The contribution of engineering to the UK economy – the multiplier impacts

A report for EngineeringUK

January 2015

Cebr

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Executive Summary

This report builds on previous research conducted by Cebr, which established estimates of the direct economic contributions made by engineering sectors to the UK economy, in terms of Gross Domestic Product (GDP) and employment.[1] This report builds on this previous study to establish the spill over effects associated with these direct contributions, while also providing an estimate of the tax contributions made by engineering sectors.

Direct economic impacts

- Engineering sectors[2] are vital to the UK's economy, contributing an estimated **£455.6 billion** to Gross Domestic Product (GDP)[3] in 2014, 27.1% total UK GDP.[4]
- Total employment in engineering sectors is estimated at 5.6 million in 2014, representing 18.2% of total employment in the UK. Adjusting for the full-time and part-time split within this figure, engineering sectors employ 5.3 million full-time equivalents (FTEs) – 20.0% of the UK total.
- In addition to these impacts, this report finds that engineering sectors contributed an estimated £117.8 billion in tax revenues to the exchequer in the 2013/14 tax year. This represents 24.0% of total HMRC receipts over the same period.
- On a regional basis, GVA produced by engineering sectors is highest within London in absolute terms (£78.8 billion in 2014), but Scotland's economy is arguably most dependent upon engineering sectors, with 37% of GVA attributable to these industries.
- Employment in engineering sectors is highest within the South East, both in absolute terms (over 1 million people) and as a proportion of total employment (23%).

Total macroeconomic impacts of engineering sectors

Based on our analysis of the engineering sectors using the ONS supply-use tables and Cebr's input-output models, we conclude that:

- For every £1 in GVA generated in engineering sectors, a further £1.45 is generated elsewhere within the UK economy. This GVA multiplier of 2.45 provides an estimate for the total GVA impact of engineering sectors in 2014 of £995.7 billion, once indirect and induced multiplier impacts are taken into consideration. This is equivalent to 66% of UK GVA and represents a GDP contribution of approximately £1,116.8 billion.
- Once direct, indirect and induced multiplier impacts of the engineering sectors are accounted for, the industry is estimated to have supported an aggregate 14.5 million FTE jobs in 2014, representing 55% of UK employment. For every one FTE employed in engineering sectors, employment of a further 1.74 FTEs is estimated to be supported within the UK economy, representing a multiplier of 2.74.
- This means than for every new engineering vacancy that is filled, 1.7 new jobs can be expected to be supported throughout the UK economy.

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[1] See 'The contribution of engineering to the UK economy' October 2014.

2 Defined by EngineeringUK's Engineering Footprint – please see Annex for full details

3 Gross domestic product is an aggregate measure of production equal to the sum of the gross values added of all resident institutional units engaged in production (plus any taxes, and minus any subsidies, on products not included in the value of their outputs).

4 Cebr projection for 2014 from UK MOD, Cebr's proprietary model of the UK economy.

Scope and methodological overview

The analysis of the macroeconomic impacts of engineering sectors makes extensive use of official data provided by the Office for National Statistics (ONS). This provides economic indicators, including revenues, costs of production and value-added for hundreds of disaggregated industries. These are broken down according to the Standard Industrial Classification (SIC) framework, which provides the underlying data collection framework for much of the economic data produced by the ONS.

To measure the economic characteristics of the engineering sectors and its direct macroeconomic impacts upon the economy, we identified the activities within the SIC framework which are classified as engineering sectors[5] and used the corresponding figures for these activities.

The multiplier impacts of the engineering sectors were estimated using Cebr's input-output models, which draw on the national accounting framework provided by the ONS. The input-output models are used to determine from which industries the engineering sectors purchase their inputs, tracing the industry's economic footprints through their supply chain relationships with other industries, supporting output and employment in those sectors and increasing earnings and employee spending in the wider economy.

[5] These were defined by EngineeringUK's Engineering Footprint, which classifies economic activity as falling under 'engineering sectors' based on their dependence on engineering. As a result this should be viewed as a wide-ranging and broad definition of engineering – please see Appendix for full details.

1 Introduction

This report builds on previous research conducted by Cebr on behalf of EngineeringUK, which established estimates of the direct economic contributions made by engineering sectors to the UK economy, in terms of Gross Domestic Product (GDP) and employment.[6] This current report builds on this previous study to establish the spill over effects associated with these direct contributions, while also providing an estimate of the tax contributions made directly by engineering sectors.

The remainder of this report is arranged in three further sections:

- **Section 2** details key direct economic contributions made by engineering sectors, which form the basis for the subsequent analysis of multiplier effects.
- **Section 3** details the estimated multiplier effects associated with engineering sectors and presents estimated total economic impacts of engineering sectors.
- **Section 4** contains a technical appendix.

[6] See 'The contribution of engineering to the UK economy' October 2014.

2 Key economic contributions of engineering sectors

This section of the report outlines the direct contributions made by engineering sectors to the UK economy, both in 2014 and alongside expectations by 2022, which are based on demand for engineers being met. We look firstly at the contributions to Gross Value Added (GVA)[7], Gross Domestic Product (GDP)[8] and the number of businesses and jobs supported, which are taken from Cebr's previous report into the contribution of engineering[9]. This is followed by estimated tax contributions of these sectors.

2.1 Engineering sectors' contribution to GVA and GDP

In 2012, engineering sectors[10] contributed £387 billion Gross Value Added (GVA) - a similar scale to the entire non-financial services industry (£505 billion)[11] and nearly four times the combined size of the construction and real estate services sectors (£105 billion)[12]. The GVA of engineering sectors is estimated to have risen to £406.3 billion in 2014, which is equivalent to an estimated Gross Domestic Product (GDP) contribution of **£455.6 billion,** 27.1% of total UK GDP.[13] Based on the potential employment projections of EngineeringUK and nominal growth in output per employee averaging 3% each year, by 2022 this contribution is expected to increase to £542.2 billion in GVA and £608.1 billion in GDP, as highlighted within Table 1.

Table 1 – Gross value added and gross domestic product contributions of engineering sectors, £ billions (nominal terms)

Year	Gross value added	Gross domestic product
2014	406.3	455.6
2022	542.2	608.1

Source: ONS, EngineeringUK, Cebr

The distribution of this GVA across the UK's nations and regions is illustrated within Table 2 below. GVA produced by engineering sectors is highest within London in absolute terms (£78.8 billion), but Scotland's economy is arguably most dependent upon engineering sectors, with 37% of GVA attributable to these industries. Northern Ireland has both the lowest GVA contribution coming from engineering sectors in both absolute terms (£7.3 billion) and as a percentage of total GVA (21%).

7 GVA or gross value added is a measure of the value from production in the national accounts and can be thought of as the value of industrial output less intermediate consumption. That is, the value of what is produced less the value of the intermediate goods and services used as inputs to produce it. GVA is also commonly known as income from production and is distributed in three directions – to employees, to shareholders and to government. GVA is linked as a measurement to GDP – both being a measure of economic output. That relationship is (GVA + Taxes on products - Subsidies on products = GDP). Because taxes and subsidies on individual product categories are only available at the whole economy level (rather than at the sectoral or regional level), GVA tends to be used for measuring things like gross regional domestic product and measures of economic output of entities that are smaller than the whole economy, such as the engineering sectors.

8 Gross domestic product is an aggregate measure of production equal to the sum of the gross values added of all resident institutional units engaged in production (plus any taxes, and minus any subsidies, on products not included in the value of their outputs).

9 See 'The contribution of engineering to the UK economy' October 2014.

10 Please see Annex for full definition

11 Annual Business Survey 2012

12 Annual Business Survey 2012

13 Cebr projection for 2014 from UK MOD

Table 2 – GVA of engineering sectors by region and nation in 2014 and 2022, £ billions (nominal) and percentage of total

Region/ nation	2014		2022
	£ billions	% of region/nation	£ billions
North East	13.5	28%	17.6
North West	40.8	28%	54.1
Yorkshire & The Humber	26.6	25%	34.6
East Midlands	28.0	30%	36.9
West Midlands	28.9	25%	37.5
East of England	31.3	23%	41.7
London	78.8	22%	107.9
South East	63.5	27%	85.9
South West	27.6	23%	36.9
England	338.9	25%	453.1
Wales	14.8	27%	19.4
Scotland	45.3	37%	60.2
Northern Ireland	7.3	21%	9.5
UK	**406.3**	**27%**	**542.2**

Source: ONS, EngineeringUK, Cebr

2.2 Employment supported by engineering sectors

In 2014 there were approximately 5.6 million people employed in engineering sectors in the UK, representing approximately 18.2% of total employment across the UK economy. Based on EngineeringUK's projections for employment demand for engineers in engineering sectors, this is expected to rise to reach 5.8 million by 2022, as outlined within Table 3.[14] Using the full-time to part-time ratios of employment in each of the engineering sectors[15] this employment is converted into 5.3 million full time equivalents (FTEs) in 2014 as presented within the table[16], which is equivalent to 20.0% of the UK total.

Table 3 – Employment within engineering sectors, millions

Year	Employment	Full-time equivalents (FTEs)
2014	5.6	5.3
2022	5.8	5.5

Source: ONS, EngineeringUK, Cebr

The distribution of this employment across the UK's nations and regions is illustrated within Table 4 below. Employment in engineering sectors is highest within the South East, both in absolute terms (over 1 million people) and as a proportion of total employment (23%). Northern Ireland has both the lowest number of people employed in engineering sectors, while the North East has the lowest proportion of employment accounted for by engineering sectors.

[14] The actual rise in employment within engineering sectors may be larger, since only anticipated demand specifically for engineers is included, rather that anticipated demand for all roles within engineering sectors.

[15] Calculated by Cebr from ONS business register and employment survey, 2013.

[16] FTE jobs or FTE employment includes employees as well as the self-employed, sole traders, partnerships etc.

Table 4 – Employment within engineering sectors by region and nation in 2014 and 2022, thousands and percentage of total

Region/ nation	2014		2022
	Thousands	% of region/nation	Thousands
North East	168	14%	170
North West	503	15%	519
Yorkshire & The Humber	419	17%	424
East Midlands	395	18%	407
West Midlands	502	20%	508
East of England	622	21%	645
London	721	17%	768
South East	1,001	23%	1,055
South West	508	19%	528
England	4,839	19%	5,023
Wales	208	15%	212
Scotland	420	16%	434
Northern Ireland	124	15%	127
UK	**5,590**	**18%**	**5,796**

Source: ONS, EngineeringUK, Cebr

2.3 Tax contributions of engineering sectors

Closely linked to the value added and employment supported by engineering sectors within the UK economy are the tax contributions which stem directly from this economic activity. These come in various forms, including taxes on income, such as income tax and national insurance contributions, taxes on profits, such as corporation tax, and taxes on products, which would include VAT. The estimated tax contributions of engineering sectors for the latest complete tax year (2013/14) are detailed in Table 5.[17]

The largest tax contribution made by engineering sectors is through taxes on income, estimated at £66.3 billion in 2013/14. This is followed by VAT, at £35.0 billion and corporation tax, estimated at £16.5 billion. The total tax contribution made by engineering sectors, of £117.8 billion, is equivalent to 24% of total HMRC receipts over the same period.

Table 5 – Tax contributions of engineering sectors, £ billions for tax year 2013/14

Taxation	Engineering sectors
Taxes on income[18]	66.3
VAT	35.0
Corporation tax	16.5
Total	117.8

Source: ONS, HMRC, EngineeringUK, Cebr

[17] These estimates were developed using official data obtained from HMRC (for corporation tax and income tax and national insurance rates), in combination with ONS national accounts data (for VAT) and the annual survey of employment and earnings (for taxes on employment income).

[18] Income tax plus employer's and employee's national insurance.

3 The multiplier impacts of engineering

To further explore the economic impact of engineering sectors, this section outlines the ways in which these sectors interact with the rest of the UK economy through their supply chain and the employee income they generate. This impact is discussed in terms of the 'multiplier' effects associated with productive activity in engineering sectors. The aim of this analysis is to provide a measure of the total economic footprint of these sectors, demonstrating the total extent of economic activity in the UK that is supported by them based on the current structure of the UK economy.[19] We first investigate the supply chain of engineering sectors, before outlining multipliers associated with both GVA and employment.[20]

3.1 The supply chain of engineering sectors

The most obvious way in which industries interact with the wider economy is through the purchases they make from other businesses through their supply chain. This therefore provides a logical starting point for an analysis of the multiplier impacts and economic footprint of engineering sectors. The structure of engineering sectors' supply chain is outlined within Table 6 below.

Table 6 – Supply chain of engineering sectors

Sector	Percentage of intermediate inputs
Engineering Sectors	48.9%
Wholesale and retail	5.8%
Administrative And Support Services	4.2%
Financial And Insurance Activities	3.8%
Transportation And Storage	2.3%
Construction	1.8%
Professional, Scientific And Technical Activities	1.5%
Agriculture, Forestry And Fishing	1.3%
Public Administration And Defence	1.0%
Real Estate Activities	0.5%
Manufacturing	0.2%
Other Service Activities	0.2%
Water and waste services	0.2%
Information And Communication	0.1%
Accommodation and food services	0.1%
Human Health And Social Work	0.1%
Imported goods and services	27.9%

Source: ONS, EngineeringUK, Cebr

By far the largest component of engineering sectors' supply chain are purchases from other engineering sectors (48.9% of goods and services purchases). This stems not only from the close ties between different forms of engineering-based activity – such as mining and extraction supporting energy generation and, subsequently, manufacturing (and vice versa), but also from the fact that the definition of engineering utilised within this research is broad in nature.

[19] Owing to the complexity of analysis and the resource required to produce sub-national multipliers, only UK-level impacts are presented here. However, further work may yet be conducted to investigate economic impacts of engineering sectors.
[20] The methodology used to develop the multipliers detailed within this section is detailed within the technical appendix.

Wholesale and retail make up the next largest sector in the engineering sectors' supply chain, at 5.8% of intermediate goods and services purchases. Meanwhile, imported goods and services in general represent over a quarter of the engineering sectors' supply chain.

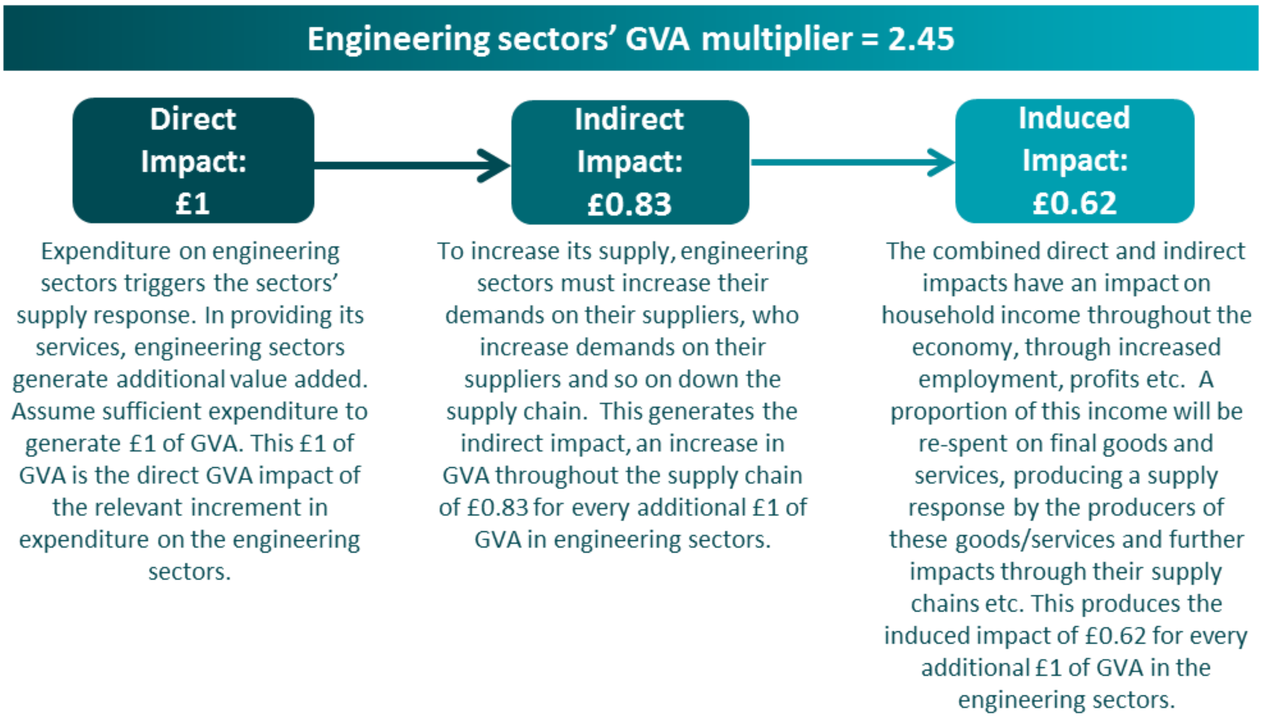
The industries highlighted within this engineering supply chain are the direct beneficiaries of increases in engineering activity. It is through demands placed on these industries – and subsequently on the suppliers of these industries, and so on – that the multiplier effects discussed in the remainder of this section are generated.

3.2 GVA multiplier impacts

The economic impacts of engineering sectors in the UK are not confined to the direct GVA contributions outlined earlier within section 2. Cebr's input-output modelling (described in the technical appendix) has produced estimates of the indirect and induced multiplier impacts which result from the economic activity of engineering sectors.

Based on this analysis, we estimate that for every £1 of GVA generated by engineering sectors in the UK, a further £1.45 of GVA is generated in the wider UK economy through indirect and induced multiplier impacts. This GVA multiplier of 2.45 is decomposed and explained further in Figure 1.

Figure 1 – Engineering sectors' GVA multiplier



Source: Cebr

Applying this GVA multiplier to the £406.3 billion direct GVA contribution of engineering sectors in 2014, provides an estimated total impact of £995.7 billion, equivalent to 66% of UK GVA.[21] This represents a GDP contribution of approximately £1,116.8 billion, once the additional contribution through net taxes on products are added to the GVA contribution. The indirect and induced components of the GVA impact are outlined within Table 7 below, alongside estimated contributions in 2022.[22]

Table 7 – Gross value added impact of engineering sectors, £ billions (nominal)*

Year	Direct		Indirect		Induced		Total impact
2014	406.3	+	336.3	+	253.1	=	995.7
2022	542.2		448.9		337.8		1,328.9

Source: ONS, EngineeringUK, Cebr
**Figures may not sum exactly due to rounding*

3.3 Employment multiplier impacts

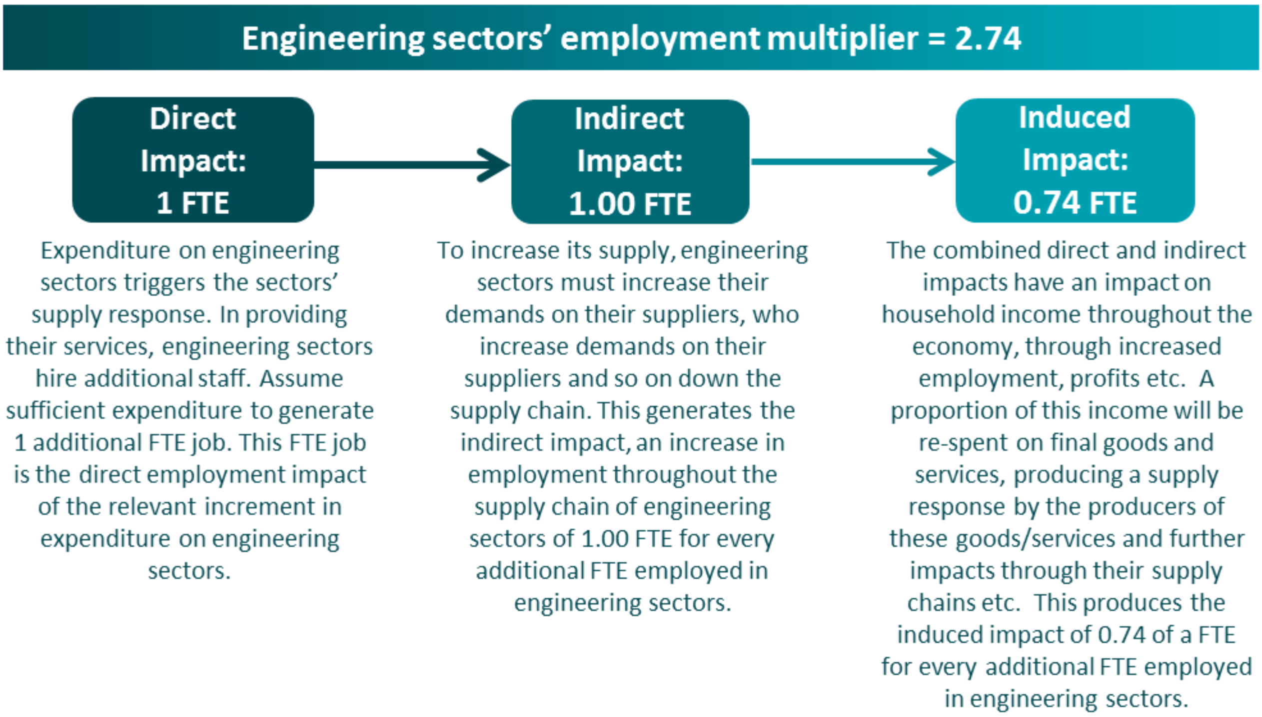
As with GVA, the employment impacts of engineering sectors are not confined to their direct jobs contribution. Using the same input-output modelling approach yields estimates for the indirect and induced multiplier impacts of employment in engineering sectors.

Based on this analysis, we estimate that for every one full time equivalent (FTE) employed in engineering sectors in the UK, employment of a further 1.74 FTEs is supported in the wider UK economy through indirect and induced multiplier impacts. This employment multiplier of 2.74 is decomposed and explained further in Figure 2.

[21] This is not to say that, if the engineering sectors did not exist, UK GDP would be 63% lower than it is. Rather, we are saying that the engineering sectors as they exist today make a 63% contribution to GDP once the multiplier impacts are taken into account. If the engineering sectors did not exist, something else would have taken their place – in other words, when the economy is operating at capacity (with no structural unemployment), people would find jobs in other sectors and consumers would find other things to spend money on. While the direct and multiplier impacts are good indicators of the size of contribution made by these activities today, the economic importance of these sectors would be reflected in the extent to which the engineering sectors have contributed more (or less) to long-term productivity and economic growth relative to whatever other economic activities would have taken place in the absence of the engineering sectors.

[22] Estimates for 2022 use the same multiplier as that used for 2012 and 2014 estimates. The implicit assumption here is therefore that the structure of the UK economy remains similar to how it is today and should therefore be treated as indicative and with this caveat in mind.

Figure 2 – Engineering sectors' employment multiplier



Source: Cebr

Applying this employment multiplier to the 5.3 million FTEs employed by engineering sectors in 2014, provides an estimated total impact of 14.5 million FTEs supported by engineering sectors throughout the UK economy, equivalent to approximately 55% of UK employment.[23] The indirect and induced components of this employment impact are outlined within Table 8 below, alongside estimates for 2022.[24]

Table 8 – FTE impact of engineering sectors, millions of FTEs*

Year	Direct		Indirect		Induced		Total impact
2014	5.3	+	5.3	+	3.9	=	14.5
2022	5.5		5.5		4.1		15.0

Source: ONS, EngineeringUK, Cebr
**Figures may not sum exactly due to rounding*

[23] The caveats outlined in footnote 21 apply equally here.

[24] Estimates for 2022 use the same multiplier as that used for 2014 estimates. The implicit assumption here is therefore that the structure of the UK economy remains similar to how it is today and should therefore be treated as indicative and with this caveat in mind.

4 Appendix

4.1 Engineering sectors

The definition of 'engineering sectors' used throughout this report

Code	Standard Industrial Classification
01.63	Post-harvest crop activities
01.64	Seed processing for propagation
05 (all)	Mining of coal and lignite
06 (all)	Extraction of crude petroleum and natural gas
07 (all)	Mining of metal ores
08.1	Quarrying of stone, sand and clay
08.91	Mining of chemical and fertiliser minerals
08.93	Extraction of salt
08.99	Other mining and quarrying n.e.c.
09 (all)	Mining support service activities
10.13	Production of meat and poultry meat products
10.20	Processing and preserving of fish, crustaceans and molluscs
10.3	Processing and preserving of fruit and vegetables
10.4	Manufacture of vegetable and animal oils and fats
10.5	Manufacture of dairy products
10.6	Manufacture of grain mill products, starches and starch products
10.7	Manufacture of bakery and farinaceous products
10.8	Manufacture of other food products
10.9	Manufacture of prepared animal feeds
11 (all)	Manufacture of beverages
12 (all)	Manufacture of tobacco products
13 (all)	Manufacture of textiles
14 (all)	Manufacture of w earing apparel
15 (all)	Manufacture of leather and related products
16 (all)	Manufacture of wood and of products of wood and cork, except furniture; manufacture of articles of straw and plaiting
17 (all)	Manufacture of paper and paper products
18 (all)	Printing and reproduction of recorded media
19 (all)	Manufacture of coke and refined petroleum products
20 (all)	Manufacture of chemicals and chemical products
21 (all)	Manufacture of basic pharmaceutical products and pharmaceutical preparations
22 (all)	Manufacture of rubber and plastic products
23 (all)	Manufacture of other non-metallic mineral products
24 (all)	Manufacture of basic metals
25 (all)	Manufacture of fabricated metal products, except machinery and equipment
26 (all)	Manufacture of computer, electronic and optical products
27 (all)	Manufacture of electrical equipment
28 (all)	Manufacture of machinery and equipment n.e.c.

29 (all)	Manufacture of motor vehicles, trailers and semi-trailers
30 (all)	Manufacture of other transport equipment
31 (all)	Manufacture of furniture
32.11	Striking of coins
32.13	Manufacture of imitation jewellery and related articles
32.20	Manufacture of musical instruments
32.30	Manufacture of sports goods
32.40	Manufacture of games and toys
32.50	Manufacture of medical and dental instruments and supplies
32.9	Manufacturing n.e.c
33 (all)	Repair and installation of machinery and equipment
35.11	Production of electricity
35.12	Transmission of electricity
35.13	Distribution of electricity
35.21	Manufacture of gas
35.22	Distribution of gaseous fuels through mains
35.30	Steam and air conditioning supply
36 (all)	Water collection, treatment and supply
37 (all)	Sewerage
38.2	Waste treatment and disposal
38.3	Materials recovery
39 (all)	Remediation activities and other waste management services
41.2	Construction of residential and non-residential buildings
42 (all)	Civil engineering
43.1	Demolition and site preparation
43.2	Electrical, plumbing and other construction installation activities
43.99/9	Specialised construction activities (other than scaffold erection) n.e.c.
45.20	Maintenance and repair of motor vehicles
49.50	Transport via pipeline
51.22	Space transport
58 (all)	Publishing activities
59.11	Motion picture, video and television programme production activities
59.12	Motion picture, video and television programme post-production activities
59.20	Sound recording and music publishing activities
61 (all)	Telecommunications
62 (all)	Computer programming, consultancy and related activities
63.1	Data processing, hosting and related activities; web portals
71.1	Architectural and engineering activities and related technical consultancy
71.20	Technical testing and analysis
72.19	Other research and experimental development on natural science and engineering
74.90/1	Environmental consulting activities
74.90/2	Quantity surveying activities

80.20	Security systems service activities
84.22	Defence activities
95.1	Repair of computers and communication equipment
95.21	Repair of consumer electronics
95.22	Repair of household appliances and home and garden equipment

4.2 Economic impact methodology

For the study, we used a combination of various official national statistics in combination with Cebr's proprietary input-output models. To establish the size and economic impact of engineering sectors, we adopted the framework provided by the ONS through the input-output analytical tables, which, alongside the supply-and-use tables, provide the most detailed official record of how the industries of the economy interact with other industries, with consumers and with international markets in producing the nation's GDP and national income.[25] This was used in combination with the annual business survey statistics, which provide detail on the 'business economy' at a more detailed level of disaggregation than the supply-and-use tables themselves.

Making use of the supply-and-use framework to analyse engineering sectors – which are only subsets of industries at the level of disaggregation provided by this framework – is one of the best means of ensuring consistency with the national accounting framework. The process of embedding a specific subset of activities within this framework involves assigning that subset an explicit role within the input-output tables.

Having assigned roles within the input-output framework for engineering sectors we had the foundation for establishing the wider economic impact of engineering sectors on the UK economy, using Leontief input-output modelling to estimate a full set of (matrix) multipliers capturing direct, indirect and induced impacts on, gross value added (GVA, a measure of economic output) and employment.

We use the multipliers in association with the direct impacts data to produce estimates of the total impacts of the industry through the supply chain response (indirect impacts) and the boost to household incomes and expenditure in the wider economy (induced impacts).

This section sets out the methods, data and assumptions used in the modelling underlying the results presented in the main body of this report.

The economic impact modelling framework

The direct impact estimates taken forward from previous research[26] provided the basis for completing the embedding process for engineering sectors.

Using these estimates as a starting point, engineering sectors were assigned a role within an adapted version of the aggregate combined use matrix. This comes in three parts:

a) The intermediate demand part, showing the inputs of products (goods and services) – both domestic and imported – used by UK industries in the production of their output.

[25] The most recent edition of these input-output tables, which relate to 2010, were published by ONS in February 2014. Supply-use tables are published in slightly more timely fashion, with the latest edition of these tables, which relate to 2012, published in October 2014.

[26] See, 'The contribution of engineering to the UK economy' October 2014.

b) The final demand part, showing the purchases of each product by each category of final demand in the UK – households (consumers), government, investment and exports.
c) The primary inputs part, showing payments to inputs that do not flow through the other industries but rather reflect employees' salaries, taxes less subsidies on production and gross operating surplus and mixed income.

The aggregate supply table incorporates taxes less subsidies on products, which are important for translating gross turnover into measures of 'industrial' output, from which all economic contributions and impacts flow.

The primary inputs part (which corresponds with the income account) was completed for engineering sectors using data obtained from ONS and within the supply-and-use tables themselves.

Having thus assigned explicit roles within the supply-and-use tables to engineering sectors we had the basis for assessing their indirect and induced impacts, in terms of GVA and employment through incorporation in Cebr's in-house input-output models.

Multiplier impacts based on Leontief input-output framework

Multipliers show the ratio of an indirect and induced change in national income to an initial change in the level of final demand spending, where the multiplier effect denotes the phenomenon whereby some initial increase (or decrease) in the rate of spending will bring about a more than proportionate increase (or decrease) in national income. The Keynesian approach barely requires a mention but is very much grounded in macroeconomic analysis, offering little capability to analyse impacts of entities that are smaller than the whole economy.

Input-output analysis, due largely to the work of Wassily Leontief, while macroeconomic in the sense that it involves analysing the economy as a whole, owes its foundations and techniques to the microeconomic analysis of production and consumption. According to ten Raa (2005), some people argue that input-output analysis is at the interface of both, defining it as the study of industries or sectors of the economy.

The well-known Leontief inverse matrix, which shows the inter-industry dependencies of an economy, is the basis for producing so-called 'ordinary' (or traditional) input-output multipliers. These are some of the most important tools for measuring the total impact on output, employment and income when there is a change in final demand.

The Leontief inverse matrix can also be described as the output requirements matrix for final demand, that is, it shows the input requirements from the other sectors of the economy per unit of output produced in the sector under examination in response to a final demand stimulus. The matrix can be used to produce two types of multiplier – the Type I multiplier incorporating direct and indirect (supply chain) impacts and the Type II multiplier incorporating induced (through higher incomes and resulting greater consumption) impacts as well.

Cebr's baseline multiplier model is based on this Leontief input-output modelling approach. The model is based on a so-called 'domestic use' table, from which imports are extracted from intermediate demands in order to focus on the domestic economy impacts of final demand stimuli.[27]

[27] From this domestic use matrix can be estimated symmetric input-output tables, from which the Leontief matrix multipliers can be more robustly estimated.