

## Article

# International comparisons of GDP during the coronavirus (COVID-19) pandemic

The coronavirus (COVID-19) pandemic has led to record declines in gross domestic product (GDP) in advanced economies in 2020. International comparisons show that the UK has experienced the largest contraction in volume GDP amongst the G7 countries. However, international comparisons have also been complicated by how National Statistical Institutes (NSIs) record non-market output. This is an economic review article.

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# 1 . Main points

- The UK has experienced the largest fall in volume or “real” gross domestic product (GDP) over Quarter 1 to Quarter 3 2020 of the G7 economies, reflecting the effects of the COVID-19 virus itself, the imposition of public health restrictions and voluntary social distancing to contain its spread; on the other hand, the current price or “nominal” UK GDP fall is broadly comparable to G7 economies and saw a lower fall than Canada, Italy and Germany.
- The pandemic has highlighted some areas where the headline volume or “real” estimates of GDP may be less comparable between countries; current price or nominal estimates of GDP are more internationally comparable but do not always capture all the features of government services provided in the volume estimates.
- There are differences in how National Statistical Institutes (NSIs) record the volume of non-market output, particularly in capturing how the provision of healthcare and education has been impacted by the pandemic in these early estimates of GDP; estimates of healthcare and education in the UK are based on volume indicators, such as the number of treatments for healthcare or students enrolled for education.
- Our early estimates look to capture the new services that have been introduced because of COVID-19, as well as those existing services that have been significantly impacted; while government spending on healthcare and education has increased, the volume of education services provided to children in school and other health procedures being undertaken has fallen in 2020.
- With countries taking different approaches, it is hard to make comparisons during this time, but one helpful approach is to remove volume estimates of government consumption expenditure; this shows that the UK has still experienced the largest contraction but that the relative comparison with the rest of the G7 is not as large.
- The effects of public health restrictions and voluntary social distancing may have been larger in the UK, reflecting how there is relatively more social consumption (for example, recreation and culture; restaurants and hotels) and how these restrictions have been more stringent and in place for longer in the UK.
- We will work with the international community to learn more about how non-market output is recorded by NSIs as part of improving communications around international comparisons of GDP; as part of this work we hope over time to be able to make even more sophisticated international comparisons.

## 2 . Coronavirus and UK GDP

The coronavirus (COVID-19) pandemic has delivered a large shock to the global economy, reflecting the effects of the COVID-19 virus itself, the imposition of public health restrictions and voluntary social distancing to contain its spread. Many advanced economies experienced double-digit declines in gross domestic product (GDP) in the first half of 2020. While some of that activity has since been recovered in Quarter 3 (July to Sept) 2020 as restrictions were partially lifted, the level of volume GDP remains below its pre-coronavirus (end of Quarter 4 (Oct to Dec) 2019) levels for most economies.

GDP captures the value added through the production of goods and services in a country in a given period of time, typically a quarter or a year. It also measures the income that is earned from that production, as well as the total that is spent on final goods and services within the economy. GDP is recorded in current prices, often referred to as “nominal” and in volume terms, often called “real”.

The current price estimates simply record the value of output, income and expenditure. If we consider output, current price GDP can rise because we produce more goods and services, or because the prices of those goods and services are rising. The volume estimate of GDP takes out the effect of price rises tends to be the headline estimate, and typically is the focus for international comparisons.

Among G7 countries<sup>1</sup>, the UK economy experienced the largest contraction in volume GDP over the first six months of 2020. The 8.6% shortfall<sup>2</sup> in volume GDP as of the end of Quarter 3 2020 relative to its pre-coronavirus level (this is the quarterly GDP estimates as of the end of Quarter 4 2019) is the largest of the G7 countries (Figure 1). However, one notable feature has been that the relative shortfall in GDP is more marked for the volume estimates than in current prices. For instance, the current price shortfall for the UK is 3.4%, less than that of Canada, Italy and Germany.

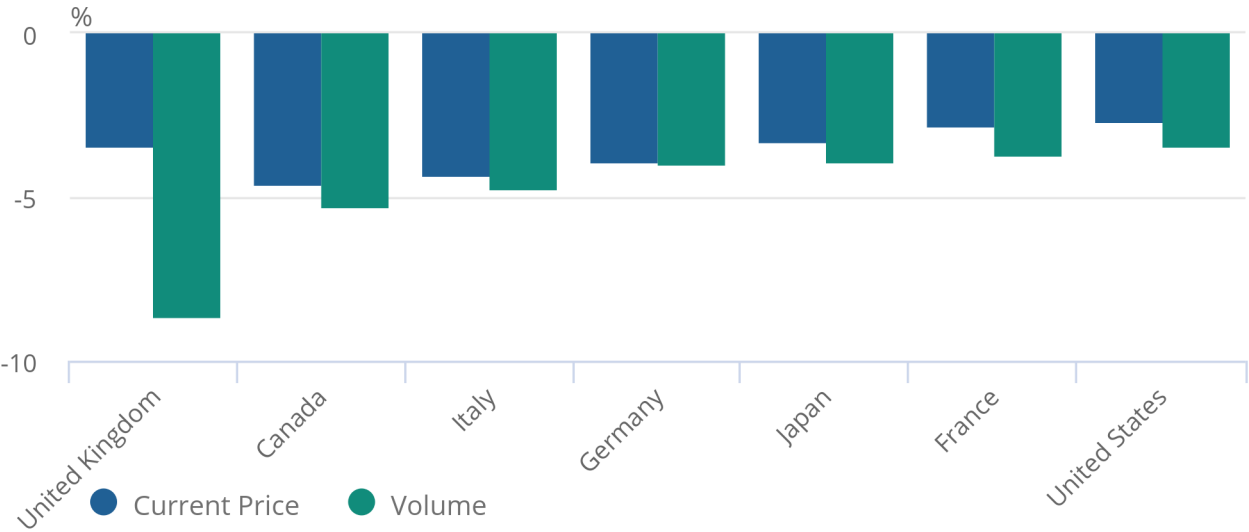
This means there have been large movements in the price for UK GDP in the time of the coronavirus pandemic, which do not appear to have been experienced elsewhere in the G7 so far. This raises the question of how comparable these headline GDP estimates are. This article explores that issue and also highlights alternative approaches to comparing GDP, including looking at international comparisons of current price estimates of GDP as well as volume estimates at this time.

**Figure 1: International comparisons of GDP highlight how the UK has been hit relatively worse than other advanced economies**

Current price and volume G7 GDP, Quarter 4 (Oct to Dec) 2019 to Quarter 3 (July to Sept) 2020

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Current price and volume G7 GDP, Quarter 4 (Oct to Dec) 2019 to Quarter 3 (July to Sept) 2020



Source: Office for National Statistics, Organisation for Economic Co-operation and Development

Notes:

1. All international figures correct as of 7 January 2021.

Voluntary behavioural change and the introduction of restrictions in the early months of 2020 to slow the transmission of the coronavirus led to record falls in GDP in advanced economies. This decline was unprecedented in the size and timing of the contraction, as well as how uneven the industry-level impacts have been. The industries that have been most adversely impacted have been those that are reliant on face-to-face interactions. Compared with previous downturns, this explains why it is unique that it has been the service industries that have experienced the largest impacts. While there was a rebound in Quarter 3 (Oct to Dec) 2020, the latest quarterly figures show that the level of volume UK GDP in Quarter 3 2020 is still 8.6% below its pre-coronavirus level.

The size of its economic impact has not been uniform for all countries. Figure 2 shows the cumulative change in volume GDP in the G7 economies<sup>3</sup> over the first three quarters (Jan to Sept) of 2020 relative to Quarter 4 (Oct to Dec) 2019. It implicitly captures that the peak-to-trough fall was most marked for the UK – a 21.2% decline over the first half of the year – while the size of the contraction ranged from 8.8% to 18.9% for the other G7 economies. This helps explain the relative shortfalls in volume GDP as at the end of Quarter 3 2020, which has been most pronounced for the UK.

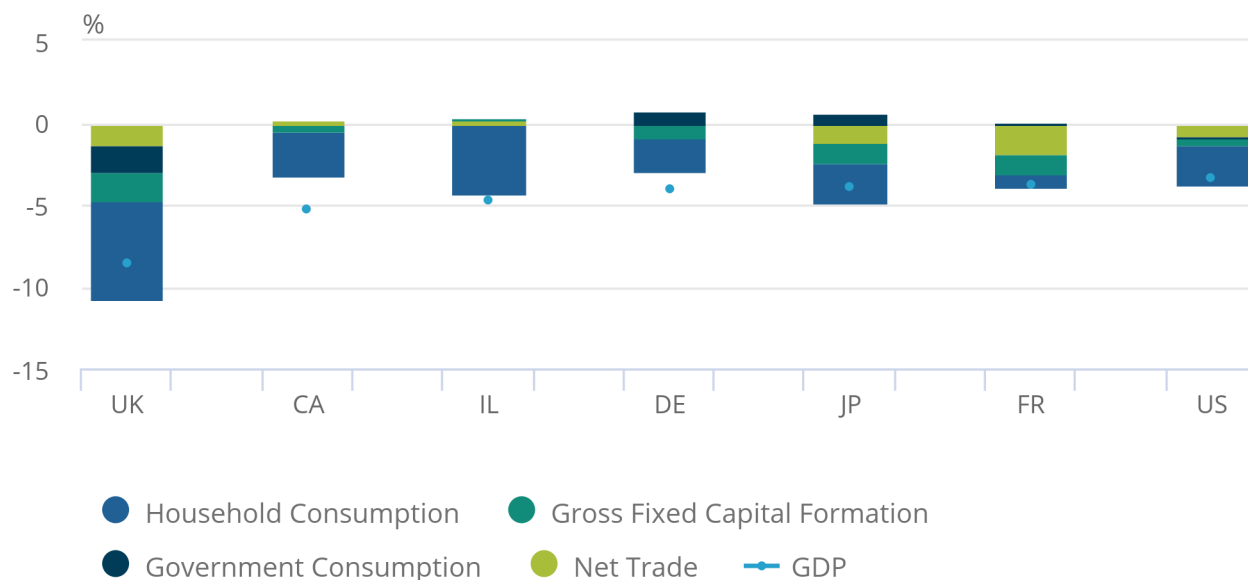
Understanding the structural composition of the G7 economies provides some insight as to why the UK has experienced the largest economic impact from the pandemic. While there have been large absolute movements in spending in 2020 for these countries, Figure 2 shows that it is the relatively larger declines in the volume of spending by households and government in the UK that explain its relative performance. Around three-quarters of this 8.6% shortfall in volume UK GDP is explained by the fall in household consumption expenditure and a further one-fifth by government consumption expenditure. While the retrenchment of consumers explain why the other G7 economies are still below their pre-pandemic levels, the volume of government spending has played little, if any, role in the shortfall for these other countries. This may be influenced by the different statistical approaches that have been implemented by National Statistical Institutes (NSIs) in measuring the output volumes of the health and education in this period of lockdown.

**Figure 2: The relative underperformance of the UK economy reflects lower levels of volume spending by households and government**

UK, Quarter 4 (Oct to Dec) 2019 to Quarter 3 (July to Sept) 2020

## Figure 2: The relative underperformance of the UK economy reflects lower levels of volume spending by households and government

UK, Quarter 4 (Oct to Dec) 2019 to Quarter 3 (July to Sept) 2020



Source: Office for National Statistics, Organisation for Economic Co-operation and Development

### Notes:

1. All international figures correct as of 7 January 2021.
2. For illustrative purposes, non-profit institutions serving households final expenditure has not been included, nor have changes in inventories and acquisitions less disposals of valuables.
3. Please note the following abbreviations: UK= United Kingdom, CA= Canada, IL= Italy, DE= Germany, JP= Japan, FR= France, US= United States.

## Notes for Coronavirus and UK GDP

1. The G7 comprises of Canada, France, Germany, Italy, Japan, the UK and the United States.
2. Estimates of the shortfall in GDP would be larger if based on where these economies would have expected to have been in the absence of the pandemic, rather than the level as of the end of Quarter 4 (Oct to Dec) 2019.
3. Future analysis will cover a wider range of countries as part of our efforts in producing international comparisons of how economies have been impacted by the coronavirus pandemic, including those that are have been cited by others in their own research so far, such as Spain.

### 3 . Household consumption expenditure

There have been large declines in current price and volume estimates of household consumption expenditure for the G7 economies<sup>1</sup>. Governments have implemented a range of restrictions on activity to help reduce transmission rates, which have not only led to a shutting down of large parts of the economy but have also had profound impacts on the mobility of individuals. However, there was variation in the speed in which these were implemented as well as how long these were kept in effect.

The [Oxford COVID-19 Government Response Tracker](#) (OxCGRT) collects information on the range of policy responses that have been taken to respond to the pandemic, including “the strictness of ‘lockdown style’ policies that primarily restrict people’s behaviour”. These include school and workplace closures as well as restrictions on internal movement and international travel, which have impacted upon the supply and demand of goods and services.

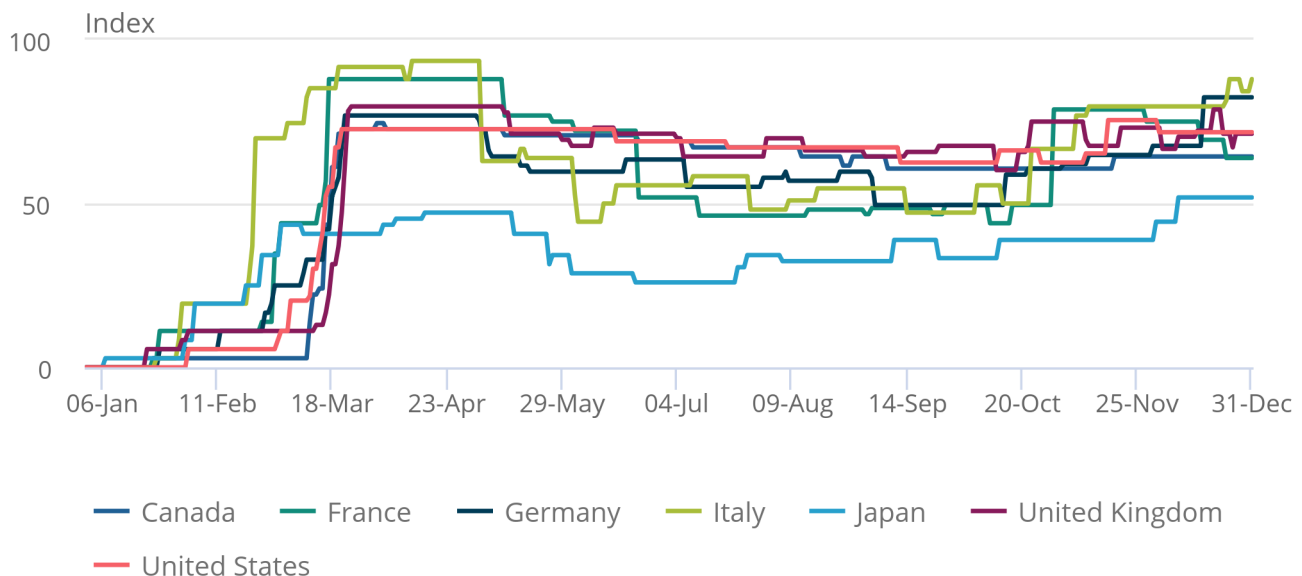
Figure 3 shows the relative stringency levels of such restrictions that have been imposed in the G7 countries over the course of 2020. This shows that the UK was one of the last countries to put such public health restrictions in place, in part reflecting the relative timing of the rise in infection rates. The restrictions have also been typically more stringent for the UK and in place for a longer period of time.

**Figure 3: The level of stringency in the UK has remained relatively high throughout 2020 compared with fluctuating levels in other G7 countries**

Stringency Index, 2020

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Stringency Index, 2020



Source: Oxford COVID-19 Government Response Tracker

It is not straightforward to separate out these voluntary and involuntary effects, especially as it is likely that there would have been a retrenchment by individuals from certain types of transactions, even if mandatory closures had not been put in place reflecting their increased levels of caution. Recent analysis by the [International Monetary Fund](#) finds that “the adoption of lockdowns was an important factor in the recession, but voluntary social distancing in response to rising infections also contributed very substantially to the economic contraction”.

This would imply that it is not only the imposition of lockdown restrictions by countries that would explain the relative economic performance, but the extent to which there have been these behavioural responses by individuals to reduce their interactions with others. Voluntary social distancing is likely to be partly explained by the levels of virus risk in the economy – the more prevalent the virus is, the higher the levels of voluntary reductions in social consumption.

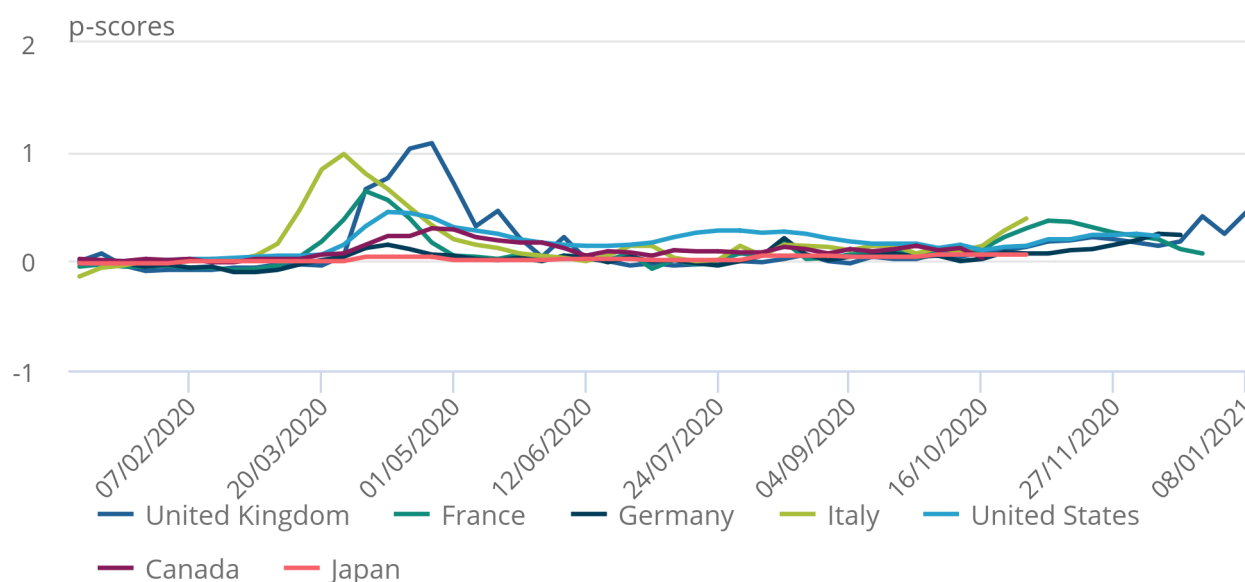
Figure 4 shows that the UK had the highest proportional excess mortality<sup>2</sup> amongst the G7 countries that occurred in April 2020. All-cause mortality accounts for deaths that have occurred as a direct and indirect effect of the virus and the associated restrictions as well as those deaths that have occurred in all settings. The p-scores are the percentage of excess deaths in 2020 against the five-year average, and so serves as an indication of the risk of the virus at a given time<sup>3</sup>. For example, a p-score with a value of 1 would be equivalent to a doubling of mortality compared with what would typically be observed at that time of year. In the UK, it reached a peak of 1.08 times that of the five-year average for 2015 to 2019 – that is, at the peak in the UK, there were over double the number of deaths we would have expected. Italy had a similar, but lower, peak a few weeks prior to this. Japan and Germany have had the lowest levels of all-cause excess mortality throughout 2020.

**Figure 4: The UK has experienced higher rates of excess mortality earlier in the pandemic**

Proportional trend in all-cause excess mortality for G7, weeks ending 03 January 2020 to 08 January 2021

## Figure 4: The UK has experienced higher rates of excess mortality earlier in the pandemic

Proportional trend in all-cause excess mortality for G7, weeks ending 03 January 2020 to 08 January 2021



Source: Office for National Statistics, National Records of Scotland, Northern Ireland Research Agency, Eurostat, e-Stat Japan, Centers for Disease Control and Prevention US, Statistics Canada

### Notes:

1. Deaths for the UK are based on the date the death was registered rather than the date the death occurred.
2. Deaths for all other countries are based on the date the death occurred.
3. Data for Japan are only available monthly – one p-score is presented for all weeks in a given month
4. p-scores are measures of proportion excess all-cause mortality. It captures the percentage of excess deaths against the five-year average, calculated as the number of deaths in 2020 minus the five-year average number of deaths for the same period divided by the five-year average number of deaths.

The economic impact of these restrictions will also depend on the structural composition of economies, given how these impact upon some types of transactions more than others. For example, one unique feature of this coronavirus shock has been that it is those services industries that are reliant on face-to-face interactions that have seen larger contractions. Recent analysis by the [Organisation for Economic Co-operation and Development \(OECD\)](#) finds that “in the first two-three months of the pandemic, output fell particularly sharply in service activities requiring close proximity between consumers and producers, or large crowds, or travel, declining by 60-80% in several countries”. As such, the industrial compositions will impact on the extent to which these restrictions will weigh on a country’s GDP. For example, services output comprises 79% of UK GDP, while consumer-facing services such as retail trade, food and beverage serving activities, travel and transport, and entertainment and recreation play a prominent role in the UK economy.



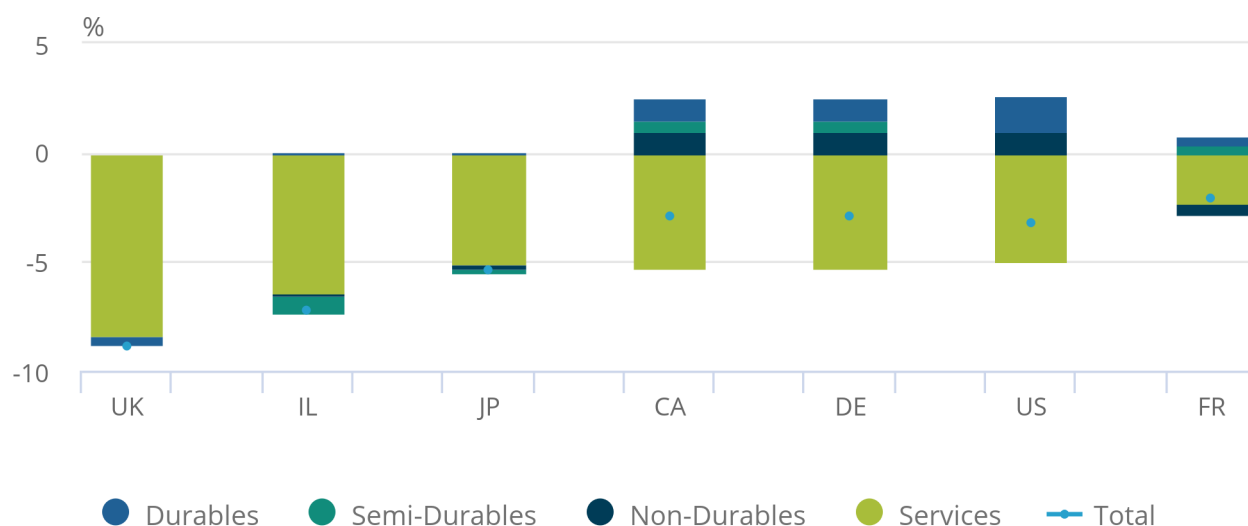
Movements in household consumption expenditure tend to be cyclical in nature, moving in line with the broader economy. This reflects how individuals adjust their spending to changes in current and/or expected employment and income. However, it is not the case that all types of spending exhibit the same cyclical properties. Durable and semi-durable goods are those that are used repeatedly or continuously over a period of more than one year. In contrast, non-durable goods are those that are only available to be used once, such as food and drink. As such, spending on durables tends to exhibit more cyclical properties, given that these types of goods provide a flow of services that can be consumed over a longer period of time and so do not need to be purchased as often. It might be that such expenditures are postponed rather than cancelled, reinforcing its cyclical properties. In contrast, spending on non-durable goods and services tend to exhibit less cyclicality.

### Figure 5: There has been a more pronounced impact on households spending on services in the UK

UK, Quarter 4 (Oct to Dec) 2019 to Quarter 3 (July to Sept) 2020

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UK, Quarter 4 (Oct to Dec) 2019 to Quarter 3 (July to Sept) 2020



Source: Office for National Statistics, Organisation for Economic Co-operation and Development

#### Notes:

1. All international figures correct as of 7 January 2021.
2. Total refers to household consumption expenditure (domestic concept) and will exclude tourism.
3. Semi-durables information is not available for the United States, which are included as part of non-durables.
4. Please note the following abbreviations: UK= United Kingdom, CA= Canada, IL= Italy, DE= Germany, JP= Japan, FR= France, US= United States.

Figure 5 shows that, unlike previous downturns, the fall in expenditure has been driven by a sharp contraction in the consumption of services. This has been most pronounced in the UK in recreational and sporting services and cultural services, which include spending on services that are provided by sport stadiums, golf courses, gyms, cinemas, theatres and concerts. There have also been sharp falls in spending on restaurants and hotels, which had been impacted by the closure of non-essential businesses as part of lockdown policies in the UK. Recently published experimental indicators produced by the Bank of England [tracks UK spending on credit and debit cards](#). This also highlights how it has been social spending that has experienced the largest impact through 2020. Relative to its pre-coronavirus (Quarter 4 (Oct to Dec) 2019) levels, social spending was around 80% lower at the time of the first national lockdown imposed in March and was still lower by around half at the end of December.

Some of these services have been impacted by the imposition of public health restrictions. It might also be explained as services also typically involve physical proximity to others and so individuals are likely to have shifted away from such transactions in response to concerns about the transmission of the virus. It is also the case that the impact will in part depend on the extent to which there are close substitutes for those impacted types of expenditure. For example, there has been some evidence that there has been a switch from restaurants to takeaway services. However, this might be less possible for all types of recreation and culture services, for instance. Similarly, the recent shift from physical retail to online retail might be more of a challenge for the provision of all types of services.

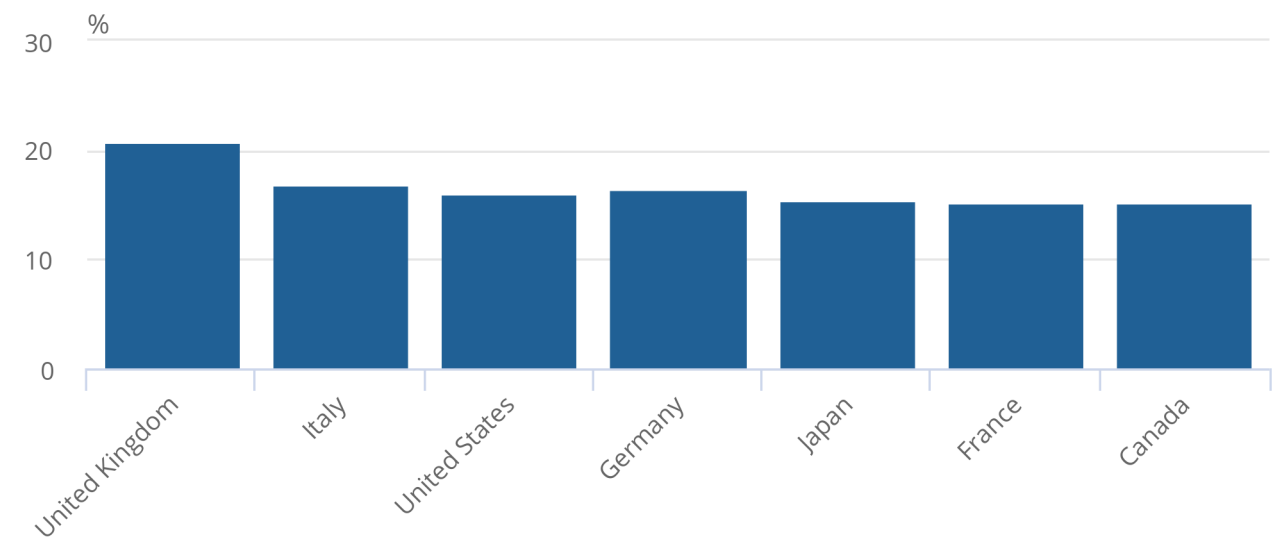
Social consumption captures spending on eating out, leisure travel and cultural activities. Individuals have been unable and/or unwilling to spend on these types of social activities, as restrictions constrain spending while heightened levels of concerns and uncertainty also adversely impact on these types of spending that typically involves direct contact between consumers and businesses. These are the specific types of consumer expenditure on services that have been most impacted. Figure 6 shows that this comprised around a fifth of total spending by households prior to the pandemic, higher than in the other G7 countries.

Figure 6: Social consumption plays a more important role in the UK

G7, 2018

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G7, 2018



Source: Office for National Statistics, Organisation for Economic Co-operation and Development

Notes:

1. All international figures correct as of 7 January 2021.
2. Social consumption refers to spending on recreation and culture, and restaurants and hotels, which is shown as a proportion of total household spending in 2018.
3. These figures are recorded in current prices.

Notes for Household consumption expenditure

1. Recent analysis explains how the [fall in household income has not reflected the fall in national income](#), reflecting the introduction of the Coronavirus Job Retention Scheme (CJRS). However, there has also been a record increase in the saving ratio, reflecting an increase in precautionary savings as well as the effects of restrictions on the ability to spend this income. It is also helpful to consider the financial positions of households as part of understanding the impact on household consumption expenditure.
2. The use of all-cause mortality, rather than deaths from COVID-19, avoids differences in how COVID-19 deaths are coded and counted between countries. This allows us to draw comparisons between countries on the impact the virus has had.
3. There is a lag between peak in infection rates and peak in mortality rates.
4. This is taken from the latest Quarterly National Accounts, published in December 2020, and refer to 2018 gross value added (GVA) weights.
5. Semi-durables tend to have a shorter expected lifetime than durables.

## 4 . Government consumption expenditure

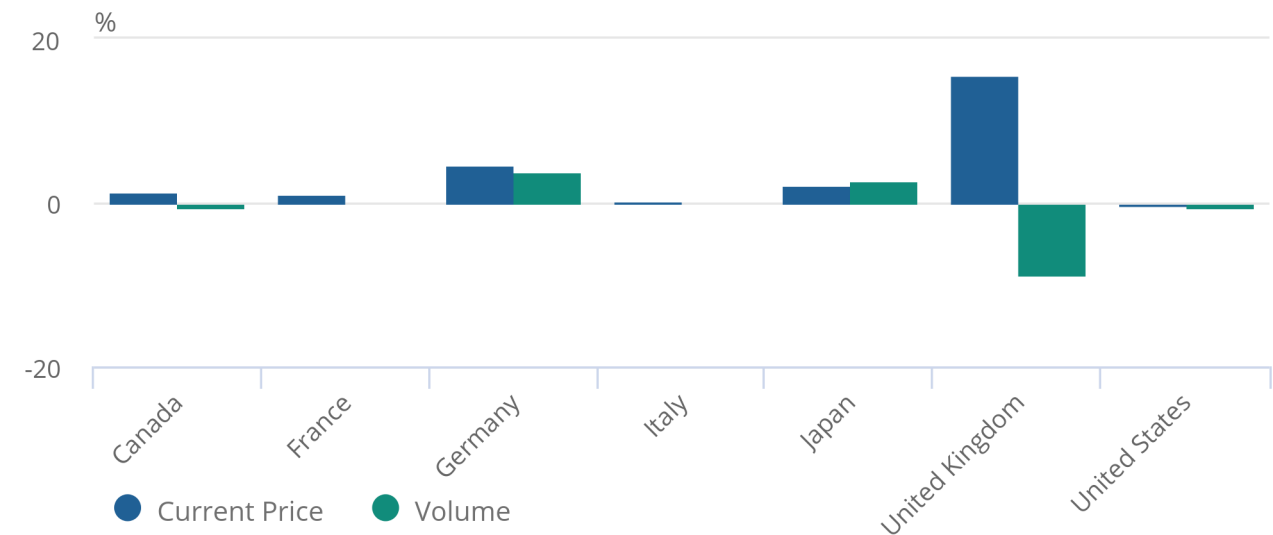
The structural composition itself does not fully not explain why the volume shortfall in UK gross domestic product (GDP) is more than twice its current price shortfall. It also does not explain why only the UK has experienced this phenomenon. Another part of the explanation is the measurement of current price and volume estimates of government consumption expenditure by National Statistical Institutes (NSIs). Figure 7 shows that the relative size of the flows of these types of government spending has been much larger in the UK. However, it also shows that there has been a 9% cumulative decline in volume expenditure, despite a 16% cumulative increase in current price expenditure over this period for the UK.

**Figure 7: There have been large but offsetting movements in current price and volume estimates of UK government consumption expenditure, in contrast to those for the other G7 economies**

G7, Quarter 4 (Oct to Dec) 2019 to Quarter 3 (July to Sept) 2020

Figure 7: There have been large but offsetting movements in current price and volume estimates of UK government consumption expenditure, in contrast to those for the other G7 economies

G7, Quarter 4 (Oct to Dec) 2019 to Quarter 3 (July to Sept) 2020



Source: Office for National Statistics, Organisation for Economic Co-operation and Development

Notes:

- 1. All international figures correct as of 7 January 2021.

Government consumption expenditure refers to the spending incurred by government in its production of non-market final goods and services and market goods and services provided as social transfers in kind. The former covers those expenditures for collective consumption that benefit all of society, such as public goods like defence. The latter covers those expenditures for individual consumption that are incurred by government on behalf of an individual household, which include health care and education.

However, estimating the value and volume of expenditure in producing these services is challenging for all NSIs, as there is typically no market price for which this output is sold – it is supplied free or at prices that are not economically significant<sup>1</sup>. The challenge has been further complicated by the impact of the coronavirus pandemic on the provision of some types of non-market output, specifically healthcare and education. From a National Accounts perspective, international comparisons are also impacted by the fact that health and education systems are not the same in each country, including the funding and control arrangements that are in place. This has led to inherently higher levels of uncertainty in these early estimates. As more information becomes available over time, this will be more likely to be prone to revisions.

Our current price estimates for the most recent quarters are provisional, primarily reflecting available information from the monitoring and reporting of spending by central government departments<sup>2</sup> as well as the latest budgetary information. The increase in current price estimates reflects additional expenditure for healthcare in response to the coronavirus pandemic, including (but not limited to) the purchases of additional personal protective equipment (PPE) and expenditure on coronavirus testing and tracing. It also reflects the planned increases to expenditure on healthcare as part of the Department of Health and Social Care five-year [NHS funding settlement](#) that was announced prior to the pandemic in 2018. There have been modest increases in expenditure on education, which are broadly in line with those seen prior to the coronavirus pandemic.

Recording the volume estimates of this expenditure is not straightforward for NSIs. The conventions<sup>3</sup> that are widely followed in estimating the volume of non-market output include:

- the volume cost of production, which covers compensation of employees, the intermediate consumption of goods and services, the consumption of fixed capital and other taxes less subsidies on production
- the change in labour input, such as the number of employees
- a volume indicator of that output, such as the number of treatments for healthcare or students enrolled for education, reflecting the cost-weights of the production of the range of non-market goods and services that are produced

As such, current price estimates of GDP are more internationally comparable in how these are compiled. These are less susceptible to differences in methodology but do not capture all the features of government services provided in the volume estimates. NSIs have discretion of which convention to implement in the recording non-market output. It is acceptable for volume estimates to be produced either by deflating inputs or by direct volume measurement – and this will often reflect what timely and relevant information is available to capture the provision of that output at that point in time. However, it is in understanding the how this is carried out in practice that allows for improved understanding of how comparable these are.

In the UK, we follow the principle of direct volume indicators in producing estimates of healthcare and education output. Efforts to measure government output directly were first introduced in the UK National Accounts in 1998, specifically allowing for changes in productivity of the provision of these government services to be captured for the first time. These principles were then reinforced by the Atkinson Review (2005) into the [Measurement of Government Output and Productivity for the National Accounts \(PDF, 1.07MB\)](#). The focus was “to advance methodologies for the measurement of government output, productivity and associated price indices in the context of the National Accounts”.

One of the main recommendations was that direct measures of output should be used in the measurement of non-market output, seeking “to measure what is achieved by spending on public services”. Eurostat explains that the implementation of policy responses to reduce the spread of the coronavirus pandemic have [had impacts on the production of non-market output \(PDF, 75KB\)](#), which NSIs would have to consider in compiling the National Accounts. For example, it highlights how sum-of-costs would be impacted if the government continues to pay the normal compensation of employees, even though employees might be working shorter hours or not at all. In this case, the measured output in current prices would be largely unchanged, even though activity is clearly reduced, so affecting volume estimates. It also explains the importance that volume indicators “cover the new services that have been introduced because of COVID-19, as well as existing services that have been significantly expanded or reduced”.

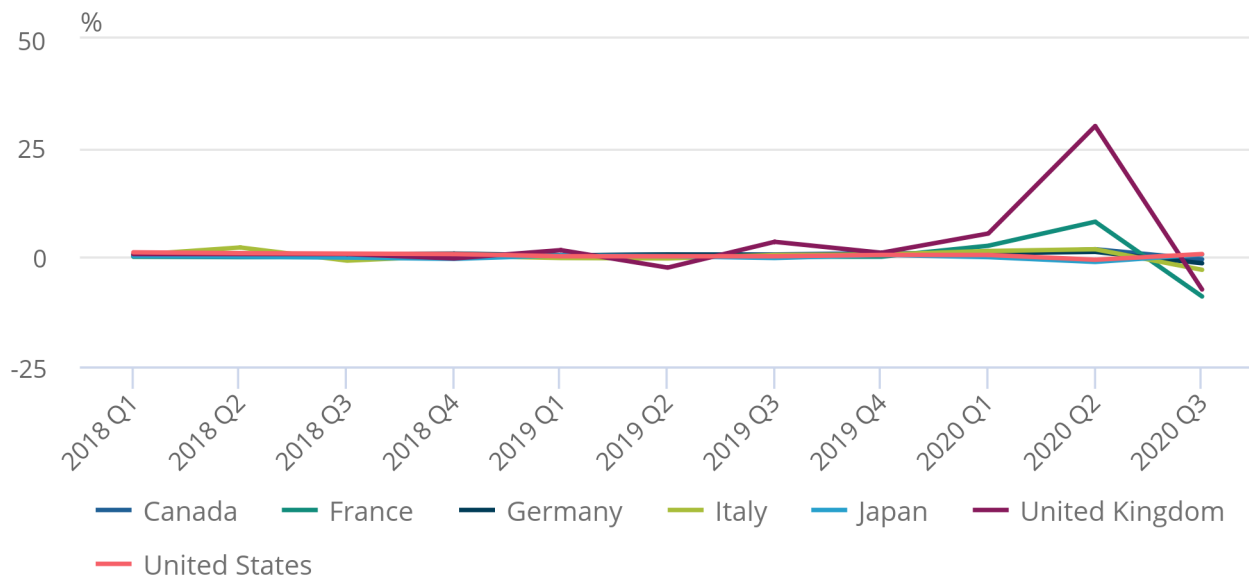
The health and economic response to the pandemic has led to a fall in the volume of some public services. Typically, the provision of these services is not cyclical – the level of healthcare and education provided would not normally be impacted in a downturn. However, that has clearly not been the case in 2020 as the NHS has had to reprioritise how it delivers its healthcare services and school closures have been introduced as part of the public health response. While the volume of these services has been impacted, there has not been a decline in current price spending on public services (or the sum-of-costs in providing those services). These current price and volume movements are then reflected in the movements in the implied price of that expenditure, which are large by historical and international standards (Figure 8) and points to how other countries might not be producing their volume estimates of non-market output in the same way at this moment.

**Figure 8: There have been unprecedented movements in the implied deflator for government consumption expenditure in the UK**

G7, Quarter 1 (Jan to Mar) 2018 to Quarter 3 (July to Sept) 2020

Figure 8: There have been unprecedented movements in the implied deflator for government consumption expenditure in the UK

G7, Quarter 1 (Jan to Mar) 2018 to Quarter 3 (July to Sept) 2020



Source: Office for National Statistics, Organisation for Economic Co-operation and Development

Notes:

1. All international figures correct as of 7 January 2021.

## Notes for Government consumption expenditure

1. A price is not economically significant when it has little or no influence on how much the producer is prepared to supply and is expected to have only a marginal influence on the quantities demanded.
2. For healthcare, we use an extract of the HM Treasury database that is used for monitoring and reporting spending by central government departments, including the Department of Health and Social Care and the devolved administrations. Estimated spending by English academies on education is also taken from this database, while spending on education by local government is taken from budget information for the financial year 2020 to 21. We update our estimates at least once a quarter, picking up the latest available information.
3. The [2010 European System of Accounts \(PDF, 6.40MB\)](#) recommends for healthcare and education that “the estimates of production and of consumption in volume terms have to be calculated on the basis of direct output measures — not adjusted for quality — by weighing up the quantities produced by the previous year unit costs of those services, without applying any correction to them in order to take account of quality”.
4. In the UK, there are instances where we have the available volume indicators to produce estimates of health and education output, but this is not the case for all types of non-market output. As such, there are also examples where we produce estimates of non-market output that reflect the sum-of-costs. Other NSIs will have their own experiences of which is the most appropriate convention to implement.
5. This is also in line with the [Eurostat Handbook on Prices and Volume Measures in the National Accounts \(PDF, 1.73MB\)](#) where the appropriate output indicators cover the services that are provided to external users, capturing a low-level of output as possible, and are weighted by the costs of each type of output in the previous year.
6. This is an implied price by comparing current price and volume estimates, as there is no market price that is observed.

## 5 . Volume estimates of health

In the UK, we estimate the volume of non-market healthcare services<sup>1</sup> using volume indicators that capture the numbers of activities and procedures that are carried out which are then weighted together by the cost of each activity. Eurostat explains that during the pandemic there may be examples in the provision of health services of [“new services may be operating temporary test and treatment facilities” \(PDF, 75KB\)](#) as well as how “there may also be significant reductions in some non-COVID-19 related health services, in order to reduce the risk of contagion or to keep hospital beds ready for COVID-19 patients”.

The impact of the coronavirus (COVID-19) pandemic on the provision of healthcare output is not straightforward. While there has been an increase in current price expenditure on healthcare in response to the pandemic, the impact on the volume estimates will reflect the change on the level and composition of healthcare activities. If there is an increase in additional high-cost (low-cost) activities, then there would be an increase (decrease) in healthcare output, all else the same.

Despite the large current price increase in healthcare spending, Figure 9 shows that there have also been large falls in many types of healthcare services. These include elective and non-elective care, the treatment of outpatients, accident and emergency services as well as consultations by General Practice consultations. These selected examples of healthcare comprise around three-quarters of total healthcare provision, which experienced sharp declines in Quarter 2 (Apr to June) 2020 in particular. This reflects how the NHS has had to prioritise the treatment of hospitalised patients, while there may have also been a reduction in demand for these services reflecting heightened levels of concerns about the transmission of the virus.

Our volume estimates for healthcare in the most recent quarters are provisional, which we update as and when new information becomes available. We collate healthcare activity data from published sources, supplemented by estimates supplied by NHS England when published figures are not yet available. Some healthcare activity has reduced due to the pandemic, while other areas have increased. We capture the effect of both within our estimates of healthcare in volume terms. [Our most recent quarterly national accounts bulletin](#) also included an initial approximate adjustment to capture coronavirus testing and tracing.

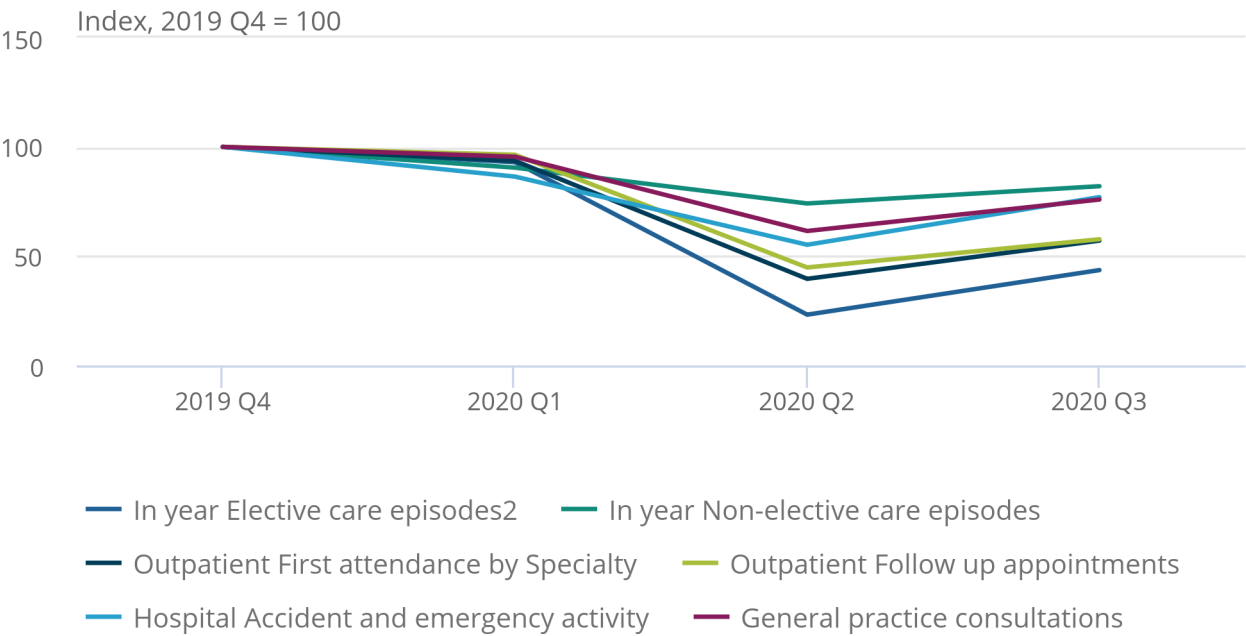


Figure 9: The pandemic has led to marked falls in many health activities

G7, Quarter 4 (Oct to Dec) 2019 to Quarter 3 (July to Sept) 2020Quarter 4 2019 to Quarter 3 2020

Figure 9: The pandemic has led to marked falls in many health activities

G7, Quarter 4 (Oct to Dec) 2019 to Quarter 3 (July to Sept) 2020Quarter 4 2019 to Quarter 3 2020



Source: Office for National Statistics

## Notes for Volume estimates of health

1. It is helpful to note that the provision of healthcare and education will not be primarily non-market output for all other G7 countries, as it is for the UK. This will impact on how much the role of how National Statistical Institutes (NSIs) record estimates of non-market output impact upon the comparability of estimates of GDP.

## 6 . Volume estimates of education

The volume of education output is based on cost-weighted activity indicators. These weight together the number of full-time equivalent students in each type of educational settings by the costs of providing that education. The costs capture the relative unit costs of production, such that increases in the number of students in a relatively high (low) weight activity consequently increase measured education output by a relatively large (small) amount.

Typically, our estimates of student numbers are provided by the school censuses in England, Scotland, Wales and Northern Ireland. These are carried out once per year and we would not expect there to be much change within the year, so these volume indicators have typically been appropriate to capture the provision of education output. However, one of the health policy responses has been the closure of schools. As such, the reliance on these annual student numbers would not capture any reduction in activity, if left unadjusted. Eurostat explains that “if the indicators used do not capture the reduction in activity where it is clear that teaching has stopped, or only a subset of pupils are being taught, [adjustments to the indicators should be made during the period concerned](#)” (PDF, 75KB). Recent analysis explains how we have [incorporated two adjustments to our volume indicators to capture the effect of school closures on education output](#).

Firstly, we have been able to incorporate more timely information on the number of students that have been attending school, including children of key workers and vulnerable children. This also captures the effect of the re-opening of schools, including how attendance had not returned to its pre-coronavirus (Quarter 4 (Oct to Dec) 2019) level as part of the public health response.

Secondly, it has also been the case that the provision of education has continued through this period of school closures through remote learning. Education services that have been delivered remotely count as non-market output just as those that have been delivered in person, if these are perfect substitutes. However, in practice this is unlikely to have been the case, so there would be a lower level in the volume of the service delivered, compared to before the pandemic. We have worked in partnership with [Teacher Tapp](#) to gather information from teachers about the amount of education provided remotely to pupils learning at home. This allows us to ensure that estimates for home schooling are included, and that estimates for support from parents are excluded (because parental instruction falls outside the definition of gross domestic product (GDP)).

## 7 . Practices of National Statistical Institutes (NSIs)

We have produced our best interpretation of the information available on volume indicators to reflect how the pandemic has impacted on the provision of healthcare and education services.

We have carried out some initial work to learn more about the experience of other National Statistical Institutes (NSIs), who have also looked to implement the international guidance that applies to how to record non-market output. The range of experiences reflects the inherent challenges of this complex topic (Table 1), specifically the availability of timely and relevant information at a sufficiently detailed level. These are only provisional findings and we will continue to work with other NSIs in improving the collective understanding of how to best record and measure non-market output. Further research is needed to how these conventions for non-market output have been implemented by all NSIs, including how the effects of the pandemic have been reflected in estimates of GDP.

It is also important to realise that there is a production cycle of GDP, where early estimates are revised as more information is collected and processed. NSIs also have their own revision policies, such that the effects of the coronavirus pandemic on the provision of non-market output might be better captured in more later estimates of GDP. It might be that some NSIs will change their measurement of non-market output over time when more information becomes available, for example output indicators that may not have been available as input for the earlier estimates. As such, estimates of volume GDP in the time of the pandemic might be more comparable at a later point in time.

Table 1: Most NSIs produce estimates of the volume of healthcare and education services based on the deflation of the inputs, unlike the UK Healthcare and Education

	Canada	France	Germany	Italy	Japan	United Kingdom	United States
<b>Health</b>							
<b>Hospitals</b>	Deflation of inputs	Deflation of inputs	Deflation of outputs	Deflation of outputs	Deflation of outputs	Output indicators	Deflation of outputs
<b>General Practitioners</b>	Deflation of inputs	Deflation of outputs	Deflation of outputs	Deflation of inputs	Deflation of outputs	Output indicators	Deflation of outputs
<b>Specialist Medical Services</b>	Deflation of inputs	Deflation of outputs	Deflation of outputs	Deflation of inputs	Deflation of outputs	Output indicators	Deflation of outputs
<b>Other Health Services</b>	Deflation of inputs	Deflation of outputs	Deflation of outputs	Deflation of inputs	Deflation of outputs	Output indicators	Deflation of outputs
<b>Education</b>							
<b>Pre-Primary Education</b>	Deflation of inputs	Deflation of inputs	Output Indicators	Output Indicators	Deflation of inputs	Output Indicators	Deflation of outputs
<b>Primary Education</b>	Deflation of inputs	Deflation of inputs	Output Indicators	Output Indicators	Deflation of inputs	Output Indicators	Deflation of outputs
<b>Secondary Education</b>	Deflation of inputs	Deflation of inputs	Output Indicators	Output Indicators	Deflation of inputs	Output Indicators	Deflation of outputs
<b>Tertiary Education</b>	Deflation of inputs	Deflation of inputs	Output Indicators	Output Indicators	Deflation of inputs	Deflation of inputs	Deflation of outputs

Source: National Statistical Institutes

Most NSIs produce estimates of the volume of non-market healthcare services based on the deflation of the inputs, while some countries rely on output indicators. It was also of interest that the majority of NSIs faced similar challenges in having timely and relevant information to identify new health services that had been provided in response to the pandemic, as well as monitoring the possible reduction in other health services. There had been some examples of quantity adjustments that had been applied.

There was a similar picture for how NSIs have estimated the volume of education services. Most carried out the deflation of inputs, including the [United States](#) whose volume estimates of education have been adjusted to reflect that the input costs for these services no longer accurately reflected the suspension of student instruction as schools transitioned from in-person to virtual teaching environments. This included adjustments to compensation of employees, reflecting a reduction in instruction time during the school closures. This was based on information on “state-by-state closure dates, enrolment, and ... the start of remote learning programs and school districts that modified their school calendar”. There were also further adjustments to consumption expenditures to reflect the lower costs of providing education services, such as the cutback in bus transportation and the related need for motor vehicle fuel and the lower purchases of food given the cutback in school cafeteria meals.

In [Canada](#), teachers would still be engaged in professional development activities while some would be looking to provide online learning programs for their students in response to school closures. However, it appears “the compensation of most of the affected employees is not being reduced and since many have related work they have been asked to do at home, this will probably be treated as a continuation of normal education and public administration accounting”. As such, it appears that no explicit quantity adjustments had been put in place and that output would not be impacted by these closures, unless these employees reported reduced actual hours worked.

## 8 . The effect of direct volume indicators for health and education services

Our initial international engagement has shown that these volume indicators have not been implemented as widely by other National Statistical Institutes (NSIs) in the early estimates of GDP, reflecting the challenges in having timely and relevant volume indicators. This may be reflected in more mature estimates, but this complicates the international comparability of volume estimates of GDP at this moment. It is helpful to compare current price estimates of GDP as well as volume estimates, so that there is a wider understanding of these measurement challenges.

We would ideally be able to produce comparable estimates for the other advanced economies that reflect how the pandemic has impacted on their own volume indicators that capture the provision of healthcare and education. However, that information is not readily available for these purposes. Instead, we estimate the volume shortfall in GDP for the G7 countries, excluding government consumption expenditure. Given that this captures the spending that is undertaken by government in its production of non-market output, this illustrative exercise helps capture the size of this measurement effect.

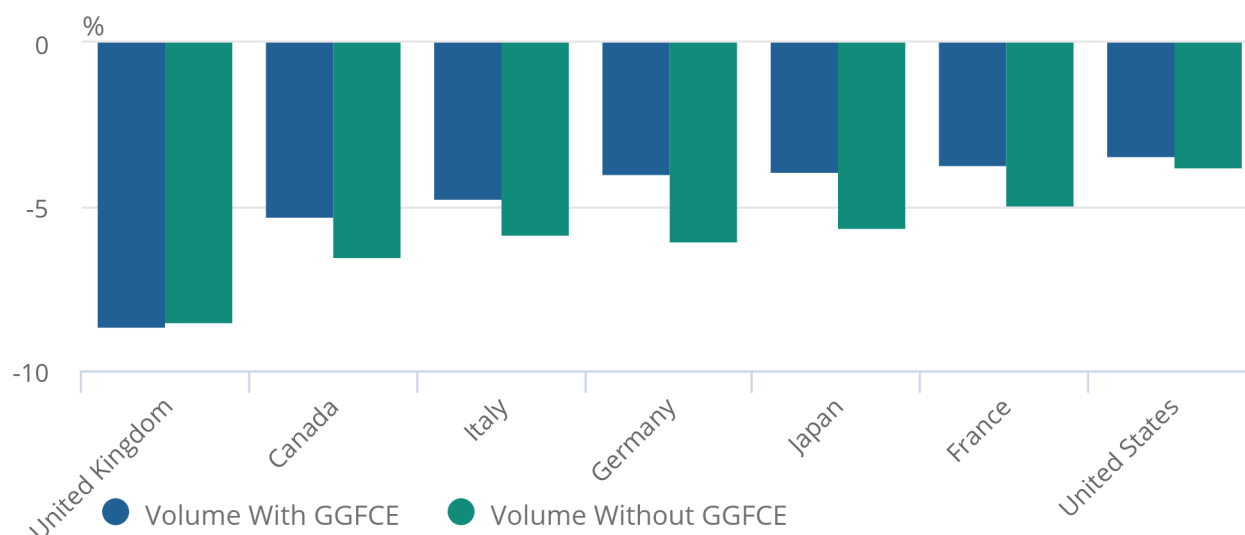
Figure 10 shows how the removal of volume estimates of government consumption expenditure increases this estimate of the volume GDP shortfall for the other G7 countries. In contrast, there is a slight reduction in the comparison with pre-coronavirus (Quarter 4 (Oct to Dec) 2019) levels for the UK, reflecting how the UK has uniquely experienced a reduction in the volume estimates of government consumption expenditure over this period. It is still the case that the UK has experienced the largest hit to these other types of expenditure, while the ranking of countries is largely unaffected. However, the difference to the rest of the G7 is not as large, illustrating the importance of understanding how GDP estimates are compiled by NSIs in producing international comparisons of GDP.

**Figure 10: The recording of volume estimates of government consumption expenditure has an impact on the size of the shortfall in GDP for other G7 countries**

G7 volume GDP, Quarter 4 (Oct to Dec) 2019 to Quarter 3 (July to Sept) 2020

Figure 10: The recording of volume estimates of government consumption expenditure has an impact on the size of the shortfall in GDP for other G7 countries

G7 volume GDP, Quarter 4 (Oct to Dec) 2019 to Quarter 3 (July to Sept) 2020



Source: Office for National Statistics, Organisation for Economic Co-operation and Development

**Notes:**

1. All international figures correct as of 7 January 2021.

It is also of note that this measurement effect of non-market output will evolve over time – that is, it will impact on the relative quarterly paths of GDP. This reflects how the impact of the provision of the healthcare and education services will change over time in response to the pandemic. For example, it was previously shown that there had already been partial unwinding of the impact on these implied prices in Quarter 3 (July to Sept) 2020, reflecting the change in the composition of cost-weighted health activity that took place. Likewise, there will be further movements in the volume of healthcare and education services over the coming year, where volume indicators are in place.

In other words, if it is argued that the perceived lack of comparability in GDP estimates in Quarter 2 (Apr to June) 2020 was not favourable for the UK, then it must also be the case that the same comparisons have been more favourable for the UK in Quarter 3. For future analysis, we will explicitly highlight how our estimates of non-market output impact upon current price and volume estimates of UK GDP, as well as explain how this might be impacting on the comparability of GDP with other countries.

## 9 . Future developments

We recognise that there is an inherent uncertainty in these estimates, but we feel that the practices that we have implemented have been our most appropriate response to capture the known changes to how healthcare and education services have been provided in the times of the pandemic. This will also become apparent as countries respond to new variants of the coronavirus, which have led the imposition of further restrictions in late 2020 and early 2021. There will also be new health services provided in response to the coronavirus pandemic that will need to be considered, such as the rollout of the mass vaccination programme. We will communicate how these non-market health impacts will be reflected in our current price and volume estimates.

Further information is needed to understand fully the comparability of volume estimates of GDP in the coronavirus pandemic. We have agreed on a joint project with the Organisation for Economic Co-operation and Development (OECD) to explore this topic in more detail with other National Statistical Institutes (NSIs) and the wider international community to learn more about the practices that have been implemented and to see how we can learn from one another in how NSIs can collectively improve how we record the effects of the pandemic<sup>1</sup>. Utilising this work to provide more clarity to users on how this might be impacting upon international comparisons of volume GDP, such that the wider public feels more informed in understanding how GDP figures truly compare internationally.

### Notes for Future developments

1. There will also be the opportunity to take stock of how NSIs compile their National Accounts, so that more can be understood on whether there are any other points of note that might impact upon the comparability of early estimates and how this might be reflected in more mature estimates of GDP.