Report

The economic case for UK investment in the Covid-19 pandemic response in 2022

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22 June 2022

Key messages

There are significant benefits to the UK economy of investing in the provision of vaccines in poorer countries, through more trade, investment and lower inflation. Estimates suggest that the UK economy benefits £7.7 billion from vaccinating low and middle income countries. Assuming that the UK pays it fair share of £1 billion, alongside other contributors, the returns to investment to the UK are at least 8:1.

Vaccination in sub-Saharan Africa and Latin America would raise UK exports by £1 billion and global vaccination would raise dividends on FDI by £2 billion.

High inflation at the end of 2021, which was above the normal average and much of it likely due to Covid and its responses, has cost poor households in the UK approximately £400 per month.

How to cite: Agarwal, P., Lemma, A., te Velde, D. W., and White, L. (2022) The economic case for UK investment in the Covid-19 pandemic response in 2022. ODI report. London: ODI (https://odi.org/en/publications/the-economic-case-for-uk-investment-in-the-covid-19-pandemic-response-in-2022/)

Acknowledgements

About this publication

This paper has been commissioned by One and Save the Children UK. We are grateful for comments, questions and guidance. The contents of the paper are the responsibility of the authors.

About the authors

This paper was written by Prachi Agarwal, Alberto Lemma, Dirk Willem te Velde and Lucy White.

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Acronyms

ACT-A	Access to COVID-19 Tools Accelerator
CPI	Consumer Price Inflation
EMEDs	Emerging Markets and Developing Economies
FDI	Foreign Direct Investment
GDP	Gross Domestic Product
GPGs	Global Public Goods
IMF	International Monetary Fund
ONS	Office for National Statistics
SSA	Sub Saharan Africa
WHO	World Health Organization

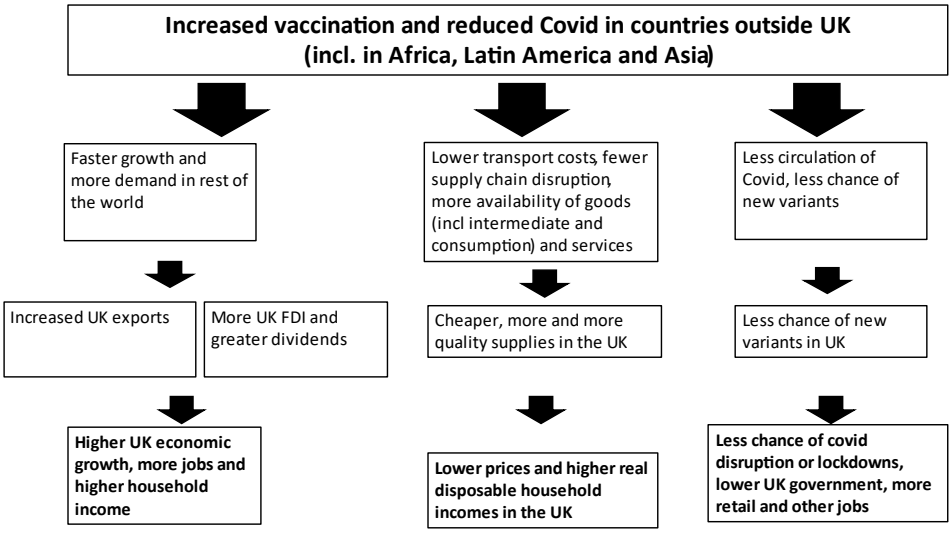
Executive summary

The UK government committed £548 million to finance the Covid vaccine response (relating to COVAX) in the poorest countries in 2020, but has since contributed little additional support despite the importance of vaccines for economic development in the poorest countries directly and indirectly to the UK. This paper argues that there are significant benefits to the UK economy of investing in the provision of vaccines in poorer countries. There is unfortunately a long way to go still as only 22.5% of sub-Saharan Africa and less than 50% of the population in Middle East, Central Asia and Developing Europe are currently fully vaccinated.

There are at least three types of benefit for the UK of financing the provision of vaccines in other countries.

- First, fewer cases of Covid increases economic activity in other countries, which will lead to more market opportunities for the UK through trade and investment.
- Second, it will reduce the risks of supply side shocks in other countries which may negatively affect the UK, e.g. through reduced availability of products or price increases.
- Third, lowering the incidence of Covid elsewhere reduces the risks of new variants for which current vaccines are not effective, including in the UK.

Figure ES1: How a reduction in Covid elsewhere benefits the UK



Source: the authors

More than 500 million people have been infected with coronavirus, with six million deaths to date. The UK has seen 4.3% of total cases and 2.8% of total deaths (WHO, 2022). The UK economy shrank by 9.8% in 2020.

Existing studies (Cakmakli et al., 2021; Hafner et al., 2020) suggest that the UK could benefit from global vaccination. These studies suggest **vaccinating emerging markets and developing economies** (EMDEs) will save the UK £71 billion in costs. Another study argues that the UK could gain £7.7 billion by vaccinating **low and middle-income countries** through increased domestic and export activity in five contact-intensive service sectors, hospitality, recreation, retail and wholesale, transportation and health and social care. Moreover, the benefits of vaccinating low income countries would be £3.8 billion.

If we assume that the UK contributed its fair share, £1 billion, to the global costs of vaccination, for every £1 invested by the UK government, it could receive an approximate return of £7.7 (£3.8) in benefits through increase in trade, employment and output by vaccinating low and middle income countries (or low income) only; therefore, the benefit to cost ratio would be 8:1 for MICs and LICs (or 4:1 for LICs only).

This paper also examines the channels of impact through which the UK might be affected, providing indicative estimates and some orders of magnitude. We

estimate the impact on UK exports by multiplying the GDP impacts of Covid (adjusted for vaccination rates) by the (bilateral) income elasticity. We find that UK exports of goods and services could rise by approximately £1 billion if sub-Saharan Africa (SSA), Latin America and the Caribbean were vaccinated (£415 million from full vaccination in sub-Saharan Africa). Globally, achieving full vaccination status for all countries could boost UK exports of goods and services by as much as £12.5 billion.

Using a similar methodology, and taking dividends proportional to FDI flow estimates, we find that, if vaccine rates were to be increased to 100%, FDI dividends to UK firms globally would potentially increase by a total of £2 billion, and by £230 million by vaccinating sub-Saharan Africa and Latin America and the Caribbean.

The pandemic also affected UK households through inflation. Consumer Price Inflation (CPI) increased from 0.9% in April 2020 to 1.6% in April 2021 and up to 7.8% in April 2022. Some price inflation had built up before the outbreak of the Russia–Ukraine war. We suggest that Covid-19 may have potentially contributed to at most a 3.8 percentage point increase in the consumer price inflation rate. This means additional annual expenses of around £396.80 for lower-income households (who are likely to be most affected financially by the pandemic) for 2022. This inflation has resulted from a rise in food prices, energy prices, and freight costs, well before any additional compounding issues such as the conflict in Ukraine. The potential rise of new Covid-19 variants in areas with low vaccine penetration rates means that further inflationary pressures, e.g. supply chain shocks, may occur.

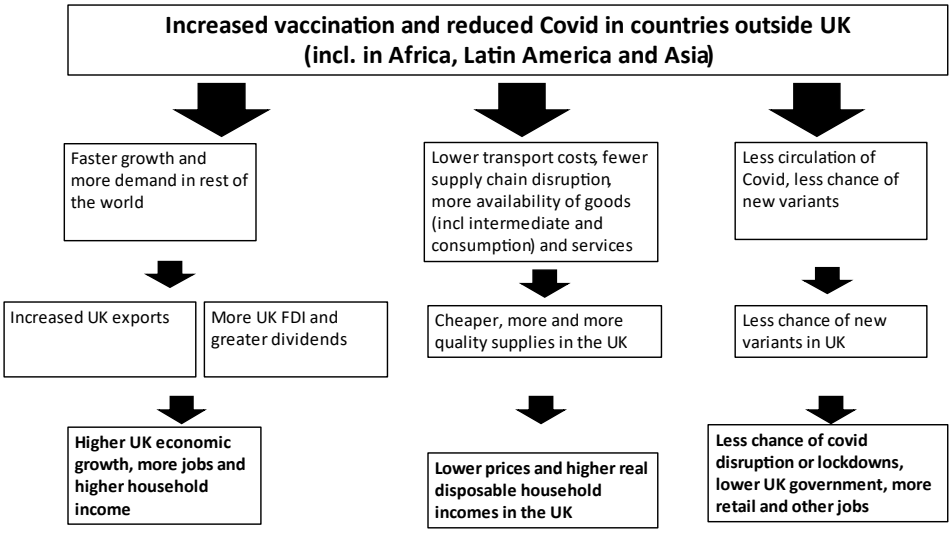
1 Introduction

The UK government committed £548 million to finance the Covid vaccine response in the poorest countries in 2020,[1] but has since contributed little additional support despite the importance of vaccines for economic development in the poorest countries directly and indirectly to the UK. This paper examines the possible economic benefits to the UK of investing in the provision of vaccines in poorer countries.

The benefits for the UK of providing vaccines in the UK are well understood, and we review some studies in Section 2. In addition, the UK can finance the provision of vaccines in other countries, contributing to the provision of health global public goods (Appendix 2). This has three types of indirect benefits for the UK (see Figure 1). First, **a decrease in the economic costs of Covid in other countries will lead to more market opportunities for the UK through trade and investment**. Second, it will also **reduce the risks of supply-side shocks in other countries** which may negatively affect the UK, e.g. **through reduced availability of products or price increases**. And third, **lowering the incidence of Covid elsewhere reduces the risks of new variants for which current vaccines are not effective, including in the UK**, and the prevention of new variants will have further significant benefits. These factors affect households and business through lower real disposable household incomes, fewer jobs, higher inflation and lower variety and volumes of goods and services. This paper presents empirical evidence around these channels of impacts.

[1] New support to help vulnerable countries tackle Omicron - GOV.UK (www.gov.uk)

Figure 1 How a reduction in Covid elsewhere benefits the UK



Source: authors

Countries and regions around the world have unequal access to vaccines. Table 1 shows that **only 22.5% of the sub-Saharan population is fully (or doubly) vaccinated according to latest data from May 2022**. The Middle East and Central Asia, as well as Emerging and Developing Europe are also lagging behind, with less than 50% of populations being fully vaccinated. Hence, a clear case could be made for the UK to contribute to vaccinating larger populations living in these regions.

The structure of the paper is as follows. Section 2 reviews studies on the significant cost of Covid (or not vaccinating) in the UK and globally, which justifies developing and funding Covid vaccines. Section 3 provides evidence on the channels through which controlling Covid in other countries may affect the UK, including trade, finance and other channels. Section 4 explains what these effects mean for households and businesses in the UK in practical terms. Section 5 draws conclusions and implications including by comparing the costs of financing the provision of vaccines with the benefits to the UK.

Table 1 Share of fully vaccinated population (2022)

Region[2]	**% Fully Vaccinated**
Sub-Saharan Africa	22.5
Middle East and Central Asia	41.4
Emerging and Developing Europe	44.2
Latin America and the Caribbean	55.5
Emerging and Developing Asia	65.1
EU27	69.9
Other Advanced Europe	73.8
North America	74.6
Advanced Oceania	81.9
Advanced Asia	86.2

Source: Our World in Data, University of Oxford (2022). Definition of 'fully vaccinated' is having received two vaccine doses.

The evidence on the costs and benefits of funding Covid vaccines aims to inform the incentives of the UK to commit its fair share – £1 billion[2] – of financing to the Covid-19 response. This means financing the ACT-A partners and meeting vaccine delivery costs, which translates to £25 billion in total to vaccinate an additional 20% of the world population (Hafner et al., 2020). Whilst the cost of vaccinating an additional person is only $5 per person, the benefits to the UK economy will recoup much of this in increased exports, lower inflation and higher household incomes and more jobs.

[2] World leaders pledge $1B for ACT-Accelerator | Devex

2 The impacts of Covid in the UK and globally

The Covid-19 pandemic resulted in human and economic costs, in the UK and globally. Overall, more than 500 million people have been infected since the beginning of the pandemic, with six million deaths. The UK saw 4.3% of total cases and 2.8% of total deaths (WHO, 2022). This section examines the (estimated) impact of Covid on the UK economy (Section 2.1) and globally (Section 2.2)

2.1 Impact of Covid on the UK economy

Fighting Covid has had a heavy impact on the UK Exchequer due to increased social expenditure and reduced tax revenues. The pandemic has also slowed down growth, employment and trade over the past two years. As a result, business activity and livelihoods have been placed at risk in the UK and globally. **In 2021, the total healthcare expenditure by the government reached £277 billion**, an increase of 7.1% (adjusted for inflation) over the previous year. This is slightly less than 2020, when total health expenditure grew by 10% over 2019 (estimated to be about £269 billion in 2020). However, the figures for 2020 and 2021 contributed 11.9% to GDP in the respective years (ONS, 2022i; ONS, 2021h). The rise in expenditure was driven by activities in response to the pandemic such as testing, tracing and vaccination programmes. The health estimates for 2021 accounted for 45% of total government expenditure on all goods and services that year (ONS, 2022i).

A modelling study estimates that the expected lifetime public finance costs of the pandemic were £368 billion, equivalent to about £5,500 per person in the UK, a figure more than double the annual NHS expenditure per person (Appleby, 2022).

In terms of actual costs, **the National Audit Office estimated an expenditure of about £55.2 billion for Covid-related healthcare and support in 2020**[3]. Another £104.8 billion was used to support businesses during the same year[4], (Appleby, 2022).

Office for National Statistics (ONS) data shows that the UK government announced at least 50 schemes during the peak of the pandemic. The cost of not spending this money, or 'financial inaction', would have been much higher in terms of lives and lost livelihoods, a valid justification of the additional pressure on fiscal expenditure. All public spending is usually supported by a constant revenue stream of taxes, but **during the pandemic, the government faced a shortfall of £36 billion in receipts in 2020–2021**[5].

Coupled with a simultaneous decline in GDP, this led to a large increase in the government's gross debt as a ratio of GDP to more than 100% of GDP[6].

Data also reveals that **the impact of Covid in 2020 on the UK economy was particularly large as it shrank by 9.8% in 2020** (Appendix 3)[7]. Comparatively, other advanced economies contracted by 4.8% in 2020, with a larger impact felt by the Eurozone economies with decelerated growth of 6.5%. Compared to emerging markets and lower-income countries, this impact seems more severe. For instance, World Bank estimates (Table A1 in Appendix 3) show that, collectively, they contracted by just 2.6%. Argentina's GDP contracted by 10.6% and India's by 9.6% in 2020.

2.2 Impact of Covid globally

A brief analysis of the global cost of the pandemic helps in understanding how the UK might be affected by the spread of Covid in other countries. The cost of

[3] Of which, approximately 75 percent was used on the total of the test and trace programme (£17.9 billion), procurement of personal protective equipment (£13.8 billion), additional spending on NHS (£7.8 billion) and about £1.8 billion was spent on vaccine and antibody supply (Appleby, 2022).

[4] Of this, £67.1 was spent on the job retention scheme alone; of which, about £36 billion on individual through the self-employment income support and universal credit; and another £60.2 billion on other public services

[5] VAT receipts were lower by £18 billion in the same year and the government was forced to borrow £323 billion or 15.1 percent of the GDP in 2020-21 to cover these costs

[6] Office for National Statistics reported that the debt-to-GDP ratio was double than at the time of the global financial crisis in 2008-09 (ONS, 2021b). Simultaneously, the overall deficit (or net borrowing) for the period 2020-2021 was 14.5 percent of GDP- 11.7 percentage points higher than in the previous year (ONS, 2021b).

[7] This can be mainly attributed to its large dependence on trade in services that were severely impacted due to social distancing measures and government-mandated lockdowns.

the pandemic in other countries- particularly if a new variant emerges- can be interpreted as the cost that can be avoided if the population is vaccinated. Given that the majority of the population in middle- and lower-income countries is often still unvaccinated, there is a strong incentive to vaccinate the population in these countries to avoid such costs. This will indirectly benefit the UK economy, albeit at an additional cost of facilitating global vaccination.

We estimate the costs of the pandemic as the difference between the sum of the actual contraction in the economy reported in 2020 and 2021 and the expected projection of growth in 2020 and 2021 reported in 2019 (see Table 2). The costs to the world are estimated to be 6.2% of GDP. The highest immediate cost of the pandemic was borne by advanced Asian economies as they were also the most integrated into global value chains, which were severely disrupted due to government-mandated closures and social distancing measures. Emerging and developing Asia suffered a large loss of 12.9% of GDP over 2020-2021 as actual growth over that period was much lower than before the pandemic in October 2019. Moreover, the Latin American and the Caribbean region, which is heavily dependent on tourism, transport and travel services, was badly affected due to closures at the peak of the pandemic and suffered losses amounting to 8.8% of GDP over 2020-2021. The reduction in growth for both these regions has adversely affected the UK's exports of goods and services as they remain important trading partners.

Table 2 Cost of the Covid-19 pandemic to various regions

Region[8]	Forecast for 2020 (Oct 2019 update)	Forecast for 2021 (April 2020 update)	Actual growth in 2020 (April 2022 update)	Actual growth in 2021 (April 2022 update)	Cost of Covid
Advanced Asia	1	8.1	-11.1	7.3	**12.9**
Advanced Oceania	2.5	6	-2.2	5.2	5.5
Emerging and Developing Asia	4.5	5.7	-4	1.2	**12.9**
Emerging and Developing Europe	3	5.4	-4.4	7.5	5.2
EU27	2.4	5.4	-4.7	6.1	6.4
Latin America and the Caribbean	3.9	5.6	-7.5	8.2	**8.8**
Middle East and Central Asia	3.2	6.8	-6.1	10.1	6
North America	2	4.5	-4.3	5.2	5.6
Other Advanced Europe	1.7	4.2	-4.9	4.8	5.9
Sub-Saharan Africa	4.2	4.7	-2	4	6.8
World	3.4	5.8	-3.1	6.1	6.2

Source: Authors' own calculations based on IMF World Economic Outlook (October 2019, April 2020, April 2022)

Model-based scenario analysis by the World Bank (2022) in January 2022 suggested that the Omicron variant of the virus could lead to a further decrease in the global economy in 2022 by 0.2% to 0.7%. The impact on emerging economies could be worse, with a reduction of about 0.4% to 1%. However, the same study postulates that the health and economic impact of Omicron might be milder than previous variants, given that some of the population was already vaccinated. Similarly, the Delta variant before that lowered global demand and exacerbated supply chain bottlenecks, although at a rate lower than previous variants (World Bank, 2022). Despite the dissipating impact of each of the subsequent variants, it is important to note that the additional costs associated

[8] The classification of regions follows that reported by the IMF in the World Economic Outlook. Some modifications have been made for ease of analysis. More details are in Appendix 1.

with each new variant, in terms of human lives and economic costs, will necessarily exert pressure on the government to provide, among others, healthcare, unemployment benefits, job retention schemes and credit schemes. Therefore, the additional costs of a new variant being discovered in another country but finding its way to the UK should be avoided if possible.

Building on such methodologies,[9] a study by Cakmakli et al. (2021) estimates that **vaccinating emerging markets and developing economies (EMDEs) will save the UK an additional US$92 billion (£71 billion) in costs**[10]. The study argues that the distribution of vaccines would hasten the recovery of EMDEs and support economic growth in the UK through increased exports of final and intermediate goods. Moreover, since the UK is primarily a service economy, increased global vaccination will also lead to greater tourism, transport and travel activity in the country. **If we filter out international costs of the pandemic and focus only on domestic costs, the pandemic would have cost only US$ 12 billion (£9.2 billion) to the UK** (Cakmakli et al., 2021)[11].

Another study suggests that the **UK could gain US$ 145 billion (£111 billion)** [12]**by vaccinating the global population**[13] **(Hafner et al., 2020).** This scenario has already been partially realised through vaccination efforts in high-income countries and relates to increased domestic and export activity in five contact-intensive service sectors, namely **hospitality, recreation, retail and wholesale, transportation and health and social care** that were affected due to social distancing measures and changes in consumer preferences during the pandemic. Therefore, while the UK would benefit from the vaccination of its domestic population, it would also remain dependent on simultaneous recovery in other regions that may be unvaccinated.

In other words, greater access to global vaccines would increase the demand for exports of contact-sensitive service sectors from the UK, thus stimulating the

[9] The results are based on the impact of demand and supply shocks emanating from the pandemic (modelled as a short-term shock) on global trade and production networks (Cakmakli et al., 2021). Here, the dynamics of unvaccinated countries feed back into the economic recovery of partner countries, making the case for greater vaccination of a larger set of countries.

[10] Assuming a constant exchange rate of US$1.3 = £1 throughout the analysis.

[11] The UK could have lost £111 billion in total, of which, the study estimates that the cost would have been £9.2 billion in the absence of international linkages. Hence, the cost of the pandemic to the UK due to international shock propagation was £101.8 billion

[12] Assuming a constant exchange rate of US$1.3 = £1 throughout the analysis.

[13] As opposed to no one having access to vaccines to begin with. This is the total gain from achieving 100% vaccination.

entire economy. To this end, **the cost of not immediately inoculating middle- and low-income countries was estimated to be $10 billion (or £7.7 billion)**[14] to the UK economy due to lower demand for services from the five contact-intensive sectors. Table 3 summarises the potential benefits to the UK economy of vaccination.

Table 3 Potential benefits to the UK economy from vaccination

Study (source)	**Benefits**	**Country Coverage**
Cakmakli, et al (2020)	£71bn	AEs and EMDEs (*with international linkages in final and intermediate goods*)
Hafner, et al. (2021)	£111bn	Global vaccination
Hafner, et al. (2021)	£31.5	Vaccination in countries outside "vaccine Nations" such USA, EU-27, UK, China, India and Russia)
Hafner, et al. (2021)	£7.7bn	Vaccination in LICs and MICs
Hafner, et al. (2021)	£3.8bn	Vaccination in LICs

It would be beneficial for the UK to invest in vaccine development and distribution, especially when the UK pays its fair share alongside other contributors. There are several estimates on the costs of vaccination. Cakmakli,et al. (2021) suggests a cost of US$ 38 billion (£29.2 billion) is needed to produce 2 billion doses to vaccinate an additional 20% of the world's population. Oxfam International (2020) and Hafner, et al. (2021) calculate~~s~~ the cost of vaccinating the poorest half of the world's population (3.7 billion people) to be about US$ 25 billion (£19 billion); while according to the ACT-A budget for October 2021 to September 2022, an additional US$16.8 billion is required to achieve 70% of global vaccination (WHO, 2022a). Of this WHO (2022) estimate~~s~~ the UK's fair share is to be US$0.98 billion (£754 million)[15]. The ONE foundation has re-calculated this fair-share to include in-country delivery as a key component of the

[14] Assuming linearity in the value of GDP each month and that all high income countries, as well as China, India and Russia (early access) are already fully vaccinated. Moreover, it could gain US$5 billion (£3.8 billion) by just vaccinating the poorest LICs, given high- and middle-income are already vaccinated.

[15] Representing a 5% global share to cover ACT-A needs and a 20% buffer (WHO, 2022)

response to COVID-19, leading to a cost of US$1.3 billion (£1 billion). Table 4 below summarises the cost of vaccination and to the UK, assuming its fair share.

Table 4 cost estimates of vaccination

Study	Cost globally / UK	Share of population
Cakmakli, et al (2020)	£29.2bn (Global)	2 billion doses or 20% population
Oxfam International (2020)	£19bn (Global)	Poorest 50% population or 3.7 billion people
WHO (2022a)/ ACT-A budget	£754mn (Fair share UK)	70% target
ONE foundation	£1bn (Fair share UK)	70% target

We can compare the costs of vaccination to the UK if it paid its fair share with the benefits of vaccination to the UK. Global vaccination costs £19 billion, and assuming that all contributor countries pay their fair share, the costs to the UK are £1 billion. Estimates of the benefits to the UK economy differ, but they could be up to £111 billion (see Table 3). The overall estimate suggests that **for every £1 invested by the UK government towards vaccinating populations (with a target of achieving 70% global vaccination), the UK could receive a return of £111, part of which has already been realized through vaccination in high-income countries[16].** In a nutshell, the UK could gain between £71 billion[17] and £111 billion if it were to vaccinate EMDEs and the entire global population[18], respectively, starting from an initial point of zero global vaccination. Finally, **if we are to assume, and this case is closest to reality, that all high-income countries, as well as countries with early access to the vaccine, namely China, India and Russia, were already vaccinated,** the UK could gain an additional £7.7 billion by just vaccinating middle- and low-income countries. **If the UK was still to pay £1 billion, the benefit to cost ratio would be 8:1[19]**.

[16] Calculated as the total gain from vaccinating the entire global population (starting from a point of zero level of vaccination) i.e., £111 billion per UK's contribution towards the cost of global vaccination i.e., £1 billion. The benefits are taken from Hafner, et al. (2021) and the costs are taken from ONE foundation's estimates based on ACT-A budget for October 2021 – September 2022.

[17] This gain from vaccination or potential loss from unvaccinated population emanates from the shock experienced by the UK economy through international trade routes and supply chains Even in the absence of shock propagation along existing trade routes, the UK could have lost £9.2 billion form the pandemic (Cakmakli, et al., 2020).

[18] Note that this scenario has already been partially realised through vaccination efforts in high-income countries, and the remaining benefit can be expected from vaccinating middle- and low-income countries.

[19] This could be an over-estimate as we are assuming that the cost of vaccinating 70% of the population is similar to the cost of vaccinating lower and middle income countries, given in 2021, most of the unvaccinated population was found in this set of countries. Therefore, £1 billion is also the cost for the UK (according to its fair share) for vaccinating lower and middle income countries. The benefits are taken from Hafner, et al. (2021) and the costs are taken from ONE foundation's estimates based on ACT-A budget for October 2021 – September 2022.

3 Impact channels of the global pandemic on the UK economy

The previous section examined the overall economic costs of the pandemic globally and on the UK economy. The negative economic impact of Covid-19 on UK GDP terms in the past is evident further from Figure A1 in Appendix 3. Quarterly GDP growth rates were around 0.1% to 0.6% in the year before the pandemic, but declined to -0.04% in the last quarter of 2019 and -19.4% in the second quarter of 2020 (See Figure A1). Sections 3.1 to 3.3 examine the channels of impact of Covid-19 on the UK economy. It first discusses the impact on UK trade, then on UK FDI and dividends, and how inflation, potentially caused by Covid-19 supply shocks, may have had a negative impact on the British economy.

3.1 Trade

UK trade in goods saw a marked decline at the onset of the Covid-19 pandemic. After a four-year period of growth, trade (as a percentage of GDP) saw a significant drop between 2019 and 2020 of 6.8% (see Figure A1) because of the effects of Covid-19 and Brexit.

Exports of UK goods (see Figure 2) saw an almost immediate impact as **monthly exports declined from £35 billion in December 2019 to £23 billion by April 2020.** This is an average monthly decline in exports of approximately 10%, or a total decline of 34% over the period. The subsequent period saw an average 2% monthly increase in exports, a similar rate of monthly growth in exports for the 12

months preceding the pandemic (1.96%). However, by December 2021 exports had not yet recovered to pre-pandemic levels when they were hit by a 22% decline between December 2021 and January 2022, likely because of the third UK lockdown in early January 2021. Imports remained stable between December 2019 and February 2020, and then dramatically declined, from £38 billion in February 2020 to £27 billion in May 2020.

Figure 2 United Kingdom, monthly trade in goods, £ (million), January 2019–March 2022

Source: ONS (2022)

UK manufactured goods were particularly affected by Covid-19. For example, the UK automotive sector saw disruptions in supply chains due to lockdowns across Europe, which limited the import of automotive parts into the country, with a knock-on impact on the capacity to export and sell vehicles through international trade (ITC, 2020). Changes in trade in services to the Covid-19 pandemic occurred sooner than changes to trade in goods. In January 2020, there was a marked decline in both exports and imports of services into the UK. Globally, Covid-19 caused significant disruptions to trade in services that required close personal proximity, such as tourism, travel and repair services (ECB, 2021), a pattern which was also seen in the UK (ONS, 2021), and resulted in a decrease in services trade from the country.

Figure 3 United Kingdom, monthly trade in services, (£ million), January 2019–March 2022

Source: ONS (2022)

The studies discussed in Section 2 (Cakmakli et al., 2021; Hafner et al., 2021) provided some estimates for the UK if there were a slowdown in the rest of the world, but did not discuss impact on trade specifically. Here, we examine the trade channel in more detail. Table A2 in Appendix 3 estimates the potential impact of full vaccination of unvaccinated populations (by region) on UK exports of goods and services to these regions. It takes the estimated GDP cost of Covid on the economies (based on estimates provided in Section 3 and scaled by a factor to account for the proportion of unvaccinated people[20]) and uses a range of bilateral income elasticities to estimate how much exports from the UK to these countries might decrease because of lower demand (through Covid-induced GDP losses), one of the key channels in Figure 1.

The results suggest that the greatest export losses in goods will accrue from the UK's larger export partners, including North America, the EU and advanced Asian countries. However, it also shows that a comparable loss from emerging and developing Asian countries could emerge as that from advanced Asian economies. The estimates also suggest that there would be a **3.5% increase in**

[20] We acknowledge that such a scaling factor is imprecise.

exports to sub-Saharan Africa if its population is vaccinated. Total export losses from emerging and developing Asian countries and sub-Saharan countries would be $722 million (£566 million).[21] If losses from Latin American countries are added the total accrues to approximately $940 million (£737 million), a loss in trade nearly as high as the expected loss from trade with North America.

Table A3 in Appendix 3 also shows that **incomplete vaccination would lead to a 4.9% decline in service exports to the sub-Saharan Africa** and 3.7% to emerging and developing Asia. Together, this loss would amount to $1.4 billion (£1.1 billion). Hence, combining exports of goods and services, a total loss of $530 million (£415 million) would be incurred with sub-Saharan Africa alone, with an additional $750 million (£590 million) with Latin America and the Caribbean. In other words, **UK exports could rise by $1.3 billion (£1 billion) if the population of sub-Saharan Africa and Latin American and Caribbean are fully vaccinated.** These estimates will be larger if other regions are included.

3.2 Investment

Covid-19 may also have affected UK inward and outward Foreign Direct Investment (FDI). The latest available data on FDI flows[22] into and out of the UK shows that, between 2019 and 2020, both inward and outward FDI flows from the UK continued to increase. Between 2019 and 2020, inward FDI grew by 17%, however outward FDI only grew by 0.8%.

According to recent investor surveys (EY, 2020; EY, 2021) the pandemic caused a fall in investor confidence among (potential) investors in the UK. However, the country remained relatively resilient in the face of the impacts of Covid-19 in terms of inward investment, buoyed by investments in its digital technologies sector and perceptions[23] that the UK had the best post-Covid-19 economic recovery plan, coupled with a swift vaccine rollout programme. While the rate of inward FDI growth in the period was broadly similar to the previous five-year average

[21] At the yearly exchange rate of 1 USD = 0.7837 GBP from https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/877346/Average-for-the-year-to-December-2019.csv/preview

[22] Only available until 2020 (included).

[23] Assessed in 2020.

(10.3%), the rate of outward FDI was significantly lower than the previous five-year annual average growth rate of approximately 9%.

Hayakawa et al. (2022) examined the impact of Covid-19 on FDI flows between 173 investor and 192 investee countries for the period 2019–2021. They suggested that the severity[24] of the impact of Covid-19 in investee countries had a significant negative effect on manufacturing and service sector FDI. However, if the Covid-19 impact was severe in the investor country there was a positive impact on outward manufacturing FDI. This finding may help to explain why the rate of growth in UK outward FDI fell, as investee countries suffered a greater impact from Covid-19, so outward UK FDI towards them declined.

Applying these findings to the UK's outward FDI dividends returns can help in understanding the financial benefit of higher vaccination rates in partner countries. Table A4 (Appendix 3) uses ONS (2022f) data for outward FDI involving UK firms, covering the same geographic regions used in the trade estimates in Tables A2–A3. It estimates that, **if vaccine rates were to be increased to 100% population penetration, FDI dividends to UK firms would potentially increase by £2 billion.**[25] In absolute terms, the largest gains would come from increasing vaccination rates across the EU and North America. In percentage terms, the greatest gains would come from regions which currently have the lowest vaccination rates, e.g. sub-Saharan Africa (8.7% increase in dividends on FDI flows) and the Middle East and Central Asia (6.6%). In terms of developing countries, focusing only on increasing vaccination rates across sub-Saharan Africa and Emerging Asia would net an increase of £180.9 million for UK FDI dividends. Adding Latin American and Caribbean countries would increase the total to £307 million.

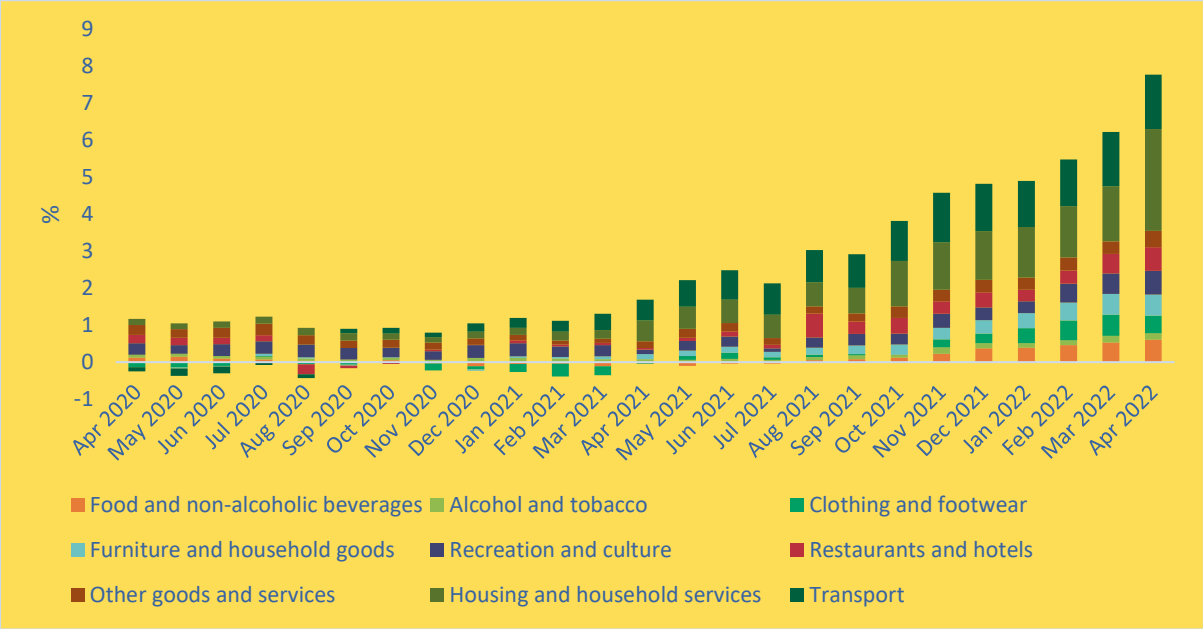
[24] Measured in terms of Covid-19 confirmed cases, deaths and the stringency of social distancing policies, i.e. lockdowns etc. (ADB, 2022).

[25] Assuming FDI dividends were affected equally proportionately to FDI flows by changes in Covid-19 case numbers, in turn affected by vaccination rates: a 10% increase in vaccinations leads to an 8% reduction in cases, and in turn a 1% decrease in cases increases inward FDI by 1.4%. We assume a proportional increase in FDI dividends back to the UK.

3.3 Inflation

There was already a marked increase in inflationary pressures following the Covid-19 pandemic at the end of 2021, significantly increasing living costs for British households. The overall effect has been a rapid rise in inflation, contributing to a 'cost of living crisis' which has significantly affected over 80% of adults across the UK (ONS, 2022g). Since the end of 2020 inflationary pressures (see Figure 4) have been accumulating. **Consumer Price Inflation (CPI) increased from 0.9% in April 2020 to 1.6% in April 2021 and up to 7.8% in April 2022** (ONS, 2022d).

Figure 4 UK Consumer Price Inflation (%), April 2020–April 2022



Source: ONS (2022d)

Subsequent (from the end of February 2022) shocks such as the conflict in Ukraine have further compounded inflation in the UK. However, if we compare the post-pandemic period before the start of the conflict (end-February 2022), when inflation was at 5.5% to the same period before the pandemic started (February 2020), where the inflation rate was 1.7% (ONS, 2022h), we can infer that **Covid-19 may have potentially contributed to at most an approximate additional 3.8% to the consumer price inflation rate** (of course recognising other potential factors).

Table 5 provides the latest available data (ONS, 2022h) illustrating the average expense basket for the lowest 30% income households in the UK[26]. It then elaborates two scenarios for the estimated impacts of Covid on household costs by the end of February 2022 (before the start of the conflict). It considers two scenarios, Covid and no-Covid. The first (Covid) looks at the impact of the two inflation periods (from March 2020 to February 2021 at 0.8%, and between March 2021 and February 2022, at 5.5%), the second (no-Covid) assumes that pre-Covid-19 average annual inflation rates (at 1.7%) were maintained for the period between March 2020 and February 2022.

Table 5 Impact of Covid on UK low-income household weekly expenses, February 2022

Expense type	Feb' 2020 Baseline (£)	Feb' 2022 no-Covid (£)	Feb' 2022 Covid (£)	Difference (£)
Food and non-alcoholic drinks	41.4	42.8	44.0	1.2
Alcoholic drinks, tobacco and narcotics	8.7	9.0	9.3	0.2
Clothing and footwear	9.9	10.3	10.5	0.3
Housing(net)1, fuel and power	64.1	66.3	68.1	1.8
Household goods and services	18.2	18.8	19.3	0.5
Health	4.9	5.0	5.2	0.1
Transport	31.0	32.0	32.9	0.9
Communication	13.5	14.0	14.4	0.4
Recreation and culture	34.8	36.0	36.9	1.0
Education	0.4	0.4	0.4	0.0
Restaurants and hotels	19.8	20.5	21.0	0.6
Miscellaneous goods and services	21.9	22.7	23.3	0.3
Other expenditure items	29.3	30.3	31.1	0.4
Total	297.9	308.1	316.5	7.6
Annual				396.8

Source: ONS (2022h)

Under the Covid scenario, by the end of February 2022 weekly household expenditure for the lowest-income households was approximately £7.60 higher than would have been expected under the no-Covid scenario. Over the course of a year this means that **annual expenses are approximately £396.80 higher for lower-income households due to Covid-19-related inflationary pressures.** It should be emphasised that this is an indicative estimate as actual Covid-induced

[26] As these are the most likely to suffer the greatest negative financial effects of the Pandemic (ONS, 2022g)

inflationary pressures may have been different, given additional factors. Below we discuss several transmission channels which, spurred by the Covid-19 pandemic, are likely to have contributed to this increase in inflation.

Food price increases have had a significant impact on inflation. From the start of the pandemic there has been a marked increase in the food price index (Figure A4, Annex 3), from 96.2 in March 2020 to 109.8 in December 2020, up to the current 155. The increase in inflation therefore started well ahead of further shocks to prices such as the Russian–Ukrainian war. The immediate post-pandemic period saw an approximate increase of 12% in food prices. In 2020, the UK imported approximately 46% of its consumed food products (DEFRA, 2021). The country is a net importer in several food categories, such as meat, dairy products and fruit. Therefore, food consumers will be susceptible to increasing food prices globally. According to the OECD (2020), the pandemic placed significant stress on food supply chains, creating bottlenecks in farm labour, processing, transport and logistics. These negative impacts mainly occurred because of policy responses to the pandemic, which have had an impact on the international food trade. One example is Indian tea prices, which by July 2020 had increased by 200% compared to March 2020, and a 59% year-on-year increase in the price of Assam tea leaves sold on the Indian auction market. Covid-19 lockdowns, combined with dry weather, caused a severe shortage of production, affecting supply and prices (Mintec, 2020). A lack of vaccines in the tea supply chain (particularly for tea plantation workers) also threatens the capacity to maintain tea supplies, as was the case in India in May 2021 when more than 10% of tea plantations had to be shut due to Covid-19 outbreaks (FT, 2021). Covid-19 also had a negative impact on the tea industry in Kenya, whose capacity to engage in international supply chains was disrupted by Covid-19 policy impacts on logistics and transport (Banga et al., 2020).

Energy price inflation is the second major component of the increase in living costs contributing to food price increases (DEFRA, 2021) and to increased household expenses. The UK is highly dependent on imported energy, and therefore significantly vulnerable to global energy price shocks. The economic recovery following Covid-19 closures has increased the demand for the same

fuels (mainly natural gas) that British businesses and households need either directly for heating or indirectly through electricity generation. However, while the demand for energy has increased there have been significant energy supply constraints. According to the IEA (2021), Covid-19 lockdowns have had an impact on the supply of energy, particularly gas supplies. There was a 27% increase in outages (most of which were unplanned) in the global natural gas supply in the first nine months of 2021 compared to the average in the period 2015–2020. At the same time, increased demand for energy in the pandemic recovery period has created a significant mismatch between demand and supply, which has contributed to increased energy prices. The average energy price (see Figure A5, Appendix 3) in the UK increased from 0.5 pence per kilowatt hour (p/kW h) in early 2020 to 12.8 p/kW h in December 2021 before falling back to 6.6 p/kW h in January 2022, well ahead of the conflict in Ukraine. These increases are likely to decrease low-income households disproportionately given they spend a greater proportion of their disposable income on energy (2022f).

The pandemic has also led to **an increase in freight costs**, which may have also had a significant impact on consumer price inflation, including food. A review of global maritime trade (UNCTAD, 2021) finds that the pandemic[27] caused significant bottlenecks in international maritime trade between 2020 and 2021, causing input shortages for several industries, particularly across Europe. Freight rates also increased significantly for both containerised and dry bulk goods. Dry bulk freight rates increased by 'record breaking levels' (UNCTAD, 2021) driven by increased growth in demand for goods, linked to the resumption of economic activity following Covid-19 shutdowns, which far outpaced the growth in the maritime fleet. Given the importance of imported food for the UK, increases in both containerised and dry goods freight prices will have likely contributed to an increase in food prices in the country.

Covid-19 seems to have contributed to an ongoing series of overlapping inflationary impacts on energy prices, transport costs and food prices. Prices have been rising since early 2021, well before any additional compounding

[27] As well as the Suez Canal blockage of 2021 and the impacts of extreme weather events.

issues such as the Russian–Ukrainian war. As vaccination penetration rates increased, countries gradually loosened their social distancing measures and economic activity resumed. Demand for products increased, but so did demand for energy and logistics. The supply of energy could not keep up with demand, which caused an increase in energy prices, while the trade logistics network could not cope with the sudden resurgence in international trade, causing bottlenecks in both importing and exporting markets. At the top end, if all inflation build-up above the average inflation was caused by Covid, it may have contributed **an estimated £400 in additional annual expenses to lower-income UK households during the pandemic**. **The potential rise of new Covid-19 variants in areas with low vaccine penetration rates means that further inflationary shocks may occur. Uncertainty levels remain high** (WTO, 2020) and the risk of further supply shocks remains, particularly if local lockdowns force the closure of key manufacturing or logistics components of global value chains (Attinasi et al., 2021). A recent example of such a localised lockdown with far-reaching consequences has been the Shanghai lockdown in early 2022 (Fortune, 2022). Providing more resources to reduce the likelihood of the emergence of new Covid-19 variants both in the UK and in other countries (that could then also enter the UK), through a globally concerted effort to increase vaccination rates, could help reduce the risks of future economic slowdowns and subsequent supply shocks.

3.4 Which UK households and business are affected?

Analysis shows that poorer households in the UK are disproportionately affected by the above macroeconomic impacts (see details in Appendix 4). Poorer households, defined as those in the bottom quintile of the income distribution, were more likely to report reduced household income from April 2020–October 2020 than any other income quintile. Poorer households were most vulnerable to the economic impacts of lockdowns too, as only 19% of people with an income less than £20,000 reported that they were able to work from home, compared to 55% of people with an income over £20,000. In terms of the furlough scheme, only 27.8% of those in the bottom income quintile were paid in full by their employers, compared to 52% in the top income quintile.

The poorest fifth of income deciles spend the largest proportion of their disposable income on food compared to other income deciles, indicating that poorer households are most vulnerable to rising food costs. Inflationary pressures on food prices in the UK, driven in part by the Covid-19 crisis, may therefore be contributing to increased food poverty in the country. This labour shortage meant that 50% of businesses could not meet demand. For example, there was a noticeable drop in consumption, with an 88% fall in expenditure on hotels and restaurants and a 59% reduction in transport expenditure. A shortage of HGV drivers in the UK led to wider impacts on supply chains and businesses.

4 Conclusions and implications

The UK government helped finance the Covid vaccine response in the poorest countries in 2020, but has since contributed little additional support despite the importance directly and indirectly to the UK of vaccines for economic development in the poorest countries. This paper has argued that more aid to fund vaccination is money well spent globally, and also for the UK as global vaccination will bring benefits to the UK economy.

There is a significant role for aid financing of health GPGs such as a world free of Covid (see Appendix B), particularly in countries that lack the resources but which have a strong role to play in the effective provision of the GPGs. The cost of vaccinating is only $5 per person. Vaccinating the unvaccinated in Africa would cost around $5–10 billion, but the benefits are significant worldwide and to the UK. This provides a more direct rationale for the UK to provide aid to combat Covid.

The costs of Covid to the UK economy are significant. Expected lifetime public finance costs are £368 billion, equivalent to about £5,500 per person in the UK, a figure more than double annual NHS expenditure per person. We estimate the costs of Covid to the world over 2020 and 2021 to be 6.2% of GDP.

There are several studies on the costs and benefits of vaccination to the UK economy. The costs of global vaccination are estimated to be £19 billion. These costs could be shared globally, and if global contributors pay their fair share, the UK would pay £1 billion. Several estimates exist indicating large global benefits of vaccination globally or even just in low and ~~in~~ middle income~~d~~ countries. The benefits are also expected to be large to the UK economy, £111 billion from global vaccination or even £7.7 billion by just vaccinating low and middle income countries. Thus, the range of benefit to cost is estimated to be 8:1 to 111:1.

Looking into some channels in more detail, we estimate that UK exports of goods and services could increase by $1.3 billion (£1 billion) if the population of sub-Saharan Africa and Latin America and the Caribbean are fully vaccinated. UK investment will also increase, which opens up the opportunity for increased profits from overseas investment, whose rates are twice as high in Africa than in more developed countries. The UK would also invest more abroad, which would raise dividends by £2 billion if the world population would be vaccinated.

Whilst Covid reduced economic activities and hence led to inflationary pressures in 2020, there were also supply-side shocks that raised prices. Now, as countries loosen their social distancing measures and use economic stimulus, economic activity has increased, including demand for products and services such as food, for energy and logistics. As supply often could not keep up with demand inflation started to build up. This suggests that Covid-19 has been a significant contributor to increased inflationary pressures in the UK economy which have been increasing since early 2021, well before any additional compounding issues such as the conflict in Ukraine. The UK imported approximately 46% of its consumed food products and is therefore susceptible to global food price inflation.

Failure to eradicate Covid worldwide raises the prospect of new variants arriving in the UK. We find that poorer households in the UK are most vulnerable to the economic impacts of lockdowns to combat Covid, as only 19% of people with an income less than £20,000 reported that they were able to work from home, compared to 55% of people with an income over £20,000. And only 27.8% of those in the bottom income quintile were paid in full by their employers, compared to 52% in the top income quintile.

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Appendix 1 Regional classification of countries (modified from IMF)

EU27	***North America***	***Advanced Asia***	***Other Advanced Europe***	***Advanced Oceania***	***Emerging and Developing Asia***	***Emerging and Developing Europe***	***Latin America and the Caribbean***	***Middle East and Central Asia***	***Sub-Saharan Africa***
Austria	Canada	Hong Kong	Iceland	Australia	Bangladesh	Albania	Antigua and Barbuda	Afghanistan	Angola
Belgium	United States	Japan	Norway	New Zealand	Bhutan	Belarus	Argentina	Algeria	Benin
Bulgaria		Macau	Switzerland		Brunei Darussala	Bosnia and Herzego	Aruba	Armenia	Botswana

Croatia		Singapore	United Kingdom		Cambodia	Kosovo	The Bahamas	Azerbaijan	Burkina Faso
Cyprus		South Korea			China	Moldova	Barbados	Bahrain	Burundi
Czech Republic		Taiwan			Fiji	Montenegro	Belize	Djibouti	Cabo Verde
Denmark					India	North Macedonia	Bolivia	Egypt	Cameroon
Estonia					Indonesia	Russia	Brazil	Georgia	Central African Repu
Finland					Kiribati	Serbia	Chile	Iran	Chad
France					Lao PDR	Turkey	Colombia	Iraq	Comoros
Germany					Malaysia	Ukraine	Costa Rica	Israel	Democratic Republic Congo
Greece					Maldives		Dominica	Jordan	Republic of Congo
Hungary					Marshall Islands		Dominican Republic	Kazakhstan	Côte d’Ivoire
Ireland					Micronesia		Ecuador	Kuwait	Equatorial Guinea
Italy					Mongolia		El Salvador	Kyrgyz Republic	Eritrea
Latvia					Myanmar		Grenada	Lebanon	Eswatini
Lithuania					Nauru		Guatemala	Libya	Ethiopia
Luxembourg					Nepal		Guyana	Mauritania	Gabon
Malta					Palau		Haiti	Morocco	The Gambia
Netherlands					Papua New Guine		Honduras	Oman	Ghana

Poland					Philippines		Jamaica	Pakistan	Guinea
Portugal					Samoa		Mexico	Qatar	Guinea-Bissau
Romania					Solomon Islands		Nicaragua	Saudi Arabia	Kenya
Slovak Republic					Sri Lanka		Panama	Somalia	Lesotho
Slovenia					Thailand		Paraguay	Sudan	Liberia
Spain					Timor-Leste[2]		Peru	Syria	Madagascar
Sweden					Tonga		St. Kitts and Nevis	Tajikistan	Malawi
					Tuvalu		St. Lucia	Tunisia	Mali
					Vanuatu		St. Vincent and the Gre	Turkmenistan	Mauritius
					Vietnam		Suriname	United Arab Emirat	Mozambique
							Trinidad and Tobago	Uzbekistan	Namibia
							Uruguay	Yemen	Niger
							Venezuela		Nigeria
									Rwanda
									São Tomé and Príno
									Senegal
									Seychelles
									Sierra Leone
									South Africa

									South Sudan Tanzania Togo Uganda Zambia Zimbabwe

Appendix 2 Aid financing global public good: Covid vaccines

The global provision of vaccines and development of a vaccine against Covid help to provide core global public good (GPGs) such as a world free of communicable diseases including Covid. There are three building blocks underpinning the case for aid financing of (health) GPGs. First, the private sector will not provide a sufficient amount of public goods, as it will consider profit rather than social benefits. This calls for some public sector engagement. Second, individual countries have insufficient incentives to make an optimal contribution to GPGs, given that not all benefits accrue nationally (e.g. Covid has international spillovers). This calls for some form of cooperation between countries. Finally, poor countries lack the resources to make a full contribution to the provision of GPGs. This justifies aid finance of GPGs in poor countries (te Velde, 2002; Mascarenhas and Sandler, 2004).

The literature on financing the provision of IPGs also depends on such issues as the aggregation technology for the provision of public goods (Sandler, 2002). Some global public goods can be best provided at the point of the weakest link, such as the eradication of polio or Covid in those few countries being able to do least about it, but which are crucial in the fight against a communicable disease. The poorest countries tend to be the most unstable, both politically and economically, with relatively low levels of capacity, and are least able to pay.

For these reasons, financing GPGs is often justified in terms of aid allocations by rich countries to poor countries (te Velde et al., 2002).

Appendix 3 Supporting tables and figures

Table A1 Growth estimates across studies for various countries

	OECD Sep. 2021 Estimates				IMF Oct. 2021 Estimates				World Bank Jan. 2021 Estimates		
	2020	2021*	2022*		2020	2021*	2022*		2019	2020	2021*
World	-3.4	5.7	4.5	World	-3.1	5.9	4.9	World	2.3	-4.3	4.0
Advance Economies	-4.8	5.3	3.8	Advanced Economies	-4.5	5.2	4.5	Advance Economies	1.6	-5.4	3.3
Australia	-2.5	4.0	3.3	United States	-3.4	6.0	5.2	United States	2.2	-3.6	3.5
Canada	-5.3	5.4	4.1	Euro Area	-6.3	5.0	4.3	Euro Area	1.3	-7.4	3.6
Euro area	-6.5	5.3	4.6	Germany	-4.6	3.1	4.6	Japan	0.3	-5.3	2.5
Germany	-4.9	2.9	4.6	France	-8.0	6.3	3.9	Emerging Econ	3.6	-2.6	5.0
France	-8.0	6.3	4.0	Italy	-8.9	5.8	4.2	East Asia	5.8	0.9	7.4
Italy	-8.9	5.9	4.1	Spain	-10.8	5.7	6.4	China	6.1	2.0	7.9
Spain	-10.8	6.8	6.6	Japan	-4.6	2.4	3.2	Indonesia	5.0	-2.2	4.4
Japan	-4.6	2.5	2.1	United Kingdom	-9.8	6.8	5.0	Thailand	2.4	-6.5	4.0
Korea	-0.9	4.0	2.9	Canada	-5.3	5.7	4.9	Central Asia	2.3	-2.9	3.3
Mexico	-8.3	6.3	3.4	China	2.3	8.0	5.6	Russia	1.3	-4.0	2.6
Turkey	1.8	8.4	3.1	India	-7.3	9.5	8.5	Turkey	0.9	0.5	4.5
United Kingd	-9.8	6.7	5.2	Russia	-3.0	4.7	2.9	Poland	4.5	-3.4	3.5
United State	-3.4	6.0	3.9	Latin America	-7.0	6.3	3.0	Brazil	1.4	-4.5	3.0
Argentina	-9.9	7.6	1.9	Brazil	-4.1	5.2	1.5	Mexico	-0.1	-9.0	3.7
Brazil	-4.4	5.2	2.3	Mexico	-8.3	6.2	4.0	Argentina	-2.1	-10.6	4.9
China	2.3	8.5	5.8	Middle East	-2.8	4.1	4.1	Middle East	0.1	-5.0	2.1
India	-7.3	9.7	7.9	Saudi Arabia	-4.1	2.8	4.8	Saudi Arabia	0.3	-5.4	2.0
Indonesia	-2.1	3.7	4.9	Africa	-1.7	3.7	3.8	Iran	-6.8	-3.7	1.5
South Africa	-7.0	4.6	2.5	Nigeria	-1.8	2.6	2.7	Egypt	5.6	3.6	2.7

				South Africa	-6.4	5.0	2.2	South Asia	4.4	-6.7	3.3
								India	4.2	-9.6	5.4
								Pakistan	1.9	-1.5	0.5
								Bangladesh	8.2	2.0	1.6
								Africa	2.4	-3.7	2.7
								Nigeria	2.2	-4.1	1.1
								South Africa	0.2	-7.8	3.3
								Angola	-0.9	-4.0	0.9

Sources: *OECD Economic Outlook: Interim Report*, Organization for Economic Cooperation and Development, September 2021; *World Economic Outlook*, International Monetary Fund, October 2021; *Global Economic Prospects*, World Bank Group, January 2021.

Note:* Projections

Table A2 Estimates of the impact of vaccinating unvaccinated population on UK's exports in goods

Region	% UK Exports in goods (2019)	% of population fully vaccinated (2022)	% Global GDP (2019)	Cost of covid (2 year estimate, % of GDP)	Bilateral Income Elasticity	UK exports (2019, USD million)	% change in UK exports[1]	Level changes in UK exports (USD million)[2]
EU27	46.4	69.9	17.9	6.4	0.8	215349	1.4	3119
North America	17.0	74.6	26.5	5.6	1.0	78771	1.4	1067
Advanced Asia	6.6	86.2	8.7	12.9	1.2*	30725	2.1	646
Emerging and Developing Asia	9.2	65.1	23.3	12.9	0.3^	42761	1.5	636
Latin America and the Caribbean	1.7	55.5	5.9	8.8	0.7"	7806	**2.8**	218
Middle East and Central Asia	6.4	41.4	4.7	6.0	0.4	29918	1.3	383
Emerging and Developing Europe	2.6	44.2	3.2	5.2	0.7"	12249	2.1	253
Other Advanced Europe	4.3	73.8	4.6	5.9	0.8**	20027	1.2	232
Sub-Saharan Africa	0.5	22.5	0.8	6.8	0.7^^	2442	**3.5**	86
Advanced Oceania	1.4	81.9	1.8	5.5	0.7"	6545	0.7	46

Source: Regional mean values for income elasticities was taken from BIS (2013). Data on UK exports was taken from World Bank's WITS database (2019); data on v status was taken from University of Oxford (2022); data on share in global GDP was taken from World Bank (2019)

1/The **Percentage change in UK exports** was calculated as follows: Bilateral income elasticity * Cost of COVID-19 * COVID-19 factor, where, Cost of COVID-19 is expressed as a share of GDP based on IMF's World Economic Outlook (2019;2020,2022); COVID-19 factor is expressed as (1- rate of vaccination)

2/ **Level changes in UK exports** (USD million) was calculated as Percentage change in UK exports * Export value in 2019

Note: *This is an average for Japan and Korea from Senhadji (1998) and BIS (2010)

**This is an average for Large European Economies from BIS (2013)

"This is the mean income elasticity for UK exports to the world. Source: BIS (2013)

^This is the mean income elasticity for middle-income Asia from BIS (2013)

^^This is a mirrored value for South Africa from Sehnadji (1998) and BIS (2010)

Table A3 Estimates of the impact of vaccinating unvaccinated population on UK's exports in services

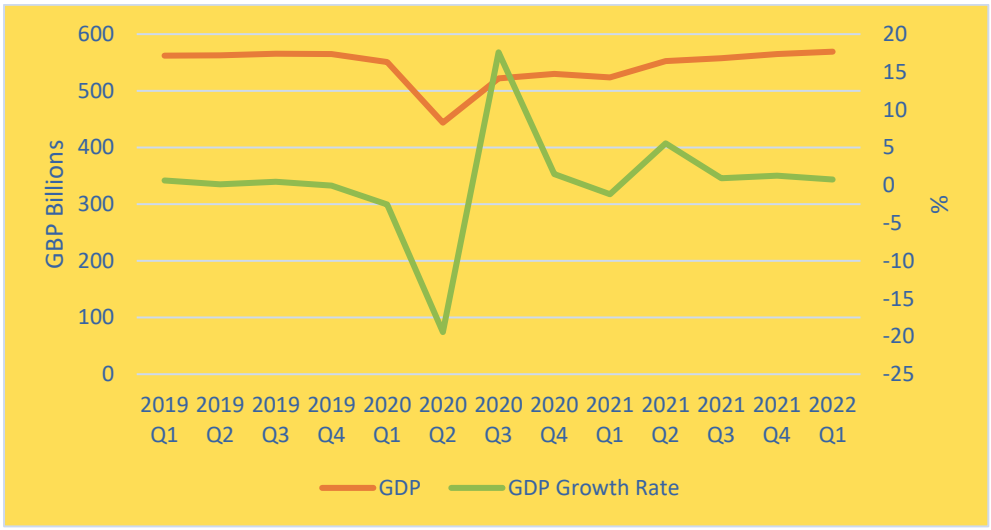
Region	% UK Exports in (2019)	% Fully Vaccinated (2022)	% Global GDP (2019)	Cost of covid (2 year estimate, % of GDP)	Bilateral Income Elasticity	UK exports (2019, ONS, GBP million)	% change in UK exports	Level changes in UK exports (GBP million)
Advanced Asia	6.4	86.2	8.7	12.9	-4.2	21087	-7.4	-1570
Advanced Oceania	2.2	81.9	1.8	5.5	1.9**	7345	1.9	136
Emerging and Developing Asia	6.0	65.1	23.3	12.9	0.8	19610	**3.7**	735
Emerging and Developing Europe	4.2	44.2	3.2	5.2	0.9"	13625	2.7	365
EU27	37.4	69.9	17.9	6.4	1.2*	122333	2.4	2935
Latin America and the Caribbean	3.5	55.5	5.9	8.8	0.9"	11471	3.6	415
Middle East and Central Asia	5.7	41.4	4.7	6.0	0.9"	18780	3.3	609
North America	27.3	74.6	26.5	5.6	1.1	89293	1.6	1413
Other Advanced Europe	4.9	73.8	4.6	5.9	1.9**	16141	2.9	464
Sub-Saharan Africa	2.2	22.5	0.8	6.8	0.9"	7144	**4.9**	348

Source: Regional mean values for income elasticities was taken from BIS (2013). Data on UK exports was taken from ONS (2019); data on vaccination status was taken from University of Oxford (2022); data on share in global GDP was taken from World Bank (2019)

1/The **Percentage change in UK exports** was calculated as follows: Bilateral income elasticity * Cost of COVID-19 * COVID-19 factor, where,
Cost of COVID-19 is expressed as a share of GDP based on IMF's World Economic Outlook (2019;2020,2022); COVID-19 factor is expressed as (1- rate of vaccination)
2/ **Level changes in UK exports** (GBP million) was calculated as Percentage change in UK exports * Export value in 2019

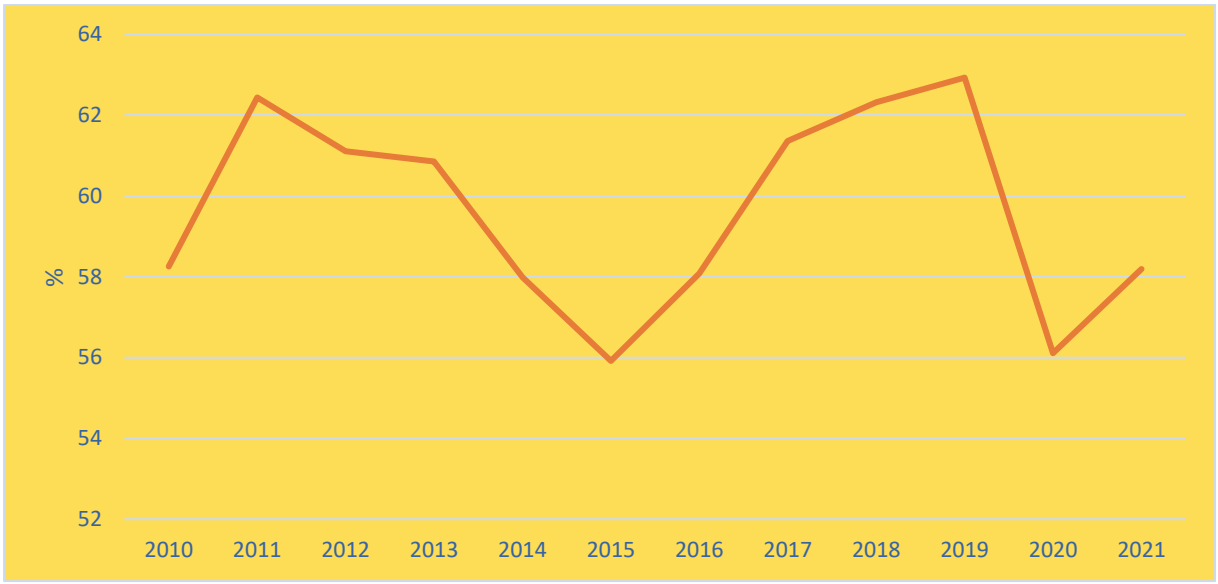
Note: *Average of Large European countries and Central Europe from BIS(2013)
**Average for Large European countries from BIS(2013)
"Average across all partners from BIS(2013)

Figure A1 Quarterly GDP and GDP growth rates for the UK, Q1 2019 to Q1 2022



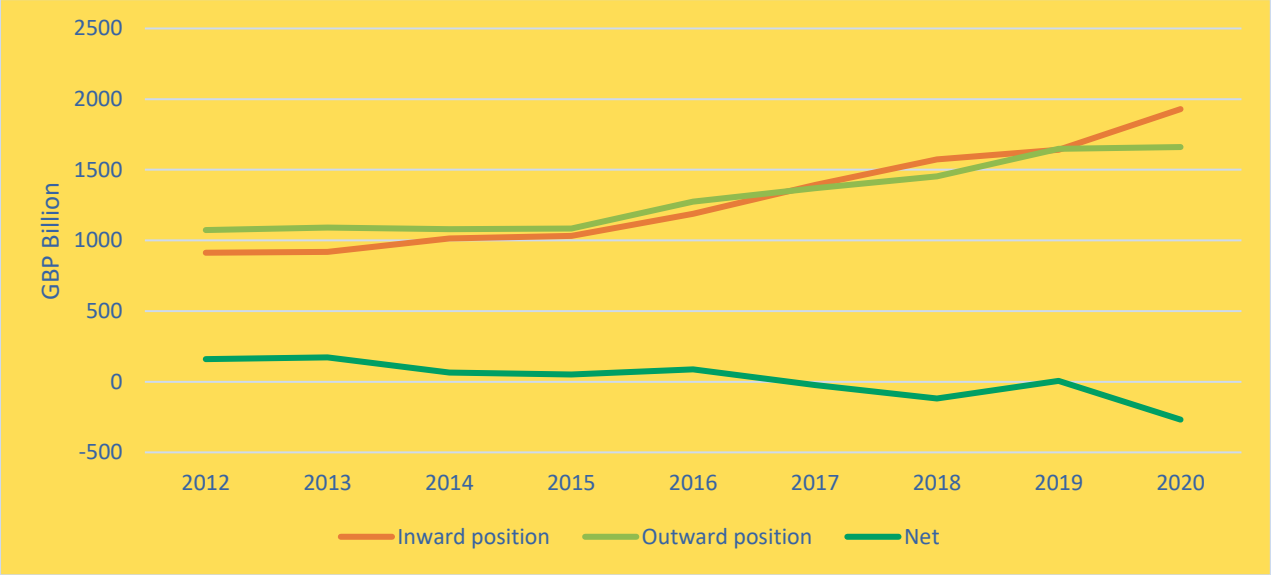
ONS (2022a)

Figure A2 Trade (goods and services) as a percentage of GDP, United Kingdom, 2010–2021



Sources: World Bank (2022); ONS (2022; 2022a)

Figure A3 UK, inward and outward FDI flows, 2012–2020 (£ billion)



Source: ONS (2022b)

Table A4 Estimated UK FDI dividends returns if vaccine rates achieve 100%

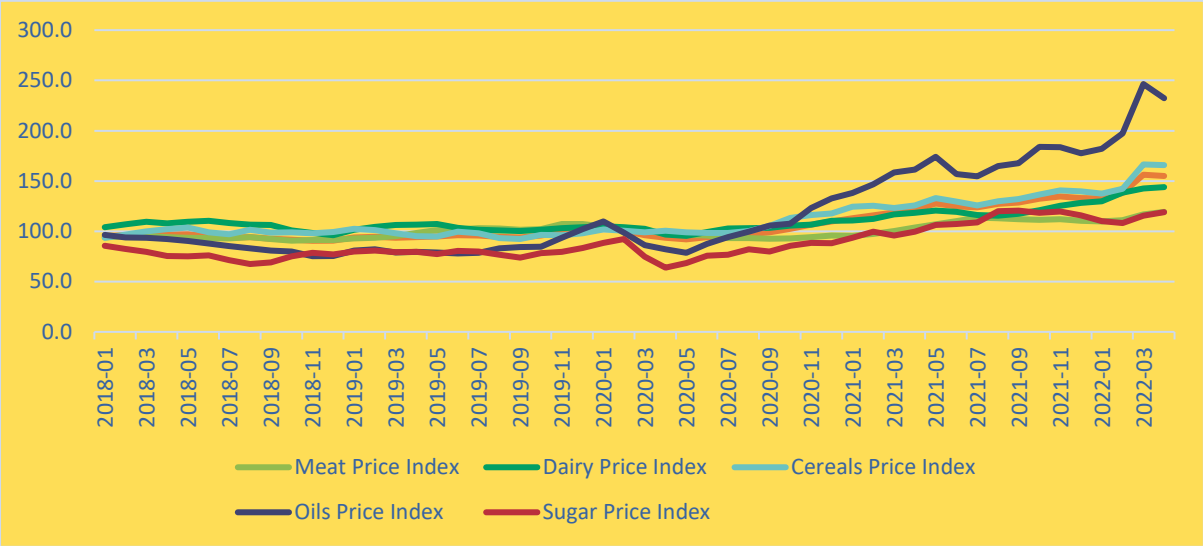
Region	Vaccine Coverage (% population)	COVID-19 cases Reduction if full vaccination (% cases) (1)	Full Vaccine FDI (%) Increase (2)	Current FDI Dividends (GBP million)	Full Vaccine FDI Dividends (GBP millions)	Potential FDI Gain (GBP million)
EU27	69.9	24.1	3.4	22273	23023.9	750.9
North America	74.6	20.3	2.8	15310	15745.5	435.5
Advanced Asia	86.2	11.0	1.5	3321	3372.3	51.3
Emerging and Developing Asia	65.1	27.9	3.9	1977	2054.3	77.3
Latin America and the Caribbean	55.5	35.6	5.0	2523	2648.7	125.7
Middle East and Central Asia	41.4	46.9	6.6	1872	1994.9	122.9
Emerging and Developing Europe	44.2	44.6	6.2	3757	3991.8	234.8
Other Advanced Europe	73.8	21.0	2.9	2500	2573.4	73.4
Sub-Saharan Africa	22.5	62.0	8.7	1193	1296.6	103.6
Advanced Oceania	81.9	14.5	2.0	1564	1595.7	31.7
Total						2007

Source: ONS (2022f); Suthar et al.. (2022), Hayakawa et al.. (2022), University of Oxford (2022)

(1) **Case Reduction:** Calculated using estimates (Suthar et al.. 2022) that for every 10% increase in vaccine penetration, there i reduction in COVID-19 cases.

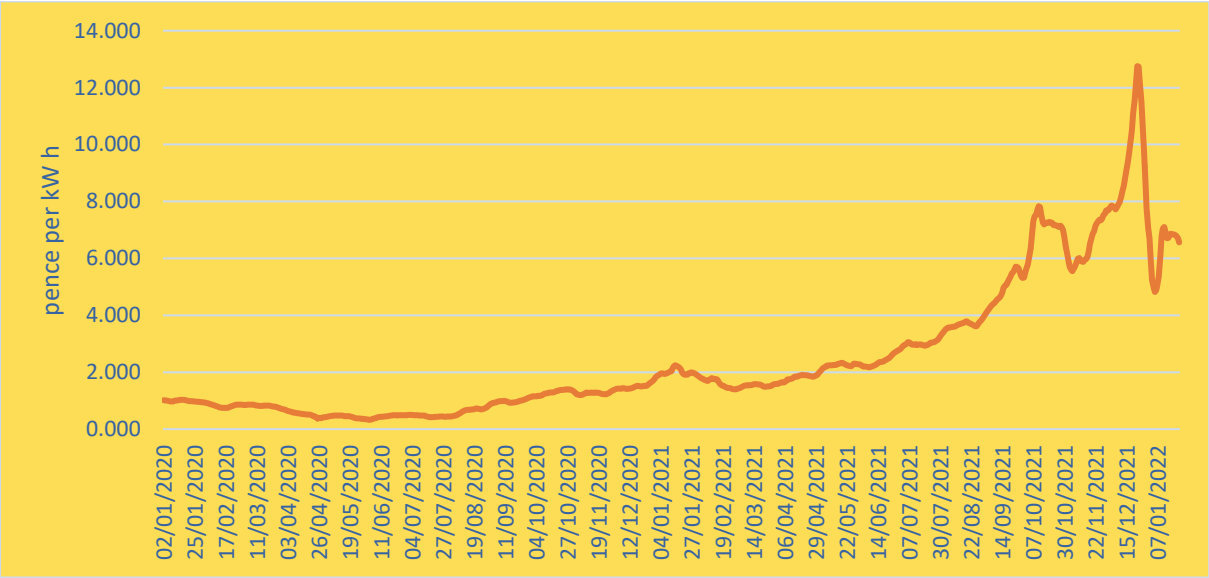
(2) **Full Vaccine FDI (%) increase:** Calculated based on Hayakawa et al. (2022) estimates that a 1% reduction in COVID-19 cases in the FDI host country leads to a 1.4% increase in inward FDI. We then assume such changes in inward FDI will have impact on FDI dividends.

Figure A4 FAO food price index (2014–2016=100), January 2018–March 2022



Source: FAO (2022)

Figure A5 Gas prices (pence per kW h) in the UK, January 2020–January 2022



Source: ONS (2022e)

Appendix 4 Micro-level impacts of Covid in the UK

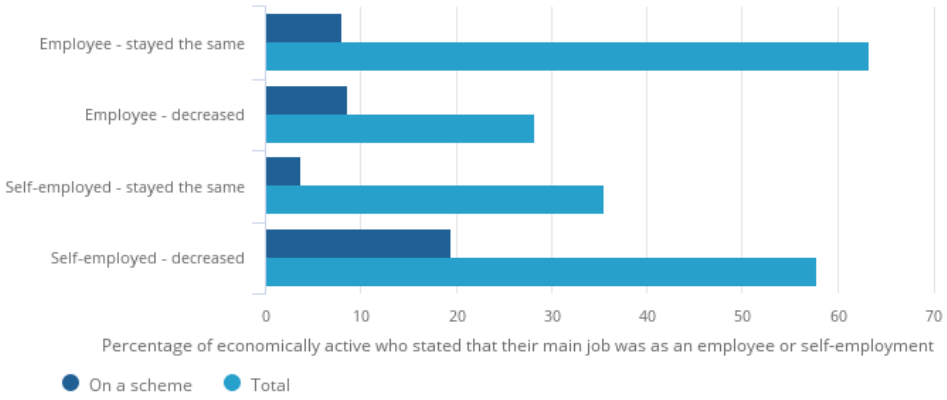
Distributional impacts on UK households

As illustrated in Section 3.3, the UK has experienced a rapid and significant rise in inflation since April 2020, which has accrued from increases in household running costs, driven by increases in energy prices, transport costs and food costs. However, as the cost of living increased, the income of many groups decreased. Analysis shows that some groups, namely poorer households, were disproportionately affected by these macroeconomic impacts.

Poorer households, defined by those in the bottom quintile of the income distribution[28], were more likely to report reduced household income from April 2020- October 2020 than any other income quintile. Figure A6 below shows that 43% of economically active people in the lowest quintile reported reduced income, compared to only 30% of economically active people in the top income quintile.

[28] Individuals are ranked by their equivalised household disposable incomes, using the modified Organisation for Economic Co-operation and Development (OECD) scale, and then divided into five income quintiles.

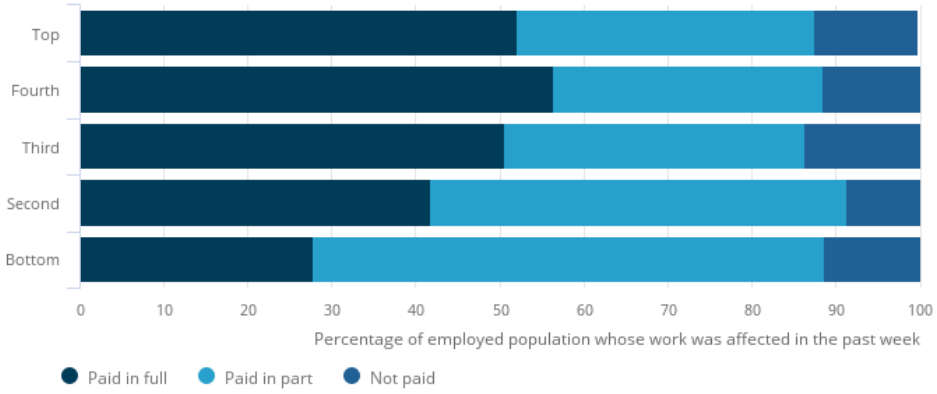
Figure A6 Percentage of economically active population reporting on whether household income has changed, split by income quintile band for financial year ending 2020, Great Britain, April 2020–October 2020



Source: ONS (2021d)

Poorer households were most vulnerable to the economic impacts of lockdowns too, as only 19% of people with an income less than £20,000 reported that they were able to work from home, compared to 55% of people with an income over £20,000. To mitigate income losses during lockdowns, the government launched the Coronavirus Job Retention Scheme (also known as furlough) from March 2020 to September 2021. A total of 11.7 million people were furloughed, costing a total of £70 billion. This scheme- a government subsidy- provided grants to employers so that they could continue paying furloughed staff up to 80% of their wages. Employers were allowed to ‘top up’ these wages the additional 20%. However, only 27.8% of those in the bottom income quintile were paid in full by their employers, compared to 52% in the top income quintile (figure A7). This further explains why poorer households were more likely to have a reduced income during the pandemic.

Figure A7 Percentage of people responding to whether they were still being paid while work was on hold, by income quintile band for financial year ending 2020, Great Britain, May 2020 to October 2020.



Source: ONS (2021d)

Not only were poorer households more vulnerable to reduced income than any other income quintile, but poorer households spend the largest proportion of their disposable income basket on food and housing costs (including energy). In 2020, the bottom fifth of income deciles spent 12.5% of their disposable on food and non-alcoholic drinks on average, which increased to 13.2% in 2021. In comparison, in 2020 the top fifth of income deciles spent only 7.5% of their disposable income on food and non-alcohol drinks on average, which increased to 9.3% in 2021. Given that food inflation was more than 10% during this period, and the poorest fifth of income deciles spend the largest proportion of their disposable income on food compared to other income deciles, this indicates that poorer households are most vulnerable to rising food costs.

Similarly, with regards to housing costs (including energy), in 2020 the bottom fifth of income deciles spent 20.6% of their disposable income on housing costs, on average, which remained fairly constant at 20.2% in 2021. In comparison, in 2020 the top fifth of income deciles spent only 9.1% of their disposable income on housing costs on average, which increased to 10.4% in 2021. As such, given housing cost inflation, and the poorest fifth of income deciles spend the largest proportion of their disposable income on food compared to other income

deciles, this indicates that poorer households are most vulnerable to rising energy costs.

Moreover, analysis shows that poorer households were less likely to be able to save during the pandemic than their counterparts. 30.3% of households with an income lower than £20,000 reported that there were able to save, compared to 53.1% of households with an income over £20,000.

Food poverty in the UK and Covid-19

Data from the Trussel Trust (2022), an association of food banks distributing emergency food parcels to families, show that between 2020 and 2021 there was a 14% increase in the amount of emergency food parcels distributed across their network in the UK. Data from the Independent Food Aid Network (IFAN, 2020) states that, between February 2020 and November 2020, there was a 110% rise in the amount of emergency food parcels distributed by their food bank network in the UK. Food poverty issues persist, with estimates that 9% of all UK households experienced food insecurity in the first six months of 2021, compared to a pre-pandemic level of 7.6% of households (Food Foundation, 2021).

Inflationary pressures on food prices in the UK (as seen in Section 3.3), driven in part by the Covid-19 crisis, may therefore be contributing to increased levels of food poverty in the country. The impact is likely to be more evident for those in the lowest income groups who may be forced to make choices between spending more money on the same basket of food or paying for other essential costs such as energy. However, as energy prices remain high (compounded by reduced income levels as evidenced in Section 3.3) increased financial pressure on lower-income households may mean that choices may need to be made between maintaining existing food consumption levels at the cost of reduced energy consumption levels (or vice-versa) or a reduction in consumption for both.

As a result of rising energy prices (compounded by the Russia–Ukraine war), the UK is likely to implement a proposed £15 billion emergency support package, further increasing the economic costs of Covid-19. The support package will likely alleviate some pressure on lower-income households, but if food prices continue to rise or are subject to further price shocks the incidence of food poverty will likely increase, particularly if energy costs do not fall and support packages are eventually removed.

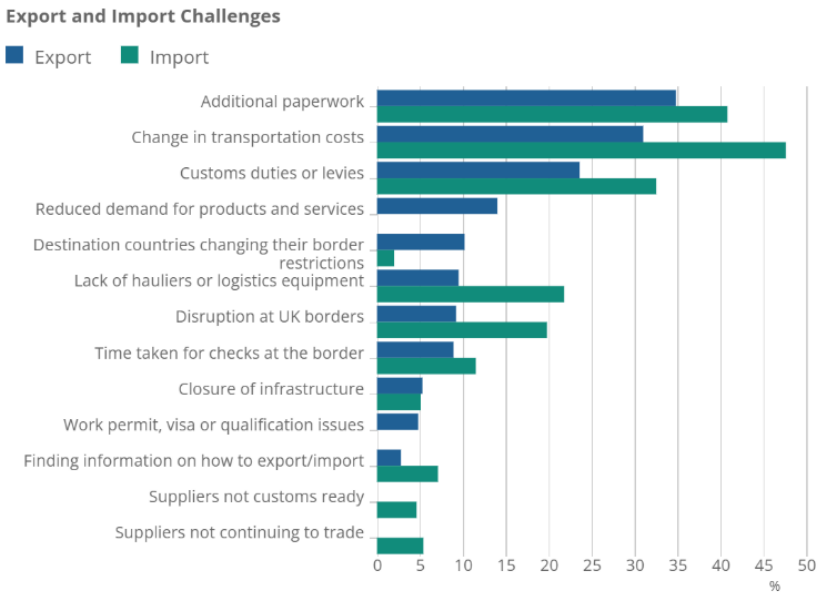
Impacts on UK businesses

UK businesses were negatively affected during the coronavirus pandemic. Reduced household incomes, compounded by public health restrictions and a series of lockdowns, triggered a sharp decline in final consumption expenditure (FCE) from April to June 2020. Exacerbating this, employee numbers in the UK fell by 466,000 (1.4%) in the year ending September 2021. Prior to this, employment numbers had been rising by 0.9% a year on average over the last four years. Moreover, the pandemic sparked a labour market shortage with a record high of 1.2 million job vacancies in October 2021. This labour shortage meant that 50% of businesses could not meet demand, along with a plethora of issues outlined in this section.

The fall in capital expenditure caused by public health restrictions and lockdowns triggered a sharp decline of 22% in FCE from April to June 2020, with some sectors disproportionately affected. For example, there was a noticeable drop in consumption, with an 88% decline in expenditure on hotels and restaurants, as well as a 59% reduction in transport expenditure.

Overall, employee numbers fell during the coronavirus pandemic. Many lower-paid and lower-skilled occupations saw the greatest falls in employment. For example, during the pandemic there were 39,000 fewer Heavy Goods Vehicle (HGV) drivers in the UK in the year ending June 2021 than there were in the year ending June 2019. With specific regard to UK nationals employed as HGV drivers, there were 26,000 (10%) fewer in the year ending June 2021 than in the year ending June 2019 (263,000). This shortage of HGV drivers was caused, in part, by the fact that HGV driving tests were not taking place because of the pandemic. The shortage of HGV drivers led to wider impacts on supply chains and businesses. In particular, UK businesses reported issues including: 14% of all exporting businesses reported reduced demand for products and services; 22% of all importing businesses reported lack of hauliers of logistics equipment; 47% of all importing businesses reported change in transportation costs (Figure A8).

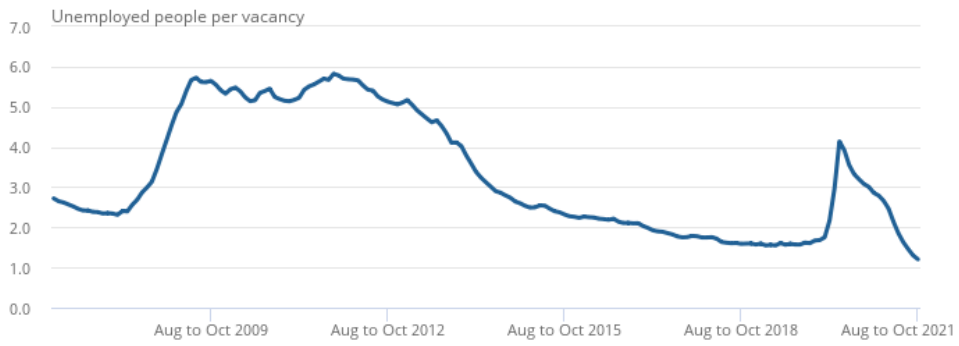
Figure A8 Percentage of businesses currently trading, who reported they had exported or imported in the last year, and reported how their exports or imports were affected, weighted by count, 6–19 September 2021



Source: ONS (2021f)

The pandemic caused a labour market shortage in the UK. There were a record 1.2 million vacancies from September to November 2021, and unemployment fell to 1.4 million, indicating a tightening of the labour market with fewer people to fill increasing vacancies. The number of unemployed people per vacancy decreased sharply from April–June 2020, when there were 4.1 unemployed people per vacancy, to 1.2 by August–October 2021 (Figure A9).

Figure A9 Number of unemployed persons per vacancy, UK, December 2006–February 2007 to August–October 2021



Source: ONS (2021e)

More than 50% of businesses who reported labour shortages were unable to meet demand, hence demand outstripped supply. The impact of worker shortages was that 14.4% of all businesses had to pause trading entirely; 27.3% of businesses with 10 or more employees had to pause trading of some of the business; and 50% of all businesses were unable to meet demands (Figure A10).

Figure A10 Impact of worker shortages, broken down by employment size band, weighted by count, UK, 15–28 November 2021

Source: ONS (2021e)

Coronavirus also had a negative impact on the number of hours worked. The average number of hours worked per week fell by 3.1 (9%) in the year ending September 2020, compared to the year ending September 2019. It can be inferred reduced working hours leads to reduced productivity, which leads to reduced supply, and therefore partly explains why businesses cannot keep up with demand during the pandemic.

To summarise, reduced capital expenditure in the economy compounded by a labour market shortage mean that UK businesses were unable to meet demand during the pandemic. As the economy begins to bounce back, this situation is likely to worsen due to ongoing supply-side constraints, with demand outstripping supply.