

JEDHub Annual Economic Report Methodology and Quality Report

JEDHub Survey and Report Analysis

Annex A

1. Background and Context

- The JEDHub is a collaborative initiative hosted at the UK Defence Solutions Centre (UKDSC) and sponsored by UK MOD, it is supported by other government departments, industry partners, and academia.
- The report has been produced by the UKDSC with support from UK MOD and the JEDHub Delivery and Industry Working Groups (DWG and IWG), based on analysis of data provided through the JEDHub Industry Survey 2022 and from other sources such as the Office for National Statistics (ONS) and ADS Facts and Figures.
- The methodologies included in this annex explain the process followed by the UKDSC and MOD Industrial Programmes (Ind Progs) teams to collect data with the JEDHub Industry Survey through to producing the outputs in the report and is presented according to the five chapters of the report.
- The purpose of the Industry Survey was to draw out new insights on the economic impact of the defence sector, by collecting data directly from industry. Other publicly available data on the economic impact of defence, such as employment, are largely based on estimation and modelling.
- The main focus of this year's Industry Survey was to identify greater fidelity and granularity related to employment, turnover, supply-chain and skills and demographics within the surveyed population, which includes some of the UK's largest defence suppliers.
- When referring to the defence sector and/or defence activity, a working definition was agreed between the JEDHub Delivery Working Group, which included relevant cross-government and trade body experts:
'the defence sector represents those activities that support the production and delivery of goods or services (including subcontracted work) for a defence customer (UK or international).'
- This definition underpinned the survey questions, which companies were asked to consider when evaluating which elements of their business constituted defence business.
- The survey was shared with a list of companies made up of members of the Defence Growth Partnership (DGP), Defence Suppliers Forum members, MOD Strategic Suppliers, members of defence trade bodies and further identified defence suppliers. In total, we received 26 responses to the survey.

2. Methodology

- The JEDHub has relied heavily on data provided by the JEDHub Industry Survey 2022 to provide specific insights about the UK defence sector. The data supplied by companies was anonymised and aggregated for analysis using an automated tool; further details about this tool can be found in Annex B.
- The analysis methodology for each chapter of the report can be found in the subsequent pages of this annex. Separate annexes are included for the analysis of DGP indirect jobs and ONS supply chain analysis as they were completed by government representatives on the JEDHub DWG.
- The survey sought to gather data on:
 - Company Revenue
 - Of which, defence
 - Source (by location and customer type)
 - Capability Breakdown (breakdown by domestic and international)
 - National and Local Employment
 - Supply-Chain data
 - Employment demographics (age, gender, wages, experience)
 - Skills
 - The following capability segments were agreed with DWG and IWG Members:
 - Air (Combat Air)
 - Air (Rotary Wing)
 - Air (Fixed Wing Other)

- Cross-cutting and enabling capabilities
- Cyber
- Land
- Maritime (Surface)
- Maritime (Sub-surface)
- Military C3 (Command, Control and Communications, including Crypt Key - excluding space and cyber capabilities)
- Space
- Weapons and ammunition (including missile systems).

3. Quality Assurance

- The quality management of the analysis began with the data input, where the survey automatically checked for simple errors as the companies responded. The companies worked closely with UK MOD to ensure accuracy and appropriateness of the responses before submission, and a subsequent manual Quality Assurance (QA) activity took place on the anonymised data.
- Once all the survey returns were in, the MOD Ind Progs team made a testing spreadsheet. This spreadsheet was used to process completed survey responses. Team members reviewed responses for errors, comments and missing information. Access to the spreadsheet was kept within the MOD Ind Progs team, no one outside of this team had access to this spreadsheet.
- The MOD Ind Progs team liaised with companies to address issues raised with responses to ensure accuracy of responses.

- The UKDSC also supported the quality assurance process, through controlled and supervised access to anonymised returns, allowing the MOD Ind Progs team to follow up directly with specific companies, in accordance with the survey data handling agreement and principles.
 - Survey returns were aggregated automatically via the JEDHub portal and reviewed by MOD Ind Progs team to protect company anonymity. The MOD Ind Progs team members completed a manual check of defence full-time equivalent (FTE) numbers against the aggregator tool to ensure reliability of results and the tools. In accordance with the data handling agreement, the aggregated and anonymised data set was saved onto a limited access, secure online platform for analysis purposes. The aggregated dataset was limited to individuals operating in the JEDHub team in MOD and UKDSC and MOD Analysis teams developing the supply-chain section.
 - All resulting data and analysis quoted in the report has been internally peer reviewed at the UKDSC and externally reviewed throughout the report development process by the UK MOD, DWG, IWG and an academic panel.
 - In full transparency, all the data presented in the report has been made available publicly, with the permission of the data providers, following reviews for disclosure.
 - The JEDHub Annual Economic Report has been written by the UKDSC following its principles of independent, impartial and data-driven analysis.
- #### 4. Relevance, Timeliness and Accessibility
- **Relevance:** the data from the JEDHub Industry Survey is based on the 26 responses received and so is not representative of all companies that operate in the defence sector, however the JEDHub believes the data presented is valuable and indicative of the wider defence sector's characteristics, particularly when supplemented with external data sources as in the report.
 - **Timeliness:** the data from the JEDHub Industry Survey has an annual frequency, covering the calendar years of 2020 and 2021.
 - **Accessibility:** the JEDHub Annual Economic Report has been produced in a visual style to promote ease of understanding and to ensure the key data points are not missed, with notes and explainers where appropriate. The full data tables are publicly available alongside the report on [JEDHub.org](https://jedhub.org).
- #### 5. Comparability
- Where appropriate, the JEDHub Annual Economic Report has made reference to other data and reports regarding other similar sectors. This is intended to contextualise the JEDHub data rather than draw comparative conclusions between different sectors.
 - Due to the limited sample frame, there is limited scope for drawing comparative conclusions against other data sources representative of different sectors.

1. People in Defence

1. Background and Context

The People in Defence chapter of this report draws on JEDHub Industry Survey data and ONS data regarding the UK manufacturing industry to present a picture of employment related to the defence sector. This includes a total employment number for the surveyed sample at a national and regional level, how this compares to wider manufacturing, and the demographics of those employed by defence companies.

i. Definitions

- *Full Time Equivalents (FTEs)*: a measure of employment that takes into account the total hours worked by both full time and part time employees, standardised by a common measure of full-time hours. The FTEs may therefore be less than total jobs.

$$FTEs = \text{Number of full time employees} + \left(\text{number of part time employees} \times \left[\frac{\text{average part time weekly hours}}{\text{average full time weekly hours}} \right] \right)$$

- *Defence hours worked*: the total number of hours worked delivering defence goods and services.
- *Indirect Jobs*: jobs supported by companies through their supply chain spending.
- *Location quotient*: a statistical measure of the regional concentration of jobs within a sector relative to another sector. For the purpose of the JEDHub, the distribution of defence jobs has been compared to wider manufacturing jobs in the UK.
- *International Territorial Level 1 region*: geocode standard regions of the UK defined and recognised internationally for statistical analysis. These do not necessarily equate to political or cultural boundaries.
- *Total costs of wages and salaries of defence FTEs*: the sum of all basic pay, relating to the pay period, before deductions for PAYE, National Insurance, pension schemes, student loan repayments and voluntary deductions for defence FTEs. Includes paid leave (holiday pay), maternity pay, furlough pay, sick pay, area allowances (e.g. London), bonus or incentive pay, pay for a different pay period, shift premium pay, and overtime pay. This excludes expenses, the value of salary sacrifice schemes, benefits in kind and all deductions.
- *Mean average salary*: the average annual salary paid to a worker including all basic pay, relating to the pay period, before deductions for PAYE, National Insurance, pension schemes, student loan repayments and voluntary deductions. Includes paid leave (holiday pay), maternity pay, furlough pay, sick pay, area allowances (e.g. London), bonus or incentive pay, pay for a different pay period, shift premium pay, and overtime pay.

1. People in Defence

- *Median average salary*: the average salary taken by finding annual pay of the 50th percentile worker.
- *Wage premium*: the level of pay in a sector relative to a given alternative sector or the wider population.
- *Linear interpolation*: a method of estimating a value along a curve given two sets of coordinates, and the position of a third coordinate.

2. Process

i. Data sources

- JEDHub Industry Survey 2022
- [Earnings and hours worked, UK region by industry by two-digit SIC: ASHE Table 5](#)
- [Region by broad industry group \(Standard Industrial Classification\) – Business Register and Employment Survey \(BRES\): Table 4](#)
- [JOBS02: Workforce jobs by industry](#)
- [Earnings and hours worked, UK region by industry by two-digit SIC: ASHE Table 5 - Office for National Statistics](#)

ii. Method

Surveyed Defence FTEs:

- The JEDHub Industry Survey measured *defence FTEs* per company by calculating the total FTEs for the companies (including defence and civil employment) then multiplying the figure by *% total employment allocated to defence*. The Survey aggregator then summed the responses to generate a total surveyed defence FTE figure.

DGP Indirect Jobs:

- Please see separate methodology annex for full breakdown of indirect jobs methodology.

Regional Defence FTEs:

- The JEDHub Industry Survey asked each company for a list of company sites in the UK. For each of these sites, the companies were then asked for the total number of *defence hours worked* at each site. The Survey aggregator matched these postcodes with the appropriate ITL1 region and summed the responses to generate a total surveyed defence hours worked per region. This total number was then divided by 1950 (equivalent to a 37.5 hour full-time working week) to generate the regional defence FTEs figure.

1. People in Defence

Location Quotient:

- The location quotient for each region is found by taking the ratio of the proportion of surveyed defence FTEs per region against the proportion of UK manufacturing jobs per region from Business Register and Employment Survey (BRES) Table 4.

Demographics:

- All the demographics data in the report is presented as a proportion of the surveyed FTEs per question, no further calculations have been executed. The data might therefore not represent the full survey sample of FTEs.

Median average salary:

- Due to the nature of the JEDHub Survey data, the median salary could not be measured directly, thus an estimation was made using linear interpolation and data on salary bands. The companies in the JEDHub Survey were asked for their number of defence FTEs per salary band (the salary bands were pre-defined with industry partners). The total defence FTEs per salary band was then summed by the Survey aggregator.
- The salary band with the 50th percentile of defence FTEs was identified as the £22,001 to £45,000 salary band, which captures the 6.17 to 53.23 percentiles. The following linear interpolation equation was then used:

$$\text{Median average salary} = \text{£}22,001 + \frac{(50 - 6.17)(45,000 - 22,001)}{53.23 - 6.17}$$

Mean average salary:

- The JEDHub Industry Survey asked companies for their *total costs of wages and salaries for defence FTEs*, this number was summed by the Survey aggregator. The total defence FTEs for the same sample of companies was calculated separately from the Survey microdata (due to difference in response rate). The average salary was then calculated by simply dividing the total costs of wages and salaries for defence FTEs by the corresponding number of defence FTEs.

1. People in Defence

iii. Limitations and Assumptions

- The JEDHub Industry Survey captures responses from 26 companies and is unable to produce data representative of the whole UK defence sector.
- Since no statistical estimations have been made on the JEDHub Survey data, no statistical robustness or confidence testing has been conducted.
- The UK manufacturing sector is often used as a comparator for the defence sector as much of defence activity is manufacturing, however there is a significant element of service delivery in the defence sector which is difficult to define, and might not be comparable to manufacturing.
- Whilst data was available on employment at a postcode level, the data is presented at an ITL1 regional level to avoid issues with disclosure.
- It should be noted that the sample period includes the COVID-19 pandemic. No attempt has been made to measure the impact of COVID-19 on the defence sector, and caution should be applied when comparing to other sectors which may have been affected by the pandemic to a different degree. Further detail on the impact of COVID-19 on the workforce [can be found on the ONS website](#).
- Surveyed employment doesn't include contracted temporary and contingent workers not on the organisation's payroll.
- Total costs of wages and salaries does not include the wages and salaries of contractors or temporary workers.

2. Investment in People

1. Background and Context

The JEDHub aims to draw attention to the large volume of investment that takes place within the UK defence sector, in particular into skills and R&D, developing a specialised workforce and new technologies which might otherwise not exist in the UK economy. Attention is drawn to this in the JEDHub Annual Economic Report by focusing on the level of investment the defence sector injects into its people in terms of wage premiums, skilled roles, and training programmes. Limited data is also available on R&D activity.

i. Definitions

- *Research & Development (R&D)*: the Frascati Manual defines research and development (R&D) as "creative and systematic work undertaken in order to increase the stock of knowledge - including knowledge of humankind, culture and society - and to devise new applications of available knowledge". Defence R&D activity includes any theoretical or practical research undertaken to develop ideas that might meet future defence or dual-use requirements, as well as any development work on future defence products, regardless of whether they go to market.
- *Production activity*: includes any physical production in the delivery of defence goods. This will include any new product builds as well as upgrade activities. This excludes any R&D activity or support for existing products.
- *Customer Support, Services and Training activity*: defence customer training, services and support activities include any non-manufacturing business services delivered to defence customers. This might include training customers in the use of a defence product, providing logistics and spares support for a defence product, providing consulting services to a defence customer, etc.
- *STEM-related employment*: Employment in Engineer, Scientist, Researcher, Technician and Technologist roles.
- *Production-related employment*: Roles which entail manufacturing production line work, as well as management of goods when in storage and transport.
- *Apprentices*: employees on specific apprenticeship training programmes.
- *Graduates*: employees on specific graduate training programmes.

2. Investment in People

2. Process

i. Data sources

- JEDHub Industry Survey 2022

ii. Method

Defence employment by product lifecycle:

- The Survey asked companies for the percentage of their total defence hours allocated to each of the three product lifecycle activities: Research & Development, Manufacturing & Production, Customer Services, Training & Support (and Other for remaining hours that cannot be attributed to the three categories). The number of defence hours worked within each of the lifecycle activities was calculated on a company-by-company basis by the Survey aggregator, and then summed for the total value. The overall percentage for the surveyed sample was then calculated based on total surveyed hours within each lifecycle activity.

Skills and trainee data:

- All the skills and trainee data in the report was collected in terms of defence FTEs, the Survey aggregator summed the values and the data is presented as an absolute value or as a proportion of the surveyed FTEs per question, no further calculations have been executed. The data might therefore not represent the full survey sample of FTEs.

iii. Limitations and Assumptions

- Data on vacancies may not be representative of typical open vacancies in a given period as there is no measure of how many vacancies were filled.

3. Defence Value

1. Background and Context

The JEDHub Industry Survey captures data on turnover which provides a measure of the value added by the defence sector to the UK. This is important to contextualise the size and contribution of the UK defence sector to the UK economy. The JEDHub Annual Economic Report is able to draw on the survey data to understand in which defence capability areas the surveyed companies operate, which customer sources the sector relies upon, and how productive the sector is relative to other manufacturing industries.

i. Definitions

- *Total turnover*: the total of adding the values of sales of goods produced, goods purchased and resold without further processing, work done and industrial services rendered, and non-industrial services rendered for the survey year in question. This is before trade discounts, VAT and other taxes. Excludes repatriation of profits from overseas.
- *Defence turnover*: the amount of Total Annual Sales Turnover derived from Defence Related Activities for the survey year in question.
- *Capability area*: defence activities were defined according to 11 distinct capabilities areas as agreed with the DWG and IWG. Survey respondents were asked to apportion their total defence turnover according to these capability areas.
- *Gross Value Added (GVA)*: GVA measures the contribution of a company or a sector to the GDP of the economy.
- *Gross Value Added per FTE*: GVA per FTE is used as a measure of productivity looking at how much value is generated on average per worker.
- *Output*: the sum of the goods and services produced by a company or sector within a given period of time.
- *Intermediate consumption*: the goods and services used up in the production of goods and services within a company or sector.

2. Process

i. Data sources

- JEDHub Industry Survey 2022
- [ADS Facts & Figures 2022](#)
- [GDP output approach – low-level aggregates - Office for National Statistics \(ons.gov.uk\)](#)

3. Defence Value

- [UK manufacturers' sales by product - Office for National Statistics \(ons.gov.uk\)](https://ons.gov.uk)
- [Broad Industry Group \(Standard Industrial Classification\) – Business Register and Employment Survey \(BRES\): Table 1 - Office for National Statistics \(ons.gov.uk\)](https://ons.gov.uk)
- [Industry \(two, three and five-digit Standard Industrial Classification\) – Business Register and Employment Survey \(BRES\): Table 2 - Office for National Statistics \(ons.gov.uk\)](https://ons.gov.uk)
- [Output per job, UK - Office for National Statistics \(ons.gov.uk\)](https://ons.gov.uk)

ii. Method

Total surveyed defence turnover:

- The JEDHub Industry Survey measured *total sales turnover* for the companies, and separately asked for sales turnover derived from defence customers. The Survey ensured that this number was below that of total sales turnover. This was then anonymised and summed by the Survey aggregator.

Customer turnover:

- Survey respondents were asked to further breakdown the total defence turnover according to whom the associated contract was with; UK MOD, Other UK Government Departments, UK Industry, International Governments, or International Industry. The turnover from International Governments and International Industry was further broken down according to the region in which the customer was located. This was then anonymised and summed by the Survey aggregator.

Capability turnover:

- Survey respondents were asked to breakdown their defence turnover as a percentage of the 11 capability areas, and for each of these capability areas, the percentage from domestic and international customers. The Survey aggregator used these percentages to calculate the turnover for each of the capability areas per respondent before aggregation.

3. Defence Value

Surveyed GVA:

- GVA was estimated for the surveyed companies using the production approach, based on the following equation:

$$GVA = Output - Intermediate Consumption + Change in Capital Inventories$$

Where *Output* is proxied by total defence turnover, *Intermediate Consumption* is proxied by total value of purchases used in the production of defence goods and services (see Defence Supply Chain methodology), and *Change in Capital Inventories* is assumed to be constant. This calculation used the anonymised aggregated data to calculate GVA for the total surveyed sample.

Surveyed GVA per FTE:

- Surveyed GVA per FTE was estimated using the estimated surveyed GVA and the total defence FTE figure calculated from the survey for the same group of companies. The GVA figure was simply divided by the FTE figure.

GVA per Worker (ONS Manufacturing):

- GVA per worker for UK manufacturing was calculated as a reference to contextualise the surveyed GVA per FTE. Gross value added, in chained volume measures, seasonally adjusted, was captured from the ONS low level aggregates dataset, whilst UK level total employment was captured from ONS BRES Table 1. The GVA was then simply divided by total employment for GVA per worker.
- This process was repeated for SICs 25.4, 30.1 and 30.3, using total employment from ONS BRES Table 2.

iii. Limitations and Assumptions

- The productivity measure of surveyed GVA per FTE uses FTEs rather than total jobs, which is used in the ONS analysis of the manufacturing sector, and the analysis found in the previous JEDHub Annual Economic Report. This is to allow an accurate measure of defence-specific productivity. Therefore, whilst the ONS data is provided for context and reference, the JEDHub has chosen not to directly compare GVA per FTE and GVA per job as the latter may undervalue the output of part-time workers.
- All turnover data is in nominal terms and has not been adjusted for inflation.
- No data has been provided on capital levels, thus it has been assumed that capital inventories are constant for the purpose of GVA calculations.
- The GVA estimate does not reflect the total survey sample. Count rate can be found in the accompanying data tables.

4. Defence Trade

1. Background and Context

The Defence Trade chapter of this report draws on two different data sources; the UK Defence and Security Exports (UK DSE) organisation within the Department for Business and Trade (DBT), and the Janes Global Platforms and Systems (GPS) database. The chapter aims to provide an overview of the economic value generated by the sector through the export of UK materiel globally, as well as highlighting the key providers of defence goods to the UK.

i. Definitions

- *Value of Defence Orders*: The value of defence orders placed, in a given year
- *Value of Defence Deliveries*: The value of defence goods delivered to a customer, in a given year

2. Process

i. Data sources

- [DBT Defence and Security Exports, 2021](#)
- Janes GPS

ii. Method

- **DBT DSE**: A comprehensive methodology is provided by UK DSE, accompanying the annual release of these statistics. This can be found [here](#). These data are the Official Statistics on trade in defence for the UK, and should be treated as the primary source of information in this area. These statistics assess the value of defence orders placed, using a 10-year average figure.
- **Janes GPS**: Janes describe the GPS database as covering ‘the 70 largest defence markets that Western-oriented firms can address’, accounting for over 98% of this Western addressable defence market space. The database provides a 10-year forecast of procurement and R&D programmes, as well as prior years’ actuals dating back to 2012. The dataset is pulled together using a web-scraping process conducted by a team of analysts, alongside inputs from country and regional experts. This is a similar methodology that is used elsewhere to produce export data. Where possible, Janes GPS uses official government sources (budgets, strategy reviews, contract data etc.). It also draws on trade press reporting and company press releases. US data is primarily sourced from US DoD procurement and RDT&E justification documents. The dataset measures exports and imports as sales from the systems and components source country to final product end-customer, regardless of any intermediary transactions or international movements. This method ensures there is no double-accounting and allows for more accurate tracking of UK-produced components of platforms.

5. Defence Supply Chain

1. Background and Context

The Defence Supply Chain chapter of the report shows that despite UK MOD spending its money with a relatively small number of companies, this does not capture the full extent of the defence supply chain. This chapter draws on data from MOD, the JEDHub Survey and ONS datasets to build a narrative of how money moves through the supply chain, from the customer, to primes and then deeper. This is important for Government to understand where its spending travels in the economy to ensure it is adding value.

i. Definitions

- *Direct suppliers*: suppliers with which companies directly source goods and services from, this may include parent companies and subsidiaries.
- *Supply chain purchases*: the value of goods and services purchased by the UK entity of a survey company. Measured as the sum of money paid into a supplier's bank account in a given time period.
- *Supply chain purchases used in the production of defence goods and services*: the value of goods and services purchased which are consumed in the production of defence outputs by the purchasing company.
- *Supply chain purchases on defence goods and services*: the value of other defence goods and services bought by the purchasing company from other defence suppliers. These goods may or may not then be used in the production of further defence goods and services.

2. Process

i. Data sources

- JEDHub Industry Survey 2022
- [MOD trade, industry and contracts 2022 - GOV.UK](#)
- [Central government spend with small and medium-sized enterprises, 2020 to 2021 - GOV.UK](#)

5. Defence Supply Chain

ii. Method

Total supply chain purchases, and derivative data points:

- All supply chain data from the JEDHub Survey was first calculated on a company-by-company basis by the Survey aggregator, before aggregation for the total surveyed values. No further data manipulation was required.

JEDHub Industry Survey Microdata Analysis:

- The UK MOD Analysis team looked at the anonymised microdata for the JEDHub Industry Survey. In some analysis, the responses were split into two groups, those with defence turnover greater than £1bn and those with turnover less than £1bn, to proxy for large and small companies, respectively.
- The median data points for each group were then used for the different values within the supply chain dataset. The median was preferred over the mean as being more representative of the typical company due to outliers skewing the data.

For ONS Microdata Analysis please see Annex C.

iii. Limitations and Assumptions

- Due to the relatively small sample size, it was not possible to identify Small to Medium Enterprises (SMEs) within the JEDHub Survey, and thus comparisons cannot be made with other data on SMEs.
- The jobs identified in the ONS BRES dataset are not limited to defence-specific employment.

Industry Survey Aggregator

Annex B

Survey Response Aggregation

1. Context

- Survey responses were collected using a secure online platform which has been tested and security-assured. This was implemented in support of response security, response validation, and ease of aggregation.
- To enhance respondent anonymity, responses were tagged with a 'token', a unique code representing a respondent. The lookup table for tokens was stored separately. This ensured 'separation of concern' as data was processed by different components of the JEDHub online platform.
- Data was aggregated following quality assurance by the MOD Ind Progs team.

2. Approach

- The JEDHub online platform features functionality to aggregate responses on a per-question basis. Aggregation was automated, using a script to apply a fixed and repeatable methodology.
- Questions were aggregated in one of 3 ways;
 - Wholly; a count, mean, median, percentiles, standard deviation and total were calculated based upon all responses. This aggregation approach was utilised for calculations such as total FTEs.
 - Per-company; calculations were made on a per-company basis by the script, before being aggregated by the 'Wholly' method above. This approach was utilised for sections such as supply chain, where calculations involving multiple question responses were required. This ensured appropriate weightings.

- Lookup; postcode-based responses were matched against an International Territorial Level (ITL) dataset, and grouped based upon these responses using the 'Wholly' aggregation.

3. Aggregation Handling

- The MOD Ind Progs team exported aggregated data from the survey management area and shared it with the UKDSC team via a secure online platform for analysis.

Supply chain analysis using ONS and NISRA Microdata

Annex C

Supply Chain Analysis – ONS and NISRA Microdata¹

1. Background and Context

The purpose of analysing the ONS and Northern Ireland Statistics and Research Agency (NISRA) Microdata obtained under separate Data Access Agreements by MOD is to provide additional insights and context for the businesses that are identified as selling military manufacturing products², and hence can be seen as being part of the Defence sector. This helps provide an estimate of these businesses' sales and employees broken down by Standard Industrial Classification (SIC) and International Territorial Level (ITL) 1 region. This complements the analysis of the JEDHub survey responses contained elsewhere in this Report, and includes a larger group of businesses than responded directly to the survey.

It is important to note that the analysis of ONS and NISRA microdata in this Report only contains businesses that are identified as selling **manufactured military goods** as defined in the UK Manufacturers' sales by product (PRODCOM) dataset.^{2,3} Some of these businesses will have responded to the JEDHUB survey but these cannot be identified separately due to the data protection rules of the JEDHUB survey and the microdata Data Access Agreements in place. This analysis does not include sales of services for military purposes, as these data are not contained in PRODCOM.

2. Methodology and Production: General Overview

The analysis in this Report is based on:

1. Microdata have been obtained under Data Access Agreements from Office for National Statistics (ONS) and Northern Ireland Statistics and Research Agency (NISRA) to undertake this analysis.
2. The group of businesses included in the analysis is defined by their presence in the microdata for four military-use PRODCOM codes: 30119999 Manufacture, installation and repair of military vessels and parts thereof, 30309999 Manufacture, installation and repair of military aircraft and parts thereof, 30409999 Manufacture of military fighting vehicles and 25408999 Manufacture of military weapons and parts thereof.
3. Manufacturers' Sales by Product Survey (PRODCOM)
4. Business Register and Employment Survey (BRES)

- PRODCOM³ data for UK for 2021; BRES⁴ microdata for 2021 for Great Britain and BRES⁴ microdata for Northern Ireland for 2021.

i) PRODCOM Methodology

PRODCOM data for reference period 2021 were analysed in the following ways:

- The data was extracted from PRODCOM on the four Military codes.² Data was then checked for duplicates and a flag was marked for volume and values.

Analysis and aggregation of this processed output file was undertaken to produce the charts and visualisations within this Report. There was a focus on the aggregated sales and count of businesses within each of the Military codes.

Limitations/Assumptions:

The selection of the four Military codes is assumed to include major defence manufacturing businesses and hence represents a significant proportion of the UK defence sector. However, it does not represent the entirety of the UK defence sector as many suppliers of military goods and services, particularly sub-systems and IT and testing services may not be captured by the selection of the four military codes within this analysis.

Supply Chain Analysis – ONS and NISRA Microdata

ii) BRES (ONS) Methodology

BRES data for reference period 2021 were analysed in the following ways:

- These data were mapped against the Reporting Units⁵ that had a Military code from the PRODCOM data.
- The variables of interest for each Reporting Unit were: i) *weighted_totempee*; ii) division (the 2 digit SIC classification of the Local Unit⁶); and iii) region (the ITL Level 1 region of the Local Unit).

Analysis and aggregation of this processed output file by Division and Region was undertaken to produce the charts and visualisations within this Report. There was a focus on aggregating the employees of Reporting Units with military products sales and breaking down the employees of Reporting Units by SIC division and ITL 1 region.

Limitations\Assumptions:

It is important to note that the BRES analysis contained in this Report cannot be broken down into which jobs are associated with military output within each Reporting Unit. This detail is not included in the BRES business questionnaire.

iii) BRES (NISRA) Methodology

BRES Northern Ireland data for reference period 2021 were analysed in the same way as for ONS BRES data:

- These data were mapped against the Reporting Unit References that had a Military code from the PRODCOM data.

The variables of interest for each Reporting Unit were i) *W_tot* and ii) *LUSIC4*

Analysis and aggregation of this processed output file was undertaken to produce the charts and visualisations within this Report. There was a focus on aggregating the employees of Reporting Units with military products sales and breaking down the employees of Reporting Units by industry. These were then grouped with the BRES ONS data to provide a complete UK picture.

Limitations\Assumptions:

As before, it is important to note that the BRES analysis contained in this Report cannot be broken down into which jobs are associated with military output within each Reporting Unit. This detail is not included in the BRES business questionnaire.

5. Reporting Unit is the unit of the business which is sent a questionnaire. Responses generally cover the whole enterprise, but can be broken down into separate sub-units (called Local Units)

6. An individual site (for example a factory or shop) in an enterprise is called a **local unit** (ONS).

Supply Chain Analysis – ONS and NISRA Microdata

3. Quality Management and accuracy

The data processing and outputs from the PRODCOM and two BRES files were independently checked and verified by a statistical team using a different coding language, and any errors were corrected. ONS officials advised on disclosure control issues within the output files. Chart files were independently produced from the processing work, and checked by a third team. Data were compared with ONS published sources for PRODCOM 2021 and where close similarities were found, this was taken as indirect evidence that analysis of ONS microdata contained in the this Report had been undertaken correctly and findings in this Report are accurate.

4. Relevance, Timeliness and accessibility

Relevance - The analysis of ONS and NISRA microdata linked to businesses that sell manufacturing military products is relevant to users that wish to know more about their estimated product sales and employee totals, industry and ITL Level 1 distribution which is not available in open source, published tables.

This analysis will be of interest to users from media, politicians, policy professionals, students and members of the general public.

Timeliness - The analysis in the Supply Chain section uses the latest data available with a reference period of 2021.

Accessibility - is maintained by providing visualisations of data with accompanying narrative and any caveats or notes to the charts provided on the same page.

5. Comparability

i) These data should not be directly compared with Official Statistics published by MOD on employment supported by MOD expenditure with industry⁷. This is due to a number of source data and methodology differences:

- The data used in the product level supply chain analysis contained in this Report is derived from ONS and NISRA microdata sources. Published MOD Official Statistics are based on Management information held within internal payment systems.
- Data on total employees in the analysis contained in this Report includes all jobs associated with matched Reporting Units in the Sample Frame whereas MOD statistics estimate direct and indirect jobs associated with MOD direct spending with industry. As such, analysis in this Report will include some jobs associated with civilian output produced by businesses selling military products but MOD statistics on direct and indirect jobs are only those associated with MOD spending. The latter estimates are therefore based on a different definition of the defence sector in the UK to the analysis in this Report. They also do not include export-related employment.
- Both methods and analysis therefore have some limitations and care should be taken with the interpretation of their respective findings. Further background quality information about Official Statistics on employment supported by MOD Expenditure is published by MOD.⁸

7. [MOD regional expenditure with UK industry and commerce and supported employment 2021/22](#)

8. [Background quality report: MOD regional expenditure with UK industry and commerce and supported employment 2021/22](#)

Supply Chain Analysis – ONS and NISRA Microdata

ii) The ADS Group (Aerospace, Defence, Security & Space) also produce an estimate of direct jobs supported in the Defence Sector in their annual Industry Facts and Figures report⁹.

The ADS method uses MOD spending data as its initial source but excludes elements of spending that aren't considered as defence, and includes an estimate of jobs supported by defence export orders, to produce an overall estimate based on a definition of the 'Defence Sector'.

For similar reasons to the comparability of MOD Official Statistics, the analysis of BRES microdata in this Report should not be directly compared to the ADS estimates. They are using different data sources and methodologies to estimate the number of defence employees in the UK.

6. Confidentiality and Security.

This analysis was produced under Data Access Agreements between MOD and ONS, and MOD and NISRA, permitting access to PRODCOM and BRES 2021 microdata files.

All data has been held on secure networks and systems which have been accredited by the MOD. Data shared between the ONS, NISRA and MOD has been via an online secure file transfer platform.

We have ensured appropriate Disclosure Control protocols were used to produce the analysis contained in this Report. These disclosure controls

have been checked by ONS and NISRA, so data is only shown in aggregate and by categories such as SIC classifications and ITL 1 territories of the UK.

In BRES analysis, data have been rounded to the nearest 1,000 employees and to the nearest £ thousand or £ million in PRODCOM to protect individual data points being disclosed.

DGP Indirect Jobs Estimate

Annex D

1. Background and Context:

- The ONS publishes FTE employment multipliers which estimate the number of jobs a given industry supports outside of itself, through its purchases of goods and services. For instance, these multipliers suggest that for every FTE job in the Automotive manufacturing industry, a further 2.2 jobs are “supported” elsewhere in the UK Economy. Estimating indirect jobs supported by a sector provides a more comprehensive understanding of the economic impact of the sector in terms of workforce.
- This excludes so-called “induced” jobs supported by the spending of employees of a sector within the economy. This analysis was completed on behalf of the JEDHub by a member of the Department for Business and Trade, Advanced Manufacturing Directorate.

2. Methodology:

- These figures are derived using the ONS Analytical Input Output Tables (2018) which gauge where the supply of good and services into the UK economy come from (domestically produced or imported) and where they go to – either to industry, households, capital formation or exports. Where an industry is purchasing goods and services produced within the UK this creates demand for UK production and therefore employment.
- These multipliers are based on a “whole industry” level so do not take any account of jobs that may be supported “within itself” – for example UK automotive manufacturers buying from other UK automotive manufacturing businesses. This is one reason why these multipliers may

seem less than what individual businesses themselves might claim to support in terms of indirect jobs.

- To apply a similar process to the members of the Defence Growth Partnership firms we needed their employment level and the SIC code for their company. This second part was challenging as all these business are large, cover a number of activities and the SIC codes recorded on their Companies House Records do not always reflect the defence aspects of the business.
- Using subject matter expertise and a review of company websites and companies house records the JEDHub applied the most appropriate industry code to each DGP member. Using DGP companies defence FTE employment we applied the identified indirect job multiplier for the given SIC code. Following this step, we considered the value of each DGP members defence turnover in the supply chain of other DGP members, and removed associated defence employment to avoid double counting. This resulted in our estimate of indirect jobs supported by DGP members.