5,192	4,755	4,957	36,401
Average employment (No.)	50.60	52.62	62.16	64.94	65.55	70.70	66.15	61.29 <sup>1</sup>
Sales per employment (£'000)	143.78	138.08	139.72	153.66	156.29	151.23	138.39	145.65 <sup>1</sup>
	<i>Pre-Brexit decision</i>			<i>Post-Brexit decision</i>		<i>Covid</i>		
		140.62			153.82		138.38	
GVA per employment (£'000)	48.57	49.70	50.80	56.72	56.28	55.72	54.17	52.93 <sup>1</sup>
	<i>Pre-Brexit decision</i>			<i>Post-Brexit decision</i>		<i>Covid</i>		
		49.62			56.24		54.17	

**Note:** Underlying data are indexed to 2019 prices (ONS, 2022). <sup>1</sup>Average across the seven years.

### GVA per employment

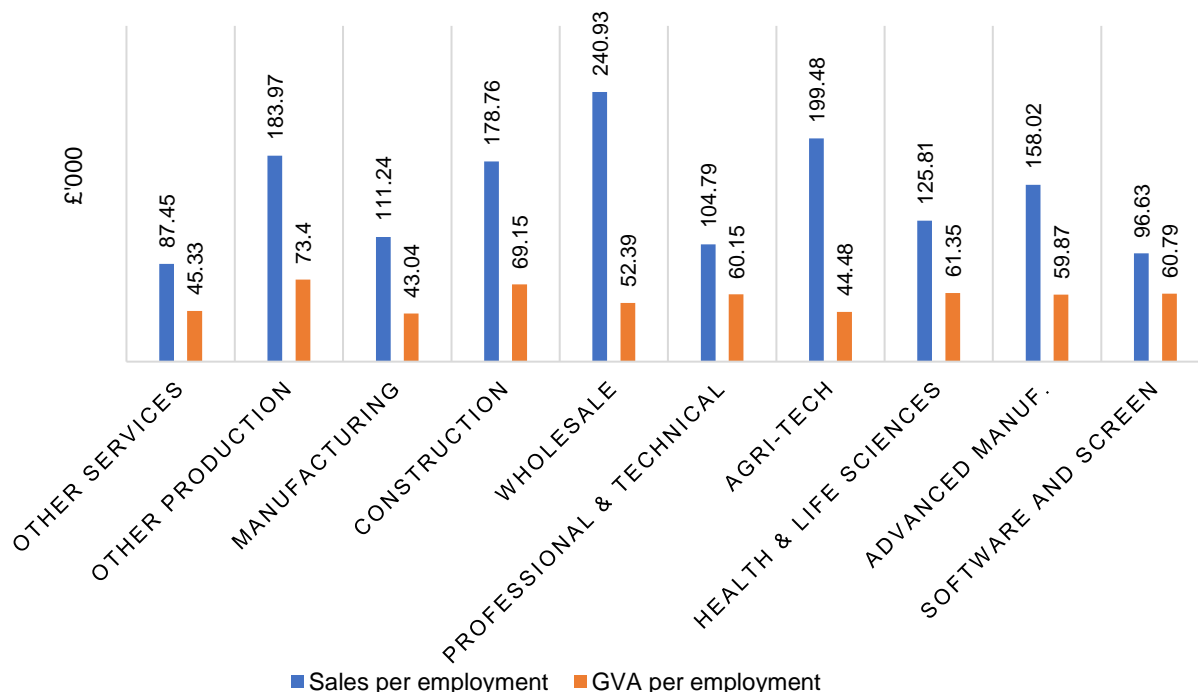
This is calculated as GVA at basic prices divided by the total number in employment for each business. In a similar trend, the average *GVA per employment* for the period was £52,930, increasing by 14.7% in real terms, from £48,570 in 2014 to £55,720 in 2019. In particular, increases are observed over the period 2014–2017, before stabilising at around £56,000 per employment. *GVA per employment* fell to £54,170 in 2020. These figures suggest a general trend of increasing sales and value-added per employment.

### Sectoral analysis

As shown in Figure 2.4, differences in *sales per employment* and *GVA per employment* are observed across sectors. Businesses that use advanced technologies (10X) report lower purchases as a percentage of sales and, as a result, three of the 10X sectors (to the right-hand side of Figure 2.4) have high *GVA per employment* relative to *sales per employment*. Yearly analysis of the ratio of *GVA to sales* by sector is provided in Table A3.9 and Figure A3.6

(Appendix 3). As noted in Table A3.9, in two of the 10X sectors, health and life sciences and software and screen, the *GVA to sales* ratios were consistently higher than the average for all sectors in Northern Ireland.

**Figure 2.4 Average sales and GVA per employment by sector, 2014–2020\***



**Note:** Underlying data are indexed to 2019 prices (ONS, 2022). \*Each bar represents the average reported for the whole period.

This figure identifies that the highest *sales per employment* for the whole period arises within the wholesale and retail (£240,930), agri-tech (£199,480), other production (£183,970) and construction (£178,760) sectors. The lowest *sales per employment* arises within the other services (£87,450) and software and screen (£96,630) sectors. The greatest levels of growth in *sales per employment* between 2014 and 2019 are observed in the software and screen (75%),<sup>13</sup> construction (34.4%),<sup>14</sup> health and life sciences (34.3%)<sup>15</sup> and advanced manufacturing (14.5%)<sup>16</sup> sectors.

Figure 2.4 identifies that the highest *GVA per employment* arises within the other production (£73,400), construction (£69,150), health and life sciences (£61,350), software and screen (£60,790) and professional, scientific and technical (£60,150) sectors. The lowest *GVA per employment* arises within the manufacturing (£43,040), agri-tech (£44,480) and other services (£45,330) sectors. The greatest levels of growth in average *GVA per employment* between 2014 and 2019 are observed in the software and screen (74.3%),<sup>17</sup> construction (32.5%),<sup>18</sup> health and life sciences (25%),<sup>19</sup> and advanced manufacturing (21%)<sup>20</sup> sectors. Patterns in the

<sup>13</sup> (£123,400/£70,500 – 1) \* 100 = 75% (source data in Table A3.5).

<sup>14</sup> (£198,600/£147,800 – 1) \* 100 = 34.4% (source data in Table A3.5).

<sup>15</sup> (£149,100/£111,000 - 1) \* 100 = 34.3% (source data in Table A3.5).

<sup>16</sup> (£171,600/£149,900 – 1) \* 100 = 14.5% (source data in Table A3.5).

<sup>17</sup> (£69,200/£39,700 – 1) \* 100 = 74.3% (source data in Table A3.7).

<sup>18</sup> (£77,900/£58,800 – 1) \* 100 = 32.5% (source data in Table A3.7).

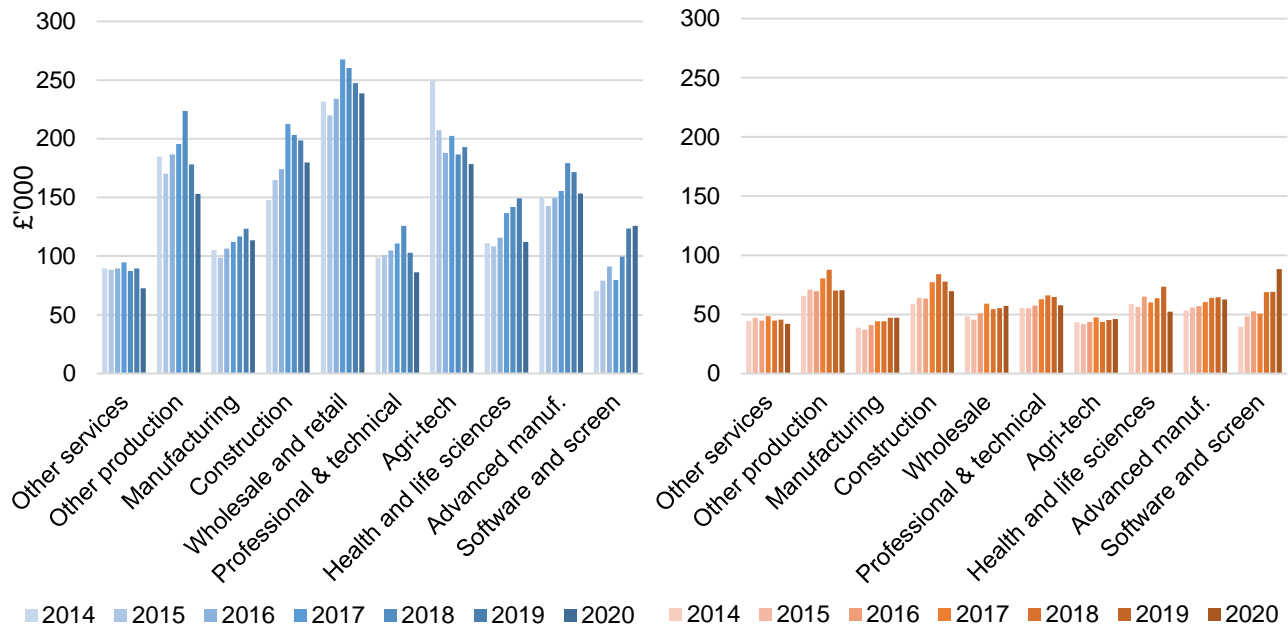
<sup>19</sup> (£73,400/£58,700 – 1) \* 100 = 25% (source data in Table A3.7).

<sup>20</sup> (£64,600/£53,400 – 1) \* 100 = 21% (source data in Table A3.7).

movement in the two performance indicators for each sector over time are illustrated in Figures 2.5 and 2.6 (underlying data are available in Tables A3.5 and A3.7, Appendix 3).

Figure 2.5 Sales per employment by sector, 2014–2020

Figure 2.6 GVA per employment by sector, 2014–2020



Consistent with the patterns observed in Figure 2.5 for *sales per employment* by sector, Figure 2.6 shows that in most instances *GVA per employment* in 2019 was higher than in 2014, though in some sectors the ratio declined in the later years. The largest increase is observed in the software and screen sector (from £39,700 in 2014 to £69,200 in 2020). In 2019, *GVA per employment* is highest in the construction (£77,900), health and life sciences (£73,400) and other production (£70,300) sectors; and lowest in the agri-tech (£45,200), other services (£45,500) and manufacturing (£47,200) sectors. Though *sales per employment* typically declined in 2020, this pattern is not observed for *GVA per employment* in many sectors due to reductions in purchasing, provision of subsidies, and reductions in employment. Indeed, *GVA per employment* increased in the software and screen and wholesale and retail sectors; and decreased in the construction, professional and scientific, and health and life sciences sectors. Other sectors reported similar *GVA per employment* to 2019 (see Table A3.7, Appendix 3).

### Evaluation of performance either side of the Brexit decision

As shown in Table 2.6 average *sales per employment* increased in the post-Brexit decision period, relative to the pre-Brexit period. However, this overall figure masks sectoral variation as observed in Figure 2.5. Moreover, within the period 2017–2019 the overall average *sales per employment* fell in the period 2018–2019 by 3.23%. A further fall of 8.49% was observed between 2019–2020, coinciding with the recession related to Covid-19. In a similar pattern to *sales per employment*, *GVA per employment* increased from an average of £49,620 for the years 2014–2016, to £56,240 for the years 2017–2019, though fell from £56,720 in 2017 to £55,720 in 2019 (see Table 2.6 above).

As shown in Table 2.7, after treatment for outliers, and controlling for location, legal status, trade characteristics, subsidies, size, and year effects, regression analysis identified that the Brexit decision affected sectors differently and the significant movements are broadly consistent with those observed in Figures 2.5 and 2.6 Data from 2020 are not included in the regressions as the potential Brexit effect cannot be differentiated from the Covid-19 effect. Full regression results are available in Appendix 12, Table A12.1. Most sectors reported higher *sales per employment* in the post-Brexit period relative to the pre-Brexit period or no difference with the exception of wholesale and retail which reported significantly lower sales per employment over the period 2017–2019. Finally, half of the sectors reported significantly higher *GVA per employment* in the post-Brexit period relative to the pre-Brexit period or no significant difference (See Table 2.7).

**Table 2.7 Change in sales and GVA per employment of sectors in the post-Brexit period (2017–2019) relative to the pre-Brexit period (2014–2016)**

	Sales per employment	GVA per employment
	Model 1b	Model 2b
Observations	34,143	34,143
Number of businesses	13,216	13,216
<b>Non-10X</b>	<b>Post-Brexit</b>	<b>Post-Brexit</b>
Other services	↑	↑
Other production	↑	↑
Manufacturing	↑	↑
Construction	—	—
Wholesale and retail	↓	—
Professional and technical	—	↑
<b>10X</b>		
Agri-tech	—	—
Health and life sciences	↑	—
Advanced manufacturing	↑	—
Software and screen	↑	↑

**Legend:** statistically significant increase ↑; decrease ↓; no significant difference —.

**Note:** Full regression results are included in Appendix 12 (Table A12.1).

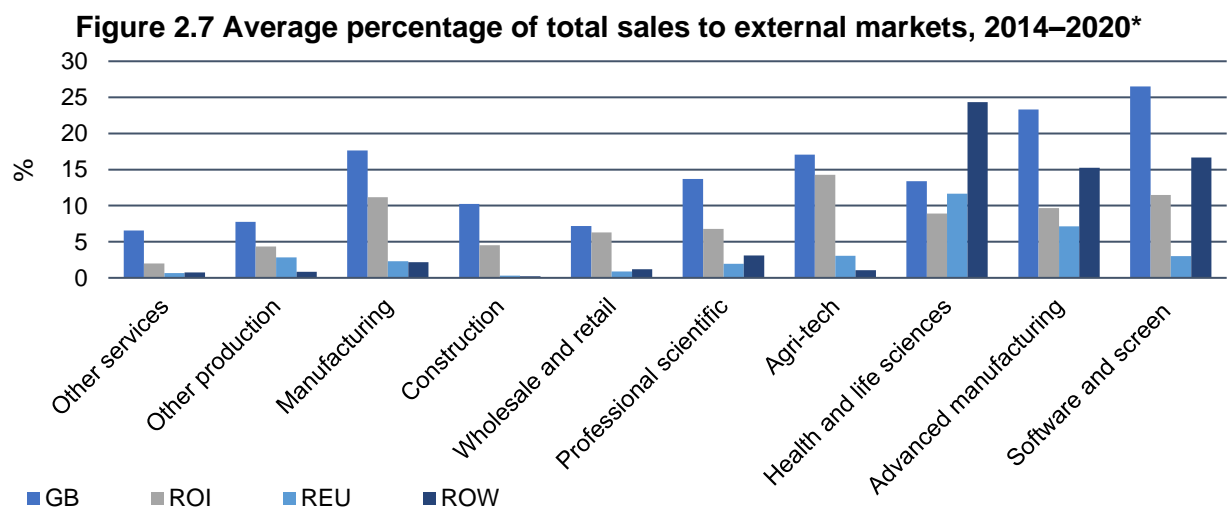
## 2.5 External sales

To examine the importance of trading with external markets, the trade behaviour of Northern Irish businesses is analysed using four ratios that reflect the percentage of overall sales that each business undertakes with Great Britain (GB), the Republic of Ireland (ROI), the Rest of the European Union (REU) and the Rest of the World (ROW). The results are based on the returns of approximately 5,000 Northern Irish businesses each year (see Table 2.8). The sample is skewed towards larger businesses as reflected in the high overall average employment figure of 60.49 individuals. The most important external market is GB, accounting for, on average, 11.75% of businesses sales, followed by the ROI (6.18%), the ROW (2.69%) and the REU (1.74%). The general trend observed is that the percentage of total sales to these external markets increased steadily over the period 2014–2019 and declined in 2020, coinciding with Covid-19.

**Table 2.8 Average sales to external markets, 2014–2020**

	2014	2015	2016	2017	2018	2019	2020	Total
Number of businesses	6,171	5,942	4,874	4,661	5,207	4,755	5,051	36,661
Average employment (size)	50.18	51.80	61.22	63.45	64.58	70.45	65.30	60.49 <sup>1</sup>
GB% of sales	9.64%	10.20%	12.37%	11.88%	13.18%	13.91%	11.72%	11.75% <sup>1</sup>
	<i>Pre-Brexit decision</i>			<i>Post-Brexit decision</i>			<i>Covid</i>	
		10.64%			13.00%		11.72%	
ROI% of sales	5.49%	5.27%	5.60%	6.46%	6.88%	7.54%	6.34%	6.18% <sup>1</sup>
	<i>Pre-Brexit decision</i>			<i>Post-Brexit decision</i>			<i>Covid</i>	
		5.44%			6.96%		6.34%	
REU% of sales	1.44%	1.31%	1.77%	1.73%	2.20%	2.05%	1.80%	1.74% <sup>1</sup>
	<i>Pre-Brexit decision</i>			<i>Post-Brexit decision</i>			<i>Covid</i>	
		1.49%			2.00%		1.80%	
ROW% of sales	2.00%	1.95%	2.49%	2.96%	3.13%	3.78%	2.82%	2.69% <sup>1</sup>
	<i>Pre-Brexit decision</i>			<i>Post-Brexit decision</i>			<i>Covid</i>	
		2.13%			3.29%		2.82%	

**Note:** Underlying data are indexed to 2019 prices (ONS, 2022). <sup>1</sup>Average for the seven years.



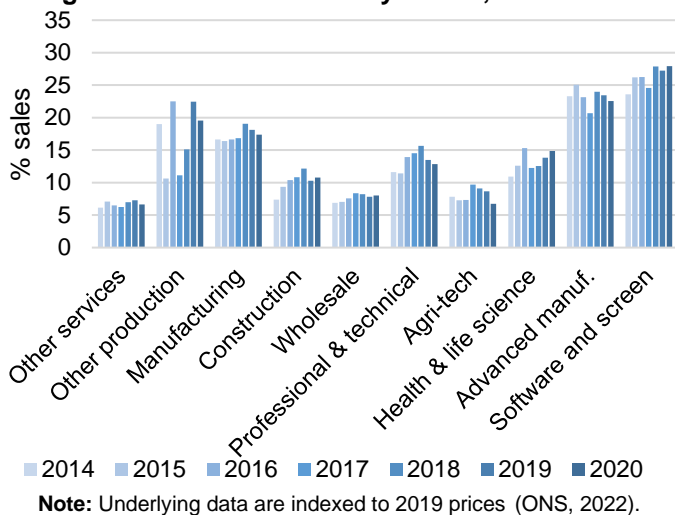
**Note:** Underlying data are indexed to 2019 prices (ONS, 2022). \*Each represents the average reported for the whole period.



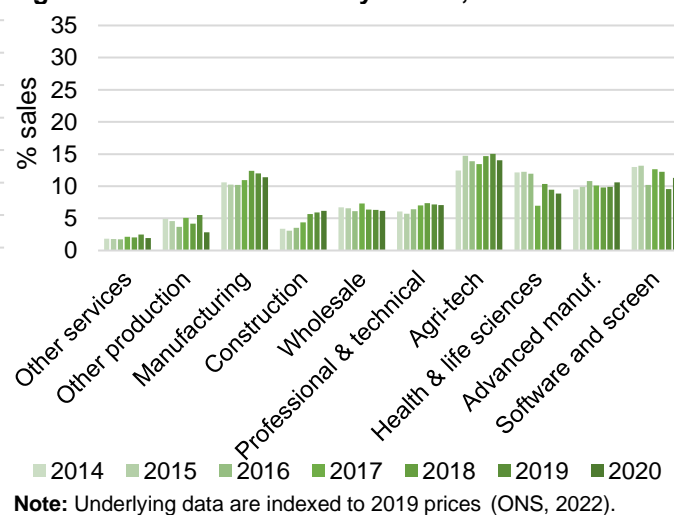
As illustrated in Figure 2.7, sectoral differences are evident in the *percentage of total sales* to the four markets. Generally, non-10X businesses (the six to the left-hand side of the figure) are less engaged with external markets relative to 10X businesses (the four to the right-hand side of the figure).

Patterns in the *percentage of total sales* to the four markets are further analysed over the period 2014–2020 in Figures 2.8 to 2.11.

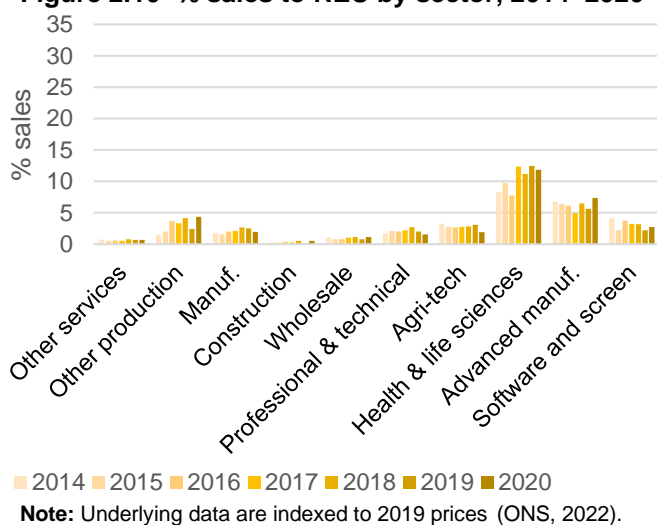
**Figure 2.8 % sales to GB by sector, 2014–2020**



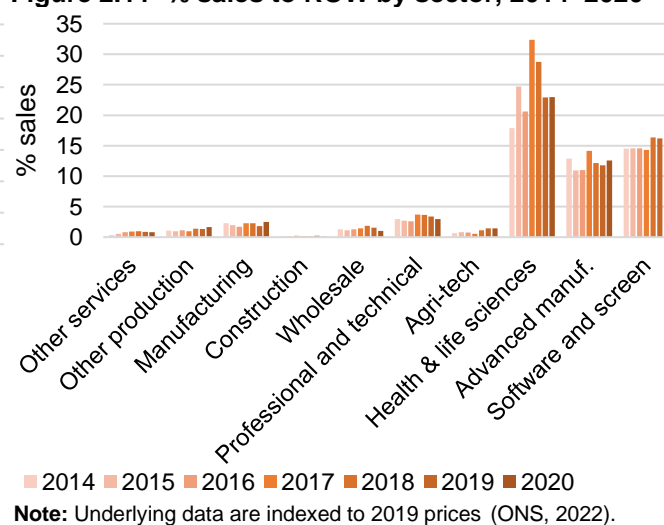
**Figure 2.9 % sales to ROI by sector, 2014–2020**



**Figure 2.10 % sales to REU by sector, 2014–2020**



**Figure 2.11 % sales to ROW by sector, 2014–2020**



Tables with the average ratio values for each sector by year are included in Appendix 3 (Table A3.11 (GB), Table A3.13 (ROI), Table A3.15 (REU) and Table 3.17 (ROW)). Overall, the largest external market is GB (Figure 2.8), followed by ROI (Figure 2.9). Differences in the relative importance of markets is observed across sectors. For example, the ROI market is most important to the agri-tech sector (Figure 2.9), and the ROW market is most important to the health and life sciences sector (Figure 2.11), probably indicative of sales to the USA. This sector is also very active in markets in the REU (Figure 2.10). As shown in the four graphs, businesses in the 10X sectors (four sectors to the right of each graph) are generally more

active in the four external sales markets relative to businesses in the non-10X sectors (six sectors to the left of each graph).

### Evaluation of external sales behaviour either side of the Brexit decision

An examination around the Brexit decision at the end of 2016, identifies that the proportion of business sales to GB increased from an average of 10.64% of total sales for the years 2014–2016, to an average of 13% for the years 2017–2019 (see Table 2.8), before falling to 11.72% in 2020 with the onset of the Covid-19 pandemic. This pattern is observed for the other three markets: ROI, REU and ROW. Random effects regression analysis is used to identify the determinants of external sales behaviour and to test whether the sales activity of each sector changed significantly after the Brexit decision. Extract results are shown in Table 2.9.

**Table 2.9 Change in the percentage of sales to external markets of sectors in the post-Brexit period (2017–2019) relative to the pre-Brexit period (2014–2016)**

Percentage of sales to:	GB (%)	ROI (%)	REU (%)	ROW (%)
Model	1b	2b	3b	4b
Observations	35,288	35,288	35,288	35,288
Number of businesses	13,561	13,561	13,561	13,561
<b>Non-10X</b>	<i>Post-Brexit</i>	<i>Post-Brexit</i>	<i>Post-Brexit</i>	<i>Post-Brexit</i>
Other services	—	—	—	—
Other production	↑	↑	↑	—
Manufacturing	—	↑	↑	—
Construction	↑	—	—	↓
Wholesale and retail	—	—	—	—
Professional and technical	↑	—	↑	—
<b>10X</b>				
Agri-tech	↑	—	—	—
Health and life sciences	—	↓	↑	↑
Advanced manufacturing	↓	↓	↓	↑
Software and screen	↑	↓	—	↑

**Legend:** statistically significant increase ↑; decrease ↓; no significant difference —.

Full regression results are available in Appendix 12, Table A12.2. After treatment for outliers and controlling for location, legal status, trade characteristics, subsidies, size, and year effects we find (in the main) consistent results with those observed in Figures 2.8 to 2.11. In general, the proportion of sales to the ROI in 10X businesses declined in the period 2017–2019 relative to those reported in 2014–2016 as indicated by the yellow arrows, though increased to the ROW. With the exception of trade between businesses in the construction industry to the ROW (significant decline in activity), all other non-10X businesses either significantly increased external sales activity or did not change their external sales behaviour over the period 2017–2019.

## 2.6 Sub-NI regions defined

A business is assigned to a geographical location within Northern Ireland based on the postcode of the address of the site which reports Northern Ireland activity, i.e., the Northern Ireland Reporting Unit. This is usually the main operating site or 'head office' within Northern Ireland.

In the NIABI, data are available at the ward level, however, due to GDPR concerns and restrictions by the data provider, for this research data were only available at the local government department (LGD) level.<sup>21</sup>

For our 2014–2020 horizon, this regional dimension is particularly interesting given the changing administrative burden and physical checks imposed by the post-Brexit trading environment. Furthermore, Belfast has favourable endowments (such as proximity to ports, airports, universities, knowledge hubs, peer businesses and talent pool) which suggest distinguishing a Belfast regional location from other business locations; although, we recognise that the endowments for trade will also vary across Northern Ireland e.g., proximity to Northern Irish ports. A further regional dimension of interest is proximity to the border as this may affect the propensity to engage in cross-border trade and affect business experience of Brexit effects.

We chose not to directly use the NUTS III geographical locations because LGD areas do not match for the border area in the east of Northern Ireland. Instead, we created our own regional areas, which drew heavily on the NUTS III classification.

1. We merged the LGDs: North Down and Ards; and Mid and East Antrim. This was also justified in terms of distance from Belfast.<sup>22</sup>
2. We merged the LGDs: Fermanagh and Omagh; and Mid Ulster. Both regions interface with the border and are considered to have limited infrastructure (no port, train, public airport and limited dual carriageways).
3. We merged the LGDs: Newry, Mourne and Banbridge; and Armagh. Both regions interface with the border, are distant from Belfast, but are the closest counties in Northern Ireland to Dublin port and airport. These counties are also supported with dual carriageways and the Enterprise train route (Belfast–Dublin), making travel between businesses and Belfast and Dublin easier for the physical movement of goods and people.
4. We kept separate the LGDs: Derry and Strabane; and Causeway Coast and Glens. Both are relatively far from the ports in Belfast and Dublin, however, Derry and Strabane interfaces with the border and has a public airport.

Our classification yielded eight areas which we call:

1. Belfast
2. Antrim and Newtownabbey

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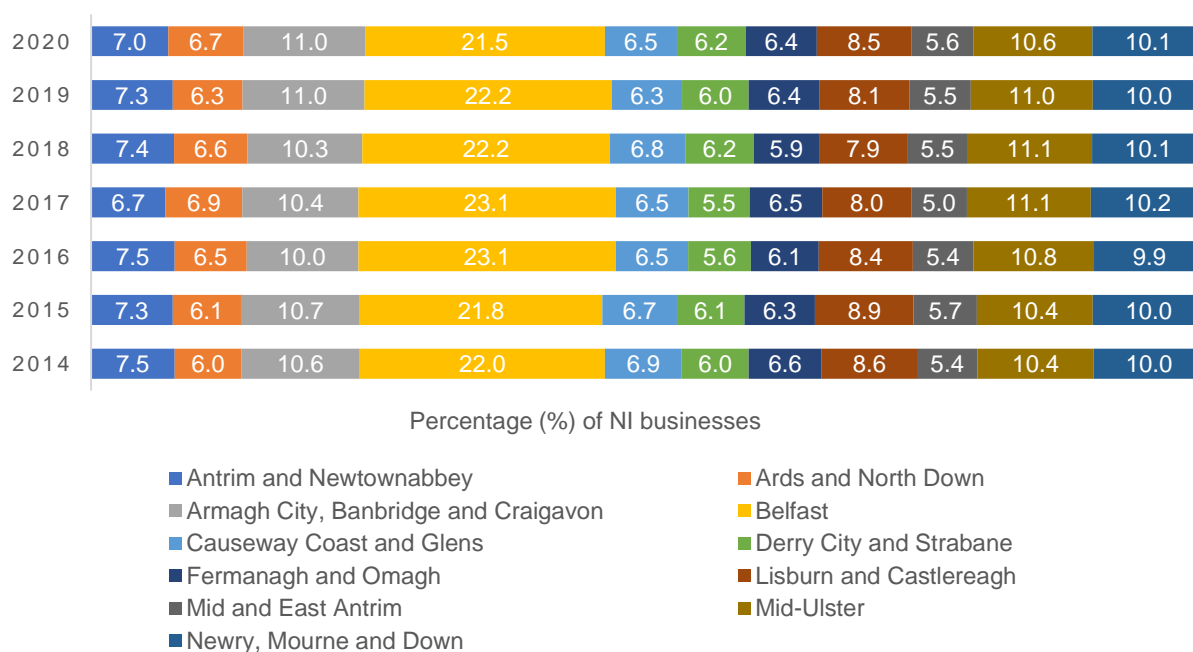
<sup>21</sup> There are eleven LGDs in Northern Ireland.

<sup>22</sup> Though it could be argued that North Down and Ards are closer to Dublin port so may behave differently; we tested for this and found no significant difference in GVA per employment between the two sub-regions.

3. North Down and East Antrim
4. Lisburn and Castlereagh
5. South Down and Armagh
6. Causeway Coast and Glens
7. Derry City and Strabane
8. Fermanagh and Mid-Ulster

As illustrated in Figure 2.4 and Table 2.10, a relatively consistent proportion of the dataset was sourced from each of the combined sub-regions across the seven-year period in line with NISRA's data selection procedures.

**Figure 2.4 Percentage of businesses by (combined) location, 2014–2020**



**Table 2.10 Businesses by (combined) sub-region, 2014–2020**

	2014	2015	2016	2017	2018	2019	2020	Total
	No.	No.	No.	No.	No.	No.	No.	No.
Belfast	1,408	1,327	1,165	1,117	1,200	1,094	1,124	8,435
Antrim and Newtownabbey	480	447	378	323	402	361	363	2,754
North Down and East Antrim	729	720	600	575	651	579	644	4,498
Lisburn and Castlereagh	547	539	425	386	427	398	444	3,166
South Down and Armagh	1,315	1,261	1,004	997	1,102	1,034	1,098	7,811
Causeway Coast and Glens	441	407	327	315	365	311	339	2,505
Derry City and Strabane	383	370	284	265	333	294	323	2,252
Fermanagh and Mid-Ulster	1,085	1,019	853	852	917	854	888	6,468
<b>Total</b>	<b>6,388</b>	<b>6,090</b>	<b>5,036</b>	<b>4,830</b>	<b>5,397</b>	<b>4,925</b>	<b>5,223</b>	<b>37,889</b>

**Note:** 3,147 data entries removed as location is unknown

When analysing trade performance sales and GVA were expressed 'per employment'. Due to further missing data relating to the employment variable the data analysing performance was further restricted to 36,401 survey responses. Analysis by combined sub-region is provided in Table A2.5 (Appendix 2). Moreover, when evaluating external sales activity, businesses not trading outside NI were excluded, resulting in 36,661 survey responses. Analysis by combined sub-region is provided in Table A2.6 (Appendix 2).

## 2.7 Sub-regional business activity

Analysis of absolute levels of real GVA (Table 2.11), sales (Appendix 3, Table A3.3) and purchases (Appendix 3, Table A3.4) by sub-region provided an indication of the prevalence of businesses across NI. For example, for 2020, the Belfast sub-region has the highest level of total GVA, sales, purchases in NI, while Derry City and Strabane has the lowest level.

**Table 2.11 Total GVA by sub-region (£'000s), 2014–2020**

	2014	2015	2016	2017	2018	2019	2020
Belfast	6,083,958	5,904,775	6,112,845	6,325,932	6,620,572	6,326,306	7,191,497
Antrim and Newtownabbey	2,084,646	1,788,440	1,943,824	1,897,676	2,046,252	2,240,166	1,655,780
North Down and East Antrim	1,541,479	1,634,780	1,536,964	1,556,875	1,673,213	1,882,146	1,735,637
Lisburn and Castlereagh	1,145,476	1,358,315	1,367,164	1,152,491	1,256,545	1,758,542	1,591,447
South Down and Armagh	3,192,691	3,291,035	3,479,774	3,652,086	3,777,202	4,156,702	3,708,928
Causeway Coast and Glens	811,044	805,622	776,158	865,699	888,875	967,271	1,082,214
Derry City and Strabane	929,575	928,359	921,993	855,602	1,042,977	1,158,402	984,497
Fermanagh and Mid-Ulster	2,166,345	2,322,727	2,496,678	2,491,155	2,781,476	3,053,385	2,550,082

**Note:** Data are weighted [NISRA (2023) NIABI] and indexed to 2019 prices [ONS (2022) Regional GVA balanced by industry].

As this is based on sample data, a more meaningful analysis of trade performance is to examine growth in sales, purchases and GVA over the period within each sub-region as shown in Table 2.12.

**Table 2.12 Changes in total sales, purchases and GVA by sub-region 2014–2019 and total GVA 2019–2020**

	2014–2019			2019–2020
	Sales	Purchases	Total GVA	Total GVA
Belfast	↓ 9.19%	↓ 17.14%	↑ 3.98%	↑ 13.67%
Antrim and Newtownabbey	↑ 4.37%	↑ 1.29%	↑ 7.46%	↓ 26.09%
North Down and East Antrim	↑ 0.99%	↓ 11.84%	↑ 22.10%	↓ 7.78%
Lisburn and Castlereagh	↑ 19.68%	↑ 8.30%	↑ 53.52%	↓ 9.50%
South Down and Armagh	↑ 15.41%	↑ 5.95%	↑ 30.19%	↓ 10.77%
Causeway Coast and Glens	↑ 2.57%	↓ 2.37%	↑ 19.26%	↑ 11.88%
Derry City and Strabane	↓ 7.07%	↓ 20.47%	↑ 24.62%	↓ 15.01%
Fermanagh and Mid-Ulster	↑ 14.16%	↑ 4.20%	↑ 40.95%	↓ 16.48%
Total	↓ 3.00%	↓ 4.04%	↑ 14.89%	↓ 3.26%

**Note:** Data from Tables 2.11, A3.3 (Appendix) and A3.4 (Appendix 3).

All sub-regions experienced an increase in total weighted real GVA over the period 2014–2019, with the largest increases observed in the Lisburn and Castlereagh (53.52%) and Fermanagh and Mid-Ulster (40.95%) sub-regions. The greatest growth in sales activity is observed in the Lisburn and Castlereagh sub-region (19.68%) and a reduction in sales activity is observed for the Belfast sub-region (9.19%), though the reduction in purchases is by a greater proportion (17.14%) resulting in improved overall productivity (GVA increased by 3.98%).

The Belfast sub-region experienced a relatively large increase in GVA of 13.67% over the 2019–2020 period, coinciding with the onset of Covid-19. Causeway Coast and Glens was the only other sub-region to report an increase in GVA (11.88%). The Covid-19 period had the greatest negative impact on businesses within the Antrim and Newtownabbey sub-region (fall in GVA of 26.09%), followed by businesses in the Fermanagh and Mid-Ulster (16.48%) and Derry City and Strabane (15.01%) sub-regions.

# Belfast Trade 2014–2020

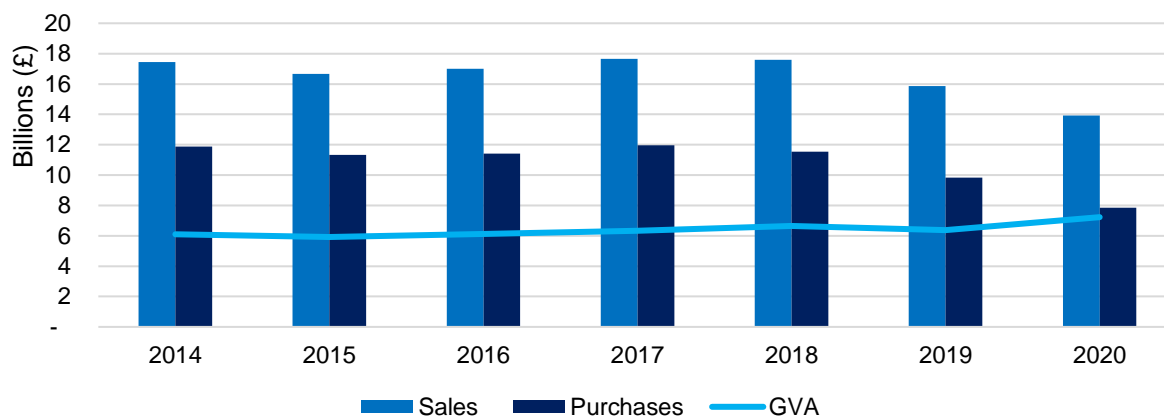
*using NISRA's BESES and NIABI datasets*



### 3.1 Overall business activity

Belfast hosts the greatest concentrations of businesses of the eight sub-regions examined in this study (22.2% – Table 2.10). After indexation to 2019 prices and interpolation using NISRA’s weighting system, it is estimated that these businesses generate over £6 billion in GVA per year to the economy (Figure 3.1 and Table A4.1, Appendix 4). Sales and purchases fell steadily over the period 2018–2020 (Table A4.1, Appendix 4). As total purchases fell by more than sales, total real GVA increased.

**Figure 3.1 Total sales, purchases and GVA, 2014–2020**



**Note:** Data are weighted [NISRA (2023) NIABI] and indexed to 2019 prices [ONS (2022) Regional GVA balanced by industry].  
Source data - Table A4.1, Appendix 4.

#### Overall business activity by sector (GVA)

As identified in Table 3.1, the service sector is strongly represented in Belfast, with high levels of real GVA being generated by businesses classed as other services and professional and technical. There is a decline in GVA reported by businesses in the wholesale and retail sector (40.18%) during 2014–2019, a considerable decline even before the impact of the Covid recession. Belfast hosts the greatest proportions of NI software and screen businesses and the sector experienced growth in real GVA of 126% over the period 2014–2020.

**Table 3.1 Total GVA by sector (£'000s), 2014–2020**

	2014	2015	2016	2017	2018	2019	2020
<b>Non-10X</b>							
Other services	1,955,381	2,008,097	2,132,311	2,309,103	2,183,604	2,261,063	2,496,213
Other production	778,189	827,786	904,858	906,137	912,795	964,899	1,296,929
Manufacturing	91,875	99,323	119,224	115,663	95,741	113,817	151,601
Construction	271,055	223,753	283,587	359,184	377,306	262,454	306,894
Wholesale and retail	1,402,527	1,075,419	867,416	787,134	938,957	839,051	600,601
Professional and technical	736,964	769,015	802,529	794,599	907,221	918,244	850,502
<b>10X</b>							
Agri-tech	122,785	113,833	142,426	173,426	152,875	126,036	96,239
Health and life sciences	8,429	7,657	14,524	2,407	13,658	23,681	13,277
Advanced manufacturing	329,622	331,124	415,573	338,555	305,875	195,326	503,994
Software and screen	387,131	448,768	430,397	539,724	732,540	621,735	875,247

**Note:** Data are weighted [NISRA (2023) NIABI] and indexed to 2019 prices [ONS (2022) Regional GVA balanced by industry]. The weighting process is designed for NI level data. Extreme fluctuations in the weighted figures imply the desirability for deeper investigation of entries in wholesale and retail (2014 and 2017), health and life sciences (2017 and 2019), manufacturing (2018) and advanced manufacturing (2016 and 2019) sectors. The wholesale and retail, professional and technical services, agri-tech and health and life sciences sectors were perhaps negatively affected by Covid-related recession.

## 3.2 Business performance

Our results are based on the returns of over 1,000 Belfast-based businesses each year (as shown in Table 3.2). The sample is skewed towards larger businesses as reflected in the high overall average employment figure of 89.79 individuals. The size distribution characteristics of the sample have changed over the period: in 2014 the average employment per business was 75.07 individuals, increasing to 102.47 by 2019. This needs to be considered when analysing the descriptive statistics. Size has been controlled for in the regression analysis. Two indicators are used to evaluate performance: *sales per employment* and *GVA per employment*.

### Sales per employment

As shown in Table 3.2, the average *sales per employment* per business for the period 2014–2020 is £144,760, increasing by 5.3% in real terms from £139,000 in 2014 to £146,333 in 2019 (the 2019 data is lower to that reported in 2017 and 2018 and may be understated). As the underlying data have been adjusted for inflation, this increase may be attributed to increased productivity (or changes in the characteristics of the underlying sample). *Sales per employment* fell to £123,550 in 2020, coinciding with the Covid-19 pandemic.

**Table 3.2 Average sales and GVA per employment, 2014–2020**

	2014	2015	2016	2017	2018	2019	2020	Total
Number of businesses	1,302	1,252	1,090	1,036	1,130	1,035	1,045	7,890
Average employment (size)	75.07	78.97	90.70	74.12	95.97	102.47	94.90	89.79 <sup>1</sup>
Sales per employment (£'000)	139.00	143.78	144.53	159.90	157.14	146.33	123.55	144.76 <sup>1</sup>
	<i>Pre-Brexit decision</i>			<i>Post-Brexit decision</i>		<i>Covid</i>		
		142.27			154.54		123.55	
GVA per employment (£'000)	51.77	55.81	56.32	60.57	59.82	59.98	58.34	57.28 <sup>1</sup>
	<i>Pre-Brexit decision</i>			<i>Post-Brexit decision</i>		<i>Covid</i>		
		54.50			60.11		58.34	

**Note:** Data are indexed to 2019 prices (ONS, (2022) Regional GVA (balanced) by industry).

### GVA per employment

The average *GVA per employment* for the period was £57,280, increasing by 15.9% in real terms from £51,770 in 2014 to £59,980 in 2019. Increases are observed over the period 2014–2017, before stabilising at around £60,000 per employment. *GVA per employment* fell to £57,280 in 2020 (Table 3.2). These figures suggest a general trend of increasing sales and value-added per employment.

### Sectoral analysis

Patterns in the movement of the two performance indicators for each sector over time are illustrated in Figures 3.2 and 3.3. The underlying data are available in Tables A4.4 and A4.5 in Appendix 4. The tables also detail the number of businesses within each sector per year. The 10X agri-tech and health and life sciences sectors are combined as separate disclosure jeopardises anonymity (i.e., less than ten businesses are included in some years).



Figure 3.2 Sales per employment by sector, 2014–2020

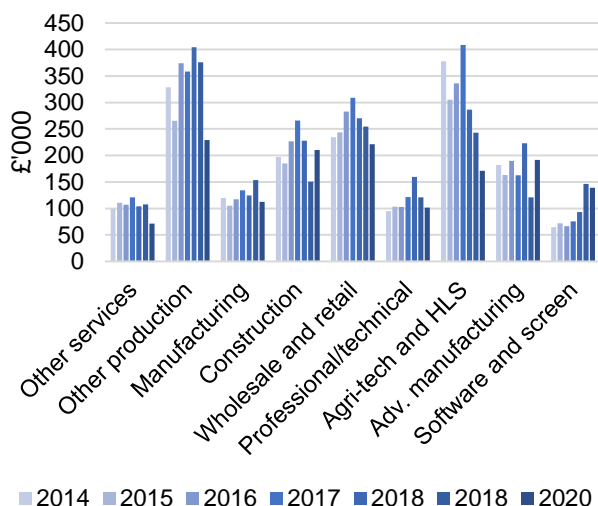
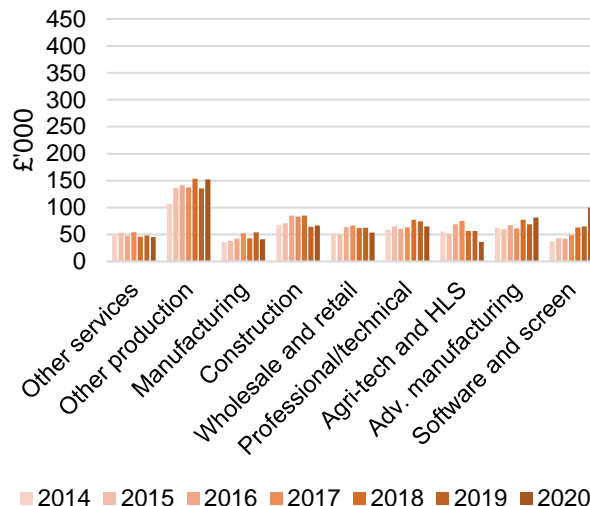


Figure 3.3 GVA per employment by sector, 2014–2020



In most instances *sales and GVA per employment* in 2019 was higher than in 2014. Declines in *sales per employment* were observed in three sectors: construction, agri-tech and health and life sciences, and advanced manufacturing. *Sales per employment* fell sharply between 2018 and 2019 and then increased between 2019 and 2020 for both the construction and advanced manufacturing sectors (see Table A4.4, Appendix 4).

The largest increase in *GVA per employment* is observed in the software and screen sector, which increased by 73.2% from £37,300 in 2014 to £64,600 in 2020. In 2019, *GVA per employment* is highest in the other production (£135,500), professional and technical (£74,600) and advanced manufacturing (£69,200) sectors; and lowest in the other services (£48,000), manufacturing (£54,400) and agri-tech and health and life sciences (£56,500) sectors. Though *GVA per employment* typically declined in 2020, alongside the onset of Covid-19, increases were noted for the software and screen, other production, construction and advanced manufacturing sectors (though the latter two may be a result of reporting sales in the wrong period as noted in the previous paragraph) (see Table A4.5, Appendix 4).

### Evaluation of performance either side of the Brexit decision

An examination of the descriptive statistics relating to the Brexit decision at the end of 2016 in Table 3.2, identifies that the average *sales per employment* increased from £142,270 in the pre-Brexit decision period to £154,540 in the post-Brexit period. However, within the period 2017–2019 the overall average *sales per employment* fell by 8.5% from £159,900 in 2017 to £146,330 in 2019. A further fall of 15.6% was observed between 2019 and 2020, coinciding with Covid-19. In a similar pattern to *sales per employment*, *GVA per employment* increased from an average of £54,500 for the years 2014–2016 to £60,110 for the years 2017–2019 (see Table 3.2). The ratio stabilised at about £60,000 in the post-Brexit period.

Random effects regression analysis is used to identify the determinants of trade performance and to test whether the performance of each sector changed **significantly** after the Brexit decision. Extract results are shown in Table 3.3. After treatment for outliers, and controlling for location, legal status, trade characteristics, subsidies, size, and year effects, regression

analysis identified that the Brexit decision affected sectors differently and the significant movements are broadly consistent with those observed in Figures 3.2 and 3.3 (data from 2020 are not included in the regressions as the potential Brexit effect cannot be differentiated from the Covid-19 effect in that year). As highlighted in Table 3.3, four sectors reported higher average sales per employment in the post-Brexit period relative to the pre-Brexit period; other sectors had no significant difference. Five sectors also reported significantly higher average GVA per employment in the post-Brexit period relative to the pre-Brexit period; other sectors had no significant difference.

**Table 3.3 Change in sales and GVA per employment of sectors in the post-Brexit period (2017–2019) relative to the pre-Brexit period (2014–2016)**

	Sales per employment	GVA per employment
	Model 1b	Model 2b
Observations	6,944	6,944
Number of businesses	2,581	2,581
<b>Non-10X</b>	<b>Post-Brexit</b>	<b>Post-Brexit</b>
Other services	↑	—
Other production	—	—
Manufacturing	↑	↑
Construction	—	—
Wholesale and retail	—	↑
Professional and technical	—	↑
<b>10X</b>		
Agri-tech	—	—
Health and life sciences	↑	↑
Advanced manufacturing	—	—
Software and screen	↑	↑

**Legend:** statistically significant increase ↑; decrease ↓; no significant difference —.

**Note:** Full regression results are included in Appendix 13 (Table A13.1).

### 3.3 External sales

To examine the importance of trading with external markets, the trade behaviour of Belfast businesses is analysed using four ratios that reflect the percentage of overall sales that each business undertakes with Great Britain (GB), the Republic of Ireland (ROI), the Rest of Europe (REU) and the Rest of the World (ROW).

The results are based on the returns of over 1,000 Belfast businesses each year (see Table 3.4). The sample is skewed towards larger businesses as reflected in the high overall average employment figure of 87.29 individuals. The most important external market is GB, accounting for, on average, 10.62% of businesses sales for the total period, followed by the ROI (4.63%), the ROW (4.10%) and the REU (1.66%). The general trend observed is that the percentage of total sales to these external markets increased steadily over the period 2014–2019 and declined in 2020 (coinciding with Covid-19).

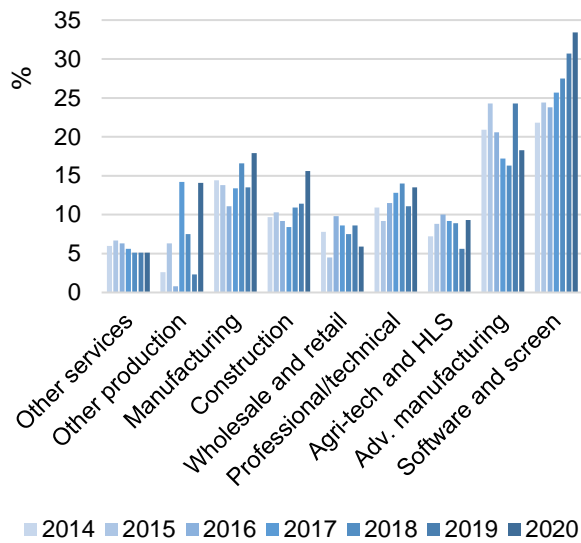
**Table 3.4 Average sales to external markets, 2014–2020**

	2014	2015	2016	2017	2018	2019	2020	Total
Number of businesses	1,313	1,263	1,093	1,041	1,123	1,026	1,055	7,914
Average employment (size)	73.37	76.31	87.99	91.86	94.62	100.47	91.79	87.29 <sup>1</sup>
GB% of sales	9.50%	8.88%	11.01%	11.00%	10.91%	12.18%	11.48%	10.62% <sup>1</sup>
	<i>Pre-Brexit decision</i>			<i>Post-Brexit decision</i>			<i>Covid</i>	
		9.74%			11.34%		11.48%	
ROI% of sales	4.38%	4.16%	4.24%	5.26%	4.89%	5.40%	4.22%	4.63% <sup>1</sup>
	<i>Pre-Brexit decision</i>			<i>Post-Brexit decision</i>			<i>Covid</i>	
		4.26%			5.17%		4.22%	
REU% of sales	1.27%	1.27%	1.89%	1.70%	2.18%	1.87%	1.54%	1.66% <sup>1</sup>
	<i>Pre-Brexit decision</i>			<i>Post-Brexit decision</i>			<i>Covid</i>	
		1.46%			1.92%		1.54%	
ROW% of sales	2.68%	3.15%	3.88%	5.21%	5.17%	4.78%	4.36%	4.10% <sup>1</sup>
	<i>Pre-Brexit decision</i>			<i>Post-Brexit decision</i>			<i>Covid</i>	
		3.20%			5.06%		4.36%	

**Note:** Underlying data are indexed to 2019 prices (ONS, 2022). <sup>1</sup>Average for the seven years.

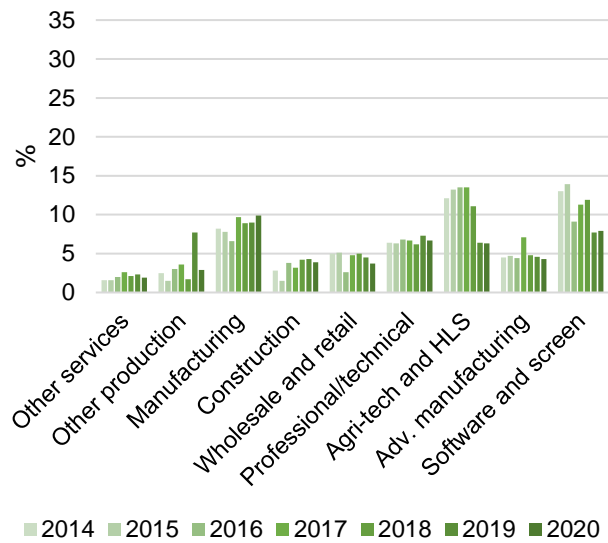
Patterns in the percentage of sales to the four markets are analysed over the period 2014–2020 in Figures 3.4 to 3.7. The 10X agri-tech and health and life sciences sectors are combined as separate disclosure jeopardises anonymity (i.e., less than ten businesses are included in some years). As illustrated in the four figures, sectoral differences are evident in the percentage of sales to the four markets. Generally, non-10X businesses (the six to the left-hand side of the figure) are less engaged with external markets relative to 10X businesses (the three to the right-hand side of the figure).

**Figure 3.4 % sales to GB by sector, 2014–2020**



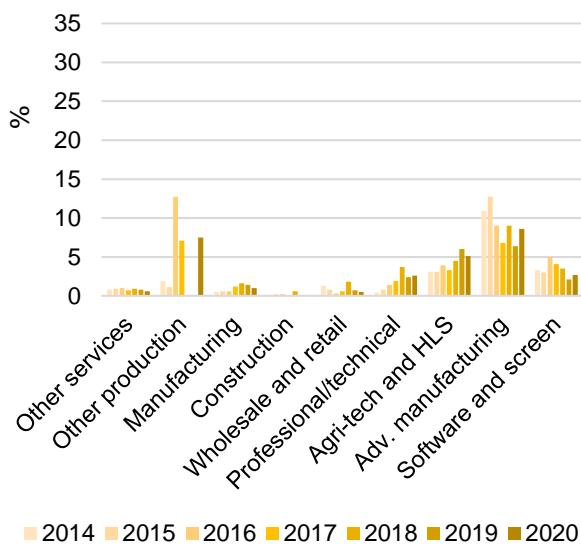
**Note:** Underlying data are indexed to 2019 prices (ONS, 2022).

**Figure 3.5 % sales to ROI by sector, 2014–2020**



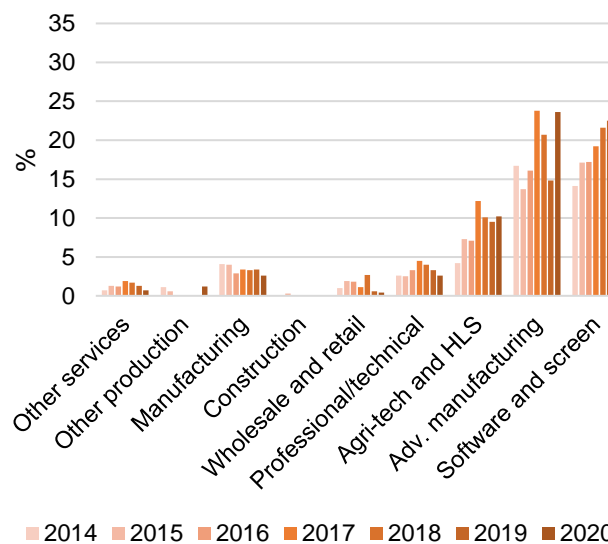
**Note:** Underlying data are indexed to 2019 prices (ONS, 2022).

**Figure 3.6 % sales to REU by sector, 2014–2020**



**Note:** Underlying data are indexed to 2019 prices (ONS, 2022).

**Figure 3.7 % sales to ROW by sector, 2014–2020**



**Note:** Underlying data are indexed to 2019 prices (ONS, 2022).

Tables with the average ratio values for each sector by year are included in Appendix 4 (Table A4.6 (GB), Table A4.7 (ROI), Table A4.8 (REU) and Table 4.9 (ROW)). The tables also detail the number of businesses within each sector per year. Overall, the largest external market for Belfast businesses is GB (Figure 3.4), followed by ROI (Figure 3.5). Differences in the relative importance of markets is observed across sectors. For example, the GB and ROW markets are most important for the software and screen and advanced manufacturing sectors (Figures 3.4 and 3.7).

## Evaluation of external sales behaviour on either side of the Brexit decision by sector

An examination of the descriptive statistics relating to the Brexit decision at the end of 2016 identifies that the proportion of business sales to each of the four external markets increased in the post-Brexit period relative to the pre-Brexit period. For example, the percentage of sales to GB markets increased from an average of 9.74% for 2014–2016 to 11.34% for 2017–2019 (Table 3.4). It fell from 12.18% in 2019 to 11.48% in 2020, coinciding with the Covid-19 pandemic.

Random effects regression analysis is used to identify the determinants of external sales behaviour and to test whether the sales activity of each sector changed **significantly** after the Brexit decision. Extract results are shown in Table 3.5. Full regression results are available in Appendix 13, Table A13.2. After treatment for outliers and controlling for location, legal status, trade characteristics, subsidies, size, and year effects, we find (in the main) consistent results with those observed in Figures 3.4 to 3.7. As shown in Table 3.5, significant increases in the percentage of sales to the GB market occurred in the other production, manufacturing and software and screen sectors in the period 2017–2019 relative to the percentages reported in 2014–2016. Significant increases in the percentage of sales to the ROI market are observed for the manufacturing sector and significant decreases in the agri-tech and software and screen sectors. Significant increases in percentage of sales to the REU are observed in the wholesale and retail and professional and technical sectors and significant decreases in the other services and advanced manufacturing sectors. Finally, significant increases to the ROW are observed in the health and life sciences, advanced manufacturing and software and screen sectors and significant decreases are noted for the manufacturing sector.

**Table 3.5 Change in the external sales behaviour of sectors in the post-Brexit period (2017–2019) relative to the pre-Brexit period (2014–2016)**

	GB (%)	ROI (%)	REU (%)	ROW (%)
Model	1b	2b	3b	4b
Observations	7,308	7,308	7,308	7,308
Number of businesses	2,695	2,695	2,695	2,695
<b>Non-10X</b>	<b>Post-Brexit</b>	<b>Post-Brexit</b>	<b>Post-Brexit</b>	<b>Post-Brexit</b>
Other services	—	—	↓	—
Other production	↑	—	—	—
Manufacturing	↑	↑	—	↓
Construction	—	—	—	—
Wholesale and retail	—	—	↑	—
Professional and technical	—	—	↑	—
<b>10X</b>				
Agri-tech	—	↓	—	—
Health and life sciences	—	—	—	↑
Advanced manufacturing	—	—	↓	↑
Software and screen	↑	↓	—	↑

**Legend:** statistically significant increase ↑; decrease ↓; no statistically significant difference —.

**Note:** Full regression results are included in Appendix 13 (Table A13.2).

# Antrim and Newtownabbey Trade 2014–2020

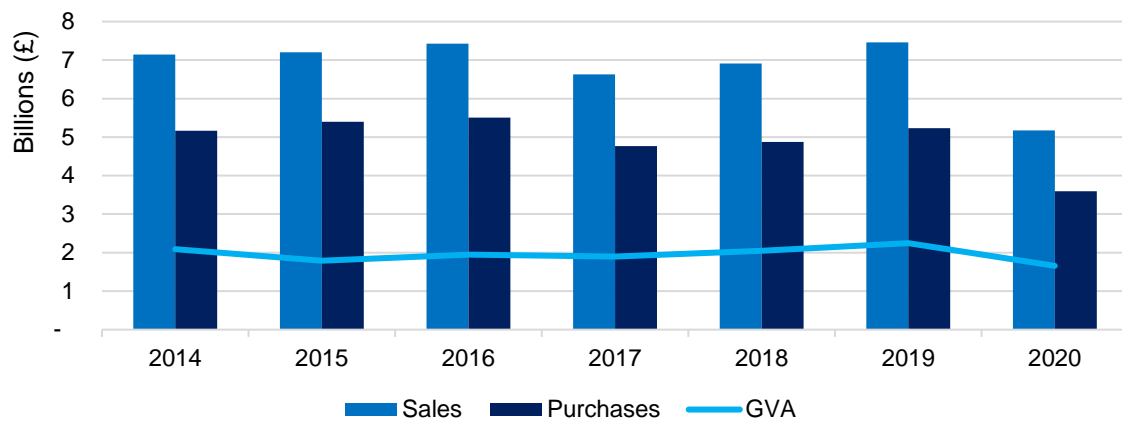
*using NISRA's BESES and NIABI datasets*



## 4.1 Overall approximate business activity

Businesses in the Antrim and Newtownabbey sub-region account for 7.3% of the total dataset used in this study (2,754 responses representing between 323 and 480 businesses in each year – Table 2.10). After interpolation using NISRA’s weighting system, it is estimated that these businesses generate about £2 billion in GVA per year (at 2019 prices) to the economy (Figure 4.1 and Table A5.1, Appendix 5). In general, total sales and total purchases are increasing, though fell in 2020. As a result, total real GVA has increased over the period 2014–2019 by 7.5% (Table A5.1, Appendix 5).

**Figure 4.1 Total sales, purchases and GVA, 2014–2020**



**Note:** Data are weighted [NISRA (2023) NIABI] and indexed to 2019 prices [ONS (2022) Regional GVA balanced by industry]. Source data - Table A5.1, Appendix 5.

### Overall approximate business activity by sector (GVA)

As shown in Table 4.1, services (professional and technical and other), wholesale and retail and advanced manufacturing businesses generate the highest levels of GVA in this sub-region. Some sectors contracted (other services, construction) over the period 2014–2019, others expanded (manufacturing and other production, wholesale and retail, professional and technical and all 10X sectors). The Covid-related recession had the greatest detrimental impact on real GVA, on businesses categorised as other 10X (54.6%), wholesale and retail (53.7%) and construction (26.9%) sectors.

**Table 4.1 Total GVA by sector (£'000s), 2014–2020**

	2014	2015	2016	2017	2018	2019	2020
Other services	504,005	462,924	528,116	453,535	474,053	438,026	349,327
Manuf. & other production	195,332	171,117	197,825	230,459	191,814	238,658	253,880
Construction	368,059	228,162	209,345	145,502	200,220	210,565	153,863
Wholesale and retail	732,202	628,366	644,654	670,824	796,489	922,146	426,497
Professional and technical	60,934	86,286	60,114	71,319	70,109	83,868	197,678
<b>10X</b>							
Other 10X	56,075	55,108	134,651	87,674	63,773	102,929	46,746
Advanced manufacturing	168,039	156,477	169,119	238,363	249,794	243,974	227,789

**Note:** Data are weighted [NISRA (2023) NIABI] and indexed to 2019 prices [ONS (2022) Regional GVA balanced by industry]. The weighting process is designed for NI level data. The need for further investigation of data entries making up professional and technical in 2020, construction in 2014 and 2017 and other production and manufacturing in 2018 is implied as these figures go against the trend in the observed data.

## 4.2 Business performance

Our results are based on the returns of 313 to 459 Antrim and Newtownabbey based businesses each year (as shown in Table 4.2). The sample is skewed towards larger businesses as reflected in the high overall average employment figure of 93.58 individuals. The size distribution characteristics of the sample have changed over the period: in 2014 the average employment was 75 individuals, increasing to 105.20 by 2019. This needs to be considered when analysing the descriptive statistics. Size has been controlled for in the regression analysis. Two indicators are used to evaluate business performance: *sales per employment* and *GVA per employment*.

### Sales per employment

As shown in Table 4.2, the average *sales per employment* per business for the period 2014–2020 is £152,950, increasing by 13.6% in real terms, from £142,520 in 2014 to £161,950 in 2019. As the underlying data has been adjusted for inflation, this increase may be attributed to increased productivity (or changes in the characteristics of the underlying sample). *Sales per employment* per business fell to £148,640 in 2020, coinciding with the Covid-19 pandemic.

**Table 4.2 Average sales and GVA per employment, 2014–2020**

	2014	2015	2016	2017	2018	2019	2020	Total
Number of businesses	459	433	367	313	388	350	351	2,661
Average employment (size)	75	79.82	106.05	119.49	102.21	105.20	77.24	93.58 <sup>1</sup>
Sales per employment (£'000)	142.52	144.46	145.56	173.03	161.16	161.95	148.64	152.95 <sup>1</sup>
	<i>Pre-Brexit decision</i>			<i>Post-Brexit decision</i>			<i>Covid</i>	
		144.07			164.97		148.64	
GVA per employment (£'000)	50.48	45.81	46.81	57.46	56.96	57.63	54.35	52.44 <sup>1</sup>
	<i>Pre-Brexit decision</i>			<i>Post-Brexit decision</i>			<i>Covid</i>	
		47.80			57.34		54.35	

**Note:** Underlying data are indexed to 2019 prices (ONS, 2022). <sup>1</sup>Average for the seven years.

### GVA per employment

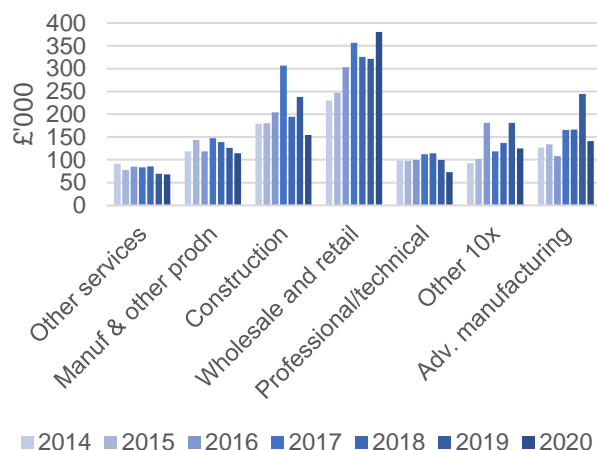
The average *GVA per employment* per business for the period was £52,440, increasing by 14.2% in real terms, from £50,480 in 2014 to £57,630 in 2019. *GVA per employment* fell to £54,350 in 2020, coinciding with Covid-19 (Table 4.2). The figures suggest a general trend of increasing sales and value-added per employment, though growth in the latter seems to have tapered off, well before the 2020 recession.

### Sectoral analysis

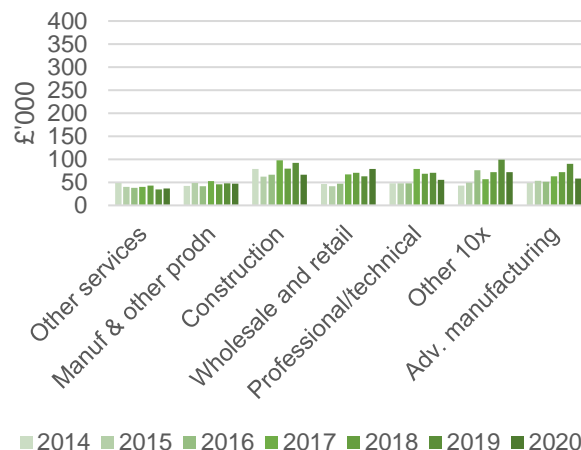
Patterns in the movement of the two performance indicators for each sector over time are illustrated in Figures 4.2 and 4.3. The underlying data are available in Tables A5.4 and A5.5 in Appendix 5. The tables also detail the number of businesses within each sector per year. The non-10X other production and manufacturing are combined into one category. Likewise, the 10X agri-tech, health and life sciences and software and screen sectors are combined into one category called 'other 10X. This is required as separate disclosure jeopardises anonymity (i.e., less than ten businesses are included in some years).



**Figure 4.2 Sales per employment by sector, 2014–2020**



**Figure 4.3 GVA per employment by sector, 2014–2020**



**Note:** Underlying data are indexed to 2019 prices (ONS, 2022).

**Note:** Underlying data are indexed to 2019 prices (ONS, 2022).

*Note: Outliers are observed in the sales per employment data; this is corrected for in the regression analysis.*

In most instances, *sales per employment* in 2019 were higher than in 2014 (other services is the exception) and declined in 2020. However, the ratio increased between 2019 and 2020 for the wholesale and retail sector (Table A5.4, Appendix 5).

The largest increase in *GVA per employment* is observed in the other 10X sectors (software and screen, agri-tech and health and life sciences). It increased by 132%, from £42,800 in 2014 to £99,300 in 2019, though fell in 2020 to £72,100. In 2019, *GVA per employment* is highest in the other 10X sectors (£99,300), construction (£92,100) and advanced manufacturing (£90,000) sectors; and lowest in the other services (£34,400) and manufacturing and other production (£47,800) sectors. Though *GVA per employment* typically declined in 2020, alongside the onset of Covid-19, increases were noted for the other services and wholesale and retail sectors (see Table A5.5, Appendix 5).

### Evaluation of performance either side of the Brexit decision

An examination of the descriptive statistics relating to the Brexit decision at the end of 2016 in Table 4.2, identifies that the average *sales per employment* increased from £144,070 in the pre-Brexit decision period to £164,970 in the post-Brexit period. Similarly, *GVA per employment* increased from an average of £47,800 for the years 2014–2016 to £57,340 for the years 2017–2019. The ratio stabilised at about £57,500 in the post-Brexit period.

Random effects regression analysis is used to identify the determinants of trade performance and to test whether the performance of each sector changed **significantly** after the Brexit decision. Extract results are shown in Table 4.3. After treatment for outliers, and controlling for location, legal status, trade characteristics, subsidies, size, and year effects, regression analysis identified that the Brexit decision affected sectors differently and the significant movements are broadly consistent with those observed in Figures 4.2 and 4.3. (Data from 2020 are not included in the regressions as the potential Brexit effect cannot be differentiated from the Covid-19 effect.) As highlighted in Table 4.3, there is no significant difference in average *sales per employment* in the post-Brexit period relative to the pre-Brexit period when analysed

at the sector level and when other characteristics are controlled for. Two sectors (wholesale and retail and agri-tech) reported significantly higher average *GVA per employment* in the post-Brexit period relative to the pre-Brexit period.

**Table 4.3 Change in sales and GVA per employment of sectors in the post-Brexit period (2017–2019) relative to the pre-Brexit period (2014–2016)**

	Sales per employment	GVA per employment
	Model 1b	Model 2b
Observations	2,324	2,324
Number of businesses	852	852
<b>Non-10X</b>	<b>Post-Brexit</b>	<b>Post-Brexit</b>
Other services	—	—
Other production	—	—
Manufacturing	—	—
Construction	—	—
Wholesale and retail	—	↑
Professional and technical	—	—
<b>10X</b>		
Agri-tech	—	↑
Health and life sciences	—	—
Advanced manufacturing	—	—
Software and screen	—	—

**Legend:** statistically significant increase ↑; decrease ↓; no significant difference —.

**Note:** Full regression results are included in Appendix 14 (Table A14.1).

## 4.3 External sales

To examine the importance of trading with external markets, the trade behaviour of Antrim and Newtownabbey businesses is analysed using four ratios that reflect the percentage of overall sales that each business undertakes with Great Britain (GB), the Republic of Ireland (ROI), the Rest of Europe (REU) and the Rest of the World (ROW).

The results are based on the returns of between 300 and 461 businesses each year (see Table 4.4). The sample is skewed towards larger businesses as reflected in the high overall average employment figure of 92.25 individuals. The most important external market is GB, accounting for, on average, 13.63% of businesses sales for the total period, followed by the ROI (4.69%), the ROW (2.72%) and the REU (1.90%). The general trend observed is that the percentage of total sales to these external markets has increased steadily over the period 2014–2017 and declined in the period 2018–2020.

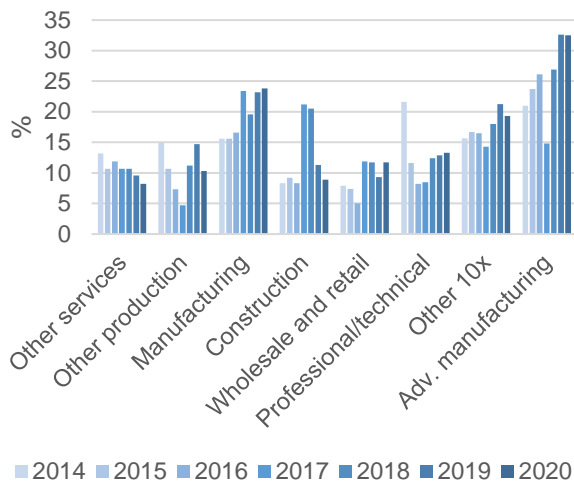
**Table 4.4 Average sales to external markets, 2014–2020**

	2014	2015	2016	2017	2018	2019	2020	Total
Number of businesses	461	434	359	300	380	342	349	2,625
Average employment (size)	73.2	78.33	103.7	118.69	100.69	106.87	75.26	92.25 <sup>1</sup>
GB% of sales	12.38%	11.29%	12.48%	15.23%	15.56%	15.45%	14.01%	13.63% <sup>1</sup>
	<i>Pre-Brexit decision</i>			<i>Post-Brexit decision</i>			<i>Covid</i>	
		12.03%			15.43%		14.01%	
ROI% of sales	3.89%	3.75%	4.33%	4.77%	5.36%	5.88%	5.31%	4.69% <sup>1</sup>
	<i>Pre-Brexit decision</i>			<i>Post-Brexit decision</i>			<i>Covid</i>	
		3.97%			5.36%		5.31%	
REU% of sales	1.36%	1.07%	2.32%	2.02%	2.44%	2.47%	1.90%	1.90% <sup>1</sup>
	<i>Pre-Brexit decision</i>			<i>Post-Brexit decision</i>			<i>Covid</i>	
		1.54%			2.33%		1.90%	
ROW% of sales	2.55%	2.15%	3.15%	3.27%	2.83%	2.80%	2.50%	2.72% <sup>1</sup>
	<i>Pre-Brexit decision</i>			<i>Post-Brexit decision</i>			<i>Covid</i>	
		2.59%			2.95%		2.50%	

**Note:** Underlying data are indexed to 2019 prices (ONS, 2022). <sup>1</sup>Average for the seven years.

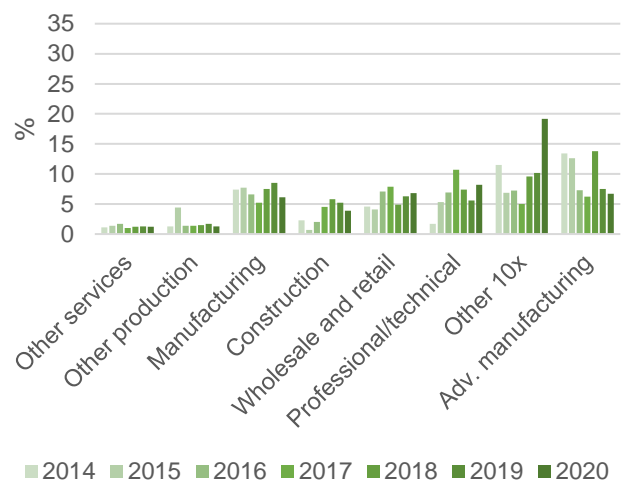
Patterns in the percentage of sales to the four markets are analysed over the period 2014–2020 in Figures 4.4 to 4.7. The 10X agri-tech, health and life sciences and software and screen sectors are combined to form a new category called ‘Other 10X’ as separate disclosure jeopardises anonymity (i.e., less than ten businesses are included in some years). As illustrated in the four figures, sectoral differences are evident in the percentage of sales to the four markets. Generally, non-10X businesses (the six to the left-hand side of the figure) are less engaged with external markets relative to 10X businesses (the two to the right-hand side of each figure).

**Figure 4.4 % sales to GB by sector, 2014–2020**



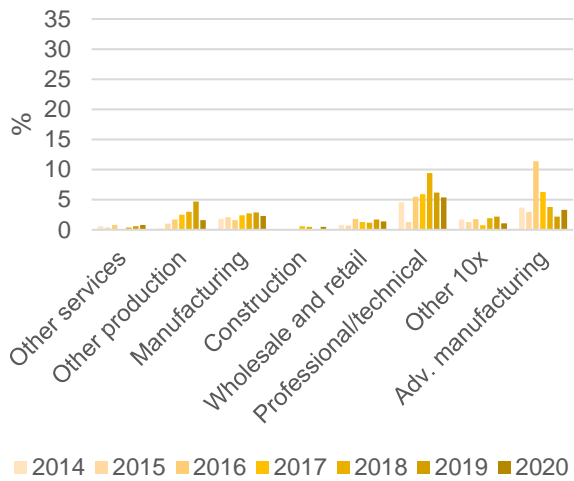
**Note:** Underlying data are indexed to 2019 prices (ONS, 2022).

**Figure 4.5 % sales to ROI by sector, 2014–2020**



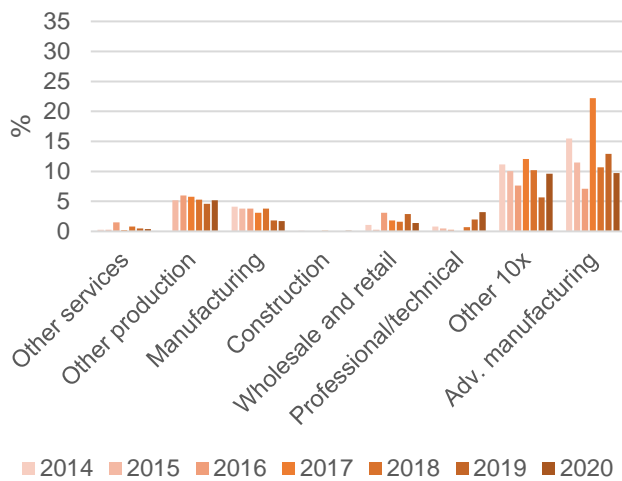
**Note:** Underlying data are indexed to 2019 prices (ONS, 2022).

**Figure 4.6 % sales to REU by sector, 2014–2020**



**Note:** Underlying data are indexed to 2019 prices (ONS, 2022).

**Figure 4.7 % sales to ROW by sector, 2014–2020**



**Note:** Underlying data are indexed to 2019 prices (ONS, 2022).

Tables with the average ratio values for each sector by year are included in Appendix 5 (Table A5.6 (GB), Table A5.7 (ROI), Table A5.8 (REU) and Table 5.9 (ROW)). The tables also detail the number of businesses within each sector per year. Overall, the largest external market for Antrim and Newtownabbey businesses is GB (Figure 4.4). Differences in the relative importance of markets is observed across sectors. For example, the GB market is most important for the manufacturing and 10X sectors (two sectors to the right of Figure 4.4). As portrayed in the four bar charts, businesses in the 10X sectors are more active in the four external sales markets relative to businesses in the non-10X sectors (six sectors to the left of each graph), particularly in the ROW market (Figure 4.7).

### Evaluation of external sales behaviour on either side of the Brexit decision by sector

An examination relating to the Brexit decision at the end of 2016 identifies that the proportion of business sales to each of the four external markets increased in the post-Brexit period relative to the pre-Brexit period (all post-Brexit averages increased). For example, the percentage of sales to GB markets increased from an average of 12.03% for 2014–2016 to

15.43% for 2017–2019 (Table 4.4). It fell from 15.45% in 2019 to 14.01% in 2020, coinciding with the Covid-19 pandemic.

Random effects regression analysis is used to identify the determinants of external sales behaviour and to test whether the sales activity of each sector changed **significantly** after the Brexit decision. Extract results are shown in Table 4.5. After treatment for outliers and controlling for location, legal status, trade characteristics, subsidies, size, and year effects, we find (in the main) consistent results with those observed in Figures 4.4 to 4.7. As shown in Table 4.5, significant increases in the percentage of sales to the GB market occurred in the manufacturing, construction, wholesale and retail and software and screen sectors in the period 2017–2019 relative to the percentages reported in 2014–2016, whereas significant decreases were observed for businesses in the other services sector. Significant increases in the percentage of sales to the ROI market are observed for the agri-tech sector. Significant increases in percentage of sales to the REU are observed in the other production and professional and technical sectors, whereas significant decreases occurred in the advanced manufacturing sectors. Finally, significant increases to the ROW are observed in the software and screen sector and significant decreases for the other production and health and life sciences sectors.

**Table 4.5 Change in the external sales behaviour of sectors in the post-Brexit period (2017–2019) relative to the pre-Brexit period (2014–2016)**

	GB (%)	ROI (%)	REU (%)	ROW (%)
Model	1b	2b	3b	4b
Observations	2,390	2,390	2,390	2,390
Number of businesses	874	874	874	874
<b>Non-10X</b>	<b>Post-Brexit</b>	<b>Post-Brexit</b>	<b>Post-Brexit</b>	<b>Post-Brexit</b>
Other services	↓	—	—	—
Other production	—	—	↑	↓
Manufacturing	↑	—	—	—
Construction	↑	—	—	—
Wholesale and retail	↑	—	—	—
Professional and technical	—	—	↑	—
<b>10X</b>				
Agri-tech	—	↑	—	—
Health and life sciences	—	—	—	↓
Advanced manufacturing	—	—	↓	—
Software and screen	↑	—	—	↑

**Legend:** statistically significant increase ↑; decrease ↓; no statistically significant difference —.

**Note:** Full regression results are included in Appendix 14 (Table A14.2).

# North Down and East Antrim Trade 2014–2020

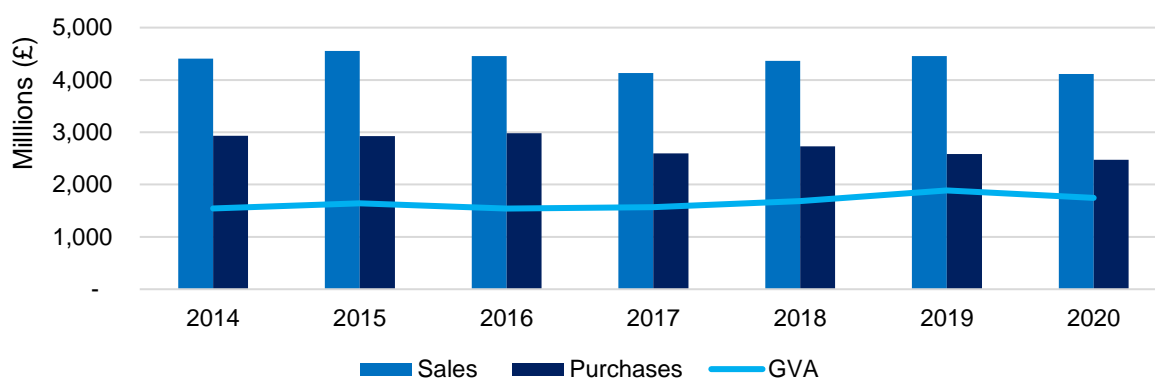
*using NISRA's BESES and NIABI datasets*



## 5.1 Overall approximate business activity

Businesses in the North Down and East Antrim sub-region account for 11.9% of the total dataset used in this study (4,498 responses representing between 575 and 729 businesses in each year – Table 2.10). After interpolation using NISRA’s weighting system it is estimated that these businesses generate about £1.5 to £1.8 billion in GVA per year (at 2019 prices) to the economy (Figure 5.1 and Table A6.1, Appendix 6). Overall, total sales increased by 1.0% and total purchases fell by 11.9% between 2014–2019 with the result that total real GVA increased over the period 2014–2019 by 22.1% (Table A6.1, Appendix 6).

**Figure 5.1 Total sales, purchases and GVA, 2014–2020**



**Note:** Data are weighted [NISRA (2023) NIABI] and indexed to 2019 prices [ONS (2022) Regional GVA balanced by industry]. Source data - Table A6.1, Appendix 6.

### Overall approximate business activity by sector (GVA)

As evidenced in Table 5.1, other services, wholesale and retail, construction and manufacturing contribute most to total GVA for this sub-region. Over the period 2014–2019, two sectors contracted (health and life sciences, advanced manufacturing), the others expanded, with the largest increases identified in the software and screen (207.5%), construction (101.2%), and other production (93.9%)<sup>23</sup>. The data suggest that businesses in the other production, manufacturing, construction and professional and technical sectors were negatively affected by the Covid-related recession, with increases in GVA reported for the other sectors for 2019–2020.

**Table 5.1 Total GVA by sector (£'000s), 2014–2020**

	2014	2015	2016	2017	2018	2019	2020
Other services	464,471	479,152	386,603	427,865	494,071	493,273	527,907
Other production	93,876	71,078	78,737	77,072	146,761	182,072	53,858
Manufacturing	149,611	141,777	161,607	130,316	142,236	201,786	187,050
Construction	163,537	195,028	201,511	223,045	291,927	328,992	202,370
Wholesale and retail	281,570	326,519	317,576	352,308	300,180	403,417	422,268
Professional and technical	83,723	118,394	115,626	141,145	108,293	94,961	82,383
<b>10X</b>							
Agri-tech	48,445	42,707	49,252	38,804	55,480	62,526	70,183
Advanced manufacturing	230,029	221,623	181,438	130,803	107,558	75,571	78,897
Software screen & HLS	26,217	38,502	44,614	35,517	26,707	39,548	110,721

**Note:** Data are weighted [NISRA (2023) NIABI] and indexed to 2019 prices [ONS (2022) Regional GVA balanced by industry]. The weighting process is designed for NI level data. The need for further investigation of data entries making up other services in 2016, other production in 2018 and 2019, manufacturing in 2019, professional and technical in 2017, and software and screen in 2020 is implied as these figures do not fit with patterns in the observed data.

<sup>23</sup> The software and screen and health and life science sectors are combined in Table 5.1 to ensure data anonymity.

## 5.2 Business performance

Our results are based on the returns of 553 to 704 North Down and Mid and East Antrim based businesses each year (as shown in Table 5.2). The sample of businesses are smaller in size to the sample returned for the Belfast and Antrim and Newtownabbey sub-regions as reflected in the lower overall average employment figure of 32.61 individuals. The size distribution characteristics of the sample have changed over the period: in 2014 the average employment was 29.37 individuals, increasing to 35.21 by 2019. This needs to be considered when analysing the descriptive statistics. Size has been controlled for in the regression analysis. Two indicators are used to evaluate trade performance: *sales per employment* and *GVA per employment*.

### Sales per employment

As shown in Table 5.2, the average *sales per employment* per business for the period 2014–2020 is £118,820 increasing by 4.9% in real terms, from £116,320 in 2014 to £122,000 in 2019. The average has oscillated from a low of £110,000 to a high of £132,420 during the period. *Sales per employment* fell to £111,220 in 2020, coinciding with the Covid pandemic.

**Table 5.2 Average sales and GVA per employment, 2014–2020**

	2014	2015	2016	2017	2018	2019	2020	Total
Number of businesses	704	699	580	553	623	560	616	4,335
Average employment (size)	29.37	29.82	32.60	33.37	35.72	35.21	33.34	32.61 <sup>1</sup>
Sales per employment (£'000)	116.32	115.36	110.00	125.52	132.42	122.00	111.22	118.82 <sup>1</sup>
	<i>Pre-Brexit decision</i>			<i>Post-Brexit decision</i>			<i>Covid</i>	
		114.14			126.87		111.22	
GVA per employment (£'000)	44.64	48.80	43.55	51.02	54.65	51.41	46.37	48.53 <sup>1</sup>
	<i>Pre-Brexit decision</i>			<i>Post-Brexit decision</i>			<i>Covid</i>	
		45.78			52.45		46.37	

**Note:** Underlying data are indexed to 2019 prices (ONS, 2022). <sup>1</sup>Average for the seven years.

### GVA per employment

The average GVA per employment for the period was £48,530, increasing by 15.2% in real terms, from £44,640 in 2014 to £51,410 in 2019. GVA per employment fell to £46,370 in 2020, alongside the disruptive impact of Covid (Table 5.2).

### Sectoral analysis

Patterns in the movement of the two performance indicators for each sector over time are illustrated in the bar graphs in Figures 5.2 and 5.3. The underlying data is available in Tables A6.4 and A6.5 in Appendix 6. The tables also detail the number of businesses within each sector per year. The 10X software and screen and health and life sciences sectors are combined as separate disclosure jeopardises anonymity (i.e., less than ten businesses are included in some years).



Figure 5.2 Sales per employment by sector, 2014–2020

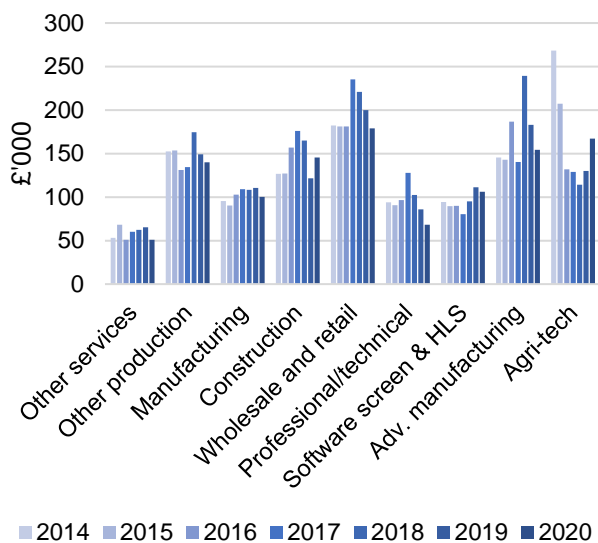
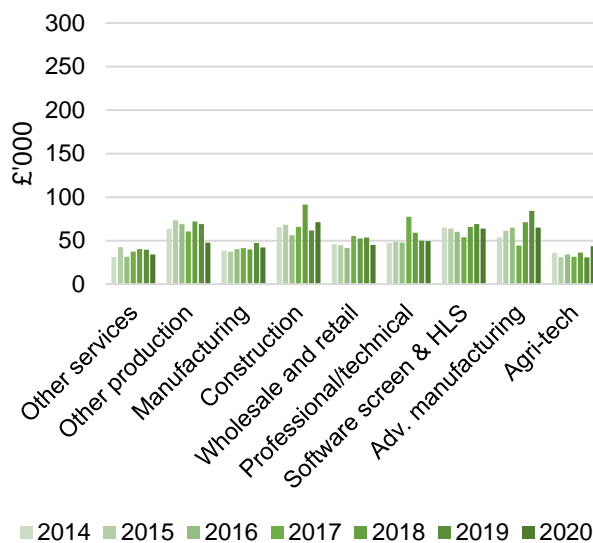


Figure 5.3 GVA per employment by sector, 2014–2020



Note: Underlying data are indexed to 2019 prices (ONS, 2022).

Note: Underlying data are indexed to 2019 prices (ONS, 2022).

Note: Outliers are observed and corrected for in the regression analysis.

In six of the ten sectors<sup>24</sup>, *sales per employment* in 2019 was higher than in 2014. *Sales per employment* had decreased in the other production, construction, professional and technical, and agri-tech sectors. Most declined over the period 2019–2020, except for the construction and agri-tech sectors (Table A6.4, Appendix 6).

The largest increase in *GVA per employment* is observed in the advanced manufacturing sector. It increased by 56.8% from £53,700 in 2014 to £84,200 in 2019. In 2019, *GVA per employment* is highest in the advanced manufacturing (£84,200), software, screen and health and life sciences (£69,100) and other production (£69,000) sectors; and lowest in the agri-tech (£30,700) and other services (£39,400) sectors. Though *GVA per employment* typically declined in 2020, likely due to the Covid-related recession, increases were noted for the construction and agri-tech sectors (Table A6.5, Appendix 6).

### Evaluation of performance either side of the Brexit decision

An examination of the descriptive statistics relating to the Brexit decision at the end of 2016 in Table 5.2, identifies that average *sales per employment* increased from £114,140 in the pre-Brexit decision period to £126,870 in the post-Brexit period. In a similar pattern, *GVA per employment* increased from an average of £45,780 for the years 2014-2016, to £52,450 for the years 2017-2019.

Random effects regression analysis is used to identify the determinants of trade performance and to test whether the performance of each sector changed **significantly** after the Brexit decision. Extract results are shown in Table 5.3. After treatment for outliers, and controlling for location, legal status, trade characteristics, subsidies, size, and year effects, regression analysis identified that the Brexit decision affected sectors differently and the significant

<sup>24</sup> Increases are observed in both the software and screen and health and life science sectors, though both are combined in Table A6.4 to preserve anonymity.

movements are broadly consistent with those observed in Figures 5.2 and 5.3 (Data from 2020 is not included in the regressions as the potential Brexit effect cannot be differentiated from the Covid-19 effect). As highlighted in Table 5.3, businesses in the other services sector experienced significant increases in average *sales per employment* in the post-Brexit period relative to the pre-Brexit period and businesses in the agri-tech sector experienced significant decreases. One sector, the other services sector, reported significantly higher average *GVA per employment* in the post-Brexit period relative to the pre-Brexit period and two sectors, other production and manufacturing experienced significantly lower *GVA per employment*.

**Table 5.3 Change in sales and GVA per employment of sectors in the post-Brexit period (2017–2019) relative to the pre-Brexit period (2014–2016)**

	Sales per employment	GVA per employment
	Model 1b	Model 2b
Observations	3,756	3,756
Number of businesses	1,588	1,588
<b>Non-10X</b>	<b>Post-Brexit</b>	<b>Post-Brexit</b>
Other services	↑	↑
Other production	—	↓
Manufacturing	—	↓
Construction	—	—
Wholesale and retail	—	—
Professional and technical	—	—
<b>10X</b>		
Agri-tech	↓	—
Health and life sciences	—	—
Advanced manufacturing	—	—
Software and screen	—	—

**Legend:** statistically significant increase ↑; decrease ↓; no significant difference —.

**Note:** Full regression results are included in Appendix 15 (Table A15.1).

## 5.3 External sales

To examine the importance of trading with external markets, the trade behaviour of North Down and East Antrim businesses is analysed using four ratios that reflect the percentage of overall sales that each business undertakes with Great Britain (GB), the Republic of Ireland (ROI), the rest of the European Union (REU) and the rest of the World (ROW).

The results are based on the returns of between 564 and 705 businesses each year (see Table 5.4). The sample of businesses are smaller in size to the sample returned for the Belfast and Antrim and Newtownabbey sub-regions as reflected in the lower overall average employment figure of 32.36 individuals. The size distribution characteristics of the sample have changed over the period: in 2014 the average employment was 29.23 individuals, increasing to 34.72 by 2019. The most important external market is GB, accounting for, on average, 13.17% of businesses sales for the total period, followed by the ROI (4.13%), the ROW (2.63%) and the REU (1.46%). The general trend observed is that the percentage of total sales to these external markets has increased steadily over the period 2014–2019 and declined in 2020, coinciding with the Covid-19 pandemic.

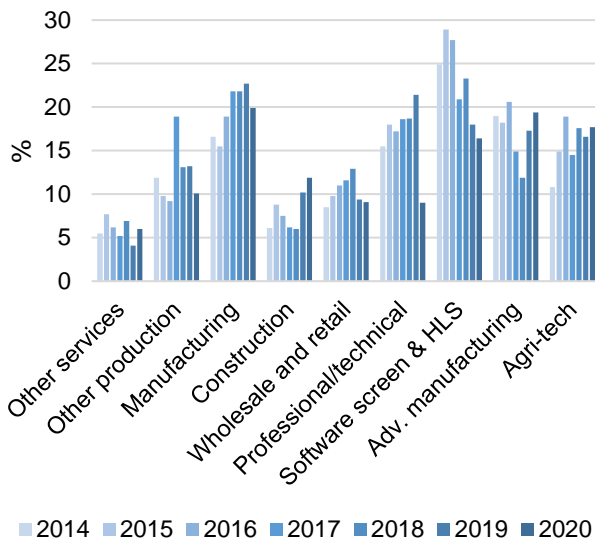
**Table 5.4 Average sales to external markets, 2014–2020**

	2014	2015	2016	2017	2018	2019	2020	Total
Number of businesses	705	708	587	564	636	570	634	4,404
Average employment (size)	29.23	29.46	32.57	33.21	35.33	34.72	33.08	32.36
GB% of sales	10.27%	11.20%	19.99%	12.43%	13.53%	14.24%	11.66%	13.17%
	<i>Pre-Brexit decision</i>			<i>Post-Brexit decision</i>			<i>Covid</i>	
		13.45%			13.41%		11.66%	
ROI% of sales	3.76%	3.51%	3.65%	3.80%	4.53%	5.13%	4.70%	4.13%
	<i>Pre-Brexit decision</i>			<i>Post-Brexit decision</i>			<i>Covid</i>	
		3.64%			4.49%		4.70%	
REU% of sales	1.34%	0.88%	1.07%	1.43%	1.98%	2.11%	1.56%	1.46%
	<i>Pre-Brexit decision</i>			<i>Post-Brexit decision</i>			<i>Covid</i>	
		1.10%			1.85%		1.56%	
ROW% of sales	2.14%	1.64%	3.14%	2.60%	2.98%	3.43%	2.77%	2.63%
	<i>Pre-Brexit decision</i>			<i>Post-Brexit decision</i>			<i>Covid</i>	
		2.26%			3.00%		2.77%	

**Note:** Underlying data are indexed to 2019 prices (ONS, 2022). <sup>1</sup>Average for the seven years.

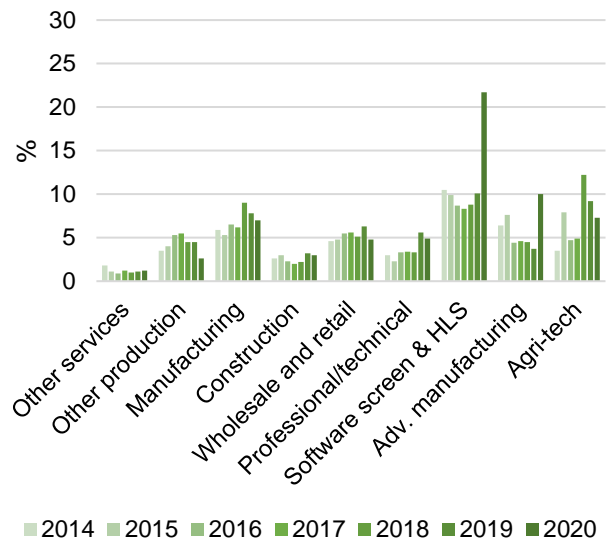
Patterns in the percentage of sales to the four markets are analysed over the period 2014–2020 in Figures 5.4 to 5.7. The 10X software, screen and health and life sciences sectors are combined, as separate disclosure jeopardises anonymity (i.e., less than ten businesses are included in some years). As illustrated in the four figures, sectoral differences are evident in the percentage of sales to the four markets. Generally, non-10X businesses (the six to the left-hand side of the figure) are less engaged with external markets relative to 10X businesses (the three to the right-hand side of each figure).

**Figure 5.4 % sales to GB by sector, 2014–2020**



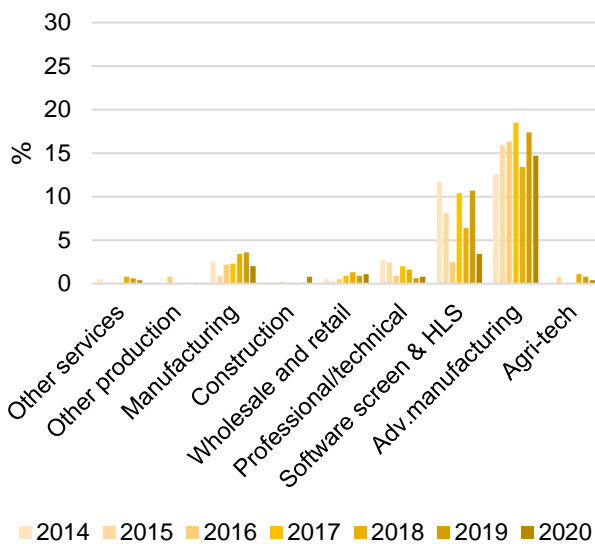
**Note:** Underlying data are indexed to 2019 prices (ONS, 2022).

**Figure 5.5 % sales to ROI by sector, 2014–2020**



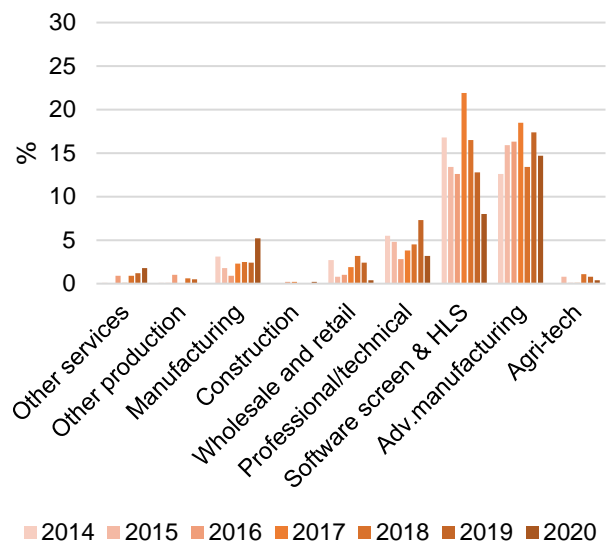
**Note:** Underlying data are indexed to 2019 prices (ONS, 2022).

**Figure 5.6 % sales to REU by sector, 2014–2020**



**Note:** Underlying data are indexed to 2019 prices (ONS, 2022).

**Figure 5.7 % sales to ROW by sector, 2014–2020**



**Note:** Underlying data are indexed to 2019 prices (ONS, 2022).

Tables with the average ratio values for each sector by year are included in Appendix 6 (Table A6.6 (GB), Table A6.7 (ROI), Table A6.8 (REU) and Table 6.9 (ROW)). The tables also detail the number of businesses within each sector per year. Overall, irrespective of sector type, the largest external market for North Down and East Antrim businesses is GB (Figure 5.4). Differences in the relative importance of markets are observed across sectors. In particular, the REU and ROW markets are important for the advanced manufacturing sector (Figures 5.6 and 5.7). With the exception of agri-tech, businesses in the 10X sectors are (three sectors to the right of each graph) more active in the four external sales markets relative to businesses in the non-10X sectors (six sectors to the left of each graph).

## Evaluation of external sales behaviour on either side of the Brexit decision by sector

An examination of the descriptive statistics relating to the Brexit decision at the end of 2016, identifies that the proportion of business sales to each of the four markets increased in the post-Brexit period relative to the pre-Brexit period (the 2016 value for GB percentage of sales is assumed to be affected by outliers). For example, the percentage of sales to ROI markets increased from an average of 3.64% for the years 2014–2016, to 4.49% for the years 2017–2019 (Table 5.4). It fell from 5.13% in 2019 to 4.70% in 2020, coinciding with the Covid-19 pandemic.

Random effects regression analysis is used to identify the determinants of external sales behaviour and to test whether the sales activity of each sector changed **significantly** after the Brexit decision. Extract results are shown in Table 5.5. After treatment for outliers and controlling for location, legal status, trade characteristics, subsidies, size, and year effects, we find (in the main) consistent results with those observed in Figures 5.4 to 5.7. As shown in Table 5.5, significant increases in the percentage of sales to the GB market occurred in the other production and manufacturing sectors in the period 2017–2019 relative to the percentages reported in 2014–2016. Significant increases in the percentage of sales to the ROI market are observed for the manufacturing and software and screen sectors, but a significant decrease occurred in advanced manufacturing. Significant decreases in percentage of sales to the REU are observed in the health and life sciences sector. Finally, significant increases to the ROW are observed in the health and life sciences and advanced manufacturing sectors.

**Table 5.5 Change in the external sales behaviour of sectors in the post-Brexit period (2017–2019) relative to the pre-Brexit period (2014–2016)**

Percentage of total sales to:	GB (%)	ROI (%)	REU (%)	ROW (%)
Model	1b	2b	3b	4b
Observations	3,852	3,852	3,852	3,852
Number of businesses	1,618	1,618	1,618	1,618
<b>Non-10X</b>	<b>Post-Brexit</b>	<b>Post-Brexit</b>	<b>Post-Brexit</b>	<b>Post-Brexit</b>
Other services	—	—	—	—
Other production	↑	—	—	—
Manufacturing	↑	↑	—	—
Construction	—	—	—	—
Wholesale and retail	—	—	—	—
Professional and technical	—	—	—	—
<b>10X</b>				
Agri-tech	—	—	—	—
Health and life sciences	—	—	↓	↑
Advanced manufacturing	—	↓	—	↑
Software and screen	—	↑	—	—

**Legend:** statistically significant increase ↑; decrease ↓; no statistically significant difference —.

**Note:** Full regression results are included in Appendix 15 (Table A15.2).

# Lisburn and Castlereagh Trade 2014–2020

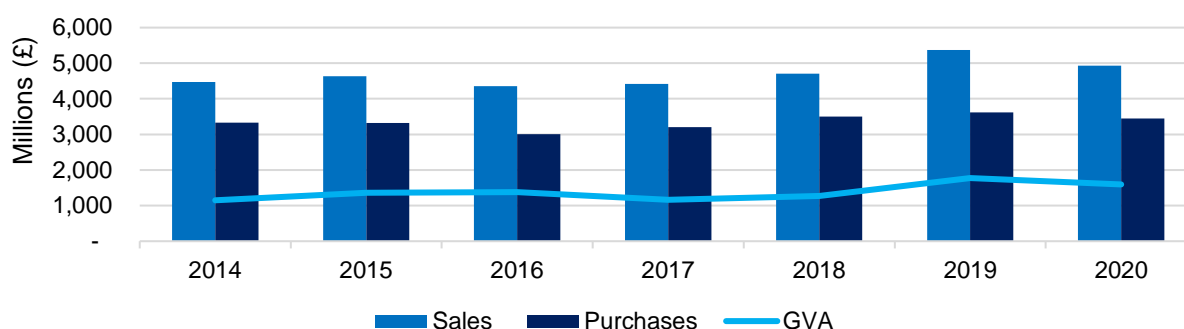
*using NISRA's BESES and NIABI datasets*



## 6.1 Overall approximate business activity

Businesses in the Lisburn and Castlereagh sub-region account for 8.4% of the total dataset used in this study (3,166 responses representing between 386 and 547 businesses in each year – Table 2.10). After interpolation using NISRA’s weighting system, it is estimated that these businesses generate about £1.1 to £1.8 billion in GVA per year (at 2019 prices) to the economy (Figure 6.1 and Table A7.1, Appendix 7). Overall, total sales increased by 19.7% and total purchases increased by 8.3% between 2014 and 2019 with the result that total real GVA over the period 2014–2019 increased by 53.5% (Table A7.1, Appendix 7).

**Figure 6.1 Total sales, purchases and GVA, 2014–2020**



**Note:** Data are weighted [NISRA (2023) NIABI] and indexed to 2019 prices [ONS (2022) Regional GVA balanced by industry]. Source data - Table A7.1, Appendix 7.

### Overall approximate business activity by sector (GVA)

The wholesale and retail, construction and other services sectors generate the largest amounts of real GVA in this sub-region (Table 6.1). GVA increased in all sectors over the period 2014–2019, with the largest increases observed in the health and life sciences (227.1%)<sup>25</sup>, other production (228.2%) and professional and technical services (108.6%) sectors. The data suggest that businesses in the services (other and professional and technical), construction, wholesale and retail, health and life sciences, advanced manufacturing and software and screen sectors were negatively affected by the Covid-related recession, with increases in GVA reported for other production, manufacturing and agri-tech for 2019–2020.

**Table 6.1 Total GVA by sector (£'000s), 2014–2020**

	2014	2015	2016	2017	2018	2019	2020
Other services	209,849	281,674	336,333	280,697	238,625	348,949	152,877
Other production	38,346	57,677	73,292	45,977	74,361	125,836	238,769
Manufacturing	114,285	124,894	130,643	144,477	158,782	138,707	182,932
Construction	279,157	320,255	279,276	132,635	195,731	402,677	271,572
Wholesale and retail	310,893	299,971	264,638	275,732	346,946	449,713	434,844
Professional and technical	57,846	81,610	108,664	104,168	85,852	120,646	111,384
<b>10X</b>							
Agri-tech and HLS	43,305	85,632	42,323	51,651	56,786	64,576	112,898
Advanced manufacturing	83,720	96,352	117,064	106,813	92,338	95,357	78,062
Software and screen	8,075	10,250	14,931	10,341	7,124	12,081	8,109

**Note:** Data are weighted [NISRA (2023) NIABI] and indexed to 2019 prices [ONS (2022) Regional GVA balanced by industry]. The weighting process is designed for NI level data. The need for further investigation of the totals for other services in 2016 and 2019, other production in 2017, construction in 2017 and 2018, agri-tech in 2015 and 2017, health and life sciences in 2018 and 2019, advanced manufacturing in 2017 and software and screen in 2020 is implied as these figures do not fit with patterns observed for their respective sectors.

<sup>25</sup> Agri-tech and health and life sciences are combined in Table 6.1 to preserve anonymity.

## 6.2 Business performance

Our results are based on the returns of 371 to 527 Lisburn and Castlereagh based businesses each year (as shown in Table 6.2). The sample of businesses are smaller in size to the sample returned for the Belfast and Antrim and Newtownabbey sub-regions as reflected in the lower overall average employment figure of 43.96 individuals. The size distribution characteristics of the sample have changed over the period: in 2014 the average employment was 37.55 individuals, increasing to 51.45 by 2019. This needs to be considered when analysing the descriptive statistics. Size has been controlled for in the regression analysis. Two indicators are used to evaluate trade performance: *sales per employment* and *GVA per employment*.

### Sales per employment

As shown in Table 6.2, the average *sales per employment* per business for the period 2014–2020 is £155,790 increasing by 7.8% in real terms, from £157,820 in 2014 to £170,170 in 2019. The average has oscillated from a low of £145,780 to a high of £170,170 during the period. *Sales per employment* fell to £155,330 in 2020, coinciding with the Covid-related recession.

**Table 6.2 Average sales and GVA per employment, 2014–2020**

	2014	2015	2016	2017	2018	2019	2020	Total
Number of businesses	527	522	413	371	411	385	421	3,050
Average employment (size)	37.55	38.82	45.50	44.73	51.45	51.45	42.04	43.96 <sup>1</sup>
Sales per employment (£'000)	157.82	145.78	152.34	156.18	156.04	170.17	155.33	155.79 <sup>1</sup>
	<i>Pre-Brexit decision</i>			<i>Post-Brexit decision</i>			<i>Covid</i>	
		151.97			160.75		155.33	
GVA per employment (£'000)	45.88	59.23	53.92	55.47	51.67	53.44	56.88	51.95 <sup>1</sup>
	<i>Pre-Brexit decision</i>			<i>Post-Brexit decision</i>			<i>Covid</i>	
		49.34			53.49		56.88	

**Note:** Underlying data are indexed to 2019 prices (ONS, 2022). <sup>1</sup>Average for the seven years.

### GVA per employment

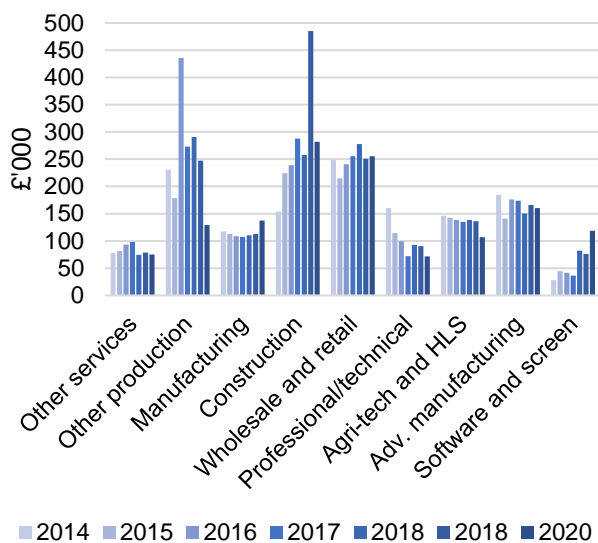
The average *GVA per employment* for the whole period was £51,950, increasing by 16.5% in real terms, from £45,880 in 2014 to £53,440 in 2019. *GVA per employment* increased to £56,880 in 2020 despite the impact of the Covid-related recession (Table 6.2).

### Sectoral analysis

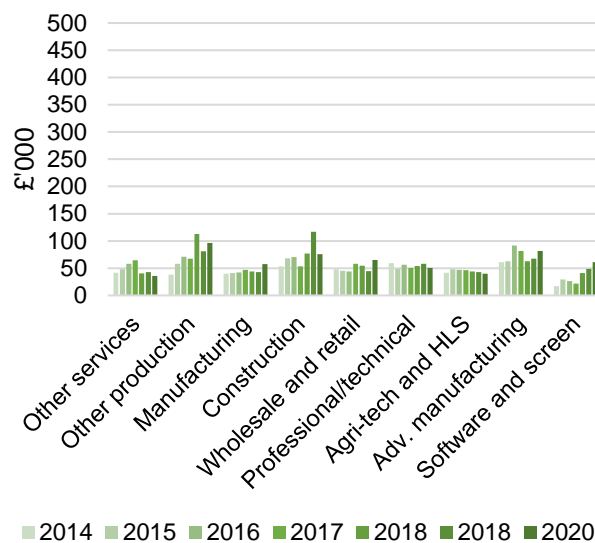
Patterns in the movement of the two performance indicators for each sector over time are illustrated in Figures 6.2 and 6.3. The underlying data are available in Tables A7.4 and A7.5 in Appendix 7. The tables also detail the number of businesses within each sector per year. The 10X agri-tech and health and life sciences sectors are combined as separate disclosure jeopardises anonymity (i.e., less than ten businesses are included in some years).



**Figure 6.2 Sales per employment by sector, 2014–2020**



**Figure 6.3 GVA per employment by sector, 2014–2020**



**Note:** Underlying data are indexed to 2019 prices (ONS, 2022).

**Note:** Underlying data are indexed to 2019 prices (ONS, 2022).

*Note: Outliers are noted in the sales per employment graph and corrected for in the regression analysis.*

In five of the sectors, *sales per employment* in 2019 was higher than in 2014. *Sales per employment* decreased in the manufacturing, professional and technical, agri-tech/health and life sciences and advanced manufacturing sectors. Most sectors declined over the period 2019–2020, except for the manufacturing, wholesale and retail and software and screen sectors (Table A7.4, Appendix 7).

The largest increase in *GVA per employment* is observed in the software and screen sector. It increased by 183.6% from a low £17,100 in 2014 to £48,500 in 2019. In 2019, *GVA per employment* is highest in the construction (£116,700), other production (£81,000) and advanced manufacturing (£67,700) sectors; and lowest in the agri-tech (£43,000), other services (£42,700), manufacturing (£42,800) and wholesale and retail (£44,300) sectors. Though *GVA per employment* typically declined in 2020, likely as a result of the Covid-related recession, increases in this region were noted for the other production, manufacturing, wholesale and retail, advanced manufacturing and software and screen sectors (Table A7.5, Appendix 7).

### Evaluation of performance either side of the Brexit decision

An examination of the descriptive statistics relating to the Brexit decision at the end of 2016 in Table 6.2, identifies that average *sales per employment* increased from £151,970 in the pre-Brexit decision period to £160,720 in the post-Brexit period. In a similar pattern, *GVA per employment* increased from an average of £49,340 for the years 2014 to 2016, to £53,490 for the years 2017 to 2019.

Random effects regression analysis is used to identify the determinants of trade performance and to test whether the performance of each sector changed **significantly** after the Brexit decision. Extract results are shown in Table 6.3. After treatment for outliers, and controlling for location, legal status, trade characteristics, subsidies, size, and year effects, regression

analysis identified that the Brexit decision affected sectors differently and the significant movements are broadly consistent with those observed in Figures 6.2 and 6.3. (Data from 2020 is not included in the regressions as the potential Brexit effect cannot be differentiated from the Covid-related recession effect.) As highlighted in Table 6.3, businesses in the other services and software and screen sectors experienced significant increases in average *sales per employment* in the post-Brexit period relative to the pre-Brexit period, while businesses in the other production, wholesale and retail, professional and technical and agri-tech sectors experienced significant decreases. One sector, the other services sector, reported significantly higher average *GVA per employment* in the post-Brexit period relative to the pre-Brexit period.

**Table 6.3 Change in sales and GVA per employment of sectors in the post-Brexit period (2017–2019) relative to the pre-Brexit period (2014–2016)**

	Sales per employment	GVA per employment
	Model 1b	Model 2b
Observations	2,645	2,645
Number of businesses	1,006	1,006
<b>Non-10X</b>	<b>Post-Brexit</b>	<b>Post-Brexit</b>
Other services	↑	↑
Other production	↓	—
Manufacturing	—	—
Construction	—	—
Wholesale and retail	↓	—
Professional and technical	↓	—
<b>10X</b>		
Agri-tech	↓	—
Health and life sciences	—	—
Advanced manufacturing	—	—
Software and screen	↑	—

**Legend:** statistically significant increase ↑; decrease ↓; no significant difference —.

**Note:** Full regression results are included in Appendix 16 (Table A16.1).

## 6.3 External sales

To examine the importance of trading with external markets, the trade behaviour of Lisburn and Castlereagh businesses is analysed using four ratios that reflect the percentage of overall sales that each business undertakes with Great Britain (GB), the Republic of Ireland (ROI), the Rest of Europe (REU) and the Rest of the World (ROW).

The results are based on the returns of between 377 and 535 businesses each year (see Table 6.4). The sample of businesses are smaller in size to the sample returned for the Belfast and Antrim and Newtownabbey sub-regions as reflected in the lower overall average employment figure of 44.39 individuals. The size distribution characteristics of the sample have changed over the period: in 2014 the average employment was 38.14 individuals, increasing to 51.91 by 2019. The most important external market is GB, accounting for, on average, 13.04% of businesses sales for the total period, followed by the ROI (6.84%), the ROW (2.45%) and the REU (2.04%). The general trend observed is that the percentage of total sales to these external markets has increased steadily over the period 2014–2019 and declined in 2020 (except for the percentage of sales to ROW), coinciding with the Covid-related recession.

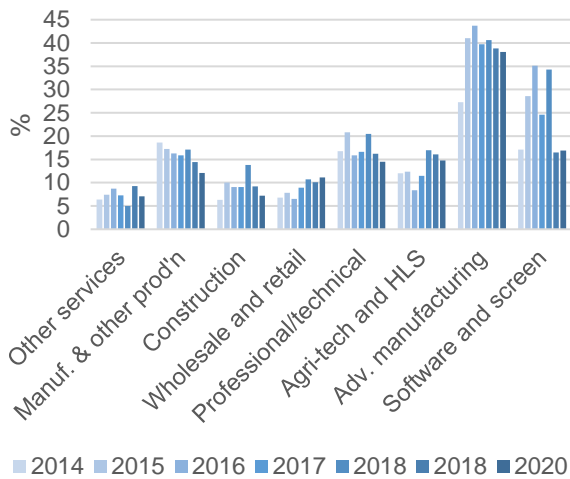
**Table 6.4 Average sales to external markets, 2014–2020**

	2014	2015	2016	2017	2018	2019	2020	Total
Number of businesses	535	531	415	377	415	388	433	3,094
Average employment (size)	38.14	39.28	46.36	45.25	51.55	51.91	42.05	44.39 <sup>1</sup>
GB% of sales	10.78%	11.88%	13.10%	13.58%	15.38%	15.17%	12.53%	13.04% <sup>1</sup>
	<i>Pre-Brexit decision</i>			<i>Post-Brexit decision</i>			<i>Covid</i>	
		11.83%			14.74%		12.53%	
ROI% of sales	6.90%	6.02%	5.95%	6.68%	7.45%	7.83%	7.25%	6.84% <sup>1</sup>
	<i>Pre-Brexit decision</i>			<i>Post-Brexit decision</i>			<i>Covid</i>	
		6.32%			7.33%		7.25%	
REU% of sales	1.73%	1.51%	2.64%	2.10%	2.67%	2.15%	1.75%	2.04% <sup>1</sup>
	<i>Pre-Brexit decision</i>			<i>Post-Brexit decision</i>			<i>Covid</i>	
		1.91%			2.32%		1.75%	
ROW% of sales	1.74%	1.75%	2.34%	2.54%	3.09%	2.99%	3.11%	2.45% <sup>1</sup>
	<i>Pre-Brexit decision</i>			<i>Post-Brexit decision</i>			<i>Covid</i>	
		1.91%			2.88%		3.11%	

**Note:** Underlying data are indexed to 2019 prices (ONS, 2022). <sup>1</sup>Average for the seven years.

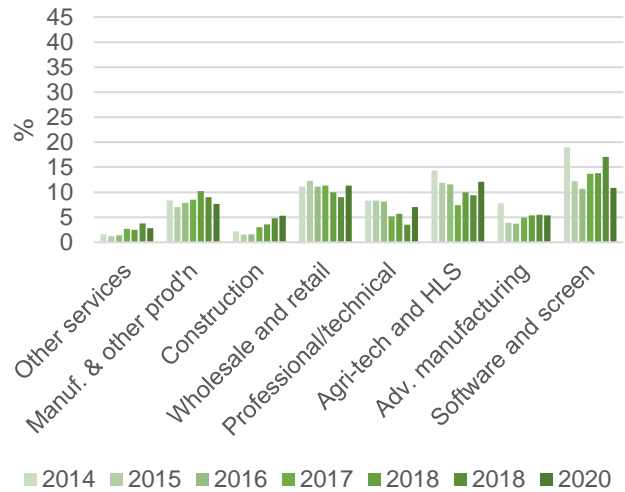
Patterns in the percentage of sales to the four markets are analysed over the period 2014–2020 in Figures 6.4 to 6.7. The non-10X other production and manufacturing sectors are combined and the 10X agri-tech and health and life sciences sectors are combined. This is required as separate disclosure jeopardises anonymity (i.e., less than ten businesses are included in some years). As illustrated in the four figures, sectoral differences are evident in the percentage of sales to the four markets. Generally, non-10X businesses (the five to the left-hand side of the figure) are less engaged with external markets relative to 10X businesses (the three to the right-hand side of the figure).

**Figure 6.4 % sales to GB by sector, 2014–2020**



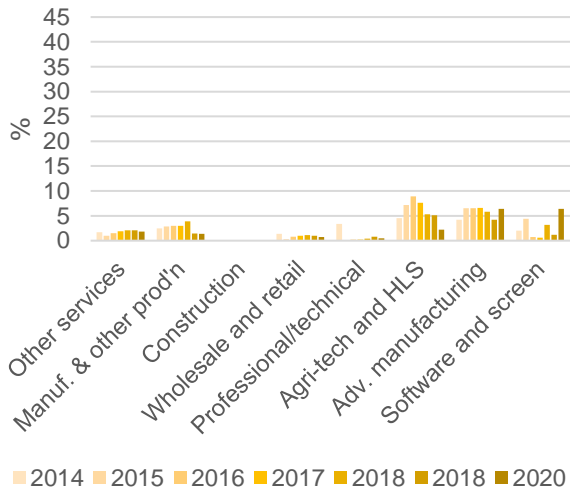
**Note:** Underlying data are indexed to 2019 prices (ONS, 2022).

**Figure 6.5 % sales to ROI by sector, 2014–2020**



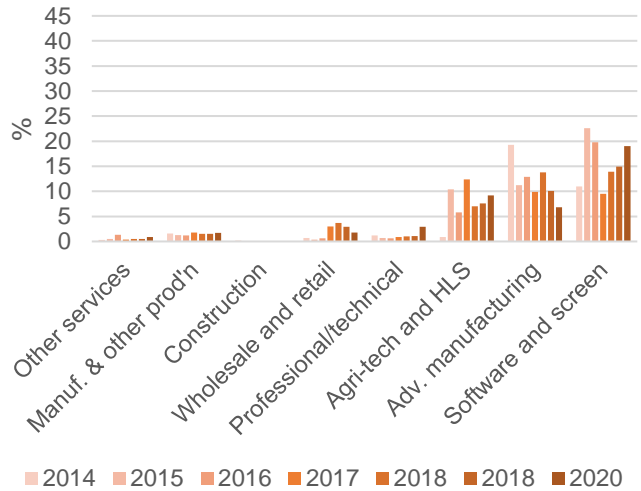
**Note:** Underlying data are indexed to 2019 prices (ONS, 2022).

**Figure 6.6 % sales to REU by sector, 2014–2020**



**Note:** Underlying data are indexed to 2019 prices (ONS, 2022).

**Figure 6.7 % sales to ROW by sector, 2014–2020**



**Note:** Underlying data are indexed to 2019 prices (ONS, 2022).

Tables with the average ratio values for each sector by year are included in Appendix 7 (Table A7.6 (GB), Table A7.7 (ROI), Table A7.8 (REU) and Table A7.9 (ROW)). The tables also detail the number of businesses within each sector per year. Overall, irrespective of sector type, the largest external market for Lisburn and Castlereagh businesses is GB (Figure 6.4). Differences in the relative importance of markets are observed across sectors. For example, the GB market is particularly important for the advanced manufacturing and software and screen sectors (Figure 6.4). The ROW markets are important for the 10X sectors (three to the right of Figures 6.5 and 6.7). Businesses in the 10X sectors are more active in the four external sales markets relative to businesses in the non-10X sectors (five sectors to the left of each graph).

## Evaluation of external sales behaviour on either side of the Brexit decision by sector

An examination relating to the Brexit decision at the end of 2016, identifies that the proportion of business sales to each of the four markets increased in the post-Brexit period relative to the pre-Brexit period. For example, the percentage of sales to ROI markets increased from an average of 6.32% for the years 2014–2016, to 7.33% for the years 2017–2019 (Table 6.4). It fell from to 7.25% in 2020, coinciding with the Covid-related recession.

Random effects regression analysis is used to identify the determinants of external sales behaviour and to test whether the sales activity of each sector changed **significantly** after the Brexit decision. Extract results are shown in Table 6.5. After treatment for outliers and controlling for location, legal status, trade characteristics, subsidies, size, and year effects, we find broadly consistent results with those observed in Figures 6.4 to 6.7. As shown in Table 6.5, when the data for businesses located in the Lisburn and Castlereagh sub-region for the period 2017–2019 are compared to the period 2014–2016, we find:

- no significant differences in sales activity to the GB market
- significant decreases in the percentage of sales to the ROI market for the wholesale and retail, professional and technical and agri-tech sectors.
- significant increases in the percentage of sales to the REU in the health and life sciences sector and significant decreases in the agri-tech sector; and
- significant decreases to the ROW in the health and life sciences sector.

**Table 6.5 Change in the external sales behaviour of sectors in the post-Brexit period (2017–2019) relative to the pre-Brexit period (2014–2016)**

	GB (%)	ROI (%)	REU (%)	ROW (%)
Model	1b	2b	3b	4b
Observations	2,721	2,721	2,721	2,721
Number of businesses	1,023	1,023	1,023	1,023
<b>Non-10X</b>	<b>Post-Brexit</b>	<b>Post-Brexit</b>	<b>Post-Brexit</b>	<b>Post-Brexit</b>
Other services	—	—	—	—
Other production	—	—	—	—
Manufacturing	—	—	—	—
Construction	—	—	—	—
Wholesale and retail	—	↓	—	—
Professional and technical	—	↓	—	—
<b>10X</b>				
Agri-tech	—	↓	↓	—
Health and life sciences	—	—	↑	↓
Advanced manufacturing	—	—	—	—
Software and screen	—	—	—	—

**Legend:** statistically significant increase ↑; decrease ↓; no statistically significant difference —.

**Note:** Full regression results are included in Appendix 16 (Table A16.2).

# South Down and Armagh Trade 2014–2020

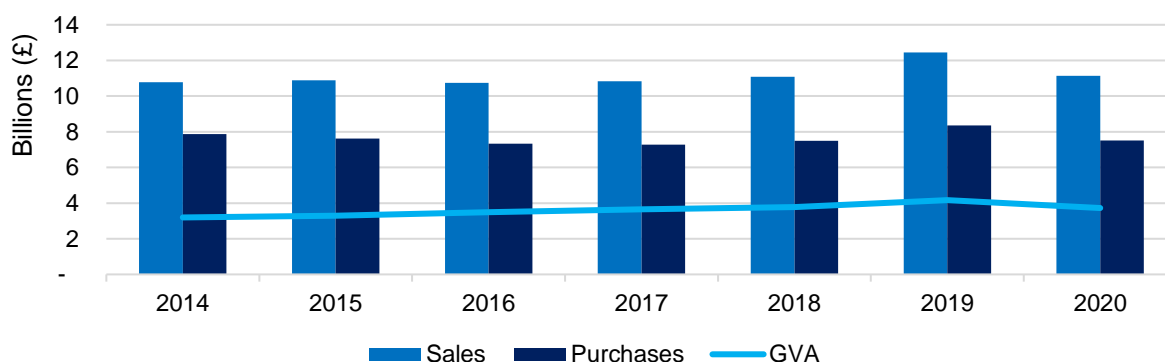
*using NISRA's BESES and NIABI datasets*



## 7.1 Overall approximate business activity

Businesses in the South Down and Armagh sub-region account for 20.6% of the total dataset used in this study (7,811 responses representing between 997 and 1,315 businesses in each year – Table 2.10). After interpolation using NISRA’s weighting system it is estimated that these businesses generate between £3.2 to £4.2 billion in GVA per year (at 2019 prices) to the economy (Figure 7.1 and Table A8.1, Appendix 8). Overall, total sales increased by 15.4% and total purchases increased by 6.0% between 2014 and 2019 with the result that total real GVA over the period 2014–2019 increased by 30.2% (Table A8.1, Appendix 8).

**Figure 7.1 Total sales, purchases and GVA, 2014–2020**



**Note:** Data are weighted (NISRA, NIABI (2023)) and indexed to 2019 prices (source data - Table A8.1, Appendix 8).

### Overall approximate business activity by sector (GVA)

As evidenced in Table 7.1, wholesale and retail, other services, construction, advanced manufacturing and agri-tech businesses are most prevalent within this sub-region<sup>26</sup>. With the exception of health and life sciences, which reported reductions in real GVA (29.9%), the other sectors reported increases in real GVA over the period 2014–2019. The largest increases were observed in the advanced manufacturing (570.5%), software and screen (321.6%) and manufacturing (44.3%) sectors. The data suggest that businesses in the services (other and professional and technical), other production, construction, agri-tech, advanced manufacturing and software and screen sectors were negatively affected by the Covid-related recession, with increases in GVA reported for manufacturing and health and life sciences for 2019–2020.

**Table 7.1 Total GVA by sector (£'000s), 2014–2020**

	2014	2015	2016	2017	2018	2019	2020
Other services	890,085	806,266	862,116	766,236	790,280	911,928	676,604
Other production	144,660	117,189	120,201	150,942	156,644	195,622	150,179
Manufacturing	241,312	249,262	279,823	344,448	334,535	348,125	375,687
Construction	439,744	416,728	517,509	440,492	426,107	574,016	501,967
Wholesale and retail	692,702	709,610	687,355	638,614	539,631	797,056	798,936
Professional and technical	218,726	221,427	209,181	189,609	231,723	250,116	236,412
<b>10X</b>							
Agri-tech	362,036	355,529	351,695	375,314	403,980	401,078	353,508
Advanced manufacturing	64,368	261,691	338,366	544,629	655,172	431,570	398,861
Software/screen and HLS	139,058	153,333	113,528	201,802	239,130	247,191	216,774

**Note:** Data are weighted [NISRA (2023) NIABI] and indexed to 2019 prices [ONS (2022) Regional GVA balanced by industry]. The weighting process is designed for NI level data. The need for investigation of the totals for other services in 2019, other production in 2019, construction in 2016, wholesale and retail in 2018, professional and technical in 2017 and advanced manufacturing in 2014 is implied as these figures do not fit with the overall patterns observed for these sectors.

<sup>26</sup> Software and screen and health and life sciences are combined in Table 7.1 to preserve anonymity.

## 7.2 Business performance

Our results are based on the returns of 975 to 1,273 South Down and Armagh based businesses each year (as shown in Table 7.2). The sample of businesses is smaller in size than the sample returned for the Belfast and Antrim and Newtownabbey sub-regions as reflected in the lower overall average employment figure of 45.90 individuals. The size distribution characteristics of the sample have changed over the period: in 2014 the average employment was 35.82 individuals, increasing to 56.27 by 2019. This needs to be considered when analysing the descriptive statistics. Size has been controlled for in the regression analysis. Two indicators are used to evaluate performance: *sales per employment* and *GVA per employment*.

### Sales per employment

As shown in Table 7.2, the average *sales per employment* for the period 2014–2020 is £153,790 increasing by 7.8% in real terms, from £151,970 in 2014 to £163,810 in 2018. The ratio fell in 2019 to £151,490, before rising to £152,160 in 2020.

**Table 7.2 Average sales and GVA per employment, 2014–2020**

	2014	2015	2016	2017	2018	2019	2020	Total
Number of businesses	1,273	1,227	979	975	1,079	1,012	1,064	7,609
Average employment (size)	35.82	37.25	44.70	47.25	51.93	56.27	51.86	45.90 <sup>1</sup>
Sales per employment (£'000)	151.97	147.37	147.49	163.71	163.81	151.49	152.16	153.79 <sup>1</sup>
	<i>Pre-Brexit decision</i>			<i>Post-Brexit decision</i>		<i>Covid</i>		
		148.09			159.71		152.16	
GVA per employment (£'000)	48.88	47.56	50.92	58.66	53.45	53.99	53.06	52.09 <sup>1</sup>
	<i>Pre-Brexit decision</i>			<i>Post-Brexit decision</i>		<i>Covid</i>		
		48.99			55.28		53.06	

**Note:** Underlying data are indexed to 2019 prices (ONS, 2022). <sup>1</sup>Average for the seven years.

### GVA per employment

The average *GVA per employment* for the whole period was £52,090, increasing by 10.5% in real terms, from £48,880 in 2014 to £53,990 in 2019. *GVA per employment* decreased to £53,060 in 2020, coinciding with the Covid-19 pandemic (Table 7.2).

### Sectoral analysis

Patterns in the movement of the two performance indicators for each sector over time are illustrated in Figures 7.2 and 7.3. The underlying data are available in Tables A8.4 and A8.5 in Appendix 8. The tables also detail the number of businesses within each sector per year. The 10X software and screen and health and life sciences sectors are combined as separate disclosure jeopardises anonymity (i.e., less than ten businesses are included in some years).



Figure 7.2 Sales per employment by sector, 2014–2020

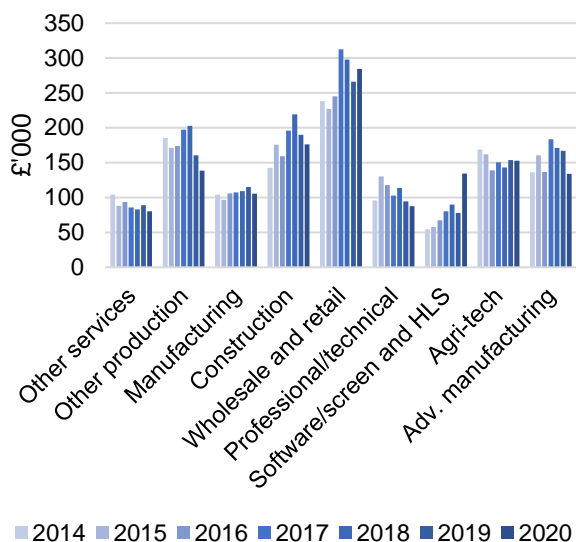
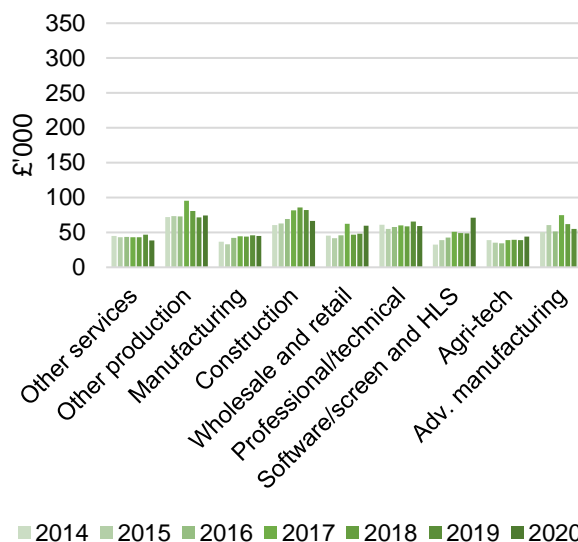


Figure 7.3 GVA per employment by sector, 2014–2020



Note: Underlying data are indexed to 2019 prices (ONS, 2022).

Note: Underlying data are indexed to 2019 prices (ONS, 2022).

In five of the sectors, *sales per employment* in 2019 was higher than in 2014. *Sales per employment* decreased in the other services, other production, professional and technical and agri-tech sectors. Most declined over the period 2019–2020, except for the wholesale and retail and software/screen and health and life sciences sectors (Table A8.4, Appendix 8).

All sectors reported increases in real *GVA per employment* over the period 2014–2019. The largest increase is observed in the software/screen/health and life sciences sector<sup>27</sup>. It increased by 48.9% from £32,500 in 2014 to £48,400 in 2019. In 2019, *GVA per employment* is highest in the construction (£82,100) and other production (£71,600) sectors; and lowest in the agri-tech (£39,200) and manufacturing (£45,700) sectors. Though *GVA per employment* typically declined in 2020, perhaps as a result of the Covid-related recession, increases were noted for the other production, wholesale and retail, agri-tech and software/screen/health and life sciences sectors (Table A8.5, Appendix 8).

### Evaluation of performance either side of the Brexit decision

An examination of the descriptive statistics relating to the Brexit decision at the end of 2016 in Table 7.2, identifies that average *sales per employment* increased from £148,090 in the pre-Brexit decision period to £159,710 in the post-Brexit period. In a similar pattern, *GVA per employment* increased from an average of £48,990 for the years 2014–2016 to £55,280 for the years 2017–2019.

Random effects regression analysis is used to identify the determinants of trade performance and to test whether the performance of each sector changed **significantly** after the Brexit decision. Extract results are shown in Table 7.3. After treatment for outliers, and controlling for location, legal status, trade characteristics, subsidies, size, and year effects, regression analysis identified that the Brexit decision affected sectors differently and the significant movements are broadly consistent with those observed in Figures 7.2 and 7.3. (Data from 2020 are not included in the regressions as the potential Brexit effect cannot be differentiated from

<sup>27</sup> Other production reports a very small decline in 2019, however this low average is not consistent with the pattern observed over the whole period.

the Covid-19 effect.) As highlighted in Table 7.3, businesses in the other services, other production, advanced manufacturing and software and screen sectors experienced significant increases in average *sales per employment* in the post-Brexit period relative to the pre-Brexit period. Businesses in the other production and manufacturing sectors reported significantly higher *GVA per employment* in the post-Brexit period relative to the pre-Brexit period.

**Table 7.3 Change in sales and GVA per employment of sectors in the post-Brexit period (2017–2019) relative to the pre-Brexit period (2014–2016)**

	Sales per employment	GVA per employment
	Model 1b	Model 2b
Observations	6,567	6,567
Number of businesses	2,583	2,583
<b>Non-10X</b>	<b>Post-Brexit</b>	<b>Post-Brexit</b>
Other services	↑	—
Other production	↑	↑
Manufacturing	—	↑
Construction	—	—
Wholesale and retail	—	—
Professional and technical	—	—
<b>10X</b>		
Agri-tech	—	—
Health and life sciences	—	—
Advanced manufacturing	↑	—
Software and screen	↑	—

**Legend:** statistically significant increase ↑; decrease ↓; no significant difference —.

**Note:** Full regression results are included in Appendix 17 (Table A17.1).

## 7.3 External sales

To examine the importance of trading with external markets, the trade behaviour of South Down and Armagh businesses is analysed using four ratios that reflect the percentage of overall sales that each business undertakes with Great Britain (GB), the Republic of Ireland (ROI), the rest of the European Union (REU) and the Rest of the World (ROW).

The results are based on the returns of between 975 and 1,289 businesses each year (Table 7.4). The sample of businesses are smaller in size to the sample returned for the Belfast and Antrim and Newtownabbey sub-regions as reflected in the lower overall average employment figure of 45.26 individuals. The size distribution characteristics of the sample have changed over the period: in 2014 the average employment was 35.70 individuals, increasing to 55.72 by 2019. The most important external market is GB, accounting for, on average, 11.55% of businesses sales for the total period, followed by the ROI (9.00%), the REU (2.42%) and the ROW (2.11%). The general trend observed is that the percentage of total sales to these external markets has increased steadily over the period from 2014–2019 and declined in 2020, coinciding with the onset of the Covid-related recession.

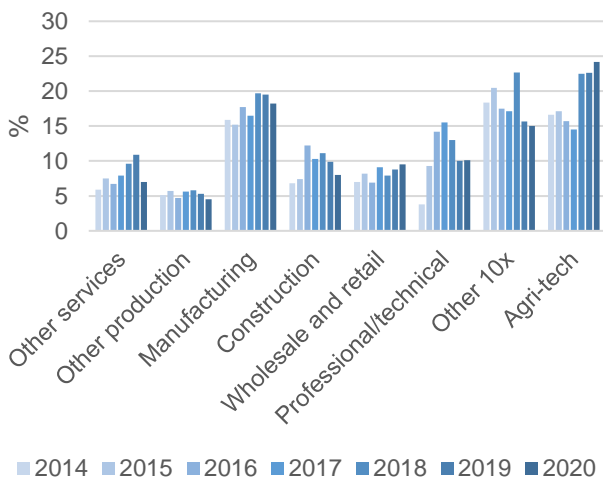
**Table 7.4 Average sales to external markets, 2014–2020**

	2014	2015	2016	2017	2018	2019	2020	Total
Number of businesses	1,289	1,244	986	975	1,074	1,008	1,073	7,649
Average employment (size)	35.70	36.63	43.99	46.56	51.17	55.72	50.83	45.26 <sup>1</sup>
GB% of sales	8.78%	9.81%	11.70%	11.88%	14.07%	13.79%	11.82%	11.55% <sup>1</sup>
	<i>Pre-Brexit decision</i>			<i>Post-Brexit decision</i>			<i>Covid</i>	
		9.95%			13.28%		11.82%	
ROI% of sales	7.59%	7.42%	8.74%	9.77%	10.26%	10.60%	9.26%	9.00% <sup>1</sup>
	<i>Pre-Brexit decision</i>			<i>Post-Brexit decision</i>			<i>Covid</i>	
		7.85%			10.21%		9.26%	
REU% of sales	1.87%	1.91%	2.50%	2.75%	3.18%	2.57%	2.37%	2.42% <sup>1</sup>
	<i>Pre-Brexit decision</i>			<i>Post-Brexit decision</i>			<i>Covid</i>	
		2.06%			2.84%		2.37%	
ROW% of sales	1.49%	1.53%	1.98%	2.49%	2.32%	2.62%	2.59%	2.11% <sup>1</sup>
	<i>Pre-Brexit decision</i>			<i>Post-Brexit decision</i>			<i>Covid</i>	
		1.64%			2.47%		2.59%	

**Note:** Underlying data are indexed to 2019 prices (ONS, 2022). <sup>1</sup>Average for the seven years.

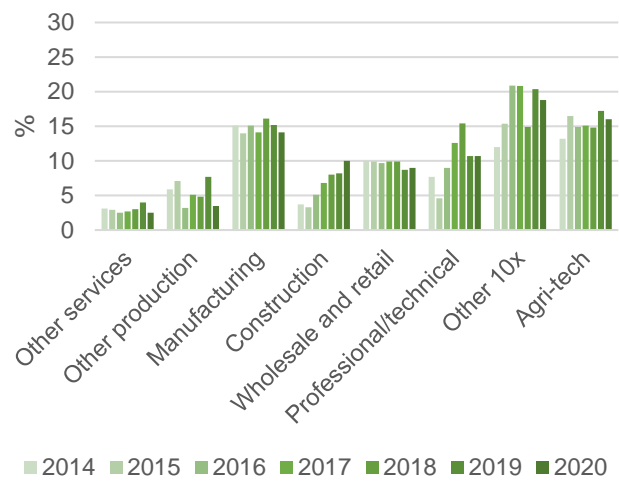
Patterns in the percentage of sales to the four markets are analysed over the period 2014–2020 in Figures 7.4 to 7.7. The 10X advanced manufacturing, software and screen, and health and life sciences sectors are combined to form one category called ‘other 10X’, as separate disclosure jeopardises anonymity (i.e., less than ten businesses are included in some years). As illustrated in the four figures, sectoral differences are evident in the percentage of sales to the four markets.

**Figure 7.4 % sales to GB by sector, 2014–2020**



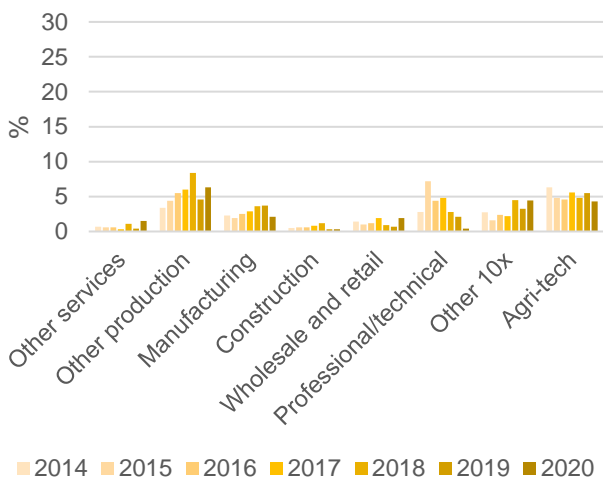
**Note:** Underlying data are indexed to 2019 prices (ONS, 2022).

**Figure 7.5 % sales to ROI by sector, 2014–2020**



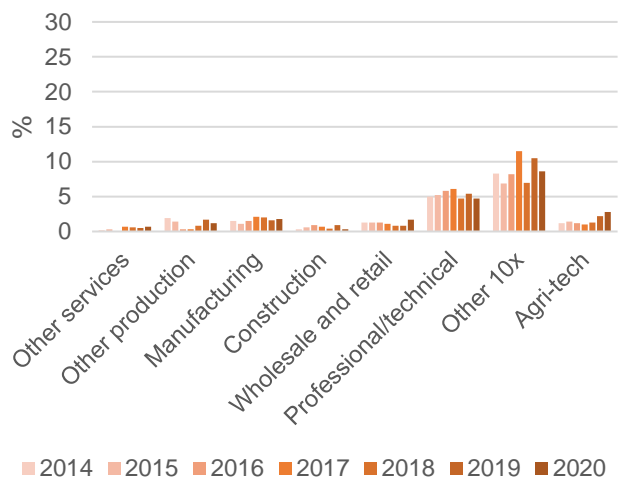
**Note:** Underlying data are indexed to 2019 prices (ONS, 2022).

**Figure 7.6 % sales to REU by sector, 2014–2020**



**Note:** Underlying data are indexed to 2019 prices (ONS, 2022).

**Figure 7.7 % sales to ROW by sector, 2014–2020**



**Note:** Underlying data are indexed to 2019 prices (ONS, 2022).

Tables with the average ratio values for each sector by year are included in Appendix 8 (Table A8.6 (GB), Table A8.7 (ROI), Table A8.8 (REU) and Table A8.9 (ROW)). The tables also detail the number of businesses within each sector per year. Overall, irrespective of sector type, the largest external market for South Down and Armagh businesses is GB (Figure 7.4), though businesses in this sub-region also have strong export trade to the ROI (Figure 7.5). Differences in the relative importance of markets are observed across sectors. For example, the GB and ROI markets are particularly important for the 10X (two sectors to the right of each graph) and the manufacturing sectors (Figure 7.4 and 7.5). Businesses in the 10X sectors are more active in the four external sales markets relative to businesses in the non-10X sectors (six sectors to the left of each graph).

## Evaluation of external sales behaviour on either side of the Brexit decision by sector

An examination relating to the Brexit decision at the end of 2016, identifies that the proportion of business sales to each of the four markets increased in the post-Brexit period relative to the pre-Brexit period. For example, the percentage of sales to ROI markets increased from an average of 7.85% for the years 2014–2016, to 10.21% for the years 2017–2019 (Table 7.4). It fell from to 9.26% in 2020, coinciding with the Covid-19 pandemic.

Random effects regression analysis is used to identify the determinants of external sales behaviour and to test whether the sales activity of each sector changed **significantly** after the Brexit decision. Extract results are shown in Table 7.5. After treatment for outliers and controlling for location, legal status, trade characteristics, subsidies, size, and year effects, we find broadly consistent results with those observed in Figures 7.4 to 7.7. As shown in Table 7.5, when the data for businesses located in the South Down and Armagh sub-region for the period 2017–2019 are compared to the period 2014–2016, we find:

- significant increases in the percentage of sales to the GB market for the professional and technical and agri-tech sectors and significant decreases for the advanced manufacturing sector.
- significant decreases in the percentage of sales to the ROI market for the software and screen sector.
- significant increases in the percentage of sales to the REU in the other production sector and significant decreases in the agri-tech sector; and
- significant increases in the percentage of sales to the ROW in the other production, advanced manufacturing and software and screen sectors and significant decreases in the professional and technical and health and life sciences sectors.

**Table 7.5 Change in the external sales behaviour of sectors in the post-Brexit period (2017–2019) relative to the pre-Brexit period (2014–2016)**

	GB (%)	ROI (%)	REU (%)	ROW (%)
Model	1b	2b	3b	4b
Observations	6,708	6,708	6,708	6,708
Number of businesses	2,628	2,628	2,628	2,628
<b>Non-10X</b>	<b>Post-Brexit</b>	<b>Post-Brexit</b>	<b>Post-Brexit</b>	<b>Post-Brexit</b>
Other services	—	—	—	—
Other production	—	—	↑	↑
Manufacturing	—	—	—	—
Construction	—	—	—	—
Wholesale and retail	—	—	—	—
Professional and technical	↑	—	—	↓
<b>10X</b>				
Agri-tech	↑	—	↓	—
Health and life sciences	—	—	—	↓
Advanced manufacturing	↓	—	—	↑
Software and screen	—	↓	—	↑

**Legend:** statistically significant increase ↑; decrease ↓; no statistically significant difference —.

**Note:** Full regression results are included in Appendix 17 (Table A17.2).

# Causeway Coast and Glens Trade 2014–2020

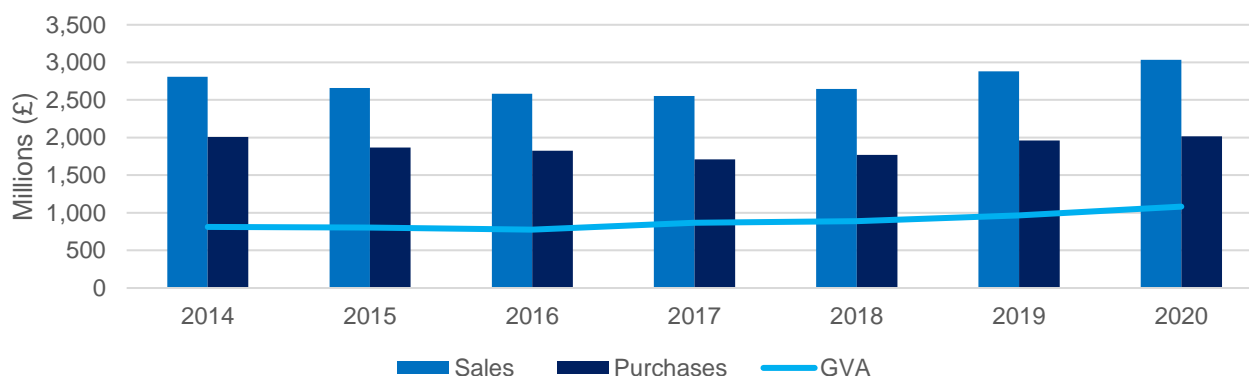
*using NISRA's BESES and NIABI datasets*



## 8.1 Overall approximate business activity

Businesses in the Causeway Coast and Glens of Antrim sub-region account for 6.6% of the total dataset used in this study (2,505 responses representing between 311 and 441 businesses in each year – Table 2.10). After interpolation using NISRA’s weighting system it is estimated that these businesses generate between £0.8 to £1.1 billion in GVA per year (at 2019 prices) to the economy (Figure 8.1 and Table A9.1, Appendix 9). Overall, total sales increased by 2.6% and total purchases fell by 2.4% between 2014 and 2019 with the result that total real GVA over the period 2014–2019 increased by 19.3% (Table A9.1, Appendix 9).

**Figure 8.1 Total sales, purchases and GVA, 2014–2020**



**Note:** Data are weighted [NISRA (2023) NIABI] and indexed to 2019 prices [ONS (2022) Regional GVA balanced by industry].  
Source data - Table A9.1, Appendix 9.

### Overall approximate business activity by sector (GVA)

As evidenced in Table 8.1, other services, wholesale and retail and construction businesses contribute the most real GVA to the economy in this sub-region<sup>28</sup>. Over the period 2014–2019, total GVA decreased in the other production (17.3%), professional and technical services (39%) and agri-tech (23.7%) sectors. The other sectors reported increases in real GVA. The data suggest that businesses in the other production, agri-tech, health and life sciences and software and screen sectors were negatively affected by the Covid-related recession, with increases in GVA reported for the other sectors for 2019–2020.

**Table 8.1 Total GVA by sector (£'000s), 2014–2020**

	2014	2015	2016	2017	2018	2019	2020
Other services	240,437	276,073	235,809	282,105	364,728	292,681	303,722
Manuf. and other production	85,311	77,835	83,651	99,451	97,804	100,554	97,999
Construction	116,824	106,797	142,233	183,931	139,663	173,184	196,593
Wholesale and retail	186,289	189,880	180,507	118,749	160,166	236,811	259,766
Professional and technical	55,925	52,785	53,635	50,142	41,611	34,140	50,666
<b>10X</b>							
Total 10X	126,258	102,252	80,323	131,321	84,903	129,901	173,468

**Note:** Data are weighted [NISRA (2023) NIABI] and indexed to 2019 prices [ONS (2022) Regional GVA balanced by industry]. The weighting process is designed for NI level data. The need for further investigation of the totals for other services in 2016, other production in 2017, construction in 2017, wholesale and retail in 2017 and 2018, health and life sciences in 2018 and advanced manufacturing in 2017 and 2020 is implied as these figures do not fit with the overall patterns observed for these sectors.

<sup>28</sup> The non-10X sectors manufacturing and other production, and separately the four 10X sectors, are combined in Table 8.1 to preserve anonymity.

## 8.2 Business performance

Our results are based on the yearly returns of between 302 and 423 businesses located in the Causeway Coast and Glens sub-region of Northern Ireland (as shown in Table 8.2). The sample of businesses is smaller in size than the sample returned for the Belfast and Antrim and Newtownabbey sub-regions as reflected in the lower overall average employment figure of 34.62 individuals. The size distribution characteristics of the sample have changed over the period: in 2014 the average employment was 26.51 individuals, increasing to 42.76 by 2020. This needs to be considered when analysing the descriptive statistics. Size has been controlled for in the regression analysis. Two indicators are used to evaluate performance: *sales per employment* and *GVA per employment*.

### Sales per employment

As shown in Table 8.2, the average *sales per employment* for the period 2014–2020 is £133,930. It oscillated from a low of £127,010 in 2016 to a high of £139,880 in 2019. The ratio fell in 2020 to £138,740, coinciding with the Covid-related recession.

**Table 8.2 Average sales and GVA per employment, 2014–2020**

	2014	2015	2016	2017	2018	2019	2020	Total
Number of businesses	423	393	319	304	353	302	323	2,417
Average employment (size)	26.51	28.37	34.20	34.06	38.33	42.25	42.76	34.62 <sup>1</sup>
Sales per employment (£'000)	139.33	131.053	127.01	127.88	132.15	139.88	138.74	133.93
	<i>Pre-Brexit decision</i>			<i>Post-Brexit decision</i>			<i>Covid</i>	
		133.17			133.23		138.74	
GVA per employment (£'000)	48.08	46.95	44.90	50.71	48.55	47.07	48.81	47.84 <sup>1</sup>
	<i>Pre-Brexit decision</i>			<i>Post-Brexit decision</i>			<i>Covid</i>	
		46.79			48.77		48.81	

**Note:** Underlying data are indexed to 2019 prices (ONS, 2022). <sup>1</sup>Average for the seven years.

### GVA per employment

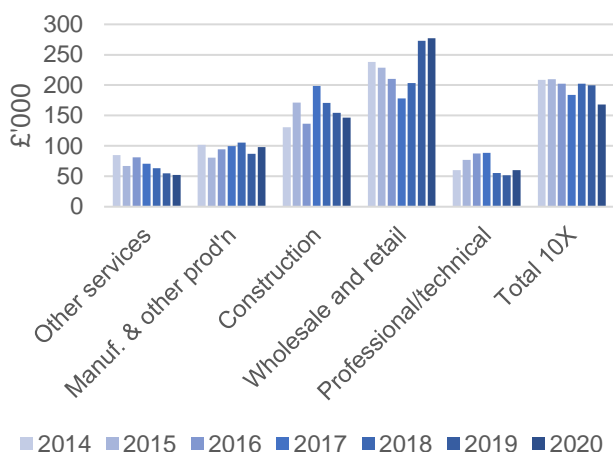
The average *GVA per employment* for the whole period was £47,840. It oscillated from a low of £44,900 in 2016 to a high of £50,710 in 2017. *GVA per employment* increased from £47,070 in 2019 to £48,810 in 2020 despite the impact of the Covid-related recession (Table 8.2).

### Sectoral analysis

Patterns in the movement of the two performance indicators for each sector over time are illustrated in Figures 8.2 and 8.3. The underlying data are available in Tables A9.4 and A9.5 in Appendix 9. The tables also detail the number of businesses within each sector per year. The non-10X sectors: other production and manufacturing are combined. The four 10X sectors: agri-tech, health and life sciences, advanced manufacturing and software and screen sectors are combined to create the 'Total 10X' sector as separate disclosure jeopardises anonymity (i.e., less than ten businesses are included in some years for some of these sectors).

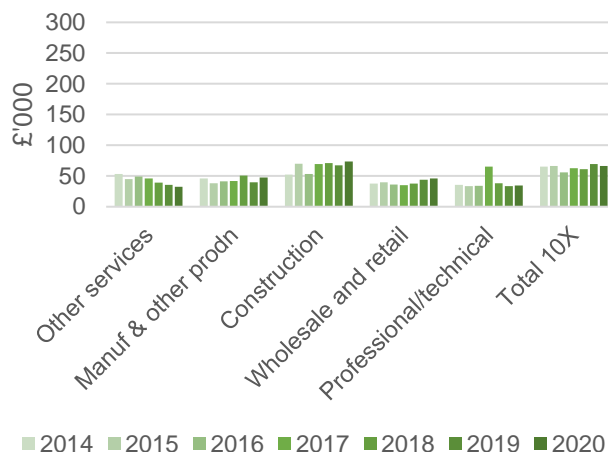


**Figure 8.2 Sales per employment by sector, 2014–2020**



**Note:** Underlying data are indexed to 2019 prices (ONS, 2022).

**Figure 8.3 GVA per employment by sector, 2014–2020**



**Note:** Underlying data are indexed to 2019 prices (ONS, 2022).

In two of the six sectors, *sales per employment* in 2019 were higher than in 2014. *Sales per employment* decreased in the other services, manufacturing and other production, professional and technical and total 10X sectors. Coinciding with the Covid-related recession, *sales per employment* fell in 2020 in three sectors, however, increases are observed for the manufacturing and other production, wholesale and retail, professional and technical and advanced manufacturing sectors (Table A9.4, Appendix 9).

Three sectors reported decreases in real *GVA per employment* over the period 2014–2019. Increases were reported for the construction, wholesale and retail and total 10X sectors. The largest increase is observed in the construction sector. It increased by 29.3% from £52,200 in 2014 to £67,500 in 2019. In 2019, *GVA per employment* is highest in the Total-10X (£69,300) and construction (£67,500) sectors; and lowest in the professional and technical (£33,700), other services (£35,400) and manufacturing and other production (£39,700) sectors. Though *GVA per employment* typically declined in 2020 (alongside Covid), increases were noted for the manufacturing and other production (the pattern of results suggests that 2019 is uncharacteristically low), construction, wholesale and retail and professional and technical sectors (Table A9.5, Appendix 9).

### Evaluation of performance either side of the Brexit decision

An examination of the descriptive statistics relating to the Brexit decision at the end of 2016 in Table 8.2, identifies that average *sales per employment* decreased yearly over the period 2014 to 2016 and increased yearly from 2016 to 2019, before falling in 2020. *GVA per employment* increased from an average of £46,790 for the years 2014–2016, to £48,770 for the years 2017–2019.

Random effects regression analysis is used to identify the determinants of trade performance and to test whether the performance of each sector changed **significantly** after the Brexit decision in 2016. Extract results are shown in Table 8.3. After treatment for outliers, and controlling for location, legal status, trade characteristics, subsidies, size, and year effects, regression analysis identified that the Brexit decision affected sectors differently and the significant movements are broadly consistent with those observed in Figures 8.2 and 8.3. (Data from 2020 are not included in the regressions as the potential Brexit effect cannot be

differentiated from the Covid effect.) As highlighted in Table 8.3, businesses in the other production, manufacturing, advanced manufacturing and software and screen sectors experienced significant increases in average *sales per employment* in the post-Brexit period relative to the pre-Brexit period. Businesses in the other production and advanced manufacturing sectors reported significantly higher *GVA per employment* in the post-Brexit period relative to the pre-Brexit period.

**Table 8.3 Change in sales and GVA per employment of sectors in the post-Brexit period (2017–2019) relative to the pre-Brexit period (2014–2016)**

	Sales per employment	GVA per employment
	Model 1b	Model 2b
Observations	2,114	2,114
Number of businesses	846	846
<b>Non-10X</b>	<b>Post-Brexit</b>	<b>Post-Brexit</b>
Other services	—	—
Other production	↑	↑
Manufacturing	↑	—
Construction	—	—
Wholesale and retail	—	—
Professional and technical	—	—
<b>10X</b>		
Agri-tech	—	—
Health and life sciences	—	—
Advanced manufacturing	↑	↑
Software and screen	↑	—

**Legend:** statistically significant increase ↑; decrease ↓; no significant difference —.  
**Note:** Full regression results are included in Appendix 18 (Table A18.1).

## 8.3 External sales

To examine the importance of trading with external markets, the trade behaviour of Causeway Coast and Glens businesses is analysed using four ratios that reflect the percentage of overall sales that each business undertakes with Great Britain (GB), the Republic of Ireland (ROI), the rest of the European Union (REU) and the Rest of the World (ROW).

The results are based on the returns of between 310 and 430 businesses each year (Table 8.4). The sample of businesses are smaller in size to the sample returned for the Belfast and Antrim and Newtownabbey sub-regions as reflected in the lower overall average employment figure of 34.03 individuals. The size distribution characteristics of the sample have changed over the period: in 2014 the average employment was 25.91 individuals, increasing to 41.53 by 2019. The most important external market is GB, accounting for, on average, 9.13% of businesses sales for the total period, followed by the ROI (4.36%), the ROW (2.03%) and the REU (1.09%). The general trend observed is that the percentage of total sales to these external markets has increased steadily over the period from 2014–2019 and declined in 2020 (except for trade to the ROW), coinciding with the onset of the Covid-related recession.

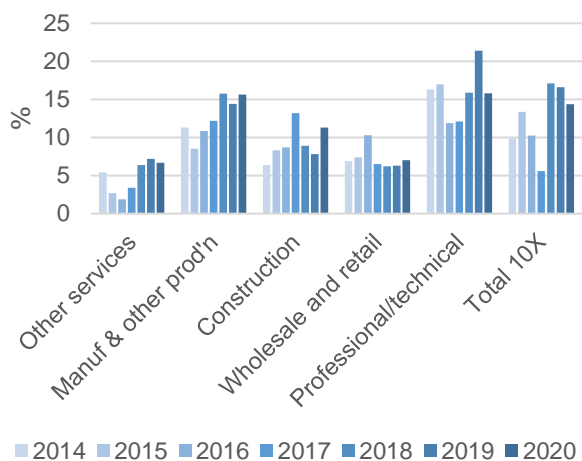
**Table 8.4 Average sales to external markets, 2014–2020**

	2014	2015	2016	2017	2018	2019	2020	Total
Number of businesses	430	399	320	310	359	303	331	2,452
Average employment (size)	25.91	27.93	34.02	33.38	37.47	41.53	41.98	34.03 <sup>1</sup>
GB% of sales	7.88%	7.52%	7.93%	8.44%	10.67%	11.22%	10.89%	9.13% <sup>1</sup>
	<i>Pre-Brexit decision</i>			<i>Post-Brexit decision</i>			<i>Covid</i>	
		7.78%			10.13%		10.89%	
ROI% of sales	2.82%	2.88%	4.20%	5.24%	6.48%	6.45%	4.20%	4.36% <sup>1</sup>
	<i>Pre-Brexit decision</i>			<i>Post-Brexit decision</i>			<i>Covid</i>	
		3.23%			5.76%		4.20%	
REU% of sales	0.82%	1.06%	1.02%	0.84%	1.27%	1.44%	1.29%	1.09% <sup>1</sup>
	<i>Pre-Brexit decision</i>			<i>Post-Brexit decision</i>			<i>Covid</i>	
		1.00%			1.19%		1.29%	
ROW% of sales	1.94%	1.41%	1.76%	1.73%	2.40%	2.47%	2.59%	2.03% <sup>1</sup>
	<i>Pre-Brexit decision</i>			<i>Post-Brexit decision</i>			<i>Covid</i>	
		1.71%			2.21%		2.59%	

**Note:** Underlying data are indexed to 2019 prices (ONS, 2022). <sup>1</sup>Average for the seven years.

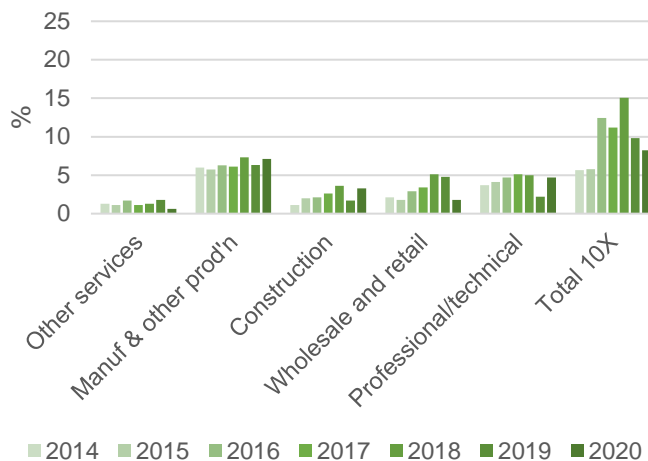
Patterns in the percentage of sales to the four markets are analysed over the period 2014–2020 in Figures 8.4 to 8.7. Some of the sectors were combined as separate disclosure jeopardises anonymity (i.e., less than ten businesses are included in some years for some of these sectors). The non-10X other production and manufacturing sectors and separately the four 10X sectors: agri-tech, health and life sciences, advanced manufacturing and software and screen sectors are combined. As illustrated in the four figures, sectoral differences are evident in the percentage of sales to the four markets. Generally, non-10X businesses (the five to the left-hand side of the figure) are less engaged with external markets relative to 10X businesses.

**Figure 8.4 % sales to GB by sector, 2014–2020**



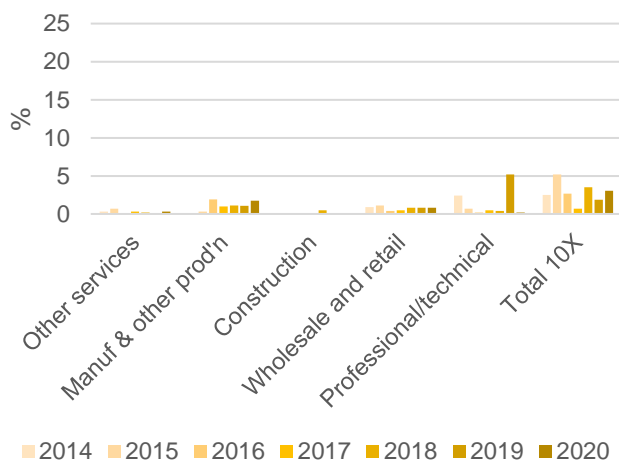
**Note:** Underlying data are indexed to 2019 prices (ONS, 2022).

**Figure 8.5 % sales to ROI by sector, 2014–2020**



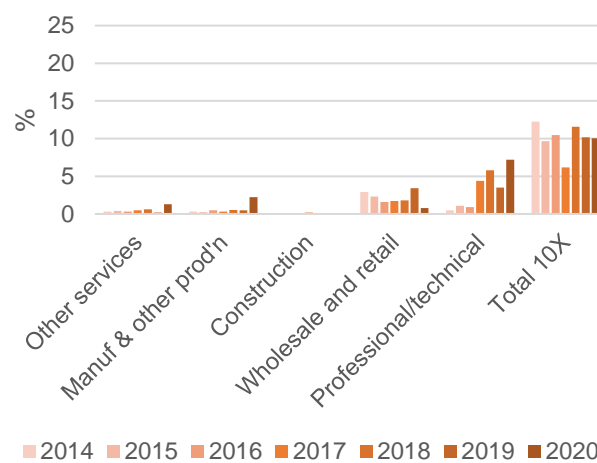
**Note:** Underlying data are indexed to 2019 prices (ONS, 2022).

**Figure 8.6 % sales to REU by sector, 2014–2020**



**Note:** Underlying data are indexed to 2019 prices (ONS, 2022).

**Figure 8.7 % sales to ROW by sector, 2014–2020**



**Note:** Underlying data are indexed to 2019 prices (ONS, 2022).

Tables with the average ratio values for each sector by year are included in Appendix 9 (Table A9.6 (GB), Table A9.7 (ROI), Table A9.8 (REU) and Table A9.9 (ROW)). The tables also detail the number of businesses within each sector per year. Overall, irrespective of sector type, businesses in this sub-region tend to engage less with external markets relative to other sub-regions as the scale is lower (maximum is 25%, whereas in all other sub-regions the graphs are scaled to 35%). Consistent with other sub-regions, the largest external market for Causeway Coast and Glens businesses is GB (Figure 8.4). Export sales to the ROI are markedly lower to those reported in other sub-regions. Differences in the relative importance of markets are observed across sectors. For example, the GB, ROI and ROW markets are important for the 10X sectors. The GB and ROI markets are also important for the manufacturing sector (Figures 8.4 and 8.5).

**Evaluation of external sales behaviour on either side of the Brexit decision by sector**

An examination relating to the Brexit decision at the end of 2016, identifies that the proportion of business sales to each of the four markets increased in the post-Brexit period relative to the pre-Brexit period. For example, the percentage of sales to ROI markets increased from an average of 3.23% for the years 2014–2016 to 5.76% for the years 2017–2019 (Table 8.4). It fell to 4.20% in 2020, coinciding with the Covid-19 pandemic.

Random effects regression analysis is used to identify the determinants of external sales behaviour and to test whether the sales activity of each sector changed **significantly** after the Brexit decision. Extract results are shown in Table 8.5. After treatment for outliers and controlling for location, legal status, trade characteristics, subsidies, size, and year effects we find (in the main) consistent results with those observed in Figures 8.4 to 8.7. As shown in Table 8.5, when the data for businesses located in the Causeway Coast and Glens sub-region for the period 2017–2019 are compared to the period 2014–2016, we find:

- significant increases in the percentage of sales to the GB market for the construction sector.
- significant increases in the percentage of sales to the ROI in the manufacturing and agri-tech sectors and significant decreases for the wholesale and retail sector.
- no significant differences in sales activity to the REU market; and
- significant increases in the percentage of sales to the ROW in the health and life sciences sector.

**Table 8.5 Change in the external sales behaviour of sectors in the post-Brexit period (2017–2019) relative to the pre-Brexit period (2014–2016)**

	GB (%)	ROI (%)	REU (%)	ROW (%)
Model	1b	2b	3b	4b
Observations	2,166	2,166	2,166	2,166
Number of businesses	862	862	862	862
<b>Non-10X</b>	<b>Post-Brexit</b>	<b>Post-Brexit</b>	<b>Post-Brexit</b>	<b>Post-Brexit</b>
Other services	—	—	—	—
Other production	—	—	—	—
Manufacturing	—	↑	—	—
Construction	↑	—	—	—
Wholesale and retail	—	↓	—	—
Professional and technical	—	—	—	—
<b>10X</b>				
Agri-tech	—	↑	—	—
Health and life sciences	—	—	—	↑
Advanced manufacturing	—	—	—	—
Software and screen	—	—	—	—

**Legend:** statistically significant increase ↑; decrease ↓; no statistically significant difference —.

**Note:** Full regression results are included in Appendix 18 (Table A18.2).

# Derry and Strabane Trade 2014–2020

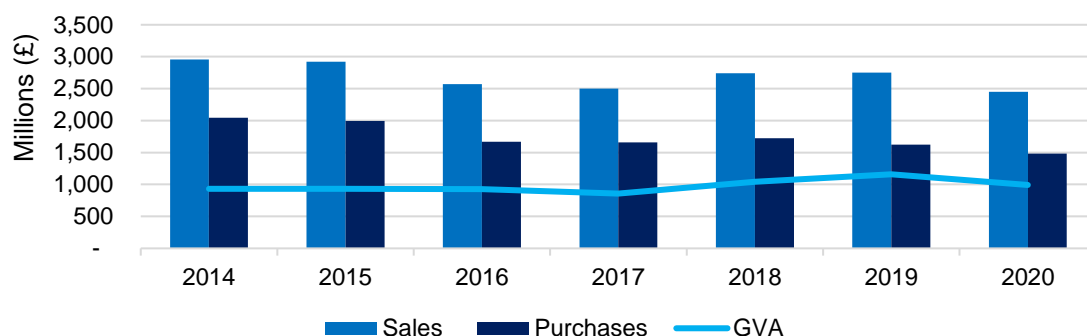
*using NISRA's BESES and NIABI datasets*



## 9.1 Overall approximate business activity

Businesses in the Derry City and Strabane sub-region account for 5.9% of the total dataset used in this study (2,252 responses representing between 265 and 383 businesses in each year – Table 2.10). After interpolation using NISRA’s weighting system, it is estimated that these businesses generate between £0.9 to £1.2 billion in GVA per year (at 2019 prices) to the economy (Figure 9.1 and Table A10.1, Appendix 10). Overall, total sales decreased by 7.1% and total purchases fell by 20.5% between 2014 and 2019 with the result that total real GVA over the period 2014–2019 increased by 24.6%.

**Figure 9.1 Total sales, purchases and GVA, 2014–2020**



**Note:** Data are weighted [NISRA (2023) NIABI] and indexed to 2019 prices [ONS (2022) Regional GVA balanced by industry]. Source data - Table A10.1, Appendix 10.

### Overall approximate business activity by sector (GVA)

As evidenced in Table 9.1, other services, wholesale and retail and manufacturing and other production contribute the most real GVA to the economy in this sub-region<sup>29</sup>. Over the period 2014–2019, total GVA decreased in the other services (1.9%) and wholesale and retail (4.6%) sectors. All other sectors reported increases, the largest of which were observed in the agri-tech (280.5% - though 2019 seems high) professional and technical (248.1%) and manufacturing and other production (100.0%) sectors. Within the ‘Other 10X’ category, the advanced manufacturing sector declined by 32.6%, whereas in total the smaller software and screen and health and life sciences sectors increased by 310.1%. The data suggest that businesses in the other services, wholesale and retail, professional and technical, agri-tech were perhaps negatively affected by the Covid-related recession, with increases in GVA reported for the other sectors for 2019–2020.

**Table 9.1 Total GVA by sector (£’000s), 2014–2020**

	2014	2015	2016	2017	2018	2019	2020
Other services	243,778	228,015	205,556	211,080	288,942	239,176	229,217
Manuf. & other production	91,542	118,542	121,041	149,943	215,595	183,115	188,462
Construction	132,220	153,500	147,393	135,568	168,678	142,935	191,502
Wholesale and retail	197,772	193,158	195,328	109,688	101,616	188,641	148,644
Professional and technical	22,029	26,189	28,575	30,040	33,538	76,693	61,929
<b>10X</b>							
Agri-tech	47,063	32,421	48,336	54,919	61,049	179,065	23,672
Other 10X <sup>a</sup>	195,171	176,534	175,764	164,364	173,559	148,777	141,071

**Note:** Data are weighted [NISRA (2023) NIABI] and indexed to 2019 prices [ONS (2022) Regional GVA balanced by industry]. The weighting process is designed for NI level data. The need for further investigation of the totals for other services in 2018, other production in 2017, construction in 2017 and 2019, wholesale and retail in 2017 and 2018, agri-tech, software and screen and health and life sciences in 2019 is implied, as the reported figures do not fit with the overall patterns observed for these sectors.

<sup>a</sup> Includes health and life sciences, advanced manufacturing and software and screen.

<sup>29</sup> The non-10X sectors: manufacturing and other production, and separately the three 10X sectors: health and life sciences, advanced manufacturing and software and screen, are combined in Table 9.1 to preserve anonymity.

## 9.2 Business performance

Our results are based on the returns of 259 to 374 Derry and Strabane based businesses each year (as shown in Table 9.2). The sample of businesses is smaller in size than the sample returned for the Belfast and Antrim and Newtownabbey sub-regions as reflected in the lower overall average employment figure of 43.67 individuals per business. The size distribution characteristics of the sample have changed over the period: in 2014 the average employment was 35.39 individuals, increasing to 52.44 by 2019. This needs to be considered when analysing the descriptive statistics. Size has been controlled for in the regression analysis. Two indicators are used to evaluate performance: *sales per employment* and *GVA per employment*.

### Sales per employment

As shown in Table 9.2, the average *sales per employment* for the total period 2014–2020 is £125,710 increasing by 10.5% in real terms, from £123,900 in 2014 to £136,950 in 2019. The ratio fell in 2020 to £133,540, coinciding with the Covid-related recession.

**Table 9.2 Average sales and GVA per employment, 2014–2020**

	2014	2015	2016	2017	2018	2019	2020	Total
Number of businesses	374	359	276	259	318	285	308	2,179
Average employment (size)	35.39	35.12	46.67	51.39	48.94	52.44	41.02	43.67 <sup>1</sup>
Sales per employment (£'000)	123.90	114.37	111.71	133.39	128.74	136.95	133.54	125.71 <sup>1</sup>
	<i>Pre-Brexit decision</i>			<i>Post-Brexit decision</i>			<i>Covid</i>	
		117.20			132.85		133.54	
GVA per employment (£'000)	38.05	43.97	37.50	43.30	47.34	49.67	53.56	44.65 <sup>1</sup>
	<i>Pre-Brexit decision</i>			<i>Post-Brexit decision</i>			<i>Covid</i>	
		40.00			46.90		53.56	

**Note:** Underlying data are indexed to 2019 prices (ONS, 2022). <sup>1</sup>Average for the seven years.

### GVA per employment

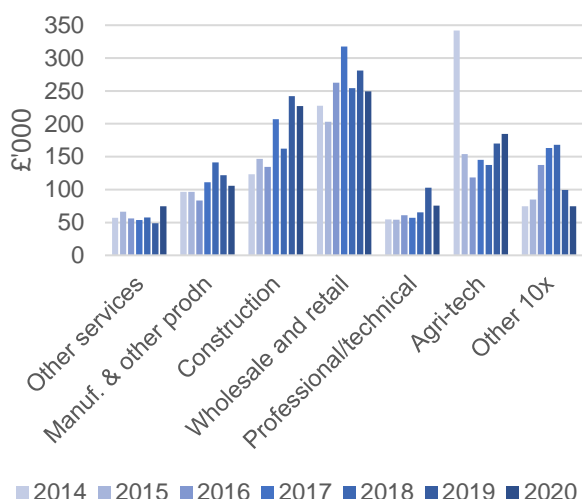
The average *GVA per employment* for the whole period was £44,650, increasing by 30.5% in real terms, from £38,050 in 2014 to £49,670 in 2019. *GVA per employment* increased to £53,560 in 2020 despite the impact of the Covid-related recession (Table 9.2).

### Sectoral analysis

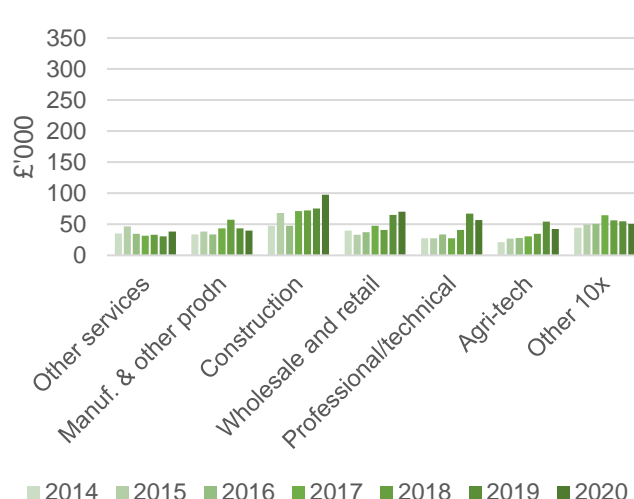
Patterns in the movement of the two performance indicators for each sector over time are illustrated in Figures 9.2 and 9.3. The underlying data are available in Tables A10.4 and A10.5 in Appendix 10. The tables also detail the number of businesses within each sector per year. The two non-10X sectors: other production and manufacturing are combined and the three 10X sectors: software and screen, advanced manufacturing and health and life sciences sectors are combined to create the 'Other 10X' sector. This is required as separate disclosure jeopardises anonymity (i.e., less than ten businesses are included in some years for some of these sectors).



**Figure 9.2 Sales per employment by sector, 2014–2020**



**Figure 9.3 GVA per employment by sector, 2014–2020**



**Note:** Underlying data are indexed to 2019 prices (ONS, 2022).

**Note:** Underlying data are indexed to 2019 prices (ONS, 2022).

In most of the seven sectors *sales per employment* in 2019 were higher than in 2014. *Sales per employment* decreased in the other services and agri-tech sectors; however, these two sectors were also the only sectors to report an increase in *sales per employment* in the period affected by the Covid-19 pandemic, 2019–2020 (Table A10.4, Appendix 10). The highest *sales per employment* in 2019 is reported for the wholesale and retail sector (£280,900), the lowest for the other services sector (£48,900).

All sectors reported increases in real *GVA per employment* over the period 2014–2019, with the exception of other services (Table A10.5, Appendix 10). The largest increase is observed in the agri-tech sector, which increased by 155.7% from £21,200 in 2014 to £54,200 in 2019. In 2019, *GVA per employment* is highest in the construction (£75,200) and professional and technical (£67,200) sectors; and lowest in the other services (£30,400) and manufacturing and other production (£43,500) sectors. Though *GVA per employment* typically declined in 2020 (alongside the Covid-related recession), increases were noted for the other services, construction and wholesale and retail sectors (Table A10.5, Appendix 10).

### Evaluation of performance either side of the Brexit decision

An examination of the descriptive statistics relating to the Brexit decision at the end of 2016 in Table 9.2, identifies that average *sales per employment* increased from £117,200 in the pre-Brexit decision period to £132,850 in the post-Brexit period. In a similar pattern, *GVA per employment* increased from an average of £40,000 for the years 2014–2016 to £46,900 for the years 2017–2019.

Random effects regression analysis is used to identify the determinants of trade performance and to test whether the performance of each sector changed **significantly** after the Brexit decision. Extract results are shown in Table 9.3. After treatment for outliers, and controlling for location, legal status, trade characteristics, subsidies, size, and year effects, regression analysis identified that the Brexit decision affected sectors differently and the significant movements are broadly consistent with those observed in Figures 9.2 and 9.3. (Data from 2020 are not included in the regressions as the potential Brexit effect cannot be differentiated from the Covid effect.) As highlighted in Table 9.3, businesses in the other services, manufacturing

and software and screen sectors experienced significant increases in average *sales per employment* in the post-Brexit period relative to the pre-Brexit period. Businesses in the manufacturing, wholesale and retail and software and screen sectors reported significantly higher *GVA per employment* in the post-Brexit period relative to the pre-Brexit period.

**Table 9.3 Change in sales and GVA per employment of sectors in the post-Brexit period (2017–2019) relative to the pre-Brexit period (2014–2016)**

	Sales per employment	GVA per employment
	Model 1b	Model 2b
Observations	1,885	1,885
Number of businesses	792	792
<b>Non-10X</b>	<b>Post-Brexit</b>	<b>Post-Brexit</b>
Other services	↑	—
Other production	—	—
Manufacturing	↑	↑
Construction	—	—
Wholesale and retail	—	↑
Professional and technical	—	—
<b>10X</b>		
Agri-tech	—	—
Health and life sciences	—	—
Advanced manufacturing	—	—
Software and screen	↑	↑

**Legend:** statistically significant increase ↑; decrease ↓; no significant difference —.

**Note:** Full regression results are included in Appendix 19 (Table A19.1).

## 9.3 External sales

To examine the importance of trading with external markets, the trade behaviour of Derry and Strabane businesses is analysed using four ratios that reflect the percentage of overall sales that each business undertakes with Great Britain (GB), the Republic of Ireland (ROI), the rest of the European Union (REU) and the rest of the World (ROW).

The results are based on the returns of between 258 and 372 businesses each year (Table 9.4). The sample of businesses are smaller in size to the sample returned for the Belfast and Antrim and Newtownabbey sub-regions as reflected in the lower overall average employment figure of 42.89 individuals. The size distribution characteristics of the sample have changed over the period: in 2014 the average employment was 35.19 individuals, increasing to 51.75 by 2019. The most important external market is GB, accounting for, on average, 10.01% of businesses sales for the total period, followed by the ROI (8.69%), the REU (3.22%) and the ROW (1.59%). The general trend observed is that the percentage of total sales to these external markets has increased steadily over the period from 2014–2019 and declined in 2020, coinciding with the Covid-related recession. The 2014 averages for the *percentage of sales* to the REU and the ROW seem high, given the patterns of growth observed.

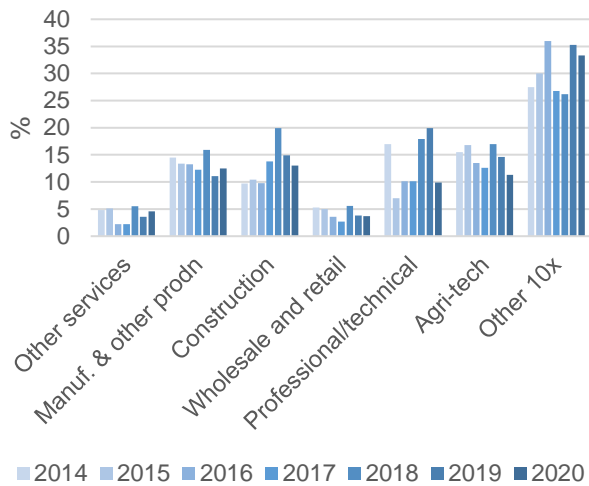
**Table 9.4 Average sales to external markets, 2014–2020**

	2014	2015	2016	2017	2018	2019	2020	Total
Number of businesses	372	361	278	258	325	284	313	2,191
Average employment (size)	35.19	34.59	45.75	50.56	47.55	51.75	39.86	42.89 <sup>1</sup>
GB% of sales	9.21%	8.75%	8.38%	9.17%	13.16%	11.60%	9.83%	10.01% <sup>1</sup>
	<i>Pre-Brexit decision</i>			<i>Post-Brexit decision</i>			<i>Covid</i>	
		8.82%			11.46%		9.83%	
ROI% of sales	6.76%	7.47%	7.91%	9.86%	9.90%	10.39%	9.27%	8.69% <sup>1</sup>
	<i>Pre-Brexit decision</i>			<i>Post-Brexit decision</i>			<i>Covid</i>	
		7.33%			10.05%		9.27%	
REU% of sales	2.09%	1.25%	1.42%	1.46%	1.61%	1.85%	1.39%	1.59% <sup>1</sup>
	<i>Pre-Brexit decision</i>			<i>Post-Brexit decision</i>			<i>Covid</i>	
		1.61%			1.65%		1.39%	
ROW% of sales	3.02%	2.64%	2.95%	3.53%	4.34%	3.70%	2.55%	3.22% <sup>1</sup>
	<i>Pre-Brexit decision</i>			<i>Post-Brexit decision</i>			<i>Covid</i>	
		2.86%			3.89%		2.55%	

**Note:** Underlying data are indexed to 2019 prices (ONS, 2022). <sup>1</sup>Average for the seven years.

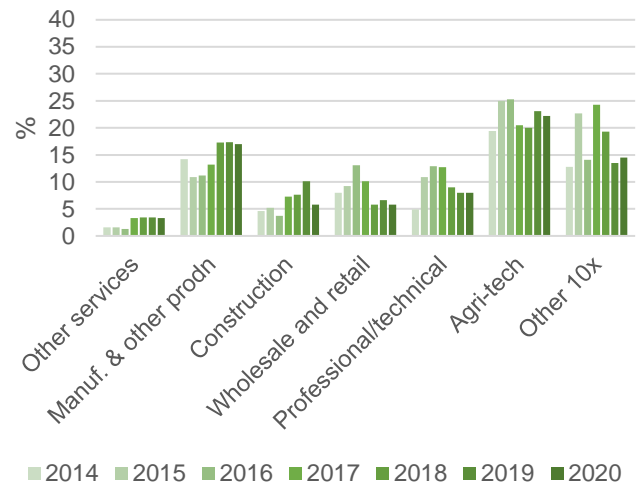
Patterns in the percentage of sales to the four markets are analysed over the period 2014–2020 in Figures 9.4 to 9.7. The two non-10X sectors: other production and manufacturing are combined to create the manufacturing and other production services sector. In addition, the three 10X sectors: software and screen, advanced manufacturing and health and life sciences sectors are combined to create the ‘Other 10X’ sector. This is required as separate disclosure jeopardises anonymity (i.e., less than ten businesses are included in some years for some of these sectors). As illustrated in the four figures, sectoral differences are evident in the percentage of sales to the four markets. Generally, non-10X businesses (the five to the left-hand side of the figure) are less engaged with external markets relative to 10X businesses (the two to the right-hand side of the figure).

**Figure 9.4 % sales to GB by sector, 2014–2020**



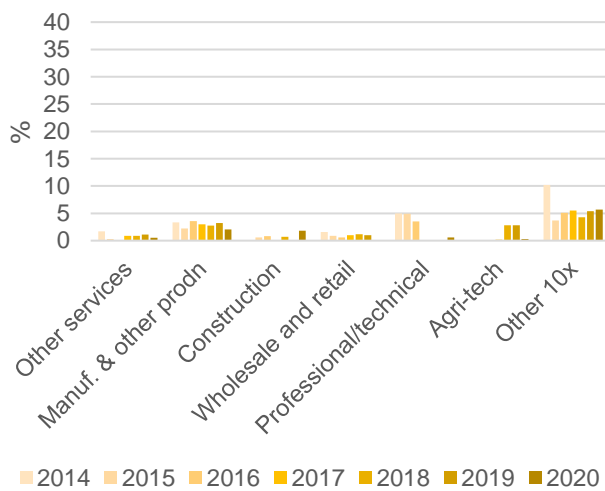
**Note:** Underlying data are indexed to 2019 prices (ONS, 2022).

**Figure 9.5 % sales to ROI by sector, 2014–2020**



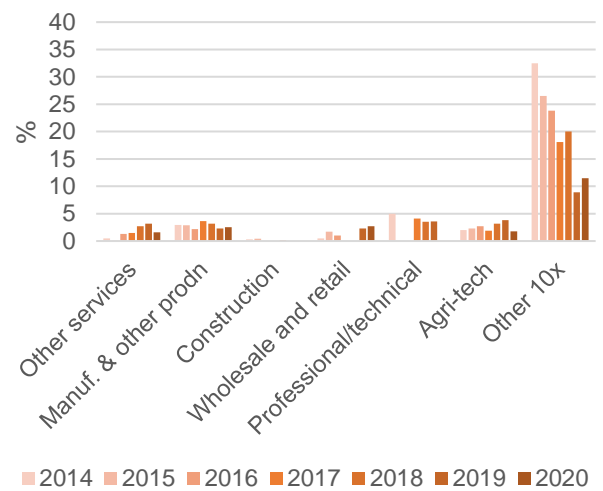
**Note:** Underlying data are indexed to 2019 prices (ONS, 2022).

**Figure 9.6 % sales to REU by sector, 2014–2020**



**Note:** Underlying data are indexed to 2019 prices (ONS, 2022).

**Figure 9.7 % sales to ROW by sector, 2014–2020**



**Note:** Underlying data are indexed to 2019 prices (ONS, 2022).

Tables with the average ratio values for each sector by year are included in Appendix 10 (Table A10.6 (GB), Table A10.7 (ROI), Table A10.8 (REU) and Table A10.9 (ROW)). The tables also detail the number of businesses within each sector per year. Overall, the largest external markets for Derry and Strabane businesses are GB (Figure 9.4) and the ROI (Figure 9.5). Differences in the relative importance of markets are observed across sectors. For example, the GB and ROI markets are particularly important for the 10X (two sectors to the right of each graph) and the manufacturing and other production sectors (Figure 9.4 and 9.5). In addition, businesses in the other 10X category are particularly active in markets in the ROW (Figure 9.7), though the percentage sales to the ROW are trending down quite strongly during 2014–2019.

## Evaluation of external sales behaviour on either side of the Brexit decision by sector

An examination relating to the Brexit decision at the end of 2016, identifies that the proportion of business sales to each of the four markets increased in the post-Brexit period relative to the pre-Brexit period. For example, the percentage of sales to GB markets increased from an average of 8.82% for the years 2014–2016 to 11.46% for the years 2017–2019 (Table 9.4). It fell from 11.60% in 2019 to 9.83% in 2020, coinciding with the Covid-related recession.

Random effects regression analysis is used to identify the determinants of external sales behaviour and to test whether the sales activity of each sector changed significantly after the Brexit decision. Extract results are shown in Table 9.5. After treatment for outliers and controlling for location, legal status, trade characteristics, subsidies, size, and year effects, we find broadly consistent results with those observed in Figures 9.4 to 9.7. As shown in Table 9.5, when the data for businesses located in the Derry and Strabane sub-region for the period 2017–2019 are compared to the period 2014–2016, we find:

- significant decreases in the percentage of sales to the GB market for the software and screen sector.
- no significant difference in the pattern of trade to the ROI market.
- significant increases in the percentage of sales to the REU in the other production and software and screen sectors; and
- significant increases in the percentage of sales to the ROW in the wholesale and retail and software and screen sectors and significant decreases in the other production sectors.

**Table 9.5 Change in the external sales behaviour of sectors in the post-Brexit period (2017–2019) relative to the pre-Brexit period (2014–2016)**

	GB (%)	ROI (%)	REU (%)	ROW (%)
Model	1b	2b	3b	4b
Observations	1,929	1,929	1,929	1,929
Number of businesses	805	805	805	805
<b>Non-10X</b>	<b>Post-Brexit</b>	<b>Post-Brexit</b>	<b>Post-Brexit</b>	<b>Post-Brexit</b>
Other services	—	—	—	—
Other production	—	—	↑	↓
Manufacturing	—	—	—	—
Construction	—	—	—	—
Wholesale and retail	—	—	—	↑
Professional and technical	—	—	—	—
<b>10X</b>				
Agri-tech	—	—	—	—
Health and life sciences	—	—	—	—
Advanced manufacturing	—	—	—	—
Software and screen	↓	—	↑	↑

**Legend:** statistically significant increase ↑; decrease ↓; no statistically significant difference —.  
**Note:** Full regression results are included in Appendix 19 (Table A19.2).

# Fermanagh and Mid-Ulster Trade 2014–2020

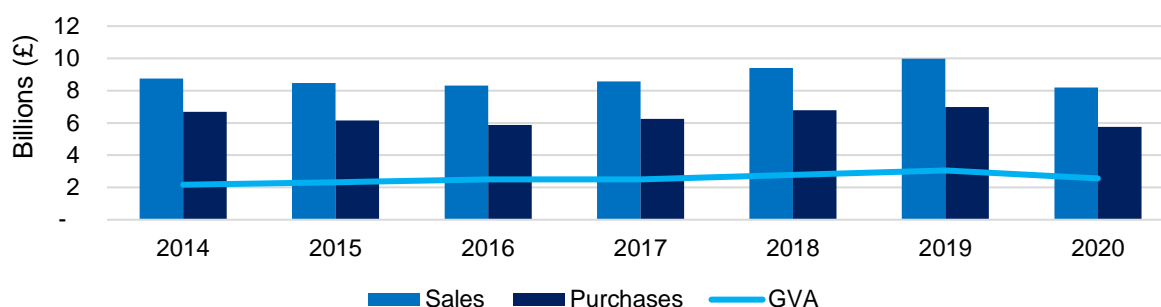
*using NISRA's BESES and NIABI datasets*



## 10.1 Overall approximate business activity

Businesses in the Fermanagh and Mid-Ulster sub-region account for 17.1% of the total dataset used in this study (6,468 responses representing between 852 and 1,085 businesses in each year – Table 2.10). After interpolation using NISRA’s weighting system, it is estimated that these businesses generate between £2.2 to £3.1 billion in GVA per year (at 2019 prices) to the economy (Figure 10.1 and Table A11.1, Appendix 11). Overall, total sales increased by 14.2% and total purchases increased by 4.2% between 2014 and 2019 with the result that total real GVA over the period 2014–2019 increased by 40.9%.

**Figure 10.1 Total sales, purchases and GVA, 2014–2020**



**Note:** Data are weighted [NISRA (2023) NIABI] and indexed to 2019 prices [ONS (2022) Regional GVA balanced by industry].  
Source data - Table A11.1, Appendix 11.

### Overall approximate business activity by sector (GVA)

As evidenced in Table 10.1, construction, wholesale and retail, manufacturing and other services contribute the most real GVA to the economy in this sub-region. Over the period 2014–2019 total GVA decreased in the professional and technical services (33.5%) and advanced manufacturing (3.1%) sectors. All other sectors reported increases in real GVA. The largest increases were observed in the manufacturing (82.9%) and other production sectors (80.6%). The data suggest that businesses in the other services, other production, manufacturing, construction, professional and technical, health and life sciences and advanced manufacturing were perhaps negatively affected by the Covid-related recession, with increases in GVA reported for the other 10X sector for 2019–2020.

**Table 10.1 Total GVA by sector (£'000s), 2014–2020**

	2014	2015	2016	2017	2018	2019	2020
Other services	375,764	351,317	353,977	323,011	339,164	489,008	365,345
Other production	79,294	64,768	120,836	61,551	94,022	143,160	93,299
Manufacturing	275,806	378,218	437,958	430,288	469,182	504,536	453,651
Construction	443,605	509,933	478,867	647,833	704,805	708,282	517,390
Wholesale and retail	444,177	537,624	582,412	572,868	630,942	671,674	702,908
Professional and technical	138,642	80,008	119,028	122,569	132,318	92,257	78,914
<b>10X</b>							
Other 10X	85,347	85,298	102,958	94,059	118,277	130,824	140,522
Advanced manufacturing	323,710	315,561	300,642	238,976	292,766	313,644	198,053

**Note:** Data are weighted (NISRA, NIABI (2023) and indexed to 2019 prices (ONS, (2022) Regional GVA (balanced) by industry). The weighting process is designed for NI level data. The need for further investigation of the totals for other services in 2019, other production in 2019 and wholesale and retail in 2017 is implied as these figures do not fit with the overall patterns observed for these sectors.

## 10.2 Business performance

Our results are based on the returns of 816 to 1,053 Fermanagh and Mid-Ulster based businesses each year (as shown in Table 10.2). The sample of businesses is smaller in size than the sample returned for the Belfast and Antrim and Newtownabbey sub-regions as reflected in the lower overall average employment figure of 34.28 individuals. The size distribution characteristics of the sample have changed over the period: in 2014 the average employment was 27.34 individuals, increasing to 40.41 by 2019. This needs to be considered when analysing the descriptive statistics. Size has been controlled for in the regression analysis. Two indicators are used to evaluate performance: *sales per employment* and *GVA per employment*.

### Sales per employment

As shown in Table 10.2, the average *sales per employment* for the total period 2014–2020 is £147,870 increasing by 12.1% in real terms, from £144,990 in 2014 to £162,490 in 2019. The ratio fell in 2020 to £145,820, coinciding with the Covid-related recession.

**Table 10.2 Average sales and GVA per employment, 2014–2020**

	2014	2015	2016	2017	2018	2019	2020	Total
Number of businesses	1,053	985	828	816	890	826	862	6,260
Average employment (size)	27.34	28.78	33.02	32.84	38.87	41.08	40.41	34.28 <sup>1</sup>
Sales per employment (£'000)	144.99	127.01	128.95	152.39	176.37	162.49	145.82	147.87 <sup>1</sup>
	<i>Pre-Brexit decision</i>			<i>Post-Brexit decision</i>			<i>Covid</i>	
		134.18			164.11		145.82	
GVA per employment (£'000)	44.51	45.87	43.82	54.54	57.50	54.26	51.39	51.02 <sup>1</sup>
	<i>Pre-Brexit decision</i>			<i>Post-Brexit decision</i>			<i>Covid</i>	
		44.78			55.49		51.39	

**Note:** Underlying data are indexed to 2019 prices (ONS, 2022). <sup>1</sup>Average for the seven years.

### GVA per employment

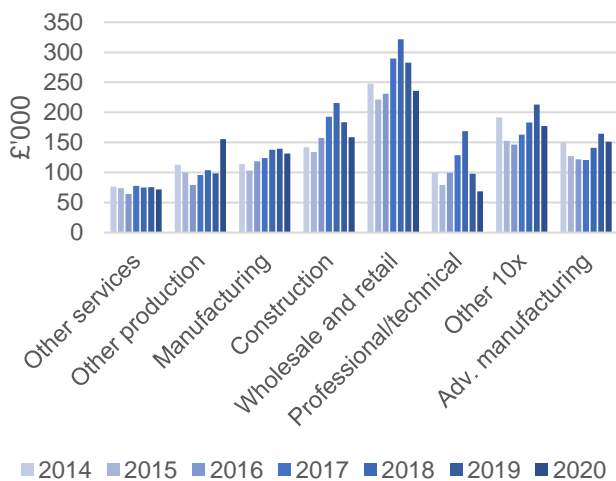
The average *GVA per employment* for the whole period was £51,020, increasing by 21.9% in real terms, from £44,510 in 2014 to £54,260 in 2019. *GVA per employment* decreased to £51,390 in 2020, coinciding with the Covid-related recession (Table 10.2).

### Sectoral analysis

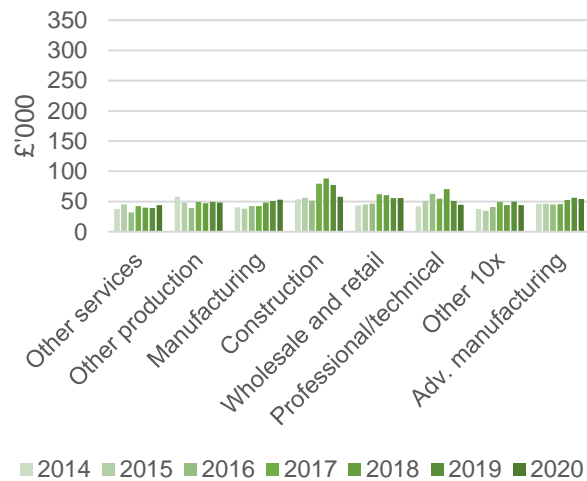
Patterns in the movement of the two performance indicators for each sector over time are illustrated in Figures 10.2 and 10.3. The underlying data are available in Tables A11.4 and A11.5 in Appendix 11. The tables also detail the number of businesses within each sector per year. The three 10X sectors, agri-tech, software and screen and health and life sciences, are combined as separate disclosure jeopardises anonymity (i.e., less than ten businesses are included in some years for some of these sectors).



**Figure 10.2 Sales per employment by sector, 2014–2020**



**Figure 10.3 GVA per employment by sector, 2014–2020**



**Note:** Underlying data are indexed to 2019 prices (ONS, 2022).

**Note:** Underlying data are indexed to 2019 prices (ONS, 2022).

In most of the sectors, *sales per employment* in 2019 was higher than in 2014. *Sales per employment* decreased in the other services, other production, professional and technical and software/screen and health and life sciences sectors. The other production sector was the only sector to report an increase in *sales per employment* in the period affected by the Covid-19 pandemic, 2019–2020 (Table A11.4, Appendix 11). The highest sales per employment in 2019 is reported for the wholesale and retail (£282,700) sector, the lowest for the other services sector (£75,300).

All sectors reported increases in real *GVA per employment* over the period 2014–2019, except for other production (Table A11.5, Appendix 11). The largest increase is observed in the other 10X sectors, which increased by 32.7% from £37,600 in 2014 to £49,900 in 2019. Within this category the agri-tech sector increased by 45%. In 2019, *GVA per employment* is highest in the construction (£77,400) sector; and lowest in the other services (£39,200), other production (£49,200) and other 10X (£49,900) sectors. Though *GVA per employment* typically declined in 2020, increases were noted for the other services and manufacturing sectors (Table A11.5, Appendix 11).

### Evaluation of performance either side of the Brexit decision

An examination of the descriptive statistics relating to the Brexit decision at the end of 2016 in Table 10.2, identifies that average *sales per employment* increased from £134,180 in the pre-Brexit decision period to £164,110 in the post-Brexit period. In a similar pattern, *GVA per employment* increased from an average of £44,780 for the years 2014–2016, to £55,490 for the years 2017–2019.

Random effects regression analysis is used to identify the determinants of trade performance and to test whether the performance of each sector changed **significantly** after the Brexit decision. Extract results are shown in Table 10.3. After treatment for outliers, and controlling for location, legal status, trade characteristics, subsidies, size, and year effects, regression analysis identified that the Brexit decision affected sectors differently and the significant movements are broadly consistent with those observed in Figures 10.2 and 10.3 Data from 2020 are not included in the regressions as the potential Brexit effect cannot be differentiated

from the Covid effect). As highlighted in Table 10.3, businesses in the other services, other production, manufacturing, professional and technical, advanced manufacturing and software and screen sectors experienced significant increases in average *sales per employment* in the post-Brexit period relative to the pre-Brexit period. Businesses in the manufacturing, construction and wholesale and retail sectors reported significantly higher *GVA per employment* in the post-Brexit period relative to the pre-Brexit period.

**Table 10.3 Change in sales and GVA per employment of sectors in the post-Brexit period (2017–2019) relative to the pre-Brexit period (2014–2016)**

	Sales per employment	GVA per employment
	Model 1b	Model 2b
Observations	5,413	5,413
Number of businesses	2,185	2,185
<b>Non-10X</b>	<b>Post-Brexit</b>	<b>Post-Brexit</b>
Other services	↑	—
Other production	↑	—
Manufacturing	↑	↑
Construction	—	↑
Wholesale and retail	—	↑
Professional and technical	↑	—
<b>10X</b>		
Agri-tech	—	—
Health and life sciences	—	—
Advanced manufacturing	↑	—
Software and screen	↑	—

**Legend:** statistically significant increase ↑; decrease ↓; no significant difference —.

**Note:** Full regression results are included in Appendix 20 (Table A20.1).

## 10.3 External sales

To examine the importance of trading with external markets, the trade behaviour of Fermanagh and Mid-Ulster businesses is analysed using four ratios that reflect the percentage of overall sales that each business undertakes with Great Britain (GB), the Republic of Ireland (ROI), the rest of the European Union (REU) and the rest of the World (ROW).

The results are based on the returns of between 834 and 1,066 businesses each year (Table 10.4). The sample of businesses are smaller in size to the sample returned for the Belfast and Antrim and Newtownabbey sub-regions as reflected in the lower overall average employment figure of 33.75 individuals. The size distribution characteristics of the sample have changed over the period: in 2014 the average employment was 27.47 individuals, increasing to 40.23 by 2019. The most important external market is GB, accounting for, on average, 12.94% of businesses sales for the total period, followed by the ROI (7.47%), the ROW (1.76%) and the REU (1.73%). The general trend observed is that the percentage of total sales to these external markets has increased steadily over the period from 2014–2019 and declined in 2020 (the proportion of sales to the ROW is the exception, it increased from 1.98% in 2019 to 2.18% in 2020), likely as a result of the Covid-related recession.

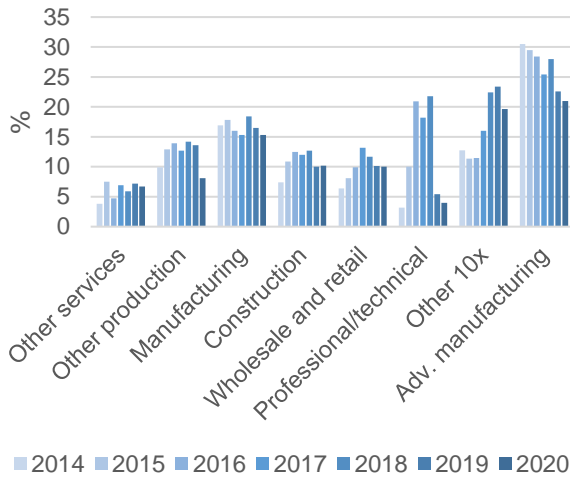
**Table 10.4 Average sales to external markets, 2014–2020**

	2014	2015	2016	2017	2018	2019	2020	Total
Number of businesses	1,066	1,002	836	836	895	834	863	6,332
Average employment (size)	27.47	28.34	32.51	32.09	38.21	40.23	39.54	33.75 <sup>1</sup>
GB% of sales	9.81%	12.01%	13.61%	13.84%	15.52%	14.44%	12.18%	12.94% <sup>1</sup>
	<i>Pre-Brexit decision</i>			<i>Post-Brexit decision</i>			<i>Covid</i>	
		11.67%			14.63%		12.18%	
ROI% of sales	6.84%	6.43%	6.88%	7.60%	8.13%	8.71%	8.01%	7.47% <sup>1</sup>
	<i>Pre-Brexit decision</i>			<i>Post-Brexit decision</i>			<i>Covid</i>	
		6.71%			8.14%		8.01%	
REU% of sales	1.37%	1.30%	1.53%	1.61%	2.13%	2.23%	2.09%	1.73% <sup>1</sup>
	<i>Pre-Brexit decision</i>			<i>Post-Brexit decision</i>			<i>Covid</i>	
		1.39%			1.99%		2.09%	
ROW% of sales	1.43%	1.38%	1.55%	1.93%	2.02%	1.98%	2.18%	1.76% <sup>1</sup>
	<i>Pre-Brexit decision</i>			<i>Post-Brexit decision</i>			<i>Covid</i>	
		1.45%			1.98%%		2.18%	

**Note:** Underlying data are indexed to 2019 prices (ONS, 2022). <sup>1</sup>Average for the seven years.

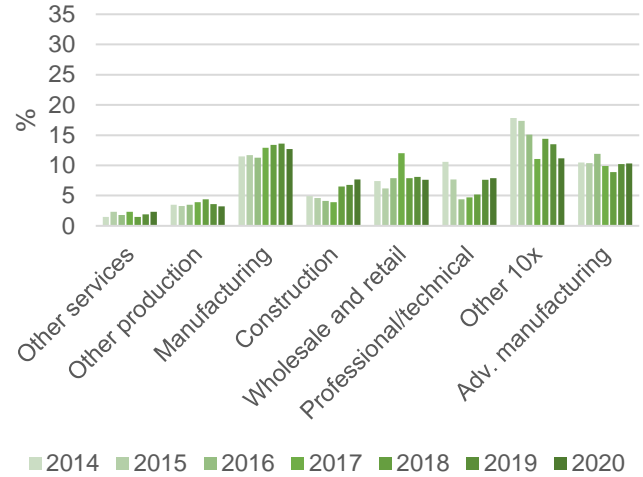
Patterns in the percentage of sales to the four markets are analysed over the period 2014–2020 in Figures 10.4 to 10.7. The three 10X sectors, agri-tech, health and life sciences and software and screen, are combined as separate disclosure jeopardises anonymity (i.e., less than ten businesses are included in some years for some of these sectors). As illustrated in the four figures, sectoral differences are evident in the percentage of sales to the four markets. Generally, non-10X businesses (the six to the left-hand side of the figure) are less engaged with external markets relative to 10X businesses (the two to the right-hand side of each figure).

**Figure 10.4 % sales to GB by sector, 2014–2020**



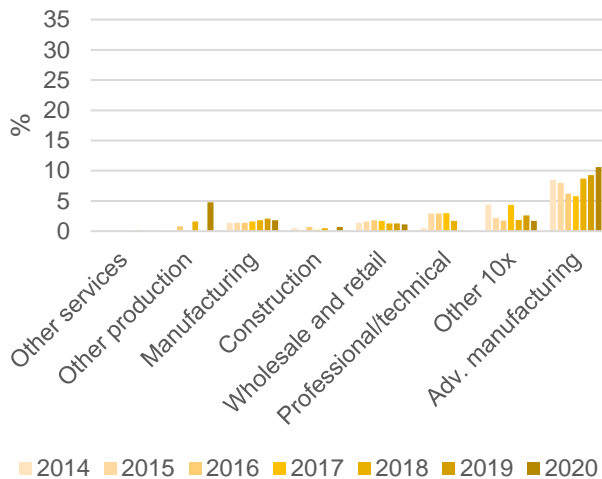
**Note:** Underlying data are indexed to 2019 prices (ONS, 2022).

**Figure 10.5 % sales to ROI by sector, 2014–2020**



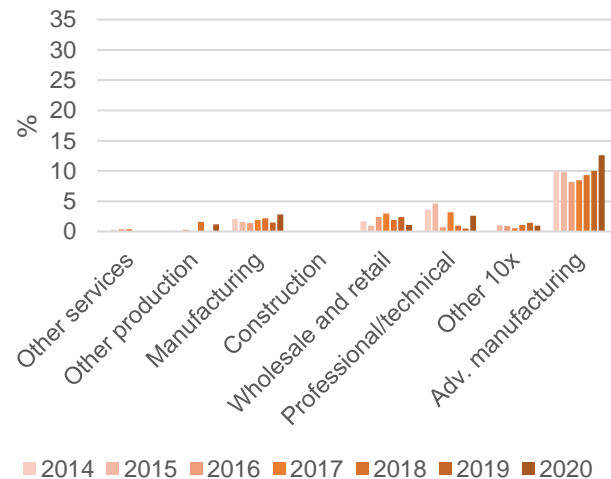
**Note:** Underlying data are indexed to 2019 prices (ONS, 2022).

**Figure 10.6 % sales to REU by sector, 2014–2020**



**Note:** Underlying data are indexed to 2019 prices (ONS, 2022).

**Figure 10.7 % sales to ROW by sector, 2014–2020**



**Note:** Underlying data are indexed to 2019 prices (ONS, 2022).

Tables with the average ratio values for each sector by year are included in Appendix 11 (Table A11.6 (GB), Table A11.7 (ROI), Table A11.8 (REU) and Table A11.9 (ROW)). The tables also detail the number of businesses within each sector per year. Overall, irrespective of sector type, the largest external market for Fermanagh and Mid-Ulster businesses is GB (Figure 10.4), though businesses in this sub-region also have strong export trade to the ROI (Figure 10.5). Differences in the relative importance of markets are observed across sectors. For example, the GB and ROI markets are particularly important for the 10X (two sectors to the right of each graph) and the manufacturing sectors (Figure 10.4 and 10.5). In addition, businesses in the advanced manufacturing category are particularly active in markets in the REU and the ROW (Figures 10.6 and 10.7).

## Evaluation of external sales behaviour on either side of the Brexit decision by sector

An examination relating to the Brexit decision at the end of 2016, identifies that the proportion of business sales to each of the four markets increased in the post-Brexit period relative to the pre-Brexit period. For example, the percentage of sales to GB markets increased from an average of 11.67% for the years 2014–2016, to 14.63% for the years 2017–2019 (Table 10.4). It fell from 14.44% in 2019 to 12.18% in 2020, coinciding with the Covid-related recession.

Random effects regression analysis is used to identify the determinants of external sales behaviour and to test whether the sales activity of each sector changed significantly after the Brexit decision. Extract results are shown in Table 10.5. After treatment for outliers and controlling for location, legal status, trade characteristics, subsidies, size, and year effects we find broadly consistent results with those observed in Figures 10.4 to 10.7. As shown in Table 10.5, when sectoral data for businesses located in the Fermanagh and Mid-Ulster sub-region for the period 2017–2019 are compared to the period 2014–2016, we find:

- significant decreases in the percentage of sales to the GB market for the manufacturing and advanced manufacturing sectors.
- significant increases in the percentage of sales to the ROI market for the other services sector and significant decreases in the percentage of sales for the agri-tech, health and life sciences and software and screen sectors.
- significant increases in the percentage of sales to the REU for the health and life sciences and advanced manufacturing sectors and significant decreases in the percentage of sales for the software and screen sector; and
- no significant change to the percentage of sales to the ROW for any sector.

**Table 10.5 Change in the external sales behaviour of sectors in the post-Brexit period (2017–2019) relative to the pre-Brexit period (2014–2016)**

	GB (%)	ROI (%)	REU (%)	ROW (%)
Model	1b	2b	3b	4b
Observations	5,577	5,577	5,577	5,577
Number of businesses	2,237	2,237	2,237	2,237
<b>Non-10X</b>	<b>Post-Brexit</b>	<b>Post-Brexit</b>	<b>Post-Brexit</b>	<b>Post-Brexit</b>
Other services	—	↑	—	—
Other production	—	—	—	—
Manufacturing	↓	—	—	—
Construction	—	—	—	—
Wholesale and retail	—	—	—	—
Professional and technical	—	—	—	—
<b>10X</b>				
Agri-tech	—	↓	—	—
Health and life sciences	—	↓	↑	—
Advanced manufacturing	↓	—	↑	—
Software and screen	—	↓	↓	—

**Legend:** statistically significant increase ↑; decrease ↓; no statistically significant difference —.

**Note:** Full regression results are included in Appendix 20 (Table A20.2).

## 11. Modelling Northern Ireland's trade

### Regional and policy context

The ability to model trade flows is of increasing interest in the transition to a post-Brexit UK economy. This is particularly so for Northern Ireland, where, notwithstanding the Windsor Framework agreement (February 2023), some of the detail about post-Brexit trading arrangements remains uncertain. It seems likely that Northern Ireland will have a form of “dual” or “hybrid” UK–EU market status, giving continued access to the EU Single Market and Customs Union, alongside, in theory, unfettered access to the UK Internal Market. Although, there are some questions relating to the movement of goods from Great Britain to Northern Ireland (Birnie, 2023). Such an arrangement would make Northern Ireland unique among the UK regions and necessitate more bespoke policymaking.

In policy terms, trade and export-orientation are crucial emphases within the 10X economic strategy and vision for Northern Ireland. This suggests a key future role for the appraisal of outward trade, including better measurement, modelling and evaluation against specific targets and benchmarks. As such, modelling trade for Northern Ireland is a pertinent policy concern, especially since such modelling is limited in existing sources. Moreover, since Northern Ireland is a small economy/regional market, the importance of external sales and exports as driven by competitiveness improvements as explanations of economic growth has long been recognised by policymakers (Byrne, 2017).

### BESES data usability

The BESES (now NIETS) dataset for Northern Ireland has been used in recent work examining Northern Irish trade.<sup>30</sup> BESES provides a rich range of firm-level information on trade-related behaviours across time. This enables the examination of temporal and geographical patterns of trade from Northern Ireland to external and export markets. However, to model trade the BESES dataset requires augmentation with other external sources. This is beyond the scope of our project, which is primarily around the testing and exploration of the newly released NIABI data. However, in the remainder of this section of our report, we aim to provide a brief insight into how the BESES dataset could be used in future research on trade modelling and ultimately inform regional policymaking.

### Gravity modelling

Gravity models are often described as the workhorse of international trade literature. These models build on the intuition that trade flows are positively correlated with country size and negatively with distance between the two countries. Distance is assumed to be a proxy for trade costs. Gravity models have a rich methodological history, with evolving theoretical and empirical understanding. Useful methodological guidance can be found in Head and Mayer (2014) and Shephard (2019).

In the UK context, gravity modelling has been a useful, although contested, tool in assessing the economic impact for the UK of leaving the EU. For example, Gudgin et al. (2017) review gravity modelling by the Treasury, IMF and OECD, and suggest that the negative impact of

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<sup>30</sup> See, for examples: <https://www.nisra.gov.uk/system/files/statistics/Summary-of-usage-of-the-Broad-Economy-Sales-and-Exports-Statistics-June-2020.pdf>.

Brexit is overstated. They point to the over-prediction of the trade benefits emerging from EU membership for the UK, and while not advocating the abandonment of gravity models their study implicitly suggests that careful consideration of the modelling assumptions is required.<sup>31</sup> Moreover, for Northern Irish firms a study by InterTradelreland (2018) finds that “the effect of a destination country being an EU member does not have a statistically significant effect on total trade flows from Northern Ireland, either for goods or services”. Breaking this down, their results suggest that EU membership increases the number of firms in existence (in other words, is positive for market entry) but, by contrast, sales are lower than expected.<sup>32</sup>

## **Selected literature**

In considering the application of gravity models to Northern Irish trade, several recent studies merit attention:

### *InterTradelreland (2018)*

InterTradelreland (2018) apply gravity modelling to examine trading patterns for Northern Irish and Irish firms in both goods and services. They use only Irish and Northern Irish data (as opposed to modelling relying on global trade patterns as a benchmark) and decompose total exports into the number of exporting firms (extensive margin) and exports per firm (intensive margin).<sup>33</sup> With respect to Northern Ireland, their analysis shows that trade with Great Britain and Ireland are significantly higher than that predicted by other market features. They also find for Northern Irish firms that EU membership matters increases access to export markets but does not have any significant impact on the volume of exports to those markets.

### *Lawless et al. (2019)*

Lawless et al. (2019) consider the determinants of trade by firms in Ireland, with particular attention on cross-border trade with Northern Ireland. Using firm-level data, they find a positive and statistically significant Irish border effect, which suggests the Irish border is less depressing on NI trade as compared to its other international borders.<sup>34</sup> Lawless et al. (2019) show that this positive border effect is mostly explained by the scale of exporting by businesses, not the number of businesses exporting.

### *Keogh (2019)*

In the Irish context, Keogh’s (2019) study marks particular methodological innovation in the application of the gravity model. Keogh estimates the model parameters using Poisson Pseudo Maximum Likelihood, which ameliorates the bias associated with OLS estimation; and includes multi-lateral resistance terms to account for barriers to trade faced with all trading partners (not solely a specific bilateral trading partner). This situates the approach in the Structural Gravity Model framework. Keogh’s study provides a useful review of gravity modelling, particularly in relation to potential improvements in methodology.

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<sup>31</sup> Gudgin et al. (2017) also highlight the role of monetary and fiscal policy.

<sup>32</sup> The study does add a clarification/caveat – see p. 43.

<sup>33</sup> See InterTradelreland (2018) p. 36 for further discussion.

<sup>34</sup> Notably, this contrasts with limited significance found in their country-level analysis.

### *Gasiorek and Tamberi (2021)*

Gasiorek and Tamberi (2021) implement a partial equilibrium model approach to assess the impact of Brexit on Northern Ireland – emphasising the complexity in such assessment given the overlapping UK, Ireland and wider EU contexts. Their headline results for a “deal” scenario suggested a decline in economic welfare (-2.4%) but an average increase in output (2.2%).<sup>35</sup> They relate the negative welfare impact to potentially increasing prices for consumers given barriers to/frictions against goods coming in from GB.

### **Conclusions/recommendations**

We consider it plausible that a gravity-type trade model could be implemented for Northern Ireland. Researchers should be aware of:

- Variables – The BESES data require augmentation with other, additional data sources to provide information on variables likely to impact on trade performance such as distance, market size, market demand, and common cultural characteristics (InterTradelreland, 2018; Keogh 2019). The studies by InterTradelreland (2018) and Keogh (2019) provide useful inspiration in this respect.
- Estimation method – The estimation of model parameters may be more appropriately determined by applying Poisson Pseudo Maximum Likelihood as opposed to Ordinary Least Squares. This is because the assumption of constant variance in OLS is inconsistent over country pair distance and the issue of zero trade flows are dealt with more satisfactorily in the Poisson Pseudo Maximum Likelihood model (Keogh, 2019).
- Unit of analysis – The choice of firm, sector or country-level analysis has implications for the results obtained (Lawless et al. 2019; Keogh, 2019). For example, Lawless et al. (2019) find the statistical significance of an Irish border effect varies depending on their use of country-level or firm-level data.

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<sup>35</sup> They attribute the positive output effect to the dual effects of enhanced protection (trade barriers) for firms in NI to the extent that they would be competing against GB firms which would be sending goods to NI. The authors note (p. 4) “The simulations in this report are not forecasts or predictions. They are simulations which help to identify the direction of possible changes, the relative orders of magnitude of those changes, and the mechanisms driving those changes.”



## 12. Future research

Based on our experience of working with this data, several lines of inquiry for future research are suggested:

- To the extent that it is possible to resolve the data reliability issues relating to “missing returns/zero outputs” in particular years, give a closer consideration to the turnover within the stock of businesses in Northern Ireland. Previous studies have suggested the stock of businesses in Northern Ireland is less “dynamic” than its counterparts in GB regions in the sense that churn is lower: having both a lower birth rate and death rate of enterprises. Is this still the case and what are the implications for competitiveness (UUEPC, 2023).
- A thorough investigation of the definition and boundaries of what constitutes a 10X business and cluster.
- Attempt to disaggregate down the results by geographical market for exports/external sales. Are certain sectors, for example, particularly aligned to the USA market (e.g., business services, software and screen, health and life sciences)?
- Disaggregate down the results by sector (particularly 10X priority clusters) to better understand the trading behaviour, employment, subsidisation and characteristics of these businesses.
- To the extent that more finely disaggregated geographical (sub-regional) data becomes available investigate further any impact of proximity to the Irish Border on sales patterns.
- Further investigate “potential Brexit effects” but (once data becomes available for more recent years) do this for the period when the new, post-Brexit trading arrangements were in place, i.e., from the start of 2021 onwards.
- Use data on purchases (by geography, e.g., whether from GB or ROI or REU) to attempt to identify any impact from the Protocol/Windsor Framework arrangements on the supply chains of Northern Ireland businesses from 2021 onwards.

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