

**MANUFACTURING METRICS
REVIEW**

Annex E: Value chain
methodology

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Contents

Annex E - Value Chain Methodology	3
Overview	3
Benefits / improvement arising from BIS methodology	4
Detailed Methodology.....	4
Validation	9

Annex E - Value Chain Methodology

Overview

BIS have estimated the number of jobs supported by the UK manufacturing sector across the value chain using concepts and methods which partly reflect the Brookings method for the USA. BIS have however, made direct use of the published UK Analytical Input-Output tables, and the methodology differs from the Brookings approach in a number of key ways. To a large extent, the Brookings method involved identifying non-manufacturing SIC sectors which have a 'goods' focus, but no distinction was made between domestically produced and imported goods, particularly in the after-sales areas.

The BIS methodology and coverage differs from Brookings in the following areas:

- Brookings' pre-production activity was limited to Market analysis, R&D and Design services – BIS have additionally included purchase of raw materials, water, energy and construction – jobs in the latter account for nearly three times as many jobs as covered by Brookings (R&D etc).
- Brookings' method excluded purchase of support services such transport, financial, business services – these have been included and account for nearly 20% of the additional jobs.
- Brookings post-production estimate included the value chain on a 'world-wide' basis, not on a 'domestic' economy basis. BIS have used an adjustment to cover only the 'domestic' economy – distribution accounts for about 50% of the additional value chain jobs (Brookings reported nearly 66%, but excluded support services).
- Most of Brookings after-sales services is considered to be part of Support services (telecoms, call centres etc). Two additional SIC sectors – 'renting' and 'repair' of goods – have been identified as relevant to after-sales services and these have been included for the UK but were excluded by Brookings. However, their contribution is relatively small and for repair covers only household goods and computers. The majority of repair and maintenance activity relates to large capital equipment (aeroplanes, trains & ships) and in accordance with international classification standards these are already included in the 'core' manufacturing sector of the economy.
- Similar to Brookings, BIS have included publishing as additional manufacturing production, but the size is relatively small.

Benefits / improvement arising from BIS methodology

It is acknowledged that the methodology adopted to estimate the number of indirect jobs supported by manufacturing across the value chain includes a number of assumptions and methods which could be challenged and, given new resources, improved.

However, the BIS method offers two key improvements over the Brooking study for the USA:

- coverage for the pre-production jobs is comprehensive and the distribution of jobs reflects the purchase of domestic goods and services (which is published in analytical input-output tables for the UK). The total number of indirect jobs has also been adjusted to a valid estimate of total indirect jobs obtained from published employment multipliers;
- post-production jobs have been adjusted to be limited to the domestic output of the manufacturing sector, whereas other studies have included the entire jobs in these sectors and so represented the world-wide value chain rather than the domestic value chain which is of real interest.

Detailed Methodology

The detailed methodology used by BIS is outlined in the Table below. Key stages include:

- estimating the total number of indirect jobs in the UK, supported by the entire manufacturing sector (expressed as an employment multiplier);
- for all sectors of the economy outside of manufacturing, estimate the distribution of indirect jobs and adjust to the figure specified by the employment multiplier (stage 1);
- group indirect jobs for pre-production activities, supported by purchase of:
- specialised services which may require some bespoke development for the manufacturing sector (including software, design, R&D, technical testing and marketing; SIC 62-63, 71-73)
- routine support services such as transport, telecoms, financial, legal, accountancy, administrative and other support services (SIC 49-53, 55-56, 58.2, 59-61, 64-66, 68-70, 74-75, 78-82, 84-88, 90-94, 96)
- raw materials such as food produce for processing, water, fuels and construction (SIC 1-3, 5-9, 35-39, 41-43)
- to avoid double counting, indirect jobs in publishing (SIC 58.1), distribution (SIC 45-47), renting (SIC 77) and repair (SIC 95) are excluded
- include jobs in SIC 58.1 publishing with core manufacturing jobs (SIC 10-33, section C)

- estimate proportion of domestic jobs in distribution (SIC 45-47), renting (SIC 77) and repair of computers and household goods (SIC 95) and apply to published jobs totals for the sectors

Stage	Task	Source	Estimation issues/limitations
1.0	Estimate employment multiplier for 'whole of manufacturing'	Employment multipliers have been published by ONS for 44 individual manufacturing sectors	Multipliers for individual sectors are not additive and cannot be averaged to obtain a figure for the whole of manufacturing. The multiplier gives the total number of indirect jobs outside of the sector which can in principle be split between the rest of manufacturing and the rest of the non-manufacturing economy.
1.1	For each individual manufacturing sector, split indirect jobs into 'rest of manufacturing' and 'rest of non-manufacturing'	Analytical input output tables (industry by product table)	Approximated from the domestic purchase of goods in the 'rest of manufacturing' and the domestic purchase of goods and services in the 'rest of the non-manufacturing'

Stage	Task	Source	Estimation issues/limitations
			economy’.
1.2	Sum estimated indirect jobs in ‘rest of non-manufacturing economy’ for all individual manufacturing sectors – derive manufacturing multiplier	Published workforce jobs for manufacturing	Gives an employment multiplier of 1.6 indicating 1,486k indirect jobs supported by the manufacturing sector. This compares with 2,562 jobs in the core manufacturing sector SIC 10-33 (section C)
2.0	Estimate indirect jobs distribution outside of the manufacturing sector. Adjust so that total equals indirect jobs from estimated employment multiplier.	Analytical input output tables (industry by product table)	Use domestic purchases as a proxy for jobs distribution
2.1	Calculate domestic purchases for entire manufacturing sector as a share of total sector output	Analytical input output tables (industry by product table)	For each product grouping given in Table B1 the total domestic purchases of the product by the entire manufacturing sector is derived from the published ‘domestic use

Stage	Task	Source	Estimation issues/limitations
			<p>table at basic prices'. The total 'sector' output is estimated from the same table allowing the purchase of products by the manufacturing sector as a share of total output in the sector to be estimated. This is used as a proxy for the share of jobs supported by the manufacturing sector.</p>
2.2	Estimate indirect jobs distribution	Published WFJ for each sector excluding manufacturing	<p>The share of jobs derived in 2.1 above is applied to the published WFJ for each sector. This distribution is summed to a UK total of 967k jobs and then adjusted to equal the total of 1,486 indirect jobs derived from the employment multipliers. This is a scaling factor</p>

Stage	Task	Source	Estimation issues/limitations
			of 1.54 – ideally the scaling factor should be close to or equal unity. ¹
3.0	Group pre-production jobs into Specialised services; Routine support services and Raw materials, utilities and construction.	Jobs estimated in 2.2 above	Exclude jobs in Publishing, Distribution, Renting and Repair to avoid double counting
4.0	Add in Publishing jobs	Published WFJ for SIC 58.1	No estimate is made for the split between physical goods and on-line publishing
5.0	Estimate jobs in post-production	Published WFJ for Distribution (SIC 45-47); Renting & leasing (SIC 77); Repair of computers & household goods (SIC 95)	Domestic content estimated as follows: SIC 45 Motor vehicles; domestic sales of cars (15%) SIC 46-47 Wholesale & retail excluding motor vehicles;

¹ Further thought will be given as to why the scaling factor is not close to unity – which is to be expected given that the distribution of jobs is derived from the distribution of purchases published in analytical input-out tables – and jobs are constrained to ONS employment multipliers which are themselves derived from the same source

Stage	Task	Source	Estimation issues/limitations
			share of domestic purchases by household sector from IO tables (29%) SIC 77 Renting & leasing; share of domestic goods purchased by the sector from IO tables (13%) SIC 95 Repair of computers & household goods; share of domestic computer purchases by household sector (9%)

Validation

It is possible to undertake a plausibility check for some sectors by considering the share (%) of jobs 'supported' by manufacturing in some sectors, compared with the share of manufacturing jobs which was 8.2% in 2010.

Notably:

- agriculture where 40% of UK output is sold to the manufacturing sector as intermediate consumption – the indirect jobs estimate represents 56% of agricultural jobs consistent with a high level of output sold to the manufacturing sector;
- water and energy where it is known that parts of manufacturing are heavy users – the indirect jobs estimate is 16% of the sectors jobs, double that of the manufacturing sector share of 8.2%;

- services which are known to be marketed across sectors of the economy may have a jobs share close to the manufacturing share of 8.2%. Products where this is so, include computer services (9%), accountancy (8%) and support services (7%).



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Contact us if you have any enquiries about this publication, including requests for alternative formats, at:

Department for Business, Innovation and Skills
1 Victoria Street
London SW1H 0ET
Tel: 020 7215 5000

Email: enquiries@bis.gsi.gov.uk

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