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# Scoping study to develop a set of Supply Use Tables for Northern Ireland

## Interim Report

*Prepared for the Northern Ireland Statistics and Research Agency*

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## Foreword

This paper is to provide users of Economic and Labour Market Statistics with an update on progress made by NISRA regarding the development of a set of Supply-Use Tables (SUTs) for Northern Ireland. Since 2012 NISRA have been working with the Office for National Statistics to undertake a Scoping Study to examine available data sources and develop a pilot set of Supply-Use Tables for Northern Ireland based on available data.

During 2012/13 NISRA was awarded funding from the Quality Improvement Fund (QIF)<sup>1</sup> to facilitate the investigation into the development of a set of Economic Accounts (Supply-Use tables) for NI. Funding was used to pay for an ONS Consultant from their Methodology Advice Service to provide expertise to undertake a Scoping Study to develop a set of SUTs for NI.

In short, a preliminary set of Supply-Use Tables were produced alongside a Scoping Study report which contained a set of recommendations for the next steps to develop the project further. These include, inter alia, areas where additional analyses from existing data sources could lead to a better balance of data to facilitate the compilation of more robust Supply and Use tables for NI.

A subsequent successful QIF bid during 2013 provided NISRA with resources to continue to take the project forward with the QIF expert during 2013/14. This second year of the project has involved taking the necessary steps to address the recommendations within the Scoping Study, on-going training of NISRA staff, the addition of other data sources, further quality assurance of the accounts developed by ONS and NISRA, preparing documentation and user consultation.

The following sections provide an overview of the project to date including highlighting areas of weakness and recommendations for the way forward.

**This paper focuses on the methodology rather than presenting initial results. Important additional information will be available later in the year and will be integrated into the tables and reviewed. The option to publish interim results will be considered at this time.**

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<sup>1</sup> Administered by the Office for National Statistics (ONS)

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# 1 Introduction

## 1.1 Aims and objectives

NISRA's main official statistics series provide a range of key measures of societal change and economic performance. However, outputs tend to be reported by subject area with no facility to place such measures within an overarching model of the NI economy. This limits commentators' ability to interpret the significance or import of reported changes in any individual series. This project is intended to be the first step towards the development of a comprehensive set of economic accounts for Northern Ireland. It has the following key objectives:

- Scoping study to critically examine data sources;
- Development of pilot Supply-Use Tables for Northern Ireland;
- Recommendations for next steps; and
- Provision of relevant National Accounts training to an in-house NISRA team.

## 1.2 Previous work

An experimental set of Supply-Use Tables was compiled by external accountants in 2007 to establish the economic impact of tourism. This exercise covered the whole of the NI economy, was consistent with UK regional accounts and made full use of the available Northern Ireland business and social survey data sets, public expenditure information, administrative sources and UK national and regional data. This enabled for the first time a comprehensive description of the role of the tourism sector in the NI economy and demonstrated the utility of the approach. However, it has not been possible to validate fully or update these tables, outside of tourism, due to key data gaps and lack of a dedicated in-house NISRA team with expertise on national and social accounts methodology.

A set of agriculture accounts has also been prepared by Wu and Keatley, Agri-Food and BioSciences Institute and Queens University Belfast. The aims of this work were to develop an Input-Output Model for the Northern Ireland economy; and to use the Input-Output Model to provide rigorous ex-ante and ex-post policy evaluation/analysis of CAP initiatives, particularly those of an agri-environmental / rural development nature. The reference year for this work was 2002, and the economy was sub-divided into 22 sectors: ten agriculture sectors; eight food processing sectors; two input sectors; one marketing sector; and the rest of the economy.

## 1.3 UK, Scottish and Welsh Supply-Use Tables

A full set of SUTs is published for the UK each year by ONS in the Blue Book. Supply-Use tables are also produced annually by the Scottish Government, with the most recent release of data covering 1998 to 2009. Supply-Use tables have also been produced periodically for Wales

by the Cardiff Business School, most recently for 2007. Many of the issues faced in compiling SUT for Wales, and, to a lesser extent Scotland, are similar to those faced in compiling Northern Ireland SUTs.

## 1.4 Structure of this report

The rest of this report is structured as follows:

- Section 2 explains the concepts under-pinning Supply Use Tables and how they may be used;
- Section 3 goes into more detail about the individual elements in the tables and describes how these were populated for Northern Ireland; and
- Section 4 summarises the work done to date and the key issues

## 2 An Overview of Supply and Use Tables (SUTs)

### 2.1 Introduction

A modern open economy like that of Northern Ireland engages in four basic economic activities:

1. Production involves industries producing goods and services.
2. Consumption represents purchases of goods and services by both industries and domestic final users comprising mainly households and Central and Local Government.
3. Accumulation involves all capital transactions including all fixed investment expenditure and changes in the level of stocks.
4. Trade involves imports from, and exports to, Great Britain and the rest of the world (RoW).

Measurement of these four activities is captured in the framework of the Supply-Use Tables. The resulting tables serve a number of purposes, all of which contribute in different ways to understanding the Northern Ireland economy. The framework is illustrated below.

Supply table				Use table												
INDUSTRY				INDUSTRY												
P R O D U C T	DOMESTIC SUPPLY at basic prices			T O T A L S U P P L Y	P R O D U C T	INTERMEDIATE DEMAND at purchasers' prices									T O T A L D E M A N D	
						Total intermediate demand	HHFce	NPISHs Fce	Central government Fce	Local Government Fce	Gross fixed capital formation	Valuables	Changes in inventories	Exports of goods & services		
	TOTAL OUTPUT					Total intermediate consumption	GVA at basic prices (primary inputs)									
						Taxes (less subsidies) on production										
						Compensation of employees										
			Gross operating surplus													
			TOTAL OUTPUT (INPUTS)													

In broad terms, the output and supply table allows the user an appreciation of the absolute monetary values of each industry's output for a given calendar year. Additionally, and possibly more importantly, this table also presents the relationships between the output of products and the output of industries - e.g. key statistics are produced on the extent of diversification within industries and the extent of competition between industries producing the same product.

The combined use matrix shows the consumption of products (goods and services) and primary inputs, in terms of combined domestic and imported goods and services, used in each industry's production process and, in doing so, presents a comprehensive description of the domestic production functions of Northern Ireland industries. This table also gives detailed purchasing information by final consumers.

## 2.2 The Supply Table

The primary purpose of the Supply Table is to show the goods and services produced by each industry in Northern Ireland along with the supply of goods and services including imports. The distinction between industries and products is important; individual firms and organisations are classified according to the products they make. If they produce more than one product, they are classified according to whichever product accounts for the largest component part of their output (£). Each industry produces what is termed to be its principal product (shown in the diagonal elements in the table) and many industries also produce a range of other products referred to as secondary production (shown in the off-diagonal cells) or by-products. The groupings of industries and products are based on standard international classifications: industries are categorised according to the standard industrial classification for 2010 (SIC 2010); while the products are categorised according to Classification of Products by Activity (CPA) 2008.

The supply of products is presented in the rows while the columns show the industries responsible for the output of these products. Imports are shown in a separate column. The full Supply Table shows the output of 110 SUT industry groups by 110 SUT product groups.

The Supply Table also demonstrates the transition from total supply of products at basic prices to total supply at purchasers' prices through the addition of distributors' trading margins and taxes less subsidies on production. Distributors' trading margins represent the difference between the prices at which distributors buy and sell their products. In the domestic supply table, these trading margins are shown as the output of the distribution industries, in the corresponding distribution services' product rows. In the distributors' trading margin column of the supply table, the trading margins are distributed among the goods actually traded, and deducted from the distribution services products, so that the total for this column is zero. Taxes on products include VAT and excise duties. The addition of these taxes completes the transition from basic prices to purchasers' prices.

Examples of the use to which the Supply Table can be used are as follows:

1. **Indicators of the diversity of commodities produced by an industry.** The leading diagonal of the supply table shows the value of output of an industry's principal product. This can be presented as 'Principal Products as a percentage of Total Industry Output'.
2. **Indicators of market share.** Conversely, it is possible to look at the industries that produce particular products, e.g. to examine the share of manufactured products produced by the manufacturing industry. This is an indicator of market share and can be presented, at 110-industry detail, in the Supply Table as 'Principal Products as a percentage of Total Output of Products'.
3. **Indicators of import penetrations.** The share of the total supply of a product made up by imports can be seen by comparing the imports and total supply columns.



## 2.3 The Use Table

Where the Supply Table presented the supply of goods and services for consumption, the Use Table shows the demand for the goods and services by industries and final demand across the product rows.

If the domestic output part of the Supply Table at basic prices can be thought of as showing the composition of industries' outputs by product, the left hand side of the Use Table can be thought of as showing the composition of industries' inputs. As with the Supply Table, industries are shown in the columns and products in the rows.

The Use Table can be split into 3 main sections.

- **The intermediate demand (section 1)**, which shows the inputs of products, both domestic and imported, used by UK industries in the production of their output.
- **The final demand (section 2)**, which shows the purchases of each product by each category of final demand (e.g. consumers, government, export).
- **The primary inputs (section 3)**, these inputs do not flow through the other industries, they are employees' salaries, taxes less subsidies on production and gross operating surplus, which together constitute Gross Value Added.

The columns shown in the **intermediate demand** part of the table list the goods and services each industry uses in order to produce its output (as described by the corresponding industry column in the Supply Table). The column totals give the total intermediate consumption of each industry. The row totals give the total intermediate demand for each product category.

The **final demand** section of the Use Table comprises the following components in the columns:

- **Final Consumption Expenditure** by: both resident and non-resident households in the UK (eg tourists or business visitors); by Non-Profit Institutions Serving Households (NPISHs); and by government, both central and local.
- **Gross Capital Formation**, which is made up by Gross Fixed Capital Formation (commonly called "investment expenditure"); Valuables; and Change in Inventories (which includes work in progress);
- **Exports of goods and services**. For the purposes of this project, the aim was to try to obtain a four-way breakdown of exports by geographical area: Great Britain; Ireland; Rest of the European Union (REU exports); and Rest of the World (RoW exports)

For each of these components, a breakdown of final demand by product is given in the rows.

The difference between the value of industry output at basic prices (which are the column totals of the Supply table) and the value of industry intermediate consumption at purchasers' prices is Gross Value Added (GVA), which is treated as an input in the Supply and Use framework. GVA itself can be split into three components: Taxes less Subsidies on Production, Compensation of Employees, and Gross Operating Surplus (including capital consumption). These make up the **Primary Inputs** table, which appears below the intermediate consumption part of the Use Table so that the column totals by industry in the Use Table sum to total output by industry.

## 2.4 Gross Domestic Product (GDP) and the Supply and Use Tables.

An important feature of the Supply and Use framework is that it presents Gross Domestic Product as measured using three distinct approaches.

### 2.4.1 GDP measured using the Production approach

GDP at basic prices is also known as Gross Value Added (GVA); that is, it is a measure of the gross value added to the economy by each producing unit in Northern Ireland. Broadly speaking, it is simply the sum of each company's outputs (sales) less inputs (purchases).

The output of an organisation is approximately equal to the total value of sales (turnover) over a given period although account is also taken of goods manufactured but held in inventory and work in progress (which is particularly relevant for industries like ship-building where the outputs are high-value but infrequent). The final component of output includes any items of a capital nature created in-house for the companies own final use e.g. databases and other computer systems. These are valued and added to the other items to form a figure for the total value of goods and services produced by an organisation - their Gross Output at Basic Prices.

In producing these outputs, an organisation will have to purchase raw materials, energy and other intermediate inputs of goods and services: these are subtracted from the output (including any taxes relating to these purchases) to yield Gross Value Added. The following shows the calculation of GVA (production approach):

Calculation of GDP (Production approach)	
Total output at basic prices	A
- Total intermediate inputs at purchasers' prices	B
= <b>Gross Value Added at basic prices</b>	A-B
+ Taxes less subsidies on products	C
= <b>Gross Domestic Product at market prices</b>	A-B+C

It is noted that experimental GVA figures using the Production approach for NI published by ONS in December 2013 estimate that GVA(P) for NI in 2010 to be £29,213m. This is measured at basic prices and is very close to the estimate of GVA calculated within the experimental NI SUT tables.

### 2.4.2 GDP measured using the Income approach

Gross Value added (GDP at basic prices) is also equal to the costs of employment (wages, national insurance and pension contributions), any taxes, less subsidies, levied upon production (e.g. business rates, vehicle excise duty) and Gross Operating Surplus (broadly analogous to profit). The following shows the calculation of GVA (income approach):

Calculation of GDP (Income approach)	
Compensation of Employees	A
+ Taxes, less subsidies, on production	B
+ Gross Operating Surplus	C
= <b>Gross Value Added at basic prices</b>	A+B+C
+ Taxes less subsidies on products	D
= <b>Gross Domestic Product at market prices</b>	A+B+C+D

### 2.4.3 GDP measured using the Expenditure approach

GDP (Gross Domestic Product at Market Prices) is usually defined/calculated as the sum of total final demand less total imports.

Total domestic demand comprises purchases (including all taxes that may apply) by: Households, Non-profit institutions, Tourists (or rather expenditure by non-residents), and Government. Gross fixed capital formation, changes in inventories and valuables are also included.

Final demand also includes the value of exports (which from a Northern Irish perspective include exports of goods and services to Great Britain). Imports include goods and services imported from Great Britain and will also include expenditure by Northern Ireland residents outside Northern Ireland. The following shows the calculation of GDP (expenditure approach):

Calculation of GDP (Expenditure approach)	
Household final consumption	A
+ Non-profit making institutions serving households	B
+ General Government final consumption	C
+ Gross capital formation	D
+ Exports	E
= <b>Total final demand</b>	A+B+C+D+E
- Total imports	F
= <b>Gross Domestic Product at market prices</b>	A+B+C+D+E-F

### 3 Compilation process for the Supply and Use Tables

#### 3.1 Introduction

A trial balance of the Supply Use Tables for Northern Ireland for 2010 was conducted. The aim was to identify the available source data, where estimation could be used and where the gaps are.

The process of compiling Supply and Use Tables is extremely data-intensive. Northern Ireland data are used where they are available and sufficiently robust, but for many items direct estimates for Northern Ireland are not available. Where this is the case, other data sources need to be relied upon, especially the UK Supply and Use Tables and associated background datasets. The compilation process for the Northern Ireland tables was therefore a mixture of a top-down apportionment driven approach, and a bottom-up raw data driven approach.

Estimates of gross value added (GVA) and its components were constrained so that they tied up with the figures for Northern Ireland published annually by ONS as part of the UK regional accounts. The table below shows the figures published for Northern Ireland for 2010. It can be seen that they are broken down by SIC section (a 20-way breakdown of industry).

ONS Regional Accounts data for Northern Ireland 2010 (£m)					
Industry Section	Compensation of Employees	Mixed Income	Gross operating surplus	Taxes less subsidies on production	Gross value added
A Agriculture, forestry and fishing	115	106	114	3	339
B Mining and quarrying	26	1	95	6	128
C Manufacturing	2735	106	1448	79	4368
D Electricity, gas, steam and air conditioning supply	74	1	138	40	253
E Water supply; sewerage, waste management and remediation activities	154	5	197	25	381
F Construction	1151	455	360	35	2002
G Wholesale and retail trade; repair of motor vehicles and motorcycles	2211	411	920	299	3841
H Transportation and storage	726	93	218	49	1086
I Accommodation and food service activities	519	101	174	76	871
J Information and communication	525	29	260	43	857
K Financial and insurance activities	573	50	618	13	1254
L Real estate activities	73	8	2174	23	2278
M Professional, scientific and technical activities	506	257	280	60	1103
N Administrative and support service activities	566	88	219	37	910
O Public administration and defence; compulsory social security	2095	0	804	0	2899
P Education	2327	24	52	8	2411
Q Human health and social work activities	2441	270	344	8	3063
R Arts, entertainment and recreation	278	19	83	26	406
S Other service activities	191	71	85	12	360
T Activities of households as employers; undifferentiated goods-and services-producing activities of households for own use	51	10	1	0	62
<b>All industries</b>	<b>17337</b>	<b>2103</b>	<b>8586</b>	<b>844</b>	<b>28871</b>

Source: ONS

The basic approach taken was to construct the NI SUT at the same level of detail as the UK SUT i.e. a 110 x 110 industry by product matrix, in order to make apportionment easier. However, in general, the data are not accurate to this level of detail; and there are data confidentiality issues.

## 3.2 Main data sources

The main data source used in the construction of the Supply Table for Northern Ireland is the NI Annual Business Inquiry (ABI). This survey covers most industries but does not cover:

- Most of agriculture, SIC industry 01. The primary source for this industry was the annual survey of agricultural businesses conducted by DARD;
- Imputed rents which is the rental value that owner-occupiers would have to pay, were they renting their own home;
- Financial services, including Financial Intermediation Services Indirectly Measured – effectively, the difference between the interest rate that is received on bank deposits compared with that paid on bank loans; and
- Output of government and non-profit making institutions serving households (NPISH). The latter mainly comprises charities, universities, and trade unions.

The following data items collected in the ABI were used in the compilation of the NI SUT:

- Turnover – sales of own-produced goods and services, resales;
- Changes in stocks;
- Subsidies receivable;
- Employment costs;
- Purchases of goods, materials, energy and services;
- Taxes on production, including business rates and vehicle excise duty; and
- Capital expenditure: acquisitions, disposals, own account capital formation, but no breakdown by type of asset

Data for central government were mainly sourced from HM Treasury's COINS/OSCAR public spending database, an administrative system mainly populated with data provided by government departments that is used to monitor public spending. Data are classified according to COFOG (the internationally recognised classification of functions of government) which allowed a split by industry to be derived.

Total output for Local Government was available from returns submitted to the Northern Ireland Department of the Environment; these were also categorised by function and hence could be classified by industry. Information was also taken from the published annual accounts for each authority.

Expenditure by households is mainly sourced from the Living Costs and Food survey, from which a detailed breakdown of expenditure by product category is available, averaged over three years because regional/country sample sizes are relatively small. This is supplemented with estimates for residents of communal establishments, such as university halls of residence or care homes. Tourist expenditure (both into and out of Northern Ireland) was based on published

reports by Visit England and DETI NI, and special analyses from the International Passenger Survey.

International trade in goods (imports and exports) is available from HMRC, broken down by Republic of Ireland, Rest of the EU and Rest of the World. Further details of manufacturing exports, including the value of trade with Great Britain, is available from the NI Manufacturing Sales and Exports Survey.

Data sources for non-profit making institutions serving households (NPISH) are limited. Published accounts for universities provide information for further education services, but there is little readily available for charities which make up the largest part of this sector.

Some information on capital expenditure is available from sources listed above. The NI Quarterly Construction Survey has also been used.

### 3.3 Construction of the initial Supply Table

The first stage of constructing a Supply Table is the generation of the domestic Supply matrix. This shows the mix of products produced by each industry (i.e. the range of industries which contribute to the domestic production of each product). The row sums of this matrix correspond to the domestic output of each product for the whole economy, and the column sums correspond to the total output of each industry.

The Supply matrix is valued at basic prices, which is the amount received by the producer for a unit of goods or services excluding any taxes or subsidies on products. This price includes only taxes on production (such as business rates) and subsidies on production (such as single farm payment). It should also exclude any transport charges invoiced separately by the producer.

The output of an industry may be entirely government produced (e.g. public administration and defence); entirely private sector; or a mixture of both (e.g. health).

The output of non-government industries was primarily sourced from the ABI, and was computed as the sum of gross value added (GVA) plus intermediate consumption. In doing this, estimates of GVA and its components by SUT category from the ABI were scaled so that they summed to the relevant SIC section from the Regional Accounts. Intermediate consumption by SUT category was then calculated so that it represented the same proportion of GVA as in the NI ABI.

Data to estimate government output were sourced from HM Treasury's COINS/OSCAR database and from local authority annual accounts and returns to the NI Department of the Environment. For government (and NPISH), output can be broken down into the following categories:

- Market output, which is the provision of services at economically significant prices;
- Own account production, including output for own gross fixed capital formation; e.g. in-house IT development; and
- Other non-market output. This is output which is provided free, or at economically insignificant prices; it includes services such as military defence and the NHS.

Most of the output of government is non-market output, and cannot be identified as uses of any specific institutional sector. Conventionally, this non-market output is valued according to the sum of the inputs used in its production (pay, procurement, gross operating surplus). The sum of these costs, when added to the value of market output and own-account production, goes into the relevant industry column of the supply table. As there is assumed to be no net operating surplus on government activities, the gross operating surplus element consists only of consumption of fixed capital.

For NPISH, total output was estimated as follows:

- For universities, as the sum of pay, intermediate consumption, and capital consumption taken from their annual accounts;
- For charities, as their estimated annual income derived from data produced by the Northern Ireland Council for Voluntary Action on average donations per head, together with annual estimates of legacy income for the UK; and
- For trade unions, as their estimated income using membership numbers and average subscription rates from the consumer prices index.

NPISH total output was then allocated to industry in line with UK proportions, except for education which was set equal to the input costs for universities.

For some industries, specific information for Northern Ireland was not readily available and ad hoc estimation methods were used.

The first of these was for **imputed rents** – the amount an owner-occupier would need to pay to rent their own property. This was calculated taking into account: relative rental levels in NI compared with UK using data from the consumer prices index; differences in the distribution of house types and relative owner-occupancy rates in NI compared to UK; and the number of households in Northern Ireland.

Measuring the output and consumption of **financial and insurance services** in Northern Ireland is particularly difficult. The output of the banking sector in the National Accounts is called FISIM (financial intermediation services indirectly measured). For borrowing from banks, this is essentially the difference between the interest rate actually paid and what would have been paid at a reference rate (such as the Bank of England's base rate). For deposits with banks, it is the difference between the interest actually received and what would have been received had the deposits received interest at the reference rate. All sectors of the economy can pay FISIM. So, in principle, the levels of bank deposits and borrowing are needed by sector and industry, split by country of residence of the bank. This information is not readily available.

For NI financial services and insurance, the regional accounts figures for GVA and its components were distributed among the relevant SUT industries in the same proportions as for the UK. The ratio of intermediate consumption to GVA for the UK for each of these industries was then used to derive estimates of intermediate consumption for Northern Ireland, and hence total output by industry.



The final stage in compiling the Supply matrix, once total output by industry had been estimated, was to populate the body of the table, showing the output by product for each industry. This was done by assuming that the split by product in Northern Ireland was the same as for the corresponding industry in the UK, enabling the use of UK Supply Table proportions.

The remaining columns of the full Supply Table show the transition from domestic product output at basic prices to total supply of products at purchasers' prices, but these are not estimated until later on in the process of compilation.

### **3.4 Intermediate demand**

In performing the trial balance, separate intermediate demand matrices of industry by product were compiled for general government and other sectors. These were summed to give the final intermediate consumption table.

Total expenditure on goods and services by industry for central and local government were apportioned to products using the proportional split for general government from the UK Supply Use Tables.

For other sectors and industries, the data sources for total intermediate consumption by industry were the same as for the Supply Table.

These totals then needed to be disaggregated to the full 110 product level used in the Supply and Use Tables. The preferred approach would be to use detailed information on purchases by companies operating in Northern Ireland from a Purchases Inquiry. Unfortunately, the results from the most recent Purchases Inquiry are now several years out of date and some industries are not covered by the Purchase Inquiry (or if they are, the sample size is too small to get an accurate picture of purchases for Northern Ireland companies in that industry). So, in the absence of such data, results from the ABI for purchases of goods, materials, energy and services were used instead, with allocations to detailed product categories based on proportions derived from the UK intermediate consumption matrix.

### **3.5 Income components – primary inputs**

For non-government industries, the primary income components (taxes less subsidies on production, compensation of employees, mixed income and GVA) were sourced from the ABI and the DARD survey of the agriculture industry. For government industries and further education, pay and capital consumption were sourced from COINS/OSCAR and annual accounts. Pay and capital consumption for charities and trade unions were assumed to be in the same proportions as for further education institutions.

The DARD, ABI and NPISH data were constrained to match the Regional Accounts totals (after deducting the government elements) by SIC section (e.g. manufacturing, construction).



## 3.6 Final Demand

### 3.6.1 Household Final Consumption Expenditure (HHFCE)

The starting point for this column is a dataset taken from the Living Costs and Food Survey regional analysis of expenditure by Northern Ireland residents, averaged over three years (2009 to 2011) because of relatively small sample sizes. These data provide estimates of total household final consumption expenditure for Northern Ireland and the UK classified by COICOP (Classification of Individual Consumption according to Purpose). Expenditure in NI as a proportion of total UK expenditure was calculated for each COICOP category.

These proportions were then applied to household final consumption expenditure in the UK (excluding expenditure by foreign visitors to the UK) classified by COICOP to give NI HHFCE by COICOP. Generally, this resulted in higher estimates of NI HHFCE than would have been obtained by grossing the LCF weekly expenditure per household by the number of household in NI. This may be due to under-reporting of relatively infrequent purchases; but it is also due to differences in coverage in that the LCF only covers private households, whereas HHFCE figures also include expenditure by residents of communal establishments, such as university halls of residence and nursing homes. An adjustment is made to accommodation services to take account of expenditure by residents of communal establishments; it is calculated as follows:

- For university students, the number of beds in halls of residence and their cost was obtained from their websites for 2013/14; this was deflated to 2010 prices using the UK consumer prices index (CPI) index for university accommodation costs; and
- The number of residents in nursing and care homes was obtained from the 2011 census; and the average weekly cost was obtained from the prices collected for the CPI for July 2010.

Expenditure by COICOP was converted to expenditure by SUT product category using the UK Household Final Consumption Expenditure table linking these two classifications. For some products, there is a one-to-one correspondence between the COICOP category and the SUT product category code (e.g. COICOP 07.2.2, motor fuels, maps directly to SIC product 19). For other categories, the COICOP 4-digit expenditure codes from the LCF were distributed across the SUT product categories in the same proportions as for total UK expenditure.

In order to get to household final consumption expenditure on the national concept, it is necessary to add travel outside of the province by Northern Ireland residents. Separate totals are available for expenditure by Northern Ireland residents to GB, Republic of Ireland, Rest of the EU and Rest of the World. These are apportioned to SUT product categories using percentage splits for the UK as follows:

- GB travel – in line with non-UK visitors' expenditure in the UK;
- Republic of Ireland – in line with RoI expenditure on visits to Northern Ireland; and
- Non-UK travel – in line with expenditure overseas by UK residents.

The product split for travel to destinations outside Northern Ireland also forms part of the Imports column in the Supply Table.

### 3.6.2 Government Final Consumption Expenditure

Under the National Accounts framework, government activities are presented in such a way that it appears to be the final consumer of its own non-market output, or put another way, government, on behalf of the people, fund a range of activities across the public services. To reflect this, columns for the final consumption expenditure of central and local government appear in the final demand section of the Use Table. These columns display the total other non-market output of government by product. They equate to the row total of the other non-market component of the central and local government Supply Tables.

For instance, consider industry 84, public administration and defence. In the Supply table all output of this industry is allocated to the corresponding principal product. There is no market output associated with this product, so no other industry is buying it – ie total intermediate consumption of this product is zero. In order to balance the supply of this product with the demand for it, government final consumption expenditure for this product is set equal to its total supply.

Formally, government final consumption expenditure at purchasers' prices is calculated as follows:

Calculation of government final consumption expenditure at purchasers' prices	
Total intermediate consumption at purchasers' prices	A
+ gross value added at basic prices	B
<b>= total output at basic prices</b>	<b>A+B</b>
- market output (receipts from actual sales)	C
- output produced for own final use	D
<b>= other non-market output (government final consumption expenditure)</b>	<b>A+B-C-D</b>

Total government output by industry was sourced from COINS/OSCAR and local authority annual accounts. From this, total government output was derived (assuming that each government industry only produces its principal product). Final consumption expenditure by product was then set equal to government output less market output (i.e. receipts from actual sales of services) for the corresponding industry - i.e. final consumption expenditure was shown as government consuming its own output.

### 3.6.3 Non-Profit Institutions Serving Households (NPISH) Final Consumption Expenditure

NPISH includes universities, charities (including most private schools), religious societies, trade unions and members' clubs. Conceptually, NPISH Final Consumption Expenditure reflects the consumption by the NPISH sector of its own other non-market output, in a similar way to General Government Final Consumption Expenditure.

Data specifically relating to the NPISH sector for Northern Ireland are very limited. The estimates in the combined Use table are based on:

1. Aggregate expenditure by universities taken from published sources;

2. Trade union membership fees using membership numbers from the Labour Force Survey and average monthly fees from the Consumer Prices Index; and
3. Average donations to charities by Northern Ireland residents.

The allocation of NPISH final consumption expenditure to product category is done using proportions obtained from the corresponding column in the UK SUT.

For universities, information on receipts of income (tuition fees, research grants, other (eg hospitality)) is available from published sources. This is subtracted from NPISH aggregate expenditure before it is apportioned across final consumption expenditure product categories.

## 3.7 Gross Capital Formation

Gross Capital Formation comprises three components in the tables:

1. Gross Fixed Capital Formation (GFCF);
2. Acquisitions less disposals of valuables; and
3. Change in inventories.

### 3.7.1 Gross Fixed Capital Formation (GFCF)

For central government, capital expenditure by broad category of product (e.g. plant and machinery, civil engineering, etc) is available from COINS/OSCAR classified according to COFOG, and hence to industry. For local government, similar information is available from their annual accounts.

For NPISH, a high level product split (e.g. buildings, equipment, etc) for capital expenditure by universities was obtained from their published annual accounts. For other components of the NPISH calculation, it was assumed capital expenditure (in aggregate) made up the same proportion of total output as it did for the universities.

For other sectors, GFCF totals from the ABI were used, with the agriculture industry supplemented by data from DARD's surveys of agriculture. The latter survey provides a breakdown of expenditure by broad category of product.

These industry level estimates were disaggregated to the product level by applying product proportions from the UK GFCF industry by product table to the Northern Irish industry GFCF totals.

Information is also available for total construction output in Northern Ireland. This was used as follows:

- Expenditure on housing was allocated to the dwellings column of the GFCF industry by product matrix;
- New housing was allocated to product 41 (building and construction works); and

- Housing repairs and maintenance was split between products 42 and 43 in line with UK Supply Use Table proportions.

The product totals for construction were constrained to these totals.

Transfer costs for land and dwellings were then estimated by working out the percentage of total construction expenditure that they represent for the UK and applying this to the corresponding totals for Northern Ireland.

Aggregating by industry then gives the GFCF final demand column split by product for the Use table.

### 3.7.2 Valuables

Due to its very small size, data on acquisitions less disposals of valuables were not estimated for Northern Ireland.

### 3.7.3 Change in Inventories

The ABI provides information about aggregate stock levels at the beginning and end of the year. The UK GDP deflator was applied to start year and end year stocks to calculate the change in inventories valued consistently in the average prices of the year. This was then split across products in line with UK proportions.

## 3.8 Exports

A four-way geographical split of exports is required: Great Britain, Ireland, Rest of the EU and Rest of the World.

The values of exports of goods by product to Ireland, Rest of the EU and Rest of World are available from HMRC's Regional Trade Statistics, and are mapped from standard international trade classification (SITC) to CPA.

The Northern Ireland Manufacturing Sales and Exports Survey (MSES) provides figures for the geographical destination (including Great Britain) of manufactured products categorised by industry.

For goods, the net balance of demand over supply by product was calculated, and allocated to imports from GB if demand exceeded supply, or allocated to exports to GB if supply exceeded demand for non-manufactured goods (exports to GB for manufactured goods were assumed to be covered by the MSES). The same was not done for services, as some of the imbalances looked implausible.

Exports of services for certain industries are available from the survey of International Trade in Services, while exports of travel services (i.e. non-residents' expenditure in Northern Ireland) are

available from tourism statistics. The latter are calculated separately for each of the desired four geographical areas as follows:

- Surveys of visitors to Northern Ireland provide:
  - total expenditure by area of residence (GB, Ireland, Rest of EU and Rest of World);
  - a breakdown of expenditure by broad category (eg bed & board; food and drink) by purpose of visit;
  - a percentage split of area of residence by purpose of visit.
- These were combined to give expenditure by broad category by area of residence; and
- Expenditure by broad category was then allocated to Supply Use products using proportions derived from the export of travel services account in the UK Balance of Payments.

There is no good information for exports of other services. These were left as zero in the trial balance.

### 3.9 Imports

Imports of goods by product from Ireland, Rest of the EU and Rest of World are available from HMRC's Regional Trade Statistics, and are mapped from standard international trade classification (SITC) to CPA. There is no good information on imports from Great Britain for goods.

Imports of services for certain industries should in principle be available from the survey of International Trade in Services. This needs to be followed up.

Imports of travel services (ie residents' expenditure outside Northern Ireland) are available from tourism statistics, broken down by the required four –way geographical split, as described in the section on household final consumption expenditure.

There is no good information for imports of other services. These were left as zero in the trial balance.

### 3.10 Domestic Supply at basic prices to Supply at purchasers' prices

The final set of transactions to consider are those needed to convert domestic supply at basic prices to total supply at purchasers' prices. They are as follows:

- Components of the difference between basic prices and purchasers' prices (i.e. the price paid by the final consumer); namely, Distributors' trading margins on products;
- Taxes on products; and
- Subsidies on products.

### 3.10.1 Distributors' trading margins

Distributors' trading margins form part of the purchasers' price of a product but are not part of the basic price. In the Supply Table at basic prices, distributors' trading margins are recorded against the appropriate distribution product (CPA 45 to 47: automotive distribution, wholesale and retail).

In the purchasers' price Use Table, the distribution margins are recorded as part of the price of the product on which they are earned. Therefore, in the Supply Table when adding in the components to take domestic output of products at basic prices to total supply at purchasers' prices, the margins component must be removed from distribution commodities and re-allocated to other products (note that only physical goods can attract distributors' trading margins). This reallocation should also include margins on exported goods. Since this is a reallocation, the positive entries in the margins column against products will be balanced by negative entries against the distribution products, and the sum of all entries in the margins column will be zero.

Distributors' trading margins were calculated for the following components of demand, using average margin rates for the same components for the UK:

- Intermediate demand
- Household final consumption expenditure
- Gross fixed capital formation
- Exports

Average UK distribution margin rates were calculated for each product by summing the total margin across all industries and dividing by the total demand for the same product. This calculation was performed for each of the four components of demand listed above. The resulting product margin factors were then applied to the Northern Ireland Use Tables and summed to give product totals. These were then scaled to match the total output of the distribution industries for Northern Ireland.

The distribution industries' output was entered with a negative sign against the corresponding margin product to ensure that the distributors trading margins column totals summed to zero in the Supply Table.

### 3.10.2 Taxes on products

Taxes on products are taxes which are levied per unit of quantity or an ad valorem basis. There are two main types of taxes: Value Added Taxes (VAT) and Other taxes on products.

There is a choice of data sources for taxes on products. The Northern Ireland Department of Finance and Personnel (DFP) produces an annual Net Fiscal Balance Report which contains estimates of tax revenues by type of tax. HMRC have recently started publishing similar experimental statistics broken down by region and country of the UK. The figures in the DFP Net Fiscal Balance report for 2010/11 are very similar to those produced by HMRC except for:

- VAT - £2.9 bn compared with £2.3bn.

- **Stamp duty** - DFP base their estimate on the NI/UK ratio of adults owning stocks, shares, unit trusts, PEPs and ISAs as measured in the Family Resources Survey. HMRC's estimate for stamp duty on share transactions is zero on the grounds that a negligible proportion on FTSE-100 and non-FTSE companies are based in NI.

For the purposes of the trial balance for 2010, the DFP figures were used, except for VAT where average rates payable on intermediate consumption and final demand for the UK in 2010 were applied to the corresponding expenditure totals for Northern Ireland. These figures are broadly comparable with HMRC data once timing differences and the increase in the VAT rate from 17.5% to 20% that took place in January 2011 are taken into account.

The methodology and sources used by DFP for other taxes are summarised in the table below.

Apportionment methodologies and sources used to estimate Public Sector Revenues in NI: 2010/11		
Revenue	Methodology	Source
Land & property stamp duty	Actual outturns	HMRC
Stock & shares stamp duty	NI/UK ratio of adults owning stocks, shares, unit trusts, PEPs and ISAs	DWP Family Resources Survey
Fuel duties	NI's share of UK road traffic fuel consumption	Road Transport Energy Consumption at Regional and Local Authority Level: BERR
Tobacco duties	NI's share of UK expenditure on tobacco	Family Spending Survey: ONS
Alcohol duties	NI's share of UK expenditure on alcohol	Family Spending Survey: ONS
Betting & Gaming duties	NI's share of UK expenditure on betting and gaming	Family Spending Survey: ONS
Air Passenger duty	NI's share of UK population	ONS
Insurance Premium tax	NI's share of UK population	ONS
Land fill tax	NI's share of UK tonnage sent to landfill	NI Environment Agency, Scottish Environment Protection Agency, Environment Agency, DEFRA
Climate Change Levy	Electricity: NI's share of UK electricity consumption Solids & other fuels: NI's share of UK GVA (less extra regio)	Electricity: BERR Solids & other fuels: HMRC
Aggregates Levy	NI's share of UK GVA (less extra regio)	Regional Accounts: ONS

Source: DFP Northern Ireland Net Fiscal Balance Report 2009-10 and 2010-11

### 3.10.3 Subsidies on products

Subsidies on products are subsidies payable per unit of quantity or an ad valorem basis. For the NI SUT, subsidies are included for the following products:

- Agriculture, taken from figures published by DARD; and
- Passenger travel by bus and rail, taken from published information about subsidies paid to Translink.

## 3.11 Balancing the tables

### 3.11.1 General approach to balancing

The compilation of the SUT involves the use of a range of different data sources and assumptions. This generally means that when first put together the tables do not balance. There are two accounting identities that apply when the Supply Use Tables are fully balanced, namely the industry balance condition, and the product balance condition:

- The industry balance requires the column totals of the domestic Supply Table at basic prices (outputs by industry) to equal the column totals of the left hand side of the Use Table (inputs by industry).
- The product balance requires the row sums of the Supply table to equal those in the Combined Use table so that total demand for products is equal to total supply.

The first stage of balancing usually involves the introduction of manual balancing adjustments to remove some of the large imbalances. Information in the table itself, from the time series of tables, and any external information which can be brought to bear may be used to help inform this process. The plausibility of the cells in the matrices should also be assessed e.g. do the cells in the intermediate consumption part of the Use Table look sensible when compared to the UK (i.e. they do not represent an unreasonably small or large proportion of the corresponding UK cells).

The matrix nature of the tables means that adjustments to one cell to bring a row into balance can introduce imbalances into other rows and columns. Imbalances identified here can also bring to light problems arising earlier in the compilation process, and require amendments to column totals in order to maintain the industry balance. Within the manual balance system, balancing adjustments should be made as much as possible to data items with the least robust data source.

The process of balancing is neither straightforward nor linear. Problems may come to light at a later stage in the process which requires revisiting of the earlier stages. More fundamentally, significant changes made during the balancing process can render the tables inconsistent with the tax, margin and subsidy figures. Re-estimating these can then return the tables to an unbalanced state. An iterative process of re-estimation and rebalancing is therefore required until the tables converge to a consistent and balanced final estimate.

Once manual adjustments have been made, the final adjustments to bring the table fully into balance can be carried out automatically through an iterative proportional fitting method known as the RAS procedure (See [Eurostat Manual of Supply, Use and Input-Output Tables](#) p 222 for details).



### 3.11.2 Balancing the Northern Ireland SUT

Initial estimates of the NI supply and combined use matrices were compiled as described in earlier sections. At this point industry output at basic prices in both the initial Supply and Use tables were equal. However, because a range of different data sources and assumption had been used in the different parts of the Supply and Use tables, initially the product balance did not hold. For the purpose of the Northern Ireland trial balance, no manual adjustments were made. The balancing was done entirely using the RAS automatic process. Under this procedure, as applied for Northern Ireland, the product and industry totals from the Supply Table were held fixed. The rows of the Use Table were scaled one by one so that the product imbalance was removed. This then introduced an imbalance in the industry identity, which was removed by scaling the columns of the Use Table to match total output at basic prices calculated in the Supply Table. The procedure was then repeated, with alternate scaling of rows and columns, until a full balance was achieved.

While doing this, the GVA estimates by industry derived from the Regional Accounts were not adjusted, so as to ensure consistency with the published figures.

## 4 Conclusions and next steps

### 4.1 Conclusions

It was possible to create an initial trial balance for Northern Ireland for 2010; however it should be noted that the Northern Ireland results are indicative and should be treated with caution. There is a considerable amount of estimation involved in producing these figures and they have not been subjected to the rigorous quality assurance processes involved in compiling the UK SUT, such as those required for manual balancing adjustments. Without such additional work initial results could potentially be misleading.

The SUT information has been made available to an expert group of users including academics, economic commentators and consultants for their detailed consideration. The minutes of these meetings can be found at our [user consultation and information webpage](#).

It was the view of the expert user group that the development of the NI SUTs has still some way to go before it would be appropriate to publish any estimates. NISRA have accepted this recommendation.

The process of compiling a trial balance for Northern Ireland has helped to identify several data sources that can be used to populate parts of the table. It has also identified areas of weakness, including in particular:

- The product split for intermediate consumption;
- International trade in services, particularly imports;
- Trade with Great Britain;
- Measures of the output of the financial and insurance sectors, and consumption of their primary products;
- Estimates of household final consumption from the Living Costs and Food Survey; and
- Inputs and outputs of the charitable sector.

The intermediate consumption matrix is a key part of the accounts. Historically, information on purchases of goods and services has been obtained from the Purchases Inquiry, but the most recent of these was run several years ago and there is no firm date for the next one. Errors in the apportionment of products can have a significant impact on the product balance. This is less of an issue for the Supply matrix because most industries mainly produce their primary products, and there is a good source for output by industry in the shape of the Annual Business Inquiry. However, there is a much greater spread of products used as inputs to the production process.

It is recommended that NISRA give consideration to undertaking a Northern Ireland version of the Purchases Inquiry at the same time as the new ONS survey.

The international trade in services survey (ITIS) has been used to provide estimates for exports of services (although without a geographical split) in the trial balance. It should also be able to provide some results for imports.

NISRA has integrated the Manufacturing Sales and Exports Survey with the ABI, which now collects the aggregate value of exports (including trade with Great Britain) for goods and services separately, with a geographical split. It also now collects similar data (but not for trade with Great Britain) for imports. The methodology for analysis of this data is still in development and it is hoped that exports results will be available by Spring 2014. This would be a useful step forward. Information on imports from Great Britain would be of more use still and it is understood NISRA is planning to incorporate such questions in the Annual Business Inquiry (ABI) for survey reference year 2013. However, any new data collection such as the Purchases Inquiry or ABI would involve compliance costs, and these need to be taken into account, as would the set up and maintenance costs involved with validating and processing any additional questions.

The current estimates of household final consumption are based on three year averages from the Northern Ireland element of the Living Costs and Food Survey. Development of the Supply Use Tables would benefit from an increased Northern Ireland sample size from 2015 onwards, should resources allow.

Charities make up the largest element of the NPISH sector, but there is little information readily available regarding their costs (wages; purchases of goods and services; capital expenditure; depreciation) for the different types of services they provide. The Charities Commission for Northern Ireland or the Northern Ireland Council for Voluntary Action may be able to help with this.

## 4.2 Next Steps

NISRA are continuing to work with ONS to develop this project and to address identified weaknesses. This includes:

- Taking on board the views of users;
- Identifying priorities and seeking resources;
- Include new 'Exports' and 'Imports' data available from the ABI;
- Collect GB 'Imports' data (potentially through new ABI questions);
- Consider the possibility of conducting a purchases inquiry for NI and increasing the sample size for the Living Costs and Food survey;
- Address other data gaps identified e.g. in the Financial Sector / NGO / Charitable Sectors;
- Build expertise within NISRA and update Tables for 2011, incorporating new data which come available.

In order to continue to develop the project we welcome any comments or feedback from users regarding any elements of this project. Comments can be provided to NISRA at the following email address: [chris.ganley@dfpni.gov.uk](mailto:chris.ganley@dfpni.gov.uk)