Office for National Statistics

Article

Indicative impact of a new framework including double deflation on industry volume estimates of GDP: Blue Book 2021

This article presents the impact of double deflation on industry chain volume measure annual estimates.

Contact:
Rhys Lewis
blue.book.coordination@ons.gov.uk
+44 (0)1633 455284

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1 . Main points

- This article provides the first official estimates of the impact of the improved framework for calculating volume estimates of gross domestic product (GDP), including double deflation.
- There has been a modest revision to overall current price and volume GDP however, there are larger revisions at the industry level such as stronger volume growth in the manufacturing sector.
- Improved telecommunication services deflator has resulted in higher gross value-added volume growth.

2 . Introduction

This article includes indicative impacts to the industry composition of volume gross value added (GVA) following a new framework which will be implemented in Blue Book 2021, including the first official estimates of double deflated GVA. Double deflation is widely recognised as the best approach to produce volume estimates of GVA – that is output minus intermediate consumption.

Estimates presented in this article are consistent with the Annual Blue Book 2021 changes on current price and volume estimates of gross domestic product also published today.

3 . Summary of changes

In the UK National Accounts, Supply and use tables (SUTs) are used to set the annual current price level of gross domestic product (GDP). From Blue Book 2021, annual SUTs will also be used to compile volume estimates of gross value added (GVA), which will enable us to implement double deflation for the first time.

Improvements from our new framework are discussed further in Double deflation methods and deflator improvements to UK National Accounts. Broadly, we can summarise these as:

- Improved current price data: Expending the SUT framework to current price and volume leads to more coherent estimates on industry-level GVA; industry level current price annual estimates from within the SUTs framework are richer than those that historically fed our industry short-term volume estimates.
- Double deflation: For every industry, the current price estimate of its output is deflated by a price index for output and separately the current price estimate of its inputs is then deflated by an input price index.
- Reconciliation of volume estimates within the annual SUT framework: Confronting volume estimates of production and expenditure now occur at a lower industry and product level than previously used.

We have incorporated wider improvements in this Blue Book, including the impacts of the Financial Services Survey and improved deflators for telecommunications services and clothing.

The impact of all these changes on our productivity statistics are explored further in the Impact of double deflation on labour productivity also published today.

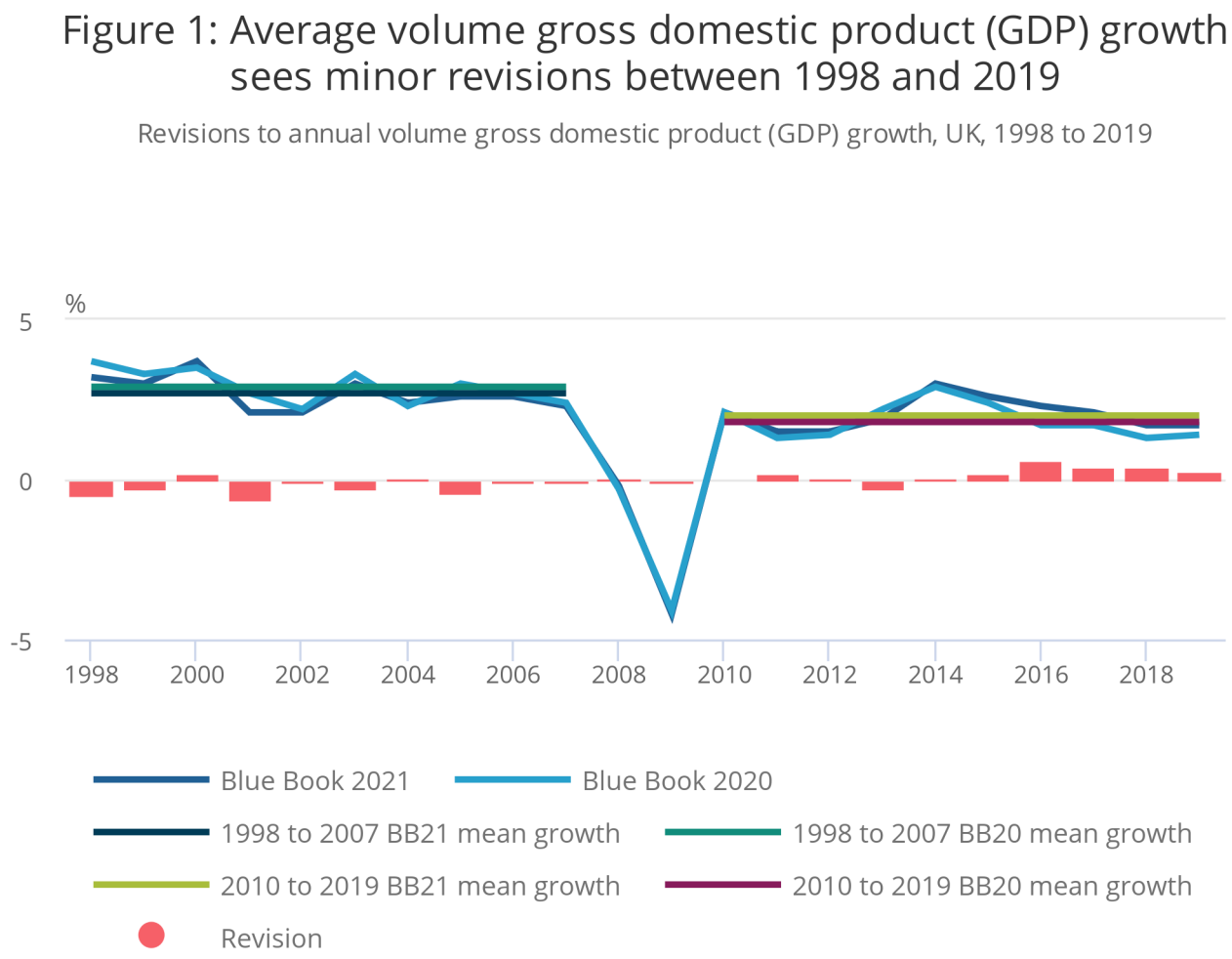
4 . Indicative impact of Blue Book 2021

Figure 1 shows the indicative revision to the annual profile of volume gross domestic product (GDP) growth.

These indicative estimates show that annual volume GDP growth over the period 1998 to 2007 is now 2.7%, slightly down from the 2.9% recorded in Blue Book 2020. For the period 2010 to 2019, GDP growth has been revised up from 1.8% to 2.0%.

Figure 1: Average volume gross domestic product (GDP) growth sees minor revisions between 1998 and 2019

Revisions to annual volume gross domestic product (GDP) growth, UK, 1998 to 2019



Source: Office for National Statistics

Notes:

1. Revision calculated on growth rates rounded to 1 decimal place.

Prior to 2010, reconciliation of volume estimates in the supply and use table (SUT) framework and improvements to the clothing deflator are the main drivers of the downward revision to annual growth.

One example of this reconciliation is in the manufacture of computer, electronics, and optical products. The exclusion of quality change from a product's price is important in estimating its "pure" price change over time. There are numerous ways in which this can be carried out, including hedonic price adjustment where the impact of observed changes in the characteristics of a product on its price is estimated.

Of the transactions within the SUT framework, household final consumption expenditure is the one transaction that attempts to fully take account of quality improvements in the products deflator, achieved through hedonic price adjustment. This leads to stronger volume growth on the use side of the framework compared with supply.

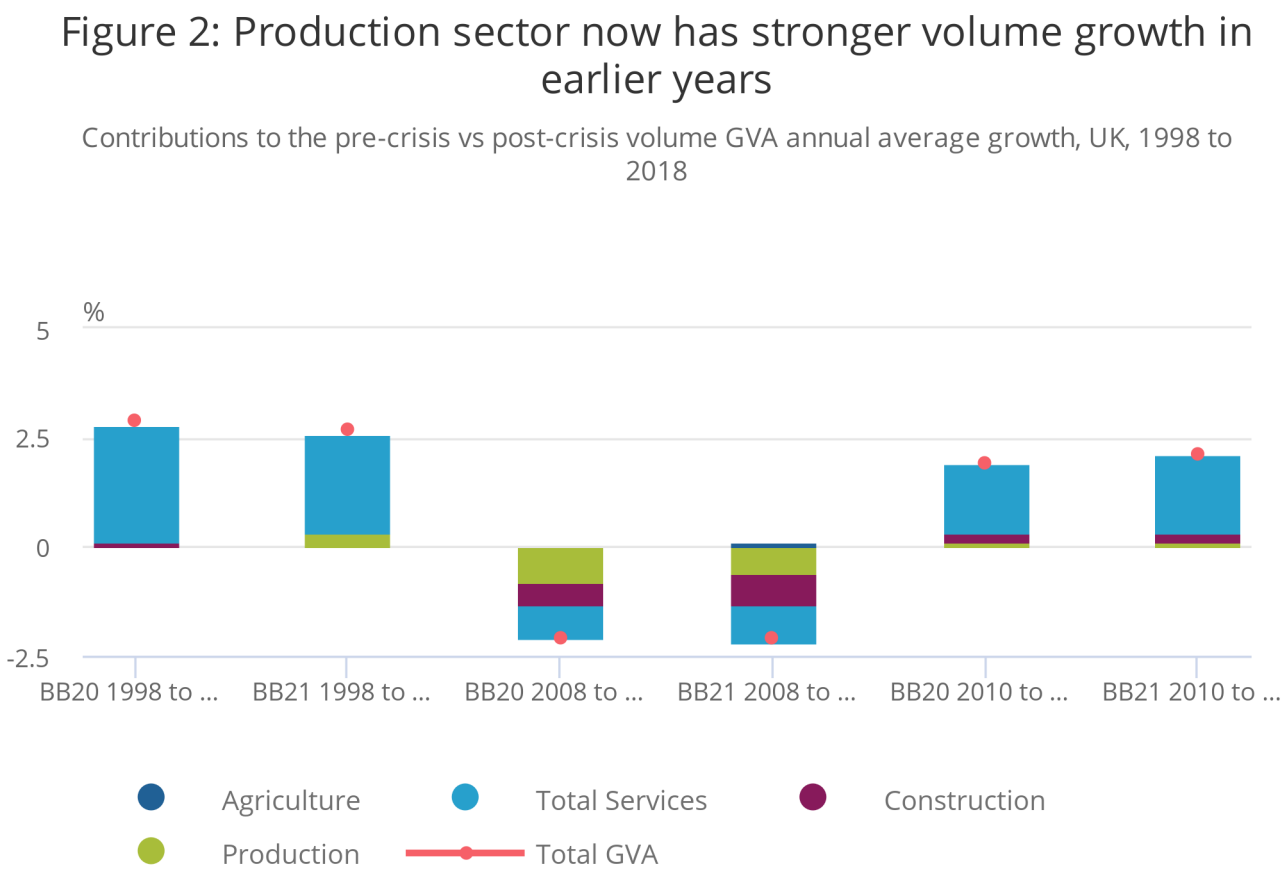
To achieve a balance across the SUT framework, balancing adjustments have been applied to the supply transactions that did not fully take account of these quality changes in the deflator. This results in stronger import of goods volume growth prior to 2010, which has a downward impact on annual GDP volume growth.

In later years, the introduction of the Financial Services Survey and an improved deflator for telecommunication services are driving the upward revision to annual volume GDP growth.

Figure 2 shows the impacts of these improvements to industry-level volume gross value added (GVA), comparing the change to the industry composition of volume GVA over different time periods.

Figure 2: Production sector now has stronger volume growth in earlier years

Contributions to the pre-crisis vs post-crisis volume GVA annual average growth, UK, 1998 to 2018



Source: Office for National Statistics

Notes:

1. Figures may not sum because of rounding.
2. Volume gross value added (GVA) growth and its contributions are based on the arithmetic averages for these periods.
3. Total services are the sum of the individual service industry's volume GVA growth contributions.

In the pre-crisis period (1998-2007), before the economic downturn, Blue Book 2021 (BB21) indicative estimates show production sector GVA increased by 1.8% per year on average over this period, compared with 0.2% per year on average in BB20. This has primarily been driven by the manufacturing sector and is because of our new approach where volume is now reconciled by confronting volume estimates of production and expenditure at a detailed product by industry level.

In the pre-crisis period annual average growth for the manufacturing sector was 3.1% in BB21 compared with 0.3% in Blue Book 2020 (BB20). The main industries contributing to the 3.1% growth in the pre-crisis period for the sector are the manufacturing of:

- computers, electronics, and optical products at 0.5 percentage points
- transport equipment at 0.5 percentage points
- wood, paper products and printing at 0.4 percentage points
- machinery and equipment n.e.c at 0.4 percentage points

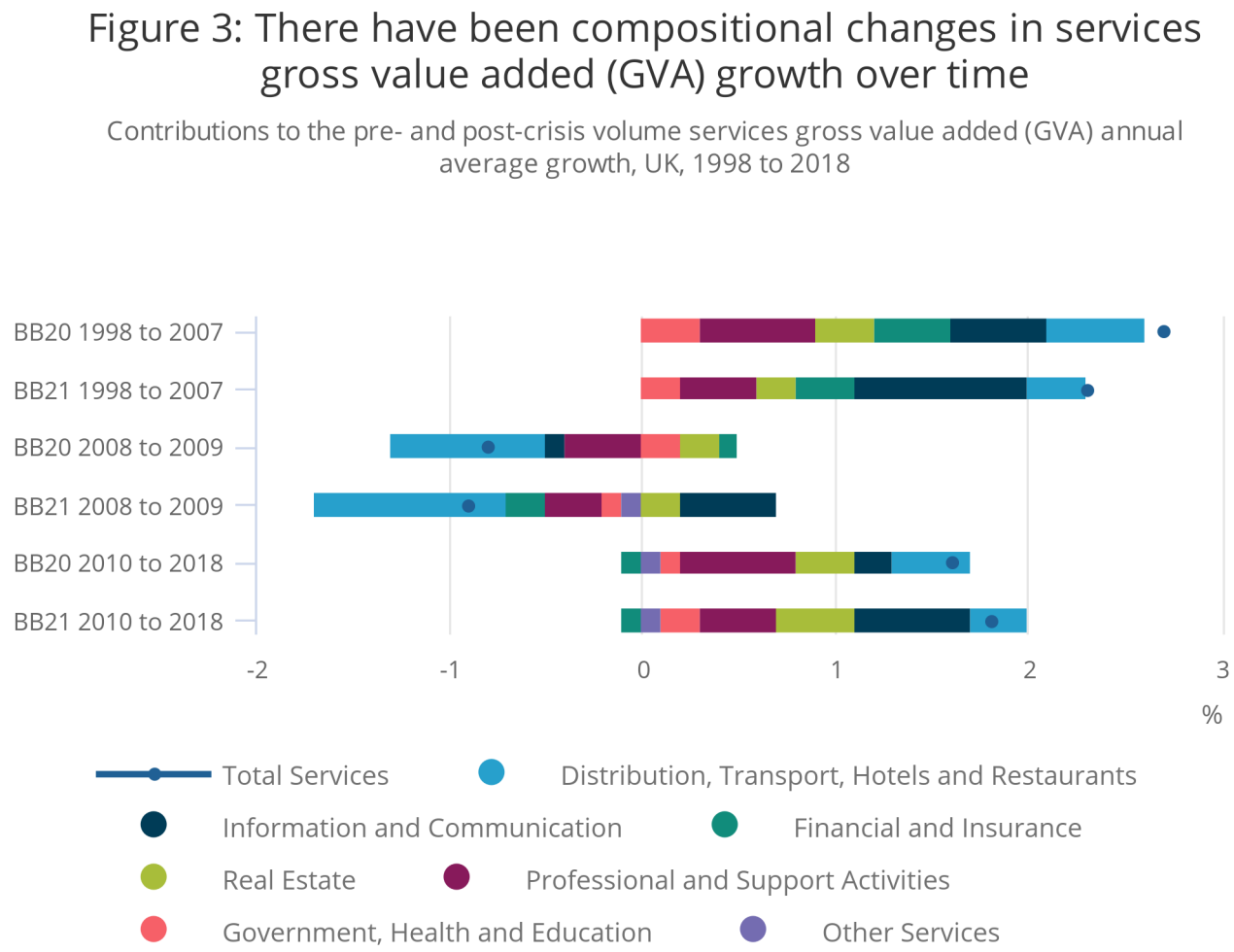
In each of these industries, adjustments have been applied to the supply transactions to achieve a balance across the framework. This reflects our view that the use side deflators for these industries are of a superior quality. The result of which is stronger GVA volume growth in earlier years.

The contributions of the agriculture and construction industries are largely unchanged over the pre-crisis period. That said, this mainly reflects the relatively low weight of these industries as there have been some downward impacts to construction GVA growth leading up to the crisis. In the pre-crisis period annual average growth for the construction industry is 0.9% in BB21 compared with 2.2% in BB20. This weaker GVA growth is because of stronger growth in the volume of intermediate consumption over earlier years relative to output. BB21 preliminary estimates also show a larger contraction in the construction industry in the years of the financial crisis, declining by 10.1% per year on average compared with a decline of 7.9% in BB20. This is because of varying output and input volume trends in 2008; growth in the volume of intermediate consumption but a fall in the volume of output which has a further downward impact on GVA volume growth.

Figure 3 shows a breakdown of the industry contribution to volume estimates of services GVA over time.

Figure 3: There have been compositional changes in services gross value added (GVA) growth over time

Contributions to the pre- and post-crisis volume services gross value added (GVA) annual average growth, UK, 1998 to 2018



Source: Office for National Statistics

Notes:

1. Figures may not sum because of rounding.

2. Volume gross value added (GVA) growth and its contributions are based on the arithmetic averages for these periods.

3. Total services are the sum of the individual service industry's volume GVA growth contributions.

Before 2010, the underlying contributions in finance and insurance are lower, which in part reflects both the impact of telecommunication services as an intermediate input and the introduction of the Financial Services Survey in BB21. We have also taken the opportunity to review and implement adjustments to the insurance and re-insurance product to improve balancing across the SUT framework. Between 1998 and 2007, indicative GVA annual average growth of the finance and insurance sector is 5.0% in BB21 down from 7.3% in BB20.

There have also been downward impacts to the contributions for distribution, transport, hotels, and restaurants for all periods. A lower contribution, particularly in the pre- and post-crisis period around the economic downturn, is also evident for professional and support services activities.

At a more detailed industry level, Table 1 shows the average GVA growth for the same three periods, comparing BB21 provisional estimates against those in BB20.

Table 1: The impacts of these indicative estimates are reflected by industry and over time
Average annual volume gross value added (GVA) growth, Blue Book 2021 (BB21) and Blue Book (BB20), 1998 to 2018

		1998 to 2007	2008 to 2009	2010 to 2018
Agriculture	**BB21**	4.4	9.2	0.6
	BB20	1.0	0.6	1.6
Production	**BB21**	1.8	-3.7	0.6
	BB20	0.2	-5.1	0.6
Construction	**BB21**	0.9	-10.1	2.8
	BB20	2.2	-7.9	3.1
Distribution, Transport, Hotels and Restaurants	**BB21**	1.5	-5.5	2.0
	BB20	2.6	-4.6	2.3
Information and Communication	**BB21**	14.9	7.7	8.8
	BB20	8.7	-1.0	3.8
Finance and Insurance	**BB21**	5.0	-2.3	-0.8
	BB20	7.3	1.1	-1.0
Real Estate	**BB21**	1.3	1.6	2.9
	BB20	2.3	1.5	2.1
Professional and Support Services	**BB21**	3.5	-3.0	3.4
	BB20	6.3	-3.7	5.4
Government, Health and Education	**BB21**	1.3	-0.6	1.1
	BB20	1.8	1.2	0.7
Other Services	**BB21**	0.8	-1.7	1.8
	BB20	1.6	-0.7	1.7

Source: Office for National Statistics

There is scope for increased volatility in volume GVA growth for most of these industries over the period 1998 to 2018. This will be most pronounced when there is inherent volatility in the movements of output and input prices, particularly where the product mix of output and intermediate consumption for an industry might be contrasting and/or those industries that might be more exposed to oil and commodity price shocks in its output or input prices.

Table 2 shows the relative change in output and input prices over time for each industry. It shows the industry-level difference in the average annual output and input price inflation. It also picks up the effects of prices shocks on an industry basis but also implicitly the compositional change in the production process. Double deflation has been carried out within the SUTs framework, so it is picking up the effects of change in the product composition of output and input for an industry.

Table 2: Information and communication output prices are falling faster than input prices
Percentage point difference between the average implied deflators for output and intermediate consumption, by industry, UK, 1998 to 2018

	1998 to 2007	2008 to 2009	2010 to 2018
Agriculture	-2.6	-3.3	0.3
Production	-1.2	-1.1	-0.3
Construction	1.4	1.4	0.1
Distribution, Transport, Hotels and Restaurants	0.2	1.2	-0.2
Information and Communication	-3.8	-4.5	-2.9
Finance and Insurance	-1.2	4.0	0.6
Real Estate	-1.1	-17.5	0.7
Professional and Support Services	1.1	0.9	0.5
Government, Health and Education	2.5	1.5	0.3
Other Services	2.2	0.8	1.1

Source: Office for National Statistics

The implied price of the output of information and communication has fallen much faster than its implied input price. Between 1998 and 2018 the price of its output fell by 3.3% per year on average over this entire period. This in part reflects the effects of technological change and how we are capturing the quality change much more effectively here in the price of its output. In contrast, there was a slight increase in the price of its input of 0.2% per year on average. All else the same, this would imply that the effects of double deflation would lead to an upward change to volume GVA growth for this industry.

The real estate and agriculture industries share a similar narrative before 2010 in that output prices increased at a slower rate than their input. For example, within real estate this is driven by imputed rents of owner-occupied dwellings which is an estimate of the flow of housing services consumed by owner occupiers. Construction activities, linked to maintaining a property, and financial service activities are key inputs to this industry and drive stronger intermediate consumption price growth in earlier years.

In contrast, the sectors: "construction", "government", "health and education", and "other services", have output prices increasing at a faster rate than their inputs. This means that the effects of double deflation would have a downward impact on GVA volume growth for these industries.

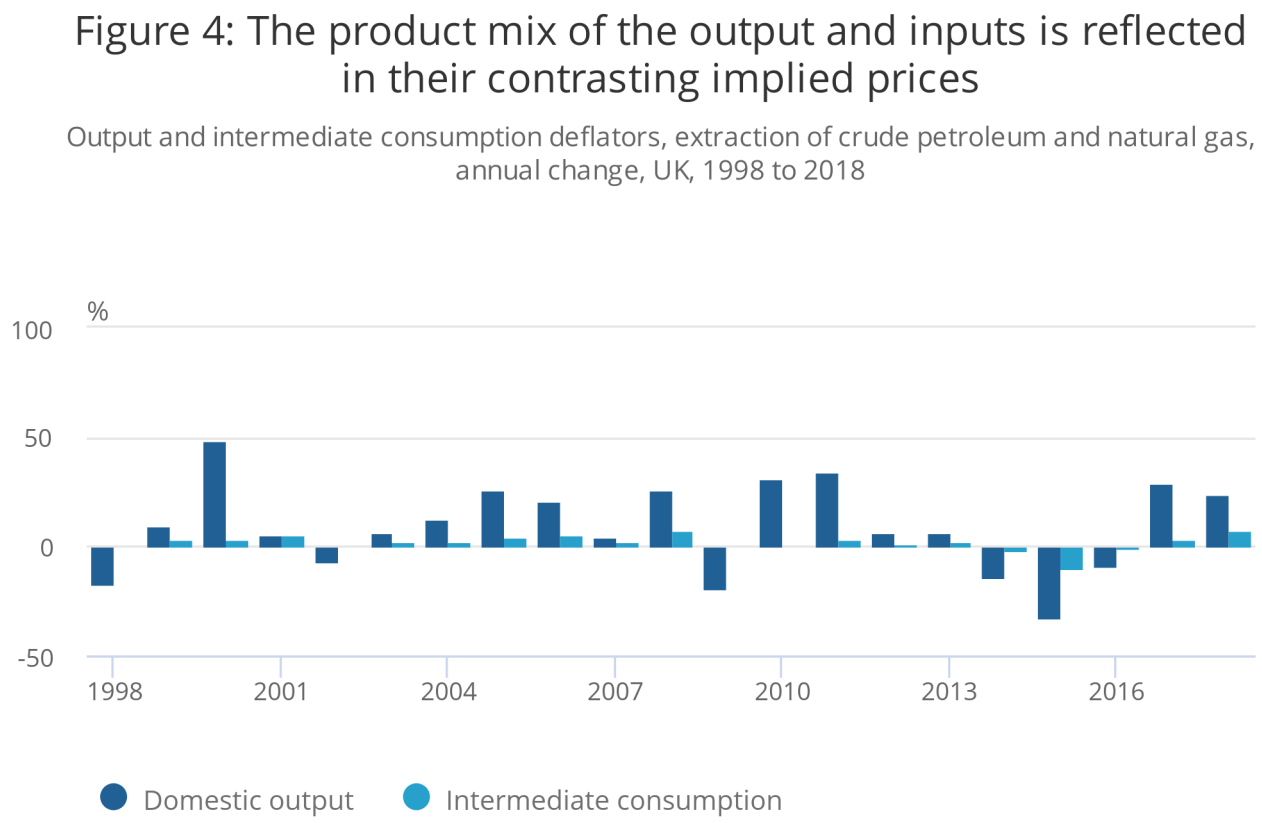
5 . Focus on selected industries

Extraction of crude petroleum and natural gas

Figure 4 shows the relative price change of output and intermediate consumption for the petroleum and gas industry. This is an industry in which the move from single-deflated gross value added (GVA) estimates to double-deflated GVA has had an impact that reflects the contrasting product mix of the output and input for that industry. This is then reflected in the respective implied prices over this period of time.

Figure 4: The product mix of the output and inputs is reflected in their contrasting implied prices

Output and intermediate consumption deflators, extraction of crude petroleum and natural gas, annual change, UK, 1998 to 2018

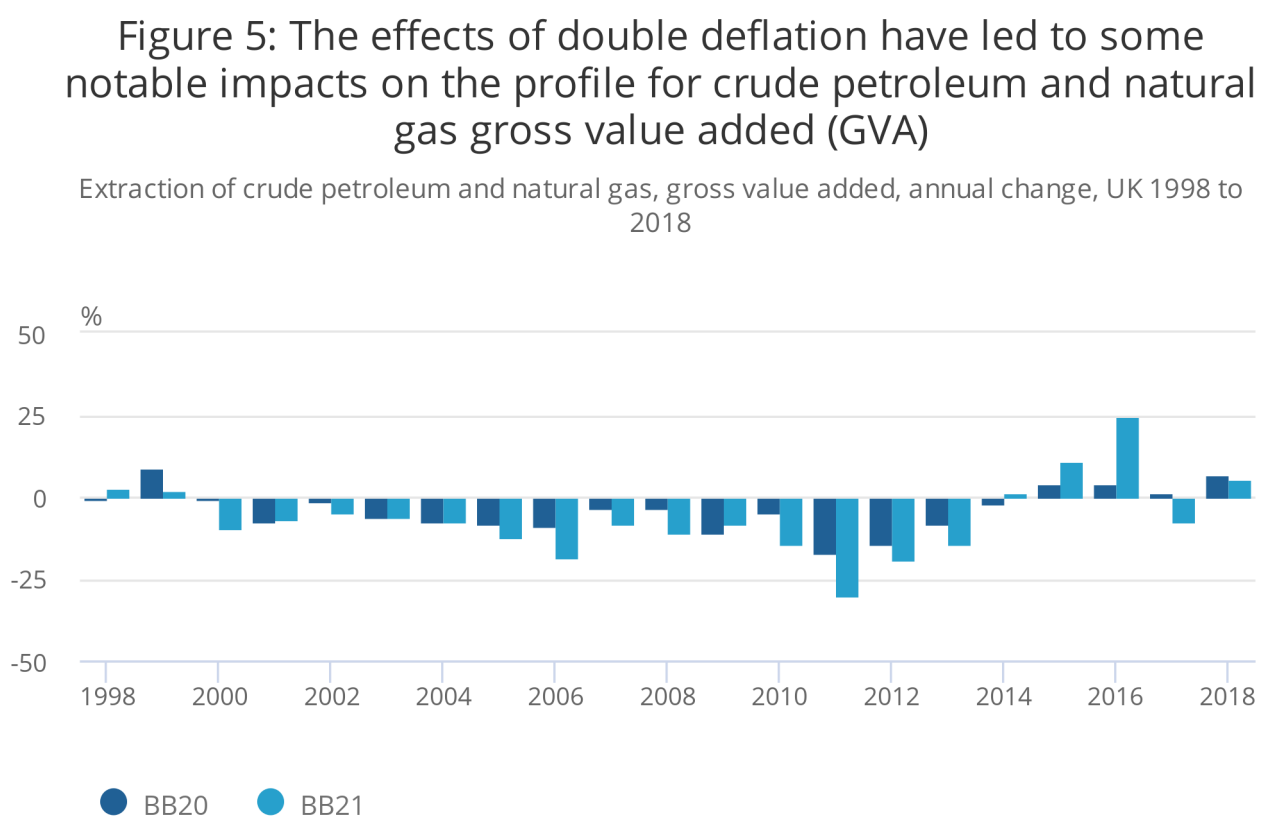


Source: Office for National Statistics

While the change in the output price index is driven by the price of oil and gas, its inputs largely comprise of mining support activities and machinery and equipment which has less of a correlation with the price of oil and gas. Different trends in the output and input price indices are then reflected in double-deflated estimates of GVA (Figure 5).

Figure 5: The effects of double deflation have led to some notable impacts on the profile for crude petroleum and natural gas gross value added (GVA)

Extraction of crude petroleum and natural gas, gross value added, annual change, UK 1998 to 2018



Source: Office for National Statistics

Figure 5 shows a large upward change to volume GVA growth for mining and quarrying from 2014. This reflects the large decline in oil prices that was recorded in the latter half of 2014, reflecting a range of supply and demand factors. This large fall in the price was then reflected in a higher volume estimates of output of this industry, while having much less of a pronounced effect on the price and so volume of its intermediate inputs.

Manufacture of clothing

In Blue Book 2021 (BB21) we are implementing improvements to the clothing deflator used in National Accounts. In 2010, changes to the methodology used to collect prices in the consumer price inflation family of indices were made. The historical series (1997 to 2010) for the clothing deflator used in household final consumption expenditure is now aligned with the methodological improvements that were made in the consumer price inflation family from 2010. This improvement has a downward impact of around 0.1 percentage points on gross domestic product (GDP) annual average growth before 2010.

Figure 6 shows indicative BB21 gross value added (GVA) volume growth against Blue Book 2020 (BB20) for the manufacture of the clothing industry. Between 1998 and 2007, indicative BB21 estimates show annual average growth of 1.1% compared with a fall of 5.8% in BB20. The use side of the SUT framework for this product was showing stronger volume growth relative to the supply side. Given the deflator improvement implemented for household expenditure (use side) and confidence in its volume, balancing adjustments have been applied to the supply transactions to achieve a balance across the SUT framework. This has led to stronger GVA volume growth in earlier years in our BB21 estimates.

Figure 6: Manufacture of clothing now has stronger gross value added (GVA) volume growth

Manufacture of clothing: annual volume gross value added (GVA) growth, UK 1998-2018

Source: Office for National Statistics

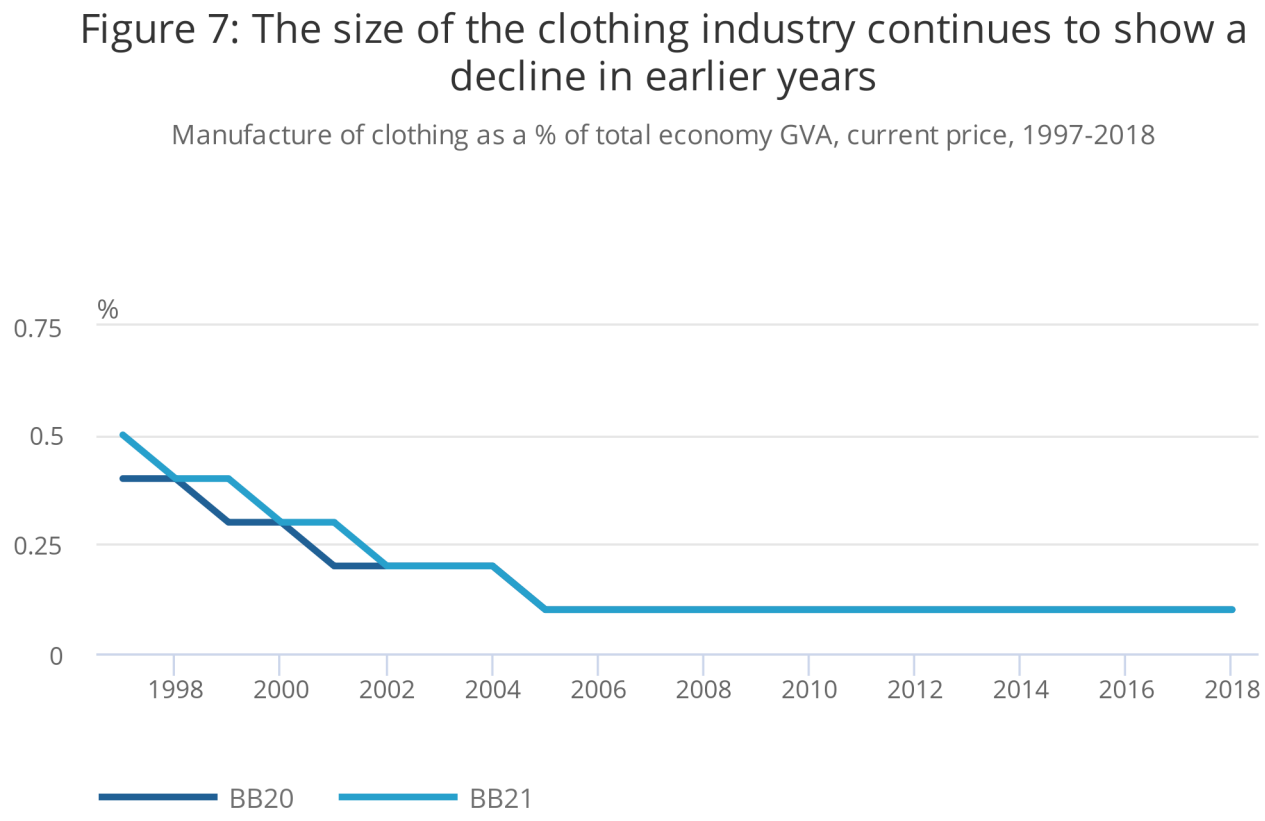
Between 2009 and 2010 a larger fall in the volume of intermediate consumption relative to the volume of output leads to gross value added volume growth. Some balancing effects also contribute during this period.

After 2010 the impact of improved current price data and some double deflation effects are driving differences in the growth trends. In BB20, industry volume estimates of GVA were based primarily on the returns of the Monthly Business Survey. This is a proxy for the production measure of GDP, calculated by taking turnover and removing the impact of price changes. The expansion of the supply and use table (SUT) framework to current prices and volume introduces coherent estimates of industry level GVA from BB21 and drives some of the differences in our industry volume estimates.

This improved volume trend of industry GVA has no impact of the size of the clothing industry within the economy which is instead calculated in current prices. While there have been some current price changes, the size of the industry continues to show a decline over earlier years. (Figure 7).

Figure 7: The size of the clothing industry continues to show a decline in earlier years

Manufacture of clothing as a % of total economy GVA, current price, 1997-2018



Source: Office for National Statistics

Notes:

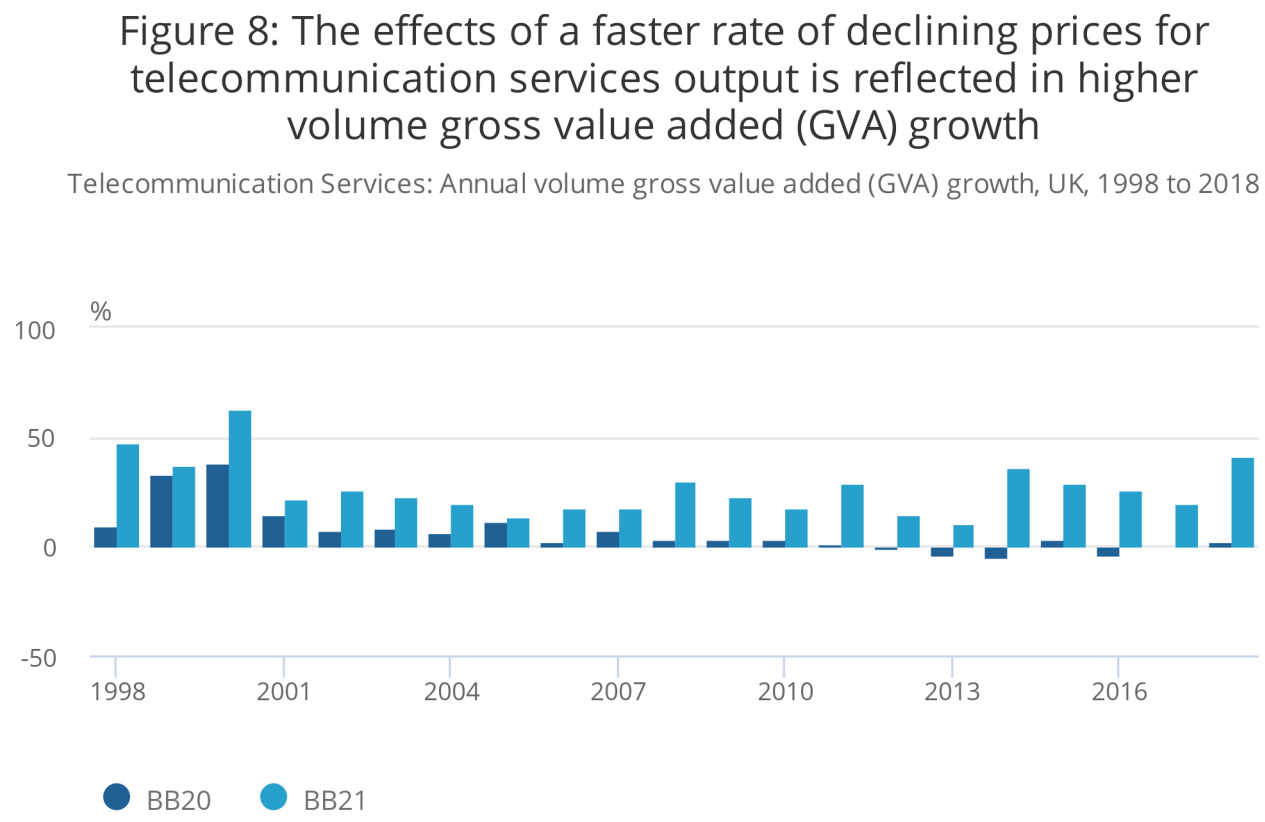
1. Rounded to 1 decimal place.

Telecommunication services

We have improved how we estimate the change in prices of telecommunication services output, specifically the under-representation of internet services and an improvement in the handling of access charges for telecommunications services. Figure 8 shows the impact of these improvements on the volume GVA for the telecommunication services industry. A faster rate of declining prices within this industry is reflected in higher volume GVA growth. Average annual GVA growth for this industry was 27% over the period 1998 to 2018 in indicative BB21 estimates, compared with 6.8% in BB20.

Figure 8: The effects of a faster rate of declining prices for telecommunication services output is reflected in higher volume gross value added (GVA) growth

Telecommunication Services: Annual volume gross value added (GVA) growth, UK, 1998 to 2018



Source: Office for National Statistics

The impact of the telecommunication services deflator improvement is wider than this industry. This is because that through double deflation, the volume of products in an industry are consumed by other industries as part of their production process. Aside from other industries in the information and communication sector, industries which consume telecommunication services and thus most impacted include finance and insurance services and gambling and betting services (in other services). The impact of this change in isolation is to lower the volume GVA growth for these industries.

6 . Future developments

This article is one of a package of releases published today. More on these can be found in Section 10 - Related links.

Further indicative impacts for Blue Book 2021 (BB21) will be published on 28 July 2021. This will contain further detail on how we expect the production, income, and expenditure measures of gross domestic product (GDP) to be revised, while including a preliminary view of the new quarterly profile of current price and volume estimates of GDP.

The improvements presented in these papers will be officially reflected in the September 2021 quarterly national accounts and October 2021 monthly GDP estimates.

7 . Impact of double deflation data

Indicative BB21 industry volume estimates: 1997 to 2019
Dataset | Released 28 June 2021
Industry chain volume measure annual estimates following a new framework which will be implemented in Blue Book 2021, including double deflation. GVA, output and intermediate consumption. Index and growth rates.

8 . Data sources and quality

One of the statistical limitations that has previously been highlighted in the production of the UK National Accounts has been the absence of double-deflated volume measures of industry gross value added (GVA). Recognised as international best practice, it has been one of our long-standing aims to produce double-deflated estimates of GVA. In recent years, we have undertaken significant work in progressing this part of the transformation of the UK National Accounts. This in turn has helped identify numerous theoretical and practical challenges in the compilation of UK gross domestic product (GDP) estimates.

For the first time in the UK, we have produced official volume estimates in a supply and use tables (SUTs) framework, including double-deflated estimates of GVA. Further detail on our approach can be found in Double deflation methods and deflator improvements to UK National Accounts.

9 . Glossary

Double deflation

Double deflation is a method for calculating value added by industry chained volume measures, which takes separate account of the differing price and volume movements of input and outputs in an industry's production process.

Gross domestic product (GDP)

Gross domestic product (GDP) is the total value of output in the economic territory. It is the balancing item on the production account for the whole economy. Domestic product can be measured gross or net. It is presented in the accounts at market (or purchasers') prices.

10 . Related links

Impact of Annual Blue Book 2021 changes on current price and volume estimates of gross domestic product
Article | Released 28 June 2021
Methodological and data improvements that affect current price and chain volume measure of gross domestic product (GDP), 1997 to 2019.

Impact of double deflation on UK labour productivity: 1997 to 2018
Article | Released 28 June 2021
In Blue Book 2021 (BB21), a new framework will be introduced to produce gross domestic product (GDP) in volume terms, which includes double-deflated, industry-level gross value added (GVA). These are indicative estimates of the impact on labour productivity measures for the whole economy and by industry from 1997 to 2018.

Methods changes to the financial sector data
Methodology | Released 28 June 2021
Changes and improvements to the way we calculate financial services estimates for Other Financial Institutions, using industry-specific data.

UK National Accounts, The Blue Book: 2020
Compendium | Released 30 October 2020
National accounts statistics including national and sector accounts, industrial analyses, and environmental accounts.