

***Input-Output Tables  
and Multipliers  
for Scotland  
1998***



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**Computer disk**

An Excel file containing 128-industry I-O tables and multipliers for Scotland (including Type I and Type II Leontief) is included.

## **Preface**

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This publication presents the 1998 Scottish Input-Output Tables and Multipliers. This is the first set of Scottish tables to be compiled under the European System of Accounts 1995<sup>1</sup>.

### **Scottish Input-Output Tables**

Input-Output (I-O) tables provide a complete picture of the flows of products and services in the economy for a single year, illustrating the relationship between producers and consumers and the interdependence of industries. The tables also reconcile the output, income and expenditure measures of Gross Domestic Product (GDP).

Supply and Use balances are the basis for the Input-Output tables, which provide separate analyses of the uses of domestically produced and imported goods and services. They also provide a framework to assess the direct, indirect and induced changes on the whole economy when the demand for a single product increases or decreases.

The 1998 Scottish Input-Output tables are the latest in a series of Scottish I-O balances which began with the 1989 tables, published in 1994. Since then a full set of Input-Output tables have been published for 1994, 1995 and 1996 with Supply & Use balances published for 1992 and 1993.

### **Input-Output Tables and Multipliers for Scotland 1998**

The 1998 tables have incorporated a number of substantial developments in terms of both methodology and data sources. These are detailed in Section B. The use of I-O tables for year on year comparisons is discouraged and would be particularly inappropriate for this year given the number of changes.

This publication is split into three sections:

**Section A - Use of the Scottish Input-Output Tables and Multipliers** gives an overview of the structure and use of the main I-O tables, namely: the Supply table, the Use matrix and the Industry by Industry matrix. Guidance on multipliers and their use is also given here.

**Section B – Methodology** provides details of data sources and methodology changes since the last publication – most notably the introduction of ESA95. Reference to further text and documentation on the construction of I-O tables is also provided.

**Section C** presents the **main tables at 128-industry level**. These include: Output and Supply; Use matrix; Industry by Industry matrix; Type I Multipliers and Type II Multipliers.

In addition, this year we have provided a full set of tables (including Leontief matrices) on **floppy disk**. This publication is also available electronically via the Internet:

[www.scotland.gov.uk/stats/docs/io98.pdf](http://www.scotland.gov.uk/stats/docs/io98.pdf) (text)  
[www.scotland.gov.uk/stats/docs/io98.xls](http://www.scotland.gov.uk/stats/docs/io98.xls) (tables)

## **Users of Input-Output Tables**

We would welcome any comments users have on the Scottish I-O tables and their presentation.

All requests for further information should be addressed to:

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## ***Section A - Use of the Scottish Input-Output Tables and Multipliers***

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A modern open economy like that of Scotland engages in 4 basic economic activities. These are production, consumption, accumulation and trade. Production involves industry and commodity sectors producing goods and services. Consumption represents purchases of goods and services by both industries and domestic final users comprising mainly households and Central and Local Government. Accumulation involves all capital transactions including all fixed investment expenditure and stock change. Trade involves Imports from, and Exports to, the Rest of the UK (RUK) and the Rest of the World (RoW).

There are 2 basic Input-Output tables. These are the Make matrix that shows production of commodities by domestic industries and the Use matrix that shows purchases of commodities by domestic industries and by Final Demand sectors. These basic matrices are used to derive the main Input-Output tables: the Industry-by-Industry matrix, the Leontief Inverse and the Multipliers matrices.

This section describes the key Input-Output tables presented for 1998, beginning with the two basic balances – the Supply table (summarising the Make matrix and imports) and the Use table. Descriptions of the Industry-by-Industry matrix and multipliers are then given. This section aims to give a brief overview of each table, showing clearly what the data represents and how it can be used for analysis.

## A1 - Output and Supply

The primary purpose of the Supply table (A1) is to show the goods and services (commodities) produced by each industry in Scotland in 1998 along with the supply of commodities through imports. The distinction between industries and commodities 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 Table A1) and many industries also produce a range of other commodities referred to as **secondary production** (shown in the off-diagonal cells).

The supply of commodities is presented in the rows while the columns show the industries responsible for the output of these commodities. This table is an aggregate version of the full Make matrix, which shows the output of each of the 128 I-O industry groups by each of the 128 I-O commodity groups. The full Make matrix is no longer published due to the disclosive nature of the data. However, some information about the levels of supply and market share of each of the 128 industries is available, in summary form, in the Domestic Output & Supply of Products matrix (Section C, Table 1).

Table A1 also demonstrates the transition from domestic gross output of products at basic prices to output at purchasers' prices through the addition of distribution margins and taxes *less* subsidies on products. The transition from domestic output to total supply is made by the addition of imports and their related taxes and margins.

### Use of the Supply Table

#### Indicators of the diversity of commodities produced by an industry.

It can be seen in column 3 of Table A1 that the Manufacturing industry produced £35,724 million of its principal product in 1998, accounting for 93 per cent of this industry's total output (£38,247m). The remaining cells within this column reveal levels of secondary production of four main commodity groups: Distribution and Catering (£1,411m); Finance and Business (£955m); Transport and Communication (£123m); and Construction (£28m).

This indicator is presented, at 128-industry detail, in Table 1 of Section C as 'Principal Products as a percentage of Total Industry Gross Output'. This statistic shows that, in the majority of industries in Scotland in 1998, secondary production of goods and services accounted for less than 20 per cent of their total gross output.

#### Indicators of market share

Conversely, to look at the industries that produce Manufacturing commodities, we consider row 3 of Table A1. We find that the manufacturing industry is responsible for the production of virtually all manufacturing commodities (99.9%). This is an indicator of market share and is presented, at 128-industry detail, in Table 1 of Section C- 'Principal Products as a percentage of Total Gross Output of Products'.



**Table A1 Aggregate Supply Table 1998 (Output at basic prices and Supply at purchasers' prices)**

| Product                           | Domestic Output                |             |               |                  |              |                         |                           |                    |                   |                |                              | Supply = Domestic Output + Imports           |   |   |              |              |   |                                 |                                    |
|-----------------------------------|--------------------------------|-------------|---------------|------------------|--------------|-------------------------|---------------------------|--------------------|-------------------|----------------|------------------------------|--|---|---|--------------|--------------|---|---------------------------------|------------------------------------|
|                                   | Agriculture forestry & fishing | Mining      | Manufacturing | Energy and water | Construction | Distribution & catering | Transport & communication | Finance & business | Public admin etc. | Other services | Total Output at basic prices | Taxes /less subsidies on products (domestic) | Distribution margins on Scottish output | Total Scottish output at purchasers' prices | RUK Imports  | RoW imports  | Taxes /less subsidies on products (imports) | Distribution margins on imports | Total supply at purchasers' prices |
| Agriculture, forestry and fishing | 3310                           | 0           | 0             | 0                | 0            | 0                       | 0                         | 0                  | 0                 | 0              | 3310                         | -667   | 428                                     | 3071  | 456          | 568          | 15  | 106                             | 4215                               |
| Mining                            | 1                              | 3551        | 6             | 0                | 0            | 0                       | 0                         | 0                  | 0                 | 0              | 3558                         | -2   | 111                                     | 3666  | 790          | 83           | 21  | 52                              | 4612                               |
| Manufacturing                     | 1                              | 34          | 35724         | 0                | 0            | 0                       | 0                         | 0                  | 0                 | 0              | 35759                        | 3241   | 5769                                    | 44769                                       | 20709        | 13885        | 3721  | 6852                            | 89936                              |
| Energy and water                  | 0                              | 0           | 0             | 5489             | 0            | 0                       | 0                         | 0                  | 0                 | 0              | 5489                         | 118  | 0                                       | 5607  | 541          | 42           | 11  | 0                               | 6202                               |
| Construction                      | 10                             | 1           | 28            | 50               | 8673         | 16                      | 56                        | 11                 | 35                | 1              | 8882                         | 452  | 0                                       | 9334  | 393          | 33           | 22  | 0                               | 9782                               |
| Distribution and catering         | 36                             | 32          | 1411          | 47               | 100          | 16801                   | 75                        | 106                | 31                | 0              | 18638                        | 517  | -6308                                   | 5837 <sup>(1)</sup>                         | 827          | 524          | 82  | -7010                           | 7269                               |
| Transport and communication       | 0                              | 5           | 123           | 40               | 0            | 1                       | 9895                      | 0                  | 0                 | 0              | 10064                        | 85   | 0                                       | 10150                                       | 1553         | 833          | 87  | 0                               | 12623                              |
| Finance and business              | 61                             | 32          | 955           | 114              | 42           | 276                     | 139                       | 22277              | 306               | 18             | 24220                        | 581  | 0                                       | 24801                                       | 4510         | 785          | 219   | 0                               | 30315                              |
| Public admin etc                  | 9                              | 0           | 0             | 0                | 0            | 24                      | 3                         | 5                  | 27089             | 0              | 27129                        | 501  | 0                                       | 27631                                       | 927          | 511          | 136   | 0                               | 29204                              |
| Other services                    | 0                              | 0           | 0             | 0                | 0            | 0                       | 0                         | 0                  | 0                 | 1285           | 1285                         | 72   | 0                                       | 1357  | 249          | 175          | 21  | 0                               | 1802                               |
| <b>Total</b>                      | <b>3428</b>                    | <b>3655</b> | <b>38247</b>  | <b>5740</b>      | <b>8815</b>  | <b>17117</b>            | <b>10166</b>              | <b>22400</b>       | <b>27462</b>      | <b>1304</b>    | <b>138334</b>                | <b>4898</b>                                  | <b>0</b>                                | <b>136222<sup>(1)</sup></b>                 | <b>30953</b> | <b>17439</b> | <b>4337</b>                                 | <b>0</b>                        | <b>195961</b>                      |

<sup>(1)</sup> Domestic output includes distribution margins on imports. The margin of £ -7,010 million is therefore included in Total Scottish output at purchaser prices.

## A2 - Demand for Products

An aggregate Domestic Use matrix is presented in Table A2. As in Table A1, industries are shown in the columns and commodities in the rows. Where the Supply table presented Scottish output at purchasers' prices (column 14), the Use matrix shows the demand for this output by industries and final demand sectors across the commodity rows. Imports and other inputs used by industries in their production are also shown. The Use matrix can be split into 4 main quadrants:

1. The intermediate demand quadrant (domestic), which shows the inputs of domestic commodities used by Scottish industries in the production of their output.
2. The final demand quadrant, which shows the purchases of each domestic product by each category of final demand (e.g. consumers, government, exports etc.).
3. The primary inputs quadrant, which shows the additional inputs (e.g. employees' salaries, imports etc.) required by Scottish industries as part of their production processes.
4. The fourth quadrant shows the imports that do not flow through the domestic industries but are used directly by final demand.

The Domestic Use matrix is repeated at full 128-industry detail in Table 2 of Section C.

### Use of the Use Matrix

#### Inputs to the production process

Column 3 of Table A2 shows the purchases made by the Scottish Manufacturing industry in order to produce its own output. We can see that the main purchases made by this industry comprised: an estimated £3,763 million of its own principal commodity, £1,648 million of Finance and Business services, £811 million of Agriculture, Forestry and Fishing products and £629 million of Energy and Water. In addition to the above purchases of domestic commodities, it is also estimated to have purchased £8,688 million of commodities from the Rest of the UK and £8,389 million of commodities from the Rest of the World.

#### Destination of commodities

The total demand for Manufactured commodities is given in Table A2 as £44,769 million. Row 3 of Table A2 presents the purchases of manufacturing commodity by both the intermediate and final demand sectors of the economy. This row shows that, in addition to the £3,763 million purchased by the Manufacturing industry, Public Admin (£1,280m) and Distribution & Catering (£1,103m) were the most significant intermediate markets for these commodities. However, the majority (70%) of domestically manufactured commodities are exported; to the Rest of the UK (£13,472m) and to the Rest of the World (£17,708m).

#### Industry's contribution to GDP

The income measure of Gross Domestic Product at basic prices is defined as the sum of Taxes less subsidies on production, plus Compensation of employees and Gross operating surplus giving a total of £62,153 million. This figure corresponds to the estimate of Scottish GDP(I) presented in the ONS Regional Accounts. It is possible to estimate each industry's contribution to GDP from Table A2 by dividing the Gross Value Added (GVA) at basic prices for each industry by the overall total GVA figure. For example, the Manufacturing industry contributes approximately 21% (£13,260m) to Scottish GDP.

**Table A2 Aggregate Domestic Use Matrix 1998 (Purchasers' Prices)**

| Product   | Input of Industry              |        |               |                  |              |                         |                           |                    |                   |                |       | Final Expenditure              |                        |            |                                 |             |             | Total demand |                    |
|---|--------------------------------|--------|---------------|------------------|--------------|-------------------------|---------------------------|--------------------|-------------------|----------------|-------|--------------------------------|------------------------|------------|---------------------------------|-------------|-------------|--------------|--------------------|
|   | Agriculture forestry & fishing | Mining | Manufacturing | Energy and water | Construction | Distribution & catering | Transport & communication | Finance & business | Public admin etc. | Other services | FISIM | Total intermediate consumption | Consumers' expenditure | Government | Capital formation & inventories | Exports RUK | Exports RoW |              | Total final demand |
| Agriculture, forestry and fishing               | 341                            | 2      | 811           | 0                | 13           | 238                     | 1                         | 2                  | 13                | 0              | 0     | 1423                           | 92                     | 0          | 147                             | 744         | 664         | 1648         | 3071               |
| Mining  | 0                              | 91     | 246           | 627              | 162          | 18                      | 1                         | 1                  | 17                | 0              | 0     | 1163                           | 3                      | 0          | 32                              | 1029        | 1439        | 2503         | 3666               |
| Manufacturing                                   | 552                            | 90     | 3763          | 310              | 1044         | 1103                    | 465                       | 836                | 1280              | 125            | 0     | 9566                           | 3076                   | 0          | 948                             | 13472       | 17708       | 35203        | 44769              |
| Energy and water                                | 48                             | 15     | 629           | 2160             | 23           | 265                     | 49                        | 83                 | 416               | 15             | 0     | 3703                           | 1458                   | 0          | 106                             | 260         | 80          | 1905         | 5607               |
| Construction                                    | 77                             | 76     | 29            | 46               | 1201         | 333                     | 108                       | 1010               | 766               | 67             | 0     | 3713                           | 297                    | 0          | 4316                            | 917         | 91          | 5621         | 9334               |
| Distribution and catering                       | 156                            | 48     | 90            | 28               | 5            | 89                      | 180                       | 154                | 191               | 1              | 0     | 941                            | 4176                   | 0          | 105                             | 614         | 0           | 4896         | 5837               |
| Transport and communication                     | 95                             | 140    | 487           | 26               | 69           | 406                     | 2091                      | 1186               | 395               | 141            | 0     | 5038                           | 1597                   | 0          | 19                              | 2914        | 582         | 5111         | 10150              |
| Finance and business                            | 89                             | 782    | 1648          | 119              | 1802         | 1099                    | 1337                      | 3509               | 2010              | 81             | 1897  | 14372                          | 6044                   | 0          | 641                             | 2693        | 1051        | 10429        | 24801              |
| Public admin etc                                | 144                            | 36     | 205           | 43               | 54           | 53                      | 151                       | 202                | 3893              | 6              | 0     | 4786                           | 4111                   | 16860      | 94                              | 1536        | 243         | 22844        | 27631              |
| Other services                                  | 13                             | 1      | 2             | 1                | 141          | 13                      | 32                        | 30                 | 114               | 3              | 0     | 349                            | 725                    | 0          | 0                               | 156         | 127         | 1008         | 1357               |
| Total domestic purchases at purch' prices       | 1515                           | 1280   | 7909          | 3358             | 4514         | 3618                    | 4415                      | 7013               | 9095              | 441            | 1897  | 45054                          | 21581                  | 16860      | 6409                            | 24335       | 21983       | 91168        | 136222             |
| Imports from Rest of UK                         | 425                            | 698    | 8688          | 566              | 932          | 2139                    | 1039                      | 2969               | 2553              | 21             | 0     | 20030                          | 13806                  | 0          | 3996                            | -           | -           | 17802        | 37833              |
| Imports from Rest of World                      | 222                            | 252    | 8389          | 23               | 185          | 574                     | 209                       | 309                | 934               | 0              | 0     | 11096                          | 9431                   | 0          | 1379                            | -           | -           | 10810        | 21906              |
| Total intermediate consumption at purch' prices | 2162                           | 2229   | 24987         | 3947             | 5631         | 6330                    | 5663                      | 10291              | 12583             | 462            | 1897  | 76181                          | 44818                  | 16860      | 11784                           | 24335       | 21983       | 119780       | 195961             |
| Taxes less subsidies on production              | 11                             | 14     | 293           | 133              | 34           | 504                     | 94                        | 187                | 248               | 22             | 0     | 1539                           |                        |            |                                 |             |             |              | 1539               |
| Compensation of employees                       | 585                            | 672    | 7066          | 709              | 2606         | 5033                    | 3192                      | 5380               | 12637             | 516            | 0     | 38396                          |                        |            |                                 |             |             |              | 38396              |
| Gross operating surplus                         | 671                            | 740    | 5901          | 951              | 544          | 5249                    | 1218                      | 6543               | 1994              | 303            | -1897 | 22218                          |                        |            |                                 |             |             |              | 22218              |
| Gross value added at basic prices               | 1266                           | 1426   | 13260         | 1793             | 3185         | 10787                   | 4503                      | 12110              | 14878             | 842            | -1897 | 62153                          | -                      | -          | -                               | -           | -           | -            | 62153              |
| Output at basic prices                          | 3428                           | 3655   | 38247         | 5740             | 8815         | 17117                   | 10166                     | 22400              | 27462             | 1304           | 0     | 138334                         | -                      | -          | -                               | -           | -           | -            | 258114             |

### A3 - Industry by Industry Domestic flows

The Domestic Use matrix showed that each industry purchases a certain mix of commodities in order to produce its output, and that each commodity is sold to a variety of domestic industries and final markets. For the analysis of industry linkages and economic impacts, it is more meaningful to represent the Use matrix in Industry by Industry form.

The Industry by Industry domestic flows matrix forms the platform for the derivation of analytical tables on the structure of the Scottish economy in 1998, such as the Leontief Inverse matrices (supplied on disk) and the Output, Employment and Income Multipliers (Section C, Tables 4 and 5). A description of the construction of the Industry by Industry matrix, the Leontief Inverse and Multipliers is given in Volume 2, Chapter 22 of the Scottish Input-Output tables for 1989<sup>2</sup>.

#### Use of the Industry by Industry (Ixl) Matrix

The structure of the Ixl matrix is very similar to the Use matrix and can be used for similar analyses but, as the rows have been converted from purchases of commodities to purchases from each industry, a number of additional analyses are readily available from the Ixl matrix.

##### Destination of industry output

Where the Use matrix showed the destination of manufactured **commodities**, the Ixl matrix shows the destination of manufacturing **industry** output – be it manufacturing commodities or other secondary commodities. From Table A2 the exports of manufactured commodities were estimated as £13,472 million (RUK) and £17,708 million (RoW), where as Table A3 gives exports by the manufacturing industry of £10,178 million (RUK) and £17,962 million (RoW).

##### Balance of trade at basic prices

The Ixl matrix shows the purchases of imported goods and services by each industry and final demand sector in addition to the exports by Scottish industries to the Rest of the UK and the Rest of the World. As both imports and exports are presented in terms of industry purchases and sales, we can estimate the balance of trade between Scotland and these other locations.

For example, the balance of trade (at basic prices) between Scotland and RUK is equal to the value of goods and services exported to RUK (£22,774m), minus the value of goods and services imported from RUK (£30,953m). Therefore, we can estimate that the balance of trade is approximately -£8,000million. This calculation can be repeated for the balance of trade with RoW (+£4,000million) and combined with the RUK balance to arrive at a total balance of trade figure for Scotland of approximately -£4,000 million. It should be stressed that the balance of trade estimates from the 1998 tables are not comparable with previous estimates due to the significant changes in methodology introduced this year.

##### Industry linkages

The columns of the Ixl matrix show purchases made by industries and final demand from each Scottish industry's output arising from both principal **and** secondary production. Column 3 of Table A3 shows that Manufacturing purchases the majority of its domestic inputs from other firms in the same industry; Distribution and Catering; and Finance and Business. If the output of the Manufacturing industry rose then more inputs would be required from its supplier industries (e.g. Distribution and Finance).

The demand for Manufacturing industry outputs could in turn be influenced by the industries it supplies. Looking at row 3 of the Ixl matrix, if demand for Public Admin rose we could expect to see an increase in the demand for Manufacturing industry outputs, as a supplier to Public Admin etc.

These industry linkages can be summarised as industry Multipliers and can be used to look at the knock-on effects throughout the Scottish economy of a change in final demand.

**Table A3 Aggregate Industry by Industry 1998 (Basic Prices)**

| Industry                                       | Input of Industry              |        |               |                  |              |                         |                           |                    |                   |                | Final Expenditure              |                        |            |                                 |             | Total final demand | Total demand |             |
|--|--------------------------------|--------|---------------|------------------|--------------|-------------------------|---------------------------|--------------------|-------------------|----------------|--------------------------------|------------------------|------------|---------------------------------|-------------|--------------------|--------------|-------------|
|  | Agriculture forestry & fishing | Mining | Manufacturing | Energy and water | Construction | Distribution & catering | Transport & communication | Finance & business | Public admin etc. | Other services | Total intermediate consumption | Consumers' expenditure | Government | Capital formation & inventories | Exports RUK |                    |              | Exports RoW |
| Agriculture, forestry and fishing              | 477                            | 6      | 908           | 0                | 29           | 284                     | 7                         | 15                 | 22                | 0              | 1749                           | 129                    | 1          | 146                             | 733         | 671                | 1680         | 3428        |
| Mining   | 0                              | 99     | 253           | 629              | 156          | 17                      | 1                         | 1                  | 17                | 0              | 1174                           | 4                      | 0          | 35                              | 1063        | 1380               | 2482         | 3655        |
| Manufacturing                                  | 408                            | 80     | 3243          | 230              | 934          | 882                     | 319                       | 736                | 1054              | 72             | 7957                           | 1766                   | 0          | 383                             | 10178       | 17962              | 30289        | 38247       |
| Energy and water                               | 48                             | 15     | 650           | 2150             | 25           | 288                     | 53                        | 90                 | 436               | 16             | 3770                           | 1533                   | 0          | 110                             | 255         | 72                 | 1970         | 5740        |
| Construction                                   | 67                             | 74     | 19            | 26               | 1183         | 326                     | 103                       | 988                | 733               | 63             | 3583                           | 270                    | 0          | 4098                            | 801         | 63                 | 5232         | 8815        |
| Distribution and catering                      | 318                            | 171    | 2700          | 126              | 338          | 717                     | 337                       | 660                | 810               | 23             | 6201                           | 7458                   | 4          | 644                             | 2810        | 1                  | 10916        | 17117       |
| Transport and communication                    | 87                             | 153    | 491           | 22               | 77           | 426                     | 2225                      | 1228               | 404               | 149            | 5262                           | 1652                   | 0          | 43                              | 2724        | 485                | 4904         | 10166       |
| Finance and business                           | 143                            | 785    | 1793          | 220              | 1744         | 1077                    | 1316                      | 3387               | 2140              | 83             | 12687                          | 5792                   | 2          | 597                             | 2601        | 722                | 9713         | 22400       |
| Public admin etc                               | 136                            | 33     | 200           | 37               | 66           | 55                      | 154                       | 229                | 3915              | 6              | 4830                           | 4060                   | 16769      | 116                             | 1469        | 218                | 22631        | 27462       |
| Other services                                 | 12                             | 1      | 3             | 1                | 140          | 14                      | 31                        | 32                 | 112               | 3              | 348                            | 711                    | 0          | 0                               | 141         | 104                | 956          | 1304        |
| Total domestic purchases at basic prices       | 1697                           | 1417   | 10259         | 3440             | 4693         | 4086                    | 4545                      | 7367               | 9642              | 415            | 47560                          | 23374                  | 16776      | 6171                            | 22774       | 21677              | 90773        | 138334      |
| Imports from Rest of UK                        | 309                            | 576    | 7188          | 465              | 753          | 1722                    | 808                       | 2454               | 2105              | 17             | 16397                          | 10816                  | 0          | 3739                            | -           | -                  | 14555        | 30953       |
| Imports from Rest of World                     | 161                            | 212    | 6889          | 19               | 146          | 458                     | 160                       | 238                | 739               | 0              | 9022                           | 7132                   | 0          | 1285                            | -           | -                  | 8418         | 17439       |
| Total intermediate consumption at basic prices | 2166                           | 2205   | 24336         | 3925             | 5592         | 6266                    | 5512                      | 10059              | 12487             | 432            | 72979                          | 41322                  | 16776      | 11196                           | 22774       | 21677              | 113747       | 186726      |
| Taxes on products                              | 66                             | 82     | 1075          | 165              | 233          | 233                     | 338                       | 466                | 495               | 47             | 3202                           | 3495                   | 84         | 588                             | 1560        | 306                | 6033         | 9235        |
| Taxes less subsidies on production             | 11                             | 14     | 293           | 133              | 34           | 504                     | 94                        | 187                | 248               | 22             | 1539                           |                        |            |                                 |             |                    |              | 1539        |
| Compensation of employees                      | 585                            | 672    | 7066          | 709              | 2606         | 5033                    | 3192                      | 5380               | 12637             | 516            | 38396                          |                        |            |                                 |             |                    |              | 38396       |
| Gross operating surplus                        | 600                            | 682    | 5477          | 809              | 350          | 5080                    | 1030                      | 6308               | 1595              | 286            | 22218                          |                        |            |                                 |             |                    |              | 22218       |
| Gross value added at basic prices              | 1196                           | 1368   | 12836         | 1650             | 2990         | 10618                   | 4315                      | 11875              | 14480             | 824            | 62153                          | -                      | -          | -                               | -           | -                  | -            | 62153       |
| Output at basic prices                         | 3428                           | 3655   | 38247         | 5740             | 8815         | 17117                   | 10166                     | 22400              | 27462             | 1304           | 138334                         | -                      | -          | -                               | -           | -                  | -            | 258114      |

## A4 - Multiplier Analysis

If there is an increase in **Final Demand** for a particular commodity, there will be an increase in the output of that commodity, as producers react to meet the increased demand; this is the **direct impact**. As these producers increase their output, there will also be an increase in demand on their suppliers and so on down the supply chain; this is the **indirect impact**. As a result of the direct and indirect impacts the level of income throughout the economy will increase, a proportion of this increased income will be re-spent on final goods and services: this is the **induced effect**. The ability to quantify these multiplier effects is important as it allows economic impact analyses to be carried out on the Scottish economy. Type I and Type II multipliers are presented in Section C of this publication, in general terms, the former sum together direct and indirect impacts while the latter **also** include induced effects.

### Definitions of multipliers and effects:

#### Output multipliers

The output multiplier for an industry is expressed as the ratio of direct and indirect (and induced if Type II multipliers are used) output changes to the direct output change due to a unit increase in final demand. So that multiplying a change in final demand (direct impact) for an individual industry's output by that industry's Type I output multiplier will generate an estimate of direct + indirect impacts upon output throughout the Scottish economy.

#### Employment Multipliers

The employment multiplier is the ratio of direct plus indirect (plus induced if Type II multipliers are used) employment changes to the direct employment change.

#### Employment effects

Employment effects show the ratio of direct plus indirect (plus induced if Type II multipliers are used) employment change to the direct output change due to a unit increase in final demand.

#### Income Multipliers

These measure the change in income (compensation of employees) which occurs throughout the economy as a result of a change in final demand. They show the ratio of direct plus indirect (plus induced if Type II multipliers are used) income changes to the direct income change.

#### Income effects

These show the ratio of direct plus indirect (plus induced if Type II multipliers are used) income change to the direct output change due to a unit increase in final demand.

### **(1) Use of employment multipliers - The effect of a company opening or closing**

Multipliers can be used to look at the impact of a specific event on the Scottish economy – for example a company opening or closing. To illustrate this, a hypothetical opening of a company in the “Other financial institutions” industry, employing 100 people on a full-time basis is considered.

In assessing the impact of this new company we estimate:

- effects on suppliers of the company
- effects on the economy due to a increase in the spending of the new employees

This is achieved by employing the appropriate multipliers for the type of industry concerned. For the illustrative example, the multipliers used will be for the “100.2 - Other Financial Institutions” Input-Output group.

#### Effects on Suppliers (Indirect Employment Effect)

Multiplying the direct increase in jobs by the “Other financial institutions” Type I employment multiplier gives:  $100 \times 2.4 = 240$  **direct and indirect new full-time equivalent jobs**. Subtracting the initial direct job increase gives the additional indirect increase in jobs throughout the Scottish economy as **140 (full-time equivalent)**.

#### Effect of increased Household Expenditure (Induced Employment Effect)

In addition to the effect of increased employment, we would expect to see an increase in household expenditure among the people who have gained employment through both the direct and indirect employment effects. This is the induced effect and is estimated using the Type II multipliers.

Multiplying the direct increase in jobs by the “Other financial institutions” Type II employment multiplier gives:  $100 \times 2.77 = 277$  **direct, indirect and induced jobs**. As we have already calculated a direct and indirect increase in employment of **240 (FTE)**, we estimate that **37** further jobs will be created as a result of this induced demand.

### **(2) Estimating the effects of a change in final demand**

The above example used an estimate of jobs created directly in one industry to estimate the numbers of jobs created indirectly and through induced demand throughout the economy. However, the direct impacts upon an industry are often presented in monetary terms i.e. increased exports or a change in Government spending. The following example uses the hypothetical scenario of an additional £5 million of exports to the Rest of the World from the “Man. of Other Inorganic Basic Chemicals” industry.

#### The effect on output (using Output Multipliers)

The direct impact upon “37 - Man. of Other Inorganic Basic Chemicals” will be a requirement to increase its total output by £5 million to meet this additional final demand. To estimate the indirect effect on this industry’s suppliers, we multiply the direct impact (£5m) by the Type I output multiplier for this industry (1.39) giving a **total of direct plus indirect impacts of £6.95 million**. Similarly to the example above, we would expect the direct and indirect increases in output to lead to increased employment in the affected industries and subsequently to an increase in household consumption. Multiplying the direct impact (£5m) by the Type II output multiplier (1.56) gives **£7.8 million of increased output (direct, indirect and induced effects)**.

#### The effect on employment (using Effects on Employment)

The direct change in output can be also be used to estimate the effect upon employment in Scotland. Multiplying the direct output change by the Type I employment effect for this industry gives an estimate of the direct + indirect employment changes resulting from this additional output.  $£5m \times 12.51 = 62.5$  **full-time equivalent jobs created directly and indirectly throughout the Scottish economy**. The direct, indirect and induced employment change can be estimated using the Type II employment effects.

#### The effect on income (using Effects on Income)

If employment were to rise, we would expect to see an associated rise in household income as these new posts are filled. The income effects estimate the effect of the direct change in output upon household income in Scotland. Multiplying the direct output change by the Type I income effect for this industry gives an estimate of the direct + indirect income changes resulting this additional output:  $£5m \times 0.32 = £1.6m$  **of additional household income created directly and indirectly**. The direct, indirect and induced income change can be estimated using the Type II employment effects.

## **Section B - Methodology**

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This section describes the main data sources used to compile the Scottish I-O tables and provides reference to further documentation on I-O analysis. For those who have used previous years' Scottish tables, we have also provided a description of the changes to the 1998 tables - including those brought about by the introduction of the new European System of Accounts.

### **B1 - Compilation of the Tables**

The Scottish Input-Output tables follow closely the guidance given in European System of Accounts 1995 (ESA95)<sup>1</sup> which is based on the System of National Accounts 1993 (SNA93)<sup>3</sup> - a system which has been adopted world-wide. The Scottish tables are also on a consistent basis to the UK Supply and Use Tables<sup>4</sup> as published by ONS. For a full description of the methodology and treatments behind the production of I-O tables reference should be made to the ESA95 publication and to the UK National Accounts Sources and Methods<sup>5</sup>. Scottish I-O Tables for 1989<sup>2</sup> also provide detailed description of the construction and uses of I-O tables.

A Eurostat Task Force has also been set up to develop an I-O manual giving guidance on the compilation of I-O tables in accordance with ESA95 and SNA93 – this will be available by the end of 2001.

### **B2 – Data Sources**

A wide variety of data sources have been used. Inevitably these have been of varying suitability and quality; information on purchases, in particular, is very scarce for some industries. Wherever possible, real Scottish data from ONS enquiries has been used, in addition to data from Scottish Executive surveys or other official sources.

The data presented in this balance represent our best estimate of the structure of supply and demand.

The main data sources used in this balance were as follows:

**Agriculture and fishing:** The estimates are largely based on data from the Scottish Executive Rural Affairs Department (SERAD).

**Forestry:** These estimates are based on data supplied by the Forestry Commission.

**Production industries:** The source of the estimates of total output and key purchases of these industries is the Scottish Production Database, which is compiled using ONS Annual Business Inquiry data. Estimates of imports and exports come from the Scottish Manufacturing Trade Flow Survey for 1998.

**Construction:** Estimates for the construction industry are based on the Scottish Construction Database, which is compiled using ONS Annual Business Inquiry data. Data on imports and exports comes from the 1997 Construction Trade Flow Survey.

**Services (excluding the public sector and those mentioned separately below):** These estimates are based on the Scottish Services Database, which is compiled using ONS Annual Business Inquiry data. The 1995 Scottish Service Sector Trade Flow Survey provides the breakdown of trade.

**Transport:** These estimates are based on a mixture of Scottish Services Database information, Scottish Transport Statistics and ad hoc sources.



**Postal services and telecommunications:** Estimates for these industries are based on company reports and UK I-O tables. The 1995 Scottish Services Sector Trade Flow Survey provides the breakdown of trade and domestic purchases.

**Financial services:** These estimates are largely based on information provided by the CSCB (Committee of Scottish Clearing Banks) about the rates of growth in the industry and the level of net interest income. The 1995 Scottish Services Sector Trade Flow Survey provides the breakdown of trade and domestic purchases.

**Public services:** The main sources for these estimates are Government expenditure records.

**Distributors' trading margins:** These estimates are based on the UK product level data which, along with output, is used to estimate Scottish margins. The allocation of distributors' trading margins to products is approximate.

**Taxes less subsidies on production and on products:** Government records provide a detailed breakdown of individual taxes and subsidies. Applying UK proportions to Scottish activity at the most detailed industry level derives Scottish taxes and subsidies. Each product tax is allocated on the basis of the pattern of expenditure on those products attracting the tax.

**Consumers' & tourists expenditure:** Scottish consumers' expenditure data were available at the level of the Family Expenditure Survey categories. These were further split using UK proportions. Data on tourist expenditure was taken from the ONS Regional Accounts figures and from Visit Scotland.

**Government final consumption:** Total Government expenditure is estimated from Scottish Executive expenditure data. Estimates for Health and Local Authority activities are provided by the relevant Scottish Executive department. Purchases are broken down based on UK I-O data.

**Change in inventories:** This analysis is based on data available from the Scottish Production Database, Scottish Construction Database, Scottish Services Database, SERAD and the Forestry Commission.

**Gross fixed capital formation:** Very little information on the product composition of GFCF is collected. Most of the estimates published here are therefore based on UK proportions applied to Scottish activity.

**Exports:** Information on exports to RoW is gathered from a variety of sources, including The Scottish Council Development and Industry's manufacturing and service exports surveys, SEELLD trade flow surveys, SERAD and other industry sources. Information on exports RUK are derived mainly from SEELLD trade flow surveys.

## B3 – European System of Accounts 1995 (ESA95)

The aim of this section is to document a major technical change implemented in the 1998 Scottish Input-Output tables. This may only be of relevance to regular users of the tables who will note differences between the 1998 tables and those published in previous years.

This is the first year that the Scottish I-O tables have been produced following the guidance laid out in the European System of Accounts 1995 (ESA1995)<sup>1</sup>. Previously the tables were based on the UK system of accounts, which was, except for one or two minor differences, the same as the European System of Accounts 1979. Although Scotland is not legally required to produce ESA95 based accounts; we do so where possible to allow comparison with the UK and other European Union member states.

The implementation of ESA95 in the Scottish I-O Tables includes a wide variety of changes. All industrial sectors in the tables are affected. The effects have been grouped into 3 categories:

- Structural changes
- Change of price basis
- Expenditure/output re-classifications

### **Structural changes**

Firstly, there has been a change in the structure of the Scottish I-O tables, largely consisting of the renaming and/or disaggregation of some final demand and primary input sectors:

#### Final Demand Changes

- Consumer Expenditure has been split into *Households* and *Non-Profit Institutions Serving Households (NPISHs)*.
- General Government Final Consumption has been split into *Central Government Final Consumption (CGFC)* and *Local Government Final Consumption (LAFC)*.
- Gross Domestic Fixed Capital Formation (GDFCF) is renamed *Gross Fixed Capital Formation (GFCF)*.
- A new column for *Valuables* has been formed out of both GDFCF and Consumer Expenditure.
- Stocks are assigned the new name *Changes in Inventories*.

#### Primary Inputs Changes.

- Total Intermediate Demand has been renamed *Total Domestic Purchases* with *Total Intermediate Consumption* now formed from Total Domestic Purchases plus Imports
- Sales by Final Demand are no longer separately identified but are now included in intermediate consumption on the relevant commodity row.
- Income from Employment is now called *Compensation of Employees (CoE)*
- Other Value Added has been renamed *Gross Operating Surplus (GOS)*.

The structural changes are largely cosmetic with little quantitative effect on the tables.

### **Change of price basis**

One of the key changes introduced by ESA95 is the basic price (bp) valuation of Gross Value Added (GVA) and Gross Output (GO) – where previously GVA was at factor costs (fc) and GO was at producer prices.

At bp, GO contains Taxes *less* subsidies on production only, rather than on production **and** products as before. As a consequence of this change, valuation of the Gross Output of the economy decreases. Final Demand sectors now contain no values in the Taxes *less* subsidies row since, as non-producers, they are not liable for taxes *less* subsidies on production.

GVA at bp, and thus also GDP(I) at bp, is equal to GVA at fc **plus** taxes /less subsidies on production. The change in price basis results in an upward shift in GVA in the tables.

The change in the valuation of output from producers' prices to basic prices carries through to the Industry by Industry matrix – now also shown at basic prices.

### **Expenditure/Output reclassifications**

Finally, the switch to ESA95 introduces 35 changes to classifications of expenditures/output, many of which affect more than one sector. The majority of these changes relate to increased capitalisation. For example, purchase and output of computer software and large databases which are to be used for more than one year, should now be classed as GFCF instead of intermediate consumption.

Another example of an ESA95 change is the recognition of work in progress for services. For example, outputs of legal services, accountancy and architecture were previously only recorded on delivery, but now work on such activities can be shown as work in progress in the changes in inventories column.

Full details of individual ESA95 changes can be found in the ONS publication "Introducing the European System of Accounts 1995 in the United Kingdom"<sup>6</sup>.

### **Aggregate ESA95 Effects**

To estimate the effects of implementing ESA95 on the Scottish tables adjustments were made to the 1996 ESA79 tables. These were based on information and data on UK I-O adjustments supplied by ONS.

At an aggregate level, after both the price basis and reclassification changes are taken into account, Scottish Gross Output ESA95 (basic prices) is 1.8% lower than Scottish Gross Output ESA79 (producer prices). This difference is very close to that seen for the UK - 1.9%. The slight difference between these figures is understandable as the effects of some ESA95 changes are not felt in Scotland (e.g. changes to the treatment of IMF) and some industries have a proportionally larger (or smaller) effect on the economy in Scotland than the UK.

The impact of all of the ESA95 changes on GVA, and thus GDP(I), is to induce a 3.9% upward shift. This compares with 3.3% for the UK.

Details of how the ESA95 changes were implemented in the Scottish tables are available from the Scottish Executive Input-Output branch.

## B4 - Other Developments in the 1998 Tables

### “Government-out” to “Government-in”

The Scottish I-O tables are now produced on a Government-In basis. This treatment of Government is consistent with both the UK I-O tables and ESA95. All previous Scottish tables were produced Government-Out.

#### Definitions

- *Government-Out (pre-1998)*  
Individual purchases made by government to produce education/health etc. are shown in final demand. The only health activity given in IOC 116 relates to private healthcare. The GVA component for government activities is shown in IOC 115.

The Make matrix shows no output from government, except in Public Admin.

- *Government-In (1998)*  
Purchases to produce government activity are shown under the relevant IOC e.g. NHS purchases are now under 116:Health, with government final demand now showing block purchases of the associated output of education/health/public admin etc.

Government activity is now included as output in the Make matrix.

#### Effect on the USE matrix

For sectors 116 to 119 and 121, this change results in an increase in intermediate demand as these industries now include purchases for public sector activities. Compensation of employees has also grown considerably due to the inclusion of public sector workers whose wages were previously shown in 115. Compensation of employees by 115 has thus fallen dramatically whilst intermediate demand has increased to include inputs to public administration and defence.

Although the switch from Government-out to Government-in does have an effect on government final demand, the Total Inputs of the final demand columns remain unchanged. As stated above, central and local government continue to purchase the same amount but in block purchases of *domestic* commodities rather than individual inputs. Consequently Intermediate Demand is increased, as the inputs which were previously imported are now included as imports by the individual intermediate industries.

### **New/Updated Data Sources**

#### New ONS Annual Business Inquiry (ABI)

1998 is the first year covered by the new ABI. This survey brings together all previous separate surveys (Annual Employment Survey, Annual Census of Production & Construction, Distribution Trades and Services inquiries & Purchases inquiry). The Scottish Production Database, Scottish Services Database and Scottish Construction Database are compiled from the ABI.

These databases provide key constraining totals for the I-O tables, covering manufacturing, construction and services. More disaggregate purchase data has been extracted for the 1998 tables and the analysis has been extended to cover the service sectors. The ABI also provides a new source for employment data used for the employment multipliers. At present, this only covers employees.

#### PRODCOM Inquiry

ONS's PRODCOM survey collects information on the outputs of production industries. A Scottish extract from this survey has been used in the tables (last updated in 1995). This data provides a

breakdown of industry output by commodity for the Make matrix. The survey covers IOCs 8 to 84 and will be updated annually from 1998.

Manufacturing Trade Flow Survey

A new manufacturing trade flow survey was conducted for 1998. (last updated 1994). This survey provides updated information on imports and exports for IOCs 8-84.

Construction Trade Flow Survey

A new construction trade flow survey was conducted for 1997. This survey provides updated information on imports and exports for IOC 88.

## References

1. European System of Accounts (ESA95), EU. Eurostat, 1996 ISBN 92-827-7954-8
2. Scottish Input-Output Tables for 1989. Volumes 1 and 2. HMSO, 1994 ISBN 0-11-495177-2
3. System of National Accounts, United Nations, 1993 ISBN 92-1-161352-3
4. United Kingdom Input-Output Annual Supply and Use Tables, 1998, ISBN 1468-0718  
The Stationery Office
5. United Kingdom National Accounts Concepts, Sources and Methods, ISBN 0-11-621062-1  
The Stationery Office, 1998.
6. Introducing the European System of Accounts 1995 in the United Kingdom, The Stationery Office, 1998 ISBN 0-11-621061-3

## ***Section C – 128-Industry Tables and Multipliers***

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- Table 1: Domestic Output at Basic Prices & Supply of Products at Purchasers' Prices
- Table 2: Demand for Products – Domestic Use Matrix
- Table 3: Industry by Industry Domestic Flows Matrix
- Table 4: Type I Output, Income and Employment Multipliers for Scotland
- Table 5: Type II Output, Income and Employment Multipliers for Scotland
- Table 6: Classification of 10 and 128 Input-Output industry/product groups by SIC(92) classes

These tables are also available electronically via the Internet at:

[www.scotland.gov.uk/stats/docs/io98.xls](http://www.scotland.gov.uk/stats/docs/io98.xls)

## **Definitions**

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Throughout this publication the symbol ‘ – ’ is used to denote a value of zero.

### **Basic prices:**

The amount received by the producer for a unit of goods or services *minus* any taxes payable *plus* any subsidy receivable on that unit as a consequence of production or sale (i.e. the cost of production including subsidies). As a result the only taxes included in the basic price are taxes on the production process - such as business rates and any vehicle excise duty paid by businesses - which are not specifically levied on the production of a unit of output. Basic prices exclude any transport charges invoiced separately by the producer.

### **Central Government final consumption:**

This class of expenditure presents public spending on Public Administration (including Defence) and Health services in Scotland. No distinction is made between purchases of these services by the Scottish Executive or UK Central Government departments and agencies.

### **Changes in Inventories:**

Inventories consist of finished goods (held by the producer prior to sale), work in progress and products (materials and fuel) acquired from other producers to be used for *intermediate consumption* or resold without further processing.

### **Compensation of Employees:**

The total remuneration payable by an employer in return for their employees' labour. In addition to wages and salaries, this classification also records payment in kind and employers' contributions to social security funds and privately funded insurance schemes.

### **Distribution Margins:**

Transportation, storage and distribution do not change the physical appearance or nature of goods but change their time or place. The value added by the distributive industries is calculated as the difference in value of the good when it started and when it finished being held or moved i.e. the actual receipts from sales *less* the purchase of goods for resale *less* recurrent losses due to wastage, theft, etc *plus* net change in distributors' inventories.

### **Final Consumption:**

The expenditure on goods and services that are used for the direct satisfaction of individual needs or the collective needs of members of the community, no further value is added to these goods and services by domestic end consumers.

### **Financial Intermediation Services Indirectly Measured (FISIM):**

The output of many financial intermediation services is paid for not by charges, but by an interest rate differential, i.e. the difference between interest rates offered to borrowers and investors. The value added of these industries is shown including their interest receipts *less* payments, in effect imputing charges for their services.

### **Intermediate Consumption:**

Purchases made by industry for use in their production processes.

### **Gross Fixed Capital Formation (GFCF):**

Gross Fixed Capital Formation relates principally to investment in tangible fixed assets such as plant and machinery, transport equipment, dwellings and other buildings and structures. However, it also includes investment in intangible fixed assets, improvements to land and also the costs associated with the transfer of assets. The investment relates to assets which are used repeatedly in the production process for more than one year and as such covers such purchases as: software, mineral exploration and purchases of dairy cattle.

### **Gross Operating Surplus:**

This classification is broadly analogous to profit but is more accurately defined as the surplus (or deficit) on production activities before account has been taken of interest, depreciation, rents or charges. This class includes mixed income where, particularly in the case of sole proprietors, separately identifying profits and wages may not be possible.



**Household Final Consumption Expenditure:**

Household final consumption expenditure represents consumer spending. It includes imputed rent for the provision of owner-occupied housing, income in kind and consumption of own production. Also included is Scottish household expenditure in the rest of the UK and overseas, with spending by non-Scottish households being presented within the relevant tourist expenditure category. The household sector covers not only those living in traditional households, but also those people living in communal establishments, such as retirement homes, boarding houses and prisons

**Local Government final consumption:**

The Local Government sector in Scotland comprises the 32 Scottish Councils and services run by joint authorities such as the police and fire services. Local Government expenditure covers the provision of Education, Public Administration, Social Work, Public Health and Recreation services.

**NPISH (Non-Profit Institutions Serving Households):**

NPISH are organisations that provide goods or services to households either free or at prices that are not economically significant. There are three broad types of NPISH:

- Academic establishments, principally universities, higher education and further education colleges;
- Associations which provide benefit primarily for their members and are financed mainly by subscriptions, including professional and learned societies, trade unions, churches and religious societies, housing associations, non-collecting friendly societies, social or recreational organisations and sports clubs. This class excludes those bodies where membership gives a right to a predetermined range of goods or services; for example book clubs and the Automobile Association.
- Bodies that serve the interests of people other than their members, including charities and similar relief and aid organisations financed by donations from the public, government and business.

**Purchasers' prices:**

The prices paid for products at the point of sale, after the addition of any taxes *less* subsidies on products and after the addition of any other costs such as distributors' trading margins. Table A2 and Table 1 (Section C) shows the transition from basic to purchasers' prices.

**Taxes less subsidies on Production:**

These are compulsory and unrequited payments levied on the production and importation of goods and services, the employment of labour, the ownership and use of buildings or other assets used in production. They are payable whether or not profits are made. Subsidies on production are defined as payments made to producers with the objective of influencing their level of production, their prices or to assist with purchases of the factors of production.

**Taxes less subsidies on Products:**

The main UK taxes on products are value added tax (VAT), and taxes on alcoholic drinks, tobacco, hydrocarbon oil, betting, and stamp duties. Subsidies on products are payable per unit of good or service produced, with the aim of reducing the purchase price to the consumer. The main product subsidies in Scotland, which are paid by the European Union and Central/Local Government, relate to agriculture, transport and housing.

**Valuables:**

Goods of considerable value that are not used primarily for production or consumption but are held as stores of value over time. They consist of precious metals, precious stones, jewellery, works of art, etc.

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