

Developments and Challenges in Production of Supply and Use Tables in the United Kingdom

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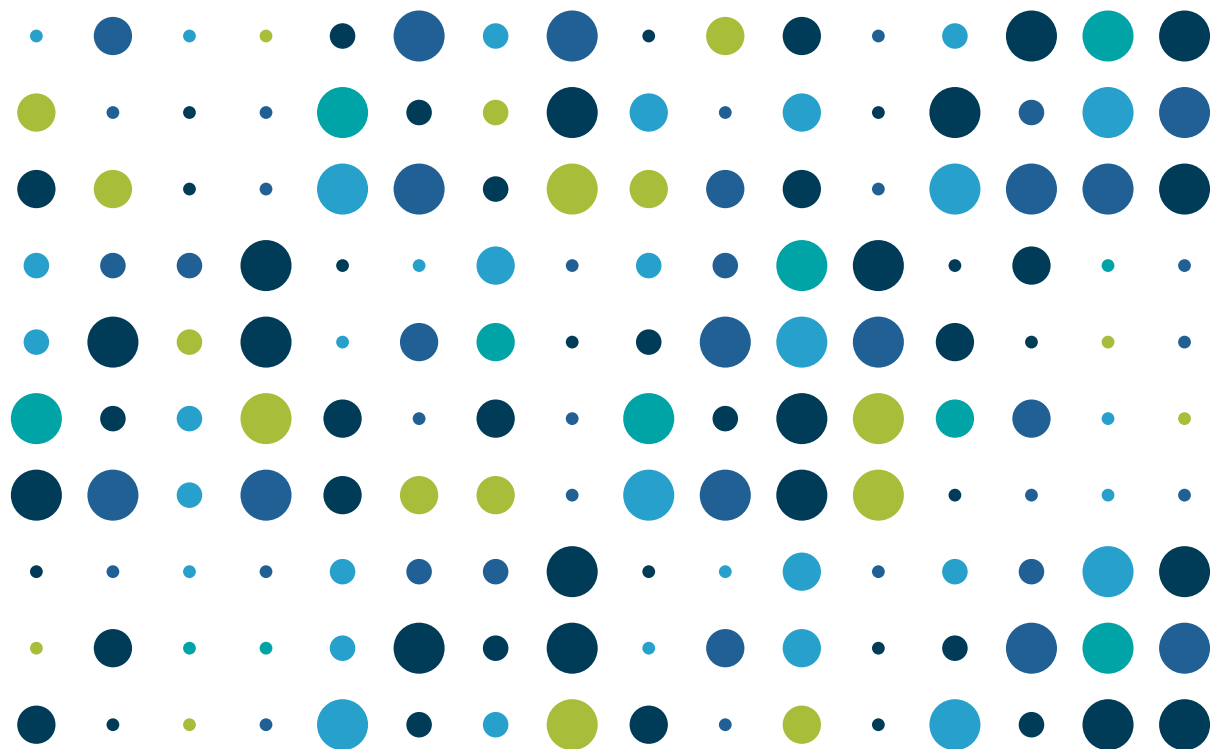


Table of Contents

1.	Introduction.....	3
2.	Background	3
3.	Producing Supply and Use Tables in the UK.....	4
	The Supply and Use Tables Framework	5
	Data Sources Used to Produce the Supply and Use Tables	6
	Exhaustiveness Adjustments.....	9
	The Annual Balancing Process.....	12
4.	Significant Improvements Deployed in 2019	17
	New/Improved Data Sources.....	17
	Methods Improvements	17
	A New Balancing Approach	18
5.	Further Significant Developments in 2022	20
	Methods Improvements	20
	Data Improvements	20
	Balancing 2020 for the First Time.....	21
6.	Implementing ESA2010.....	22
7.	Impact of Implementing ESA2010	24
	Aggregate Supply and Demand Components	25
	Product Changes to Supply/Demand	26
	Product Changes to Domestic Output at Basic Prices.....	29
	Product Change in Intermediate Demand	31
	Changes to Output and Intermediate Demand in the Industry Dimension	33
	Product Changes in Final Demand.....	37
8.	Acknowledgements	38
9.	References	38
	Annex1. Glossary of Products used in UK SUTs (CPA2008 Consistent)	40
	Annex 2. Glossary of Industries used in UK SUTs (NACE/SIC Consistent)	42
	Annex 3. Data Tables.....	44

1. Introduction

Before high quality Input Output tables (IOTs), we must have high quality estimates of Supply and Use. The United Kingdom (UK) input-output tables are, of course, derived from the annual supply and use tables (SUTs). The primary purpose of SUTs is in the balancing of the 3 measures of Gross Domestic Product (GDP) as part of producing UK National Accounts.

There is user interest in IOTs, but they are not a core regular output for Office for National Statistics (ONS – the UK Statistical Institute) and are resource intensive to compile. In the past, the IOTs were only constructed approximately every 5 years. The first year that IOTs are available as spreadsheets on the ONS website is 1984. Some earlier versions are available as far back as the 1950's in pdf form on the [UK Economic Statistics Centre of Excellence \(ESCoE\) website](#). Single year IOTs have been published annually by ONS since 2013.

The IOTs for each year are based on the most recent vintage of the Annual National Accounts available at the time. For example, the latest [2019 IOTs](#) are based on the 2022 Annual National Accounts. This means that published IOTs are based on different vintages of the National Accounts data, and so care must be taken when making comparisons over time. There are no current plans to produce multi-year IOTs on an annual basis.

This paper concentrates on production of annual SUTs in current prices. Data source strengths and weaknesses across the three measures of GDP are discussed. This includes a focus on improvements to the production data - for example introducing new purchases survey data in 2019. There is also explanation of the outcomes from phased implementation of the new [European System of Accounts 2010 \(ESA2010\)](#), that began in 2014. The paper is largely qualitative. However, there is some discussion of the difficulties in balancing the data. There is also some quantification of the scale of change introduced from 2014.

The paper looks briefly at balanced GDP estimates for 2020 that were released at the end of 2022. This explores some of the difficulties encountered in producing balanced supply and use estimates in a year of unprecedented social and economic change.

Overall, the paper gives users of the IOT's an appreciation of the complexity and challenges involved in compiling the data that underpins them. It also provides some quantification of the difficulties in making comparisons over time due to the dynamic nature of the SUTs on which they are based.

2. Background

The UK compiles the three measures of GDP (production, income, and expenditure) independently, and balances through the SUTs. The SUTs are a core part of producing the single estimate of UK annual current price GDP. They are therefore produced and published as a time series every year. In most years, the supply and use balance will be reassessed for all years back to 1997. Generally, only the most recent 3 or 4 years are fully balanced, and earlier years are adjusted to accommodate methods and data improvements. However, in 2019 the SUTs were completely rebalanced back to 1997 to incorporate significant method and data changes. In fact this major update was a significant part of introducing the ESA2010 national accounts methodology. This process began in 2014 and culminates with introducing adjustments for some key globalisation cases in the annual national accounts to be released later this year (2023).

In the UK SUTs, production data are confronted with income data at industry level, and with expenditure data at product level. We have a subdivision to 112 x 112 industries/products (reduced to 105 x 105 for publication purposes). In the industry dimension, production data (based predominantly on surveys run by the ONS) and income data (based predominantly on tax records) are confronted to

balance Gross Value Added (GVA) estimates. In the product dimension, the production data is confronted with expenditure data (from multiple administrative and surveys sources) to balance supply and demand. Each of the national accounts identities involved has its own strengths and weaknesses which vary (according to source data) from industry to industry and product to product. To balance the matrices in 2019 took over 80 manual iterations as well as multiple automated iterations using bespoke software.

UK Input-Output Tables

In the UK a new set of [Input-Output Analytical Tables](#) are now produced every year consistent with the latest edition United Kingdom National Accounts and Balance of Payments.

The latest available IOTs for the year 2019, are consistent with the 2022 National Accounts data releases, and are derived from the 2019 annual Supply and Use Table. They contain a 105 product or industry breakdown, consistent with the SUTs on which they are based.

The SUTs provide a picture of the flows of products and services in the economy for a single year. They present the composition of uses and resources across institutional sectors, and the inter-dependence of industries. Their primary purpose is to reconcile the production, income and expenditure approaches to the measurement of annual current price GDP.

In the UK approach, robust SUTs are the key building block to producing high quality IOTs. These tables are combined with supplementary data and certain economic assumptions to construct the IOTs.

The process involves two steps:

First, the SUTs are converted from purchasers' prices into basic prices by removing taxes and subsidies on products, distributor trading margins and separating out imports.

Second, the tables at basic prices are transformed into product-by-product or industry-by-industry tables.

For product-by-product, we use a "product technology" or "industry technology" assumption for each product and industry combination. Then, a transformation matrix is calculated to complete the transformation into a product-by-product matrix.

For the industry-by-industry tables, we apply the "fixed product sales assumption", which assumes that the sales of products are independent of where they are produced. The technology assumption is stored in a matrix. Then, a transformation matrix is applied that reassigns products to the industries producing them. This transformation is based on domestic output for all uses, which reflects the degree of secondary production in each industry.

This paper does not cover the transition from SUTs to IOTs in any further detail. Methodological guidance on that process is available in the paper '[Input-output analytical tables: methods and application to UK National Accounts](#)', which is available on the ONS website.

3. Producing Supply and Use Tables in the UK

In the UK we produce three, independent measures of GDP – Production, Income, and Expenditure (each outlined below). These three approaches are balanced using the SUTs framework. Each approach is compiled with reference to relative quality of its component's quality. No one approach systematically takes the lead in setting the balance. The tables are produced annually at current

prices as a central part of the annual exercise which leads up to the main annual revision of the National Accounts. The SUTs are used to balance all but the latest year in the annual accounts. In the latest year the accounts include a ‘statistical discrepancy’ on the income and expenditure estimates. The use of annual current price SUTs to balance GDP began in 1990.

In 2019, there were a number of significant improvements to the procedures for balancing GDP (see section 5). This following section describes the procedures used for the annual National Accounts compilation, including the general approach for balancing. Section 5 covers some specific balancing procedures implemented for the first time in 2019.

The Supply and Use Tables Framework

The SUTs framework used in the UK is consistent with that outlined in ESA2010. A simplified version of the SUTs is shown in the following diagram:

Figure 1. Supply and Use Balancing Framework

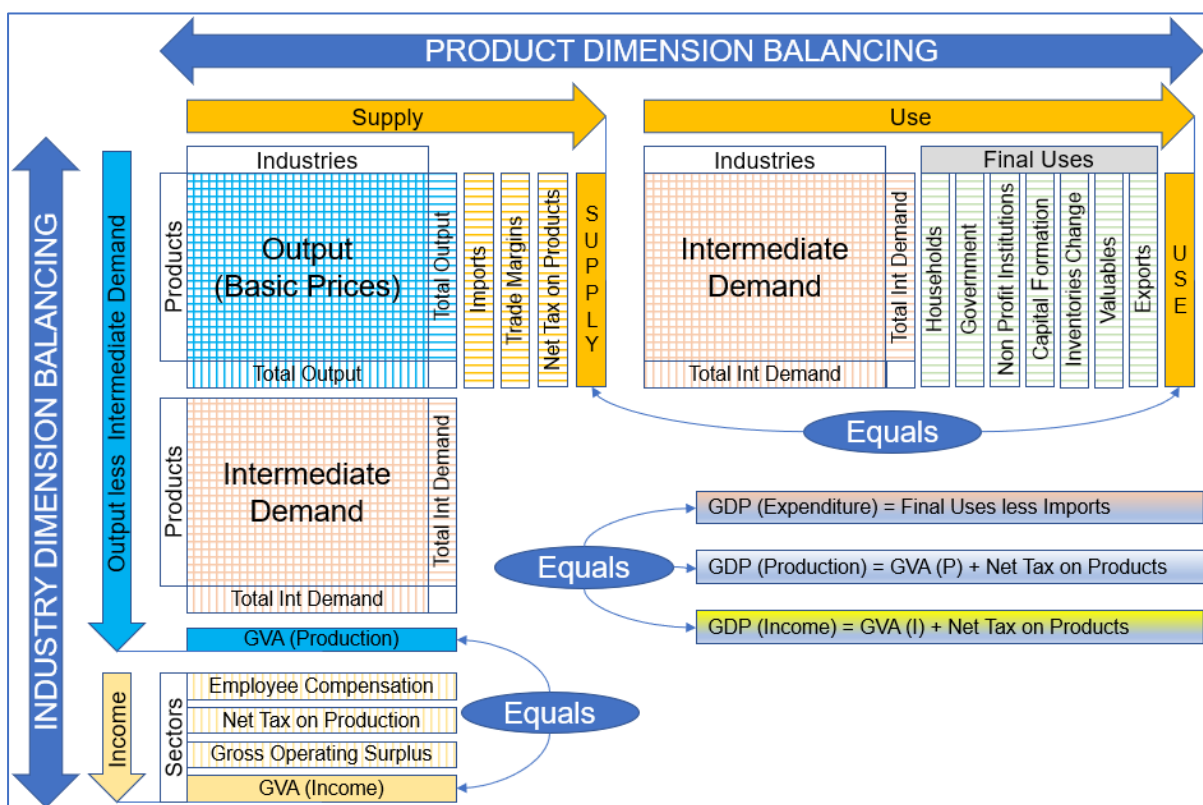


Figure 1 Shows the supply and use balancing framework as used in construction of UK National Accounts. It demonstrates that in the product dimension supply is balanced against use. Whilst in the Industry dimension, gross value added (GVA) from output less intermediate consumption is balanced against GVA from income components (compensation of employees etc.) Lastly, GDP at current market prices is balanced by adding net tax on products (i.e. taxes less subsidies) to production and income measures of GVA, and by subtracting imports from final uses to calculate the expenditure measure.

The SUTs currently use an industry classification made up of 112 groups based on the [2007 Standard Industrial Classification \(SIC\)](#) which is consistent with [NACE Revision 2](#). They use a product classification made up of 112 product groups based on the [2008 Classification of Products by Activity \(CPA\)](#).

It is worth noting that although reference is sometimes made to 114 industries/products the last two categories are 'activities of Private Households for Own Use' and 'Extra-territorial Organisations and Bodies'. In both of these cases no estimates are shown within the UK production boundary.

Data Sources Used to Produce the Supply and Use Tables

The Supply of products is valued at basic prices, which includes taxes (less subsidies) on production but not on products. The supply of products will include both the domestic production and imports of goods and services.

The Use of products is valued at purchasers' prices, which equals basic prices plus taxes (less subsidies) on products (e.g. VAT) plus distributors' trading margins. Effectively, the price paid at the point of consumption.

The difference between the two valuations is called the Basic Price adjustment. In practice, this means that while GDP (Income) and GDP (Production) can be directly compared as they are industry based value-added measures; the Basic Price Adjustment is added to them to enable direct comparison with GDP Expenditure.

Supply Side Estimates

Domestic supply at basic prices is calculated for most industry groups using data collected through the Annual Business Survey (ABS). For the manufacturing industries, total domestic output by industry groups is apportioned using the UK Manufacturers' Sales by Product (PRODCOM) survey, data to derive output of products by the 112 product groups. For the service industries, there was previously no equivalent survey producing a product breakdown of service outputs, and therefore output tended to be more focused on the principal product (or diagonal cell) of the industry. However, export data from the International Trade in Services (ITIS) survey was used as a proxy to estimate output of secondary products/services; these were allocated to their relevant 112 product groups (with an equivalent deduction from the diagonal). Further industry specific 'off-diagonal' allocations were made to cover rental income, retail sales of petrol/other products (margin), sales of business services, e.g. IT, telecommunications, training etc. These were calculated using historical proportions which were carried forward year on year. New data from the Annual Survey of Goods and Services (ASGS) are currently being integrated into the domestic supply estimates. The survey began in 2016 and the original plan was to fully use that data to derive product patterns in the 2021 data release. However, detailed quality assurance of the ASGS data raised concerns around the quality of the data in early years of the survey. Subsequently, the impact of the Covid19 pandemic on output patterns, response rates, and internal resource in 2020 and 2021 has meant that full integration has been again delayed. The ASGS data will now not be fully integrated until bluebook 2025 at the earliest. The survey data is already used to help inform manual balances in the SUTs compilation though.

Domestic output by Government and non-profit organisations (NPISH – Non-Profit Institutions Serving Households) comprises market output, output for own final use, and non-market output. The non-market output is valued through a sum of costs approach (intermediate consumption + compensation of employees + capital consumption). Government data is available from administrative data sources within central and local government. NPISH estimates rely on a wide range of administrative data sources – including the Charities Commission. In almost all cases, non-market output is diagonally mapped from industry to product.

Estimates of imports of services are based on a large number of administrative sources including the Civil Aviation Authority (CAA), Ministry of Defence, Commercial Bar Association, Baltic Exchange, British Airways Authority (BAA), the National Air Transport Service (NATS), Texaco, British Petroleum (BP), ExxonMobil and Gambling Commission.

There are also two main survey sources of data for the import of services.

- The International Trade in Services (ITIS) survey of businesses covers total exports and imports of services broken down by 52 products and the country of destination/origin. The sample size is 14,000 businesses on an annual basis. A large component of the sample comes from businesses sampled from the IDBR. These businesses belong to industries known to have a higher likelihood of trading overseas and include activities such as computer services, the performing arts, wholesale and sport. This is supplemented with information from the ABS. The question asks the contributor to indicate if international trade in services is undertaken and the total value. The more consistent element of the survey comes from those contributors known to have international trade in services. These can remain in the annual ITIS or if they grow large enough can be transferred to the quarterly ITIS.
- The International Passenger Survey (IPS) is a border survey based on face-to-face interviews with a sample of passengers travelling via the principal airports, sea routes and the Channel Tunnel.

Before the UK left the European Union (EU) at the end of 2020, the source for data on Imports of goods from the EU Member States was INTRASTAT. The INTRASTAT system applied from 1993, with minor variations, in all EU Member States. In the UK all VAT registered businesses were required to complete two additional boxes on their VAT returns; which are normally submitted quarterly. These showed the total value of exports of goods to customers in other Member States (dispatches) and the total value of imports of goods from suppliers in other Member States (arrivals).

Traders whose annual value of arrivals or dispatches exceed given thresholds were required to provide an INTRASTAT declaration each month, showing full details of their dispatches and arrivals during the month. These thresholds were reviewed annually to maintain INTRASTAT declaration coverage of approximately 97% (dispatches) and 95% (arrivals). The source for data on trade in goods with non-EU countries was EXTRASTAT. This covered the trade as declared by importers and exporters or their agents and for which documentation has been received and processed by HMRC (HM Revenue and Customs – the UK Government department responsible for collecting taxes) during the month.

Alternative reporting arrangements apply from the end of 2020 following the UK leaving the EU. Data are collected directly by HMRC, with the exception of Northern Ireland, which will continue to be sourced from INTRASTAT.

Imports of goods and services are converted from the BPM6 (Balance of Payments Manual) definitions to the CPA classification used in the SUTs.

Distributors' Trading Margins (DTMs) are estimated using a set of factors derived from data obtained via the ABS. These factors have been created from respondents in the wholesale and retail industries, taking the difference between sales and purchases of goods bought for resale to derive a margin factor. Different factors have been created for each margin type (e.g. wholesale, retail and wholesale/retail trade of motor/parts) and for each product. For each margin type, an estimate of the margin is calculated by applying the relevant factor (specific to each use-side transaction, sector and margin product) to the corresponding purchasers price value. This is further adjusted to estimate the distribution channels (the use of wholesalers and/or retailers) of the goods in question. This forms the pattern upon which total ABS estimates of wholesale and retail output are apportioned.

Taxes and subsidies on products are estimated based on government administrative data on total tax receipts (or payment of subsidies) which are then allocated to products. In some cases the allocation to products is relatively straightforward. For example, excise duty on tobacco can be allocated directly

to the tobacco product. In other cases, a more complex model is required to allocate receipts of taxes (or payment of subsidies) across products. For example, the Supply and Use Tables processing system uses Revenue & Customs (HMRC) effective VAT rates to estimate VAT paid by product. The level of VAT paid, V is calculated as $yr / (1 + r)$ where y is the demand component and r is the VAT rate (%).

The VAT model assigns the prevailing VAT rate, which is weighted by type (i.e. standard, reduced or zero), to each of the 112 product categories by industry, component and sector. The majority of VAT is incurred by households, and this is calculated from estimates of household final consumption expenditure (HHFCE). The model also accounts for the exempt industries such as Health, Finance, Central and Local Government. For these sectors/enterprises, a large proportion of VAT is non-deductible on purchases and an estimate of this is derived from their intermediate consumption and gross fixed capital formation.

The initial allocation of VAT by product generates an unconstrained total which is aligned to the official administrative total VAT receipt. This is achieved by calculating the level of the difference and apportioning over the HHFCE VAT product breakdown.

Use Side Estimates

Intermediate use at purchasers' prices is calculated using estimates of total purchases by industry based on the ABS. These industry estimates of total purchases are apportioned across product groups using a set of factors which are based on a survey of purchases.

Work was undertaken in 2016 to re-introduce the Annual Purchases Survey (APS), which had not been run since 2004. ONS despatched questionnaires to approximately 30,000 UK businesses. The questionnaire collected annual data for the 2015 reference period from businesses from all employment size bands, in all the required industries. Following a further iteration of the survey in 2017 (covering the 2016 reference period), and extensive quality assurance of the data (including congruence checks and comparison with other economic indicators), the data were considered suitable quality for integration into the annual national accounts estimates in 2019. After the year 2016 all purchasing patterns are based on the APS data. Furthermore, in compiling the 2019 data release, ONS reviewed all of the patterns back to 2004 to link the new patterns back to the patterns that were created the last time the survey was run.

Intermediate use by NPISH relies on a wide range of administrative data sources – including the Charities Commission. Government intermediate use is available from administrative data sources within central and local government. Estimates of NPISH data by product are calculated by using the private non-financial sector output industry/product data (based on APS as above) as a pattern. Product allocations within government sector are based on historical purchasing patterns from government administrative data sources.

Final use is calculated from a mixture of survey and administrative data sources. Final consumption of Households (HHFCE – Household Final Consumption Expenditure) relies on the UK household budget survey (LCF – Living Costs and Food) and ABS, supplemented with other administrative data. Final Use of Government and NPISH is equal to their non-market output (by sum of costs) plus any social transfers in kind – these are based on administrative data sources.

The estimates of the components of final use are required to be disaggregated by product. Estimates of HHFCE by product are produced by converting the estimates based on the COICOP classification (Classification of Individual Consumption by Purpose) to CPA. Survey data on household expenditure is used to carry out this conversion. Government and NPISH final consumption is predominantly mapped 'diagonally' from the industry.

Estimates of capital formation by product are based on the Annual Survey on Acquisitions and Disposals on Capital Assets survey (ACAS) and the ABS. The ACAS survey asks businesses to provide the value of acquisitions and disposals of capital assets at the 'product' level. For example, for the asset Transport Equipment (AN.1131) businesses are asked to split their capital spend across multiple products, including new cars, second hand cars, trailers, aircraft, ships etc. Detailed product splits are thus obtained for all the major GFCF assets. These data are used to proportion GFCF assets across their relevant products. Estimates of Inventories data by product are calculated using PRODCOM data as a pattern.

The estimates of exports of goods and services are based on the same sources as for imports (see supply side estimates).

Income Components of Supply and Use Balancing

The estimates of the income components of GDP by industry are derived from mainly administrative sources - i.e. data from organisational units responsible for implementing administrative regulations for which the corresponding register of units and the transactions provide a source of statistical data. This is mostly tax data from HMRC and consists of data related to:

- Taxes (less subsidies) on production
- Compensation of employees
- Gross Operating Surplus
- Taxes (less subsidies) on products

Exhaustiveness Adjustments

ONS's general approach to exhaustiveness is to identify specific under-coverage and evasion issues, and for each issue separately identify and treat the components of GDP it affects. Adjustments to resolve identified issues are then applied to the affected components of GDP.

A number of exhaustiveness adjustments are applied in the UK National Accounts to account for economic activity that is not or cannot be measured directly via surveys and administrative sources. The adjustments can be allocated to one of seven categories defined in Eurostat's tabular approach to exhaustiveness, as follows:

N1: producers deliberately not registering – underground.

N2: producers deliberately not registering – illegal.

N3: producers not required to register.

N4: legal persons not surveyed.

N5: registered entrepreneurs not surveyed.

N6: producers deliberately misreporting.

N7: other statistical deficiencies (including income-in-kind and tips).

Within separate issues identified, there is no "main method", although where appropriate one method can address multiple tabular exhaustiveness categories. For example, in tax evasion both N1 and N6

are partially addressed using the same 'Tax Gaps' data from HMRC. The investigations implement a "microeconomic" approach where the data most relevant to the specific issue is favoured, not a "macroeconomic" approach that attempts to use whole-economy data (e.g. the assumption that $GDP(E) - GDP(I) = \text{income concealed for tax evasion}$).

The allowance for each specific exhaustiveness issue is reviewed separately as part of continuous quality improvement of GDP. In the last few years there have been reviews of UK exhaustiveness adjustments for construction, tips, factors linking surveys, ABS and Business Register coverage, VAT fraud, communal establishment expenditure, and LCF under-reporting. The largest adjustments – tax evasion and under-coverage – were last reviewed in 2014 and are updated, when possible, with new 'Tax Gaps' or tax records data from HMRC. The next largest exhaustiveness adjustments, income earned-in-kind adjustments, are updated annually with HMRC tax records data.

Expenditure is generally considered the most exhaustive GDP approach, as the largest exhaustiveness issue (tax evasion) does not apply to it. This can be explained as a consequence of the general relative lack of incentive to misreport expenditure components for taxation. The main surveys underpinning HHFCE do require some exhaustiveness adjustments. The application to the GDP components (and therefore the three approaches) of each specific exhaustiveness issue is considered separately with regard to the nature of each activity. For exhaustiveness issues like illegal activities that affect the three approaches largely equally, consistency is ensured by applying equal exhaustiveness adjustments. While for tax evasion and under-coverage, consistency is ensured through the balancing process.

For exhaustiveness issues which result in equal or nearly equal adjustments to the three approaches, the balancing process plays little to no part, although small GDP neutral adjustments may be implemented where "impossible" cells (e.g. negative output or intermediate consumption) are created. For issues where the adjustments have large differences, the balancing process is crucial: in effect, a small supply and use balancing round is undertaken to resolve the resulting imbalance. As usual for balancing, this process determines the new set of coherence adjustments through economic reasoning and knowledge about the relative strengths of each GDP approach.

Output Exhaustiveness

Certain assets and activities recorded in one or more ways in private company accounts or in administrative accounts must be recorded in specific ways under ESA2010. In the UK, private accounting is principles based, rather than rules based. This means that accounting items with specific locations under ESA2010 may be acceptably recorded in various different ways in companies' financial statements.

UK financial statements are presented in relation to the nature of the costs, and not their title. For example, Wages and Salaries would not be shown on the face of the income and expenditure account and could be split into a number of different places depending on how and why they were incurred. They could be reported under cost of sales (factory wages), admin expenses (clerical), distribution (drivers), and capitalised under 'Non-current Assets' (IFRS), 'Fixed Asset' (UK GAAP). The questions on sales, employment costs, business expenditure and investment put to respondents in the ABS are accompanied by detailed guidance on what should be included or excluded for survey purposes. These notes serve to harmonise responses in readiness for translation into ESA2010 concepts and prevent private accounting interpretations from undermining the results.

Output estimates formed from production data are supplemented by estimates for income earned-in-kind, covering products provided to employees by employers, either through intra-mural production or purchased from other producers, as non-financial benefits. Income earned-in-kind data adjustments are produced using annual administrative return data provided by employers to HMRC and cover

benefits such as employer-provided cars and fuel, on-site childcare and health services, catering and accommodation.

Output estimates are also supplemented by estimates of tips and gratuities that form part of employees' income in addition to the Wages and Salaries paid to them by their employers. The adjustments applied in the UK accounts includes staff working in hotels and restaurants, hairdressers, taxi drivers and refuse collectors.

Within the production approach, nearly all industries include adjustments to allow for missing coverage from the business register (IDBR – the government Interdepartmental Business Register). These are N4 and N5 adjustments. The IDBR is the sample frame for the ABS. It has high coverage but misses some small business with no employees and turnover below the VAT threshold (although it captures any business voluntarily registering for VAT even though under threshold). Adjustments are made using data from BEIS (Government Department for Business and Industrial Strategy).

Adjustments are made for the hidden economy to account for activity associated with tax evasion (N1; N6), smuggling (N2; N6), narcotic drug supply (N2) and prostitution (N2).

Expenditure Exhaustiveness

Estimates of household final consumption expenditure on alcoholic drink and tobacco smuggled into the UK have been made since 1994. These are N2 adjustments. Estimates are based on HMRC intelligence on the level of smuggling, including freight smuggling and diversion fraud, taking place together with assumptions on the prices at which the goods are sold to final consumers through different types of outlets. N2 adjustments are also made to HHFCE data for spending on narcotics and prostitution.

N7 adjustments are made to HHFCE data to account for a range of under coverage issues with the LCF. This includes adjustments to account for 'diary fatigue' and 'rare' purchases. Adjustments for retail sales by non-retail businesses are made in some specific commodities that are based on ABS data for the 'retail' industries. N7 adjustments are also made for clothing provided as a benefit in kind (such as military uniforms); income earned-in-kind from company cars; and income earned-in-kind from food (e.g. armed forces and seafarers).

Final consumption expenditure by UK residents abroad is separately identified in the LCF questionnaire and excluded from the pounds per week estimates used to calculate HHFCE.

LCF data also excludes spending by foreign visitors to the UK. To bring them onto a 'domestic concept' basis, LCF based estimates for individual COICOPs are therefore supplemented with estimates of foreign visitors' expenditure (where this is significant). Foreign visitors' expenditure is based on data from the IPS.

Local Government pay national non-domestic rates on their property. The data are recorded within their spending reported on the annual administrative returns. As it is immediately refunded to the Local Government sub-sector, the aggregate amount is deducted when calculating Local Government intermediate consumption.

Within GFCF, N4 adjustments are made in the following areas: improvements to dwellings by contractors not on the business register; and other capital formation by businesses not on the register. N7 adjustments are made for production of own-account software. N3 adjustments are made for own-account construction.

Within Changes in Inventories, N4 adjustments are made to materials and supplies, work-in-progress, goods for resale, and finished goods to take account of the changes in inventories of enterprises not listed on the business register.

Within exports and imports of goods and services, N2 adjustments are made to take account of smuggling of alcohol and tobacco, and trade in illegal drugs. N7 adjustments are made for under recording of exports and N6 adjustments are made to take account of MTIC fraud (Missing Trader Intra-Community VAT fraud). HMRC provide the estimates for MTIC. The method used relies on information uncovered during HMRC's operational activity to tackle the fraud. HMRC regularly reviews the methodology for producing the estimates of the impact on the trade statistics to take account of mutations in the fraud.

Income Exhaustiveness

ONS makes an estimate of the value of concealed employment income not declared through tax returns (known as an Evasion adjustment). In 2015, a basic concealed income model was replaced by a new more comprehensive model based in part on HMRC 'tax gap' analysis of missing income tax.

To estimate the value of concealed rental income not declared through tax returns the evasion method takes estimates of missing taxable income from HMRC, again using the data from the published 'Tax Gaps' Report. These are N1 and N6 adjustments. Data used are collected by HMRC as an audit when people/companies fill in tax returns or compensate employees through the Pay-As-You-Earn (PAYE) direct taxation scheme.

There are exhaustiveness adjustments in Compensation of Employees, mainly for income earned-in-kind (N7), and for under-coverage of compensation of employees in the tax data (N4).

The Annual Balancing Process

The annual balancing exercise and production of SUTs is planned as a key part of the annual revision of the National Accounts. The planning of the balancing exercise considers the number of years that are open for revision, and any other changes to data sources, classifications or methods which form part of that annual exercise. The SUTs balancing process is overseen by a steering group made up of senior managers from National Accounts and members of a specialist SUTs coordination team.

The first stage in the annual balancing exercise is to deal with any revisions to GDP and the SUTs for earlier years which are not being rebalanced through a full SUTs balancing exercise. Where there are such revisions to GDP in earlier years, these are introduced through a controlled revision of the balanced SUTs for those years. Each change is introduced individually as a balanced revision before introducing the next change. This approach allows full line of sight and easy identification of revisions. Where the introduction of unbalanced revisions creates an imbalance in the SUTs it is necessary to carry out a limited rebalancing exercise. These balancing adjustments are tightly controlled and internally regulated as part of the change control process. This requires compilers, developers and senior managers to sign-off during the implementation process.

The second stage in the annual balancing exercise is the production of SUTs for those years being fully rebalanced. This process takes as its starting point the production of unbalanced SUTs for those years. In the 2022 exercise, there was full balancing of SUTs for three years (2018, 2019 and 2020), coupled with a partial rebalance of earlier years to process methodological revisions in line with ESA2010 requirements.

For the annual data release in 2021, ONS introduced a new framework within annual SUTs where we produce volume estimates of gross domestic product (GDP). This enabled implementation of double deflation (or direct deflation) for the first time, producing and balancing double deflated estimates of industry gross value added (GVA). In some cases, information from the SUT volume balancing can iterate in to setting the current price balances.

Further information on the 'double deflation approach' can be found in the following ONS articles:

<https://www.ons.gov.uk/economy/nationalaccounts/uksectoraccounts/articles/improvementstothemeasurementofukgdp/anupdateonprogress>

<https://www.ons.gov.uk/economy/nationalaccounts/uksectoraccounts/methodologies/doubledeflationmethodsanddeflatorimprovementstouknationalaccountsbluebook2021>

<https://www.ons.gov.uk/economy/nationalaccounts/uksectoraccounts/articles/producinganalternativeapproachtogdpusingexperimentaldoubledeflationestimates/2020-11-02>

Row and Column Balances

The ONS now uses a decentralised approach to balancing. Instead of having a central team fully responsible for the balancing of SUTs, this responsibility is now shared with the compilers of the basic data that form the input to the process. For example, Government data are balanced by the Public Sector division and Financial industries data are balanced by the Financial Corporations division. The move to a more decentralised approach to balancing was intended to make the process more transparent, to reduce the dependence on a small central team of balancers, and to take advantage of the knowledge that data compilers have about the strengths and weaknesses of their data.

SUTs do not give predominance to any measure of GDP; instead they assess each measure on its strengths and weaknesses, which are explained below. In general, predominance is given to the column balancing, as the industry data are considered more robust than the row (product) measure. However, there are instances where use of the product is considered a stronger source of data than the output (supply) side. These are:

- Electric power generation, transmission and distribution;
- Manufacture/distribution of gas;
- Water collection, treatment and supply;
- Manufacture of alcoholic beverages;
- Manufacture of tobacco products;
- Manufacture of coke and refined petroleum products;
- Manufacture of motor vehicles;
- Financial service activities;
- Insurance and reinsurance;
- Imputed rental of owner-occupied dwellings;
- Real estate activities; and

- Other personal service activities.

The first assessment of the data takes place before the SUTs framework is populated. The rows and columns of data are reviewed for plausibility, independently of each other. For example, estimates of HHFCE, by product, are produced and analysed to ensure the overall picture of household spending and its breakdown by product is credible. Similarly, for those components with an industry dimension, such as output, in the initial stage these data are scrutinised to ensure that the industry estimates look plausible. This first stage is carried out by the SUTs team as a pre-confrontation exercise, to ensure that data are reasonable in the context of previous deliveries and compiler briefings supplied which highlight any revision(s).

The second stage is a confrontation within the framework of the rows (products) in the SUTs framework. This challenges the data in each row with the aim of achieving a balance across the row - that is, confirmation that the supply of a product is equal to the demand for that product. This confrontation process identifies areas of inconsistency between the various sources which can then be investigated. Data within the row are then subsequently adjusted to achieve a balance. This adjustment process is based on an assessment of the quality of the data used to populate the individual cells within a row. Some components are not adjusted during the balancing process, or at least adjusted in a minimal way - for example in product or industry breakdown rather than in total. These components are generally administrative or census data:

- Central Government expenditure data from OSCAR (Online System for Central Accounting and Reporting) database, which is mostly provided by government departments on a monthly basis, then aggregated to quarterly and annual values.
- Local Government data are mainly collected from statistical returns managed by the Ministry of Housing, Communities & Local Government (MHCLG) in the case of England, and by the devolved administrations in Scotland, Wales, and Northern Ireland.
- The Wages and Salaries component of compensation of employees is mainly measured through tax records are collected in the UK by a system known as "Pay-As-You-Earn" (PAYE). The PAYE based data, are supplied by Her Majesty's Revenue & Customs (HMRC), the UK's tax collection agency. The employers' contributions component is measured mainly through data supplied by government administrative records.
- Most central government income is in the form of tax receipts, the majority of which are collected by HMRC. The data for taxes are collated and quality assured by HMRC analysts from their administrative data sources before delivery each month to ONS.
- For subsidies paid by the Central Government sub-sector, and those paid by the European Union, the main data source is OSCAR.
- For subsidies paid by the Local Government sub-sector, the main data sources are statistical returns managed by the MHCLG for England, and by the devolved administrations in Scotland, Wales, and Northern Ireland.
- The calculation of gross operating surplus (GoS) for non-financial corporations is mainly based on HMRC data from corporation tax returns. Financial corporations' GoS is mainly based on Bank of England surveys for banks and ONS surveys for other financial intermediaries.
- Data on compensation of employees and GoS for public corporations are obtained from Government Accounting Data supplied by HMT (HM Treasury - the UK Governments

economic and finance department) supported by the ONS quarterly survey of the largest public corporations, administrative data from other government departments, and from published accounts.

- The main source of data for the calculation of mixed income (sole proprietors' income from own work plus profit as an entrepreneur) is the HMRC Self-Assessment tax data which is supplemented by data from the Economic Accounts for Agriculture (EAA) produced by DEFRA for farming.
- Monetary financial institutions trading profits estimates of banks' and building societies fees, commissions and charges are obtained from a Bank of England's profit and loss (PL) survey. The PL collects those components of the non-financial accounts needed for national accounts. The PL survey return is completed by the central bank, and all other banks and building societies.
- Trade in Goods data from HMRC has until recently only been subject to balancing in specific cases. Better understanding of globalisation issues (operation of multi-national enterprises) is now beginning to suggest that in the future trade in goods data may be less 'reserved'.
- For non-monetary gold, the Bank of England provides data from the six gold clearers in the London Bullion Market. These data show net exports of nonmonetary gold that is held as a store of wealth in allocated accounts.

Furthermore, conceptually balanced data are not adjusted explicitly within the balancing process e.g. Changes in Inventories data (materials, stores and fuels, work-in-progress and finished goods) are balanced within Output, Intermediate Consumption, Change in Inventories and Holding Gains. Any coherence adjustments (to make the data coherent and mutually consistent with the other measure of GDP) are retained within those components not in the balancing process.

Other components are adjusted within tolerances supplied by the owner of the data based on their quality confidence (e.g. estimates versus returned data, admin versus survey data). This is based on data confidence and completeness.

As mentioned above, certain exhaustiveness adjustments are applied across the measures of GDP holistically. For example, Tax Evasion adjustments are calculated for GDP (I), and then further adjusted before being applied to GDP (P). In line with National Accounts strategy, any methods change to reassess exhaustiveness adjustments must identify and deal with impact on the three approaches of GDP before being signed-off.

The third stage of the balancing process is to confront the data in the columns. Whilst the second stage of balancing results in a balance of the rows it does not result in satisfying the accounting relationship for the columns, that is GVA from the production approach is equal to GVA from the income approach. This third stage of balancing has the objective of ensuring that these column identities are satisfied.

Once stage three is complete the likelihood is that the row identities balanced during stage two of the process will have subsequently been broken. The process of repeating stages two and three continues until both the row and column identities are satisfied or at least are close (usually at less than 0.1% of Total Supply) to being satisfied. This iterative and manual process of row, and column, balancing moves closer to a balance.

The description above may seem to indicate a fairly mechanistic balancing approach, but a significant amount of knowledge of the methods and quality of the basic data are used as part of the process.

This improves the quality and understanding of the outputs. Alongside this, the evolving balance is reviewed at each stage to see how the economic picture is developing and to make sure that aggregate and detailed time-series estimates are credible.

The number of iterations of row and column balances which are used depends on the number of years of data which are being balanced and may also depend on other circumstances specific to any one annual cycle: for example the nature and extent of the imbalance or the time available for balancing. The number of iterations is based on the completeness of data at the start of the process, and the number of changes required to be processed. In a normal year, after the initial examination or quality assurance of the rows and columns individually, it is typical to use at least three iterations of row and column balancing. The maximum number of iterations used would normally not exceed fifty. However, in 2019 around 80 iterations were used because of the large number of years being balanced (1997 – 2017).

Unexplained discrepancies are imputed to the least firmly based items, based on the ‘balancers’ specific knowledge of their allocation. These discrepancies are placed on one specific component or spread across multiple components, depending on the quality of the components.

During the balancing process, for the years that are open to revision, there is cross-sectional and time series analysis conducted for all components of GDP e.g. relationships between Intermediate Consumption and Output.

Achieving the Final Balance

The row and column iterations should result in a ‘near balance’. However, it would be very unlikely that this process was sufficient in itself to produce a complete balance between the three measures of GDP. In order to resolve the remaining imbalance there are either one or two further stages in the balancing process.

The first stage involves assessing whether there are still significant imbalances remaining in any of the rows and columns. In this case the central team which coordinates the balancing exercise can continue with manual balancing in order to deal with those imbalances. Unlike during the earlier balancing iterations, the central team is able to tackle row and column imbalances simultaneously which helps to begin resolving any significant imbalances which remain at this stage. There is a limit to the speed at which this form of simultaneous balancing of rows and columns can be carried out because in order to maintain control of the balancing adjustments being made, this simultaneous balancing can only be done by one person at any one time. However, this approach can be pursued until a final balance is reached.

Alternatively, when there are many small imbalances remaining, the final stage of balancing is the application of an automatic balancing method which is applied to resolve all outstanding imbalances.

The method employed in previous years is ‘RAS’ Balancing, a form of iterative raking and scaling, originally developed by Stone in the 1960s. A balance is achieved by first apportioning the supply and use differences for each product across the various industries, and then scaling the industry totals to ensure consistency of output and income GVA.

This method is a relatively simple mechanistic procedure. As such, there is no scope for additional sources of information, judgement or expert knowledge to inform the results. The method can take account of the differing quality of the sources of input data although only in the most limited of ways. It is designed so that certain ‘high quality’ data items are not adjusted, while other ‘low quality’ data items are adjusted in order to achieve a balance.

This method is only appropriate for the final stage of the balancing process when the remaining imbalances are small. The procedure is only applied when the imbalances are sufficiently small that the outcome has no effect on the final growth rate of GDP (to the nearest 0.1%). In these circumstances the time saving justifies the use of a simple automated procedure.

4. Significant Improvements Deployed in 2019

During production of the annual national accounts in 2019 considerable improvements were made to estimates of GDP. This was largely by implementation of methods and sources related to the regulatory requirement to align to ESA2010.

New/Improved Data Sources

The APS identifies the purchasing patterns of businesses through the collection of information about their expenditure on energy, services, goods and materials that are used up or transformed by the business activity corresponding to the 112 level of CPA.

Work was undertaken in 2016 to re-introduce the APS, which had not been run since 2004. ONS successfully despatched questionnaires to approximately 30,000 UK businesses. The questionnaire collected annual data for the 2015 reference period from businesses from all employment size bands, in all the required industries. Following a further iteration of the survey in 2017 (covering the 2016 reference period), and extensive quality assurance of the data (including congruence checks and comparison with other economic indicators), the data were considered suitable quality for integration into the annual national accounts estimates in 2019.

After 2016 all purchasing patterns are based on the APS data. Furthermore, in the 2019 compilation process, ONS reviewed all of the patterns back to 2004 to link the new patterns back to the patterns that were created the last time the survey was run.

Methods Improvements

Capital Stocks

Improvements were introduced to the estimation of capital stocks and therefore the consumption of fixed capital (CFC), which included:

- a review of the life length of fixed assets, delivering improved consistency with the approach taken in other countries.
- improvements to the classification of stocks by asset, industry and the institutional sector.
- implementation of hyperbolic age-efficiency, where an asset loses little of its productive value in the early years of its life but loses much more of this value as it nears the end of its life length.

Change in Inventories

Methods and processes were changed so that change in inventories could be calculated on an industry by product basis allowing for a more accurate estimate to be produced. Furthermore, deflation was carried out on a product by asset basis for the first time, rather than at industry level. Quality assurance by comparisons between estimates produced from inventories against output measured from other sources was also introduced. This resulted implausible cells/values being

identified and addressed, such as the removal of inventories work-in-progress from the services industries.

Research and Development

Expenditure on research and development (R&D) was capitalised for the first time during production of the 2014 National Accounts. During 2019 compilation, more up-to-date survey data, mostly affecting 2013 onwards, were incorporated. More consistent treatment when calculating R&D by the sum-of-costs for non-market sectors was also applied. This better aligned R&D across the accounts so that R&D was treated as a fully balanced concept – i.e. it was no longer balanced in the SUTs process.

Value Added Tax

Collaboration with HMRC and HM Treasury to review the recording of estimates of Value Added Tax (VAT) refunds improved the recording of refunds associated with the NHS, academies, the BBC and police commissioners. This resulted in an increase in the value of government final and intermediate consumption and the sum-of-costs output of government.

Trade

Improvements implemented in 2019 led to revisions to trade flows. These include the following areas:

- Estimates of the handling of intragroup transactions between resident and non-resident companies, which are part of the same group entity. Intragroup fees include those that relate to investment banking, advisory, brokerage, underwriting, insurance, loans and advances, while intragroup cost recharges are applied when the costs of a centrally managed service are allocated and charged to each group entity. Whilst transactions between UK institutions had been captured in the income and output measures of GDP already, transactions between residents and non-residents were captured within trade in services for the first time.
- HM Revenue and Customs (HMRC) data records the physical movement of goods in and out of the UK. Adjustments were applied so that they correspond to a 'change of economic ownership' basis aligning with a treatment already applied in balance of payments data.

Distributors Trade Margins (DTMs)

The change implemented in 2019 improved the way trade margins are allocated to products. The combination of product and sector proportions used to reallocate DTMs to the products on which they are made were completely reassessed. This was based on new analysis of purchases of goods for resale and sales of those goods from the ABS. The result of this work was to revise the amount of non-margin activity retained in supply/use of the CPA_G product group (wholesale and retail), and to change to the pattern used to allocate the margin activity from CPA_G to the other products.

A New Balancing Approach

In Blue Book 2019, full integration of institutional sectors into the SUTs balancing process was implemented. In particular, separating the Household and NPISH (non-profit) sectors.

In addition, an optimisation model replaced RAS (described above) for the end phase of balancing SUTs. This used the FICO Xpress software to achieve balanced SUTs by minimising the sum of squared adjustments subject to a weight assigned to each cell and a set of constraints. The model prefers spreading the adjustment among multiple values rather than only adjusting a limited number of the unbalanced values by a larger amount.

The model consists of two stages, first an optimal non-integer solution is found before a second stage finds an integer solution very close to the non-integer solution (+/- 1).

The weights of the target function are generally set so that the adjustments are proportional to the size of the values, with some upper and lower cut-off for numerical stability. A few weights are set to the maximum so that values can be theoretically changed but the model will change them as little as possible. This covers DTM's, wholesale and retail products (CPA G), Financial/Insurance products (CPA K), and R&D (CPA M72).

A number of constraints were set in the model, these include:

- The following transactions are fixed for all sectors, products and industries: Distributors Trade Margins (DTMs), All variants of taxes and subsidies (D21/D39 and D31/D39), Change in Inventories (P52), Valuables (P53), Imports and Exports of Goods (P61/P71), and Employers Social Contributions (D12).
- The Central and Local Government Sectors (S1311, S1313) and Non-Profit Institutions Serving Households (NPISH - S15) are fixed except in the product allocation of Intermediate Consumption (P2).
- Products CPA_K653 (Pension Funding services) and CPA_L68A (imputed rentals of owner occupiers) are fixed for all transactions, industries and sectors.
- For the financial corporations sectors. All variants of Output (P1) and Intermediate Consumption (P2) are fixed for all products and industries. Compensation of Employees, GoS, Mixed Income, and Taxes/Subsidies on Production are fixed for all industries.
- All values that are zero before automatic balancing are left zero after running the FICO model.
- If a pre-FICO value is greater than 100 then it cannot be adjusted by more than 50 percent.
- Product CPA_K64 (Financial Services except insurance and pensions) is only balanced upwards to maintain the FISIM (Financial Intermediation Services Indirectly Measured) matrix relationship.
- Ideally, Compensation of Employees at total industry and sector level, should be constrained to +/-5 billion of its unbalanced value in each year. However, in some years this may not be strictly enforced.
- Output and Intermediate Consumption, at the total product, industry and sector level, should not change in any year

To maintain consistency with the underlying valuation matrices a second version of this model is also used at the very end. This is the same as the model above but also fixes all data in the use table and the supply of margin products (CPA G) so the VAT and DTM product distributions are unchanged following their recalculation.

It should be noted that in the FICO model some of these constraints are implemented separately (for example where fixed transaction cover different sectors, products or industries).

The balancing adjustments for each balanced year are documented in detail, including; industry, product and component detail. This information is used by the Supply and Use team as a record of adjustments applied during the balancing process and used as the basis for the senior management

briefing and related outputs, e.g. Publication of the UK Annual National Accounts (known as the 'Blue Book') and other associated articles.

5. Further Significant Developments in 2022

The 2022 Annual National Accounts also incorporated a wide range of improvements to sources and methods used in estimation of GDP. Again this was largely related to the regulatory requirement to align to ESA2010.

Methods Improvements

Changes to the Measurement of Insurance and Pensions

A new administrative data source, [Solvency II](#), was used for the first time to estimate data for insurance in the UK economy. Applying the appropriate methodologies, in line with ESA2010 guidance, for each type of the insurance business.

For Pensions, additional data from the Financial Survey of Pension Schemes was incorporated and methods changes to the way pensions are treated were applied. These included the estimation of pension scheme service charges, non-resident household pension provision, and employer pension contributions for private sector defined benefit pension schemes.

The Improvements to insurance and pensions, which are largely shown as combined series in the National Accounts including SUTs, led to changes across a range of transactions - including output, intermediate consumption, household final consumption expenditure, imports and exports. Further information can be found in this article - [insurance and pensions methods changes](#).

Trade

Methodological improvements to the travel and tourism estimates from the [International Passenger Survey \(IPS\)](#) were included. Outdated estimates of sea disbursements exports were replaced with Vessels Value and HMRC data. This which completes the package of work to improve estimates on disbursements (services auxiliary to transport not directly provided for the movement of goods or people) in the UK by foreign operators. Other modes of transport were updated in earlier years.

Other changes affecting trade included using HMRC data to improve estimates of trade in goods with the Channel Islands and the Isle of Man. Also, aligning data on universities' exports of research and development services with those published by the Higher Education Statistics Agency (HESA).

Data Improvements

Several areas where data sources included benchmarks that were more than 5 years old were updated:

- improved methods and data measuring the value of meals provided to staff working in catering establishments
- the introduction of new sources and methods to measure the value of self-build housing
- an improved treatment of the production of accommodation services by private schools and universities that are consumed by households
- updated estimates of prescription and dental charges paid by households

- the introduction of new sources and methods for measuring household spending on private residential and local authority care homes
- a revised treatment of the economic activity of trade unions in the National Accounts
- improved data on imports of financial services provided by the Bank of International Settlements (BIS)

Balancing 2020 for the First Time

The COVID-19 pandemic prompted a historic shock to the UK economy, as measured by GDP.

Initial short-term estimates were that between April and June 2020, the height of the first national lockdown, GDP fell by a record 19.4% before rebounding 17.6% as the country reopened over the summer.

Of course, first balancing of the covid impacted year (2020) presented some unique challenges in 2022 – including:

- Business surveys were affected by low response and staff shortages in the processing teams. At the same time the usual output and consumption expenditure patterns were materially changed as businesses temporarily closed down, switched to home working, or diversified to produce new things (face masks or hand sanitiser for example).
- On the final demand side usual purchasing patterns were changed for example including curtailed spending on travel and hospitality, and later more spending on DIY and home improvements. At the same time it was especially difficult to run the usual household surveys.
- On the income side, in response to the pandemic, the UK government implemented the Coronavirus Job Retention Scheme (CJRS) and the Self-Employment Income Support Scheme (SEISS). These were significant fiscal interventions in terms of the direct impact on GDP, which ONS decided should be recorded as "other subsidies on production", to reflect the international position. By the time of the SUTs balancing, data was available from Government sources to make that adjustment.

In response to these issues ONS implemented a number of measures including prioritisation of key surveys, review of survey methods to ensure they were robust, and additional quality assurance using in-house and external economic experts.

As ever, the SUTs balancing process was able to produce one coherent estimate of GDP by balancing at the 112 industry/product level. Producing estimates of GDP was expected to be more challenging through 2020 and 2021 for theoretical and practical reasons, as explained in the [Coronavirus and the effects on UK GDP article](#). Revisions were expected to be larger, given the heightened levels of uncertainty. ONS regularly conducts revisions analysis of the short-term GDP estimates. As expected, it shows that revisions around the time of the coronavirus pandemic were larger than normal. Latest estimates (following benchmarking to annual supply and use balanced data) are that GDP fell by 21% in Quarter 2 2020, before rebounding by 16.6% in Quarter 3.

6. Implementing ESA2010

Most of the large-scale improvements in 2019 and 2022 are part of the longer-term development of the UK accounts to align to the ESA2010 international accounting standard. This began in 2014 with the initial implementation of major changes, including capitalising R&D and Weapons Systems. It will culminate with a series of adjustments for major globalisation cases (treatment of multinational enterprises) in the 2023 data release later this year.

Whilst a member of the European Union (EU), the UK paid budget contributions based on Gross National Income (GNI) data, which is derived from GDP. Consequently the UK had a regulatory requirement to implement ESA2010, which is common standard across all member states (MS) of the EU.

The calculation of GNI in both the UK and the MS is subject to verification by the European Commissions' statistical arm, Eurostat. When Eurostat find an issue relating to calculation of GNI they can place a reservation on a country's national accounts. This means that improvements to data sources, methods or both may need to be implemented. Following first verification of ESA2010 based GNI, the UK was subject to 23 reservations; 18 issues specific to the UK and five transversal issues applied to both the UK and all MS. Currently 15 reservations have been lifted (12 specific and 3 transversal), with the rest now being verified. Many MS had a large number of country specific reservations placed because of the major verification of sources and methods following adoption of the new accounting framework.

The Agreement on the Withdrawal of the UK from the European Union (EU) sets out the UK's continued liability to contribute to the EU budget for the years to 2020. Contributions are still to be finalised in some of those years for both the UK and the MS (2010 – 2020). This explains the continued focus on implementing ESA2010 standards in the UK accounts even though the UK left the EU at the end of 2020.

Timeline of some of the major developments following adoption of ESA2010:

2014

ESA2010 Changes:

Capitalisation of R&D, nuclear decommissioning costs, and weapons systems.

Other Changes:

In fact, 2014 also included some important updates to ensure alignment with the previous ESA1995 accounting standard. That included adding estimates of illegal activities (drugs and prostitution) for the first time, improvements to measurement of FISIM, and inclusion of 'mark-up' on valuation of own account construction (previously valued by a pure sum-of-costs method).

2015

ESA2010 changes:

Implementation of important classification decisions based on new ESA2010 rules; especially 3G/4G mobile phone spectrum sales, and reclassification of Network Rail and Transport for London to the non-market sector.

Other changes:

This included final alignment to the ESA1995 standard with changes to the treatment of vehicle registration tax; maintenance of dwellings; consumption of fixed capital on roads; improvement to tax evasion adjustments; and improvements to measurement of NPISH Output and Intermediate Consumption.

2016

ESA2010 Changes:

Introducing the concepts of payments for non-market output (P.131) and Social Transfers in Kind (D.632) for the non-market producers (Government and NPISH).

Other Changes:

There were multiple changes to methods – including: a major improvement to the estimates of imputed rentals (housing services consumed by owner occupiers); better estimates of vat fraud and concealed income; and an update to the illegal activities' adjustments.

2017

Other Changes:

Impacts from fully separating households and non-profit institutions in the compilation process, and further improvements to exhaustiveness adjustments (illegal activities, concealed income, and vat fraud).

2018

ESA2010 Changes:

Bringing pensions treatment in line with ESA2010 rules, which impacted Output of Financial Corporations, and Output and Compensation of Employees for the Government Sector. There was also further improvement to estimates of trade in goods.

2019

ESA2010 Changes:

Improvements to balancing including re-introducing APS, and multiple methods improvements including to capital stock and capital consumption, vat and inventories – see section 4.

2020

ESA2010 changes:

Improvements to measurement of FISIM, and further improvement to estimates of trade in goods and services.

Improvements to estimates of capital formation: new estimates of the professional fees' element of transfer costs (particularly those that relate to the purchase and sale of residential and non-residential buildings); Inclusion of cultivated assets for example trees for the first time; and coverage of capital formation of higher education establishments that were previously missed).

2021

ESA2010 Changes:

A major improvement to the quality of estimates for financial services using information from the new Financial Services Survey (FSS), including the output and intermediate consumption of other financial institutions and financial auxiliaries. This involves implementation of new estimates on fees and commissions for industries K64 (financial service activities, except insurance and pension funding) and K66 (activities auxiliary to financial services and insurance activities). This real survey data replaced the previously extrapolated data used in the national accounts.

Removal of historic link factors related to a discontinuity in the LCF source data used in HHFCE since the early 2000's. These were replaced with specific exhaustiveness adjustments. Adjustments to account for 'diary fatigue' and 'rare purchases' in the LCF were introduced. As was an adjustment for retail sales by non-retail businesses in the estimates based on ABS data for the retail industries. Changes to estimates of household spending on machine and remote gambling, and maintenance and repair of major durables were also introduced.

Improvements to estimates of freight services for all modes of transport excluding sea freight. (replacing outdated estimates of sea freight data with Vessels Value data and UK Chamber of Shipping data). Other changes impacting trade including improved estimates on transactions of second-hand ships, and new methods of approximating the import and export adjustments for ship repairs. The changes also include improved methodology for calculating disbursements in the UK by foreign operators.

Changes to measuring valuables. This included improving sources - HMRC data now identified at a more granular level of product, and imports/exports of non-monetary gold supplied by the Bank of England. Domestically produced valuables such as art, jewellery, and coins were included for the first time.

2022

ESA2010 Changes:

Improvement to measurement of Insurance and pensions services and other improvements to sources and methods as covered above in section 5.

ESA2010 Changes Planned in 2023

The changes since 2019 mostly relate to work aimed at lifting reservations. Once the last reservations have been lifted by Eurostat, ESA2010 will have been fully applied to the UK accounts. As mentioned above, the last development to be actively applied is the adjustment for the remaining transversal reservation on globalisation. The ONS began work on addressing globalisation issues in the UK accounts in response to a transversal reservation several years ago. 'Globalisation' is essentially a detailed review of how multi-national enterprises are treated. Impacts from assessing a limited number of important multi-nationals will be applied to published UK accounts in 2023.

7. Impact of Implementing ESA2010

As mentioned at the start of the article, lack of comparable IOTs hampers comparability across time periods because they are compiled from different vintages of the SUTs.

In this section, the significant changes to transaction, product, and industry breakdowns within the SUTs are analysed. This should give users of the IOTs some indication of the potential for change

even though there are important differences between the two presentations. In particular, the IOTs are in basic prices and therefore margin products are “used” rather than being an element of supply moved around products in the DTMs process. Also, IOTs distinguish between domestic supply and imports, with separate use tables for both.

Even comparing SUTs data, whilst fully comparable across the time series in single vintage of data, is difficult across data vintages. That is because the earlier data vintages are (of course) not re-run to incorporate the developments incorporated in the later vintages.

To get some idea of the impact of implementing long-run ESA2010 based developments, and other improvements over the last 10 years, it is necessary to look back to the last fully balanced year that was part of the pre ESA2010 dataset. That year is 2010 in the national accounts data release in 2013. It would be possible to repeat this analysis for earlier years, but this is not done here.

Aggregate Supply and Demand Components

Figure 2. Components of UK Supply in 2010 - ESA1995 basis and ESA2010 basis

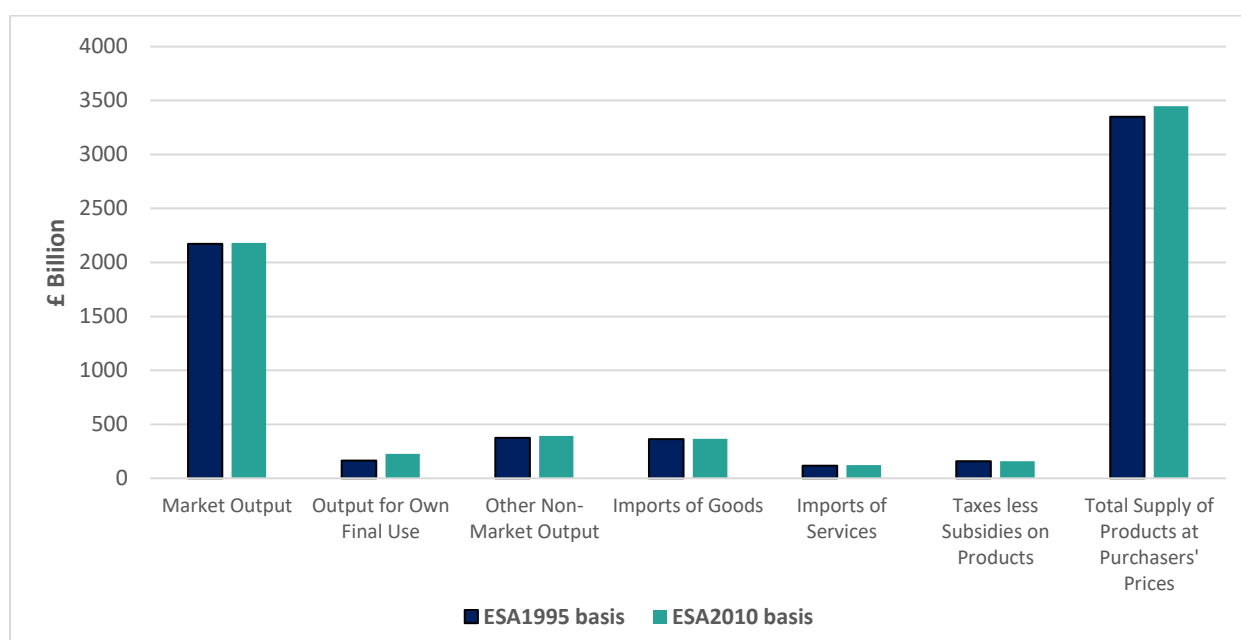


Figure 2 Shows total UK supply, and the components of total UK supply at purchasers' prices. The year shown is 2010 comparing data from the 2013 vintage of UK National Accounts (ESA1995 basis) with the 2022 vintage (ESA2010 basis). See data table at Annex 3.

As can be seen in the graph, the ESA changes and other developments have had relatively little impact on aggregate supply/demand (plus around 3%). In the components of total supply, output + imports + net taxes (net taxes convert from basic to purchasers' prices at the aggregate level), there is somewhat greater impact. Output for own final use grew by around 38% being impacted by capitalisation of R&D for example. Non-market output (the output of Government and NPISH) increased around 5% mostly as a result of various quality improvements. This is despite the impact of implementing the social transfers in kind transaction, which reduced non-market output for Government in a number of industries/products. Whilst Imports of Goods estimates were broadly unchanged, Imports of Services increased around 6% impacted by multiple updates of sources and methods.

Figure 3. Components of UK Demand in 2010 - ESA1995 basis and ESA2010 basis

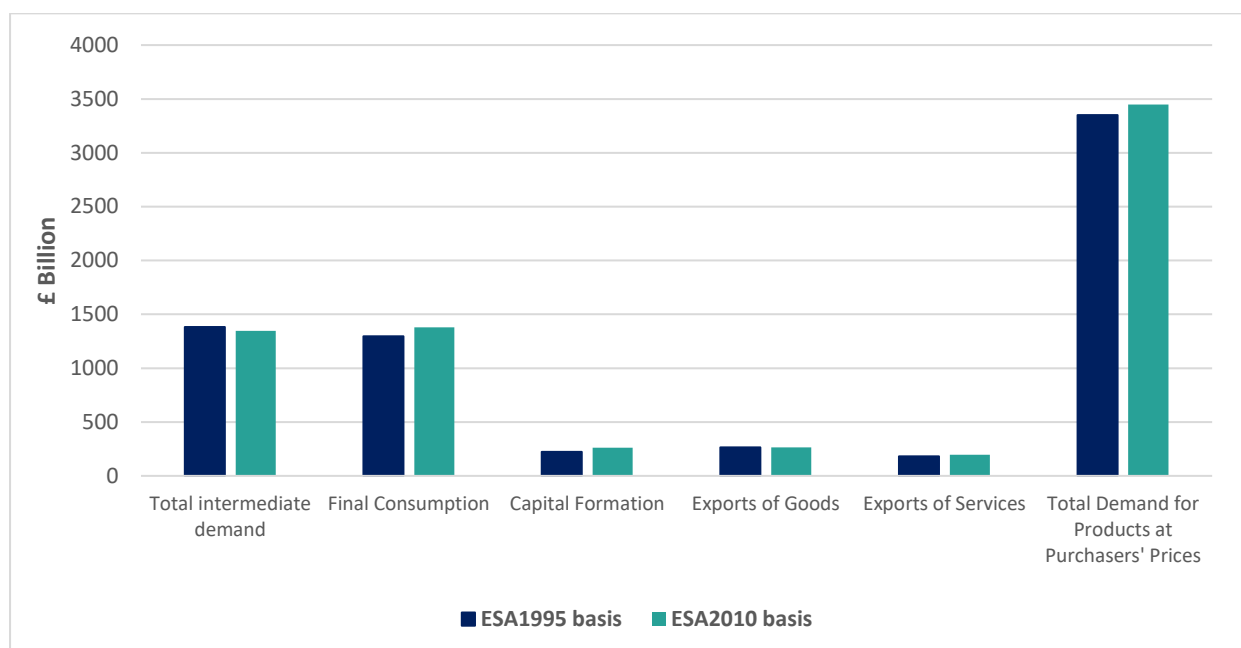


Figure 3 Shows total UK demand, and the components of total UK demand at purchasers' prices. The year shown is 2010 comparing data from the 2013 vintage of UK National Accounts (ESA1995 basis) with the 2022 vintage (ESA2010 basis). See data table at Annex 3.

The components of total demand, intermediate demand + final consumption + capital formation + exports, again show more change than for total supply/demand. There is some switching between intermediate demand (which fell around 3%) and capital formation (which increased around 17%) partially at least as a result of the capitalisation of new assets (R&D and weapons systems). Final consumption expenditure rose around 6% impacted at least partially by the increase in non-market output seen on the demand side (non-market producers finally consume their own non-market output). Improvements to the measurement of Real Estate Services including imputed rentals of owner occupiers also had a significant impact. Exports of goods were broadly unchanged as was the case with imports. Export of services rose around 8%, as with imports, impacted by multiple updates of sources and methods.

Product Changes to Supply/Demand

Within the aggregate supply/demand balance, change to products vary widely. The following graph shows impact at the high-level product breakdown (20 product groups).

Figure 4. 2010 % Change in UK Product Groups Supply/Demand ESA1995 versus ESA2010

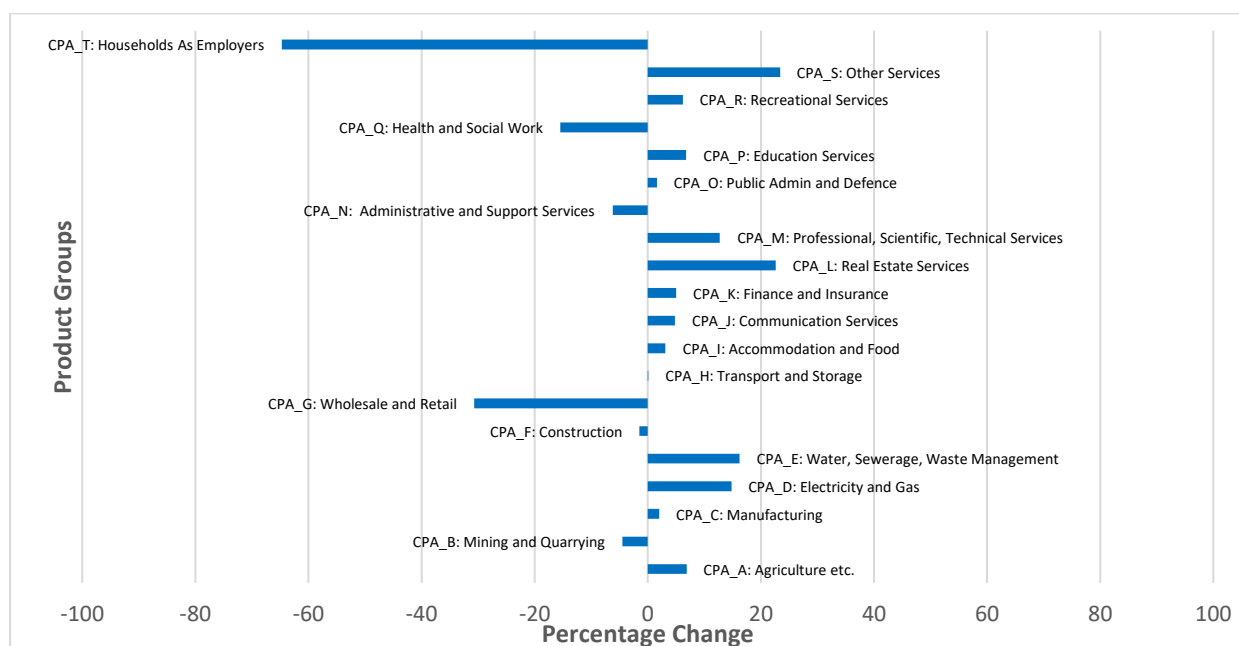


Figure 4 Shows percentage change in the UK supply/demand balance broken down to high level product groups. The year shown is 2010 comparing data from the 2013 vintage of UK National Accounts (ESA1995 basis) with the 2022 vintage (ESA2010 basis). See data table at Annex 3.

Improvements to measurement of real estate services is visible at CPA_L, this has increased by around 23% since the 2013 vintage of data. This is mostly revised output balanced in Household Final Consumption (HHFCE) on the use side.

The increase in CPA_M (professional, scientific and technical services) is around 13% and is mostly due to improvements in the measurement of R&D. The new R&D level is output on the supply side and GFCF on the use side, intermediate demand has reduced as a result of R&D now being capitalised.

The 23% increase in CPA_S (other personal services) will be largely associated with inclusion of illegal prostitution. New output balanced against HHFCE on the use side.

The reduction of 16% in CPA_Q (Human Health, Residential, and Social) will be mostly linked to the ESA2010 change to record social transfers in kind. This has the effect of removing Intermediate demand in Government with a corresponding use side reduction in Government non-market output (valued by sum-of-costs), in those products.

The reduction of 65% in CPA_T (Services of households as employers of domestic personnel) is a proportionally large reduction but on a very small estimate – the actual reduction is approximately £4Billion. This is an estimate led by expenditure sources and is simply balanced in output on the supply side.

Similarly, the large 31% reduction to CPA_G (wholesale and retail) is also relatively small in real terms at £11Billion. Two factors drive the change. Output estimates have been revised across the lower level products for a number of reasons to give a small net increase in CPA_G. Despite this, the 2019 change that reassessed the way trade margins are allocated to products has revised down the amount of non-margin activity retained in supply/use balance of the CPA_G products. The DTMs adjustment moves trade margins out of CPA_G and on to the products on which they are made – at

total product level it sums to zero. This adjustment (along with the adjustment for taxes less subsidies on products) moves the supply estimate from basic to purchasers' prices. Following the 2019 change the non-margin activity is now limited to the repair services of motor vehicles in CPA_G45 (wholesale and retail trade and repair services of motor vehicles). This value has been reduced. The use side balance of the change in supply of CPA_G45 is predominantly in intermediate demand and export of services with some HHFCE.

The remaining product groups have various changes as a result of better understanding the product dimension through improved data sources and estimation methods. Especially given the improved balancing processes and the complete reassessment of balancing across the time series that occurred in 2019. The second part of the DTMs change applied in 2019, the revised pattern used to allocate the margin activity from CPA_G to products on which the margin is made, particularly impacts CPA_A (agriculture), CPA_C (manufacturing), and CPA_J (communication services). The balances on the use side here are a complex mix of intermediate and final demand components.

Within the high-level breakdown, individual products vary even more widely. The following graph picks out the major changes – see Annex 1 for a full list and description of the low-level product categories compiled in the UK.

Figure 5. 2010 Change in Products Supply/Demand ESA1995 versus ESA2010

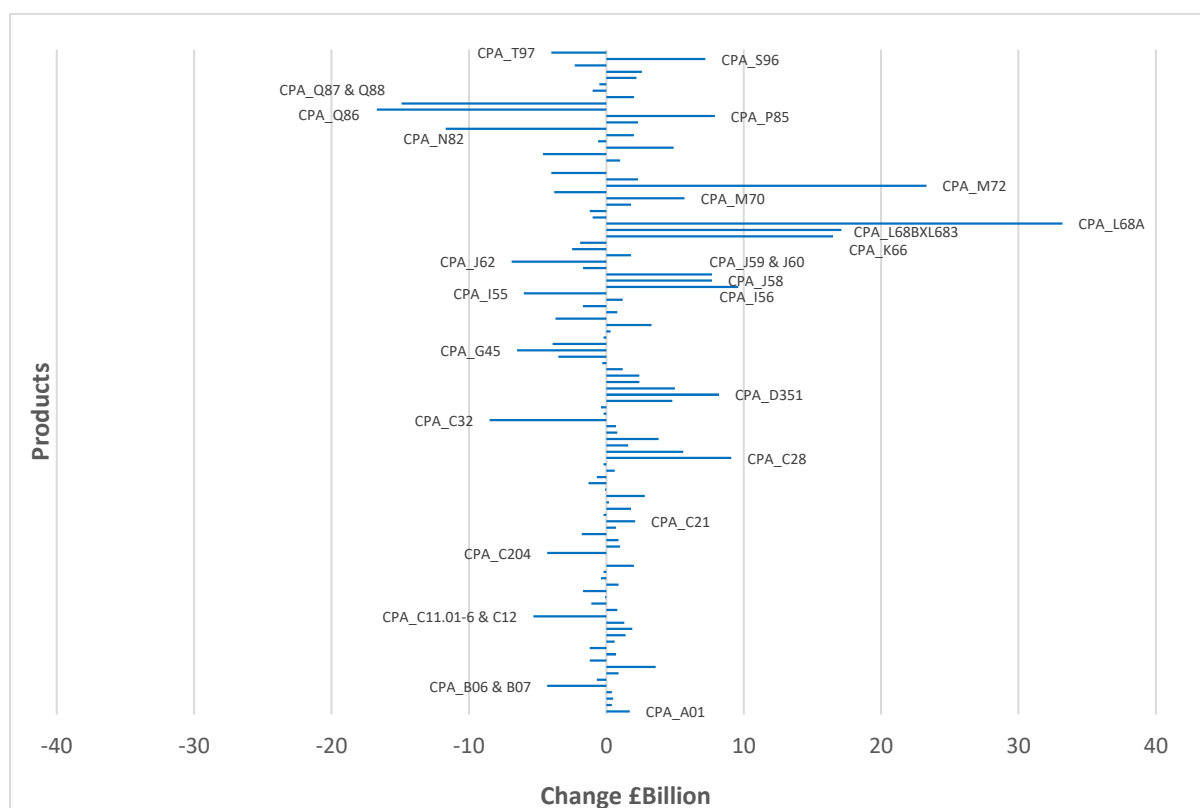


Figure 5 Shows change in the UK supply/demand balance broken down to low level products. The year shown is 2010 comparing data from the 2013 vintage of UK National Accounts (ESA1995 basis) with the 2022 vintage (ESA2010 basis). See data table at Annex 3.

Significant change is visible in the real estate and Imputed rentals products (CPA_L68) as a result of improved estimation methodology (Imputed rentals is a balanced concept largely contained in one product row – L68A). Change in auxiliary financial services (CPA_K66) is likely driven by new FSS data. Better estimation of R&D is visible as CPA_M72. CPA_N82 (business support activities) includes the somewhat general category of 'other business services and has likely been better

allocated through integration of the APS data amongst other things. However, there is also a significant revision of Imports of Services. CPA_C32 (other manufactured goods) and CPA_28 (machinery and equipment not elsewhere classified) have a significantly different, but broadly offsetting, allocation of DTM's following the improvements made in 2019. In fact, there is far more offsetting change in the CPA_C low level products than might be expected in looking at the aggregated level (just a 2% overall increase).

Strictly speaking, the inclusion of estimates for illegal prostitution and drugs is an ESA1995 change but made in the UK during the move to ESA2010. The prostitution change is visible within CPA_S96 (other personal services) as noted above. The drugs change has a less obvious impact in CPA_C21 (Pharmaceuticals). The main initial drugs estimates are incorporated in CPA_G47 (Retail) since most of the UK output is in 'distribution' not production. This is allocated back to other products in the DTMs process explained above. Adjustments for drugs are also made directly to imports and output of CPA_C21. On the use side, this product now shows greater HHFCE due to the illegal drugs change. There is also reduced intermediate demand and increased central government final consumption expenditure, which is partially at least a result of the social transfers in kind change. This change now allocates net government 'prescription costs' (cost of medication provided less the standard charge levied on the consumer) to this product as government final consumption.

Product Changes to Domestic Output at Basic Prices

Figure 6. 2010 % Change in UK Output of Product Groups ESA1995 versus ESA2010

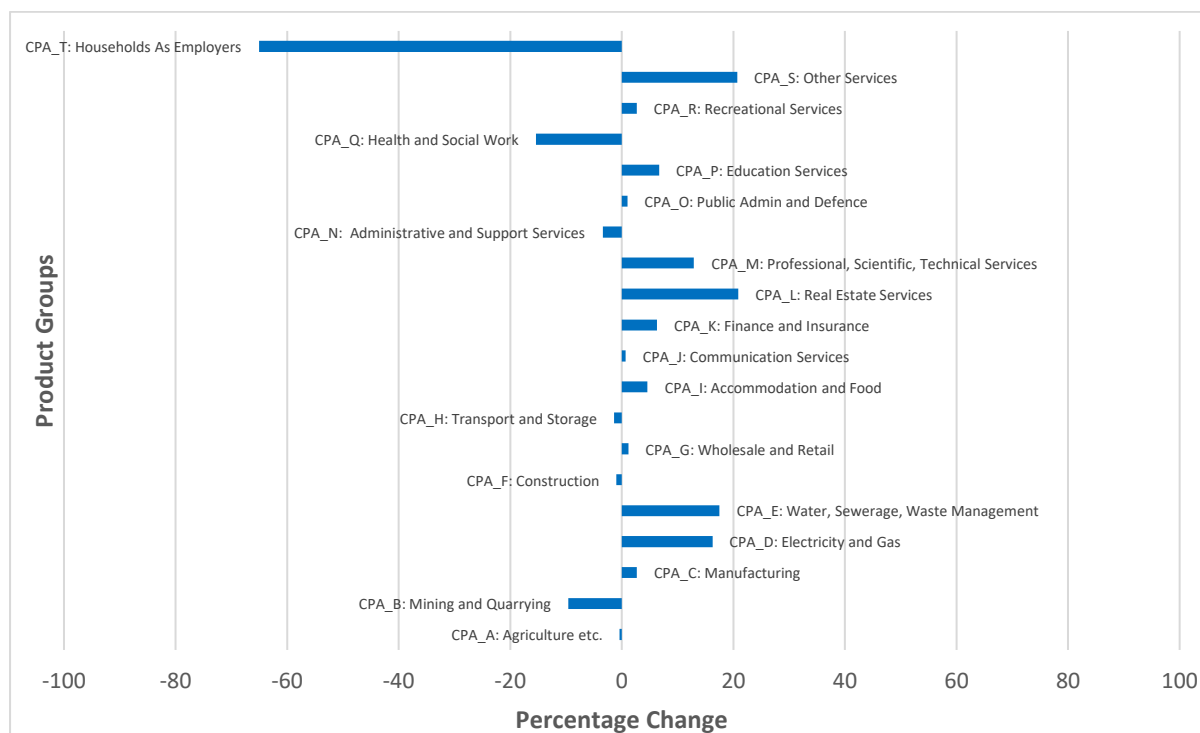


Figure 6 Shows percentage change in UK Output at Basic Prices broken down to high level product groups. The year shown is 2010 comparing data from the 2013 vintage of UK National Accounts (ESA1995 basis) with the 2022 vintage (ESA2010 basis). See data table at Annex 3.

The changes to product level outputs at aggregated product level generally reflect the change in supply/demand balances, since (as shown above in figure 2) the change in estimates of imports has been relatively modest. The major difference is in CPA_G (wholesale and retail), which is a function of the DTMs adjustment as explained above. Output of CPA_A (agriculture) is relatively unchanged compared to the larger change in the supply/demand balance, since this is mostly driven on the

supply side by the DTMs change and change to the taxes and subsidies on products adjustment (i.e. the combined adjustment from basic to purchasers' prices). The revision to output of CPA_B (crude petroleum and natural gas and metal ores) is a function of aligning to an ancillary administrative data source from BEIS (UK department for Business Energy and Industrial Strategy) energy statistics team during the rebalancing in 2019. The revision is proportionally larger than shown in the supply/demand balance due to large imports of petroleum and natural gas which are little changed.

Figure 7. 2010 Change in UK Output of Products ESA1995 versus ESA2010

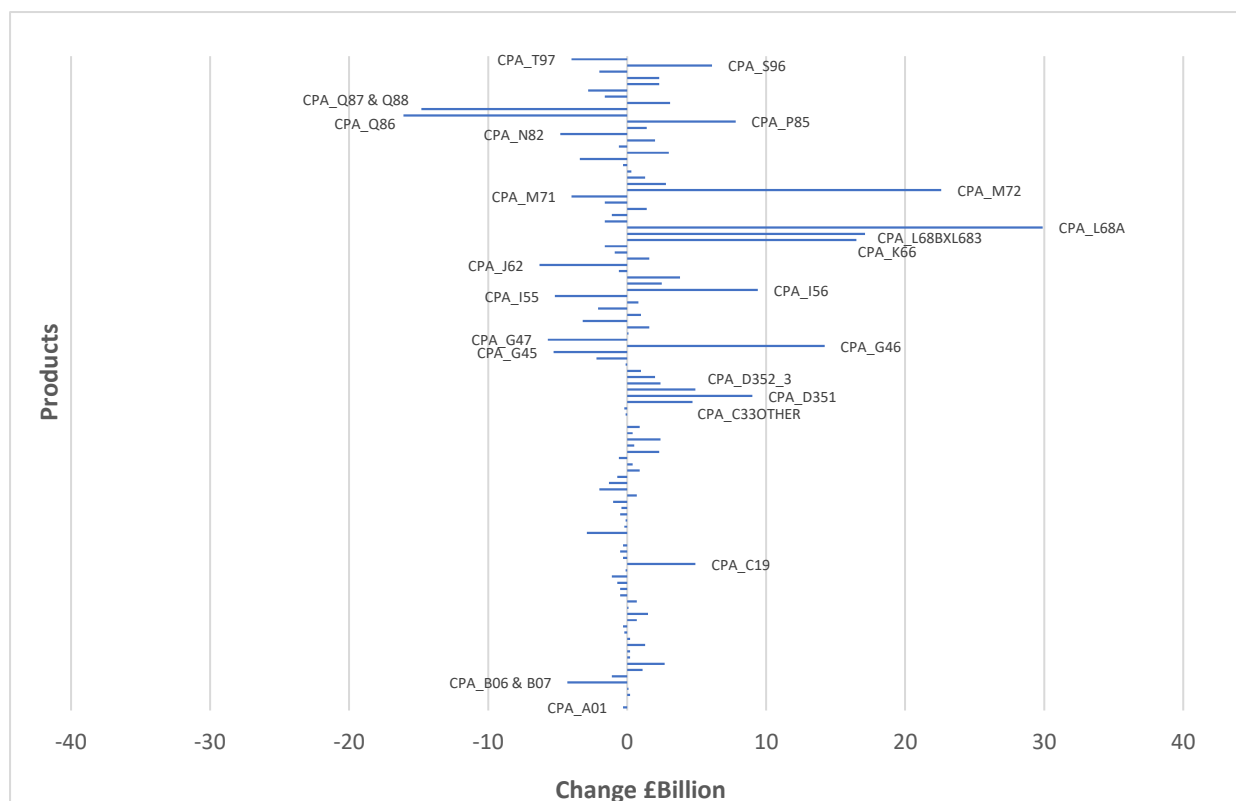


Figure 7 Shows change in UK Output at Basic Prices broken down to low level products. The year shown is 2010 comparing data from the 2013 vintage of UK National Accounts (ESA1995 basis) with the 2022 vintage (ESA2010 basis). See data table at Annex 3.

Generally, output change at the disaggregated product level also maps well to the supply/use balance. However, as discussed above, within manufacturing products (CPA_C) significant reallocation of DTM's has occurred. This does change the story somewhat within output. For example:

Product CPA_C28 (machinery and equipment not elsewhere classified) has an increase in the supply/demand balance of over £9billion, which is almost entirely driven by DTMs since the output estimate at basic prices barely changes.

The change in output of CPA_19 (coke and refined petroleum products) is more significant than for overall supply where the impact is ameliorated by lower imports and DTMs. The output and imports estimates here were likely benchmarked to BEIS data during 2019 as were the estimates for CPA_B (crude petroleum and natural gas and metal ores).

Product Change in Intermediate Demand

Figure 8. 2010 Change in UK Intermediate Demand by Product Group ESA1995 versus ESA2010

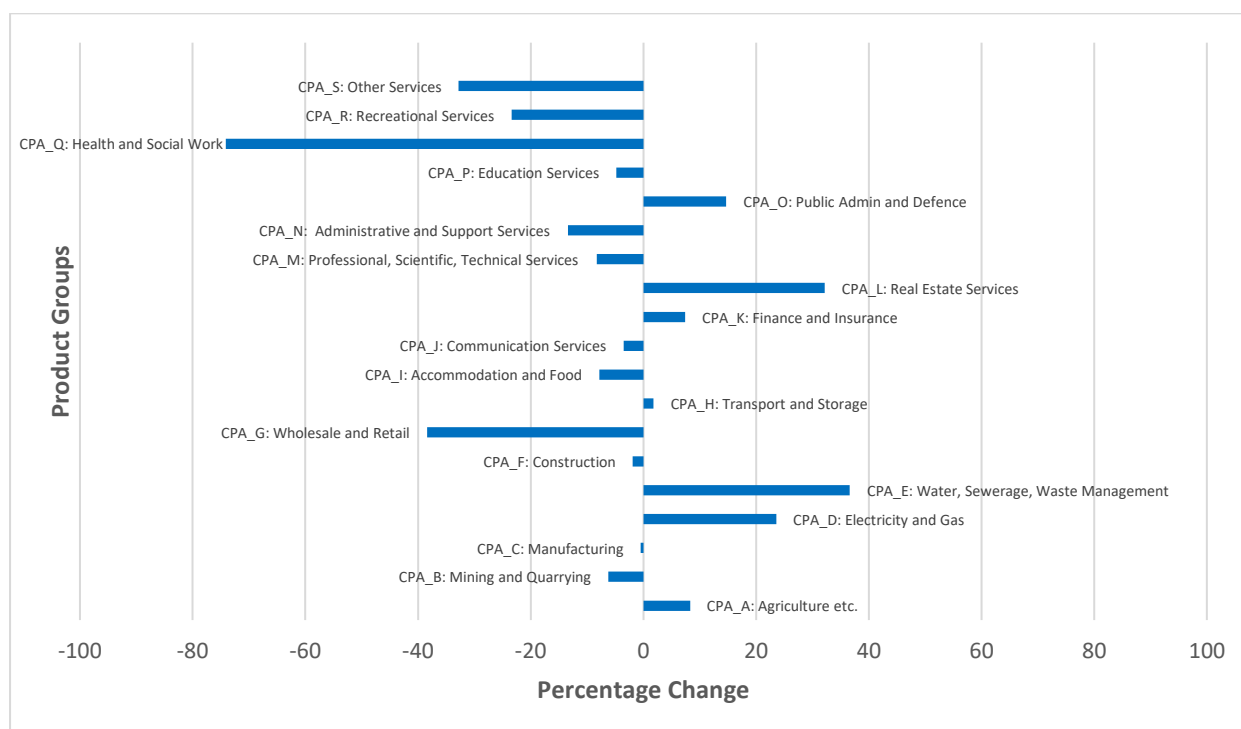


Figure 8 Shows percentage change in UK Intermediate Demand broken down to high level product groups. The year shown is 2010 comparing data from the 2013 vintage of UK National Accounts (ESA1995 basis) with the 2022 vintage (ESA2010 basis). See data table at Annex 3.

The change in intermediate demand correlates in the supply/use balance in many cases.

Intermediate demand for CPA_Q (health and social work) falls 74% due to the social transfers in kind change discussed earlier. Government no longer directly consume products passed on to households. This is the root of the corresponding output change above because of the valuation of non-market output via sum-of-costs. The social transfers in kind are now a component of government final consumption – i.e. government directly consume them on behalf of households rather than creating government output by intermediately consuming them (then also finally consuming its own output). This reduces output and intermediate demand (and the supply/use balance) but not GDP.

There are however cases where the overall change to supply/use does not match changes in intermediate demand:

CPA_T (households as employers) has no intermediate demand as discussed previously.

CPA_S (other services) has a large switch to HHFCE partially at least as a result of the inclusion of illegal prostitution' estimates discussed earlier.

For CPA_R (recreational services) there is a fall of 23% in intermediate demand despite a 6% rise in supply/use. This is due to a switch to HHFCE on the use side. Multiple factors will have impacted this change including a review of gambling and betting services and changes to estimates and balancing of NPISH. These are however small changes in real terms – i.e. just a £2Billion reduction in intermediate demand.

CPA_P (education) shows a modest decrease in intermediate demand (around £1Billion) but an increase in supply/use overall. This is due to development work that increased the output of NPISH and Local government, which is balanced on the use side as final consumption.

CPA_M (Professional, scientific, technical services) shows an 8% reduction in intermediate demand counter to strong growth in overall supply/use. This is impacted by the change to R&D explained above, which switched the use from intermediate demand to capital formation. This product group is also likely to be strongly affected by the incorporation of APS data.

CPA_J (Communication Services) shows an increase in supply of 5% in supply/use, but a reduction in intermediate use of 4%. The increase in supply is a combination of revised output and increase in the allocation of DTMs. On the use side improved and increased estimates of capital formation (especially computer software and entertainment originals) and increased estimates of exports of services offset a reduction in intermediate demand.

The 8% reduction in CPA_I (accommodation and food) is contrary to the growth in supply. However, the use in this product is predominantly in HHFCE and the decrease in intermediate demand is only around £2bn in real terms.

Figure 9. Change in 2010 UK Intermediate Demand by Products ESA1995 versus ESA2010

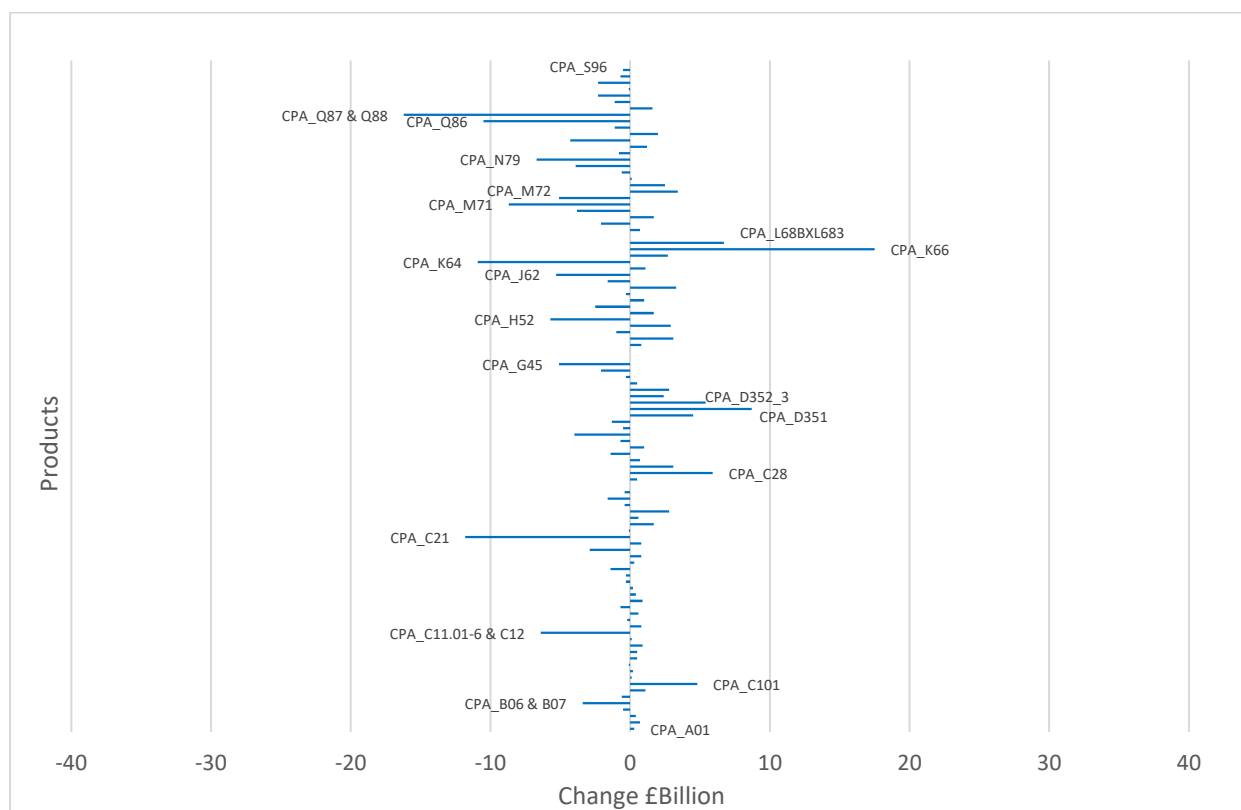


Figure 9 Shows change in UK Intermediate Demand broken down to low level products. The year shown is 2010 comparing data from the 2013 vintage of UK National Accounts (ESA1995 basis) with the 2022 vintage (ESA2010 basis). See data table at Annex 3.

As with output, there are more marked and widespread changes in the intermediate demand low level products (especially in CPA_C) likely to be strongly linked with incorporating the APS data.

Changes to Output and Intermediate Demand in the Industry Dimension

In the industry dimension, changes impact both Output and Intermediate Consumption and in turn impact Industry Gross Value Added (GVA).

Figure 10. 2010 % Change in UK Output of Industry Groups ESA1995 versus ESA2010

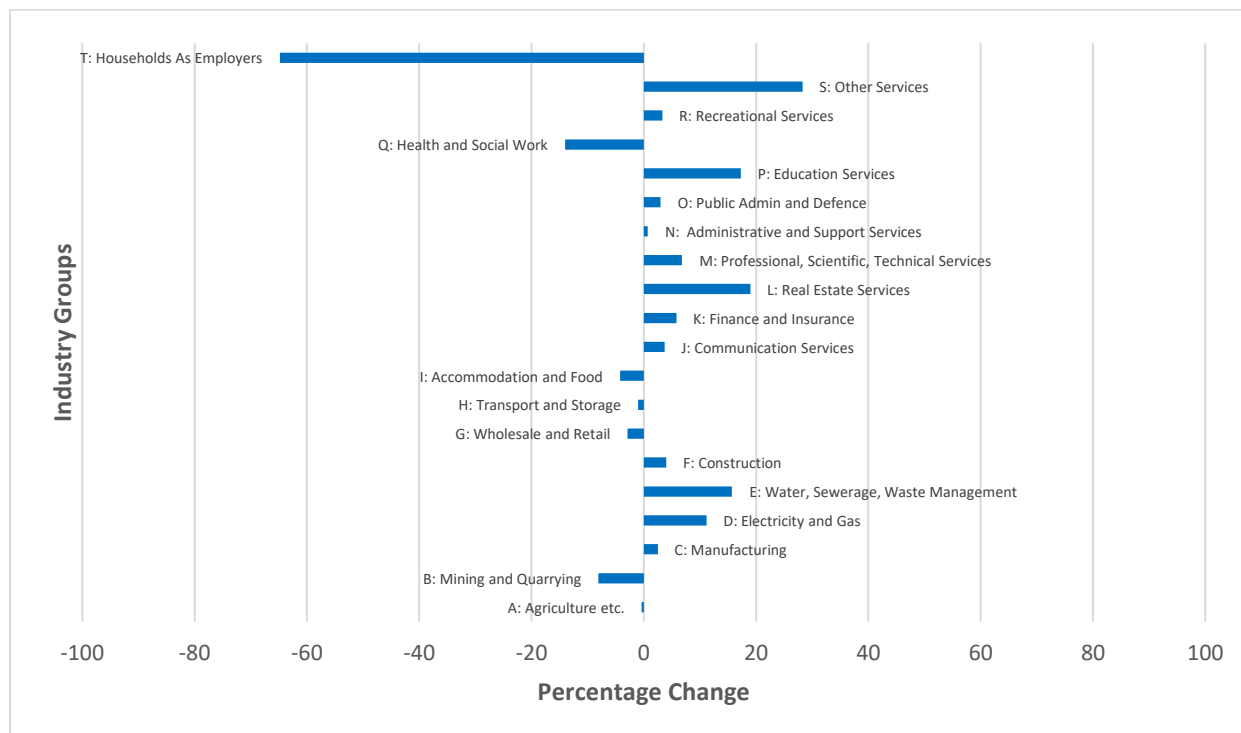


Figure 10 Shows percentage change in UK Output broken down to high level Industry groups. The year shown is 2010 comparing data from the 2013 vintage of UK National Accounts (ESA1995 basis) with the 2022 vintage (ESA2010 basis). See data table at Annex 3.

In the industry dimension the change in output is correlated with the product dimension output change due to the strong diagonal industry/product relationship which holds for many of the changes described above.

The only significant differences are:

Industry P (education) where the increase in output of the industry is more than double the increase in output of the product. This is mostly due to new/improved measure of NPISH output especially for universities where the increased output has been split between education and CPA_55 (accommodation services) representing output of halls of residence etc.

Industry I (accommodation and food) where there is an increase of 5% in output of the product but a decrease of 4% in output of the industry. This is associated with the change in CPA_P. However, it is also impacted by a review of methods to improve allocation of product CPA_I56 (food serving services) to off-diagonal industries, representing food served in workplace canteens and restaurants in retail establishments for example.

Figure 11. Change in 2010 UK Output of Industries ESA1995 versus ESA2010

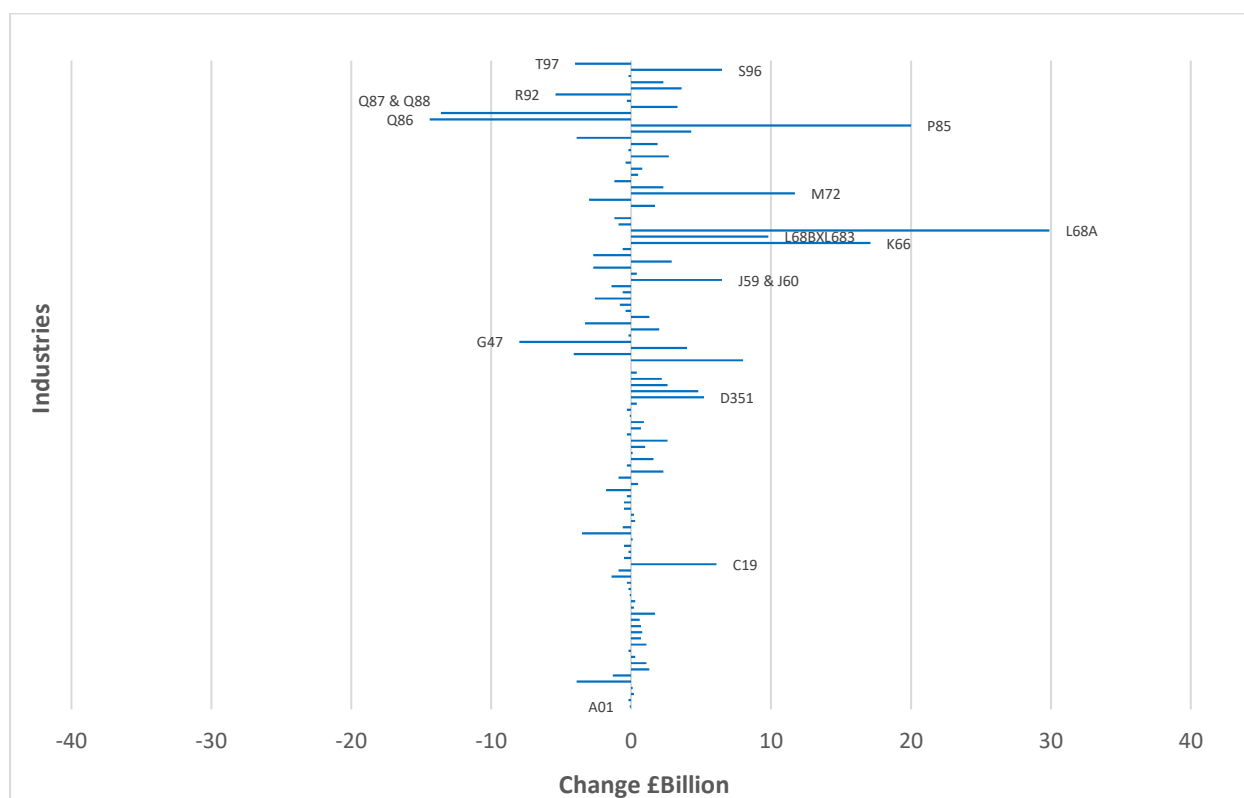


Figure 11 Shows change in UK Output broken down to low level industries. The year shown is 2010 comparing data from the 2013 vintage of UK National Accounts (ESA1995 basis) with the 2022 vintage (ESA2010 basis). See data table at Annex 3.

Significant differences between output of products and output of industries at the low level product breakdown are largely covered above.

The change in industry mix of intermediate consumption is shown below.

Figure 12. 2010 % Change in UK Intermediate Consumption by Industry Groups ESA1995 versus ESA2010

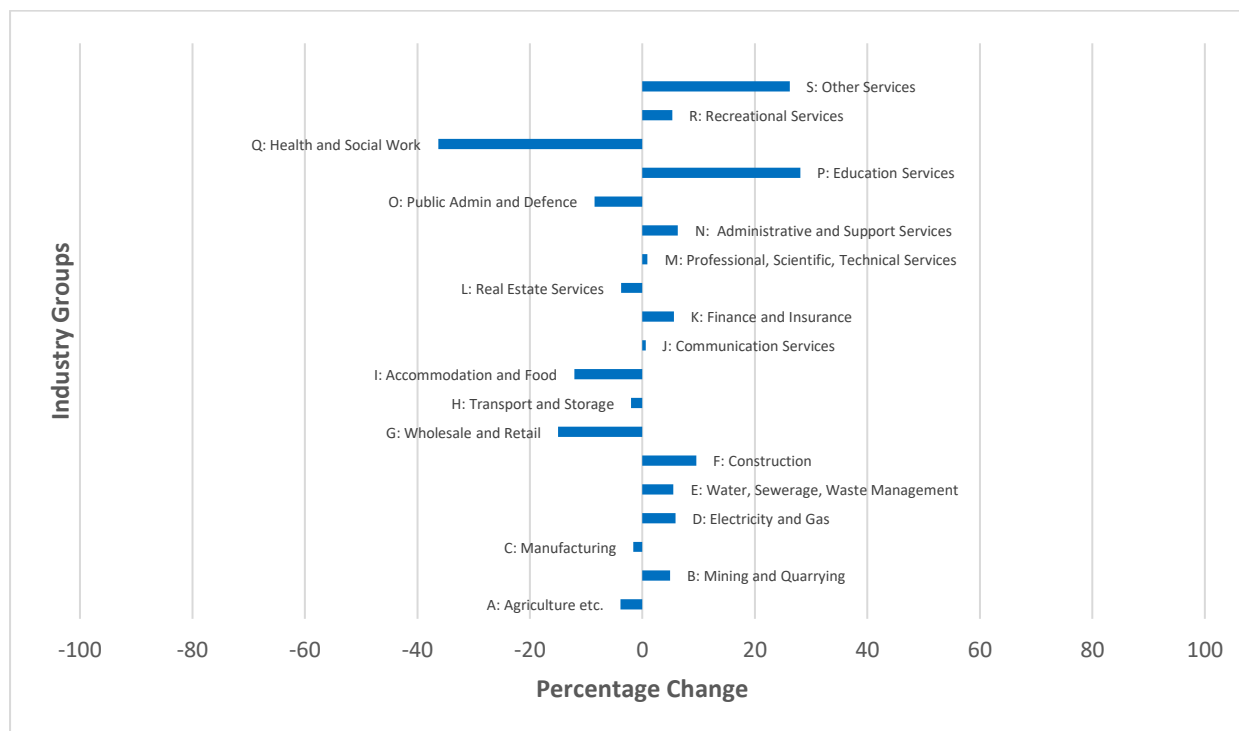


Figure 12 Shows percentage change in UK Intermediate Consumption broken down to high level Industry groups. The year shown is 2010 comparing data from the 2013 vintage of UK National Accounts (ESA1995 basis) with the 2022 vintage (ESA2010 basis). See data table at Annex 3.

Unlike for industry output, the change in intermediate demand is not correlated with the product dimension change in intermediate demand. There is no diagonal industry/product relationship for intermediate demand. Products are intermediately consumed by multiple industries. At the aggregated product level there is some weak correlation between changes in industry output and changes in intermediate consumption. This is largely because balancing in the industry dimension references income sources in setting the GVA.

There are significant exceptions to this in industry groups where use is overwhelmingly in final consumption. For example Industry L (real estate), industry O (public admin), and industry T (households as employers). Also in Industry G, which is affected by DTMs as explained previously.

Change at the detailed industry level is shown below but not further analysed.

Figure 13. 2010 Change in UK Intermediate Consumption of Industries ESA1995 versus ESA2010

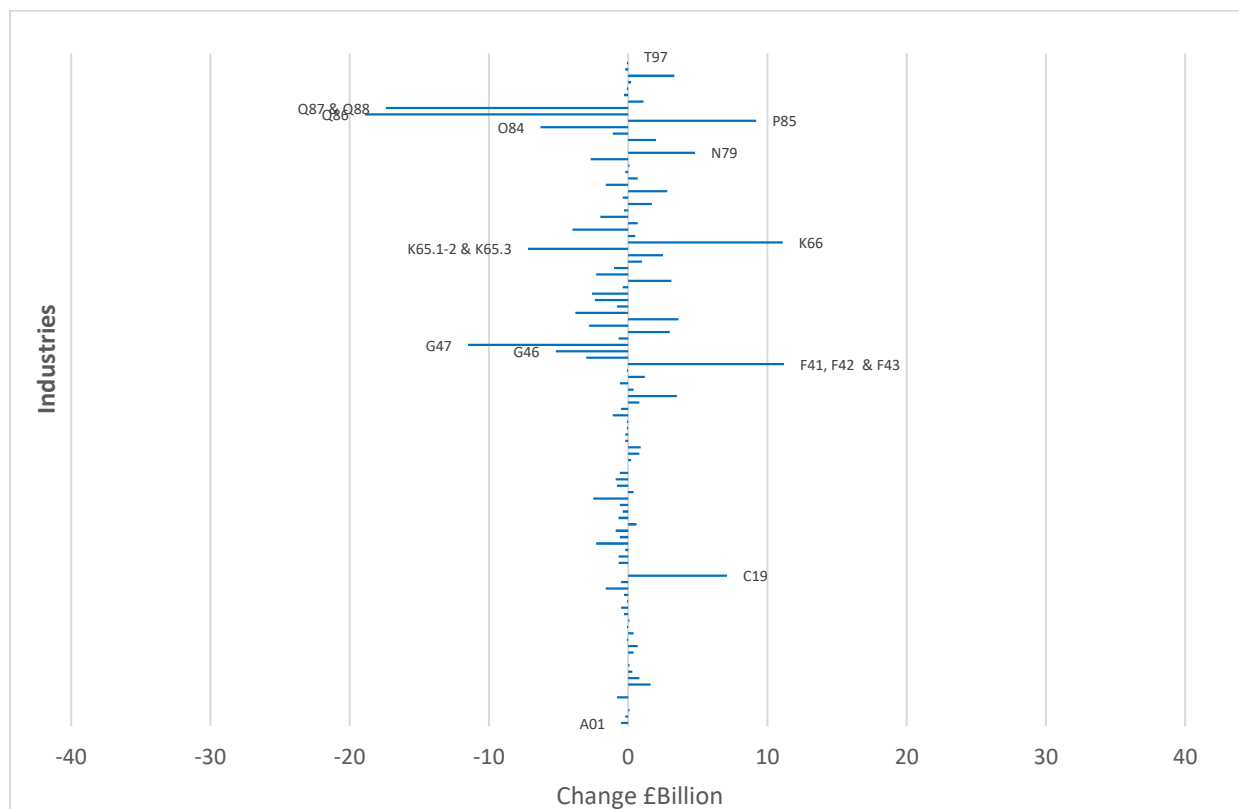


Figure 13 Shows change in UK Intermediate Consumption broken down to low level industries. The year shown is 2010 comparing data from the 2013 vintage of UK National Accounts (ESA1995 basis) with the 2022 vintage (ESA2010 basis). See data table at Annex 3.

Product Changes in Final Demand

Overall final demand (final consumption by households, government, and non-profit organisations plus exports and fixed capital formation) changes as below.

Figure 14. 2010 % Change in UK Final Demand by Product Groups ESA1995 versus ESA2010

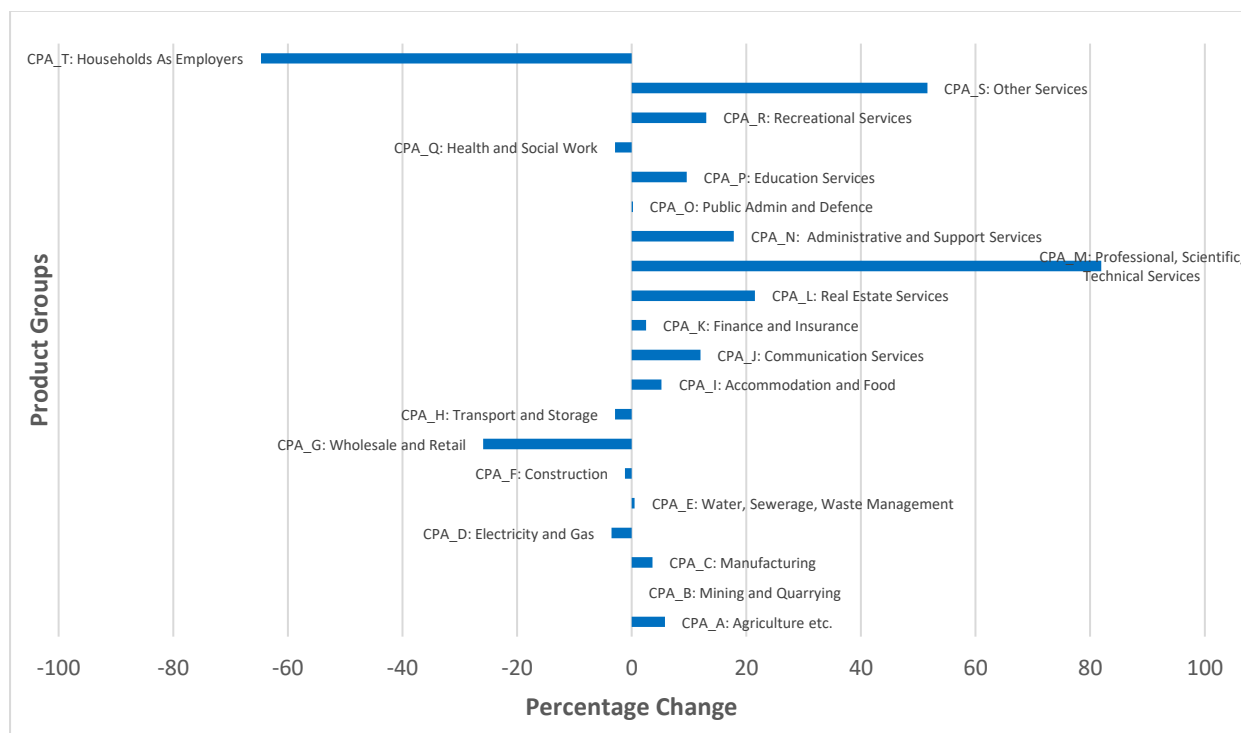


Figure 14 Shows percentage change in UK Final Demand broken down to high level product groups. The year shown is 2010 comparing data from the 2013 vintage of UK National Accounts (ESA1995 basis) with the 2022 vintage (ESA2010 basis). See data table at Annex 3.

Reasons for final demand changes are well covered earlier in the paper. For example, the change CPA_L (real estate services) is related to revised estimates of actual and imputed rentals, and the change at CPA_M (scientific and technical) is largely driven by capitalisation of R&D. It is worth noting the minimal change in CPA_Q (health and social work) caused by the social transfers in kind change. As discussed earlier, this impacts intermediate demand and valuation of output by sum-of-costs but not final consumption of government.

Change at the detailed industry product level is shown below but not further analysed having been well covered earlier in the paper.

Figure 15. 2010 Change in UK Final Demand by Products ESA1995 versus ESA2010

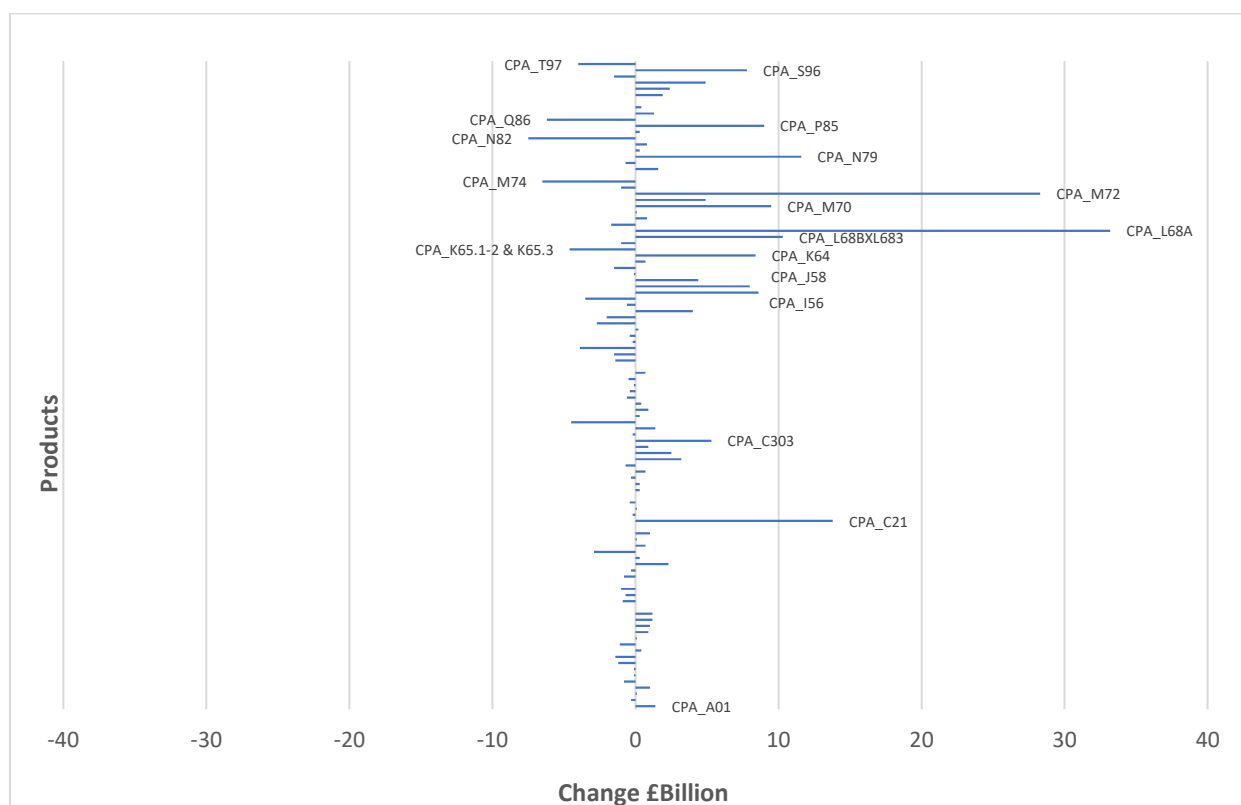


Figure 15 Shows change in UK Final Demand broken down to low level industries. The year shown is 2010 comparing data from the 2013 vintage of UK National Accounts (ESA1995 basis) with the 2022 vintage (ESA2010 basis). See data table at Annex 3.

8. Acknowledgements

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Annex1. Glossary of Products used in UK SUTs (CPA2008 Consistent)

CPA_A: Agriculture etc.
 CPA_B: Mining and Quarrying
 CPA_C: Manufacturing
 CPA_D: Electricity and Gas
 CPA_E: Water, Sewerage, Waste Management
 CPA_F: Construction
 CPA_G: Wholesale and Retail
 CPA_H: Transport and Storage
 CPA_I: Accommodation and Food
 CPA_J: Communication Services
 CPA_K: Finance and Insurance
 CPA_L: Real Estate Services
 CPA_M: Professional, Scientific, Technical Services
 CPA_N: Administrative and Support Services
 CPA_O: Public Admin and Defence
 CPA_P: Education Services
 CPA_Q: Health and Social Work
 CPA_R: Recreational Services
 CPA_S: Other Services
 CPA_T: Households As Employers

CPA_A01	Products of agriculture, hunting and related services
CPA_A02	Products of forestry, logging and related services
CPA_A03	Fish and other fishing products; aquaculture products; support services to fishing
CPA_B05	Coal and lignite
CPA_B06 & B07	Crude Petroleum And Natural Gas & Metal Ores
CPA_B08	Other mining and quarrying products
CPA_B09	Mining support services
CPA_C101	Preserved meat and meat products
CPA_C102_3	Processed and preserved fish, crustaceans, molluscs, fruit and vegetables
CPA_C104	Vegetable and animal oils and fats
CPA_C105	Dairy products
CPA_C106	Grain mill products, starches and starch products
CPA_C107	Bakery and farinaceous products
CPA_C108	Other food products
CPA_C109	Prepared animal feeds
CPA_C11.01-6/C12	Alcoholic beverages & Tobacco products
CPA_C1107	Soft drinks
CPA_C13	Textiles
CPA_C14	Wearing apparel
CPA_C15	Leather and related products
CPA_C16	Wood and of products of wood and cork, except furniture; articles of straw
CPA_C17	Paper and paper products
CPA_C18	Printing and recording services
CPA_C19	Coke and refined petroleum products
CPA_C203	Paints, varnishes and similar coatings, printing ink and mastics
CPA_C204	Soap & detergents, cleaning & polishing preparations, perfumes & toilet preparations
CPA_C205	Other chemical products
CPA_C20A	Industrial gases, inorganics and fertilisers (all inorganic chemicals) - 20.11/13/15
CPA_C20B	Petrochemicals - 20.14/16/17/60
CPA_C20C	Dyestuffs, agro-chemicals - 20.12/20
CPA_C21	Basic pharmaceutical products and pharmaceutical preparations
CPA_C22	Rubber and plastic products
CPA_C235_6	Manufacture of cement, lime, plaster and articles of concrete, cement and plaster
CPA_C23OTHER	Glass, refractory, clay, other porcelain and ceramic, stone and abrasive products (23.1-4/7-9)
CPA_C241_3	Basic iron and steel
CPA_C244_5	Other basic metals and casting
CPA_C254	Weapons and ammunition
CPA_C25OTHER	Fabricated metal products, excl. machinery and equipment and weapons & ammunition - 25.1-3/25.5-9
CPA_C26	Computer, electronic and optical products
CPA_C27	Electrical equipment
CPA_C28	Machinery and equipment n.e.c.
CPA_C29	Motor vehicles, trailers and semi-trailers

CPA_C301	Ships and boats
CPA_C303	Air and spacecraft and related machinery
CPA_C30OTHER	Other transport equipment - 30.2/4/9
CPA_C31	Furniture
CPA_C32	Other manufactured goods
CPA_C3315	Repair and maintenance of ships and boats
CPA_C3316	Repair and maintenance of aircraft and spacecraft
CPA_C33OTHER	Rest of repair; Installation - 33.11-14/17/19/20
CPA_D351	Electricity, transmission and distribution
CPA_D352_3	Gas; distribution of gaseous fuels through mains; steam and air conditioning supply
CPA_E36	Natural water; water treatment and supply services
CPA_E37	Sewerage services; sewage sludge
CPA_E38	Waste collection, treatment and disposal services; materials recovery services
CPA_E39	Remediation services and other waste management services
CPA_F41-F43	Construction
CPA_G45	Wholesale and retail trade and repair services of motor vehicles and motorcycles
CPA_G46	Wholesale trade services, except of motor vehicles and motorcycles
CPA_G47	Retail trade services, except of motor vehicles and motorcycles
CPA_H491_2	Rail transport services
CPA_H493_5	Land transport services and transport services via pipelines, excluding rail transport
CPA_H50	Water transport services
CPA_H51	Air transport services
CPA_H52	Warehousing and support services for transportation
CPA_H53	Postal and courier services
CPA_I55	Accommodation services
CPA_I56	Food and beverage serving services
CPA_J58	Publishing services
CPA_J59 & J60	Motion Picture, Video & TV Programme Production, Sound Recording & Music Publishing Activities & Programming And Broadcasting Activities
CPA_J61	Telecommunications services
CPA_J62	Computer programming, consultancy and related services
CPA_J63	Information services
CPA_K64	Financial services, except insurance and pension funding
CPA_K65.1-2/65.3	Insurance and reinsurance, except compulsory social security & Pension funding
CPA_K66	Services auxiliary to financial services and insurance services
CPA_L68BXL683	Real estate services, excluding on a fee or contract basis and imputed rent
CPA_L68A	Owner-Occupiers' Housing Services
CPA_L683	Real estate activities on a fee or contract basis
CPA_M691	Legal services
CPA_M692	Accounting, bookkeeping and auditing services; tax consulting services
CPA_M70	Services of head offices; management consulting services
CPA_M71	Architectural and engineering services; technical testing and analysis services
CPA_M72	Scientific research and development services
CPA_M73	Advertising and market research services
CPA_M74	Other professional, scientific and technical services
CPA_M75	Veterinary services
CPA_N77	Rental and leasing services
CPA_N78	Employment services
CPA_N79	Travel agency, tour operator and other reservation services and related services
CPA_N80	Security and investigation services
CPA_N81	Services to buildings and landscape
CPA_N82	Office administrative, office support and other business support services
CPA_O84	Public administration and defence services; compulsory social security services
CPA_P85	Education services
CPA_Q86	Human health services
CPA_Q87 & Q88	Residential Care & Social Work Activities
CPA_R90	Creative, arts and entertainment services
CPA_R91	Libraries, archives, museums and other cultural services
CPA_R92	Gambling and betting services
CPA_R93	Sports services and amusement and recreation services
CPA_S94	Services furnished by membership organisations
CPA_S95	Repair services of computers and personal and household goods
CPA_S96	Other personal services
CPA_T97	Services of households as employers of domestic personnel

Annex 2. Glossary of Industries used in UK SUTs (NACE/SIC Consistent)

- A: Agriculture etc.
- B: Mining and Quarrying
- C: Manufacturing
- D: Electricity and Gas
- E: Water, Sewerage, Waste Management
- F: Construction
- G: Wholesale and Retail
- H: Transport and Storage
- I: Accommodation and Food
- J: Communication Services
- K: Finance and Insurance
- L: Real Estate Services
- M: Professional, Scientific, Technical Services
- N: Administrative and Support Services
- O: Public Admin and Defence
- P: Education Services
- Q: Health and Social Work
- R: Recreational Services
- S: Other Services
- T: Households As Employers

A01	Crop And Animal Production, Hunting And Related Service Activities
A02	Forestry And Logging
A03	Fishing And Aquaculture
B05	Mining Of Coal And Lignite
B06 & B07	Extraction Of Crude Petroleum And Natural Gas & Mining Of Metal Ores
B08	Other Mining And Quarrying
B09	Mining Support Service Activities
C101	Processing and preserving of meat and production of meat products
C102_3	Processing and preserving of fish, crustaceans, molluscs, fruit and vegetables
C104	Manufacture of vegetable and animal oils and fats
C105	Manufacture of dairy products
C106	Manufacture of grain mill products, starches and starch products
C107	Manufacture of bakery and farinaceous products
C108	Manufacture of other food products
C109	Manufacture of prepared animal feeds
C1101-1106&C12	Manufacture of alcoholic beverages & Tobacco Products
C1107	Manufacture of soft drinks; production of mineral waters and other bottled waters
C13	Manufacture Of Textiles
C14	Manufacture Of Wearing Apparel
C15	Manufacture Of Leather And Related Products
C16	Manufacture Of Wood & Products Of Wood & Cork, Except Furniture; Manuf. Of Articles Of Straw
C17	Manufacture Of Paper And Paper Products
C18	Printing And Reproduction Of Recorded Media
C19	Manufacture Of Coke And Refined Petroleum Products
C203	Manufacture of paints, varnishes and similar coatings, printing ink and mastics
C204	Manufacture of soap & detergents, cleaning & polishing, perfumes & toilet preparations
C205	Manufacture of other chemical products
C20A	Manufacture of industrial gases, inorganics and fertilisers (inorganic chemicals) - 20.11/13/15
C20B	Manufacture of petrochemicals - 20.14/16/17/60
C20C	Manufacture of dyestuffs, agro-chemicals - 20.12/20
C21	Manufacture Of Basic Pharmaceutical Products And Pharmaceutical Preparations
C22	Manufacture Of Rubber And Plastic Products
C235_6	Manufacture of cement, lime, plaster and articles of concrete, cement and plaster
C23OTHER	Manufacture of glass, refractory, clay, porcelain, ceramic, stone products - 23.1-4/7-9
C241T243	Manufacture of basic iron and steel
C244_5	Manufacture of other basic metals and casting
C254	Manufacture of weapons and ammunition
C25OTHER	Manufacture of fabricated metal products, excluding weapons & ammunition - 25.1-3/5-9
C26	Manufacture Of Computer, Electronic And Optical Products
C27	Manufacture Of Electrical Equipment
C28	Manufacture Of Machinery And Equipment N.E.C.
C29	Manufacture Of Motor Vehicles, Trailers And Semi-Trailers
C301	Building of ships and boats
C303	Manufacture of air and spacecraft and related machinery

C30OTHER	Manufacture of other transport equipment - 30.2/4/9
C31	Manufacture Of Furniture
C32	Other Manufacturing
C3315	Repair and maintenance of ships and boats
C3316	Repair and maintenance of aircraft and spacecraft
C33OTHER	Rest of repair; Installation - 33.11-14/17/19/20
D351	Electric power generation, transmission and distribution
D352_3	Manufacture of gas; distribution of gaseous fuels through mains; steam and aircon supply
E36	Water Collection, Treatment And Supply
E37	Sewerage
E38	Waste Collection, Treatment And Disposal Activities; Materials Recovery
E39	Remediation Activities And Other Waste Management Services
F41, F42 & F43	Construction
G45	Wholesale And Retail Trade And Repair Of Motor Vehicles And Motorcycles
G46	Wholesale Trade, Except Of Motor Vehicles And Motorcycles
G47	Retail Trade, Except Of Motor Vehicles And Motorcycles
H491_2	Rail transport
H493T495	Land transport services and transport services via pipelines, excluding rail transport
H50	Water Transport
H51	Air Transport
H52	Warehousing And Support Activities For Transportation
H53	Postal And Courier Activities
I55	Accommodation
I56	Food And Beverage Service Activities
J58	Publishing Activities
J59 & J60	Motion Picture, Video & TV Programme Production, Sound Recording & Music Publishing Activities & Programming And Broadcasting Activities
J61	Telecommunications
J62	Computer Programming, Consultancy And Related Activities
J63	Information Service Activities
K64	Financial Service Activities, Except Insurance And Pension Funding
K65.1-2 & K65.3	Insurance, reinsurance and pension funding services, except compulsory social security
K66	Activities Auxiliary To Financial Services And Insurance Activities
L68BXL683	Buying and selling, renting and operating of own or leased real estate, excluding imputed rent
L68A	Owner-Occupiers' Housing
L683	Real estate activities on a fee or contract basis
M691	Legal activities
M692	Accounting, bookkeeping and auditing activities; tax consultancy
M70	Activities Of Head Offices; Management Consultancy Activities
M71	Architectural And Engineering Activities; Technical Testing And Analysis
M72	Scientific Research And Development
M73	Advertising And Market Research
M74	Other Professional, Scientific And Technical Activities
M75	Veterinary Activities
N77	Rental And Leasing Activities
N78	Employment Activities
N79	Travel Agency, Tour Operator And Other Reservation Service And Related Activities
N80	Security And Investigation Activities
N81	Services To Buildings And Landscape Activities
N82	Office Administrative, Office Support And Other Business Support Activities
O84	Public Administration And Defence; Compulsory Social Security
P85	Education
Q86	Human Health Activities
Q87 & Q88	Residential Care & Social Work Activities
R90	Creative, Arts And Entertainment Activities
R91	Libraries, Archives, Museums And Other Cultural Activities
R92	Gambling And Betting Activities
R93	Sports Activities And Amusement And Recreation Activities
S94	Activities Of Membership Organisations
S95	Repair Of Computers And Personal And Household Goods
S96	Other Personal Service Activities
T97	Activities Of Households As Employers Of Domestic Personnel

Annex 3. Data Tables

Figure 2. Components of UK Supply in 2010 - ESA1995 basis and ESA2010 basis

In billions	Market Output	Output for Own Final Use	Other Non-Market Output	Imports of Goods	Imports of Services	Taxes less Subsidies on Products	Total Supply of Products at Purchasers' Prices
ESA1995 basis	2172.7	164.3	374.1	363.8	116.3	157.7	3349
ESA2010 basis	2180.9	227.3	392	364.9	122.8	159.6	3447.4
% change	0.4	38.3	4.8	0.3	5.6	1.2	2.9
actual change	8.2	63	17.9	1.1	6.5	1.9	98.4

Figure 3. Components of UK Demand in 2010 - ESA1995 basis and ESA2010 basis

In billions	Total intermediate demand	Final Consumption	Capital Formation	Exports of Goods	Exports of Services	Total Demand for Products at Purchasers' Prices
ESA1995 basis	1383.3	1295.1	223.3	265.2	182	3349
ESA2010 basis	1347.3	1377.8	261.8	264.4	196.1	3447.4
% change	-2.6	6.4	17.2	-0.3	7.7	2.9
actual change	-36	82.7	38.5	-0.8	14.1	98.4

Figures 4, 6, 8,14. 2010 % (and actual) Change by Product Groups ESA1995 versus ESA2010

Product Group	Figure 4. Total Supply/Demand		Figure 6. Domestic Output		Figure 8. Intermediate Demand		Figure 14. Final Demand	
	Actual Change (£Billion)	Percentage Change	Actual Change (£Billion)	Percentage Change	Actual Change (£Billion)	Percentage Change	Actual Change (£Billion)	Percentage Change
CPA_A	2.6	6.9	-0.1	-0.4	1.4	8.3	1.2	5.8
CPA_B	-3.6	-4.5	-4.2	-9.6	-3.5	-6.2	0	0
CPA_C	20.9	2	11	2.7	-1.9	-0.5	22.8	3.6
CPA_D	13.1	14.8	13.8	16.3	14.1	23.6	-1	-3.5
CPA_E	5.7	16.2	5.3	17.5	5.6	36.6	0.1	0.5
CPA_F	-3.5	-1.5	-2.2	-1	-2.1	-1.9	-1.4	-1.2
CPA_G	-10.6	-30.7	3.2	1.2	-5.1	-38.4	-5.5	-25.9
CPA_H	0.1	0.1	-1.8	-1.4	1.7	1.8	-1.6	-2.9
CPA_I	3.7	3.1	4.2	4.6	-1.5	-7.8	5.1	5.2
CPA_J	8.6	4.8	1	0.7	-2.9	-3.5	11.5	12
CPA_K	12.1	5	14	6.3	9.3	7.4	2.9	2.5
CPA_L	49.3	22.6	45.4	20.9	7.4	32.2	41.9	21.5
CPA_M	24.1	12.7	21.8	12.9	-12.1	-8.3	36.1	81.9
CPA_N	-9.1	-6.2	-4.1	-3.4	-15.2	-13.4	6.1	17.8
CPA_O	2.3	1.6	1.4	1	2	14.7	0.3	0.2
CPA_P	7.9	6.8	7.8	6.7	-1.1	-4.8	9	9.6
CPA_Q	-31.5	-15.5	-30.9	-15.4	-26.6	-74.1	-4.9	-2.9
CPA_R	2.7	6.2	0.9	2.7	-1.9	-23.4	4.6	13
CPA_S	7.6	23.4	6.3	20.7	-3.6	-32.8	11.1	51.6
CPA_T	-4	-64.7	-4	-65	0	0	-4	-64.7

Figures 5, 7, 9,15. 2010 Actual Change by Products ESA1995 versus ESA2010

Actual Change (£Billion)	Figure 5	Figure 7	Figure 9	Figure 15
Products	Total Supply/Demand	Domestic Output	Intermediate Demand	Final Demand
CPA_A01	1.7	-0.3	0.3	1.4
CPA_A02	0.4	0	0.7	-0.3
CPA_A03	0.5	0.2	0.4	0.1
CPA_B05	0.4	0.1	-0.5	1
CPA_B06 & B07	-4.3	-4.3	-3.4	-0.8
CPA_B08	-0.7	-1.1	-0.6	-0.1
CPA_B09	0.9	1.1	1.1	-0.1
CPA_C101	3.6	2.7	4.8	-1.2
CPA_C102_3	-1.2	0.2	0.1	-1.4
CPA_C104	0.7	0.2	0.2	0.4
CPA_C105	-1.2	1.3	-0.1	-1.1
CPA_C106	0.6	0.2	0.5	0.1
CPA_C107	1.4	-0.2	0.5	0.9
CPA_C108	1.9	-0.3	0.9	1
CPA_C109	1.3	0.7	0.1	1.2
CPA_C11.01-6 & C12	-5.3	1.5	-6.4	1.2
CPA_C1107	0.8	0.1	0.8	0
CPA_C13	-1.1	0.7	-0.2	-0.9
CPA_C14	-0.1	-0.5	0.6	-0.7
CPA_C15	-1.7	-0.5	-0.7	-1
CPA_C16	0.9	-0.7	0.9	0
CPA_C17	-0.4	-1.1	0.4	-0.8
CPA_C18	-0.2	-0.1	0.2	-0.3
CPA_C19	2	4.9	-0.3	2.3
CPA_C203	0	-0.3	-0.3	0.3
CPA_C204	-4.3	-0.5	-1.4	-2.9
CPA_C205	1	-0.3	0.3	0.7
CPA_C20A	0.9	0	0.8	0.1
CPA_C20B	-1.8	-2.9	-2.9	1
CPA_C20C	0.7	-0.2	0.8	0
CPA_C21	2.1	-0.1	-11.8	13.8
CPA_C22	-0.2	-0.5	-0.1	-0.2
CPA_C235_6	1.8	-0.4	1.7	0.1
CPA_C23OTHER	0.2	-1	0.6	-0.4
CPA_C241_3	2.8	0.7	2.8	0
CPA_C244_5	-0.1	-2	-0.4	0.3
CPA_C254	-1.3	-1.3	-1.6	0.3
CPA_C25OTHER	-0.7	-0.7	-0.4	-0.3
CPA_C26	0.6	0.9	0	0.7
CPA_C27	-0.2	0.4	0.5	-0.7
CPA_C28	9.1	-0.6	5.9	3.2
CPA_C29	5.6	2.3	3.1	2.5
CPA_C301	1.6	0.5	0.7	0.9
CPA_C303	3.8	2.4	-1.4	5.3
CPA_C30OTHER	0.8	0.4	1	-0.2
CPA_C31	0.7	0.9	-0.7	1.4
CPA_C32	-8.5	0	-4	-4.5
CPA_C3315	-0.2	-0.1	-0.5	0.3
CPA_C3316	-0.4	-0.2	-1.3	0.9
CPA_C33OTHER	4.8	4.7	4.5	0.4
CPA_D351	8.2	9	8.7	-0.6
CPA_D352_3	5	4.9	5.4	-0.4

CPA_E36	2.4	2.4	2.4	-0.1
CPA_E37	2.4	2	2.8	-0.5
CPA_E38	1.2	1	0.5	0.7
CPA_E39	-0.3	-0.1	-0.3	0
CPA_F41, F42 & F43	-3.5	-2.2	-2.1	-1.4
CPA_G45	-6.5	-5.3	-5.1	-1.5
CPA_G46	-3.9	14.2	0	-3.9
CPA_G47	-0.2	-5.7	0	-0.2
CPA_H491_2	0.3	0.1	0.8	-0.4
CPA_H493_5	3.3	1.6	3.1	0.2
CPA_H50	-3.7	-3.2	-1	-2.7
CPA_H51	0.8	1	2.9	-2
CPA_H52	-1.7	-2.1	-5.7	4
CPA_H53	1.2	0.8	1.7	-0.6
CPA_I55	-6	-5.2	-2.5	-3.5
CPA_I56	9.6	9.4	1	8.6
CPA_J58	7.7	2.5	-0.3	8
CPA_J59 & J60	7.7	3.8	3.3	4.4
CPA_J61	-1.7	-0.6	-1.6	-0.1
CPA_J62	-6.9	-6.3	-5.3	-1.5
CPA_J63	1.8	1.6	1.1	0.7
CPA_K64	-2.5	-0.9	-10.9	8.4
CPA_K65.1-2 & K65.3	-1.9	-1.6	2.7	-4.6
CPA_K66	16.5	16.5	17.5	-1
CPA_L68BXL683	17.1	17.1	6.7	10.3
CPA_L68A	33.2	29.9	0	33.2
CPA_L683	-1	-1.6	0.7	-1.7
CPA_M691	-1.2	-1.1	-2.1	0.8
CPA_M692	1.8	1.4	1.7	0.1
CPA_M70	5.7	-1.6	-3.8	9.5
CPA_M71	-3.8	-4	-8.7	4.9
CPA_M72	23.3	22.6	-5.1	28.3
CPA_M73	2.3	2.8	3.4	-1
CPA_M74	-4	1.3	2.5	-6.5
CPA_M75	0	0.3	0.1	0
CPA_N77	1	-0.3	-0.6	1.6
CPA_N78	-4.6	-3.4	-3.9	-0.7
CPA_N79	4.9	3	-6.7	11.6
CPA_N80	-0.6	-0.6	-0.8	0.3
CPA_N81	2	2	1.2	0.8
CPA_N82	-11.7	-4.8	-4.3	-7.5
CPA_O84	2.3	1.4	2	0.3
CPA_P85	7.9	7.8	-1.1	9
CPA_Q86	-16.7	-16.1	-10.5	-6.2
CPA_Q87 & Q88	-14.9	-14.8	-16.2	1.3
CPA_R90	2	3.1	1.6	0.4
CPA_R91	-1	-1.6	-1.1	0
CPA_R92	-0.5	-2.8	-2.3	1.9
CPA_R93	2.2	2.3	-0.1	2.4
CPA_S94	2.6	2.3	-2.3	4.9
CPA_S95	-2.3	-2	-0.7	-1.5
CPA_S96	7.2	6.1	-0.5	7.8
CPA_T97	-4	-4	0	-4

Figures 10 and 12. 2010 % (and actual) Change by Industry Groups ESA1995 versus ESA2010

Industry Group	Figure 10. Domestic Output		Figure 12. Intermediate Demand		Gross Value Added
	Actual Change (£Billion)	Percentage Change	Actual Change (£Billion)	Percentage Change	Actual Change (£Billion)
A	-0.1	-0.4	-0.6	-3.9	0.5
B	-3.8	-8.1	0.8	4.9	-4.6
C	10.6	2.5	-4.7	-1.6	15.3
D	10	11.2	4.3	5.9	5.7
E	5.1	15.7	0.9	5.5	4.2
F	8	4	11.2	9.6	-3.2
G	-8	-2.9	-19.6	-15	11.6
H	-1.4	-1	-1.5	-2	0.1
I	-3.2	-4.2	-4.9	-12.1	1.7
J	5.6	3.7	0.4	0.6	5.2
K	13.9	5.8	6.4	5.6	7.5
L	38.7	19	-2.8	-3.8	41.5
M	10.8	6.8	0.6	0.9	10.2
N	0.8	0.7	3.1	6.3	-2.3
O	4.3	3	-6.3	-8.5	10.6
P	20	17.3	9.2	28.1	10.8
Q	-28.1	-14	-36.3	-36.3	8.2
R	1.2	3.3	0.9	5.3	0.3
S	8.6	28.3	3	26.2	5.6
T	-4	-64.8	0	0	-4

Figures 11 and 13. 2010 Actual Change by Industry ESA1995 versus ESA2010

Actual Change (£Billion)	Figure 11	Figure 13	
Industries	Domestic Output	Intermediate Consumption	Gross Value Added
A01	-0.1	-0.5	0.4
A02	-0.2	-0.2	0
A03	0.2	0.1	0.1
B05	0.1	0	0.1
B06 & B07	-3.9	-0.8	-3.1
B08	-1.3	0	-1.3
B09	1.3	1.6	-0.3
C101	1.1	0.8	0.3
C102_3	0.3	0.3	0
C104	-0.2	0.1	-0.3
C105	1.1	0	1.1
C106	0.7	0.4	0.3
C107	0.8	0.7	0.1
C108	0.7	-0.1	0.8
C109	0.6	0.4	0.2
C1101T1106 & C12	1.7	-0.1	1.8
C1107	0.2	0.1	0.1
C13	0.3	-0.3	0.6
C14	-0.1	-0.5	0.4
C15	-0.2	-0.1	-0.1

C16	-0.3	-0.3	0
C17	-1.4	-1.6	0.2
C18	-0.9	-0.5	-0.4
C19	6.1	7.1	-1
C203	-0.5	0	-0.5
C204	-0.2	-0.7	0.5
C205	-0.5	-0.7	0.2
C20A	0.1	-0.2	0.3
C20B	-3.5	-2.3	-1.2
C20C	-0.6	-0.6	0
C21	0.3	-0.9	1.2
C22	0.2	0.6	-0.4
C235_6	-0.5	-0.7	0.2
C23OTHER	-0.5	-0.4	-0.1
C241T243	-0.3	-0.6	0.3
C244_5	-1.8	-2.5	0.7
C254	0.5	0.4	0.1
C25OTHER	-0.9	-0.8	-0.1
C26	2.3	-0.9	3.2
C27	-0.3	-0.6	0.3
C28	1.6	0	1.6
C29	0.1	0.2	-0.1
C301	1	0.8	0.2
C303	2.6	0.9	1.7
C30OTHER	-0.3	-0.2	-0.1
C31	0.7	-0.2	0.9
C32	0.9	-0.1	1
C3315	-0.1	-0.1	0
C3316	-0.3	-1.1	0.8
C33OTHER	0.4	-0.5	0.9
D351	5.2	0.8	4.4
D352_3	4.8	3.5	1.3
E36	2.6	0.4	2.2
E37	2.2	-0.6	2.8
E38	0.4	1.2	-0.8
E39	0	-0.1	0.1
F41, F42 & F43	8	11.2	-3.2
G45	-4.1	-3	-1.1
G46	4	-5.2	9.2
G47	-8	-11.5	3.5
H491_2	-0.2	-0.7	0.5
H493T495	2	3	-1
H50	-3.3	-2.8	-0.5
H51	1.3	3.6	-2.3
H52	-0.4	-3.8	3.4
H53	-0.8	-0.8	0
I55	-2.6	-2.4	-0.2
I56	-0.6	-2.6	2
J58	-1.4	-0.4	-1
J59 & J60	6.5	3.1	3.4
J61	0.4	-2.3	2.7
J62	-2.7	-1	-1.7
J63	2.9	1	1.9
K64	-2.7	2.5	-5.2
K65.1-2 & K65.3	-0.6	-7.2	6.6

K66	17.1	11.1	6
L68BXL683	9.8	0.5	9.3
L68A	29.9	-4	33.9
L683	-0.9	0.7	-1.6
M691	-1.2	-2	0.8
M692	0	-0.3	0.3
M70	1.7	1.7	0
M71	-3	-0.4	-2.6
M72	11.7	2.8	8.9
M73	2.3	-1.6	3.9
M74	-1.2	0.7	-1.9
M75	0.5	-0.2	0.7
N77	0.8	0.1	0.7
N78	-0.4	-2.7	2.3
N79	2.7	4.8	-2.1
N80	-0.2	0	-0.2
N81	1.9	2	-0.1
N82	-3.9	-1.1	-2.8
O84	4.3	-6.3	10.6
P85	20	9.2	10.8
Q86	-14.4	-18.9	4.5
Q87 & Q88	-13.6	-17.4	3.8
R90	3.3	1.1	2.2
R91	-0.3	-0.3	0
R92	-5.4	-0.1	-5.3
R93	3.6	0.2	3.4
S94	2.3	3.3	-1
S95	-0.2	-0.2	0
S96	6.5	-0.1	6.6
T97	-4	0	-4