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Annex:

Multiplier Effects

How do the multipliers in the toolkit compare to ONS multipliers derived from input-output analysis?

The Office for National Statistics (ONS) provides a table of employment multipliers derived from input-output analysis. These 'I-O multipliers' can be used to assess the impact of a specific event, such as a firm opening, on the UK economy. Such multipliers capture both the direct employment effect and the indirect employment effects on suppliers of the new firm and tells us in which sectors these are likely to occur.

We can use this table of I-O multipliers to calculate tradable-to-tradable multipliers and public-to-private multipliers that can be compared to those reported in the toolkit. Unfortunately, these I-O multipliers cannot be used to calculate tradable-to-non-tradable multipliers, that are the focus of the evidence summarised in the toolkit.

It is important to note that the resulting I-O multipliers are calculated based on what we know about observed input-output linkages across firms and predict the multiplier impact for the UK as a whole. In contrast, the multipliers in our toolkit are based on estimating what happens in practice when employment changes in a given location. The I-O multipliers are quite detailed and are often used for 'ex-ante' calculations i.e. before changes have taken place. However, economists worry that the I-O multipliers might miss general equilibrium effects – such as price changes by suppliers – that may be very important for the size of any multipliers in practice.

ONS multipliers

The multipliers that we can derive from the ONS I-O multipliers are in Table A1 and details of how we calculate these are provided below. The average tradable-to-tradable employment multiplier is 0.73, which means that for each additional job in the tradable sector, 0.73 jobs are created in other parts of the tradable sector. This estimate is higher than the average local multiplier of 0.41 that we report in the toolkit.

For high-tech tradable-to-tradable the ONS I-O multiplier of 1.4 suggests that one additional job in that sector leads to 1.4 jobs in the rest of the tradable sector. We do not have employment multipliers for high-tech tradable to tradable in our toolkit but the finding that I-O employment multipliers are larger for high-tech is consistent with our toolkit findings.

The final column of the table derives the public-sector-to-private-sector multiplier. The ONS estimate of 0.37 is again higher than our toolkit estimate of 0.25.

It is important to note that the tradable-to-tradable and public-sector-to-private-sector estimates reported in the toolkit are based on relatively small numbers of studies (three and six, respectively). However, in both cases the I-O estimates are larger than those reported in our toolkits. One part of the explanation for the differences is that the I-O multipliers pick up the effect across the UK, whereas our toolkit focuses on local effects. Given that some supply comes from outside the area, such leakage should lead to an overestimate of the local effect when using the I-O multipliers. The other part of the explanation could be that this reflects economists' concerns that price changes might dampen real-world multipliers compared to I-O based multipliers. For both these reasons, using traditional I-O multipliers might tend to overstate any additional local employment generated.

Finally, we can use the ONS I-O multipliers to get separate estimates of the three different types of multiplier by sector. Table A1 reports the mean, minimum and maximum of these estimates for each of the three multipliers. Unfortunately, the ex-post estimates reported in the toolkit only provide averages so we have no point of comparison to assess the accuracy of these sector level multipliers.

Table A1: Employment multipliers based on ONS data

	Tradable Tradable	High-tech Tradable Tradable	Public sector Private
Mean	0.73	1.40	0.37
Min	0.19	0.55	0.20
Max	4.07	4.07	2.48

Technical details

The input-output table is constructed based on how firms within one sector and across sectors are interrelated given the production structure observed in the UK economy. These multipliers are referred to as full time equivalent (FTE) Type I employment multipliers. They are available by two-digit (sometimes three-digit) sector classifications. They are calculated based on an input-output analysis, using 2014 as the reference year.

So called Type I employment multipliers include the direct employment effects that resulted from an increase in final goods use of a given industry, as well as the indirect (employment) effects resulting from an increase in use on suppliers of that industry (or possibly other related industries). For example, the Type I employment multiplier for the industry group 10.1, 'Processing and preserving of meat and

production of meat products', is 2.89, comprised of a direct effect equal to one additional job (by construction) and indirect effects equal to 1.89 additional jobs (calculated from the I-O table). As the meat industry (group 10.1) mostly supplies itself, at least at the two-digit sectoral level, most of these indirect demand effects occur in the meat industry i.e. group 10.1.

As discussed above, we use the ONS table of multipliers to work out the employment multiplier for tradable to tradable, and for public sector to the tradable/private sector. We proceed in three steps:

1. We first review the definitions of tradable and high-tech sector in the studies that we gather. There are two ways of defining the tradable sector. The first includes mainly the 'manufacturing' sector, and some services such as publishing, printing and reproduction, management consultancy activities, accounting, scientific research, advertising, and other professional, scientific and technical activities (see Table A2 for a detailed description). The second is based on the degree of geographical concentration of activities since concentrated activities are more tradable. We use the first approach, which is the only one that is feasible given the data we have available. The high-tech sector is a subset of the tradable sector, which includes sectors such as machinery and computing equipment, electrical machinery and professional equipment, chemicals, accounting and computing, communication, medical, pharmaceuticals, aircraft and spacecraft.
2. For each industry, we produce weights based on employment shares. Employment figures come from the ONS and, specifically, from the Business Register and Employment Survey (BRES), which has data on employment at two-, three-, and five-digit standard industrial classification of economic activities (SIC).
3. Instead of computing the simple average which assigns equal weights to industries with different size (in terms of employment), we compute weighted averages of the multiplier using employment shares as weights that add up to one. Using weights allows us to account for the fact that some industries are large in size and therefore we should place more weight on their I-O multiplier when calculating the average.

Table A2: Tradable industries included in the analysis

SU114 Industry group	Description	Classification	Total employment (in thousands)
10.1	Processing and preserving of meat and production of meat products	Tradable	77.1
10.2-3	Processing and preserving of fish, crustaceans, molluscs, fruit and vegetables	Tradable	47.1
10.4	Manufacture of vegetable and animal oils and fats	Tradable	2.1
10.5	Manufacture of dairy products	Tradable	22
10.6	Manufacture of grain mill products, starches and starch products	Tradable	9.9
10.7	Manufacture of bakery and farinaceous products	Tradable	99.5
10.8	Manufacture of other food products	Tradable	95.6
10.9	Manufacture of prepared animal feeds	Tradable	14.4

11.01-6 and 12	Manufacture of alcoholic beverages & tobacco products	Tradable	29.1
11.07	Manufacture of soft drinks; production of mineral waters and other bottled waters	Tradable	11.9
13	Manufacture of textiles	Tradable	59.4
14	Manufacture of wearing apparel	Tradable	19.9
15	Manufacture of leather and related products	Tradable	8.5
16	Manufacture of wood & products of wood & cork, except furniture; manuf. of articles of straw	Tradable	70.8
17	Manufacture of paper and paper products	Tradable	51.3
18	Printing and reproduction of recorded media	Tradable	101.2
19	Manufacture of coke and refined petroleum products	Tradable & High-tech	8.5
20A	Manufacture of industrial gases, inorganics and fertilisers (inorganic chemicals) - 20.11/13/15	Tradable	9.8
20B	Manufacture of petrochemicals - 20.14/16/17/60	Tradable & High-tech	5.9
20C	Manufacture of dyestuffs, agro-chemicals - 20.12/20	Tradable & High-tech	3.2
20.3	Manufacture of paints, varnishes and similar coatings, printing ink and mastics	Tradable	13.9
20.4	Manufacture of soap & detergents, cleaning & polishing, perfumes & toilet preparations	Tradable & High-tech	28
20.5	Manufacture of other chemical products	Tradable & High-tech	18.3
21	Manufacture of basic pharmaceutical products and pharmaceutical preparations	Tradable & High-tech	39.2
22	Manufacture of rubber and plastic products	Tradable	174.8
23OTHER	Manufacture of glass, refractory, clay, porcelain, ceramicstone products - 23.1-4/7-9	Tradable	37.4
23.5-6	Manufacture of cement, lime, plaster and articles of concrete, cement and plaster	Tradable	28.3
24.1-3	Manufacture of basic iron and steel	Tradable	31.9
24.4-5	Manufacture of other basic metals and casting	Tradable	34
25OTHER	Manufacture of fabricated metal products, excluding weapons & ammunition - 25.1-3/5-9	Tradable	296.9
25.4	Manufacture of weapons and ammunition	Tradable & High-tech	13.1

26	Manufacture of computer, electronic and optical products	Tradable & High-tech	114.8
27	Manufacture of electrical equipment	Tradable & High-tech	84
28	Manufacture of machinery and equipment n.E.C.	Tradable & High-tech	182.4
29	Manufacture of motor vehicles, trailers and semi-trailers	Tradable & High-tech	153
30.1	Building of ships and boats	Tradable & High-tech	29.4
30.3	Manufacture of air and spacecraft and related machinery	Tradable & High-tech	82.5
30OTHER	Manufacture of other transport equipment - 30.2/4/9	Tradable & High-tech	12.1
31	Manufacture of furniture	Tradable	81.4
32	Other manufacturing	Tradable	75.7
33.15	Repair and maintenance of ships and boats	Tradable	8.1
33.16	Repair and maintenance of aircraft and spacecraft	Tradable & High-tech	17.7
33OTHER	Rest of repair; installation - 33.11-14/17/19/20	Tradable	96.2
35.1	Electric power generation, transmission and distribution	Tradable & High-tech	89.3
58	Publishing activities	Tradable	120.9
59-60	Motion picture, video & tv programme production, sound recording & music publishing activities & programming and broadcasting activities	Tradable	151.5
61	Telecommunications	Tradable	207.6
62	Computer programming, consultancy and related activities	Tradable	742
69.2	Accounting, bookkeeping and auditing activities; tax consultancy	Tradable	395.1
70	Activities of head offices; management consultancy activities	Tradable	799
71	Architectural and engineering activities; technical testing and analysis	Tradable	508.4
72	Scientific research and development	Tradable	134.6
73	Advertising and market research	Tradable	169.3
74	Other professional, scientific and technical activities	Tradable	201.3

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