

THE ANNUAL PURCHASES SURVEY IN NORTHERN IRELAND – MODELLING THE ORIGIN OF PRODUCTS

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SUMMARY

In the current social, political and economic context, new needs have arisen with regards to the origin and flow of the various products that are purchased by businesses in Northern Ireland.

Official statistics published by NISRA provide insight into the value of purchases of goods and services by origin as part of the Northern Ireland Broad Economy Sales and Exports Statistics (BESES)¹, derived from the Northern Ireland Annual Business Inquiry (NIABI), while NISRA's experimental Economic Accounts Project has led to the production of Supply and Use Tables (SUTs) that also provide a breakdown at Northern Ireland level of product consumption by industry group².

In particular, BESES outputs provide a comprehensive measure of business external purchases (including those from Great Britain) and imports of both goods and services, with the data collected at a broad country level (Republic of Ireland, Rest of the European Union³, Rest of the World⁴). Whilst strong and reliable, those outputs are currently still short of providing the necessary product-level detail to facilitate estimates of potential impacts, identify opportunities and add to the understanding of the characteristics of those businesses currently affected by the changes and challenges ahead.

The newly re-instated Annual Purchases Survey (APS) is designated as 'experimental' as it is still being developed by the Office for National Statistics (ONS), but its primary aim is to provide a comprehensive picture of the goods and services used in the production process by UK businesses, otherwise referred to as intermediate consumption.

Nevertheless, the format and structure of the micro-data from the 2015 Northern Ireland subset of the APS made available by ONS mean that the opportunity surfaced to analyse the data in conjunction with other data sources, hence complementing its product-level information with the origin of purchases data from the NIABI.

This has led to the development of a model based on the linked APS-NIABI data in order to extract information that had not been available or required previously but has gained new interest in the current context. The main findings of this analysis and research indicated that:

- The main components of intermediate consumption expenditure in 2015 as estimated by the APS were *Buildings and building construction works* (7.0% of the total intermediate consumption expenditure), *Wood and of products of wood and cork, except furniture articles of straw and plaiting materials* (4.5%) and *Fabricated metal products, except machinery and equipment* (4.3%).

¹<https://www.nisra.gov.uk/publications/current-publication-broad-economy-sales-exports-statistics>

²<https://www.nisra.gov.uk/publications/ni-economic-accounts-project-2014-and-2015-experimental-results>

³The Rest of the EU (RoEU) is composed of the following countries: Austria; Belgium; Bulgaria; Croatia; Cyprus; Czech Republic; Denmark; Estonia; Finland; France; Germany; Greece; Hungary; Italy; Latvia; Lithuania; Luxembourg; Malta; Netherlands; Poland; Portugal; Romania; Slovakia; Slovenia; Spain; and Sweden.

⁴The Rest of the World (RoW) refers to all other destinations outside the EU.

- Businesses that contributed the most to the Northern Ireland intermediate consumption in 2015 as estimated by the APS were within the industry categories of *Production* (39.6% of the total intermediate consumption expenditure), *Distribution, transport, hotels and restaurants* (27.4%) and *Construction* (21.8%).
- The proportion of intermediate consumption goods and services products purchased from within Northern Ireland as estimated by the linked APS-NIABI model ranged from 44.4% (*Manufacturing* products) to 89.0% (*Arts, entertainment and recreation* products). There were 54.1% of *Financial and insurance activities* products purchased from Northern Ireland, and 42.7% from Great Britain.
- In terms of imports, the linked APS-NIABI model estimated that 9.1% of *Agriculture, Forestry and Fishing* products were imported from the Republic of Ireland, while 13.0% of *Manufacturing* goods and services products were imported from the Rest of the European Union. The biggest area of import from the Rest of the World was also from the *Manufacturing* products category (8.8%).

BACKGROUND

The Annual Purchases Survey (APS) is a UK-wide survey that was re-instated by the Office for National Statistics (ONS) in 2015 after a previous survey, entitled Purchases Inquiry, was suspended in 2006. Although experimental in nature, APS estimates have now been processed and validated for the 2015 reference period. **It is important to note that this survey is still being developed and any estimates quoted or derived in this research paper are subject to revision; in particular, it is anticipated that the APS data currently being processed for 2016 and 2017 will contribute to improve the 2015 data.**

ONS have nonetheless published the article *Detailed product by industry proportion estimates using the results from the Annual Purchases Survey 2015* on 26 July 2018⁵. This article indicates that the APS collects information on companies' intermediate consumption, a national accounts concept defined as:

"(...) goods and services consumed as inputs by a process of production, excluding fixed assets whose consumption is recorded as consumption of fixed capital. The goods and services are either transformed or used up by the production process."

The present research paper aims to highlight the main characteristics of the Northern Ireland subset of the 2015 APS estimates⁶ and to what extent these statistics have the potential, in support of and complement to the Northern Ireland Annual Business Inquiry (NIABI), to provide additional detailed economic information within the wider context of the EU Exit and its local impact.

In particular, a model was designed to try and provide contextual information on the origin of the services and goods products itemised in the APS based on the published purchases & imports of goods and services from trade partners as part of the Northern Ireland Broad Economy Sales and Exports Statistics (BESES) derived from the NIABI.

⁵<https://www.ons.gov.uk/businessindustryandtrade/business/businessservices/articles/annualpurchasesurvey/2015>

ANNUAL PURCHASES SURVEY DESCRIPTIVE STATISTICS

Background

The APS data relates to the purchase of individual intermediate consumption products made by each business. The value of purchased products is collected and each corresponding variable links to the Classification of Products by Activity (CPA), forming three main sections: purchases of energy water and waste; purchases of services; and purchases of goods, materials and related services. Aggregation of these totals will provide an estimate of total intermediate consumption.

As explained in the ONS APS development paper⁶, it includes raw materials, power and fuel, rental on buildings and business services such as advertising, recruitment consultancy and cleaning but specifically excludes fixed assets or capital investment, staff costs and goods and services bought for resale without further processing. Total expenditure on energy, services, goods and materials purchased for resale without further processing is captured but not itemised and does not contribute to the intermediate consumption as defined.

The following provides a brief summary of the estimates produced from the data collected as part of the 2015 APS. Note that the figures quoted in this section are not statistical estimates, but rather aim to provide background information to the modelling exercise that was derived as part of the research project carried out in the context of the United Kingdom leaving the European Union.

Coverage and Northern Ireland Sample

The number of businesses in the Northern Ireland APS population⁷ was estimated at 48,402 in 2015. The APS is a UK-wide survey, and as a result is not specific to Northern Ireland and the totals were constrained to the ABS (the ONS equivalent of the NIABI) on a UK-wide basis.

It is important to note that the sample used as part of this research project is based on the Northern Ireland marker attached to the overall dataset, and as a consequence, some larger companies may have filled the survey questionnaire centrally from Great Britain, encompassing local units located in Northern Ireland, resulting in a potential differences in the count of NI businesses and their distribution across business size bands. The estimates quoted within this section are exclusively aimed at providing contextual background information on the data used as part of the modelling and cannot and should not be compared with published official statistics.

A breakdown by business size (Table 1) and by industry group (Table 2) of both the sample and the derived population estimates provides further insight of the distribution of the targeted businesses.

⁶<https://www.ons.gov.uk/businessindustryandtrade/business/businessservices/articles/developmentoftheannualpurchasessurvey/2017-12-15>

⁷Note that the sample used to generate this estimate is a subset of the national ONS Annual Purchases Survey and as such was not designed with the aim of producing Northern Ireland only specific estimates. Further details relating to the target population, coverage and sampling methods are available from the ONS website:
<https://www.ons.gov.uk/businessindustryandtrade/business/businessservices/articles/annualpurchasessurvey/2015>

Table 1 – Breakdown of 2015 APS sample by broad business bands

		Sample n=2,091		Estimated Population	
		Frequency	Percent	Frequency	Percent
Business size	0-9	274	13.1	41,516	85.8
	10-19	259	12.4	3,614	7.5
	20-49	675	32.3	2,057	4.2
	50-99	463	22.1	655	1.4
	100-249	261	12.5	369	0.8
	250+	159	7.6	191	0.4
	Total	2,091	100.0	48,402	100.0

Note that due to rounding, percentages may not add to 100%. Those estimates cannot and should not be compared with published official statistics.

Businesses falling under sections O (Public administration and defence), T (Activities of households as employers) and U (Activities of extraterritorial organisations and bodies) as well as some groups within section A (Farming within Agriculture, forestry and fishing) are excluded from the target population and are therefore not included (Table 2).

Table 2 – Breakdown of 2015 APS sample by broad industry groups

		Sample n=2,091		Estimated Population	
		Frequency	Percent	Frequency	Percent
Industry group	A: Agriculture	15	0.7	603	1.2
	B-E: Production	531	25.4	4,165	8.6
	F: Construction	162	7.7	9,263	19.1
	G-I: Distribution, transport, hotels and restaurants	533	25.5	17,283	35.7
	J: Information and communication	83	4.0	1,687	3.5
	K: Finance and insurance	58	2.8	659	1.4
	L: Real estate	31	1.5	1,888	3.9
	M-N: Professional and support activities	357	17.1	7,676	15.9
	O-Q: Government, health and education	227	10.9	2,307	4.8
	R-S: Other services	94	4.5	2,871	5.9
Total	2,091	100.0	48,402	100.0	

Note that due to rounding, percentages may not add to 100%. Those estimates cannot and should not be compared with published official statistics.

The employment estimates derived from the 2015 APS were obtained by using the IDBR employment values (table 3). The total Northern Ireland employment of the businesses within the scope of the APS was estimated at 487,793 employees. Businesses with 250 employees and over contributed to over 30% of the overall employment (30.4%) while smaller businesses with nine employees and under contributed to 25.8% of the overall employment.

Table 3 – Northern Ireland estimate of employment from the 2015 APS by broad business bands

		Frequency	Percent
Business size	0-9	125,785	25.8
	10-19	51,851	10.6
	20-49	59,052	12.1
	50-99	45,585	9.3
	100-249	57,257	11.7
	250+	148,264	30.4
	Total	487,793	100.0

Note that due to rounding, percentages may not add to 100%. Those estimates cannot and should not be compared with published official statistics.

Purchases

The APS purpose is “to provide a comprehensive picture of the goods and services used in the production process by UK businesses, otherwise referred to as intermediate consumption”⁸. The questionnaire is therefore designed to collect information at product level for those purchases of energy, services, goods and material used up or transformed by the businesses, as opposed to those products for resale without further processing.

The intermediate consumption by NI businesses in 2015 as estimated by the APS consisted of 47.6% of Goods, Materials and Related Services, 44.3% of Services and 8.2% of Energy, Water and Waste (Table 4).

Table 4 – Northern Ireland estimate of business expenditure from the 2015 APS by broad business size

Proportion of Business Intermediate Consumption (%)	Business Size						Total
	0-9	10-19	20-49	50-99	100-249	250+	
Total expenditure on energy, services, goods and materials used up or transformed by your business? Of which:	25.3	6.1	13.9	10.8	18.2	25.7	100.0
<i>Section C - Purchases of Energy, Water and Waste</i>	1.6	0.7	1.0	1.0	2.2	1.6	8.2
<i>Section D - Purchases of Services</i>	16.9	3.0	5.8	4.3	5.6	8.6	44.3
<i>Section E - Purchases of Goods, Materials and Related Services</i>	6.8	2.5	7.0	5.5	10.3	15.5	47.6

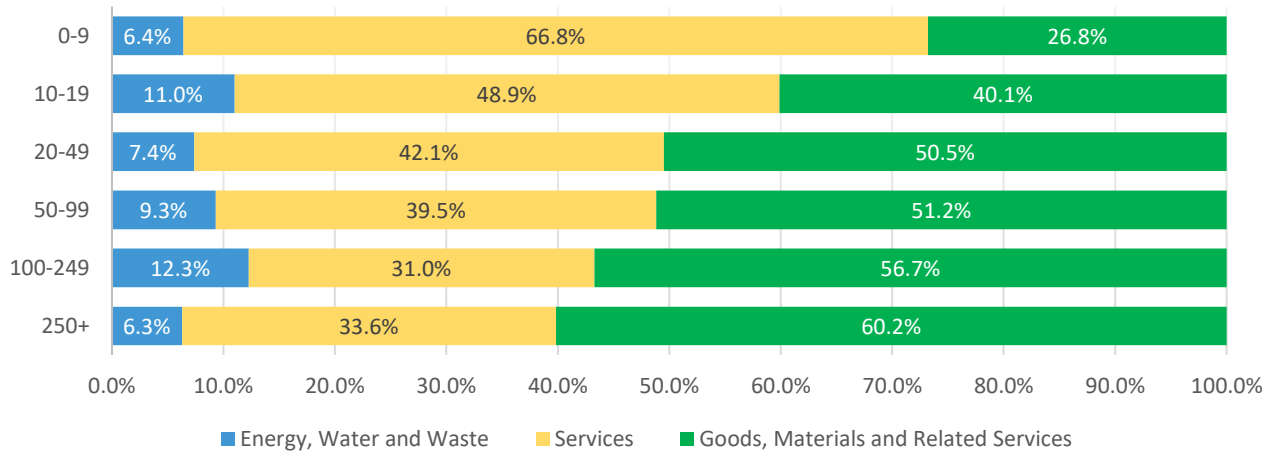
Note that due to rounding, percentages may not add to 100%.

Large businesses with 250 or more employees (250+) accounted for 25.7% of the overall intermediate consumption, with small businesses of nine employees and under (0-9) accounted for 25.3%. Although the purchases from both business size categories were of the same order, the distribution in the type of products differed; indeed, while 60.2%

⁸<https://www.ons.gov.uk/businessindustryandtrade/business/businessservices/articles/developmentoftheannualpurchasesurvey/2017-12-15>

of the intermediate consumption of large businesses (250+) consisted of Goods, Materials and Related Services, over two third of the products consumed by small businesses (0-9) were Services (66.8%). Figure 1 below illustrates the distribution of the general nature of products purchased to be used up or transformed across business sizes.

Figure 1 – Proportion of products purchased by NI businesses by section and broad business size



Note that due to rounding, percentages may not add to 100%.

The main asset of the APS is the collection of purchases of products and services that constitute the components of intermediate consumption, with data collected at category level, the fifth level of the statistical classification of products by activity (CPA). Table 5 presents the intermediate consumption of the 30 product categories with the most purchases made in 2015. The top 20 purchased product categories amounted to 63.0% of the overall intermediate consumption, with the top 30 purchased product categories representing over three quarters of the intermediate consumption (75.9%).

Table 5 – Top 30 categories of purchased products

Purchases CPA Category (top 30)	% of Intermediate Consumption
Buildings and building construction works	7.0
Wood and of products of wood and cork, except furniture; articles of straw and plaiting materials	4.5
Fabricated metal products, except machinery and equipment	4.3
Machinery and equipment n.e.c.	4.2
Basic iron and steel	4.1
Specialised construction works	3.9
Land transport services and transport services via pipelines, excluding rail transport	3.7
Buying, selling, renting and operating of own or leased real estate, excluding imputed rental	3.5
Products of agriculture, hunting and related services	3.1
Preserved meat and meat products	3.1
Plastic products	3.0
Diesel	2.4
Rental and leasing services	2.3
Dairy products	2.3
Electricity, transmission and distribution services	2.3
Motor vehicles, trailers and semi-trailers	2.0
Architectural and engineering, technical testing and analysis services	2.0
Constructions and construction works for civil engineering	1.9
Financial services, except insurance and pension funding	1.7
Paper and paper products	1.5
Insurance and reinsurance, except compulsory social security	1.5
Petrochemicals (Part of Chemicals and chemical products)	1.5
Repair and installation services of machinery and equipment	1.4
Advertising and market research services	1.4
Computer programming, consultancy and related services	1.4
Electrical equipment	1.2
Grain mill products, starches and starch products	1.2
Cement, lime, plaster and articles of concrete, cement and plaster	1.2
Employment services	1.2
Telecommunication services	1.0

Those 30 products consisted of 14 services products (out of a total of 54 products itemised in the APS, accounting for 31.3% of the overall intermediate consumption), 14 goods, material and related services products (out of 53, accounting for 33.9% of the overall intermediate consumption) and two products from the energy, water and waste section (out of 21, accounting for 4.7% of the overall intermediate consumption).

Table 6 below provides the top 10 product classifications within the main sections: purchases of energy, water and waste; purchases of services and purchases of goods, materials and related services.

Table 6 – Top 10 categories of purchased products by main section

Purchases CPA Category – Purchases of energy, water and waste (top 10)	% of total section purchases
Diesel	29.7
Electricity, transmission and distribution services	28.3
Coal and lignite	9.9
Natural gas, liquefied or in gaseous state	5.1
Manufactured gas; distribution services of gaseous fuels through mains	4.8
Motor spirit (gasoline)	3.5
Waste treatment and disposal services	3.1
Waste; waste collection services	3.1
Gas oils	3.0
Natural water	2.4
<i>Remaining 11 energy, water and waste products</i>	<i>7.0</i>
Purchases CPA Category – Purchases of Services (top 10)	% of total section purchases
Buildings and building construction works	15.8
Specialised construction works	8.8
Land transport services and transport services via pipelines, excluding rail transport	8.5
Buying, selling, renting and operating of own or leased real estate, excluding imputed rental	8.0
Rental and leasing services	5.3
Architectural and engineering, technical testing and analysis services	4.4
Constructions and construction works for civil engineering	4.2
Financial services, except insurance and pension funding	3.8
Insurance and reinsurance, except compulsory social security	3.3
Repair and installation services of machinery and equipment	3.3
<i>Remaining 44 services products</i>	<i>34.6</i>
Purchases CPA Category – Purchases of goods, materials and related services (top 10)	% of total section purchases
Wood and of products of wood and cork, except furniture; articles of straw and plaiting materials	9.5
Fabricated metal products, except machinery and equipment	9.1
Machinery and equipment n.e.c.	8.9
Basic iron and steel	8.6
Products of agriculture, hunting and related services	6.6
Preserved meat and meat products	6.5
Plastic products	6.3
Dairy products	4.9
Motor vehicles, trailers and semi-trailers	4.3
Paper and paper products	3.1
<i>Remaining 43 goods, materials and related services products</i>	<i>32.2</i>

Note that due to rounding, percentages may not add to 100%.

The extent to which businesses purchase intermediate consumption of energy, services and goods, tabulated by business industry classification and product category is highlighted in Table 7 below. As per the analysis

published by ONS at UK level⁹, this table provides an indication of the 'spread' of intermediate consumption across industry groups, with each cell showing the percentage of total intermediate consumption on products within each classification. The sum of the product proportions (columns) will sum to 100 within each industry group. The bottom row indicates the proportion of intermediate consumption by each industry group, while the column most on the right provides the distribution of consumed products by product category.

Table 7 – Northern Ireland proportion of Intermediate Consumption of products by industry group

		Industry group										Total Proportion of Intermediate Consumption (%)
		A	B-E	F	G-I	J	K	L	M-N	O-Q	R-S	
Product category	A	8.4	7.7	0.0	0.8	0.0	0.0	0.1	0.9	0.0	0.0	3.3
	B-E	44.7	79.8	21.4	52.0	22.1	16.2	9.5	44.8	47.3	28.3	54.2
	F	0.0	1.0	53.7	0.4	0.2	0.8	31.9	2.0	0.5	0.3	12.8
	G-I	28.9	4.8	0.6	19.1	4.1	8.6	1.1	7.6	3.6	6.6	7.9
	J	1.2	0.7	1.4	4.8	40.6	31.2	1.4	7.8	5.5	5.1	3.6
	K	2.4	0.9	8.1	2.7	2.0	8.2	3.4	3.7	3.4	4.3	3.2
	L	0.0	0.5	1.1	9.3	6.4	5.7	7.6	4.4	10.0	3.1	3.7
	M-N	14.5	4.4	13.7	10.8	23.1	26.5	45.0	27.1	21.2	21.2	10.7
	O-Q	0.0	0.1	0.0	0.0	0.8	1.1	0.0	1.2	5.8	0.7	0.2
R-S	0.0	0.0	0.0	0.2	0.6	1.6	0.0	0.4	2.7	30.4	0.4	
<i>Total Proportion of Intermediate Consumption (%)</i>		0.2	39.6	21.8	27.4	2.8	0.3	1.5	3.7	1.7	0.9	100.0

Industry and Product category key: A: Agriculture, B-E: Production, F: Construction, G-I: Distribution, transport, hotels and restaurants, J: Information and communication, K: Finance and insurance, L: Real estate, M-N: Professional and support activities, O-Q: Government, health and education, R-S: Other services. Note that due to rounding, percentages may not add to 100%.

Purchases by businesses in Northern Ireland within the *Production* sector (B-E) constituted the main expenditure in 2015, representing 39.6% of the total intermediate consumption. Those purchases tended to mainly remain within the same activity area, with 79.8% of total sector consumption on products and services linked to the *Production* category.

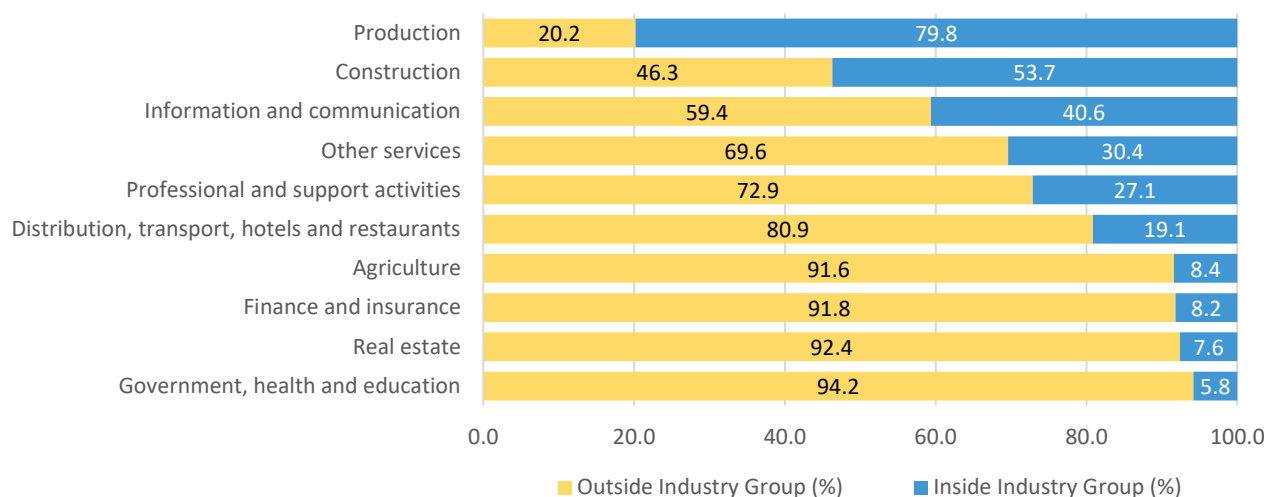
Consumption of businesses within the *Distribution, transport, hotels and restaurants* sector (G-I) was the second highest item of expenditure, representing 27.4% of the intermediate consumption. Purchases by businesses within that sector were however spread out more equally across product categories: 52.0% of purchases were *Production* products, 19.1% were *Distribution, transport, hotels and restaurants* products and 10.8% were *Professional and support activities* products.

A similar spread pattern can be observed for businesses within the *Construction* sector (F), which accounted for 21.8% of the overall intermediate consumption. Construction businesses' intermediate consumption consisted of 53.7% of products classified within the *Construction* category, followed by 21.4% of products within the *Production* category and 13.7% on *Professional and support activities goods and services*.

⁹<https://www.ons.gov.uk/businessindustryandtrade/business/businessservices/articles/annualpurchasesurvey/2015>

Figure 2 below provides an illustration of the extent to which Northern Ireland businesses purchased intermediate products classified within the same activity group. Similar patterns to the UK-wide analysis can be observed overall, with the exception of businesses within the *Other services* sector (R-S) which had 30.4% of their intermediate consumption within the *Other services* product group compared with 6.7% at UK level.

Figure 2 – Proportion of products purchased by NI businesses within or outside their sector of activity



Note that due to rounding, percentages may not add to 100%.

Most energy, services, goods and materials used up or transformed by businesses were within the *Production* category (B-E), representing 54.2% of the total intermediate consumption. Products from the *Construction* sector (F) accounted 12.8% of the overall intermediate consumption, while products within the *Professional and support activities* category (M-N) represented 10.7%.

MODELLING THE ORIGIN OF INTERMEDIATE CONSUMPTION PURCHASES

Background

The current social, political and economic context along with the new challenges faced at Northern Ireland level and UK-wide in terms of trade and flow of goods and services following the exit from the European Union have created the need for further information as to the origin and flow of the various products purchased by businesses in Northern Ireland.

As highlighted in the first part of this paper, the Annual Purchases Survey constitutes a new source of estimates of businesses intermediate consumption, the value of goods and services used in the production process by UK businesses, with expenditure classified in 128 products, which is around half of the overall business expenditure on products.

The Northern Ireland Annual Business Inquiry (NIABI), which covers a similar population (with a few exceptions), is the basis for the Broad Economy Sales and Exports Statistics (BESES) that provides a single comprehensive measure of business external purchases (including those from Great Britain) and imports of both goods and services. Although a considerable amount of information regarding businesses is available, the data collected from BESES is at a broad country level (Republic of Ireland, Rest of the European Union¹⁰, Rest of the World¹¹) but is not disaggregated by the type of product.

Research was therefore carried out to assess the feasibility and potential of linking the APS to the NIABI and consequently provide an analytical platform to a variety of users within the Department for Economy, NISRA and wider stakeholders.

Linking the APS to the NIABI

The NIABI feeds into the UK-wide Annual Business Survey (ABS) that is conducted in Great Britain by ONS. ONS have carried out some analysis to assess the coherence between the APS and the ABS from which a derived equivalent of intermediate consumption can be estimated for those recipients of the ABS long form¹².

Whilst both survey samples are designed from the Inter-Departmental Business Register (IDBR), there are a few minor differences in coverage, in particular, the APS includes businesses classified under Financial and insurance activities (section K) or Medical and dental practice activities (group 86.2 within section Q) as per the UK Standard Industrial Classification (SIC), while those are excluded from the NIABI.

Sampling methodologies of the APS and NIABI may also differ and potentially have an impact on the quality of the linkage. The NIABI sample stratification is based on the SIC division classification and employee size band, with all businesses with 50 employees and over, or 20 employees and over with more than one local unit, being fully enumerated. There are a few additional specifics that are detailed in the background notes of the latest NIABI publication¹².

¹⁰The Rest of the EU (RoEU) is composed of the following countries: Austria; Belgium; Bulgaria; Croatia; Cyprus; Czech Republic; Denmark; Estonia; Finland; France; Germany; Greece; Hungary; Italy; Latvia; Lithuania; Luxembourg; Malta; Netherlands; Poland; Portugal; Romania; Slovakia; Slovenia; Spain; and Sweden.

¹¹The Rest of the World (RoW) refers to all other destinations outside the EU.

¹²<https://www.nisra.gov.uk/sites/nisra.gov.uk/files/publications/rm1-ABI-2016-RU-PUBLICATION-FINALV2.pdf>

On this basis, the linkage of the Northern Ireland subset of the 2015 APS and NIABI was carried out, and a linkage rate of 70.3% was obtained, whereby 1,470 records from the APS Northern Ireland sample were identified in the 2015 NIABI sample.

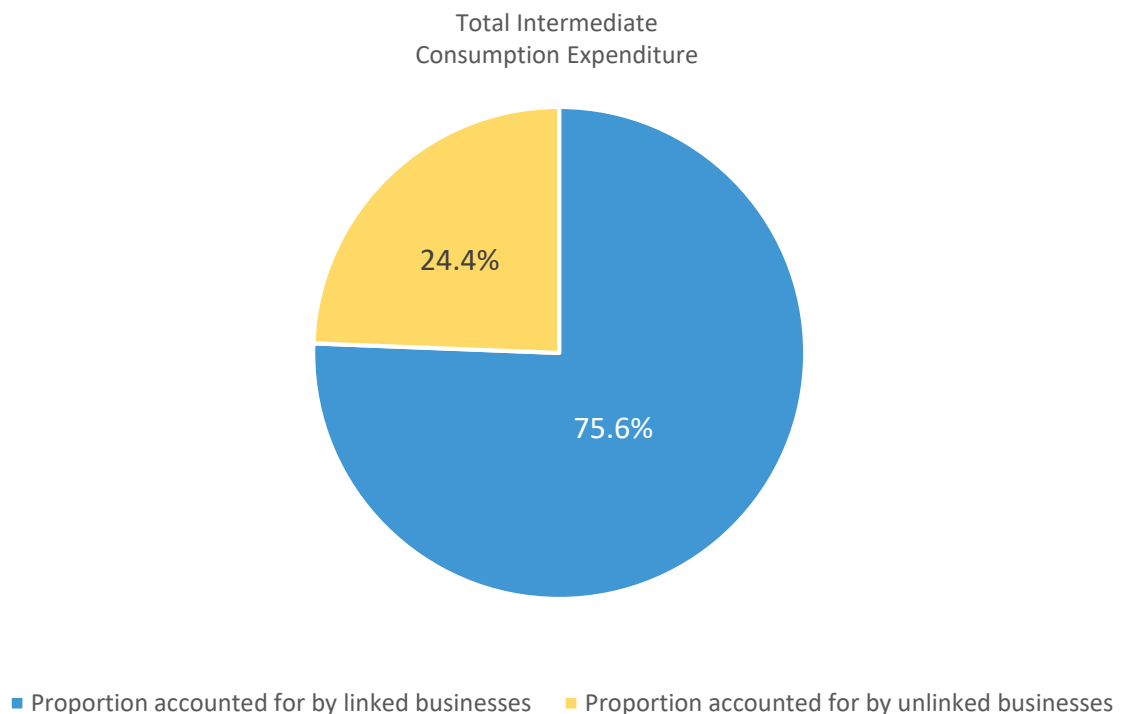
Table 8 below illustrates the differences observed in the business size of the linked records with 82.6% (1,214) being in the same size band in both samples.

Table 8 – Cross checking of linked APS and NIABI businesses by broad business size

		NIABI Business size						Total
		0-9	10-19	20-49	50-99	100-249	250+	
APS Business size	0-9	35	9	2	0	0	0	46
	10-19	26	104	27	0	0	0	157
	20-49	7	20	400	36	1	0	464
	50-99	7	1	34	339	39	0	420
	100-249	2	0	1	19	203	15	240
	250+	1	0	0	1	8	133	143
	Total	78	134	464	395	251	148	1,470

The subset of those APS businesses that linked to the 2015 NIABI accounted for over three quarters of the total business expenditure (Figure 2), with the intermediate consumption of the unlinked sample accounting for 24.4%.

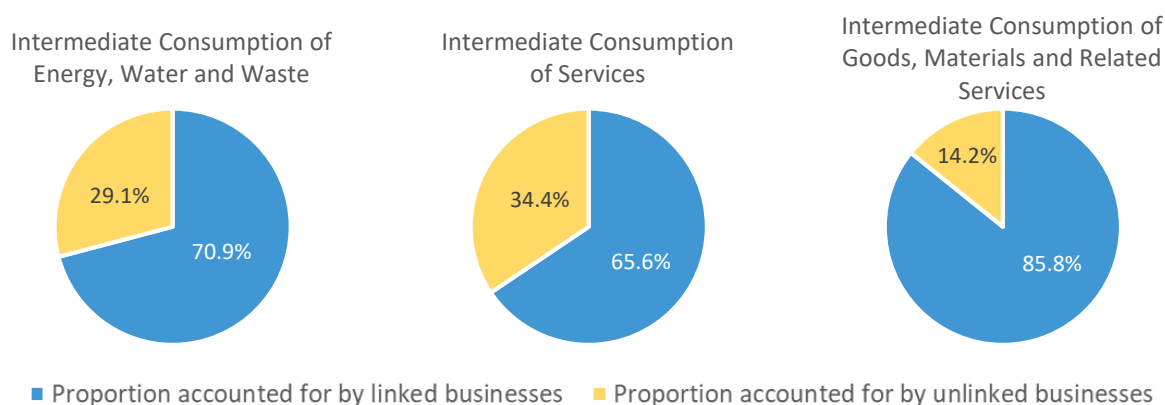
Figure 2 – Proportion of intermediate consumption accounted for by linked and unlinked samples



Fluctuation was observed across the various product sections, with the proportion of intermediate consumption of goods, materials and related services (section E) representing 85.8% of the total goods expenditure whereas the

intermediate consumption of energy, water and waste (section C) of those businesses linking to the NIABI amounted to 70.9% and that of the services (section D), 65.6% (Figure 3).

Figure 3 – Proportion of intermediate consumption accounted for by linked and unlinked samples within each product section



Modelling Process

The strong linkage rate between the APS and NIABI (70.3%) and coherence between matched businesses in both surveys were a key component in the definition and formulation of the various assumptions made and consequently inform the methods that were tested in the course of this research project. In particular, the high linkage rate along with the constraining of the APS findings to the ABS totals (albeit on a national UK basis) were central to the definition of the modelling process steps, whereby information for unlinked APS records was, where possible, retrieved from the characteristics of the unlinked NIABI subset based on similar industry and business size characteristics.

The data of interest from the NIABI originates from the micro-data of the NIABI that was validated to meet the needs of the BESES purchases and imports publication¹³. The variables used correspond to the purchases and imports of goods and services from trade partners, which are itemised as Northern Ireland purchases, Great Britain purchases, Republic of Ireland imports, Rest of the European Union imports and Rest of the World imports.

Records from the APS were linked to the NIABI and processed through a number of incremental steps aiming to allocate the corresponding goods and services purchases origin from the NIABI. When an APS record was linked to the 2015 NIABI, the proportions for goods and services by origin were used as enumerated in the NIABI data. The 2014 NIABI data was used when necessary to try and boost the linkage for those unlinked businesses.

For those APS records that did not link, the approach consisted of applying the values of the unlinked businesses in the NIABI subset that had similar characteristics based on business size and industry group classification. Where such records could not be identified from the NIABI unlinked sample, the average values of the records from the overall sample were used.

¹³<https://www.nisra.gov.uk/publications/current-publication-broad-economy-sales-exports-statistics>

Model limitations

One of the main aims in designing this model was to explore new and existing data sources in order to extract information that had not been available or required previously but has since gained new interest in the current social, political and economic context. A number of factors should be taken into consideration in terms of interpreting the resulting model:

- As mentioned previously, the APS is a UK-wide survey, with totals constrained to the ABS (the ONS equivalent of the NIABI) on a UK-wide basis, causing since some larger companies to have filled the survey questionnaire centrally from Great Britain, encompassing local units located in Northern Ireland and resulting in those units not being incorporated in the APS subset used.
- The APS data used for the model is that of the first year of the survey being carried out in this format, and although ONS have subsequently run the survey in 2016 and 2017, the quality-controlled subsets were not yet available, which has prevented potential additional validation that would be specific to the NI subset (e.g. sampling issues or shortcomings in the linkage to the NIABI which could potentially be resolved using the 2016 data).
- The APS provides the intermediate consumption component, i.e. the amount of products that are used up by NI businesses or processed/transformed. Inversely, the NIABI does not provide origin of expenditure broken down between products purchased for resale without further processing and intermediate consumption. The information relating to the origin of products therefore corresponds to both types of expenditure, and those values are then applied to the itemised APS products.
- Moreover, the origin information collected and validated from the NIABI only deals with goods and services, despite total value figures being collected as part of the survey for energy as well as a breakdown of goods purchased for resale without further processing and intermediate consumption. This information is however not quality assured and not used for statistical outputs, and as a result, these elements were not used as part of the modelling hereby presented. Note that work is ongoing as part of the development of Supply and Use Tables in NISRA which may lead to this information being validated in the future, in which case it would be possible to integrate them in the modelling process.

Model evaluation

The methods used to create the model relied on a certain degree of approximation, due in part to the limitations highlighted above and the various assumptions made but also to the potential discrepancies in the information provided by businesses for both the NIABI and APS surveys, which were not run concurrently. The resulting outputs presenting proportions by industry group, product type and origin of purchase were re-aggregated and the results of the model were compared to the finalised APS data.

This showed that the model as designed introduced a slight under-estimation of the overall intermediate consumption of goods and services (0.02%). This differential was however distributed across the different sections; the variation for those purchases made from the UK was 1.3%, while that of imports represented -6.2%.

The level of under-estimation of goods and services taken individually may be a consequence of the linkage rate across some industry sections as highlighted previously in Figure 3; indeed, the subset of the APS data that linked to the 2015 NIABI represented 85.8% of the overall purchase of intermediate consumption goods, whilst it represented only 65.6% of the overall purchase of intermediate consumption services.

Main Product Categories

The proportion of intermediate consumption services purchased from Northern Ireland as estimated by the model was 64.6%, while 30.3% originated from Great Britain (Table 10). Imports of intermediate consumption services accounted for 5.1%, with the Republic of Ireland the main origin of import of services (3.0%).

The origin of intermediate consumption goods purchased by NI businesses is more diverse, with 46.0% originating from Northern Ireland and 27.2% from Great Britain. Imports of intermediate consumption goods accounted for over a quarter of all intermediate consumption goods (26.8%), with 5.8% originating from the Republic of Ireland, 12.5% from the Rest of the EU, and 8.4% from the Rest of the World.

Table 10 – Distribution by origin of intermediate consumption services and goods

Product Section	Origin of purchase				
	NI (%)	GB (%)	RoI (%)	RoEU (%)	RoW (%)
Services	64.6	30.3	3.0	0.9	1.2
Goods, materials and related services	46.0	27.2	5.8	12.5	8.4

Note that due to rounding, percentages may not add to 100%.

Table 11 below provides the origin of purchases of intermediate consumption of services and goods by product activity. The proportion of intermediate consumption goods and services products purchased from Northern Ireland ranged from 44.4% (*Manufacturing* products) to 89.0% (*Arts, entertainment and recreation* products).

Mining and quarrying intermediate consumption products were mainly purchased from Northern Ireland (61.7%) and Great Britain (17.1%), with imports accounting for just over one fifth (21.2%). Goods within this product category showed a similar distribution of origin of purchases, driven by a much higher volume of purchases, whereas 53.9% of *Mining and quarrying* services were purchased from Northern Ireland and 44.9% from the Republic of Ireland.

There were 54.1% of *Financial and insurance activities* products purchased from Northern Ireland, and 42.7% from Great Britain; these products were the category that had the highest proportion of purchases originating from Great Britain.

Purchases of intermediate consumption products from the *Manufacturing* goods and services products imported from the Rest of the European Union accounted for 13.0%, whilst 9.1% of *Agriculture, Forestry and Fishing* products and 7.9% of *Mining and quarrying* products were imported from the Republic of Ireland. The biggest area of import from the Rest of the World was also from the *Manufacturing* products category (8.8%).

Table 11 – Distribution by origin of intermediate consumption services and goods

Product Category	Origin of Purchase				
	Northern Ireland	Great Britain	Republic of Ireland	Rest of the EU	Rest of the World
A Agriculture, Forestry and Fishing (goods)	72.8	15.9	9.1	2.1	0.2
B Mining and quarrying	61.7	17.1	7.9	6.6	6.8
<i>B Mining and quarrying – services products</i>	53.9	1.2	44.9	0.0	0.0
<i>B Mining and quarrying – goods products</i>	61.8	17.3	7.4	6.6	6.8
C Manufacturing	44.4	28.3	5.5	13.0	8.8
<i>C Manufacturing – services products</i>	65.5	28.5	3.5	1.1	1.4
<i>C Manufacturing – goods products</i>	43.6	28.3	5.6	13.4	9.1
D Electricity, gas, steam and air conditioning supply (energy) ¹⁴	*	*	*	*	*
E Water supply, sewerage, waste management and remediation activities (energy) ¹⁴	*	*	*	*	*
F Construction (services)	66.0	32.6	1.2	0.1	0.0
G Wholesale and retail trade, repair of motor vehicles and motorcycles (services)	74.9	18.6	3.4	2.6	0.4
H Transportation and storage (services)	64.2	24.9	6.3	2.3	2.3
I Accommodation and food service activities (services)	61.2	28.8	2.8	1.2	5.9
J Information and communication (services)	61.6	29.8	4.8	0.9	2.9
K Financial and insurance activities (services)	54.1	42.7	2.2	0.5	0.4
L Real estate activities (services)	75.3	22.2	1.2	0.6	0.8
M Professional, scientific and technical activities (services)	65.2	28.8	3.7	1.3	1.0
N Administrative and support service activities (services)	57.8	36.1	3.4	0.8	2.0
P Education (services)	81.5	12.4	1.3	0.2	4.5
Q Human health and social work activities (services)	71.5	22.2	4.0	0.9	1.3
R Arts, entertainment and recreation (services)	85.6	13.0	0.3	0.6	0.6
S Other service activities (services)	89.0	9.9	0.6	0.3	0.2

Note that due to rounding, percentages may not add to 100%.

Services Products – Top Five

Table 12 shows the distribution of the five service products most purchased by Northern Ireland businesses, broken down by origin of purchase. The proportion from these five products represented 46.3% of the overall services purchased for intermediate consumption in 2015, and over a fifth of the overall intermediate consumption (20.5%).

These five services products were mainly sourced from Northern Ireland (proportions ranging from 58.5% for *Rental and leasing services* to 74.5% for *Buildings and building construction works* and 74.8% for *Buying, selling, renting and operating of own or leased real estate, excluding imputed rental*).

The proportion of services products sourced from Great Britain accounted for 36.1% of *Specialised construction works services*, and 35.7% of *Rental and leasing services*, while the largest proportion of service products imported were those relating to *Land transport services and transport services via pipelines, excluding rail transport* with 9.3% (consisting of 5.8% from the Republic of Ireland, 2.5% from the Rest of the European Union and 1.0% from the Rest of the World).

¹⁴Products itemised under categories D (Electricity, gas, steam and air conditioning supply) and E (Water supply, sewerage, waste management and remediation activities) were exclusively from the energy, water and waste product section and were therefore out of the scope of the modelling exercise.

Table 12 – Distribution by origin of the five most purchased intermediate consumption services

Service Product	Proportion of Intermediate Consumption of Services (%)	Origin of purchase				
		NI (%)	GB (%)	RoI (%)	RoEU (%)	RoW (%)
Buildings and building construction works	15.8	74.5	24.9	0.4	0.1	0.1
Specialised construction works	8.8	62.2	36.1	1.6	0.1	0.0
Land transport services and transport services via pipelines, excluding rail transport	8.5	72.2	18.4	5.8	2.5	1.0
Buying, selling, renting and operating of own or leased real estate, excluding imputed rental	8.0	74.8	22.5	1.2	0.6	0.9
Rental and leasing services	5.3	58.5	35.7	2.9	0.7	2.3

Note that due to rounding, percentages may not add to 100%.

Goods Products – Top Five

Table 13 below shows the distribution of the five most purchased goods products, which represented 42.7% of the overall goods, materials and related services purchased for intermediate consumption by Northern Ireland businesses in 2015, and 20.3% of the overall intermediate consumption.

Table 13 – Distribution by origin of the five most purchased intermediate consumption goods

Goods, Material and Related Services Product	Proportion of Intermediate Consumption of Services (%)	Origin of purchase				
		NI (%)	GB (%)	RoI (%)	RoEU (%)	RoW (%)
Wood and of products of wood and cork, except furniture; articles of straw and plaiting materials	9.5	24.0	10.1	3.1	49.5	13.3
Fabricated metal products, except machinery and equipment	9.1	51.5	24.3	5.0	9.7	9.4
Machinery and equipment n.e.c.	8.9	28.9	36.1	5.9	12.5	16.7
Basic iron and steel	8.6	17.2	51.3	3.3	4.5	23.7
Products of agriculture, hunting and related services	6.6	72.9	15.8	8.8	2.2	0.2

Note that due to rounding, percentages may not add to 100%.

Unlike for services, the picture is more varied in terms of origins of these five goods products. *Products of agriculture, hunting and related services* were mostly sourced from Northern Ireland (72.9%), while *Basic iron and steel* goods mainly originated from Great Britain (51.3%), with noticeably 23.7% of those products purchased from the Rest of the World, the fourth highest such proportion of all products.

Wood and of products of wood and cork, except furniture; articles of straw and plaiting materials goods products imported from the Rest of the European Union accounted for 49.5% of overall purchases of those products. This is the intermediate consumption product which had the highest proportion of Rest of the European origin.

CONCLUSION

Various sources of data have contributed to providing information on business expenditure from Northern Ireland businesses. While the NIABI provides a breakdown of the origins of goods and services as a whole and the Supply and Use Tables currently being developed will provide further insight of the type of products purchased by each business, the pressing need for trade flow information means that the model designed in the course of this research project could provide valuable information that had not been previously available, hence delivering a platform upon which economists and policy-makers could pitch questions and test assumptions.

The model outputs provide previously unknown details on the type of intermediate consumption products purchased by businesses in Northern Ireland and where they purchased or imported them from.

Notwithstanding the valuable information provided by these outputs, it is important to notice that this is only a part of overall picture; the nature and origin of products for resale without further processing is not addressed in the APS, while the origin of energy purchases does not form part of the BESES outputs. Various projects are being run concurrently at Northern Ireland and UK level that will help complement the outputs produced here.

The work around the 2016 and 2017 APS by ONS is ongoing, and the results from those exercises will also help improve the accuracy of the model as well as provide valuable time series that will contribute to the possibility of further analysis in line with the evolution of the needs for data and information surrounding the trade flow of products to and from Northern Ireland.

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