

### Development of Supply & Use Satellite Accounts for Extra-Regio Economic Activities

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#### Overview

This paper describes work to produce the first estimates of Scottish trade which fully factor in North Sea oil and gas and the supply chain links between the offshore and onshore economies.

Provisional experimental results are included in this paper based on the new estimation framework and a range of illustrative data models. There are outstanding data gaps which lead to uncertainty in these results. The next phase of this project, which will be undertaken over the next six months, will identify data sources to fill these gaps and enable more certain estimates to be produced in future years, and, where possible, for past years as well.

#### Introduction

At the present time, many economic statistics for Scotland, including Scottish trade statistics and GDP, relate to Scotland's land-based activity only. The boundary of Scotland is taken at the shoreline and the statistics exclude any share of activities in the offshore and overseas economic territories of the United Kingdom. This is often referred to as the Scottish "onshore" economy. All residents of Scotland reside in this onshore territory.

Some statistics are also produced by the Scottish Government and other UK Government departments which include illustrative shares of UK offshore and overseas activity estimated for Scotland. This includes Government Expenditure and Revenue Scotland (GERS). These statistics extend the boundary of Scotland beyond the shoreline and relate to the wider economic territory. This wider economic territory, referred to in this report as the whole of Scotland's economic territory for short, includes Scottish adjacent waters and the underlying continental shelf, plus an illustrative population share of UK overseas enclaves. In practice, the additional economic activities to be included in the whole of Scotland approach are offshore oil and gas extraction in and around the North Sea, and overseas public administration and defence activities such as activities of embassies. The developments in this paper only relate to the activities in the North Sea. Future developments will extend the whole of Scotland approach to include the population share of overseas government activities.

The Scottish Economic Statistics Plan for 2017-18<sup>1</sup> includes a Special Project to extend the range of statistics produced for the whole of Scotland's economic territory to include trade statistics for the first time. This paper sets out the proposed methodology used to provide these statistics and presents initial results.

This paper describes work on a new approach to estimating offshore oil and gas activity using methods consistent with the onshore national accounts. The methods developed for this approach result in the first estimates of Scottish trade which fully factor in North Sea oil and gas and the

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<sup>1</sup> <http://www.gov.scot/Topics/Statistics/Browse/Economy/ScotStat/Planning/SESP-2017-18>

supply chain links between the offshore and onshore parts of the economy. Provisional results are included in this paper based on the new estimation framework and a range of illustrative data models. There are outstanding data gaps which lead to some uncertainty in these results. The next phase of this project will identify data sources to fill these gaps and enable more certain estimates to be produced in future years, and, where possible, for past years as well.

All results in this paper are designated as **experimental statistics**. These are defined as new official statistics undergoing development and testing. The methods, data sources and results in this paper are open for ongoing consultation with users, and we welcome feedback on all aspects of the release. All users should be aware that **the results in this paper are provisional and will be revised and updated** when further developments are made. They should therefore be used with appropriate caution at this time.

We welcome any thoughts or views on this analysis.

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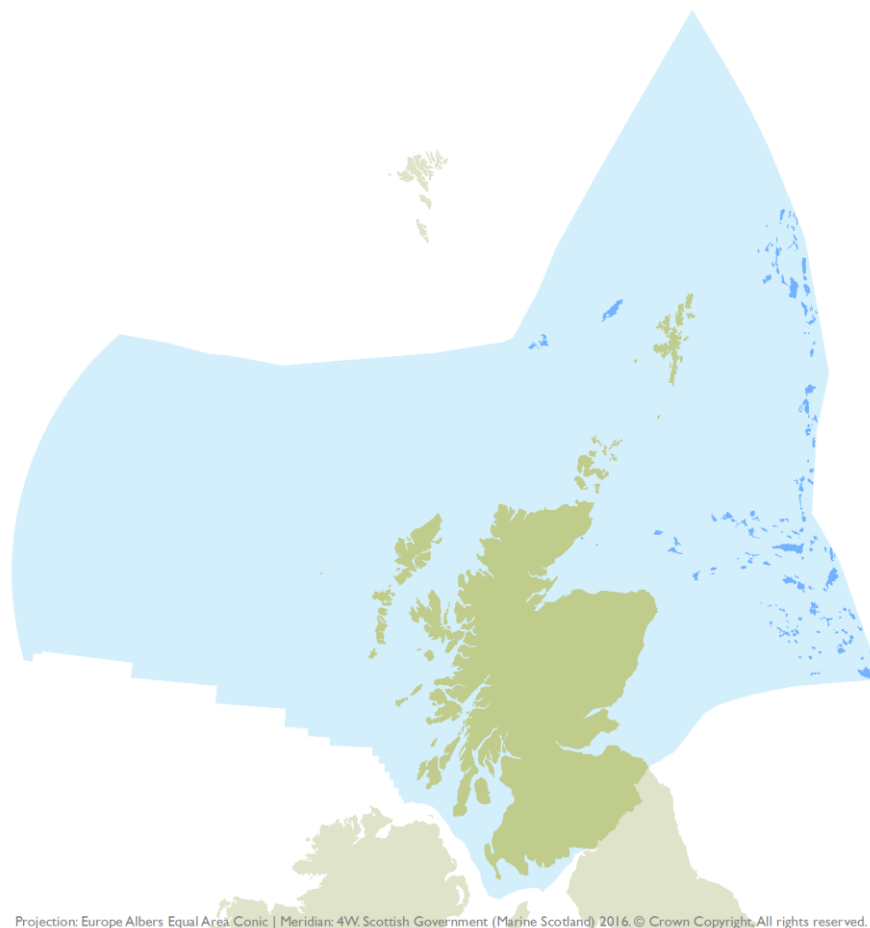
## Background

### The development of economic statistics for Scotland

Historically, economic statistics produced by the government in Scotland (both pre- and post-devolution) were developed to be consistent with, or to expand upon, the information available in the Regional Accounts produced by ONS. As such, they related to onshore activity only, while all offshore oil and gas extraction was treated as a separate activity not associated with any region of the UK.

This territorial concept of Scotland results in all UK offshore activity being treated as part of the rest of the UK (RUK), and all transactions between onshore Scottish units and offshore operators being counted as external transactions (otherwise known as trade). This means that sales from Scottish companies to offshore operators are classified as Scottish exports to RUK, whilst oil produced in the Scottish North Sea and landed in Scotland is considered to be an import from RUK.

**Figure 1: Oil and Gas Fields in Scottish Adjacent Waters**



### Statistics for the whole of Scotland, not just onshore

In more recent years, some economic statistics for Scotland have been produced using a wider territorial concept for Scotland which includes an illustrative geographical share of North Sea oil and gas production. These are explained in more detail below. Of increasing interest has been the need to better understand the overall trade position of Scotland, and to better understand the links between the oil and gas industry and its onshore supply chain. This project further advances the development of economic statistics for Scotland to include activities within this wider economic territory.

All estimates in this paper are based on the Scottish Adjacent Waters boundary (Figure 1), which was established in 1999 for the devolution of offshore marine policy and follows the equidistant (median) lines between Scotland, England and Northern Ireland. The use of this boundary has been adopted by the Scottish Government, HMRC and ONS in the production of some economic, trade and public sector finance statistics for Scotland.

In the remainder of this paper the term Scottish waters will be used to refer to the area within the adjacent waters boundary, and Scotland will refer to the area including Scottish waters, with references to offshore and onshore activity noted as such.

National accounts statistics for the onshore Scottish economy are comprehensive and balanced. This means that they cover all three aspects of Gross Domestic Product (GDP), and the components of these are internally consistent (figure 2). To date, only the Income measure of GDP for the wider economic territory of Scotland has been produced in a national accounts framework. Other statistics have been developed which cover Production and Expenditure components, however these have not previously been produced in a comprehensive and balanced way.

**Figure 2: components of GDP previously available for different territorial concepts**

|   | <b>Production</b><br>Output, Intermediate<br>Consumption | <b>Income</b><br>COE, GOS | <b>Expenditure</b><br>C + G + I + (exp – imp) |
|---|--|---------------------------|---|
| “onshore”: Scotland excluding any share of UK Extra-regio   | ✓  | ✓                         | ✓   |
| “Wider economic territory”: Scotland including an illustrative geographical share of UK Extra-regio | ✓  | ✓                         | ✓   |

Balanced Components

Unbalanced Components

## Objectives

The principal aim of this project is to develop the statistical framework and methods for extending Scotland’s national accounts to include offshore oil and gas extraction activities. Provisional estimates produced using this framework are constrained to the onshore national accounts produced by the Scottish Government, and to estimates of UK oil and gas activity produced by ONS. Specific objectives are:

- To produce balanced estimates of GDP and its components using all three approaches: production, income and expenditure. Current estimates of GVA in Quarterly National Accounts Scotland are based solely on the income approach (Figure 2).
- To produce estimates of exports of oil and gas produced in Scotland which are consistent with the balanced GDP statistics.
- To produce estimates of the supply chain links between the onshore Scottish economy and oil and gas producers.

## Producing an Oil and Gas Industry Satellite Account

To ensure that statistics developed for the whole of Scotland economic accounts project are consistent with the established onshore statistics, the selected approach is to use a supply and use framework to develop a set of annual satellite accounts (i.e. extensions to the onshore national accounts).

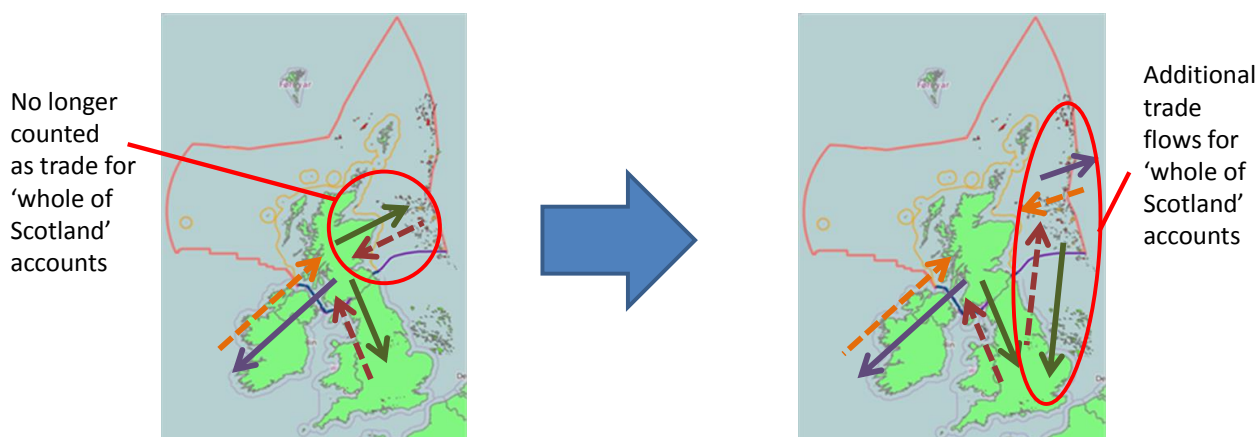
### Adapting the definitions for Scotland's trade statistics

As previously explained, Scottish Government trade figures currently relate to Scotland's onshore economic activity. Under this approach, sales of goods and services by Scottish-based companies to the oil and gas producers in Scottish Waters are defined as exports to RUK. Likewise, onshore purchases of oil and gas produced in Scottish waters are defined as imports from RUK. International exports of oil and gas from the North Sea are treated as exports from RUK and therefore are not included in the statistics for Scotland at all.

Until now, the range of statistics which include offshore activity has not included comprehensive estimates of total exports or imports. The production of such statistics represents a fundamental change to the way that trade flows for Scotland are considered. This has been identified as an important addition to Scotland's economic statistics.

Figure 3 summarises the flows estimated in in the current onshore trade statistics for Scotland, and the adaptations – in terms of additions and subtractions – needed to produce new estimates of trade for Scotland's wider economic territory.

**Figure 3: Adapted trade flows required for whole of Scotland approach**



The left hand side of Figure 3 shows the trade flows that are currently estimated in published export and import figures for the onshore Scottish economy. Exports of goods and services are represented by the solid arrows and imports by the dashed arrows. From the perspective of the onshore economy, all parts of the rest of the UK, including Scottish waters, are considered external. This means that transactions such as the sale of mining support services from companies in Scotland to offshore platforms are counted as exports to RUK, rather than internal sales within Scotland.

The right hand side of Figure 3 shows the trade flows that are required for estimates using the whole of Scotland approach. These include a range of additional flows into and out of Scottish Waters, and also need to remove transactions between the onshore and offshore parts of Scotland. Specifically, to introduce this new methodology, estimates are required for:

- The value of sales of goods and services from onshore Scotland to oil and gas producers in the Scottish North Sea, and sales of oil and gas from the Scottish North Sea to onshore Scottish buyers, as these are no longer counted as exports to or imports from RUK;

- Direct exports of crude oil and gas from the Scottish North Sea to RUK and ROW, which are not currently counted as exports from Scotland;
- Flows of goods and services from RUK and ROW to the Scottish North Sea, which are not currently counted as imports to Scotland.

These flows can all be estimated or modelled within a Supply and Use satellite account for the offshore oil and gas industry.

### **Overview of the supply and use modelling approach**

The oil and gas satellite account is produced using a similar procedure to the onshore supply and use tables for Scotland. The process is simplified by considering only one industry in addition to the 111 detailed onshore industries. However the supply and use of products for and by this industry spans across all 111 detailed products included in the onshore supply and use tables, which requires careful balancing of the accounts.

All estimates are currently based on the UK supply and use tables and regional accounts statistics consistent with Blue Book 2016, for years 1998-2014, with provisional (unbalanced) results for 2015 and 2016 based on trends in oil and gas production and exports. Scottish Supply and Use tables for 1998-2014 are likewise produced using data from Blue Book 2016.

The first stage is to estimate the industry supply and use columns for the offshore oil and gas industry. This generates estimates for gross value added and its income components, as well as output and intermediate consumption broken down by detailed products. A similar procedure is followed for Gross Fixed Capital Formation (GFCF). The second stage of the satellite account modelling process is to estimate the supply chain flows required to meet the offshore demand for intermediate and capital goods, and to ensure that the output of the industry balances with export and onshore demand for oil and gas.

Due to the relatively high uncertainties involved in second stage of the satellite account at this time, a range of underlying assumptions and parameters have been established during the modelling process. These can be updated in the future if more detailed data are identified. Further information on the satellite account production process is included in **Annex C**.

### **Oil and Gas Commodity Balances and Trade**

Estimates of exports of oil and gas to the rest of the world are derived from the Regional Trade Statistics (RTS) produced by HMRC. Within these statistics, exports of oil directly shipped from platforms in Scottish waters are allocated to Scotland. Other exports from Scotland include oil which is initially exported to RUK and then subsequently re-exported to overseas. RTS statistics are based on UK overseas trade statistics, and are broadly consistent with UK exports in the balance of payments and national accounts produced by ONS.

### **Oil and Gas Supply Chain Adjustments**

There is a shortage of data on the supply chain of goods and services supplied to the offshore industry. The analysis below therefore adopts three different scenarios based on different assumptions about the degrees of supply chain specialisation in the onshore Scottish economy.

Further research and engagement with industry stakeholders is required to produce more certain estimates of how much of the supply chain is in Scotland, RUK and overseas, and how this changes over time. These estimates will be updated in future releases. At the present time, a central modelled estimate is based on several data sources to apply different levels of specialisation for goods and services such as engineering services, machinery manufacture, construction, transport services, and fabricated metal products. Further information on the alternative scenarios is included in Annex C.

## Key data sources and model parameters

The main data sources and methods used in the production of the satellite account are listed below for each component of the supply and use tables. This summarises the modelling approaches employed, along with any key assumptions or parameters.

| Supply and Use Component  | Summary of modelling approach   |
|---|---|
| Gross Operating Surplus (GOS)                                   | Direct apportionment of ONS GOS for extra-regio for Section B, Mining & Quarrying. Scottish shares are estimated using approx. GOS (income minus operating costs) from Oil & Gas Production Statistics <sup>2</sup>   |
| Compensation of Employment (COE)                                | Direct apportionment of ONS COE for extra-regio for Section B, Mining & Quarrying. Scottish shares are estimated using approx.. COE (income minus GOS and operating costs) from Oil & Gas Production Statistics   |
| Gross Value Added (GVA)   | Constrained to income components, sum of GOS and COE  |
| Intermediate Consumption by 111 products                        | Adjusted apportionment of UK Use Table intermediate consumption for Industry 06. Scottish shares are estimated using operating costs from Oil & Gas Production Statistics, and adjusted during balancing to constrain with final output estimates and GVA(income)   |
| Output by 111 products  | Adjusted apportionment of UK Supply Table output for Industry 06. Initial Scottish shares are estimated using income from Oil & Gas Production Statistics. Any off-diagonal output (i.e. other than oil & gas) which exceeds Intermediate Consumption or GFCF within the industry is subtracted from total output, and Intermediate Consumption adjusted to remain balanced. Output of oil and gas itself is adjusted to meet external demand from exports and onshore use, leading to further balancing adjustments in Intermediate Consumption  |
| Gross Fixed Capital Formation (GFCF) by 111 products            | Direct apportionment of UK GFCF Use Table for Industry 06. Scottish shares are estimated using capital expenditure from Oil & Gas Production statistics   |
| ROW Exports of oil and gas from Scottish Waters                 | Direct estimate derived from HMRC Regional Trade Statistics for SITC 33 (petroleum and petroleum products). Data for value allocated to Scotland by location of rig is supplemented by approx. 50% of value allocated by trader employment/location based on proportion of freight cargo shipped from Scotland split between crude and refined petroleum. RTS data are available from 2013-2016. Previous trends are extrapolated using data for UK total crude oil exports from HMRC OTS. Exports of gas to the Republic of Ireland are from onshore.  |
| RUK Exports of oil and gas from Scottish Waters                 | Sum of direct estimates of oil and gas transported by pipeline to terminals in England and indirect estimates of oil and gas shipped to or traded by companies in RUK. Total RUK exports are constrained to total production minus ROW exports and demand from onshore Scotland detailed in onshore Use Tables.   |
| Offshore supply chain imports from ROW by 111 products          | Modelled estimate of the proportion of offshore demand for intermediate and capital demand. Estimates based on average UK import propensity for each product  |
| Offshore supply chain imports from Scotland/RUK By 111 products | Modelled estimates of the proportion of offshore demand not sourced from ROW. Three illustrative scenarios have been modelled:<br><u>Low supply chain specialisation</u> in Scotland: the share of supply chain activity in Scotland based on the proportion of each product supplied from Scotland (Supply tables)<br><u>Mid supply chain specialisation</u> in Scotland: more detailed shares are used for some products, based on appropriate data sources which provide more detail than Supply Tables<br><u>High supply chain specialisation</u> in Scotland: the share of all UK sourced products is set at 41%, the share of indirect oil and gas employment reported by Oil and Gas UK. |

<sup>2</sup> <http://www.gov.scot/Topics/Statistics/Browse/Economy/oilgas>



## Provisional Results (Experimental Statistics)

### Key Results Summary

All results are designated as **experimental statistics**. Users should be aware that **the results in this paper are provisional and will be revised and updated** when further developments are made. They should therefore be used with appropriate caution at this time.

- Balanced estimates of Scotland's offshore gross value added (GVA) and the supply and use of goods and services by the oil and gas industry have been produced for the first time. Results span the period 1998-2014, with provisional estimates included for 2015 and 2016.
- The expenditure components of Gross Domestic Product (GDP) for the whole of Scotland's economy, not just onshore, are summarised in Table 1 below.
- In 2014, the latest balanced year, exports of oil and gas are estimated at £20.3 billion. Of this, £9.6 billion was directly to the rest of the world, and £10.7 billion to the rest of the UK. Some exports to RUK will be subsequently re-exported to the rest of the world.
- In 2014, the supply chain links between the onshore and offshore parts of the Scottish economy are estimated to be have been worth £4.5 billion. That is, £4.5 billion of the £47.1 billion exports to RUK in the onshore national accounts is estimated to be sales to producers in Scottish Waters.
- Scotland's total exports, including oil and gas, are estimated to have been £91.4 billion in 2014. Provisional estimates for more recent years are £87.2 billion in 2015 and £87.5 billion in 2016, following the oil price fall in 2014.
- In 2014, Oil and Gas producers in Scottish waters are estimated to have imported £12.4 billion of intermediate and capital goods and services. Of this, £3.0 billion is estimated to come from ROW and £9.4 billion from RUK.
- Scotland's total imports are estimated to have been £97.0 billion in 2014. Provisional estimates for more recent years are £93.7 billion in 2015 and £94.9 billion in 2016, following the reduction in offshore capital investment after 2014.

**Table 1: Gross Domestic Product by category of expenditure, including offshore Scotland**

£ million

| Year              | Domestic final expenditure on goods and services |   |                    |                                 |                                  |                                       | Trade in goods and services |               |                                       |                  |               | Gross Domestic Product <sup>3</sup> |
|-------------------|--|---|--------------------|---------------------------------|----------------------------------|---------------------------------------|-----------------------------|---------------|---------------------------------------|------------------|---------------|-------------------------------------|
|                   | Final Consumption Expenditure                    |   |                    |                                 |                                  |                                       | ADJUSTED                    |               |                                       |                  |               |                                     |
|                   | Households                                       | Non-Profit Institutions Serving Households (NPSH) | General Government | ONSHORE Gross Capital Formation | OFFSHORE Gross Capital Formation | ADJUSTED ONSHORE <sup>1</sup> Exports | OFFSHORE Exports            | TOTAL Exports | ADJUSTED ONSHORE <sup>2</sup> Imports | OFFSHORE Imports | TOTAL Imports |                                     |
| 1998              | 49,347   | 1,339   | 16,996             | 14,947                          | 738                              | 40,696                                | 7,647                       | 48,343        | 44,190                                | 1,373            | 45,563        | 86,148                              |
| 1999              | 51,531   | 1,450   | 18,110             | 14,307                          | 478                              | 41,443                                | 10,822                      | 52,265        | 46,967                                | 2,030            | 48,997        | 89,143                              |
| 2000              | 54,328   | 1,534   | 19,456             | 15,673                          | 328                              | 44,078                                | 16,385                      | 60,463        | 51,176                                | 1,970            | 53,145        | 98,636                              |
| 2001              | 56,283   | 1,642   | 21,312             | 15,177                          | 533                              | 43,822                                | 15,591                      | 59,413        | 51,022                                | 2,802            | 53,824        | 100,534                             |
| 2002              | 58,938   | 1,874   | 22,741             | 15,736                          | 3,793                            | 43,844                                | 15,222                      | 59,066        | 52,914                                | 4,994            | 57,908        | 104,240                             |
| 2003              | 62,376   | 1,941   | 24,219             | 15,731                          | 3,245                            | 47,006                                | 14,574                      | 61,580        | 54,411                                | 4,589            | 59,000        | 110,093                             |
| 2004              | 65,355   | 2,091   | 26,057             | 16,509                          | 3,074                            | 50,227                                | 14,753                      | 64,980        | 56,829                                | 4,452            | 61,281        | 116,783                             |
| 2005              | 69,654   | 2,134   | 28,099             | 18,443                          | 4,442                            | 50,114                                | 18,703                      | 68,817        | 59,658                                | 5,989            | 65,647        | 125,944                             |
| 2006              | 74,461   | 2,323   | 29,286             | 20,550                          | 4,293                            | 52,545                                | 21,204                      | 73,748        | 62,096                                | 5,974            | 68,070        | 136,592                             |
| 2007              | 77,111   | 2,592   | 30,036             | 22,245                          | 4,556                            | 57,607                                | 19,005                      | 76,612        | 66,707                                | 4,624            | 71,331        | 141,820                             |
| 2008              | 79,356   | 2,969   | 31,050             | 20,284                          | 4,326                            | 58,724                                | 28,255                      | 86,979        | 67,878                                | 8,553            | 76,432        | 148,533                             |
| 2009              | 78,202   | 2,973   | 30,976             | 18,665                          | 3,958                            | 61,989                                | 17,954                      | 79,943        | 67,617                                | 5,187            | 72,804        | 141,912                             |
| 2010              | 78,558   | 2,944   | 31,355             | 19,999                          | 4,836                            | 60,245                                | 23,466                      | 83,710        | 68,611                                | 7,818            | 76,430        | 144,974                             |
| 2011              | 80,489   | 3,290   | 32,344             | 21,166                          | 6,940                            | 63,136                                | 24,626                      | 87,762        | 70,759                                | 10,955           | 81,714        | 150,276                             |
| 2012              | 83,514   | 3,217   | 32,285             | 20,841                          | 7,313                            | 62,214                                | 24,898                      | 87,112        | 74,689                                | 11,300           | 85,989        | 148,292                             |
| 2013              | 88,470   | 3,681   | 31,665             | 23,028                          | 10,315                           | 66,901                                | 23,377                      | 90,278        | 80,310                                | 13,011           | 93,321        | 154,114                             |
| 2014              | 90,261   | 3,546   | 33,440             | 25,533                          | 11,108                           | 71,099                                | 20,307                      | 91,406        | 84,615                                | 12,415           | 97,030        | 158,265                             |
| 2015 <sup>p</sup> | 91,511   | 3,545   | 33,690             | 26,635                          | 8,394                            | 72,535                                | 14,636                      | 87,170        | 85,332                                | 8,413            | 93,744        | 157,201                             |
| 2016 <sup>p</sup> | 95,254   | 3,571   | 34,549             | 27,267                          | 6,575                            | 74,135                                | 13,343                      | 87,479        | 88,212                                | 6,680            | 94,892        | 159,803                             |

<sup>p</sup>: provisional, unbalanced estimate

1. QNAS onshore exports /less supply chain sales to Scottish waters

2. QNAS onshore imports /less oil and gas purchases from Scottish waters

3. GDP does not include a population share of Public Admin & Defence extra-regio activity

## Gross Value Added (GVA)

Table 2 displays the balanced estimates of offshore gross value added (GVA) and its components of production and income. Provisional results for 2015 and 2016 are based on results in the latest Quarterly National Accounts Scotland (QNAS). Figure 4 charts these components over time.

**Table 2: Offshore Gross Value Added (GVA)**

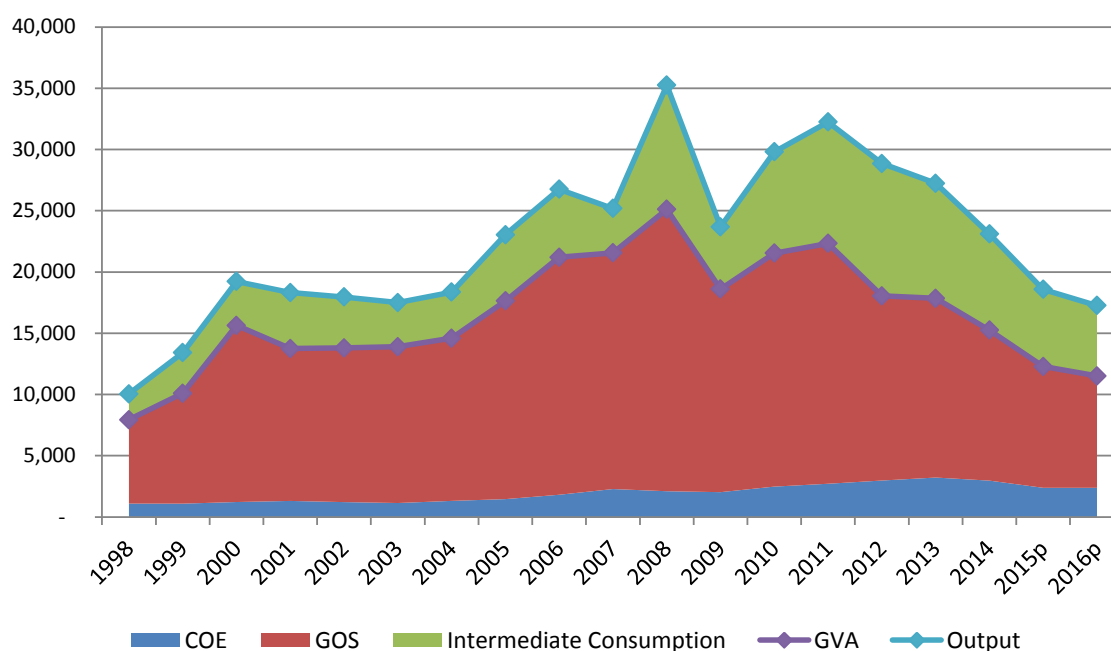
£ million

| Year              | GVA (Income Approach)            |                               | GVA (Production Approach) |                               | Gross Value Added (GVA) <sup>1</sup> |
|-------------------|----------------------------------|-------------------------------|---------------------------|-------------------------------|--------------------------------------|
|                   | Compensation of employment (COE) | Gross Operating Surplus (GOS) | Output                    | less Intermediate Consumption |                                      |
| 1998              | 1,091                            | 6,845                         | 10,045                    | 2,109                         | 7,936                                |
| 1999              | 1,087                            | 9,006                         | 13,418                    | 3,325                         | 10,093                               |
| 2000              | 1,221                            | 14,415                        | 19,222                    | 3,587                         | 15,635                               |
| 2001              | 1,309                            | 12,439                        | 18,325                    | 4,577                         | 13,748                               |
| 2002              | 1,213                            | 12,582                        | 17,963                    | 4,168                         | 13,795                               |
| 2003              | 1,139                            | 12,755                        | 17,505                    | 3,611                         | 13,894                               |
| 2004              | 1,312                            | 13,285                        | 18,360                    | 3,763                         | 14,597                               |
| 2005              | 1,458                            | 16,175                        | 23,040                    | 5,407                         | 17,633                               |
| 2006              | 1,814                            | 19,393                        | 26,758                    | 5,551                         | 21,207                               |
| 2007              | 2,279                            | 19,279                        | 25,183                    | 3,625                         | 21,558                               |
| 2008              | 2,102                            | 23,013                        | 35,256                    | 10,142                        | 25,115                               |
| 2009              | 2,025                            | 16,574                        | 23,689                    | 5,091                         | 18,599                               |
| 2010              | 2,479                            | 19,053                        | 29,815                    | 8,284                         | 21,531                               |
| 2011              | 2,712                            | 19,619                        | 32,246                    | 9,915                         | 22,331                               |
| 2012              | 2,974                            | 15,074                        | 28,859                    | 10,810                        | 18,048                               |
| 2013              | 3,218                            | 14,631                        | 27,240                    | 9,391                         | 17,849                               |
| 2014              | 2,967                            | 12,285                        | 23,100                    | 7,848                         | 15,252                               |
| 2015 <sup>p</sup> | 2,380                            | 9,903                         | 18,580                    | 6,296                         | 12,284                               |
| 2016 <sup>p</sup> | 2,174                            | 9,335                         | 17,257                    | 5,749                         | 11,508                               |

p: provisional, unbalanced estimate

1. Balanced GVA in this release is not constrained to the results in QNAS (Table E) based on production revenue shares of Income Components

**Figure 4. Offshore GVA and Output (£ million)**



## Exports of oil and gas from Scottish Waters

The oil and gas commodity balances demonstrate that the majority of oil and gas produced in Scotland is exported. In 2014, the latest balanced year, exports of oil and gas are estimated at £20.3 billion. Of this, £9.6 billion was directly to the rest of the world, and £10.7 billion to the rest of the UK. Some exports to RUK will be subsequently re-exported to the rest of the world. The value of exports has decreased in recent years due to the lower oil and gas prices experienced since 2014.

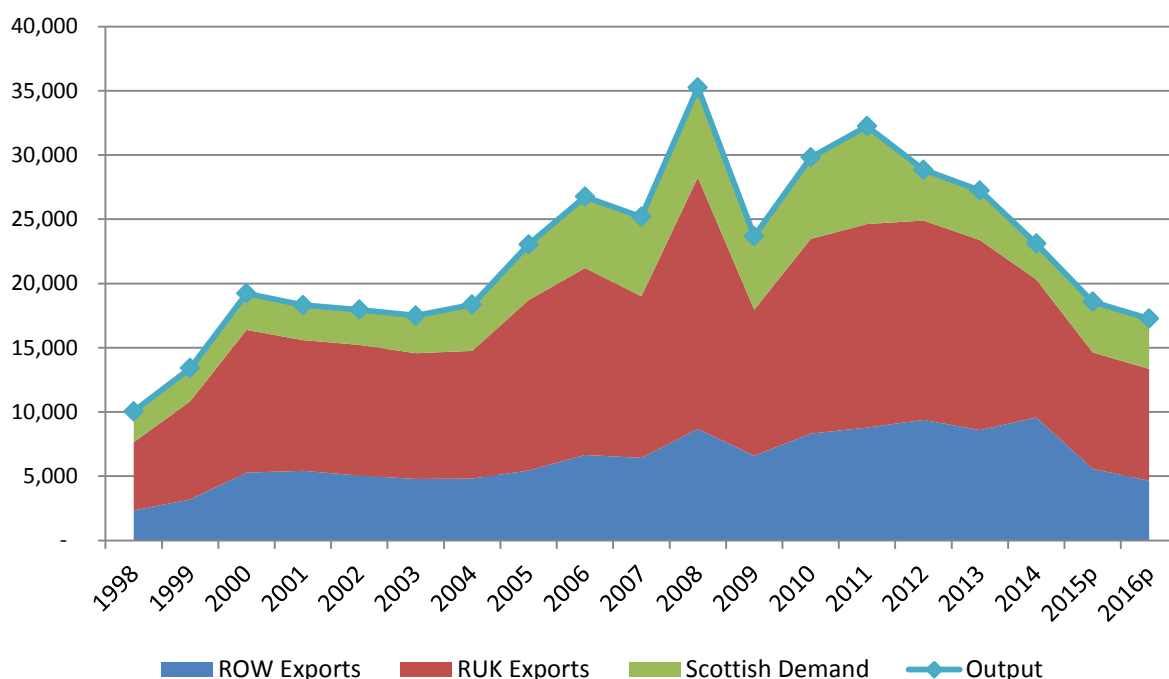
Table 3 displays estimates of exports between 1998 and 2016 derived from HMRC Regional Trade Statistics and the Scottish Government oil and gas commodity balances. Figure 5 charts these trends over time.

**Table 3: Offshore Exports to RUK and ROW**

£ million

| Year  | Exports to RUK | Exports to ROW | Total Exports |
|-------|----------------|----------------|---------------|
| 1998  | 5,312          | 2,335          | 7,647         |
| 1999  | 7,631          | 3,191          | 10,822        |
| 2000  | 11,107         | 5,278          | 16,385        |
| 2001  | 10,172         | 5,419          | 15,591        |
| 2002  | 10,171         | 5,050          | 15,222        |
| 2003  | 9,787          | 4,787          | 14,574        |
| 2004  | 9,940          | 4,813          | 14,753        |
| 2005  | 13,261         | 5,442          | 18,703        |
| 2006  | 14,549         | 6,654          | 21,204        |
| 2007  | 12,581         | 6,424          | 19,005        |
| 2008  | 19,576         | 8,679          | 28,255        |
| 2009  | 11,364         | 6,590          | 17,954        |
| 2010  | 15,153         | 8,312          | 23,466        |
| 2011  | 15,840         | 8,786          | 24,626        |
| 2012  | 15,515         | 9,383          | 24,898        |
| 2013  | 14,788         | 8,590          | 23,377        |
| 2014  | 10,739         | 9,569          | 20,307        |
| 2015p | 9,070          | 5,566          | 14,636        |
| 2016p | 8,693          | 4,650          | 13,343        |

**Figure 5. Offshore Supply and Exports (£ million)**



## Trade links between the onshore and offshore economy

Estimates of the supply chain links between the onshore and offshore parts of the Scottish economy in the satellite accounts are particularly uncertain at this time, due to a lack of detailed data on the structure of the oil and gas supply chain. To illustrate the sensitivity of the analysis to the parameters chosen, three illustrative scenarios have been modelled representing different degrees of Scottish specialisation in the supply chain. Note that while the choice of scenario does change the total value of exports estimated for Scotland, there is an equal and opposite effect to the estimated value of imports. This means that there is no net difference between the three scenarios. In 2014, supply chain links between the onshore and offshore parts of the Scottish economy are estimated to be have been worth £4.5 billion under the middle scenario.

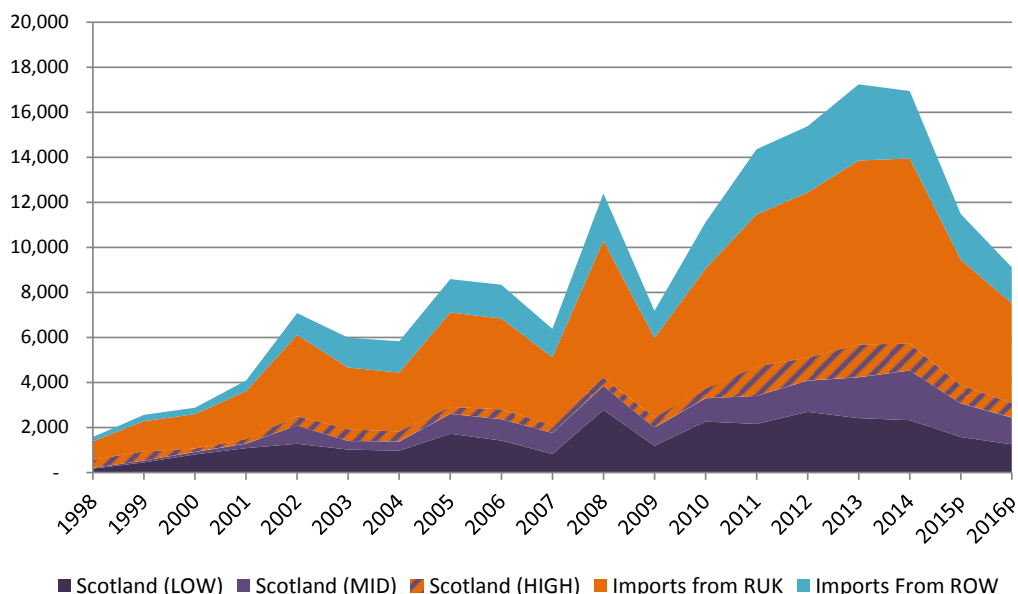
Table 4 displays estimates of the three modelled supply chain scenarios for imports from ROW and RUK and sales from onshore Scotland. Figure 6 charts these trends over time.

**Table 4: Modelled estimates of supply chain demand intermediate and capital goods and services**  
£ million

| Year              | Low Specialisation Scenario |                  |                  | Mid Specialisation Scenario |                  |                  | High Specialisation Scenario |                  |                  |
|-------------------|-----------------------------|------------------|------------------|-----------------------------|------------------|------------------|------------------------------|------------------|------------------|
|                   | Sales from Scotland         | Imports from RUK | Imports From ROW | Sales from Scotland         | Imports from RUK | Imports From ROW | Sales from Scotland          | Imports from RUK | Imports From ROW |
| 1998              | 171                         | 1,208            | 198              | 203                         | 1,175            | 198              | 565                          | 813              | 198              |
| 1999              | 447                         | 1,831            | 280              | 528                         | 1,750            | 280              | 934                          | 1,344            | 280              |
| 2000              | 801                         | 1,790            | 285              | 906                         | 1,684            | 285              | 1,062                        | 1,529            | 285              |
| 2001              | 1,080                       | 2,529            | 474              | 1,281                       | 2,328            | 474              | 1,480                        | 2,129            | 474              |
| 2002              | 1,274                       | 4,831            | 972              | 2,083                       | 4,023            | 972              | 2,503                        | 3,602            | 972              |
| 2003              | 1,016                       | 3,643            | 1,325            | 1,395                       | 3,264            | 1,325            | 1,910                        | 2,749            | 1,325            |
| 2004              | 967                         | 3,467            | 1,394            | 1,376                       | 3,058            | 1,394            | 1,818                        | 2,616            | 1,394            |
| 2005              | 1,717                       | 5,388            | 1,482            | 2,599                       | 4,506            | 1,482            | 2,913                        | 4,192            | 1,482            |
| 2006              | 1,418                       | 5,418            | 1,501            | 2,362                       | 4,473            | 1,501            | 2,803                        | 4,033            | 1,501            |
| 2007              | 822                         | 4,291            | 1,264            | 1,753                       | 3,360            | 1,264            | 2,096                        | 3,017            | 1,264            |
| 2008              | 2,775                       | 7,514            | 2,105            | 3,840                       | 6,449            | 2,105            | 4,219                        | 6,071            | 2,105            |
| 2009              | 1,188                       | 4,780            | 1,210            | 1,990                       | 3,978            | 1,210            | 2,447                        | 3,521            | 1,210            |
| 2010              | 2,258                       | 6,796            | 2,057            | 3,293                       | 5,761            | 2,057            | 3,712                        | 5,342            | 2,057            |
| 2011              | 2,156                       | 9,300            | 2,898            | 3,398                       | 8,058            | 2,898            | 4,697                        | 6,759            | 2,898            |
| 2012              | 2,691                       | 9,744            | 2,940            | 4,075                       | 8,360            | 2,940            | 5,098                        | 7,337            | 2,940            |
| 2013              | 2,413                       | 11,440           | 3,384            | 4,225                       | 9,628            | 3,384            | 5,680                        | 8,173            | 3,384            |
| 2014              | 2,321                       | 11,623           | 2,996            | 4,525                       | 9,420            | 2,996            | 5,717                        | 8,227            | 2,996            |
| 2015 <sub>p</sub> | 1,573                       | 7,876            | 2,030            | 3,066                       | 6,383            | 2,030            | 3,874                        | 5,575            | 2,030            |
| 2016 <sub>p</sub> | 1,249                       | 6,254            | 1,612            | 2,435                       | 5,068            | 1,612            | 3,076                        | 4,427            | 1,612            |

p: provisional, unbalanced estimate

**Figure 6. Demand for Intermediate and Capital Goods and Services (£ million)**



## Whole of Scotland Exports and Imports

Combining the results of the satellite account with the onshore national accounts gives estimates of total exports and imports for the whole of Scotland economic territory, as described on page 6.

In 2014, Scotland's total exports, including oil and gas, are estimated to have been £91.4 billion. Provisional estimates for more recent years are £87.2 billion in 2015 and £87.5 billion in 2016, following the oil price fall in 2014. Using the same modelled scenario for supply chain demand, Scotland's total imports are estimated to have been £97.0 billion in 2014. Provisional estimates for more recent years are £93.7 billion in 2015 and £94.9 billion in 2016, following the reduction in offshore capital investment after 2014.

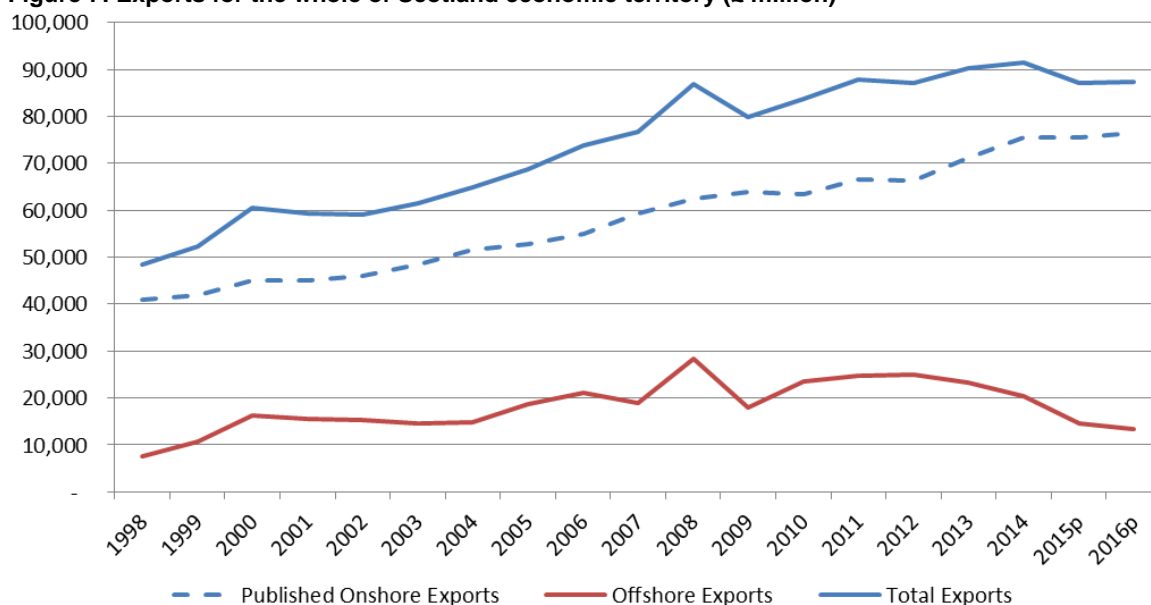
Table 5 displays the adjustments applied to move from the onshore territorial concept to the whole of Scotland approach. Figure 7 charts these trends over time.

**Table 5: Exports and Imports for the whole of Scotland economic territory**

£ million

| Year  | Exports of goods and services                   |   |  |                                 |               |                                | Imports of goods and services                     |   |                                   |               |  |                                |
|-------|---|---|--|---------------------------------|---------------|--------------------------------|---|---|-----------------------------------|---------------|--|--------------------------------|
|       | ONSHORE Exports                                 |   |  | OFFSHORE Exports to RUK and ROW | TOTAL Exports | ONSHORE Imports                |   |   | OFFSHORE Imports from RUK and ROW | TOTAL Imports |  |                                |
|       | PUBLISHED ONSHORE Exports to the Rest of the UK | PUBLISHED ONSHORE of which: sales to offshore | PUBLISHED ONSHORE Exports to the Rest of the World |                                 |               | ADJUSTED ONSHORE Total Exports | PUBLISHED ONSHORE Imports from the Rest of the UK | PUBLISHED ONSHORE of which: purchases from offshore |                                   |               | PUBLISHED ONSHORE Imports from the Rest of the World | ADJUSTED ONSHORE Total Imports |
| 1998  | 22,805  | -203  | 18,094   | 40,696                          | 7,647         | 48,343                         | 29,484  | -1,127  | 15,833                            | 44,190        | 1,373  | 45,563                         |
| 1999  | 23,283  | -528  | 18,688   | 41,443                          | 10,822        | 52,265                         | 32,417  | -1,352  | 15,902                            | 46,967        | 2,030  | 48,997                         |
| 2000  | 24,838  | -906  | 20,146   | 44,078                          | 16,385        | 60,463                         | 34,076  | -1,798  | 18,898                            | 51,176        | 1,970  | 53,145                         |
| 2001  | 25,631  | -1,281  | 19,472   | 43,822                          | 15,591        | 59,413                         | 34,307  | -1,708  | 18,423                            | 51,022        | 2,802  | 53,824                         |
| 2002  | 27,843  | -2,083  | 18,084   | 43,844                          | 15,222        | 59,066                         | 37,272  | -1,858  | 17,500                            | 52,914        | 4,994  | 57,908                         |
| 2003  | 29,896  | -1,395  | 18,505   | 47,006                          | 14,574        | 61,580                         | 39,213  | -2,059  | 17,257                            | 54,411        | 4,589  | 59,000                         |
| 2004  | 32,610  | -1,376  | 18,993   | 50,227                          | 14,753        | 64,980                         | 41,046  | -2,598  | 18,381                            | 56,829        | 4,452  | 61,281                         |
| 2005  | 33,334  | -2,599  | 19,379   | 50,114                          | 18,703        | 68,817                         | 43,298  | -3,076  | 19,436                            | 59,658        | 5,989  | 65,647                         |
| 2006  | 34,266  | -2,362  | 20,641   | 52,545                          | 21,204        | 73,748                         | 45,172  | -4,047  | 20,971                            | 62,096        | 5,974  | 68,070                         |
| 2007  | 36,921  | -1,753  | 22,439   | 57,607                          | 19,005        | 76,612                         | 48,977  | -4,374  | 22,104                            | 66,707        | 4,624  | 71,331                         |
| 2008  | 38,814  | -3,840  | 23,750   | 58,724                          | 28,255        | 86,979                         | 49,908  | -4,927  | 22,897                            | 67,878        | 8,553  | 76,432                         |
| 2009  | 39,338  | -1,990  | 24,641   | 61,989                          | 17,954        | 79,943                         | 49,794  | -3,864  | 21,687                            | 67,617        | 5,187  | 72,804                         |
| 2010  | 38,189  | -3,293  | 25,349   | 60,245                          | 23,466        | 83,710                         | 48,872  | -4,341  | 24,080                            | 68,611        | 7,818  | 76,430                         |
| 2011  | 39,533  | -3,398  | 27,001   | 63,136                          | 24,626        | 87,762                         | 50,181  | -5,119  | 25,697                            | 70,759        | 10,955   | 81,714                         |
| 2012  | 40,558  | -4,075  | 25,731   | 62,214                          | 24,898        | 87,112                         | 49,049  | -1,213  | 26,853                            | 74,689        | 11,300   | 85,989                         |
| 2013  | 44,003  | -4,225  | 27,123   | 66,901                          | 23,377        | 90,278                         | 53,461  | -1,394  | 28,243                            | 80,310        | 13,011   | 93,321                         |
| 2014  | 47,119  | -4,525  | 28,505   | 71,099                          | 20,307        | 91,406                         | 55,641  | -777  | 29,751                            | 84,615        | 12,415   | 97,030                         |
| 2015p | 46,640  | -3,066  | 28,961   | 72,535                          | 14,636        | 87,170                         | 56,123  | -733  | 29,942                            | 85,332        | 8,413  | 93,744                         |
| 2016p | 47,015  | -2,435  | 29,555   | 74,135                          | 13,343        | 87,479                         | 58,353  | -703  | 30,562                            | 88,212        | 6,680  | 94,892                         |

**Figure 7: Exports for the whole of Scotland economic territory (£ million)**



## Next Steps

### Data Sources

The principal aim of this project to date has been the development of a supply and use satellite account framework which allows the estimation and modelling of balanced national accounts statistics. This paper has demonstrated that this aim has been met. The key data sources, modelling parameters and assumptions made have been discussed throughout this publication and in the annexes. The next steps are to challenge these assumptions and to explore whether there are additional data sources or industry intelligence that can be used to improve the quality of the estimates and reduce the uncertainty in components which are primarily based on modelling at this time of initial release.

We are keen to discuss the strengths and limitations of this analysis with stakeholders as part of the on-going development programme over the next year.

### Stakeholder Engagement

Over the course of 2018/19, we will consult a range of users and data suppliers about the quality of the data sources used, the availability of any other data sources or industry intelligence, the robustness of the methodology and assumptions made, and the interpretation of trends in the initial results. This will shape the development of the analysis with a view to it being produced as a regular official statistics output and an extension to the current Scottish Government national accounts.

The initial results will be presented and discussed at the next meeting of the Scottish Economic Statistics Consultation Group (SESCG) on 16 March 2018, seeking expert views and advice. We shall then present and discuss the analysis with other experts across UK Government departments, industry experts and academics with an interest in the area.

Alongside that, we will consult all potential users of the analysis through a statistical consultation later in 2018.

### Consultation and Feedback

We welcome any initial thoughts or views on this analysis. Please feel free to contact us and to let us know what you think or whether you would like to be alerted to the statistical consultation in due course.

Please contact us at [economic.statistics@gov.scot](mailto:economic.statistics@gov.scot)

or write to:

The Scottish Government  
National Accounts Unit  
Office Of The Chief Economic Adviser – Economic Analysis  
St Andrew's House  
Regent Road  
Edinburgh  
EH1 3DG

## **Annex A – Economic territory concepts and definitions**

For national accounts purposes, the economic territory of a country is defined as the geographical territory administered by a government and within which people, goods and capital may circulate freely. Economic territory includes geographical territory (the land) and also the national air space, territorial waters, oil and gas in international waters worked exclusively by resident units, and territorial enclaves abroad. It excludes extra-territorial enclaves within the country, such as embassies of other countries.

In Scottish Government economic statistics, the economic territory of Scotland is defined as that part of the UK economic territory which is in or associated with Scotland. For example, this can include the parts of UK economic territory over which the Scottish Parliament has control over devolved policy matters.

### **Statistical Geographies: NUTS Regions**

The NUTS classification (Nomenclature of territorial units for statistics) is a hierarchical system for dividing up the economic territory of the EU for the purpose of the collection, development and harmonisation of European regional statistics, socio-economic analyses of the regions, and framing of EU regional policies. It divides the geographical territory of member states into three different levels, from small NUTS3 regions to major socio-economic NUTS1 regions. Scotland is one of the NUTS1 regions of the UK along with the other devolved countries and nine English regions.

For national and regional accounts purposes, the regional economic territory of a country consists of that part of the economic territory of a country which that is directly assigned to NUTS regions. This includes only the land-based, or geographical, territory of the countries and regions involved. This means that NUTS regions do not always match administrative boundaries within countries, particularly for coastal areas. For this reason, whilst many economic statistics have been developed for Scotland using the NUTS1 territorial concept, it does not include all parts that are ideally included in the economic territory.

### **Extra-regio economic territory**

The extra-regio economy is a national accounts concept defined by Eurostat for use in regional accounts, and is composed of the parts of a country's economic territory which cannot be assigned to a single NUTS region. This includes the national airspace and territorial waters, the continental shelf over which the country enjoys exclusive rights, and overseas enclaves. In the UK Regional Accounts, produced by ONS, the extra-regio economy is treated as the thirteenth region of the UK, alongside the NUTS1 regions of Scotland, Wales, Northern Ireland and the nine English regions.

UK extra regio economic activity consists of offshore oil and gas extraction and government activities in UK territorial enclaves such as overseas embassies and military bases. Other offshore activities, such as oil and gas support services (including drilling and surveying) and fishing, are not included as extra-regio because they are conducted using mobile equipment operated from a land-based business location.

The classification of activities as extra-regio does not depend on, or relate to, administrative boundaries or control. For example, the classification of oil and gas extraction depends only on where the activity takes place and not on whether it is a devolved or reserved policy matter.

The NUTS classification provides a single, uniform breakdown of the economic territory of the European Union. However, Eurostat also note that for national purposes regional accounts may also be compiled at a more detailed regional level. For example, this is undertaken within the UK by ONS producing regional GVA for local authorities, and by the Scottish Government producing a regional breakdown of activities in the extra-regio territory.

## Estimating a Scottish share of UK extra-regio territory

All estimates in this paper are based on the Scottish Adjacent Waters boundary, which was established in 1999 for the devolution of offshore marine policy and follows the equidistant (median) lines between Scotland, England and Northern Ireland. The use of this boundary has been adopted by the Scottish Government, HMRC and ONS in the production of some economic, trade and public sector finance statistics for Scotland. Whilst it has been widely adopted for statistics, this area remains illustrative as it is not required for administrative purposes.

The Office of Statistics Regulation, OSR (previously the UK Statistics Authority, UKSA), has previously highlighted this issue of clearly defining what is meant by 'Scotland' in the production and use of statistics. This is because comparisons of economic statistics between Scotland and other parts of the UK are substantially affected by the territorial concepts adopted. 'Land-based territory' (the geographical territory or NUTS region) and 'economic territory' were the two main options discussed by the UKSA in their 2013 paper on 'Official Statistics in the Context of the Scottish Independence Referendum'<sup>3</sup>. The wider economic territory was defined as being the land-based territory plus the Scottish element of the UK extra-regio economy.

For a number of years, The Scottish Government has produced some statistics for the wider economic territory of Scotland. These statistics have focussed on Gross Value Added (GVA) as part of Quarterly National Accounts Scotland, and public sector revenue and expenditure as part of GERS. These alternative estimates have been based on two methods for assigning shares of extra-regio activity to Scotland: a 'population share' of all extra-regio activity; and an illustrative 'geographical share' which includes a population share of overseas activity and an estimate of the oil and gas extraction activity occurring in Scottish Adjacent Waters. Most user groups have been observed to use the illustrative geographical share of offshore economic activity attributable to Scotland. The population share of offshore activity has not been observed to be widely used, and is not used in this paper.

In recent years, other UK Government departments have also begun to produce statistics consistent with the whole of Scotland approach to the illustrative geographical share of offshore activity: HMRC Regional Trade Statistics (RTS) now assign exports directly loaded from oil platforms in Scottish Adjacent Waters to Scotland, and HMRC and ONS have also applied this boundary in the production of sub-UK public sector finance statistics. It should be noted that the concept of extra-regio activity does not apply to trade statistics or public sectors finances, and has therefore not been applied in the same way as regional accounts.

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<sup>3</sup> <https://www.statisticsauthority.gov.uk/archive/assessment/monitoring/monitoring-reports/monitoring-report-6-2013---official-statistics-in-the-context-of-the-referendum-on-scottish-independence.pdf>



## Annex B - Supply and Use Tables and Satellite Accounts

To ensure that statistics developed for the whole of Scotland economic accounts project are consistent with the established onshore statistics, it has been agreed that the best approach is to make developments using a supply and use framework. This approach is in line with international best practice, and is consistent with the main national accounts statistics produced by the Scottish Government and with the UK national accounts produced by ONS.

**National accounts are a system of accounts and balance sheets that provide a broad and integrated framework to describe an economy, whether a region, a country, or a group of countries such as the European Union (EU). For internationally comparable national accounts this system needs to be based on common concepts, definitions, classifications and accounting rules, in order to arrive at a consistent, reliable and comparable quantitative description of an economy. National accounts provide systematic and detailed economic data useful for economic analysis to support the development and monitoring of policy-making. [Eurostat statistics explained: National accounts – an overview](#)**

Within the broader set of statistics included in full national accounts, the supply and use framework is the part of the system which focuses on the production and use of goods and services in an economy. The framework reflects the activities of industries and consumers, including trade links into and out of the economy. Further information on Supply and Use Tables can be accessed from Eurostat<sup>4</sup> or the Scottish Government<sup>5</sup>.

The Supply and Use tables describe the production process (such as the cost structure and outputs) for each industry and the supply and demand in the economy for each category of goods and services (output, imports, exports, final consumption, intermediate consumption and capital formation by product group). Within the national accounts system the supply, use and input-output tables offer the most detailed portrait of an economy's production and use activities and also provide a consistent framework for balancing national accounts. The tables show among others:

- the structure of the costs of production and the value added, which is generated in the production process;
- the interdependencies of industries;
- the flows of goods and services produced and used within the national economy;
- international trade in goods and services with the rest of the world.
- Supply tables record how products are made available in an economy: this may be output from a range of domestic industries or imports.

One of the strengths of using the supply and use framework is that the tables must balance, ensuring that all supply and demand is accounted for. This is achieved using two identities which must be fulfilled: for each industry, the value of output of goods and services must be equal to the sum of intermediate consumption (operating costs) plus value added; and for each category of goods and services, total supply (domestic output plus imports) must equal the sum of all intermediate demand, consumer demand, gross capital formation (investment) and exports.

Alongside core national accounts, the European System of Accounts (ESA 2010) allows for the production of satellite accounts which elaborate or modify the core accounts to serve specific data

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<sup>4</sup> [http://ec.europa.eu/eurostat/statistics-explained/index.php/National\\_accounts\\_-\\_an\\_overview](http://ec.europa.eu/eurostat/statistics-explained/index.php/National_accounts_-_an_overview)

<sup>5</sup> <http://www.gov.scot/Topics/Statistics/Browse/Economy/Input-Output>

needs. For example, the Scottish Government supply and use tables for the onshore Scottish Economy can be viewed as a satellite account for part of the UK economy. For this project, the aim is to modify the basic territorial concepts of the core Scottish accounts, and to provide additional detail for the oil and gas industry in Scottish waters. This is achieved by reclassifying activities in Scottish waters from external activities counted as part of the rest of the UK to being a separate region which is associated with Scotland. At the present time the results of this modelling remain separate from, but consistent with, the Scottish onshore national accounts, although they can be combined to produce a single set of summary statistics for the whole of Scotland's economic territory.

### **The development of oil and gas statistics for Scotland**

The Scottish Government has been developing statistics relating to oil and gas production in Scottish waters<sup>6</sup> for a number of years. This has included sourcing relevant data and developed estimates of production, operating expenditure and capital expenditure associated with oil and gas extraction in Scottish waters to supplement existing economic statistics. In addition, experimental estimates have been produced for physical commodity and energy balances, including trade in oil and gas. Until now, these oil and gas statistics have mostly been produced in line with UK energy statistics produced by the Department for Business, Energy and Industrial Strategy (BEIS) and the Oil and Gas Authority (OGA). The oil and gas statistics are not balanced against (or defined to be fully consistent with) national accounts statistics for the UK or Scotland.

This project is designed to produce a balanced estimate of the economic activities of the oil and gas industry in Scotland and its links to the rest of Scotland, the rest of the UK and the rest of the world. A supply and use approach ensures that the results – particularly with regard to trade flows between the onshore and offshore parts of the economy – do not contain structural imbalances, and can be used to estimate high level statistics for the whole of Scotland's economy.

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<sup>6</sup> <http://www.gov.scot/Topics/Statistics/Browse/Economy/oilgas>

## Annex C – Satellite Account methods and data sources

The oil and gas satellite account is produced using a similar procedure to the onshore supply and use tables for Scotland. Methods and Sources are summarised on page 8. Detail on the initial development of the satellite account was presented at the latest meeting of the Input-Output Expert User Group on 1 November 2017<sup>7</sup>. There have been further developments to the methods, including the manual balancing process and estimation of trade, since this meeting.

The first stage of the satellite account modelling estimates the industry supply and use columns, representing the output, intermediate consumption and gross value added of the offshore oil and gas industry in Scotland. This process balances the gross value added measured using income and production approaches, fulfilling the first fundamental identity noted in Annex B. After balancing the gross value added of the industry, adjustments are made along the rows of the satellite account tables to ensure that supply and demand for all goods and services across the whole of Scotland are equal. This stage fulfils the second of the fundamental balancing identities.

Due to the relatively high uncertainties involved in the satellite account at this time, several underlying assumptions and parameters have been established during the modelling process. While many of these assumptions will not be entirely correct, the impact of these effects is likely to be outweighed by other uncertainties in the results. All aspects of the modelling can be revisited in future years if more detailed data is identified.

The main simplifying assumptions applied to the satellite account are:

- There is no trade between Scottish and RUK waters. In other words, all goods and services exported from or imported to Scottish waters must be located in the Scottish or RUK onshore economies, or the rest of the World.
- The only products exported from Scottish waters are oil and gas. The production of other non-principal products by the offshore industry (other sources of income) are accounted for by offshore demand by other operators within the industry. For example, mining support services may be produced offshore and consumed by other operators offshore, but not exported.
- Whilst GVA and GFCF are constrained to the UK totals in the Use Tables, the output of the offshore industry is separately constrained by estimates of external demand (exports) to ensure that there are not imbalances in the supply of and demand for oil and gas. An output scaling approach is used to rebalance intermediate demand in line with the adjusted, balanced output.

All estimates are currently based on the supply and use tables and regional accounts statistics consistent with UK Blue Book 2016, for years 1998-2016. The supply, use and GFCF columns for the oil and gas industry are split firstly between UK onshore and extra-regio activity using regional accounts, and then between Scotland and the rest of the UK using the results in the Scottish Government Oil and Gas Production Statistics for production, operating costs and capital expenditure. This produces a four region model (offshore and onshore, RUK and Scotland) detailing output by product, intermediate consumption by product, GVA and GFCF by the UK oil and gas extraction industry. GVA is available using the components of the production approach and the income approach. This also produces detailed estimates of the products consumed as part of operating and capital expenditure which must be transported into the North Sea, which are the basis for further modelling of the supply chain links from onshore.

Whereas there is detailed information available on outputs and total inputs of the oil and gas industry, there is less information available about the supply chain. In particular, there is relatively little information on the geographical origin of the supply chain inputs to offshore oil and gas. Due

<sup>7</sup> <http://www.gov.scot/Topics/Statistics/Browse/Economy/ScotStat/InOutMeetings>

to the limits of current data, a modelling approach, rather than data-driven apportionments, is required for the next stage of processing. At this initial stage of release the results have been produced in a detailed but relatively straightforward manner, which can be updated with additional information sourced in the future.

To produce estimates of imports to offshore from the Rest of the World (e.g. imports for intermediate and capital use), results are modelled from UK supply and use tables using the average import propensities for each detailed product. Information from industry anecdotes and case studies indicates that imports from the rest of the world may be higher than these average propensities, particularly for large capital projects. If ROW imports are higher than modelled, and revised up in future when more detailed information has been identified, this will result in a corresponding downward revision to total demand from the UK (RUK and/or Scotland).

For demand sourced from the UK, an initial estimate of the split between Scotland and RUK was calculated for each product using Scottish shares of UK domestic supply. The initial stage of this estimation process was completed during the production of the onshore supply and use tables for Scotland. The onshore tables were checked, and if necessary adjusted, to ensure that there were sufficient RUK exports of each product from the onshore economy to meet this offshore demand. In particular, care was taken to ensure that once onshore Scottish exports to the offshore Scottish region were accounted for, there would be no residual negative exports to the rest of the Rest of UK (RUK).

This approach results in a supply column, an intermediate demand/GVA column, a GFCF column, and provisional import and export columns for the offshore oil and gas industry. For the Scottish and UK offshore regions, import and export columns from RoW, onshore Scotland and onshore RUK are produced. For the onshore regions corresponding import and export to offshore RUK and offshore Scotland are produced. The offshore RUK and onshore RUK regions were combined at this stage, and not taken forward to the manual balancing process and detailed quality assurance.

## **Oil and Gas Commodity Balances and Trade**

The main inputs to the oil and gas satellite account manual balance process are estimates of exports of oil and gas from Scottish waters, representing the output of the industry. Apart from a relatively small amount of oil and gas used by the industry offshore, for example for power generation or pumping operations, most oil and gas is transported to terminals in mainland Scotland or England, or shipped directly overseas.

Estimates of exports of oil and gas to the rest of the world are derived from the Regional Trade Statistics (RTS) produced by HMRC. These statistics are based on the UK overseas trade statistics, and are broadly consistent with UK exports in the balance of payments and national accounts produced by ONS.

Since September 2016, a new methodology has been adopted by HMRC. Where oil is processed on platforms in the North Sea and dispatched directly to other countries, this trade is categorised according to the location of the platform using the Scottish Adjacent Waters Boundary. Other exports of oil are associated with exporting businesses, rather than production platforms, and allocated using employments shares. The information currently available from HMRC includes data for crude and refined oil products (SITC 33). To produce estimates for crude oil only, an estimate of the relevant proportion of SITC 33 has been produced using detailed shipping cargo statistics published by the Department for Transport. These approximate shares can be updated when more detailed breakdowns of trade statistics are identified.

A large proportion of oil produced in Scotland is initially exported to the rest of the UK and then subsequently re-exported abroad. These trade flows can occur in physical terms (actual shipments or pipeline transport) or as merchant trade where goods are purchased and re-sold without physically changing hands. The proportions of oil and gas exports estimated to be to RUK and

ROW may be revised when more detailed information becomes available, but are constrained within a total determined by how much oil and gas is produced in Scotland.

## Oil and Gas Supply Chain Adjustments

In addition to manual adjustments made to exports of oil and gas produced in Scotland, two alternative treatments of the offshore supply chain have been included in the satellite account modelling process. These estimates represent alternative scenarios for the degree of specialisation in the offshore supply chain located in the onshore Scottish economy.

The rationale for these additional estimates is that the initial supply and use modelling process described above is unlikely to adequately capture the specialisations present in the Aberdeen area and other parts of Scotland. Whilst Supply and Use tables provide the most detailed accounting for industries and products across the economy as a whole, they do not drill down to the level of detail which reflects many of the specialist manufacturing, construction, engineering and other services employed by the oil and gas industry. In fact, it is not possible to do so at all using the Standard Industrial Classification, especially when many businesses operate for a range of customers including the oil and gas industry, or produce products which can be applied in many industries. Further research and engagement with industry stakeholders is therefore required to produce more detailed estimates of where in the UK the supply chain operates, and how much is imported from abroad. At the present time however, the three scenarios considered are:

- Low specialisation in Scotland. As described above, supply chain imports from abroad are modelled using UK import propensities for each product, and the remainder from Scotland and RUK is modelled using the relative shares of output derived from supply and use tables. In 2014, this approach assigns an average of 17% of the UK supply chain to Scotland, but varies by product up to more than 80% of the supply of Mining Support Services.
- Medium (variable) specialisation in Scotland. Supply chain imports from abroad are modelled as in the Low specialisation scenario, but a variety of data sources are used to assign specific proportions of some key products in the UK supply chain to Scotland. In 2014 this approach assigns an average of 32% of the UK supply chain to Scotland when viewed across all products. The shares used, differing from the low specialisation scenario are:
  - For fabricated metal products, 55% of UK supply sourced from Scotland. This is based on employment by companies identified in the UKOG [Fabricators Directory](#)
  - For air transport, water transport and other land transport (including pipelines), 76% of UK supply sourced from Scotland. This is based on the proportion of oil and gas produced in Scottish waters.
  - For Architectural and Engineering Services, Technical Testing and Analysis, 18% of UK supply chain sourced from Scotland. This is based on the turnover share from the Annual Business Survey for detailed SIC 71.12 and 71.2 (i.e. excluding architecture). Engineering and technical services provide input or relate to a number of other supply chain industries, as well as direct input to oil and gas. The 0.18 share has therefore also been applied to manufacture of machinery n.e.c., construction, rental and leasing and employment services.
- High (uniform) specialisation in Scotland. Supply chain imports from abroad are modelled as in the other two scenarios. The Scottish share of the UK supply chain for all products is simply modelled using the estimated proportion of indirect (i.e. not extraction operators) oil and gas employment based in Scotland, reported by Oil and Gas UK.