

Article

# Gross domestic product and economic welfare, UK: 1987 to 2022

Exploring how adjustments to gross domestic product (GDP) can produce measures of economic activity that provide a greater focus on welfare considerations.

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# 1 . Main points

- Real gross domestic product (GDP) is designed as a measure of a nation's production volume of output or production; however, throughout the history of the development of the National Accounts, statisticians have discussed alternative measures of economic activity that are more focused on the perspective of a nation's welfare.
- Real gross domestic income considers movements in the terms of trade to reflect the overall purchasing power of a nation's GDP; despite a deterioration in the UK's terms of trade in the last two years following a strong rise in global energy and commodity prices, the UK has benefitted from an improvement in its terms of trade over the longer term.
- Real income is a measure that is linked to the sustainable level of consumption, and it is also a measure that is "net" of depreciation, includes the balances in net foreign income and transfers, and is deflated using the price of consumption expenditure; this measure has often diverged from real GDP, suggesting the growth in UK economic welfare is not always in line with the volume of output or production.

## 2 . Overview of gross domestic product and economic welfare

Gross domestic product (GDP) is a measure of the total output produced in a particular country. While GDP is typically viewed as more appropriate for measuring production and productivity, its limitations as a measure of welfare or well-being are widely acknowledged. We outline how measurement of the economy might include broader impacts of economic change on people and the environment in our [inclusive income measures](#).

However, it is not correct to suggest that GDP as a measure does not account for welfare considerations altogether. Cross-country comparisons generally report a positive correlation between GDP per capita and other measures of societal progress, as discussed in the [Centre for Economic Policy Research's GDP as a measure of well-being article](#). Furthermore, throughout the history of national accounting, statisticians have debated how the economy should be measured, including how to reflect societal welfare.

In this article we present two alternative measures of economic activity which are based on GDP but give more significance to welfare. Both have been published by the ONS for many years in the [UK National Accounts: The Blue Book](#), although typically receive little attention or commentary. Our two alternative measures are:

- real gross domestic income (real GDI), which is a measure of the purchasing power of GDP, reflecting how movements in the terms of trade can affect a nation's ability to consume in world markets
- real income, which is a measure that is linked to the level of sustainable consumption, namely the income generated by a country that can be used to fund current and future consumption opportunities

These measures provide additional insights into the changing UK economy that are not fully captured in GDP. For example, real GDI provides a greater focus on how society might be affected by movements in commodity prices and exchange rates, both of which have been significant factors for the UK in recent years. Similarly, real income considers, among other things, investment income earned from and paid out to the rest of the world, which can be quantifiably important for a country such as the UK that is home to a large international financial centre.

## 3 . Real gross domestic income

## The purchasing power of GDP

During the 1930s when the National Accounts were in their early years of development, the majority of statisticians advocated for the same price index, such as a cost-of-living index, to be applied to all items to adjust for price changes. These adjustments were looked on as a general correction for changes in the purchasing power of money resulting from inflation and motivated by the measurement of welfare changes, rather than producing explicit volume estimates of output or expenditure.

After the Second World War, the majority view shifted to advocate for each component of the National Accounts to be deflated by its own price index. [The Geary method](#), as it became known, has since been the standard approach for deriving volume measures. Because it is consistent with classical [double deflation of value added](#) (the idea that the volume of inputs and outputs should be measured separately), it emphasises gross domestic product (GDP) as a measure of production and productivity rather than welfare.

However, those who advocated for the purchasing power approach to deflation did achieve the concession that there should be two categories of main GDP aggregates at constant prices:

- a measure of real GDP, now considered conventional, showing the extent to which production in the economy is expanding in volume terms
- a measure of real gross domestic income (real GDI), now rarely commented on, reflecting the purchasing power of a nation's output and more focused on the concept of welfare

We publish annual estimates of both measures in the Blue Book. To explore both real GDP (ABMI) and real GDI (YBGL), see Table 1.1 in our [National accounts at a glance supplementary table](#).

As real GDI describes the purchasing power of a nation's output over goods and services in world markets, it is sometimes referred to as [Command-basis GDP](#). This description is mainly used in the United States to avoid confusion because the term real GDI is used there for the income measure of GDP.

The difference between real GDP and real GDI is the terms of trade effect. The terms of trade is the ratio of a nation's export prices to import prices, so an improvement means the price received for exports has increased relative to the price paid for imports. The value of the terms of trade effect specifically relates to the deflation of the trade balance:

$$T = \text{Terms of trade effect} = \left( \frac{X}{P} - \frac{X}{PX} \right) + \left( \frac{M}{PM} - \frac{M}{P} \right)$$

Where:

$X$  is nominal exports deflated by the export deflator

$M$  is nominal imports deflated by the import deflator

$P$  is some other general deflator

The System of National Accounts (SNA) does not restrict the choice for the general deflator ( $P$ ), but the typical choice of national statistics institutes, including the Office for National Statistics (ONS) in the UK National Accounts, is the import deflator ( $PM$ ). For further information, see [Review of Income and Wealth's Measurement of terms of trade effects article](#). In this case, the terms of trade effect simplifies to:

$$T = \text{Terms of trade effect} = \frac{X}{PM} - \frac{X}{PX}$$

Under the Geary approach to deflation, an improvement in the terms of trade where export prices have increased relative to import prices would have no impact on real GDP. This is because exports and imports have been deflated by their own price indices leaving volume estimates unchanged. However, real GDI will increase relative to real GDP because exports are being deflated by the relatively lower import price index. Similarly, a country whose import prices fall may not experience any change to real GDP, but it could experience an increase in its relative purchasing power and real GDI.

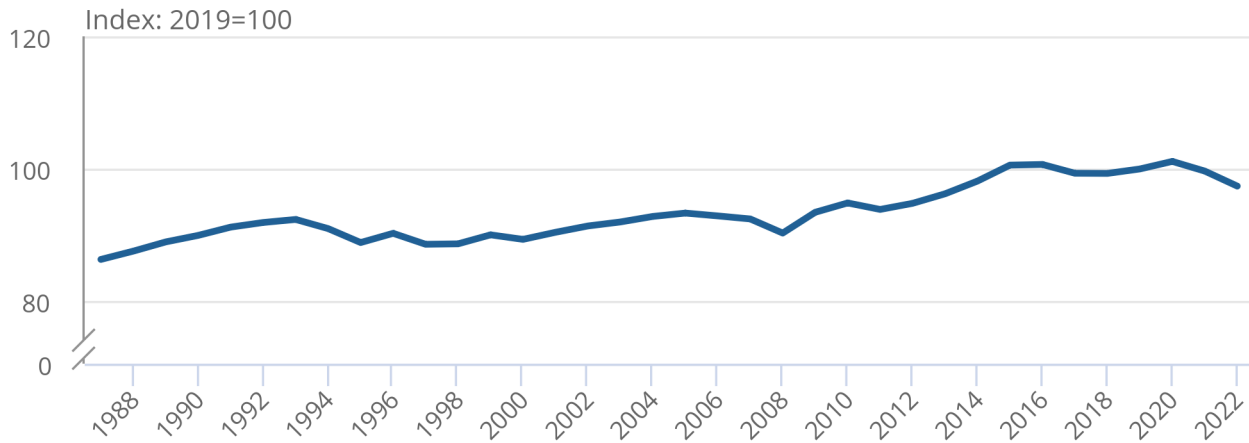
Following an improvement in the terms of trade, the purchasing power of domestic output is higher because the same volume of exports can now be used to purchase a greater volume of imports. A positive terms of trade shock should have a similar impact on domestic welfare as a positive productivity shock. For more information, see the [United States National Bureau of Economic Research's Are shocks to the terms of trade shocks to productivity working paper](#). The paper considers foreign trade as a form of production technology where exports are fed into the production process and transformed into imports. The terms of trade determine the rate at which exports are transformed into imports, so an improvement in the terms of trade then acts like a positive technology shock; namely, the same volume of exports now produces a larger volume of imports for domestic consumption.

A negative terms of trade shock, where all else is held constant, has the opposite effect. Real GDP is unaffected, but the purchasing power of domestic output is diminished. Real GDI falls relative to real GDP with a negative impact on welfare despite the volume of domestic output as currently measured being unchanged.

Movements in a country's terms of trade are particularly relevant at times of large movements either in energy and commodity prices or the exchange rate, or both. For example, in Figure 1 we can see that, although the UK's terms of trade have generally improved over the last three decades, there has been a substantial decline in the last two years as global energy and commodity prices have increased, raising the price of the UK's imports.

**Figure 1: There has been trend improvement in the UK's terms of trade over the last three decades, despite a fall in recent years**

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**Source: UK National Accounts, The Blue Book: 2023 from the Office for National Statistics**

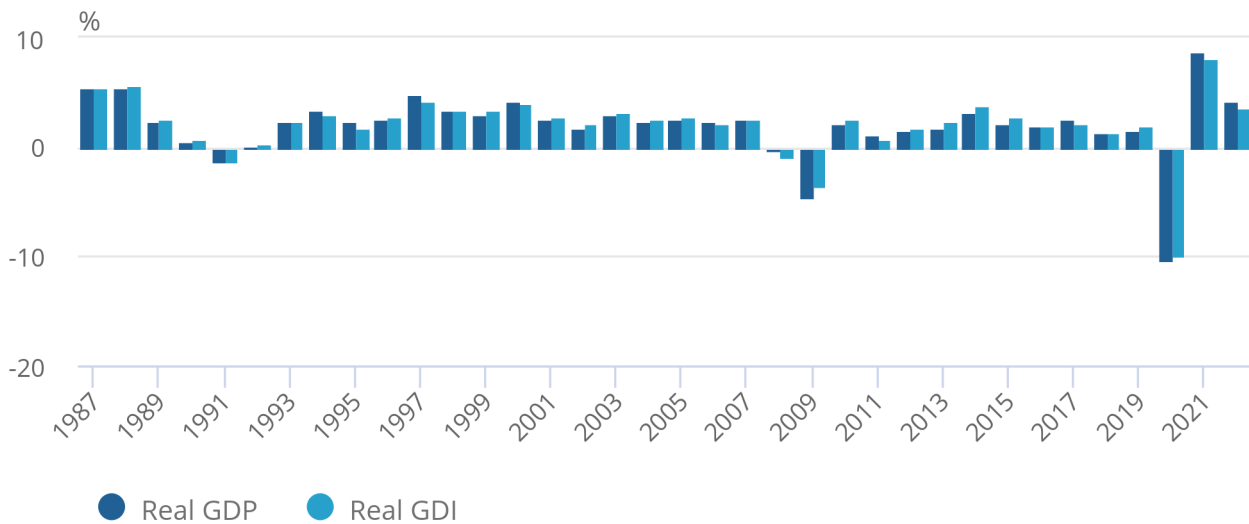
Comparing the annual growth rates for UK real GDP and real GDI shows that, in most years, the differences between the two measures are small (Figure 2). However, larger differences in certain years are associated with important changes in the terms of trade (Figure 3). For example, the fall in the UK terms of trade in 2022 has resulted in the slower growth of real GDI (3.6%) relative to real GDP (4.3%). In other words, welfare grew more slowly than production in this year.

## Figure 2: Real GDP and real GDI for the UK generally follow the same growth pattern

Annual growth rates of real gross domestic product (GDP) and real gross domestic income (GDI), percentage, UK, 1987 to 2022

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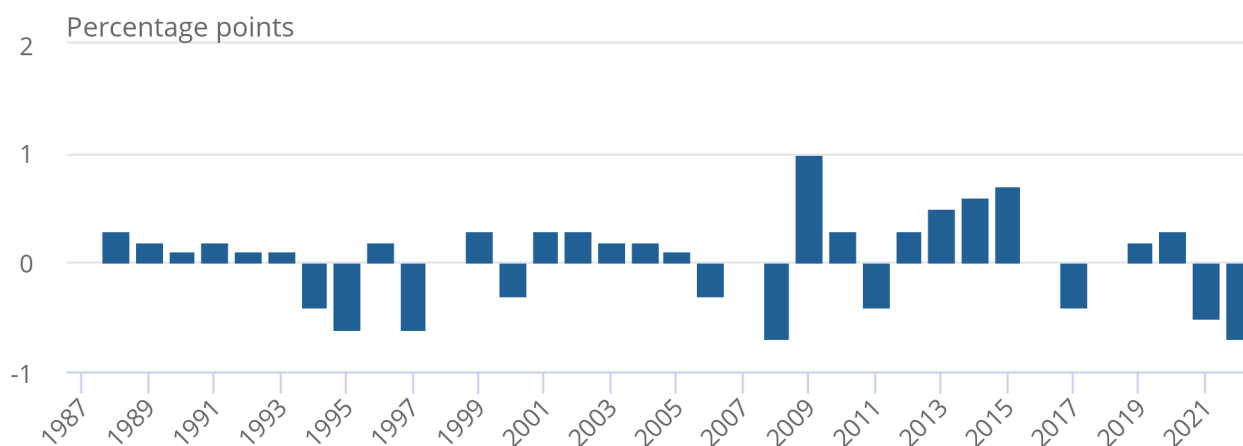
Source: UK National Accounts, The Blue Book: 2023 from the Office for National Statistics

### Figure 3: Differences between real GDP and real GDI tend to become more pronounced during periods of volatility in commodity (energy) prices and exchange rates

Percentage point difference in the annual growth rates of real gross domestic product (GDP) and real gross domestic income (GDI), UK, 1987 to 2022

### Figure 3: Differences between real GDP and real GDI tend to become more pronounced during periods of volatility in commodity (energy) prices and exchange rates

Percentage point difference in the annual growth rates of real gross domestic product (GDP) and real gross domestic income (GDI), UK, 1987 to 2022



Source: UK National Accounts, The Blue Book: 2023 from the Office for National Statistics

Despite the fall in the UK terms of trade in the last two years, the general trend over the previous three decades has been upwards. As a result, the total change in real GDI between 1987 and 2022 was 3.1 percentage points greater than the change in real GDP over the same period.

The growth gap had reached a peak of 4.8 percentage points in 2020. The general improvement in the UK's terms of trade has been attributed to several factors reflecting the UK's evolving comparative advantage in international trade, including:

- relatively strong growth in exports of higher value services, such as financial and insurance services
- a shift in the composition of imports towards lower value manufactures, including Information and Communication Technology (ICT) where relative prices have fallen significantly

These trends were particularly relevant during the strengthening of the UK terms of trade between 2008 and 2014. For further information, see the [Bank of England's What caused the rise in the UK terms of trade bulletin](#).

## 4 . Real income

## The Hicksian view of income

An early pioneer in the development of national accounting was the Nobel Prize winning economist Sir John Hicks, who provided the following frequently cited definition of income as: “the maximum amount of money which the individual can spend this week and still expect to be able to spend the same amount in real terms in each ensuing week”.

According to the Hicksian view, income was linked to current and future consumption opportunities. A person who saves (spends less than their income) plans to be better off (by which we mean has higher consumption) in the future. Similarly, a person living beyond their means by borrowing or spending more than they have earned plans to be worse off in the future in terms of lower consumption.

There are many closely related measures of the sustainable level of consumption. For example, the concept of [Weitzman net domestic product](#) places consumption as the ultimate end of economic activity. We present here the concept of [real income](#) which departs from real gross domestic product (GDP) in three ways:

- the consumption of fixed capital (or depreciation) is excluded
- net income and transfers with the rest of the world are included
- the consumption deflator is applied instead of the GDP deflator, so that the volume of net output is valued in terms of consumption units

The next three subsections will outline in more detail why each of these steps are appropriate in terms of measuring welfare and show the respective UK data.

## Net production and investment

From the standpoint of GDP, it makes no difference whether the production of goods and services are for the purpose of consumption or investment. However, from a welfare point of view, only consumption matters, and investment goods are valued only so far as they can produce more consumption goods in the future.

Therefore, investment expenditure that simply replaces capital that wears out cannot be thought of as adding to the consumption possibilities of a nation. The consumption of fixed capital, or depreciation, which is the part of gross investment that simply maintains the productive capacity of the existing capital stock at its current level, is not considered to add to welfare.

However, the part of gross investment that adds to the existing capital stock (net investment which equals gross investment minus depreciation), can be thought of as increasing future consumption and does add to welfare. Therefore, from the welfare perspective, net measures are more appropriate. Net domestic product (NDP) is GDP minus the consumption of fixed capital (depreciation), or a measure of output that includes net rather than gross investment.

Figure 4 shows that the ratio of depreciation to GDP has trended upwards since the mid-1990s. This reflects two developments:



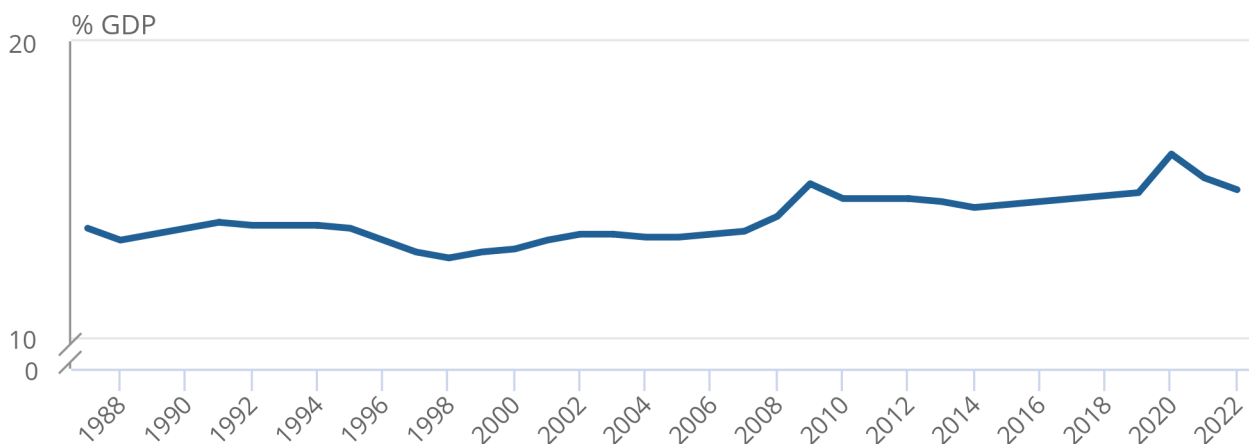
- the growing importance of faster depreciating information technology and intellectual property assets in the UK capital stock, including some intangible capital
- in value terms, the rapid growth of UK house and land prices relative to the GDP deflator; this largely accounts for why the value of depreciation has generally increased relative to GDP since the mid-1990s

**Figure 4: The value of depreciation has increased as a percentage of GDP since the mid-1990s**

The value of the consumption of fixed capital as a percentage of nominal gross domestic product (GDP), UK, 1987 to 2022

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The value of the consumption of fixed capital as a percentage of nominal gross domestic product (GDP), UK, 1987 to 2022



Source: UK National Accounts, The Blue Book: 2023 from the Office for National Statistics

Figure 4 also shows that value of depreciation increases sharply relative to GDP during times of recession, such as the global financial crisis (2008 to 2009) and the coronavirus (COVID-19) pandemic (2020 to 2021). This partly reflects the fall in the denominator as GDP declines, but also depreciation rates might rise in times of significant economic recession because of the premature retirement or scrapping of existing capital by businesses.

These changes suggest net measures of economic activity have risen less quickly in value terms than GDP with the gap particularly widening during major recessions.

## Net income and transfers to and from the rest of the world

For the purposes of calculating the income available to a population (either to consume or invest), it should not matter whether this originates from home or overseas. Income generated by the ownership of foreign assets increases these resources, whereas the income paid to foreign owners of domestic assets reduces it. Added to this are current transfers between the UK and the rest of world, which includes net payments to supranational organisations like the European Union and international aid, among others.

Therefore, from the perspective of measuring welfare, national measures are more appropriate than domestic measures. The primary income accounts in the balance of payments record the net flow of income between the UK and the rest of the world related to the ownership of the factors of production. While this includes the compensation of employees, the vast majority relates to investment income flows associated with the cross-border ownership of financial assets. Net national income (NNI) is a measure of economic activity equal to the sum of net domestic product and the balance from the primary income accounts.

Secondary income refers to the net transfers of income between the UK and the rest of the world. Net national disposable income (NNDI) is a measure of economic activity equal to the sum of net national income and the balance from the secondary income accounts.

Figure 5 shows the value in the UK of net primary and secondary income flows relative to GDP. Primary income flows tend to be variable, with the balance ranging from a surplus of 1.2% of GDP in 2002 to a deficit of 2.4% of GDP in 2016. Investment income flows are themselves reflective of volatile short-term movements in financial asset markets and exchange rates. For example, the primary income balance has been in surplus for the last two years, aided by the depreciation of sterling which has increased the value of foreign earnings in foreign currencies once converted into sterling.

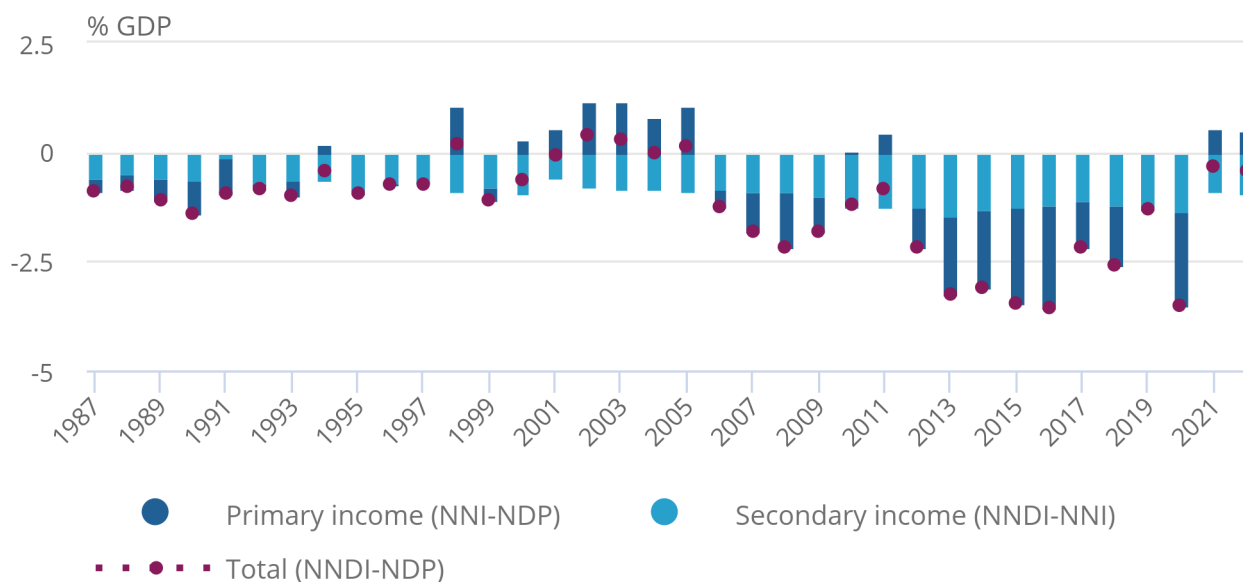
Although the volatility of international investment income flows is a feature of the National Accounts for most advanced countries, it is particularly relevant for the UK. Because of the presence of the City of London, the UK financial sector acts as an intermediary between lenders and investors from all around the world, and therefore the stock of financial assets and liabilities are a high multiple of GDP compared with other countries (UK foreign assets and liabilities are presently around six times annual GDP). This means that relative to the size of GDP, investment income flows are large compared with other countries, and the UK's primary income balance is more prone to significant changes, including between surplus and deficit.

**Figure 5: Net flow of income and transfers between the UK and the rest of the world is variable over time**

The balances on the primary and secondary income accounts, percentage of UK GDP, 1987 to 2022

## Figure 5: Net flow of income and transfers between the UK and the rest of the world is variable over time

The balances on the primary and secondary income accounts, percentage of UK GDP, 1987 to 2022



Source: UK Economic Accounts 2023 from the Office for National Statistics

**Notes:**

1. The primary income balance measures the net flow of international compensation of employees and investment income. The balance accounts for the difference between net national income (NNI) and net domestic product (NDP).
2. The secondary income balance measures net transfers of income between the UK and the rest of the world. The balance accounts for the difference between NNI and net national disposable income (NNDI).
3. The sum of primary and secondary income balances with the rest of the world account for the difference between NDP and NNDI.

In contrast, secondary income flows tend to be more stable. For example, contributions to the EU budget and the foreign aid budget have historically been based on fixed percentages of GDP. The UK has run a deficit on the secondary income balance of around 1% of GDP, reflecting a net outflow of transfers to the rest of the world.

Overall, the net deficit of the UK's primary and secondary income accounts have tended to reduce national measures of output relative to domestic measures, contributing to lower welfare measures compared with GDP.

## Consumption units

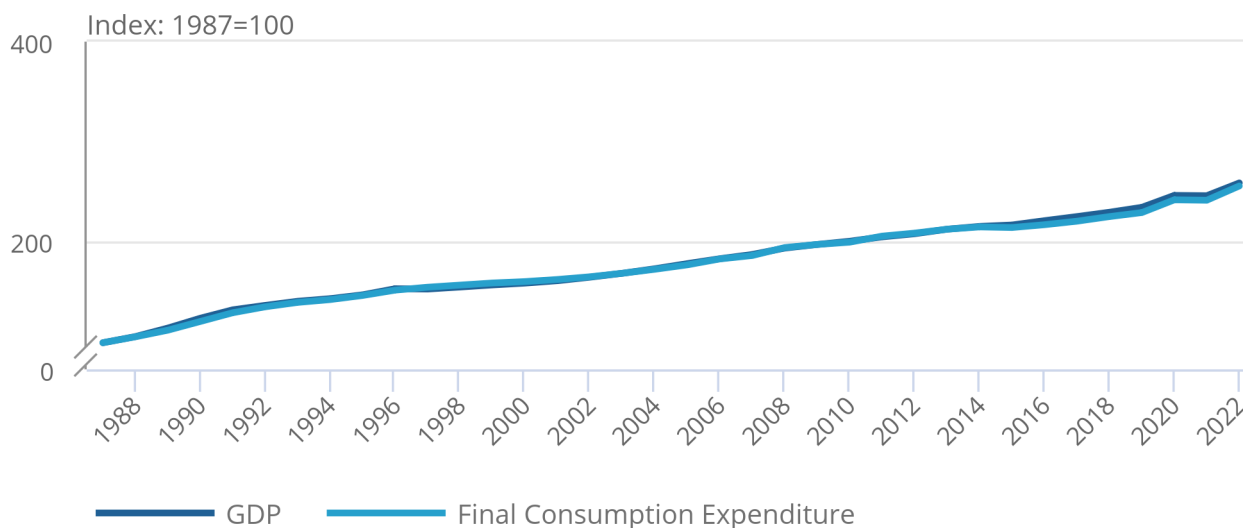
If income measures are to reflect current and future consumption possibilities it makes sense that all output is deflated by a consumption deflator. Figure 6 shows that the implied deflators for UK GDP and final consumption expenditure (FCE), which includes the household, general government and non-profit organisations serving households, have generally moved in line with each other. This suggests there would be only a small difference for using the former in welfare measurement. However, the slower growth in the final consumption deflator relative to the GDP deflator in recent years increases real income relative to real GDP.

**Figure 6: Gross domestic product (GDP) and final consumption deflators have generally moved in line with each other**

Implied deflators 1987 equals 100, UK, 1987 to 2022

### Figure 6: Gross domestic product (GDP) and final consumption deflators have generally moved in line with each other

Implied deflators 1987 equals 100, UK, 1987 to 2022



Source: UK Economic Accounts 2023 from the Office for National Statistics

Notes:

1. The final consumption expenditure (FCE) deflator is based on the consumption expenditure of the household, non-profit institutions serving households (NPISH) and general government sectors.

## Moving from GDP to real income, or production to welfare

Using National Accounts definitions, real income, or the sustainable level of consumption, is just the level of net national disposable income (NNDI) deflated by a price index for final consumption expenditure. It is derived from the level of nominal GDP through the following steps:

1. Gross domestic product (“money” GDP) minus consumption of fixed capital produces net domestic product (NDP).
2. NDP plus net income from the rest of the world (receipts excluding payments of primary income) produces net national income (NNI).
3. NNI plus current transfers from the rest of the world (receipts excluding payments of secondary income) produces net national disposable income (NNDI).
4. NNDI divided by the final consumption expenditure (FCE) deflator produces real income (sustainable consumption or welfare).

The Office for National Statistics (ONS) already publishes the following intermediary concepts in the Blue Book:

- net domestic product (NHRK)
- net national income (NSRX)
- net national disposable income (NQCP)

These can be found in Table 1.1 of our [National accounts at a glance supplementary table](#). The implied deflator for FCE is also easily calculated from Tables 1.2 and 1.3 in the Blue Book.

Following similar [analysis undertaken by the National Institute of Economic and Social Research](#), the difference between real GDP and real income can be separated into three effects:

- the depreciation effect is the value of depreciation in consumption units
- the net income effect is the value of net income and transfers with the rest of the world, also in consumption units
- the deflator effect is the difference between deflating GDP by a consumption deflator rather than the GDP deflator

Real income can move differently from real GDP for two reasons (Figure 7). Firstly, the nominal aggregates can diverge, either because of a change in the value of depreciation or because of primary and secondary incomes relative to the value of GDP. Secondly, the GDP deflator can move differently from the FCE deflator.

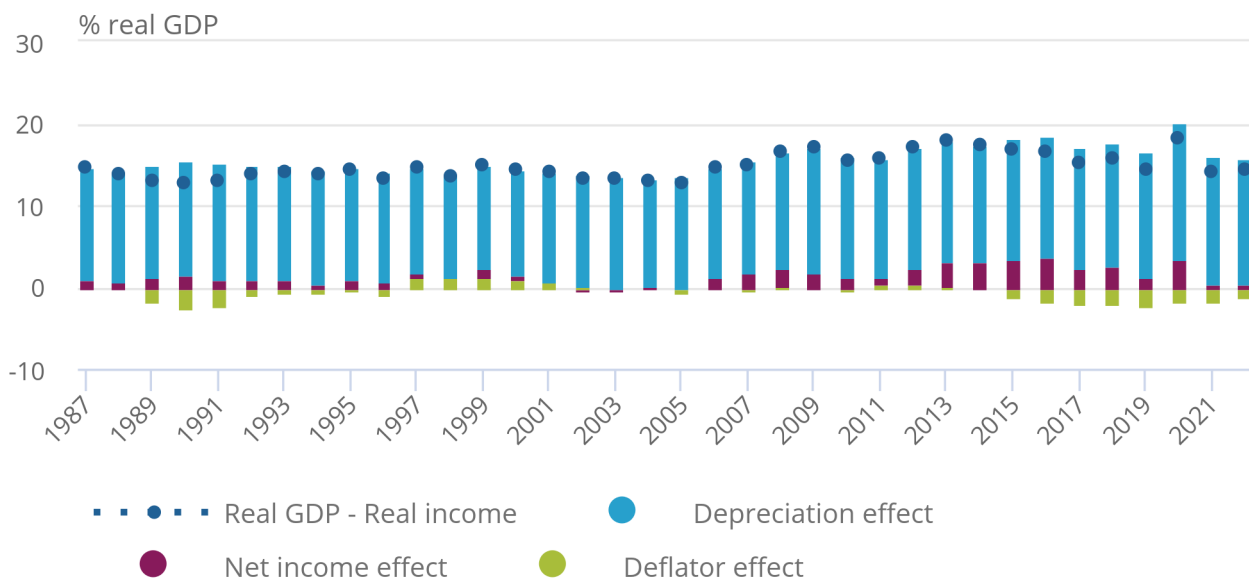
For the UK, the measurement of real income has varied between 12.8% and 18.2% lower than real GDP (Figure 7). Differences from one year to the next primarily reflect changes in the nominal aggregates, namely depreciation or net foreign income and transfers. For example, the gap between the two measures widened between 2006 and 2020 when the UK primary income balance moved into a sustained deficit.

**Figure 7: Real income has varied between 12.8% and 18.2% lower than real GDP**

The difference between real gross domestic product (GDP) and real income as a percentage of real GDP, UK, 1987 to 2022

### Figure 7: Real income has varied between 12.8% and 18.2% lower than real GDP

The difference between real gross domestic product (GDP) and real income as a percentage of real GDP, UK, 1987 to 2022



Source: UK National Accounts, The Blue Book: 2023 and author's calculations from the Office for National Statistics

## 5 . Comparing real GDP, real GDI and real income

This article has presented two measures of economic activity that are derived from gross domestic product (GDP) and aim to provide a greater focus on welfare. Neither is a new measure, and both are part of longstanding Office for National Statistics (ONS) publications reflecting discussions among statisticians on the measurement of the economy over many decades, and that have become embodied in the System of National Accounts.

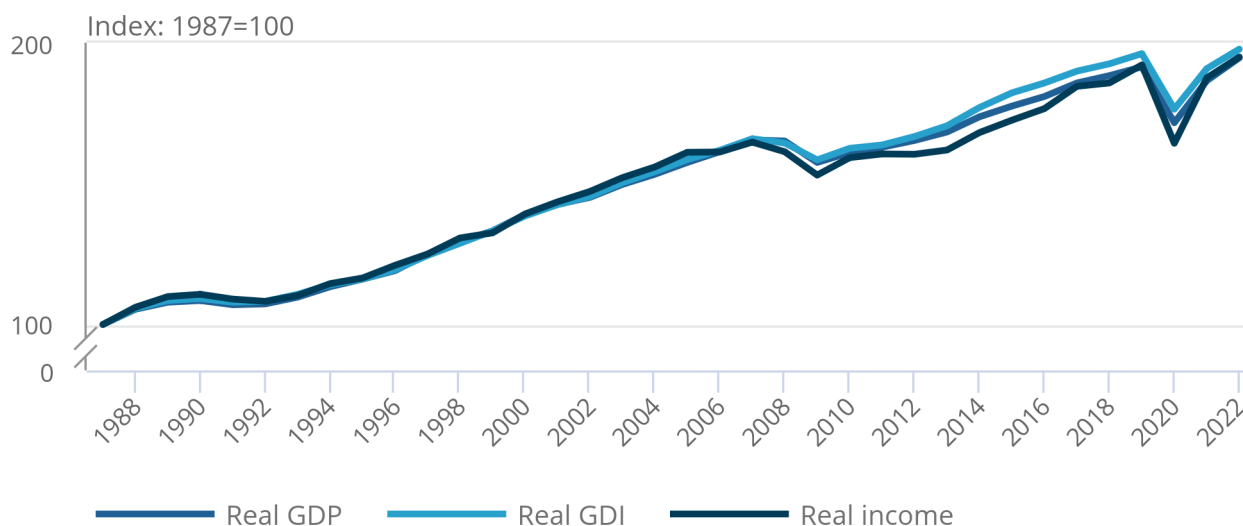
Figure 8 shows how both measures have moved relative to the level of GDP between 1987 and 2022. Real gross domestic income (real GDI) has generally increased at a faster rate, reflecting a long-term improvement in the UK terms of trade. Over the entire sample period, real income and real GDP have grown by roughly the same rate, but the gap between the two measures has varied substantially in this time span, suggesting that the growth in UK welfare is not always in line with output or production.

**Figure 8: Real GDI and real income have not always grown at the same rate as real GDP**

Real gross domestic product (GDP), real gross domestic income (GDI) and real income (1987 equals 100), UK, 1987 to 2022

### Figure 8: Real GDI and real income have not always grown at the same rate as real GDP

Real gross domestic product (GDP), real gross domestic income (GDI) and real income (1987 equals 100), UK, 1987 to 2022



Source: UK National Accounts, The Blue Book: 2023 and author's calculations from the Office for National Statistics

Looking to the future, the ONS will continue to develop its measures of [UK inclusive income](#), which analyse a broader range of economic activities than GDP, including the net and national measures discussed in this article. In addition, the next update to the System of National Accounts due to be published in 2025 is considering a proposal to extend net measures of economic activity to also include the depletion of natural resources to enhance welfare and sustainability considerations in the National Accounts.

## 6 . Gross domestic product and economic welfare data

### [UK National Accounts, The Blue Book: 2022](#)

Dataset | Released 31 October 2022

National accounts statistics including national and sector accounts, industrial analyses and environmental accounts.

### [UK Economic Accounts](#)

Dataset | Released 29 September 2023

Quarterly estimates of national product, income and expenditure, sector accounts and balance of payments.

### [Capital stocks and fixed capital consumption, UK: 1995 to 2021](#)

Dataset | Released 23 January 2023

Annual estimates of the value and types of non-financial assets used in the production of goods or services within the UK economy and their loss in value over time.

## 7 . Glossary

### **Gross domestic product**

Gross domestic product (GDP) is the total value of goods, services and structures produced by an economy in a certain time period.

### **Real gross domestic income**

The purchasing power of a nation's GDP in world markets. Also referred to as Command-basis GDP.

### **Net domestic product**

Net domestic product (NDP) is gross domestic product minus the value of fixed capital consumption; namely, the value of the capital stock that wears out or depreciates in a given time period.

### **Weitzman net domestic product**

The value of net domestic product divided by the consumption deflator.

### **Net national income**

Net domestic product plus net income flows with the rest of the world.

### **Net national disposable income**

Net national income plus net transfers to and from the rest of the world.

### **Real income**

The value of net national disposable income divided by a consumption deflator.



## 8 . Data sources and quality

The UK National Accounts are drawn together using data from many different sources. This ensures they are comprehensive and provide different perspectives on the economy, for example, sales by retailers and purchases by households. For further information on measuring gross domestic product (GDP), see our [Guide to the UK National Accounts methodology](#). For more quality and methodology information (QMI), see our [Gross domestic product QMI](#).

## 9 . Related links

### [Economic performance in France, Germany and the United Kingdom: 1997 to 2002](#)

Article | Released April 2004

Assesses the performance of France, Germany and the United Kingdom over the period 1997 to 2002.

### [Productivity versus welfare: or, GDP versus Weitzman's NDP](#)

Article | Released 6 September 2002

While gross domestic product (GDP) is still appropriate as a measure of output, this article argues that Weitzman's nominal net domestic product (WNDP) deflated by the price index for consumption is the appropriate measure of welfare.

### [Real national income](#)

Article | Released February 1996

Relates the definition of income to current and future consumption and provides estimates for the United Kingdom in the 20th century.

### [The purchasing power of GDP, UK: 2022](#)

Article | Released 8 February 2023

The impact of higher energy and commodity prices on the economy and the purchasing power of the UK.

### [UK inclusive income: 2005 to 2019](#)

Article | Released 9 June 2023

Estimates and analysis of economic progress which encompass a broader range of economic activities and assets than gross domestic product (GDP) does, such as unpaid household services, ecosystem services, and more.

### [Gross and net measures of the UK economy](#)

Methodology | Released 24 October 2023

Explains the concepts of gross domestic product and net domestic product in understanding production, welfare and sustainability.

## 10 . Cite this article

Office for National Statistics (ONS), released 13 November 2023, ONS website, article, [Gross domestic product and economic welfare, UK: 1987 to 2022](#)