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Development, Compilation and Use of Input-Output Supply and Use Tables in the United Kingdom National Accounts

by

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Introduction

This paper looks at the development, compilation and use of Input-Output in the United Kingdom (UK) since the first official tables were drawn up in 1961 for the year 1954. The Input-Output Supply and Use Tables framework is now a central part of the UK's National Accounts, and is the key to agreeing the annual level of current price Gross Domestic Product as well as feeding into various parts of the National Accounts and other products.

Abstract

In the UK, the first official Input-Output Tables were published in 1961 for the year 1954, and have been produced roughly every five years as needed for the National Accounts rebasing of constant price estimates. However, since 1991/2, the production of Input-Output Supply and Use Tables have been a central part of the UK's National Accounts and have been used to set the annual level of current price Gross Domestic Product.

This paper looks at the development of Input-Output in the UK and covers:

- **History and development** of I-O Supply and Use Tables.
- **Compilation and methodology** of I-O Supply and Use Tables, and **annual coherence adjustments** to GDP.
- Development of **data sources** used.
- Stages of **integration with National Accounts**.
- Development of **new analyses** based on I-O Supply and Use Tables to increase their value to **users**.

The paper also describes the UK's approach to maintaining consistent I-O Supply and Use Tables over time, handling revisions and the **planned improvement of the National Accounts** through the development of quarterly and annual I-O Supply and Use Tables both in current and previous years prices' prices. The paper also covers the UK's approach to meeting demands for data from the Statistical Office of the European Community (Eurostat).

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Role of Input-Output (I-O) Annual Supply and Use Tables

The main aim of the United Kingdom Office for National Statistics Input-Output work is to provide a framework for the detailed reconciliation of the components of the three measures of Gross Domestic Product (GDP), thus agreeing a single annual estimate of current market price GDP. In order to achieve this, Input-Output (I-O) Supply and Use Tables are produced annually.

The ONS *Blue Book*[1] and the *Pink Book*[2] incorporate the final results of various annual inquiries, which become available on average around 15 months after the year in question, and quarterly data, which is predominantly used to calculate estimates for the latest year. As new data are collected it is likely that revisions will be necessary, hence the provisional nature of the latest tables. The process of reassessing these estimates involves the preparation of current price I-O Annual Supply and Use Tables. This Input-Output approach brings together all the available information on inputs, outputs, gross value added, incomes and expenditures. Similarly the production of the consolidated sector and financial accounts requires the preparation of 'top-to-bottom' sector and sub-sector accounts to identify discrepancies in the sector estimates.

The first UK I-O Annual Supply and Use Tables were compiled during 1991/92 covering the year 1989, and published in the 1992 ONS *National Accounts Blue Book* (Chapter 18). For the 2006 *Blue Book* exercise, the first I-O Annual Supply and Use Tables for 2004 were produced together with revised tables for the period 1992-2003, which include revisions as described later in this article. The tables are based on the *European System of Accounts 1995* (ESA 95)[3].

The value of input-output is enhanced by the timely production of the tables, and to this end, the latest tables are now being produced around 18 months after the end of the year to which they refer.

Since 1998, in line with the ESA 95, the Input-Output framework and data sources have been used to develop and produce integrated annual production accounts by sector, and by industry, together with the annual generation of income accounts by sector, and by industry. This process has added a further dimension to the GDP accounts, and in turn, has provided further improvements to the quality of the data and the links between the UK accounts.

I-O Annual Supply and Use Tables also form the basis for the I-O Analytical Tables, which provide another dimension to the National Accounts. These tables provide separate analyses of the uses of domestically produced and imported goods and services. They also provide a framework to assess the direct and indirect changes on the whole economy, when the demand for a single product increases or decreases, as well as modelling a range of other types of economic change. The latest such tables for the UK were produced for the year 1995[4], and published in April 2002. Further details describing I-O Analytical Tables are provided later in this article.

Another major role for I-O work in the ONS is to produce supply-side estimates of final demand. I-O analyses form the basis for the models that produce these estimates. Information from I-O Annual Supply and Use Tables also forms the basis of other statistics compiled in the ONS, for example: Producer Price Input Indices, Regional Accounts, Environmental Accounts and gross value added weights used in the annual chain-linking of the constant price *production* measure of GDP.

Various new analyses have been developed based on the I-O Annual Supply and Use Tables, for example: trade performance and concentration ratios, as well as function based analyses like: ICT; food sector; oil and gas sector; and creative sector. The development of I-O Supply and Use Tables in previous year's prices extends the framework for ensuring coherence of economic statistics into new areas, such as productivity.

Key external users of I-O analyses include the Bank of England, HM Treasury and HM Revenue and Customs for modelling the economy through a disaggregated view of industrial behaviour over time. Such models allow analysis of how the economy has, or will, respond to micro or macro economic change, for example: VAT regulations, consumer behaviour, rising oil prices, introduction of the minimum wage, and situations like BSE and foot and mouth disease. Other external customers include: other government departments, Eurostat, OECD, city analysts and businesses, economic forecasters and modellers, academics, trade associations, companies and the media.

I-O Supply and Use Tables - basic structure

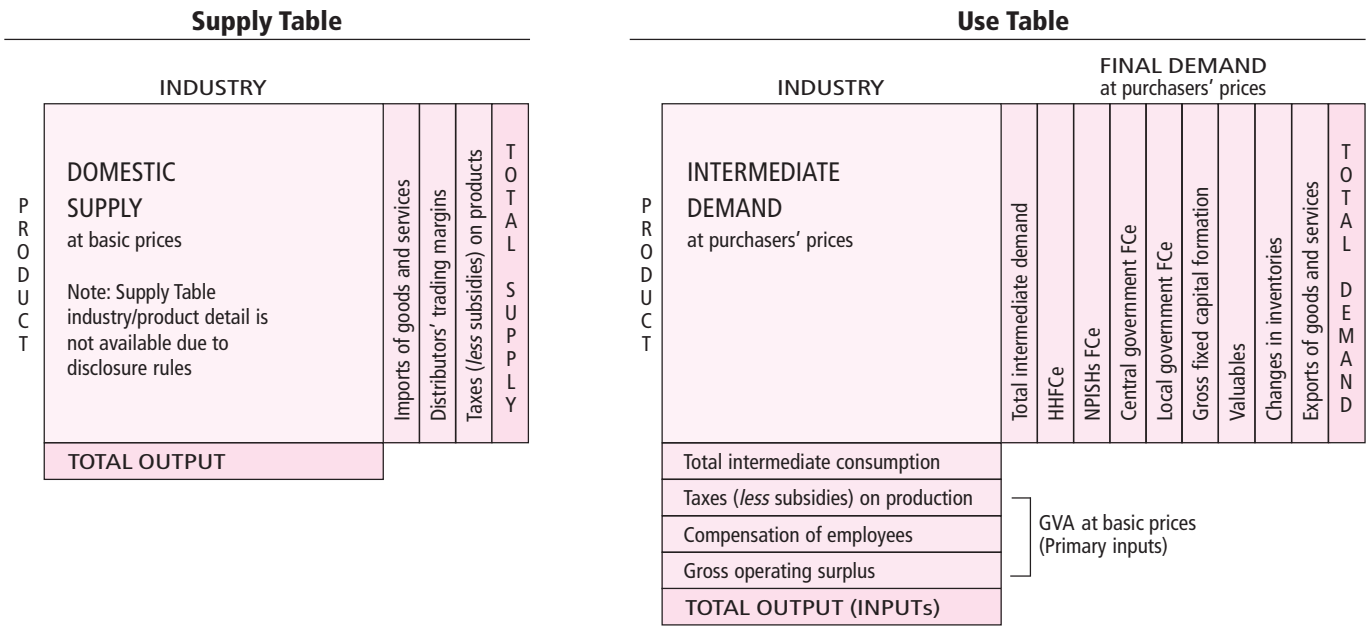
The I-O Annual Supply and Use Tables consist of two matrices, which bring together the *production*, *income* and *expenditure* measures of GDP. When balanced, they provide a single measure of annual current price GDP, which integrates the components of gross value added, inputs and outputs, and final demands.

The I-O Annual Supply and Use Tables as illustrated in **Graphic 1**, reflect the structure and availability of the data collected and the components needed to balance the three measures of GDP:

- The I-O Annual Supply and Use Tables show the supply and demand for products in terms of 123 industries (represented by columns) and 123 products (represented by rows). Industries are defined using the 2003 version of the *Standard Industrial Classification* (SIC (2003)), and businesses are classified on the ONS Inter-Departmental Business Register (IDBR) to industries according to whatever product accounts for the greatest part of their output. See *Annex A* for the classification of the 123 Input-Output groups and their links to SIC (2003).
- The Supply Table shows the output of each industry by type of product at basic prices. Industries, by definition, produce mainly the principal product of the industry to which they are classified. The off-diagonal products are secondary production or by-products of the production process. The Supply Table is published in summary form only because of disclosure rules prohibiting the publication of data that may be traced to a single contributor to ONS inquiries.
- The industrial dimension of the Use Table shows, for each industry, the costs incurred in the production process as intermediate consumption along with primary inputs (labour costs, taxes on production, profits, etc.).
- The product dimension of the Use Table shows intermediate demand and final demand and is valued at purchasers' prices, which represent the prices that purchasers actually pay.
- Estimates of consumption (both intermediate and final demand) include goods and services both domestically produced and imported.

1

I-O Supply and Use Tables framework



HHFCe represents Households final consumption expenditure.
NPISHs FCe represents Non-profit institutions serving households final consumption expenditure.

Stages of integration with National Accounts and Revisions

Publication of Blue Book and I-O Annual Supply and Use Tables

Table 2 shows the release dates for the ONS *Blue Book* dataset and for the quarterly data underpinning the annual datasets since the 1992 *Blue Book*, which contained the first Input-Output Annual Supply and Use Tables for the year 1989.

Since then, for each annual exercise, the I-O Annual Supply and Use Tables have always been consistent with, and published at the same time as, the corresponding ONS *Blue Book* and *Pink Book* datasets.

2

Release of ONS annual *Blue Book* and consistent quarterly data

Blue Book **year dataset**	**Release of quarterly dataset**	**Release of *Blue Book***
1992	Mid September	Mid August
1993	Mid September	Mid August
1994	Mid September	Mid August
1995	End June	Mid July
1996	End June	Mid July
1997	End June	Mid August
1998	End September	Early October
1999	End July	End August
2000	End June	Early August
2001	End September	End September
2002	End June	Mid July
2003	End September	End October
2004	End June	Mid July
2005	End June	Mid July
2006	End June	Mid July

Different stages of the GDP compilation process

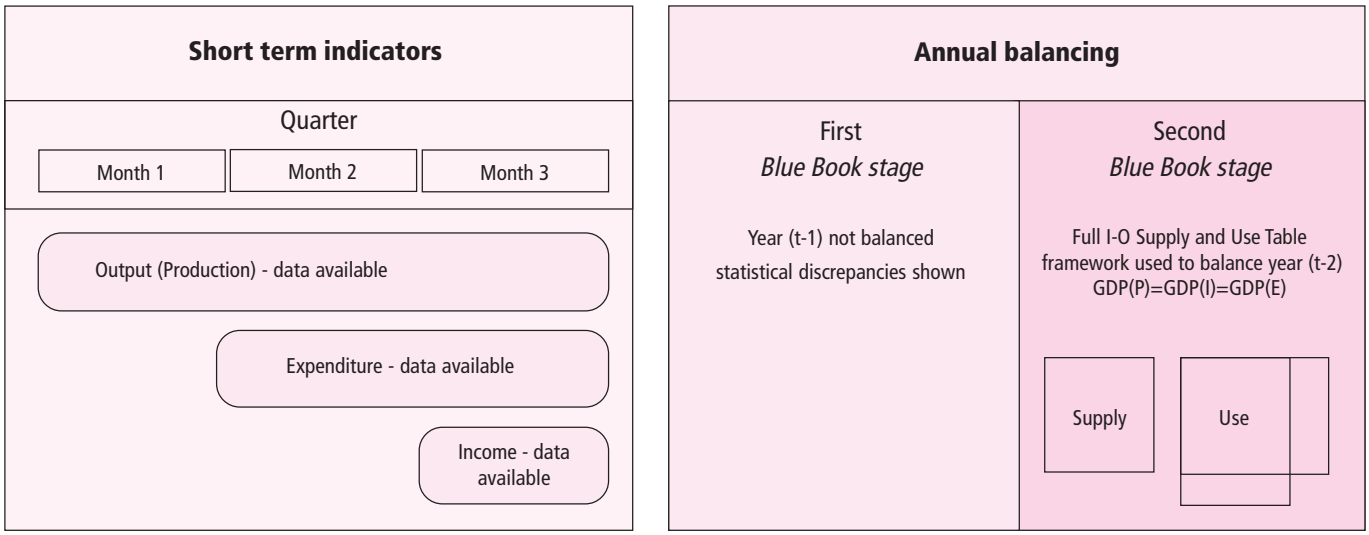
Data feeding into the compilation of GDP, like many economic statistics[5,6], are continually revised and these revisions occur at different stages of the GDP compilation process.

Graphic 3 shows the evolution of the first GDP estimate through successive monthly and quarterly exercises through to the first *Blue Book* and second *Blue Book* exercises.

Table 4 shows when the UK GDP estimate for 2004 Quarter 1 was first published in April 2004, and the timing of subsequent revisions to this period up to the annual benchmarking exercise through the Input-Output Annual Supply and Use Tables in June 2006.

3

Life cycle of national accounts data - estimation timeframe



Letter 't' denotes the year of the *Blue Book* publication

The next section of this article briefly describes the short-term and annual processes, and the cause of revisions at each stage.

Quarterly GDP process

There are three successive monthly releases after the end of each quarter:

- *Gross Domestic Product Preliminary Estimate*, referred to as Month One (M1);
- *UK Output, Income and Expenditure* release, referred to as Month Two (M2); and
- *Quarterly National Accounts*, referred to as Month Three (M3).

The *Gross Domestic Product Preliminary Estimate* is usually released around 25 days after the end of the reference quarter. The UK is one of the fastest countries in the world in releasing its first estimate of GDP, balancing a trade-off between timeliness and subsequent revisions.

4

2004 Quarter 1: Initial estimates of GDP through to annual benchmarking

Month	Release
Apr 2004	M1 Gross Domestic Product Preliminary Estimate (after 25 days)
May 2004	M2 UK Output, Income and Expenditure (after 55 days)
Jun 2004	M3 Quarterly National Accounts (after 85 days)
Sep 2004	Quarterly Round (M3)
Dec 2004	Quarterly Round (M3)
Mar 2005	Quarterly Round (M3)
Jun 2005	Blue Book One stage
Sep 2005	Quarterly Round (M3)
Dec 2005	Quarterly Round (M3)
Mar 2006	Quarterly Round (M3)
Jun 2006	Blue Book Two stage (balanced through I-O SUTs framework)

The preliminary estimate for GDP provides estimates of the growth in the volume of GDP on the previous quarter. It is based on a limited amount of information:

- Index of Production for the first two months of the quarter.
- Monthly Inquiry into Distribution and Services Sectors (MIDSS) for two full months and partial data for the third month.
- Retail Sales Inquiry estimates for the three months of the quarter.
- Limited information on the output of the rest of the economy.

Although at this stage estimates are only available for broad industry groups, the preliminary estimate provides a broad indication of the level of growth in quarterly GDP, which will become more firmly based at later stages in the process.

The *UK Output, Income and Expenditure* is released around 55 days after the end of the reference quarter. A single estimate of GDP with its *income*, *output* (or *production*) and *expenditure* components is produced, replacing and revising the preliminary estimate. Revisions between M1 and M2 arise mostly from additional output based data. This quarterly GDP estimate is improved by the addition of, for example:

- Index of Production and MIDSS data for the third month of the quarter, replacing previously used forecasts.
- New information from the inventories and gross fixed capital formation inquiries.
- Motor trades inquiry and HM Revenue and Customs data.
- Early survey data covering the construction industry.
- Data confrontation and balancing between the different approaches to the measurement of GDP.

The *Quarterly National Accounts* are released around 85 days after the end of the reference quarter. In this release, the ONS produces a full set of quarterly economic accounts, revising and expanding the information made available in the earlier estimate and revising estimates for earlier quarters in the current and, normally, previous years.

Fuller survey data for components of each of the *expenditure*, *output* (or *production*) and *income* measures are available. Revisions between M2 and M3 arise from:

- Additional output data. For example, construction industry estimates are based on full survey results in M3, replacing forecasts used in M1 and M2.
- Newly received data for *expenditure* and *income* measures of GDP, replacing previously used forecasts.
- Additional detail and replacement of imputation. For example, Expenditure and Food Survey (EFS) data are available in M3, replacing forecasts for households final consumption of services.
- Availability of data from the ONS Quarterly Profits Inquiry, and revised estimates for inventories and gross fixed capital formation.
- Availability of some Balance of Payments data for the first time at this stage.
- Data confrontation and balancing between the different approaches to the measurement of GDP.

Graphic 5 shows the evolving availability of data for components of the *expenditure* measure of GDP.

By this stage in the estimation process the full final employment figures (employee jobs in the Workforce Jobs survey) are usually available. These feed into both the *income* measure of GDP, and to a lesser extent the *output* (or *production*) measure of GDP. Given the fully integrated nature of the accounts, any imbalance in the sector accounts is also part of the evidence considered in balancing GDP.

5

Data availabilty of quarterly GDP expenditure components

Quarterly GDP Expenditure components
Data availability and estimation

R = Revised
B = Benchmarked

Expenditure components Percentages for the year 2004 in the 2006 *Blue Book*	**Month 1**	**Month 2**	**Month 3**	**First *Blue Book***	**Second *Blue Book***
HHFCe and NPISHs FCe 64.8%		45%	85%	100% R	100% B
General government FCe 21.3%		60%	60%	100% R	100% B
GFCF 16.5%		55%	80%	100% R	100% B
Changes in inventories 0.4%		65%	85%	100% R	100% B
Exports of goods 16.2%		100%	100%	100% R	100% B
Exports of services 9.2%		60%	80%	100% R	100% B
Imports of goods -21.4%		100%	100%	100% R	100% B
Imports of services -7.0%		60%	80%	100% R	100% B
Total	**Limited data**	60%	80%	100% R	100% B

HHFCe is Households final consumption expenditure. NPISHs FCe is Non-profit institutions serving households final consumption expenditure. GFCF is Gross fixed capital formation. Valuables are not shown as the estimates are negligible.

Annual GDP process including I-O Supply and Use Tables

Annual data sources, as they become available, provide more detail than the quarterly releases and are published and incorporated the following year. This is known as 'Blue Book One stage'. In this stage, the latest complete year is year (t-1), where t is the year of the ONS *Blue Book*. This provides an opportunity to use data from sources that had not been available earlier, such as information from HM Revenue and Customs and Government out-turns for the fiscal year. It is likely at this stage that revisions will be made to the latest annual data and underlying quarterly data. This revision will take place 6 to 18 months after the M3 estimate has been published. For the year (t-1) in this stage, the three measures of GDP are not fully balanced, and statistical discrepancies exist for the *expenditure* and *income* measures of GDP.

The 'Blue Book One stage' estimates are again revised at the 'Blue Book Two stage', typically 18 to 30 months after the preliminary GDP estimate is published. The first Input-Output Annual Supply and Use Tables are produced for the year (t-2) using annual sources such as the ONS ABI together with a range of other benchmark sources and revised data. So, for example, the 2006 *Blue Book* included the first Input-Output Annual Supply and Use Table for the year 2004, incorporating the first set of results from the ABI for that year. When balanced, the Input-Output Annual Supply and Use Tables have removed the need for any annual statistical discrepancies between the three measures of GDP. In the 'Blue Book Two stage' revisions can go back several years and impact on the first estimate for the year (t-1) produced during the 'Blue Book One stage', as well as the underlying quarterly estimates.

Chart 6 shows the impact of the first Input-Output Annual Supply and Use Table on the year (t-2) GDP at current market prices, since the 1994 *Blue Book*.

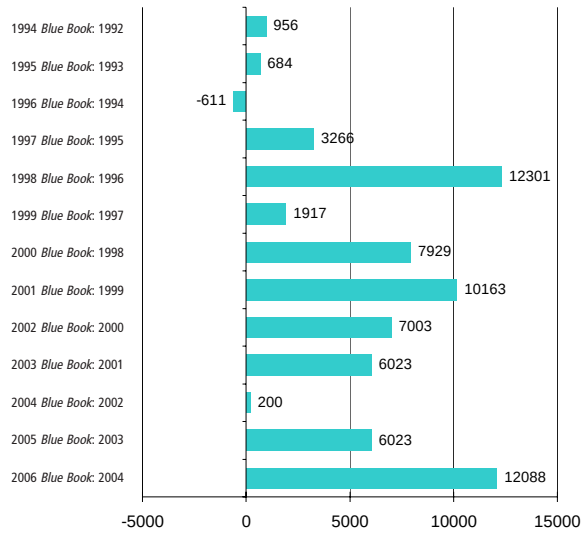
Chart 7 shows the accumulative revision from the first 'Blue Book One stage' estimate of annual GDP for each year balanced through the Input-Output Annual Supply and Use Tables process to the latest estimate published in this edition. Total revision varies between 0.4 per cent and 2.8 per cent of GDP.

For fuller details and analyses of the revisions generated by the different stages of GDP compilation. From M1 through to benchmarking, see *Akritidis*[7,8] and *Richardson*[9,10]. For further details on the annual process, see *Mahajan*[11].

6

Impact of first I-O SUTs balance on year (t-2) GDP at current market prices

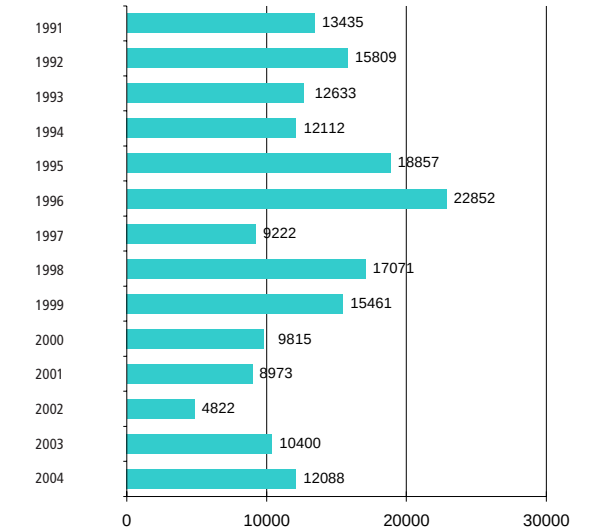
£ million



7

Accumulative revision to GDP from *Blue Book* One stage to latest estimate since the 1992 *Blue Book*

£ million



Sources of revisions

The scope for revisions to earlier periods is determined by the National Accounts revisions policy applied for each quarterly and annual exercise. The policy is based around the arrival of new data and its economic significance coupled with the need to be able to make methodological improvements. In general, revisions through the Input-Output Annual Supply and Use Tables framework are made due to:

- Receipt of additional and/or more comprehensive data and the subsequent need to review any judgmental adjustments made in previous balancing exercises, see *Penneck and Mahajan*[12].
- Update of institutional sector components to reflect final data.
- Annual benchmarking of short-term based data sources.
- Improvements and changes to methodology and classifications.
- Inclusion of new sources and improvements to existing sources.
- Specific data reconciliation exercises.

In principle, it should be noted that methodological and classification changes can cause time series to be revised all the way back to the year 1948, the earliest year of UK GDP at current market prices under the present system. Examples of recent cases that have generated substantial changes to the National Accounts and Input-Output Annual Supply and Use Tables are shown in **Table 8**. For a more complete list of changes in the 1990s, see *Brand and Jenkinson* [13].

8

Key changes affecting National Accounts and Input-Output Annual Supply and Use Tables in recent years

Blue Book **year**	**Change**
n/a	Implementation of Pickford Report Recommendations (Cabinet Office (1989))[14].
	Implementation of Chancellor's Initiatives (ONS (1991))[15] - two funded packages in May 1990 and November 1991.
1992	Introduction of annual GDP current price balancing through the Input-Output Annual Supply and Use Tables framework.
1993	Rebasing the National Accounts onto 1990=100.
1995	Conversion of estimates from SIC (80) to SIC (92).
1998	Use of ONS inquiry results based on the new Inter-Departmental Business Register.
	Rebasing the National Accounts onto 1995=100.
	Move to the European System of Accounts 1995.
2000	Improved capital stock estimates from 1948.
2001	Incorporation of the full impact of results from the new Annual Business Inquiry (ABI).
	Inclusion of estimates for alcohol and tobacco smuggling.
2003	Incorporation of initial results from the new annual all-industry purchases data collected via the ABI.
	Inclusion of estimates for Missing Trader intra-community VAT fraud activity.
	Move to annual chain-linking of GDP with reference year 2000.
2004	Reclassification of National Health Service Trusts from the public non-financial corporation sector to the central government sector.
	Review of the public sector health industry estimates.
	Chain-linking of GDP with reference year 2001.
2005	Incorporation of results from Pension Inquiry data review.
	Range of Atkinson Review related revisions.
	Conversion of estimates from SIC (92) to SIC (2003).
	Chain-linking of GDP with reference year 2002.
2006	Reclassification of the BBC and S4C from the public non-financial sector to the central government sector.
	Inclusion of new Bank of England data on spread earnings and derivatives for banks, and data from new Bank of England Profit/Loss form.
	Improved estimates of consumption of fixed capital from 1948.
	Chain-linking of GDP with reference year 2003.

Revisions can also be generated through the process of balancing Input-Output Annual Supply and Use Tables. For each year this process, when complete, shows:

- for each of the 123 products, total supply **equals** total demand;
- for each of the 123 industries, total inputs **equals** total outputs; and
- for each of the 123 industries, GVA from the *production* approach **equals** that from the *income* approach, consistent both with components of the income measure and for each of the seven National Accounts institutional sectors.

These identities hold for each year and the balancing process also has to ensure consistency of the industry, product and institutional sector detail over time. For further details of the annual balancing process, see *Mahajan* [11].

Table 9 shows for each ONS *Blue Book* since 1992, the earliest year for which revisions have been made to annual current price GDP and to Input-Output Annual Supply and Use Tables. Improvements to the quality of Input-Output Annual Supply and Use Tables have also been made without affecting total GDP. For example, the 2005 exercise included revisions for years back to 1992, whereas annual current price GDP was only revised from the year 1996.

Table 10 shows for each annual exercise from 1992, the publication of new Input-Output Annual Supply and Use Tables and the years for which earlier tables have been revised.

Annex B shows a brief summary reflecting key changes incorporated in the Input-Output Annual Supply and Use Tables in each year.

9

Earliest year revised since 1992 *Blue Book*

Blue Book year	Earliest year revised	
	Annual current price GDP	I-O Annual Supply and Use Tables
1992	1984	1989
1993	1982	1989
1994	1983	1989
1995	1987	1989
1996	1987	1989
1997	1989	1989
1998	1948	1989
1999	1996	1996
2000	1948	1989
2001	1986	1989
2002	1997	1997
2003	1996	1992
2004	1991	1991
2005	1996	1992
2006	1948	1989

10

Input-Output Annual Supply and Use Tables published since 1992

Year (t) published	Input-Output Annual Supply and Use Tables																Industrial classification	System of National Accounts
1992	'89																SIC (80)	ESA 79
1993	'89r	'90															SIC (80)	ESA 79
1994	'89r	'90r	'91	'92													SIC (80)	ESA 79
1995	'89r	'90r	'91r	'92r	'93												SIC (92)	ESA 79
1996	'89r	'90r	'91r	'92r	'93r	'94											SIC (92)	ESA 79
1997	'89r	'90r	'91r	'92r	'93r	'94r	'95										SIC (92)	ESA 79
1998	'89r	'90r	'91r	'92r	'93r	'94r	'95r	'96									SIC (92)	ESA 95
1999								'96r	'97								SIC (92)	ESA 95
2000	'89r	'90r	'91r	'92r	'93r	'94r	'95r	'96r	'97r	'98							SIC (92)	ESA 95
2001	'89r	'90r	'91r	'92r	'93r	'94r	'95r	'96r	'97r	'98r	'99						SIC (92)	ESA 95
2002									'97r	'98r	'99r	'00					SIC (92)	ESA 95
2003				'92r	'93r	'94r	'95r	'96r	'97r	'98r	'99r	'00r	'01				SIC (92)	ESA 95
2004			'91r	'92r	'93r	'94r	'95r	'96r	'97r	'98r	'99r	'00r	'01r	'02			SIC (92)	ESA 95
2005				'92r	'93r	'94r	'95r	'96r	'97r	'98r	'99r	'00r	'01r	'02r	'03		SIC (2003)	ESA 95
2006	'89r	'90r	'91r	'92r	'93r	'94r	'95r	'96r	'97r	'98r	'99r	'00r	'01r	'02r	'03r	'04	SIC (2003)	ESA 95

Letter 'r' denotes the I-O Annual Supply and Use Tables that have been revised.
Letter 't' denotes the year of publication.

The Input-Output Annual Supply and Use Tables are based on a wide range of sources:

- In the main, these tables are based on returns from ONS statistical surveys such as the ABI, PRODCOM, ITIS, Financial Industry inquiries and the Expenditure and Food Survey, as well as data from other government departments such as Defra, DTI and HM Revenue and Customs.
- Data from administrative systems are also used, such as the Government Expenditure Monitoring System, Subjective Analyses Return covering local government expenditure as well as tax and employment-based data from HM Revenue and Customs.
- Models are also used, such as the Perpetual Inventory Model, to provide estimates for market and non-market bodies' consumption of fixed capital.
- Over time, the ONS receives more complete information, for example, as more survey returns come in, this new information is incorporated within the National Accounts.

For further details covering sources and methods underlying the Input-Output Annual Supply and Use Tables are covered later in this article and, see *Mahajan*[16] and the *UK Gross National Income Inventory of Methods*[17].

Revisions analyses are published each year in the *Input-Output Analyses* publication. Also, Input-Output based articles have been published in *Economic Trends*, see *Mahajan*[18]

Annual coherence adjustments to GDP in the 2006 ONS Blue Book and I-O Supply and Use Tables

In practice, the data sources used in the National Accounts are subject to statistical error and complete coherence between measures of economic activity is not achieved without making specific adjustments. For the period 1989-2004, these adjustments are made through the current price I-O balancing process using the I-O Annual Supply and Use Tables and the underlying framework.

An article in the October 1999 *Economic Trends* [12] describes the background to these adjustments and briefly shows how they are made. The compilation and balancing process is described in more detail in the *Input-Output Methodological Guide* [16] and the January 1997 *Economic Trends*. The process of achieving coherence in the accounts by balancing I-O Annual Supply and Use Tables can most simply be explained as a series of different types of adjustment.

The main types of adjustment described in the October 1999 *Economic Trends* article are:

- conceptual and coverage adjustments;
- quality adjustments; and
- coherence adjustments.

Table 11 shows these coherence adjustments for 2003 and 2004.

11

Coherence adjustments within 2003 and 2004 annual current price GDP (£ million)

Income measure	Coherence adjustment	
	2003	2004
Financial corporations' profits	1,380	950
Private non-financial corporations' profits	1,884	-1,686
Compensation of employees	2,992	2,361
Rental income	-	-
Self-employment income	2,682	1,910
Expenditure measure		
Households final consumption	1,409	5,711
NPISHs	520	802
Central government	-	-
Local government	-	-
Gross fixed capital formation	505	3,535
Changes in inventories	-	-
Exports of services	3,010	3,265
Imports of services	2,740	2,055
Production measure (adjustment to GVA by industry)		
Agriculture, forestry & fishing	35	0
Mining & quarrying	2,815	1,570
Manufacturing	179	-1,385
Electricity, gas & water supply	660	413
Construction	-366	240
Distribution & hotels	-1,857	-3,356
Transport & communication	-1,339	-685
Finance & business services	-4,194	-4,248
Public administration & defence	-	-
Education, health & social work	181	114
Other services	-794	-224

Sources and methods underlying the I-O Supply and Use Tables

The ONS's Input-Output work follows closely the approach of the United Nations in their *System of National Accounts 1993 (SNA 93)* [19] and the *ESA 95.* In addition, the United Nations *Input-Output Tables and Analysis, Studies in Methods* and *Handbook* [20,21] provide further detailed information. It is worth noting that Eurostat, in collaboration with Member States, arranged a Task Force including the UK (representative from UK: Sanjiv Mahajan) in 2001 to develop a new I-O Manual covering the compilation of I-O Supply and Use Tables and I-O Analytical Tables consistent with the ESA 95 and SNA 93, and this is available in draft form[22].

Wherever possible, ONS inquiries have been used as the basis of the estimates in the tables. However, for the detailed figures we have to use a wide variety of data sources of varying suitability and quality. Information on purchases, in particular, is an area for which the ONS has a programme of continual development to improve the quality and coverage of the inquiries.

Table 12 shows a summary of sources either directly or indirectly used.

12

Brief summary of data sources

ONS sources	Other government departments	Non-government sources
Annual Business Inquiry	Bank of England	Association of British Insurers
Business Spend on Capital Items	Department for Environment, Food and Rural Affairs	Civil Aviation Authority
Expenditure and Food Survey	Department of the Environment, Transport and the Regions	Company annual reports and accounts
Financial Inquiries	Department of Enterprise, Trade and Investment (Nothern Ireland)	Company financial websites
Inter-Departmental Business Register	Department for Transport	Regulatory accounts
International Passenger Survey	Department of Health	
International Trade in Services Inquiry	Department of Trade and Industry	
Monthly inquiry into Distribution and Services Sector	Her Majesty's Revenue and Customs (including INTRASTAT data)	
Monthly Production Inquiry	Her Majesty's Treasury	
Perpetual Inventory Model	Ministry of Defence	
PRODCOM	Communities and Local Government	
Quarterly Profits Inquiry		
Quarterly Capital Expenditure		
Quarterly Stocks Inquiry		
Range of ad hoc pilot surveys		
VAT paid and VAT turnover data		

The estimates used for the Input-Output Annual Supply and Use Tables for 1992-2004 are our best view of the structure of supply and demand. Many of the detailed estimates have been changed by the need to achieve a balance within the I-O Annual Supply and Use Tables framework.

The UK is relatively rich in terms of the availability of source data to populate the Input-Output Annual Supply and Tables, and producing all of the components for each of the three approaches to GDP. This enables detailed data confrontation as part of the balancing process, and consequently, a better quality end-product.

Over the past 15 years, the UK has implemented recommendations from the Pickford Report (1989) and the Chancellor's Initiatives (May 1990 and November 1991), which have led to numerous improvements to UK economic statistics and the development of new business surveys and products.

Several new sources have been developed to collect annual data covering detailed information on purchases of goods and services for intermediate consumption and a breakdown of gross fixed capital formation by industry and by product.

The next part of this section covers some of the key ONS annual survey sources developed and used to populate the Input-Output Annual Supply and Tables. It is worth noting that many of the sources provide data for both the Supply Table and the Use Table.

Annual Business Inquiry

The Annual Business Inquiry (ABI) introduced in 1998, is a statutory survey with two parts: ABI/1 collects employment information and ABI/2 collects financial information from businesses and other establishments across most of the economy. The ABI/2 forms the single largest ONS based source used to populate the Input-Output Annual Supply and Tables, and covers the following industries:

- Parts of agriculture and all of forestry and fishing;
- Mining and quarrying;
- Manufacturing;
- Electricity, gas and water;
- Construction;
- Distribution and hotels;
- Transport and communication;
- Business (not financial industries); and
- Other services excluding general government.

In 2005/6, 69,900 ABI/2 forms (compared with 77,000 in 2004/05) were sent to businesses, collecting financial information covering:

- Employment costs;
- Turnover;
- Purchases of goods and services;
- Taxes paid and subsidies received;
- Changes in inventories;
- Gross fixed capital formation; and
- Imports and exports of services.

This survey also collects from the distribution industries details of sales and purchases of goods for resale without processing, from which an estimate of distributors' trading margins by product can be derived.

Detailed purchases of goods and services for intermediate consumption

Under the umbrella of the ABI/2, forms are sent to businesses across the whole economy collecting detailed breakdowns of purchases of goods and services used up as intermediate consumption. The forms are specific to each industry, asking appropriate questions relevant to the industries' activity. For example, the shoe manufacturing industry is asked about their purchases of leather, fabric, glue, rubber etc. In 2005/6, detailed questions on purchases were sent to around 13,000 businesses selected as a sub-sample of the ABI/2.

PRODCOM

PRODucts of the European COMmunity (PRODCOM) is a statutory survey undertaken by the ONS, in line with the harmonised system across the European Community for the collection and publication of product statistics. It is compiled by collecting data from manufacturers on an annual basis and covered over 24,500 businesses in 2005/6.

Detailed data is collected covering both value and volume of manufacturers' product sales, merchanted goods, work done, sales of waste products and residues, and other income.

International Trade in Services survey

The International Trade in Services survey is an annual statutory inquiry collecting product detail (51 products) on imports and exports of services (by country of origin and destination) of the private sector with a few exceptions. The annual sample in 2005/6 was around 20,000.

Business Spending on Capital Items Survey

The Business Spending on Capital Items Survey is an annual statutory survey covering most industries, and collects detailed product breakdowns of companies' capital expenditure (acquisitions and disposals are covered separately) on assets such as vehicles and plant and machinery (over 50 products). The annual sample in 2005/6 was over 2,500.

For more information and detail on the data sources used, as well as the balancing process, please refer to the *Input-Output Methodological Guide 1997 edition.* Although based on now superseded UK methodologies it still offers extensive help.

The *Gross National Income Inventory of Methods* also provides more comprehensive detail on sources and methods underlying the compilation of the three measures of GDP and the balancing process.

Gross Value Added - link between survey based estimates and the I-O Annual Supply and Use Tables

Data collected and published through the ONS Annual Business Inquiry (ABI) shows 'approximate' GVA at basic prices and 'approximate' total output at basic prices. The ABI forms a major data input in the production of I-O Annual Supply and Use Tables, which also show industry estimates of total output at basic prices and gross value added at basic prices but are different from those shown in the ABI. Alternative data sources are used for industries not covered by the ABI. In producing these estimates to be fully consistent with the ESA 95, there are essentially four key adjustments required: coverage adjustments, conceptual and valuation adjustments, quality adjustments and coherence adjustments.

The adjustments can be briefly described as follows:

Coverage adjustments

These include, for example: allowances made for units missing from the IDBR; the self-employed; and, in the past, the transformation of inquiry based estimates covering only Great Britain onto a full United Kingdom basis (including Northern Ireland).

Conceptual and valuation adjustments

These are needed to move the inquiry based estimates onto a full ESA 95 basis required for National Accounts. These adjustments include for example: income earned-in-kind; imputed insurance premium supplement; taxes and subsidies on production; and capital formation on cultivated assets.

Quality adjustments

These are needed to address issues such as known biases or discontinuities in the source data. These may be specific to a range of products, industries or even to just one year, and are often not taken into source survey results due to timing or system constraints.

Coherence adjustments

These are needed to resolve the data confrontation posed by the various data sources used in producing and balancing the *production*, *income* and *expenditure* measures of GDP through the I-O Annual Supply and Use Tables framework.

Analyses

Over the past ten years, substantial improvements have been made to the production processes allowing for the development of a range of user orientated analyses. This has further developed the role of Input-Output in the UK.

The Current Price Input-Output Branch has been staffed with around 11 members (reduced to 10 from April 2006) over the past few years and covers the development, compilation, co-ordination and balancing of the Input-Output Annual Supply and Use Tables, as well as the production of the analyses in the UK Input-Output Analyses publication, and the publication itself.

The team has continually improved compilation methodologies; developed existing and new data sources; improved links with data suppliers and the annual balancing process; and automated many processes and routines used in the compilation of the Input-Output Annual Supply and Use Tables.

These achievements have enabled the efficient production of the product, including meeting the challenge of maintaining a long run of consistent Input-Output Annual Supply and Use Tables, presently for the period 1992-2004. This in turn has allowed the team to drive forward the development of a wide-range of new economic analyses, either as a time series or year specific, based on the Input-Output Annual Supply and Use Tables. These analyses include:

- The UK economy - Analyses at a glance.
- Export shares of goods and services.
- Import penetration of goods and services.
- Net trade in goods and services.
- Information and communication technologies (ICT).
- Creative sector.
- Food sector.
- Concentration ratios for businesses by industry.
- Taxes and subsidies recorded within the production boundary.
- Oil and gas sector.
- Market sector and non-market sector activity.
- Revisions analyses.
- Chronologies of economic events for a number of industries.

Many of these analyses require appropriate industry, product and sector definitions. Wherever possible, we have used internationally recognised definitions, such as the OECD's description of ICT activity and the definition of the market sector as laid out in the ESA 95. If such definitions are not suitable, we have used definitions recognised in the user community as used for the creative sector and food sector, both of which are used by other government departments.

User demands for analyses based on the Input-Output framework have been a key driver for developing such analyses. For example, key users like the Bank of England and HM Treasury are interested in the market sector and non-market sector activity to assess the business cycle, monitor the output gap, and compare productivity between sectors as well as across other countries. Market sector estimates also provide an important indicator of demand pressures reflecting changes in the quantity of goods and services sold in the market sector of the economy.

The *United Kingdom Input-Output Analyses* publication together with other I-O based products can be viewed on the ONS Input-Output web-page at **www.statistics.gov.uk/inputoutput**.

The next part of this paper provides brief overview extracts from some of the above articles in the *United Kingdom Input-Output Analyses*, 2006 Edition, released in August 2006.

Information and communication technologies (ICT)

Introduction

This article provides detailed information and statistics produced by the ONS covering the UK ICT sector based on the Input-Output Annual Supply and Use Tables. The availability of these statistics provides users with an assessment of the impact of ICT activity on the UK economy.

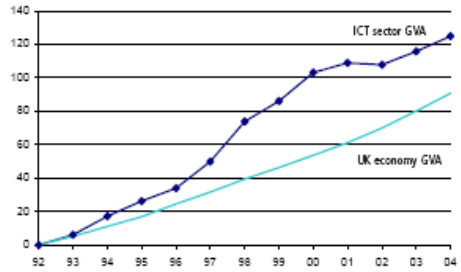
Chart 5.1 shows the growth of ICT gross value added (GVA) compared with the whole UK economy.

Throughout the 1990's, the rapid growth in both ICT production and investment was an important contributor to UK economic and productivity growth. In addition, ICT investment has added to the UK capital stock and capital services, which will affect the UK economy over the longer term.

5.1

GVA: ICT sector growth relative to the UK economy

Per cent growth (Rebased to 1992)



Food sector

Introduction

This article looks at the food sector that starts with the agricultural industry and ends, ultimately, with household consumption and exports. In between, there are a large number of processors, wholesalers (including importers and exporters), retailers and catering enterprises. Changes such as quality of products, production costs, imports and selling prices, can have a significant impact on activity at every level from farmers through to consumers.

Chart 7.1 shows the growth of the food sector compared to the whole economy.

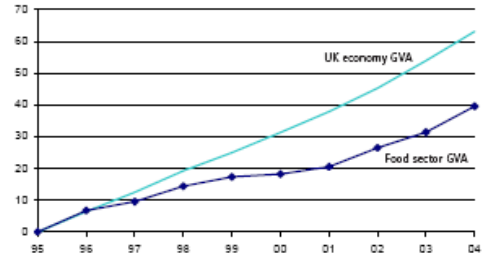
Definition and methodology

Table 7.2 shows the definition of the UK food sector, which has been derived from Defra and is also used by the Institute of Grocery Distribution (see www.igd.com).

7.1

GVA: Food sector growth relative to the UK economy

Per cent growth (Rebased to 1995)



Oil and gas sector

Introduction

Outputs from the oil and gas extraction and petroleum related industries are inputs into most economic goods and services, whether for use in the home, for business or for leisure.

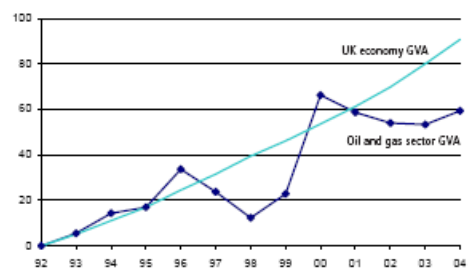
These industries enable the production of fuel for cars and heating for homes, industry and commerce but are also vital for production of plastics, paints, cleaning products, clothing, furniture, pharmaceuticals, synthetic rubber, electricity generation and many more products essential to the economy.

This article provides information and statistics produced by the ONS covering the oil and gas industries. In this article, we only consider the direct effect on the economy of these sectors, and not the indirect effect of these sectors on gross value added (GVA) at current basic prices of the oil and gas consuming industries.

10.1

GVA: Oil and gas sector growth relative to the UK economy

Per cent growth (Rebased to 1992)



Creative sector

Introduction

This article provides detailed information and statistics produced by the ONS covering the UK Creative sector based on the Input-Output Annual Supply and Use Tables. Chart 6.1 shows the growth of the creative sector compared with the whole UK economy.

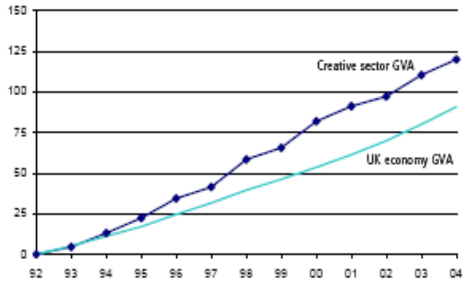
Definition and methodology

Data from ONS based sources covering the creative industries based on the *Standard Industrial Classification 2003* (SIC (2003)) are reallocated to the functional definition provided by the Department of Culture, Media and Sport (DCMS) in its "*Creative Industries Mapping Document 2001*". This attempts to show the contribution of the creative sector at an industry level and by function. DCMS also produce Creative Industry Economic Estimates (see www.culture.gov.uk/global/research/statistics_outputs/creative_industries_eco_est.htm).

6.1

GVA: Creative sector growth relative to the UK economy

Per cent growth (Rebased to 1992)



The main zero rated items in 2004 are: food, construction of new dwellings, passenger transport, books and newspapers, children's clothing and prescription medicines.

The main exempt items in 2004 are: rents, insurance premia, postal services, betting and gaming, banking, education by non-profit institutions (for example, universities), health services and funeral services.

Estimation of theortical VAT and accrued VAT

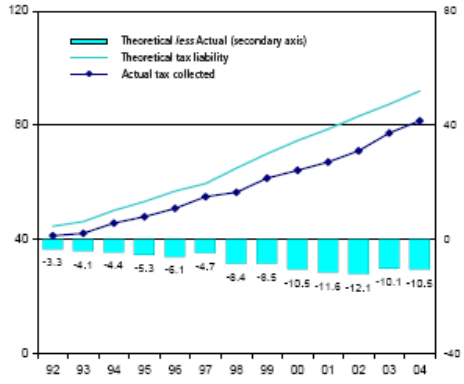
Most taxes on products can be allocated to a specific product. However, taxes like VAT are allocated across several products. In the case of VAT, some products may be charged at the standard VAT rate, zero rate or a rate in between.

For many products, there is a non-homogeneous mix of goods or services which themselves attract different rates within the product grouping. This information, together with detailed information from HM Revenue and Customs, is used to derive effective VAT rates by type of product, and by type of expenditure, which are then linked to the product demand in the Use Table to determine the amounts of VAT by product.

9.5

VAT: Theoretical tax liability compared with actual tax collected

£ billion



Market sector and non-market sector activity

Introduction

This article provides detailed information and statistics produced by the ONS covering the UK market and non-market sectors based on the Input-Output Annual Supply and Use Tables.

Tables 11.27 to 11.29 provide a summary of market sector and non-market sector statistics, using components of the *production*, *income* and *expenditure* measures of Gross Domestic Product (GDP). These statistics provide users with an assessment of the relative importance of these sectors in the UK economy.

Key users like the Bank of England and HM Treasury are interested in separating out market sector activity from the total UK economy to assess the business cycle, monitor the output gap, and compare productivity between sectors as well as across other countries. Market sector estimates also provide an important indicator of demand pressures reflecting changes in the quantity of goods and services sold in the market sector of the economy.

11.1

GVA: Market sector growth relative to the UK economy

Per cent growth

Input-Output Analytical Tables

The I-O Analytical Tables provide tools to analyse the structure of the economy and perform economic modelling. The I-O Analytical Tables show separately the consumption of UK produced goods and services and imported goods and services. These tables provide a theoretical framework for further analysis of the structure of the economy, the composition and the effect of changes in final demand on the economy.

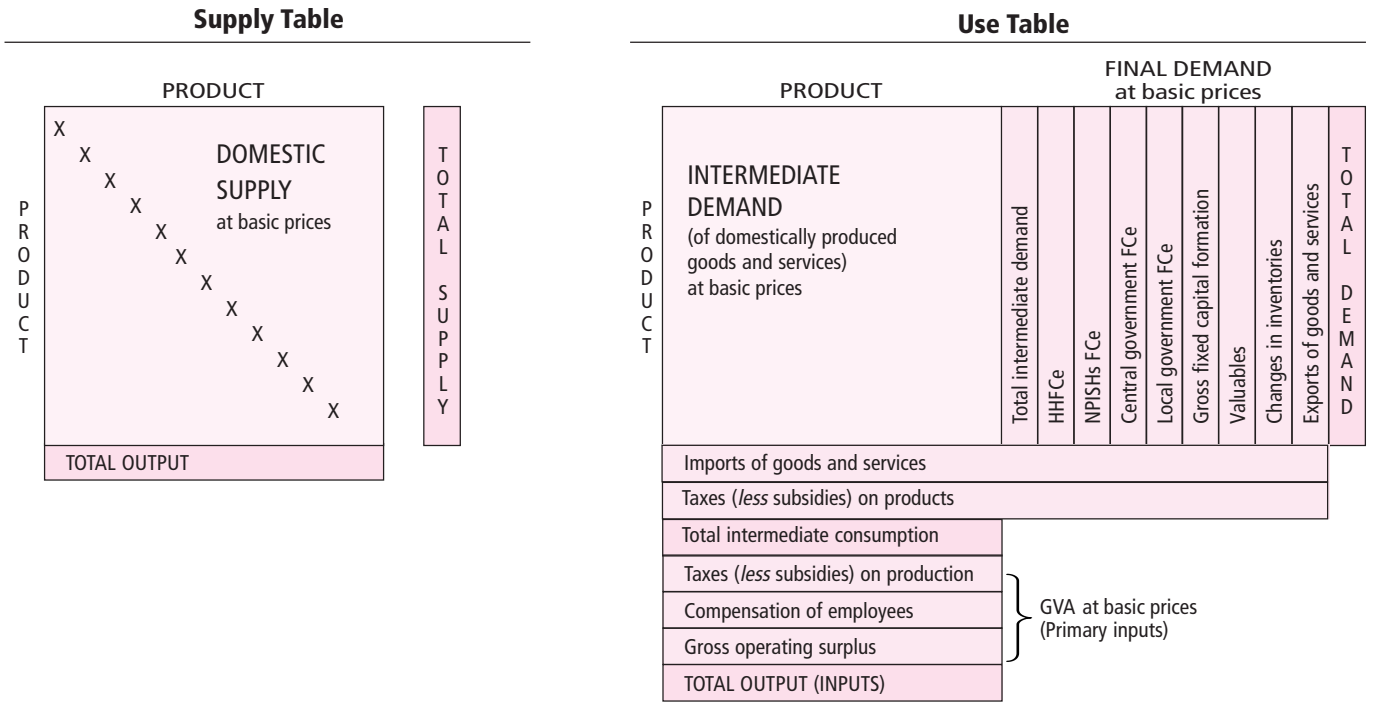
Cambridge University produced the first UK I-O Tables for the years 1948 (using only eight industry groups) and 1950, with results published in the 1952 and 1953 Blue Books respectively. The first official UK I-O tables were produced by the Board of Trade and Central Statistical Office for the year 1954 (using forty-six industry groups) based on the 1960 *Blue Book* and published in 1961. Since then, I-O Tables have been produced roughly every five years as needed for the National Accounts rebasing of constant price estimates.

The close relationship between I-O Annual Supply and Use Tables and I-O Analytical Tables has sometimes led to confusion despite being two different products. For example, previous naming conventions have described the I-O Annual Supply and Use Tables and I-O Analytical Tables as Derived Tables, Input-Output Tables, Input-Output Balances or Symmetric Tables.

Graphic 13 shows diagrammatically the structure of the symmetric I-O Analytical Tables (Product by Product).

13

I-O Analytical Tables (symmetric): Product by Product



HHFCe represents Households final consumption expenditure.
NPISHs FCe represents Non-profit institutions serving households final consumption expenditure.
X denotes the diagonal entries in the Domestic Supply Table. Off-diagonal entries in the industry by product Domestic Output Table and their associated inputs, have been moved to this product as part of the compilation of the Symmetric Table.

The main differences between I-O Analytical Tables and the I-O Annual Supply and Use Tables are:

- I-O Analytical Tables are symmetric tables (Product by Product or Industry by Industry). There are no off-diagonal elements in the Supply Table and the row totals equal the column totals in the Supply Table.

- In the I-O Analytical Tables, consumption of imports of goods and services and UK produced goods and services are shown separately, since the assumptions underlying the construction of the I-O Analytical Tables cannot be applied to imports. A symmetric Imports Use Table can be constructed only as a derivation of the domestic based I-O Analytical Tables.

- The valuation of the main I-O Analytical Tables is at basic prices. This valuation reflects the amount received by the producers for their output, excluding distributors' trading margins and taxes (*less* subsidies) on products.

There are various type of analyses that can be compiled in the process of producing I-O Analytical Tables. For example:

- Industry by product transformation matrices covering distributors' trading margins, taxes (*less* subsidies) on products and imports of goods and services;
- Domestic Use Table and Imports Use Table at basic prices (Product by Industry);
- Product by Product tables for the Domestic Use Table and Imports Use Table at basic prices;
- Industry by Industry tables for the Domestic Use Table and Imports Use Table at basic prices;
- Leontief Inverse;
- Multiplier analyses (for example: output, employment and employment costs);
- Primary input content of final demand, and links to GDP; and
- Industrial analyses in terms of primary inputs.

For further details, see the last set of *I-O Analytical Tables*. These tables covered the year 1995 and were on an ESA 95 basis using the *Standard Industrial Classification 1992* (SIC (92)). The number of I-O groups (industry/product) were extended from 123 to 138 in order to reflect the different input structures of central government, local government and NPISHs (Non-profit institutions serving households). These tables were also consistent with the I-O Annual Supply and Use Tables for 1995 published in November 2001. The I-O Annual Supply and Use Tables for 1995 have since been revised in each of the subsequent annual exercises from 2002 to 2006 inclusive.

Member States are now required under EU statistical regulation to produce I-O Analytical Tables together with I-O Annual Supply and Use Tables, and submit them to Eurostat. The UK submitted the 1995 I-O Analytical Tables in December 2002.

Although the I-O Analytical Tables have been published roughly every five years, our plan to produce these tables annually following publication of the 1995 tables, consistent with the I-O Annual Supply and Use Tables, has been in abeyance. In 2002, this plan was reconsidered in the light of changed priorities within the ONS. In particular, National Accounts production is being thoroughly reviewed as part of a re-engineering project. As a result, there are no explicit plans to produce another set of I-O Analytical Tables or to produce them annually until the higher priority parts of the National Accounts re-engineering programme is complete. At present, no further tables are expected to be produced by the ONS until 2010 at the earliest.

Annex C shows a full chronology of UK I-O Analytical Tables.

Future

Internationally driven changes

There are major changes that the UK has to prepare for, and implement. Those affecting the National Accounts and Input-Output Annual Supply and Use Tables at current prices include:

- Implementation of the allocation of FISIM, by industry, by sector and by type of final expenditure;
- Implementation of the new *Standard Industrial Classification* (2007), consistent with the new NACE Rev. 2; and
- Changes to the *System of National Accounts* 1993 (SNA 93) and the *European of System of Accounts* 1995 (ESA 95).

The UK National Accounts and Input-Output Annual Supply and Use Tables presently treat FISIM as a nominal industry and sector. The present plan is to implement the allocation of FISIM, by industry, by sector and by type of final expenditure in the 2007 annual exercise, going back to the start of the UK National Accounts.

In line with the new *Standard Industrial Classification* (2007), which will be consistent with the new NACE Rev. 2, the ONS will convert its business register onto the new classification through the year 2007. From the beginning of 2008, all ONS business surveys will be sampled using the new classification. The work programme will include the development of links between old and new register data to inform the creation of continuous survey results, and thereby continous time series within National Accounts.

The new classification will have a major impact on survey results and National Accounts, requiring extensive re-writing of computer systems and the generation of back-data onto a consistent basis. This will affect the compilation, balancing and publication of the monthly, quarterly and annual outputs of the National Accounts, including the Input-Output Annual Supply and Use Tables.

There are many international discussions covering the treatment of various issues leading to revision of the present SNA 93, due for completion sometime in 2008. This in turn will lead to a revision of the ESA 95, due for completion maybe around 2010. The UK is actively participating in many of these discussions. Once both of these stages have been agreed, it is likely that the National Accounts will be produced on the new basis maybe around 2012.

Domestically driven changes

In 2003, the UK began a major National Accounts Re-engineering Project as part of a much wider ONS office-wide Statistical Modernisation programme. All National Accounts production processes and the further development of the role of Input-Output are being reviewed. This includes the estimation of GDP through the Input-Output Supply and Use Tables framework:

- both at current prices and previous years' prices;
- quarterly and annually;
- expanding the number of industries and products;
- estimation of gross value added by double deflation;
- balancing of deflators across supply and demand; and
- improving links with labour market data.

The National Accounts Re-engineering Project also includes the re-organisation of management structures, and staff roles and responsibilities to reflect new systems and processes.

More details of this planned work are given in *Beadle* [23].

Examples of other developments we will need to consider include:

- Improving the processes, with which long-run consistent Input-Output Annual Supply and Use Tables can be maintained for an ever-increasing number of years. For example, in the 2006 annual exercise, Input-Output Annual Supply and Use Tables for the years 1992-2003 were revised and rebalanced, together with the production of new tables for the year 2004. With limited resources and time available, this approach is not sustainable. Changes required will also need to include the development of an effective and appropriate revisions policy.

- Regular production of Input-Output Analytical Tables. The last set of these tables were produced for the year 1995 and published in 2002.

- Development of new sources covering areas where the data available is relatively weak compared with other areas of the National Accounts or parts of the Input-Output Supply and Use Tables. For example, with the increasing role of the distribution and service sector, there is a growing need for a SERVCOM type survey, similar to PRODCOM but collecting detail on sales by type of product for the construction, distribution and service industries.

- An ever-changing economy and changes to the SNA/ESA require continual development of our business surveys to meet the needs of National Accounts and the compilation of Input-Output Annual Supply and Use Tables.

- Developing and publishing more economic analyses based on the Input-Output Supply and Use Tables to meet users' needs, both inside and outside government.

Summary

The role of Input-Output has greatly expanded in the UK in the past 15 years, and the challenges to date have been met in full.

The challenges ahead for the UK over the next few years are even greater with the requirements of the following:

- Implementation of the allocation of FISIM, by industry, by sector and by type of final expenditure;
- Implementation of the new *Standard Industrial Classification* (2007), consistent with the new NACE Rev. 2;
- Changes to the *System of National Accounts 1993* and the *European of System of Accounts 1995*; and
- ONS National Accounts re-engineering programme placing Input-Output as the foundation of the UK quarterly and annual National Accounts.

Success generates even greater expectations of success, and ONS will be striving to meet our targets and obligations over the next few years.

For some of these issues, we would like to benefit from the experience in other countries that already successfully carry out such processes. In other areas, we hope that our experiences and knowledge will be of assistance to other countries who are developing the role of Input-Output in their National Accounts.

References:

1 *United Kingdom National Accounts* 2006
(The ONS Blue Book) TSO 2006 ISBN 011621 7367

2 *United Kingdom Balance of Payments* 2006
(The ONS Pink Book) TSO 2006 ISBN 011621 7375

3 *European System of Accounts* 1995 (ESA 95)
(EU. Eurostat) ISBN 92 827 7954 8

4 *Analytical Input-Output Tables for the United Kingdom*, 1995
(Web only) ONS, April 2002. www.statistics.gov.uk/inputoutput

5 *Economic Trends No. 480 October 1993* (containing Handling Revisions in the National Accounts by David Wroe).
Published by HMSO 1993 ISSN 0013 0400

6 *Economic Trends No. 603 February 2004* (containing Revisions to Economic Statistics: their role in measuring economic progress by Len Cook).
Published by TSO 2004 ISSN 0013 0400

7 *Economic Trends No. 594 May 2003* (containing Revisions to Quarterly GDP Growth by Leonidas Akritidis).
Published by TSO 2003 ISSN 0013 0400

8 *Economic Trends No. 601 December 2003* (containing Revisions to Quarterly GDP Growth and Expenditure components by Leonidas Akritidis).
Published by TSO 2003 ISSN 0013 0400

9 *Economic Trends No. 584 July 2002* (containing Revisions to GDP: A time profile by Craig Richardson).
Published by TSO 2002 ISSN 0013 0400

10 *Economic Trends No. 601 December 2003* (containing Revisions Analysis: A Time Series Approach by Craig Richardson).
Published by TSO 2003 ISSN 0013 0400

11 *Economic Trends No.519 January 1997* (containing Balancing GDP: UK Annual Input-Output Balances by Sanjiv Mahajan).
Published by TSO 1997 ISSN 0013 0400

12 *Economic Trends No. 551 October 1999* (containing Annual Coherence Adjustments in the National Accounts by Stephen Penneck and Sanjiv Mahajan).
Published by TSO 1999 ISSN 0013 0400

13 *Economic Trends No. 538 May 2000 (*containing A Decade of Improvements to Economic Statistics by Martin Brand and Graham Jenkinson).
Published by TSO 2000 ISSN 0013 0400

14 Government Economic Statistics: A Scrutiny Report (Cabinet Office 1989).
Published by HMSO 1989

15 *Economic Trends No. 448 February 1991* (containing Improving Economic Statistics - The Chancellor's Initiative).
Published by HMSO 1991 ISSN 0013 0400

16 *UK Input-Output Balances Methodological Guide* by Sanjiv Mahajan, 1997 Edition.
Published by ONS February 1997 ISBN 1 85774 234 6

17 *UK ESA95 Gross National Income Inventory of Methods* (Web only) ONS.
www.statistics.gov.uk/Statbase/Product.asp?vlnk=6392

18 *Economic Trends No.610 September 2004* (containing Input-Output and GDP revisions analyses: 1992-2002 by Sanjiv Mahajan).
Published by TSO 2004 ISSN 0013 0400

19 *System of National Accounts*,
United Nations, 1993. ISBN 92 1 161352 3

20 *Input-Output Tables and Analysis. Studies in Methods*, Series F, No. 14, Rev. 1
United Nations, 1973.

21 *Handbook of Input-Output Table Compilation and Analysis, Studies in Methods*, Series F, No.74
United Nations, 1999.

22 *Eurostat Input-Output Manual* (Draft), 2001

23 *Economic and Labour Market Review*, Vol 1, no. 4 (containing Modernising the UK's National Accounts by Jon Beadle)
Published by Palgrave Macmillan 2007 ISSN (on line) 1751-8334

A Classification of Input-Output industry/product groups by Standard Industrial Classification (2003) and NACE Rev. 1.1

11 level	Detail 123 level	Industry/product groups	Standard Industrial Classification (2003) Divisions, Groups, Classes	NACE Rev. 1.1 Industrial classifications			
				Divisions A60	**Sub-sections A31**	**Sections A17**	**A6**
Agriculture	1	Agriculture, hunting and related service activities	01	01	A	A	1
	2	Forestry, logging and related service activities	02	02			
	3	Fishing, fish farming and related service activities	05	05	B	B	
Mining and quarrying	4	Mining of coal and lignite; extraction of peat	10	10	CA	C	
	5	Extraction of crude petroleum and natural gas; service activities incidental to oil and gas extraction	11 + 12	11 + 12			
	6	Mining of metal ores	13	13	CB		
	7	Other mining and quarrying	14	14			
Manufacturing	8	Production, processing and preserving of meat and meat products	15.1	15	DA	D	2
	9	Processing and preserving of fish and fish products; fruit and vegetables	15.2 + 15.3				
	10	Vegetable and animal oils and fats	15.4				
	11	Dairy products	15.5				
	12	Grain mill products, starches and starch products	15.6				
	13	Prepared animal feeds	15.7				
	14	Bread, rusks and biscuits; pastry goods and cakes	15.81 + 15.82				
	15	Sugar	15.83				
	16	Cocoa; chocolate and sugar confectionery	15.84				
	17	Other food products	15.85 to 15.89				
	18	Alcoholic beverages - alcohol and malt	15.91 to 15.97				
	19	Production of mineral waters and soft drinks	15.98				
	20	Tobacco products	16	16			
	21	Preparation and spinning of textile fibres	17.1	17	DB		
	22	Textile weaving	17.2				
	23	Finishing of textiles	17.3				
	24	Made-up textile articles, except apparel	17.4				
	25	Carpets and rugs	17.51				
	26	Other textiles	17.52 to 17.54				
	27	Knitted and crocheted fabrics and articles	17.6 + 17.7				
	28	Wearing apparel; dressing and dyeing of fur	18	18			
	29	Tanning and dressing of leather; luggage, handbags, saddlery and harness	19.1 + 19.2	19	DC		
	30	Footwear	19.3				
	31	Wood and wood products, except furniture	20	20	DD		
	32	Pulp, paper and paperboard	21.1	21	DE		
	33	Articles of paper and paperboard	21.2				
	34	Publishing, printing and reproduction of recorded media	22	22			
	35	Coke, refined petroleum products and nuclear fuel	23	23	DF		
	36	Industrial gases, dyes and pigments	24.11 + 24.12	24	DG		
	37	Other inorganic basic chemicals	24.13				
	38	Other organic basic chemicals	24.14				
	39	Fertilisers and nitrogen compounds	24.15				
	40	Plastics and synthetic rubber in primary forms	24.16 + 24.17				
	41	Pesticides and other agro-chemical products	24.2				
	42	Paints, varnishes and similar coatings, printing ink and mastics	24.3				
	43	Pharmaceuticals, medicinal chemicals and botanical products	24.4				
	44	Soap and detergents, cleaning and polishing preparations, perfumes and toilet preparations	24.5				
	45	Other chemical products	24.6				
	46	Man-made fibres	24.7				
	47	Rubber products	25.1	25	DH		
	48	Plastic products	25.2				
	49	Glass and glass products	26.1	26	DI		
	50	Ceramic goods	26.2 + 26.3				
	51	Bricks, tiles and construction products in baked clay	26.4				
	52	Cement, lime and plaster	26.5				
	53	Articles of concrete, plaster and cement; cutting, shaping and finishing of stone; manufacture of other non-metallic mineral products	26.6 to 26.8				
	54	Basic iron and steel and of ferro-alloys; manufacture of tubes and other first processing of iron and steel	27.1 to 27.3	27	DJ		
	55	Basic precious and non-ferrous metals	27.4				
	56	Casting of metals	27.5				
	57	Structural metal products	28.1	28			
	58	Tanks, reservoirs and containers of metal; central heating radiators and boilers; steam generators	28.2 + 28.3				
	59	Forging, pressing, stamping and roll forming of metal; powder metallurgy; treatment and coating of metals	28.4 + 28.5				
	60	Cutlery, tools and general hardware	28.6				
	61	Other fabricated metal products	28.7				
	62	Machinery for the production and use of mechanical power, except aircraft, vehicle and cycle engines	29.1	29	DK		
	63	Other general purpose machinery	29.2				
	64	Agricultural and forestry machinery	29.3				
	65	Machine tools	29.4				
	66	Other special purpose machinery	29.5				
	67	Weapons and ammunition	29.6				
	68	Domestic appliances not elsewhere classified	29.7				
	69	Office machinery and computers	30	30	DL		
	70	Electric motors, generators and transformers; manufacture of electricity distribution and control apparatus	31.1 + 31.2	31			
	71	Insulated wire and cable	31.3				
	72	Electrical equipment not elsewhere classified	31.4 to 31.6				
	73	Electronic valves and tubes and other electronic components	32.1	32			
	74	Television and radio transmitters and apparatus for line telephony and line telegraphy	32.2				
	75	Television and radio receivers, sound or video recording or reproducing apparatus and associated goods	32.3				
	76	Medical, precision and optical instruments, watches and clocks	33	33			
	77	Motor vehicles, trailers and semi-trailers	34	34	DM		
	78	Building and repairing of ships and boats	35.1	35			
	79	Other transport equipment	35.2 + 35.4 + 35.5				
	80	Aircraft and spacecraft	35.3				
	81	Furniture	36.1	36 + 37	DN		
	82	Jewellery and related articles; musical instruments	36.2 + 36.3				
	83	Sports goods, games and toys	36.4 + 36.5				
	84	Miscellaneous manufacturing not elsewhere classified; recycling	36.6 + 37				
Electricity, gas and water supply	85	Production, transmission and distribution of electricity	40.1	40	E	E	
	86	Gas; distribution of gaseous fuels through mains; steam and hot water supply	40.2 + 40.3				
	87	Collection, purification and distribution of water	41	41			
Construction	88	Construction	45	45	F	F	3
Wholesale and retail trade	89	Sale, maintenance and repair of motor vehicles and motorcycles; retail sale of automotive fuel	50	50	G	G	4
	90	Wholesale trade and commission trade, except of motor vehicles and motorcycles	51	51			
	91	Retail trade, except of motor vehicles and motorcycles; repair of personal and household goods	52	52			
	92	Hotels and restaurants	55	55	H	H	
Transport and communication	93	Transport via railways	60.1	60	I	I	
	94	Other land transport; transport via pipelines	60.2 + 60.3				
	95	Water transport	61	61			
	96	Air transport	62	62			
	97	Supporting and auxiliary transport activities; activities of travel agencies	63	63			
	98	Post and courier activities	64.1	64			
	99	Telecommunications	64.2				
Financial intermediation	100	Financial intermediation, except insurance and pension funding	65	65	J	J	5
	101	Insurance and pension funding, except compulsory social security	66	66			
	102	Activities auxiliary to financial intermediation	67	67			
	103	Real estate activities with own property; letting of own property, except dwellings	70.1 + 70.2(pt)	70	K	K	
	104	Letting of dwellings, including imputed rent	70.2 (pt)				
	105	Real estate activities on a fee or contract basis	70.3				
	106	Renting of machinery and equipment without operator and of personal and household goods	71	71			
	107	Computer and related activities	72	72			
	108	Research and development	73	73			
	109	Legal activities	74.11	74			
	110	Accounting, book-keeping and auditing activities; tax consultancy	74.12				
	111	Market research and public opinion polling; business / management consultancy activities; management activities of holding companies	74.13 to 74.15				
	112	Architectural and engineering activities and related technical consultancy; technical testing and analysis	74.2 + 74.3				
	113	Advertising	74.4				
	114	Other business services	74.5 to 74.8				
Public administration	115	Public administration and defence; compulsory social security	75	75	L	L	6
Education, health and social work	116	Education	80	80	M	M	
	117	Human health and veterinary activities	85.1 + 85.2	85	N	N	
	118	Social work activities	85.3				
Other services	119	Sewage and refuse disposal, sanitation and similar activities	90	90	O	O	
	120	Activities of membership organisations not elsewhere classified	91	91			
	121	Recreational, cultural and sporting activities	92	92			
	122	Other service activities	93	93			
	123	Private households employing staff and undifferentiated production activities of households for own use	95 to 97	95 to 97	P	P	

Annex B

Notable changes within each annual current price Input-Output exercise since 1992

Year	Brief overview
1992	Year (t-3) compiled using 102 I-O groups on SIC (80) classification. First set of GVA estimates produced for 1989 using the Input-Output Annual Supply and Use Tables framework. GVA by industry estimates produced using the *production* approach differed from those produced using the *income* approach.
1993	1989 and 1990 compiled using 123 I-O groups on SIC (80) classification. GVA weights at factor cost for 1990 used for rebasing *production* measure of GDP by industry onto 1990=100. At the 11 industry level, GVA estimates from the *production* and *income* approaches were brought into line for the first time. Input-Output Annual Supply and Use Tables for 1989 and 1990 compiled with government treated as a producer, as opposed to a consumer, for the first time.
1994	Timetable for Input-Output Annual Supply and Use Tables compilation accelerated, and years (t-3) and (t-2) compiled simultaneously.
1995	1992 and 1993 compiled using 123 I-O groups on SIC (92) classification. 1989 to 1991 converted from SIC (80) to SIC (92) using correlator derived from dual run of 1992 data. Input-Output Annual Supply and Use Tables completed to further reduced timetable.
1996	Complete reconciliation of estimates of GVA at factor cost derived from the *production* and *income* approaches at the 123-industry level for the first time. Inclusion of results from the new Overseas Trade In Services Inquiry.
1997	Input-Output Annual Supply and Use Tables completed to a further reduced timetable. Charts included in the I-O publication for the first time.
1998	Major revisions package (1986-96, 68 revisions implemented) balanced through the Input-Output Annual Supply and Use Tables framework using ONS inquiry results based on the new IDBR for the first time. All I-O Annual Supply and Use Tables (1989-96) converted onto an ESA 95 basis. UK Production accounts by sector, for all sectors, produced for the first time. GVA weights at basic prices for 1995 used for rebasing the *production* measure of GDP onto 1995=100.
1999	Partly incorporated results from the new Annual Business Inquiry (ABI) including extension of ABI to cover oil and gas extraction industry. Input-Output Annual Supply and Use Tables completed to a further reduced timetable.
2000	Publication of annual current price quality and coherence adjustments underlying the balanced Input-Output Annual Supply and Use Tables for the first time. Inclusion of improved consumption of fixed capital estimates going back to 1948.
2001	Major revisions package (1986-97, 94 revisions implemented) balanced through the Input-Output Annual Supply and Use Tables framework incorporating the full impact of the new ABI results, using dual run of 1997 data to provide link factors for back data. Estimates for smuggling activity included for the first time going back to 1994. Range of new analyses based on Input-Output Annual Supply and Use Tables produced for the first time, including ICT, Food sector, Creative sector, Import penetration, and Contribution of Top 5 businesses to each industry.
2002	Inclusion of ABI results covering forestry SIC (92) Class 02 and fishing SIC (92) Class 03 for the first time. Input-Output Annual Supply and Use Tables completed to a further reduced timetable. Web-only *UK Input-Output Analyses* publication, including further new analyses including Export of shares and Net trade in goods and services, all of which were made available free of charge for the first time. Inclusion of new Expenditure and Food Survey results. Inclusion of government out-turn data on a Resource Accounting and Budgeting basis. Input-Output Analytical Tables for the year 1995 produced and published, also providing feedback structural mechanism for improvements to Input-Output Supply and Use Tables.
2003	Inclusion of new ABI results covering parts of the agriculture industry (SIC (92) Class 014 and 015), and the annual all-industry purchases data. Move onto full HHFCe COICOP by I-O product analyses (from 1992). New International Trade In Services (ITIS) results going back to 1996. Inclusion of Missing Trader intra-community VAT fraud estimates for the first time going back to 1999. Inclusion of Subjective Analysis Return results to inform estimates of local government intermediate consumption by product (from 1996). GVA weights at basic prices for years up to and including 2000 used for chain-linking the *production* measure of GDP, where 2000=100. Further new analyses produced covering Taxes and subsidies, Oil and gas sector and Revisions.

Annex B (continued)

Notable changes within each annual current price Input-Output exercise since 1992

Year	Brief overview
2004	Reclassification of NHS Trusts from the public non-financial corporations sector to central government sector (from 1991). Review of public sector health industry estimates including range of reclassifications. Review of the allocation of the GFCF industry totals to I-O product groups from 1992 publishing at the NACE Rev. 1, A31 level and production of a new processing system. Review of effective VAT rates applied by I-O product linked to the detail Weighted Average Return analyses from the then HM Customs & Excise. Inclusion of estimates reflecting toll processing activity. GVA weights at basic prices for years up to and including 2001, used for chain-linking the *production* measure of GDP, where 2001=100.
2005	1992 to 2003 Input-Output Annual Supply and Use Tables compiled on SIC (2003) classification to a further reduced timetable. Further new analyses produced covering Market sector and non-market sector activity and Concentration ratios. Review of the allocation of government spending to COFOG functional categories and I-O products. Implementation of Atkinson Review related recommendations affecting education, health, social protection and fire protection, including the reclassifications of Initial Teacher Training Agency; Nursery vouchers/grants; and City Academies and City Technology Colleges. Inclusion of changes from Pension Inquiry data review. Review of GFCF industry headings to I-O product groups from 1992 publishing at the NACE Rev. 1.1, A60 level for the first time. GVA weights at basic prices for years up to and including 2002, used for chain-linking the *production* measure of GDP, where 2002=100.
2006	Complement of staff in Input-Output team reduced by one from eleven to ten staff as part of ONS National Accounts efficiency savings exercise. Sizeable revisions package (1989-2002, 46 revisions implemented). Review of the allocation of the GFCF industry totals to I-O product groups from 1992. Review of the allocation of the changes in inventories industry totals to I-O product groups, holding gains, and production of a new processing system. Reclassification of BBC licence fee from a service payment to a tax on income, and reclassification of BBC and S4C non-trading bodies from public non-financial corporations sector to central government sector. Inclusion of improved estimates of consumption of fixed capital, going back to 1948. Inclusion of new Bank of England data on spread earnings and derivatives for banks, and data from new Bank of England profit/loss form. Correction of classification of data sources for passport fees. Various publication analyses enhanced and a range of new industry chronologies introduced for the first time. GVA weights at basic prices for years up to and including 2003, used for chain-linking the *production* measure of GDP, where 2003=100.

Letter 't' represents the year of the publication of the *Blue Book*

Annex C

Chronology of UK Input-Output Analytical Tables

Title and publication details	Industrial classification	Number of industries and products	Valuation of tables
1954			
Studies in Official Statistics: No. 8 Input-Output Tables for the United Kingdom 1954 Published by HMSO 1961, S.O. Code No. 63-166	SIC (48)	46 : (of which 2 services)	Producers' prices, with output and intermediate consumption shown net of intra-industry sales
1963			
Studies in Official Statistics: No. 16 Input-Output Tables for the United Kingdom 1963 Published by HMSO 1970, SBN 11 630077 9	SIC (58)	73 : (of which 8 services)	Producers' prices
1968			
Studies in Official Statistics: No. 22 Input-Output Tables for the United Kingdom 1968 Published by HMSO 1973, SBN 11 630111 2	SIC (68)	90 : (of which 6 services)	Producers' prices
1970			
Business Monitor PA1004: *Input-Output Tables for the United Kingdom 1970* Published by HMSO 1974, ISBN 0 11 511356 8	SIC (68)	90 : (of which 6 services)	Producers' prices Update of 1968 tables
1971			
Business Monitor PA1004: *Input-Output Tables for the United Kingdom 1971* Published by HMSO 1975, ISBN 0 11 511642 7	SIC (68)	60 : (of which 7 services)	Producers' prices Update of 1968 tables
1972			
Business Monitor PA1004: *Input-Output Tables for the United Kingdom 1972* Published by HMSO 1975, ISBN 0 11 511778 4	SIC (68)	60 : (of which 7 services)	Producers' prices Update of 1968 tables
1974			
Business Monitor PA1004 *Input-Output Tables for the United Kingdom 1974* Published by HMSO 1981, ISBN 0 11 512700 3	SIC (68)	103 : (of which 12 services)	Producers' prices Update of 1968 tables
1979			
Business Monitor PA1004 *Input-Output Tables for the United Kingdom 1979* Published by HMSO 1983, ISBN 0 11 513187 6	SIC (80)	100 : (of which 13 services)	Basic prices
1984			
Input-Output Tables for the United Kingdom 1984 Published by HMSO 1988, ISBN 0 11 620299 8	SIC (80)	102 : (of which 15 services)	Basic prices
1990			
Input-Output Tables for the United Kingdom 10th Edition (containing 1990 tables) Published by HMSO 1995, 0 11 620664 0	SIC (80)	123 : (of which 33 services)	Basic prices
1995			
Analytical Input-Output Tables for the United Kingdom (containing 1995 tables) Produced by Office for National Statistics (April 2002) Web only - available from www.statistics.gov.uk/inputoutput	SIC (92)	123 : (of which 35 services, plus 15 non-market activity industries shown separately).	Basic prices

Input-Output Analytical Tables have also been known as Input-Output Tables, Theoretical Tables, Symmetric Tables or Derived Tables.