Methodology used by Oxford Economics [i] to calculate bp's impact on the UK economy in 2022

The calculation of all impacts in this report is on a gross basis. The results, therefore, do not take into account the alternative potential uses of the people and other resources that bp and its suppliers use. This is standard practice due to difficulty determining the second-best use of any resource.

Estimating bp's direct impact in the UK

In order to calculate bp's direct impact we use finance, headcount, and tax data provided by bp. The employment headcount data was as of 31st December 2022, on the basis of the normal work jurisdiction of the employee and does not include third-party contractors. Likewise, bp's tax data is aligned with the calendar year of 2022.

Gross value added is the sum of earnings before interest, tax, depreciation and amortisation (EBITDA), compensation of employees and business property rates; compensation of employees is the wages and salaries paid to employees, as well the employer's pension contributions and national insurance contributions.

Estimating bp's supply chain impact in the UK

In order to quantify bp's indirect operational and capital expenditure impacts, the analysis in this report is based on ONS analytical input-output (IO) tables. [ii] These tables can be used to estimate the impact on other industrial sectors as a result of bp's spend on inputs of goods and services and fixed assets. IO tables can be employed to create industry multipliers, through the so-called Leontief system. [iii] Under the Leontief system, multipliers are calculated through a series of manipulations of the IO matrix.

The first manipulation is the creation of a base coefficients matrix, known as an 'A' matrix for the UK. In this matrix, every cell is expressed as a proportion of that industry's output; for instance, any value in the mining column is expressed as a proportion of total mining output, and so on for each industry. The second step is creating an identity matrix, known as an 'I' matrix, whereby all values are zero except for when the consuming industry (columns) and the producing industry (rows) are the same; these cells are given a value of 1. The third action is the subtraction of the 'A' matrix from the 'I' matrix. The final manipulation is the inversion of the matrix produced in step three. The result of these matrix calculations is a table whereby the values represent the individual cross-multipliers for each sector, presenting the impact on each producing industry (row) of an increase by 1 unit of output in a consuming industry (column). The total multiplier for each consuming industry is the sum of the multipliers in the relevant column.

Estimating regional impacts using Flegg and Webber's methodology

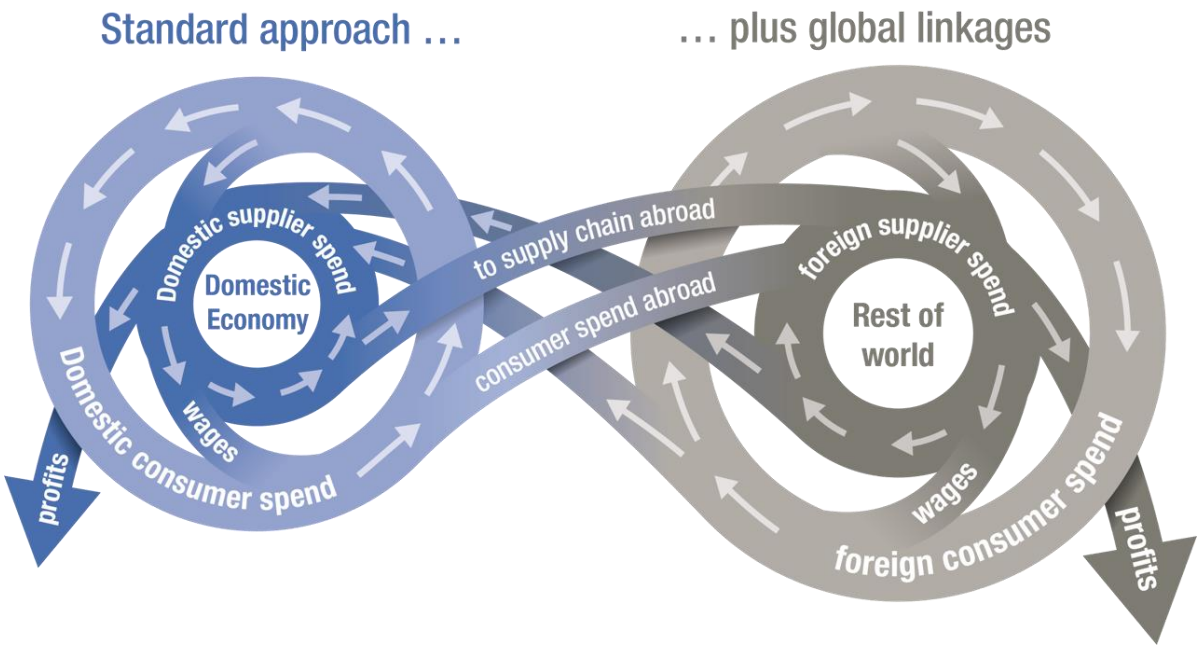
Following UK economic impact modelling, regional economic impact modelling was carried out using techniques initially developed by the academics Flegg and Webber. [v] The techniques involve constructing regional IO models by applying location quotients (LQs) [vi] and regional size adjustments to the standard UK IO tables. These adjustments allow for better estimates of the location of gross value added supported in the indirect and capital expenditure channels. The result is that geographies with higher concentrations of industries receiving procurement have larger impacts.

Estimating additional indirect operational and capital expenditure impacts on the UK economy from bp's global spending, using Oxford Economics' Global Sustainability Model

Oxford Economics analysed the extra boost that bp's global spending has on the UK economy. bp has a global presence with operational sites across the world and, given how inter-connected the modern economy is, a proportion of bp's global spending will wash up on UK shores indirectly. For example, if a bp office in France purchases equipment from a German manufacturer and the manufacturer buys some financial services from the UK, this activity will stimulate some gross value added and jobs in the UK.

Oxford Economics' Global Sustainability Model covers 96 countries that make up 97% of global GDP. In the model, each country's economy is split into 36 industries that are defined by the ISIC Revision 4 classification, from agriculture to manufacturing to utilities to professional services. This allows us to trace supply chain spending within countries and across their borders, and build up the most comprehensive estimate of bp's impact on the UK economy yet given that bp's operations are global. A global input-output model's multipliers capture spending flows that single-country models treat as leakage.

How a global input-output model differs from a domestic input-output model



Margin of error

Throughout the report, Oxford Economics has rounded bp's economic impacts to two significant figures except for bp's direct impact results. The direct impacts comprise data provided by bp's financial, human resources, and tax teams.

Because Oxford Economics' models are by necessity an approximation of reality, all resulting estimates contain an implicit margin of error. The margin of error is not necessarily uniform for every estimate, but as a rule of thumb the margin of error can be reasonably expected to be on the order of +/- 10 to 100 for estimates of the number of jobs bp supports, and +/- £1 million to £10 million for estimates of the amount of gross value added bp supports.

Exchange rate

An average annual exchange rate for 2022 of 1.24 USD per GBP was used to convert currency values where necessary. [vii]

Footnotes

[i] Oxford Economics was founded in 1981 as a commercial venture with Oxford University's business college to provide economic forecasting and modelling to UK companies and financial institutions expanding abroad. Since then, we have become one of the world's foremost independent global advisory firms, providing reports, forecasts and analytical tools on more than 200 countries, 100 industries, and 8,000 cities and regions. Our best-in-class

global economic and industry models and analytical tools give us an unparalleled ability to forecast external market trends and assess their economic, social and business impact.

[ii] ONS, (2022), United Kingdom Input-Output Analytical Tables, 2018. Input-output tables are designed to give a snapshot of an economy at a particular time, showing the major spending flows from 'final demand' (i.e. consumer spending, government spending, and exports to the rest of the world); intermediate spending patterns (i.e., what each sector buys from every other sector – the supply chain); how much of that spending stays within the economy; and the distribution of income between employment income and other income (mainly profits). In essence, an input-output model is a table that shows who buys what from whom in the economy. The latest available domestic-use input-output table for the UK, published by the ONS in 2022, was for the calendar year 2018.

[iii] Leontief (1986), *Input and output economics, second edition Oxford University Press*.

[v] Flegg and Webber, (2000), Regional Size, Regional Specialization and the FLQ Formula. Regional Studies, Vol. 34.6, pages 563-569.

[vi] LQs are based on employment by sector by region.

[vii] Oxford Economics.

1. Direct GVA comparison
    a. ONS, (2023), "GDP output approach, low level aggregates, UK, Quarter 4 (Oct to Dec) 2022", data accessed March 2023.
2. UK GDP
    a. ONS, (2023),"GDP quarterly national accounts time series", data accessed April 2023.
3. UK employment
    a. ONS, (2023)," Number of People in Employment (aged 16 and over, seasonally adjusted):000s", data accessed March 2023.
4. HMRC tax revenue
    a. HMRC, (2023)," HMRC tax receipts and National Insurance contributions for the UK", data accessed March 2023.
5. Regional GVA
    a. ONS, (2023), "Regional gross value added (balanced) by industry: all International Territorial Level (ITL) regions", data accessed March 2023. Data was only available for 2020 at the regional level. The UK level for GVA in 2022 was used to scale the regional disaggregation.
6. Regional Employment
    a. ONS, (2023),"LFS: In employment: West Midlands: All: Thousands: SA, data accessed March 2023.

Glossary

The following terms are used in the report on bp's impact on the UK economy. Every effort has been made to align reported figures with Office for National Statistics (ONS).

bp created/generated refers to metrics – such as gross value added, jobs, and tax – for which bp is directly responsible at its operational sites (direct impacts).

bp supported refers to metrics – such as gross value added, jobs and tax – that other businesses created because of bp's expenditure. For example, because bp purchased inputs of goods and services from them (indirect impacts via operational spending or indirect impacts via capital expenditure).

Capital expenditure is spending on goods and services that bp uses up across multiple years, especially on buildings, machinery, and equipment.

Currency values, unless otherwise stated, are in GBP at 2022 prices.

Direct impacts are jobs and gross value added generated at bp's operational sites in the UK.

Employment or jobs is the number of people employed, regardless of whether their employment is full-time or part-time, or whether they are employed directly by bp or as an individual on a fixed-term. It is measured on a headcount terms for comparability to national statistics.

Gross value added (GVA) is the difference between the revenue of a firm minus the cost of bought in goods and services used up to produce that revenue. It is also equal to the sum of compensation of employees and earnings before interest, taxes, depreciation, and amortisation (EBITDA). Summed up for all firms in an economy, gross value added is equal to GDP with minor adjustments for taxes and subsidies.

Gross domestic product (GDP) is the sum of all gross value added created across all entities, plus some adjustments for taxes and subsidies within an economy in a single year. GDP is the most common number economists and commentators use to measure the size of an economy and the rate it is growing.

Indirect impacts via operational spending are gross value added, jobs, and tax supported due to bp's spending with its operational suppliers.

Indirect impacts via capital goods spending are gross value added, jobs, and tax supported due to bp's spending with its capital goods suppliers.

Operational expenditure is spending on goods and services that will be used up in a single year.

Taxes are monetary payments to the Exchequer or local authorities.