

IDENTIFYING SENSITIVE AND STRATEGIC SECTORS

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KEY POINTS

- Policy discussions about the effects and opportunities of international trade recognise that some parts of the economy might be more sensitive than others to changes in trade and/or trade policy, but the concept of a sensitive industry has different meanings.
- There is no single correct way to identify whether sectors are sensitive to import competition, or offer strategic export opportunities, so a range of indicators must be modelled to identify sensitive and strategic industries.
- Our highlights include:
 - o the largest low-wage sectors are in services, with little exposure to international trade
 - o many of the manufacturing sectors which score highly on several indicators of sensitivity (clothing, leather, textiles, wood) are small
 - o the large food manufacturing sector has a very high level of protection from import competition
 - o the sectors identified as having strategic export potential typically have high wages, high levels of R&D expenditure, high exports, and low SME presence, but otherwise are quite diverse

WHAT IS A SENSITIVE SECTOR?

Farmers are very unhappy about the UK's recent trade agreements with Australia and New Zealand, because they fear that increased imports will harm their interests. It has emerged that their unhappiness is shared by George Eustice, who was at the time of the agreements the Secretary of State responsible for agriculture.

The fact that some groups dislike a trade policy does not necessarily mean it's a bad policy: British farmers will lose out if prices fall, but British consumers will benefit.

However, those who plan, negotiate and vote for such changes need to be aware of whether they are inflicting pain on sensitive sectors which will have to be ignored, placated, or compensated.

How can we identify such sensitive sectors? That's what this Briefing Paper is about.

Is agriculture a sensitive sector? The statistics show that wages in agriculture are low, much of the

sector consists of small businesses, and quite a high proportion of farm employment is outside the prosperous south-east of England; and all three factors might make policymakers concerned about harming this sector. The agricultural sector is small (accounting for less than 1% of UK employment) but evidently not too small to have a loud voice.

Fishing is another sector which has a loud voice: generally hostile before 2016 to UK membership of the EU but now pretty unenthusiastic about the outcome of Brexit too. It is even smaller than agriculture (with much less than a tenth of percent of UK employment), like agriculture is dominated by small enterprises and is largely located outside the south-east, but has much higher wages than agriculture.

Continuing to march through the sectoral landscape on our stomachs, we reach food manufacturing which too is predominantly located outside the south-east, and is the country's largest manufacturing sector (though at only 1.2% of UK employment). With higher wages than

agriculture and a low share of small businesses, we might think it's not particularly sensitive. So, let's move on to the food and beverage services sector, which really is large (almost 6% of UK employment), and out of all the 96 UK industries in the Standard Industrial Classification is the one with the lowest wages and the highest share of labour in its input mix.

What does this excursion down the food chain tell us about sensitivity? It suggests some relevant indicators for sensitive industries: wages, labour share, small business share, regional distribution, and size. It shows that sensitivity is multi-dimensional: these four closely related sectors display very different patterns of these five indicators, even though at least three of the four sectors have strong claims to being sensitive.

At 6% of UK employment, food and beverage services is a large sector, but not as large as health (8%), education (9%), and non-motor retail services (over 9%). These four sectors together account for almost a third of UK employment. Apart from their size, all have a claim to sensitivity. Wages in retail and education are low (though not as low as in food services) and the share of labour is high in all four (though highest in food services).

But none of them is regionally concentrated and, of course, as service sectors, none is subject to significant import competition (though the retail and food service sectors rely heavily on imported supplies, and all four sectors probably have a high proportion of foreign-born employees).

Food manufacturing is the largest manufacturing sector, but other manufacturing sectors may seem more vulnerable to import competition: clothing and leather are largely located outside the south-east, and have low wages and high labour shares, and the UK clothing industry consists mostly of small businesses; the textile industry is not so labour intensive, but has relatively low wages and a high concentration outside the south-east. These look like classic examples of sectors vulnerable to strong competition from low-wage countries. They are, however, small: textiles accounting for less than 0.2 percent of UK employment, clothing and leather under 0.1 percent.

Some other manufacturing sectors have a different profile, most notably motor vehicles and other transport equipment, also located largely outside the south-east, but with relatively high wages, significant export shares and the highest levels of R&D expenditure apart from the scientific research sector. Trade policy has to pay attention to industries with export potential as well as those vulnerable to import competition.

There are several sensitivity indicators which are available only for traded goods (primary products as well as manufactures). To the characteristics of the

textiles, clothing and leather sectors already noted, we can add high levels of imports and/or low levels of exports. But even by the standards of the traded goods sectors, textiles, clothing and leather are small.

Sectors which already have high levels of tariff or non-tariff protection include agriculture, fishing, food and beverages, textiles, and clothing, so it looks as if there's a reasonable match with the indicators we have already looked at. There are interesting questions though: why the high level of protection for some quite small sectors where the gains for consumers from cheaper imports might be large?; why is the level of protection highest for food manufacturing which does not seem particularly vulnerable to import competition?

Of the traded goods with the potential for export-driven growth, the most notable are motor vehicles and other transport equipment, which are large, located outside the south-east, with moderately high wages, and very high levels of R&D.

We conclude that because 'sensitivity' can have quite different meanings there are different measures by which one might judge whether a particular sector is sensitive to foreign competition, or has the potential for export-driven growth. Some sectors score highly on several indicators, some score very highly on one or two indicators but not on others. There is overlap between different indicators, but not enough to make any one of them redundant.

There is no single correct way therefore to identify whether sectors are 'sensitive' to import competition, or offer 'strategic' export opportunities. It's possible in principle to make a composite index for each sector by aggregating the scores on each of a group of indicators, but in practice the weighting of different factors is best left to the judgement of policymakers.

We identify and illustrate the issues on which policy-makers should focus, but the policy judgements are for them to make.

INTRODUCTION

Policy discussions about the effects and opportunities of international trade recognise that some parts of the economy might be more sensitive than others to changes in trade and/or trade policy. For example, agriculture and fisheries are associated with vulnerable rural communities, many industrial sectors face competition from rapidly developing countries (especially China) which may create adjustment problems, and financial and business services may be internationally footloose and in danger of moving out of the UK.

In this Briefing Paper, we have a threefold aim: to provide a conceptual framework for considering

the factors that could identify industries that may be sensitive or strategic from a trade perspective; to review the range of information that can identify these factors; and to illustrate the ways in which this information can be usefully applied.

Accompanying the Briefing Paper is a spreadsheet file with the underlying indicators, and some tools of analysis which we hope will be of use and interest to some readers. The spreadsheet also includes detailed information about data sources and any data adjustments made.¹

Sensitivity is most frequently discussed in relation to import competition; but here we also consider whether sectors might be of particular interest to policymakers in the sense of offering opportunities for export growth. Indeed, much of the public discourse by politicians around trade focuses on the perceived gains from access to export markets. For the sake of expositional clarity, we refer to these as strategic sectors.

We shall see that some statistical indicators could apply to both import sensitivity and strategic export potential, some only to one, and some may apply differently in the two cases.

We develop our analysis for industries at the 2-digit level of the UK Standard Industrial Classification (SIC) scheme. In many cases, sensitivity will be felt at a more disaggregated level: particular types of food products, electrical equipment or financial services, for example. However, much of the publicly available relevant information is available on a comprehensive basis only at the 2-digit level. There is scope for applying the indicators and methods we are proposing at a more disaggregated level, but we do not do it here.

We mainly focus on the characteristics of sectors rather than their actual trade performance, but we do introduce some measures of trade policy and performance. Some trade statistics are available on a commodity basis rather than an activity basis and here concordances have been used to make a (necessarily imperfect) translation from trade classifications to an industrial classification.

There are different kinds of answers to the question of what it means for a sector to be regarded as sensitive or strategic from the perspective of trade policy, and one of the strong messages of this paper is that this is partly because there are different approaches to what the question means.

In the next few sections, we explore these different approaches, starting with the question of why policymakers should care about sectoral issues.

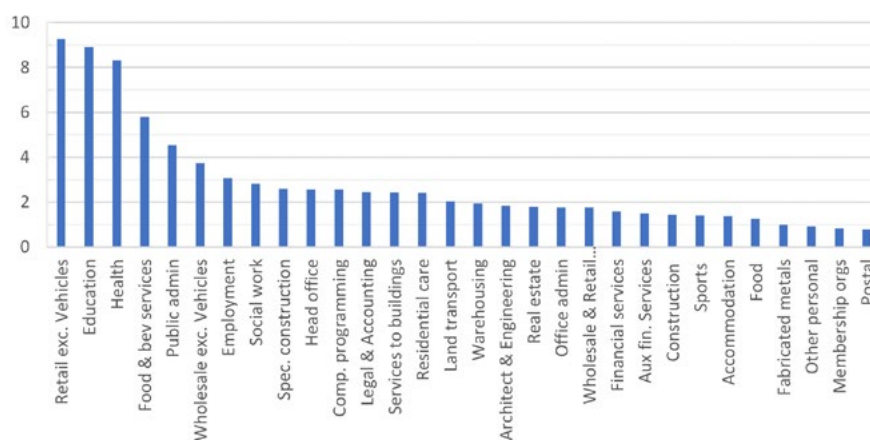
HOW TO IDENTIFY SENSITIVE AND STRATEGIC INDUSTRIES?

What sectors might UK policymakers care most about?

In this section we discuss the sectors in which susceptibility to disruptive shocks or opportunities might particularly matter, and what economic indicators are relevant.

The first obvious measure is the size of the sector. Our Size measure is derived from the Business Register and Employment Survey (BRES) accessed via the Nomis database of UK employment statistics and is relevant for both sensitive and strategic sectors. (The bold names refer to the statistical series in the accompanying spreadsheet.)

Figure 1: Top 30 UK SIC sectors by share of employment



¹ Sensitive Industries data (indicators and analysis) <https://docs.google.com/spreadsheets/d/19HENN20IYEtzCco4o6hTl1zAZORR6qm5sfA7lxnVZk/edit#gid=339765211>

The chart below depicts the top 30 sectors by share of employment (out of 82 sectors). These 30 sectors account for just under 85% of UK total employment. The chart shows that the top 5 sectors account for nearly 37% of UK employment, with the largest being over 9% in non-motor retail trade. Only two manufacturing industries (food products at 1.2%, and fabricated metals at 1%) appear in the list.

Employment shares are under 1% for all other manufacturing sectors, but it is worth noting that some large service sectors, like motor and non-motor wholesale and retail are strongly linked to traded goods – shifts in the pattern of trade might have a small overall effect on the linked service sectors but could lead to substantial shifts of resources within these sectors.

Current discussion of ‘levelling up’ focuses partly on interregional differences in economic fortunes between different parts of the UK, and our next measure is the share of sectoral employment outside the greater South-East – London, South East England and East of England – (NSEESh), also derived from the BRES. For most agricultural and manufacturing sectors the employment share outside the greater South-East is above 70%, but it is less than 50% for most service sectors. There is a negative correlation between this statistic and sector size, reflecting the disproportionate presence of many of the large service sectors in the greater South-East. Again, this is a measure relevant to both import competition and export potential.

These two statistics describe sectoral characteristics that are not linked specifically to international trade – policymakers will be interested in the size and regional distribution of affected sectors whatever policies are under discussion. And the very fact that sectors producing traded goods don’t appear in the 25 largest sectors is itself worth noting: trade may not be the most important focus of sectoral policy concern.

What sectors might UK trade policymakers care most about?

Moving on to focus more specifically on the effects of international trade on the economy, a natural starting point is how international competitive advantage might be driven by differences in endowments of factors of production. There are two reasons to be interested in such forces: the input characteristics of a sector might show it to be vulnerable to import competition or to have promising export opportunities, and secondly might indicate whether the growth of trade is likely to advantage or disadvantage particular groups.

Policymakers might therefore be interested in whether sectors are labour-intensive (and thus vulnerable to import competition from low-wage countries); or whether sectors employ highly-skilled labour (and have

the potential to do well in export markets).

One natural measure of labour intensity – the share of labour in value added – is influenced by both the level of employment and the level of wages. We split out the two effects: measuring skill intensity by the average annual wage (Wage), and then ‘raw labour intensity’ by calculating what the share of labour in value added would be if all workers in the sector were paid £15,000 per year, which is close to the bottom of the wage range. This skill-adjusted labour intensity (AdjLabSh) does not measure the share of low-wage labour in value added, but it is a simple adjustment in that direction. One could think of it as a measure of labour intensity in which wages above £15,000 are treated as returns to human capital and stripped out. The wage series is derived from the Annual Survey of Hours and Earnings (ASHE) accessed via the ONS, and the statistics on labour share of sectoral value added are computed using data from the OECD’s Structural Analysis (STAN) Database.

These two factor-intensity statistics should be thought of differently for exports and imports. Policymakers might be sensitive to import competition in sectors in which adjusted labour-intensity is high or average wages are low, because they are most vulnerable to competition from low-wage countries and their employees are less resilient. However, for strategic export opportunities, the focus is typically on high-wage (high-skill) sectors where the UK might hope to have its best opportunities.

Another trade-related issue is the extent to which imports might be vulnerable to foreign supply chains. Full consideration of supply-chain resilience is beyond the scope of this paper, as it would require us to consider the extent to which a sector depended on foreign intermediates especially from a small number of sources. Here we consider only the share of sectoral imports which are intermediates (IntImpSh) of which higher values might be an indicator of import sensitivity.

On the export side, sectors in which intermediates form a high share of export (measured by IntExpSh) might be vulnerable to foreign resilience-driven trade policies. But it’s also possible that UK intermediate exports might find markets in countries keen to diversify their supply chains. It’s not clear therefore in which direction the share of intermediates in exports points! The intermediates share statistics come from the UN Comtrade database.

There are particular policy concerns about competitiveness in high-tech sectors, where we might think the UK had its best export opportunities, indeed ‘strategic’ is almost synonymous with ‘high tech’. The wage measure may help identify such sectors,

but another measure is a Research & Development intensity index (R&D), which we compute as the ratio of R&D expenditure to gross value added using data made available by the ONS. Unsurprisingly the correlation between wage and R&D is positive, but it is not particularly large, so both measures are worth considering.

Policymakers can be concerned with the proportion of trade accounted for by SMEs who might be less resilient in the face of import competition, and whose export potential might be particularly vulnerable to the level of trade restrictions they face. There is some evidence in recent trade statistics that SMEs have been particularly affected by post-Brexit trade frictions: as small export flows to the EU have tended to dry up. Our measure here is the share of sectoral employment accounted for by firms with fewer than 500 employees (SMESh). This statistic is derived from the ONS 'business characteristics' data.

Which sectors are most exposed to trade?

We now move from the normative to the positive, and consider trade sensitivity in the sense of whether some sectors are particularly responsive to changes in trade policy or trade costs. If, for whatever reason, an industry does not adjust much to changes in trade costs, it is less likely to be sensitive/vulnerable, and trade policy is not a strong instrument of industrial strategy. The natural measures of responsiveness are supply and demand elasticities. Unfortunately, we have essentially no systematic measures of sectoral supply elasticities. Comprehensive estimates of demand elasticities have been made, for example, by Ghodsi, Grubler and Stehrer (2016) but their estimates are so closely clustered around 1 that it's hard to have confidence that small differences in their estimates translate into real-world differences in market responsiveness that are significant for our purpose.²

We should also be interested in the extent of a sector's exposure to trade. High exposure to imports seems likely to make the sector more responsive to changes in trade policy. A high export share might indicate that the sector will be more responsive to export opportunities, but we would not want to rule out the possibility of new export opportunities opening up in sectors with currently low levels of export. A low level of exports could be driven by high barriers in export markets which

might be subject to negotiated reduction.

There are two kinds of statistics of trade exposure in the ONS 'experimental' series of trade by sector. Trade statistics classified by SIC sector cover trade in both goods and services in essentially all the SIC sectors. However, these statistics need to be interpreted with care. Exports of goods and services by producers whose main activity is classified as, for example, production of apparel can reasonably be assumed mostly to be exports of apparel. Imports of goods and services by these firms, however, may not necessarily be mostly of apparel. The ratio of imports to domestic value added in the apparel sector is quite low, even though we know that most UK apparel consumption is supplied by imports from low-wage countries. Most imported apparel is likely to be recorded as imports of goods by sectors 46 and 47: wholesale and retail non-motor trade. Hence, exports by SIC of goods and services as a proportion of sectoral gross value added are a useful measure of openness (Openn) to international trade and may be an indicator of export opportunity, but imports by SIC do not give a good indicator of which sectors are subject to the most competitive pressure from imports.

The ONS trade statistics also cover trade, only in goods, classified by product of activity (CPA). Sticking with the same example, CPA apparel exports and imports aim to record trade flows actually in apparel rather than the trade flows associated with firms in the apparel sector. So, for traded goods, we can record export and imports as shares of sectoral value added (ExpSh and ImpSh). But, as noted earlier, concordances between sectors and commodities are necessarily imperfect: some exports of apparel may be made by firms which are not recorded as belonging to the apparel industry.

Finally, measures of revealed comparative advantage (RCA), calculated using trade data from the UN Comtrade database, are relevant for both import sensitivity and export opportunity: a positive RCA suggesting export opportunity and low import threat, while a negative RCA suggesting strong competition from imports and weak export opportunity. But these are measures of what has already happened, and may have ambiguous implications for future developments. A negative RCA showing that competition from imports is already strong may, but need not, imply that the sector is under threat from growing competition. Sectors that have a strong competitive performance in world markets may have potential for even stronger performance, but that is not inevitable.

² See: Working Paper: Mahdi Ghodsi & Julia Grubler & Robert Stehrer, 2016. "Import Demand Elasticities Revisited," *wiiw Working Papers* 132, The Vienna Institute for International Economic Studies, wiiw <https://ideas.repec.org/p/wii/wpaper/132.html>. Published paper: Grubler, J., Ghodsi, M., & Stehrer, R. (2021). Import demand elasticities revisited. *The Journal of International Trade & Economic Development*, 31(1), 46–74. <https://doi.org/10.1080/09638199.2021.1951820>

What is the height of existing trade barriers?

The last set of possible indicators are the pre-existing level of trade barriers. Here the measures worth considering are import tariffs, non-tariff barriers, regulatory costs, distance, and trade preferences.

Ultra-detailed tariff data is available on a commodity basis and can be translated (imperfectly) into a sectoral basis, but only for traded goods, and sectors producing traded goods account directly for only 10% of employment. For imports we use the UK Global Tariff (UKtariff) aggregated to the sectoral level on a trade-weighted basis. Ideally, this series should be further adjusted to allow for the proportion of trade in each sector covered by zero-tariff trade agreements, but we have not made this adjustment. The corresponding measure for UK export opportunities is the trade-weighted tariff faced by the UK in export markets (Wtariff). In both cases, the trade statistics come from the UN Comtrade database.

There is a substantial literature on non-tariff barriers including regulatory costs, including the way such costs are affected by trade agreements. Estimates of the size of such barriers can be derived which are sufficiently credible to be used in policy modelling, often as tariff-equivalents. Our measure of non-tariff measures (NTM) for traded goods is derived from the tables in Cadot and Gourdon (2018). (Non-tariff barriers are especially important for traded services, but are not covered in the Cadot-Gourdon work.)³

Existing barriers to trade could have more than one kind of interpretation. High tariff barriers in a sector could be taken as an indicator of policymakers’ concerns about sensitivity or strategic potential, in which case, they might align with some of the indicators we have already introduced. On the other hand, high barriers to imports might indicate that the sector is already well insulated from pressures in world markets, while high barriers to export to foreign markets might dampen expectations of strategic export potential. On the import side, our judgement is that we should give more weight to trade barriers as indicators of policymakers’ normative concerns than as indicators of trade potential; but, for exports, foreign trade barriers objectively reduce the strategic potential of the sector.

Distance gives rise to trade costs, whose effects are already reflected in the trade statistics. Changes in transport costs might have different effects in neighbouring and distant markets but such an interaction of distance with changing transport costs seems, prima facie, to be a second-order effect which is not worth pursuing at this stage.

³ Olivier Cadot, Julien Gourdon, & Frank van Tongeren. (2018). Estimating Ad Valorem Equivalents of Non-Tariff Measures. *OECD Trade Policy Papers*. <https://doi.org/10.1787/f3cd5bdc-en>

Summary list of indicators

The table below lists all the indicators emerging from the discussion above. We might expect UK policymakers to be most anxious about import competition in sectors which are large, located outside the wider South-East, with low wages and high labour intensity, with a high proportion of SMEs and a high proportion of intermediate imports, and which already have been judged to need protection with tariffs and non-tariff barriers. We also expect import competition to be stronger in low-wage, high labour-intensity sectors with already high import shares and low revealed comparative advantage. On the export side, we expect policymakers to be particularly interested in export growth opportunities in sectors which are large, located outside the wider South-East, and to see opportunities particularly in high-wage, high R&D sectors where exports and revealed comparative advantage are already high, the share of intermediates in exports is high, and barriers to trade are low.

It does need to be borne in mind, however, that some of these judgements, especially on the export side, have to be tentative – there may be strong export opportunities in areas not already represented strongly in existing trade flows and, as we have already noted, anxieties about supply chain resilience may have ambiguous effects in sectors where UK exports are already focussed on intermediate goods. It is also worth reiterating that the level of aggregation at which the analysis is undertaken is also important. In this Briefing Paper we work at a somewhat aggregated level for reasons explained previously.

Table 1: List of sensitive/strategic indicators

Import sensitivity	Export opportunity
Size	Size
NSEE share	NSEE share
Wage (-)	Wage
Raw labour intensity	
	R&D
SME share	SME share (?)
	Openness
Import share	Export share (?)
Intermediates import share	Intermediates export share
RCA (-?)	RCA (+?)
UK tariff	World tariff (-)
NTM	NTM (-)

The table is divided into two parts: for imports or exports, the first 7 indicators are available for virtually all the SIC sectors (and the only missing sectors are of little quantitative significance) while 8 further indicators are available only for traded goods. (A minus sign indicates a measure where low values would indicate sensitivity/opportunity, while a question mark indicates a degree of doubt about the effect.)

MAKING USE OF THE INDICATORS

With any single indicator, it is of course easy to rank sectors – as we illustrated earlier by considering sectors by size. It becomes more complicated to use and balance multiple indicators. In this section, we discuss the number of indicators we have and then illustrate different ways in which they can be combined to provide useful information regarding sensitivity to imports, or strategic potential for exports.

Too many indicators?

We've made a prima facie case for each of the chosen indicators, but we need to consider the possibility that there are too many of them in the sense of some indicators being redundant. One way to consider this is to look at whether there are strong correlations between different indicators. (The correlations referred to here are documented in the spreadsheet.)

We've already noted that adjusted labour intensity has a strong negative correlation with the wage rate, and it has a weak negative correlation with R&D intensity. Labour-intensive industries tend to have lower wages and less R&D; but the relationship is not so strong as to suggest we should not bother using labour intensity as an independent indicator.

Unsurprisingly, wages and R&D intensity are positively correlated, but not as strongly as might have been expected. Both wage rate and R&D intensity have a positive but not particularly strong correlation with the export-openness measure in the all-sectors data – the UK's trade pattern displays comparative advantage in high-skill and high-tech sectors. And in traded goods alone, there's a weak negative correlation between wages and export intensity.

Turning to correlations for the traded goods sectors only, although the negative correlation of the non-SE England share with sectoral employment across all sectors might seem to be mainly explained by the salience of the service sectors in the greater South-East, the correlation remains negative even among traded goods. There's still a high negative correlation between wages and labour intensity; and the relationship between wages and R&D remains surprisingly weak. RCA is unsurprisingly positively related to export intensity and it is also positively

related to foreign tariffs: sectors in which the UK has an apparent competitive advantage tend to face higher tariff barriers in export markets.

It is particularly interesting to look at the relationship between the UK tariff rate and the other variables, as one might expect tariffs to reflect policy sensitivity about import competition. Tariffs are higher in larger sectors, in sectors concentrated outside the South-East, in lower-wage sectors, in labour-intensive sectors and in sectors with higher non-tariff barriers which gives a reassuring message about the relevance of these indicators. There's a fairly high correlation between world tariffs and UK tariffs, partly reflecting that the post-Brexit UK tariff has not completely moved away from the EU's tariff, partly no doubt reflecting some commonality of policymakers' concerns in different countries.

There is only one correlation which suggests redundancy of indicators: the close to 100% correlation of the share of intermediates in export and in imports. It's not surprising that trade flows which are dominated by intermediates in one direction have the same characteristic in the other.

In short, this brief analysis of correlations does not suggest we are considering too many indicators. More positively, we see some correlations which are consistent with the rationale for our choice of indicators; and some correlations whose weakness is mildly surprising. But looking hard at all these numbers is not going to get us much further than that.

Comparing sector rankings

One approach to the use of multiple indicators is to consider the rankings of sectors and to identify which industries, and how many industries, appear as most sensitive (or strategic) across the range of indicators. In the first instance we do this by identifying the top 'n', and bottom 'n' industries for each indicator. When we look at all 82 sectors, we look at the top and bottom 20 sectors. In considering the 31 traded sectors, we look at the top and bottom 10.

Consider this first in the analysis of all sectors. Since we do not have many directly trade-related indicators at this level, we look at sectors that might be the focus of general policy concern rather than being specifically trade-sensitive. We use all 7 indicators for which data is available on all sectors, and since we are not focusing specifically on export opportunities, we take low wages as the relevant wage indicator here.

Table 2 shows all of the sectors which were one of the 'top 20' most sensitive sectors in three or more of our seven indicators (in the top half of Table 1 earlier). The pale red shading shows the most sensitive sectors while the pale green shows the least, on the respective indicators. These 19 sectors have quite

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varied characteristics: clothing, leather and furniture are labour-intensive, low-wage sectors located largely outside the SE; building services, education, residential care and social work are large, labour-intensive, low-wage sectors (with low export exposure); and chemicals, basic metals, fabricated metals, motor vehicles, and other transport equipment are high R&D sectors, located mostly outside the SE, and either with high export shares or high SME shares. But there are another 7 sectors that idiosyncratically do not fit neatly into one of these patterns, including the retail sector which is large, labour-intensive and low-wage but does not tick any other boxes.

We now focus on the 31 traded sectors for which we have a consistent set of data. From table 1 earlier we have 10 indicators of import sensitivity and 10 of export potential. We therefore identify those industries that have five or more 'top 10' indicators first for imports and then for exports.

The nine sectors that emerge on the import side as potentially sensitive with five or more 'top 10' hits are shown in the table above. These sectors rank quite differently on different indicators. Agriculture and food manufacturing are large, low-wage, and highly protected. As we have already seen, textiles, clothing and leather are labour-intensive, low-wage, located largely outside the SE, and protected, but all are quite small. Rubber and plastic products and motor vehicles are large, located outside the SE and protected, though not low wage. Again, there is no single strong pattern of sensitivity.

Table 2: All-sector sensitivity rankings

	Size	NSEEShare	AdjLabSh	Wage (-)	SMESh	Openn	R&D
Forestry	0.05	59.80	0.39	27155	1.00	0.02	0.09
Fishing	0.03	81.90	0.23	34720	0.82	1.48	0.09
Clothing	0.08	79.60	0.51	19228	0.90	0.20	0.13
Leather	0.02	75.86	0.44	25696	0.66	0.93	1.29
Coke & petrol	0.03	73.95	0.06	55253	0.24	2.13	2.14
Chemicals	0.27	79.50	0.20	41359	0.52	1.43	3.01
Basic metal	0.22	95.00	0.26	39690	0.56	1.51	1.81
Fabricated metal	0.99	75.09	0.33	32392	0.85	0.42	3.32
Motor vehicles	0.55	84.52	0.23	38654	0.43	1.73	14.10
Other transport	0.46	85.40	0.22	44553	0.33	2.88	15.86
Furniture	0.25	75.17	0.37	27161	0.78	0.09	1.41
Retail exc. Vehicles	9.29	60.44	0.47	19181	0.79	0.27	0.62
Food & bev services	5.81	57.42	0.75	15275	0.80	0.15	0.09
Head office activities	2.56	44.44	0.25	46527	0.89	0.78	1.53
Architect & engineering	1.82	55.20	0.30	40410	0.81	0.61	6.96
Services to buildings	2.43	54.25	0.45	20195	0.62	0.07	0.32
Education	8.92	59.75	0.42	27459	0.40	0.07	0.02
Residential care	2.42	64.24	0.65	20169	0.56	0.00	0.05
Social work	2.81	62.97	0.68	19407	0.71	0.00	0.05

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Table 3: Import sensitivity rankings

	Size	NSEESh	AdjLabSh	Wage (-)	SMESh	ImpSh	IntImpSh	RCA (-)	Uktariff	NTM
1 Agriculture	0.70	70	0.22	22891	0.90	0.98	25.00	-0.57	7.45	17.0
2 Forestry	0.05	60	0.39	27155	1.00	0.21	100	-0.83	0.00	9.0
10 Food	1.25	77	0.35	29229	0.48	1.31	14	-0.19	20.55	28.7
13 Textiles	0.15	88	0.33	27089	0.77	1.40	44	-0.41	7.12	9.7
14 Clothing	0.08	80	0.51	19228	0.90	8.57	0	-0.17	11.42	17.9
15 Leather	0.02	76	0.44	25696	0.66	17.85	2	-0.26	8.90	7.2
16 Wood	0.24	79	0.34	27565	0.84	1.24	95	-0.70	1.36	21.9
22 Rubber/plastics	0.48	82	0.37	31862	0.65	1.64	75	-0.12	4.69	9.9
29 Motor vehicles	0.55	85	0.23	38654	0.43	3.34	30	0.15	7.43	24.8

Table 4: Export opportunity rankings

	Size	NSEESh	Wage	R&D	SMESh	ExpSh	IntExpSh	RCA	Wtariff (-)	NTM (-)
6 Oil and gas	0.05	84	114054	0.77	0.11	1.40	100	0.09	1.44	8
20 Chemicals	0.27	80	41359	3.01	0.52	2.37	80	-0.01	5.73	9
24 Basic metal	0.22	95	39690	1.81	0.56	6.33	100	0.23	2.56	6
25 Fabricated metal	0.99	75	32392	3.32	0.85	0.40	76	-0.20	8.53	6
28 Machinery	0.55	74	40981	5.25	0.66	2.24	21	0.04	4.32	6
29 Motor vehicles	0.55	85	38654	14.10	0.43	2.40	20	0.15	14.82	25
30 Other transport	0.46	85	44553	15.86	0.33	3.13	90	0.53	2.24	5

What about export opportunities? The seven high-scoring sectors are shown in Table 4, with 'other transport equipment' being in the 'top 10' on 9/10 indicators). Most are high wage/high R&D but otherwise there is not strong commonality in their scoring pattern

But when we are thinking about export opportunities, it's worth returning to the all-sectors table and looking again at service sectors. Three service sectors score highly on the export openness measures and have high wages and high R&D: information services, head office activities, and scientific research; and it is noteworthy that financial services appear as neither export-oriented nor high-tech, but do have high wages. These observations point to the need for better data on trade in services, in particular data that covers the full range of modes of delivery of cross-border services.

It is also noteworthy that the sectors in which intermediates account for a high proportion of trade and which might be sensitive to concerns in the UK

and in foreign markets about supply chain resilience generally do not score highly on other sensitivity measures.

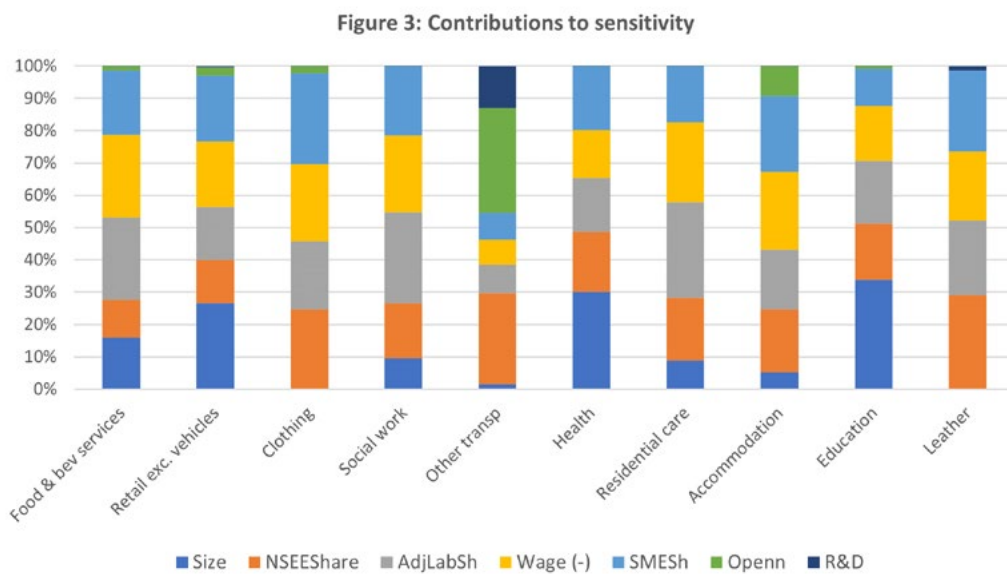
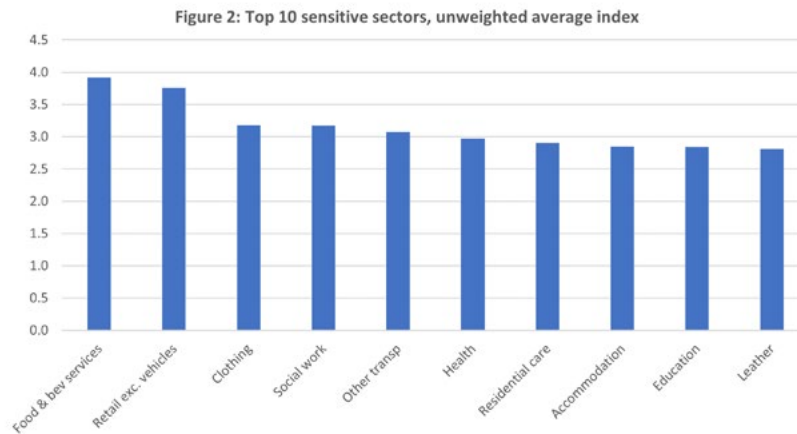
In short, the sector rankings do not have a single story to tell about sensitive and strategic sectors, but from them, we can get a number of messages. It should be noted that our analysis gives each of our measures the same weight in the summary list of sensitive or strategic industries.

Aggregating sectoral rankings

With several different measures of sensitivity in play both for imports and exports, an obvious question is whether indicators can be aggregated into an overall index.

To do this, all the indicators need to be put on a common base, and we rescale each indicator to a [0,1] scale, where 0 is (normally) the lowest value and 1 the highest. However, for imports, the focus on wages is on low-wage sectors so the **Wage** indicator is reversed

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as well as rescaled with the highest wage sector at 0 and the lowest at 1; and a similar reverse rescaling is applied to **RCA**. For exports, the reverse re-scalings are for world tariffs and **NTMs**.

For all but one of the indicators, the rescaling is linear. However, because of the very high wage in the Oil and gas sector a linear rescaling would make almost all sectors look low-wage, so we have used a non-linear rescaling into the [0,1] range (detailed in the spreadsheet.)

As with the preceding analysis, these aggregate indices should be treated with a degree of caution. They add together different kinds of issues – some like size and regional distribution are characteristics just of the sector that might make it of particular interest to policymakers, others like wages or R&D factors might affect international competitiveness of the sector or be affected by trade changes, and some like tariffs and NTMs are likely to have considerable overlap (giving

rise to a degree of double-counting). Some of the [0,1] scaling is affected by one extreme sectoral value, like the average wage in petroleum and gas extraction (SIC 6). And of course, an equal weighting of 6 or 10 different indicators implies that policymakers should give them equal weight while in reality there might be quite different levels of concern about loss of jobs in labour-intensive sectors compared with regional levelling-up.

These aggregate indices can, however, be used to interrogate what are the real concerns of policymakers, and to consider the importance of trade issues compared with other policy concerns. There are two advantages of this approach compared with the ‘ranking’ approach taken earlier. All the measures of interest are factored into the analysis, as opposed to identifying only the ones that appear in a ‘top n’ list. It is also possible to weight the different indicators according to their perceived relative importance, though we do not do that here.

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Figure 4: Contribution of each measure to import sensitivity: traded sectors

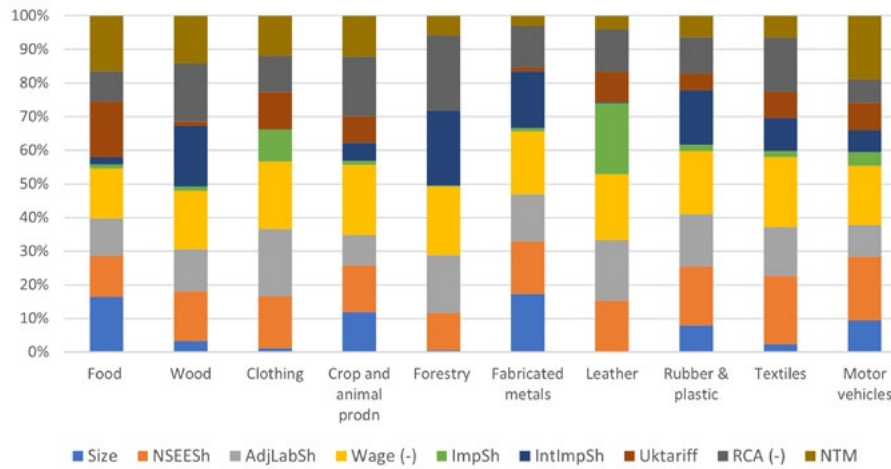
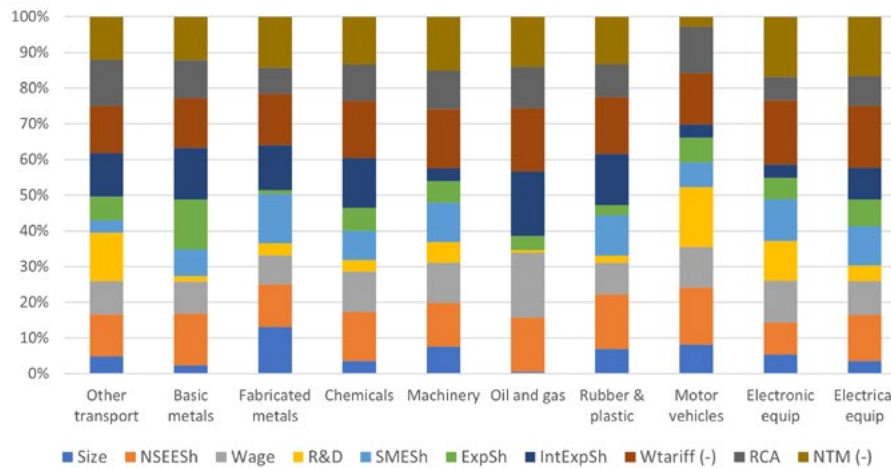


Figure 5: Contribution of each measure to export potential; traded sectors



Returning to the all-sectors sensitivity analysis, Figure 2 below displays the top 10 sectors on the basis of the same measures in Table 2 earlier, but now combined into an aggregate index. The index has been computed giving each indicator an equal weight. Figure 3 breaks down the aggregate index across the sensitivity measures.

Not surprisingly, many of the same sectors that appeared in Table 2 are also identified by the aggregate index as being 'sensitive'. However, this is not true of all (forestry had 3 'top 20' hits, but its aggregate index is far down the charts) and health and accommodation score high on the aggregate index though they had only 2 'top 20' hits because their high indicators scores are particularly high.

The contributions of different indicators are displayed in Figure 3. The labour intensity and low wage of the food service sector push it to the top, and size is a strong factor for non-vehicle retail, health and education.

Of the three manufacturing sectors in the list, clothing and leather are concentrated outside the SE, low-wage and labour-intensive, and have high SME shares, but both are very small. Other transport equipment stands out for its openness and R&D scores, but the rather similar motor vehicles sector came in 11th place.

Figures 4 and 5 repeat the exercise but focusing on the 31 goods sectors for which we have traded data, with 10 indicators of import sensitivity and 10 of export potential. In each case, we have again aggregated all 10 indicators with an equal weighting.

In Figure 4 the most sensitive industries go from left to right – food manufacturing being the most sensitive (on its aggregate sensitivity score) in this list of 10, and motor vehicles the tenth. As in Figure 3, the chart decomposes the sources of the sensitivities. Size matters for agriculture and fabricated metals, while the share of intermediates in imports is notable for forestry, wood products, fabricated metal products, and

Figure 6: Regional sensitivity (NSEEsize)

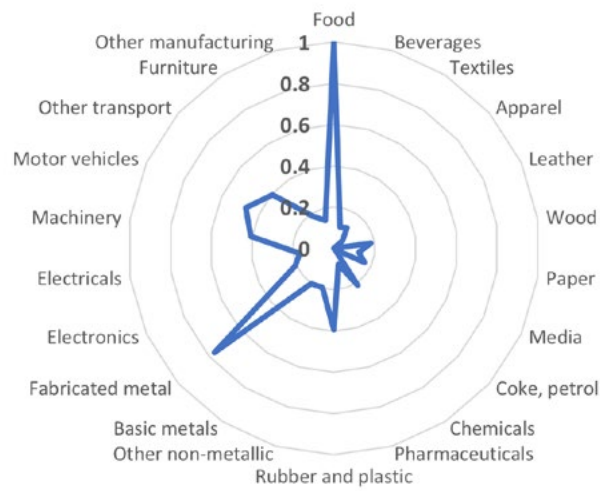


Figure 7: Regional sensitivity and market access barriers

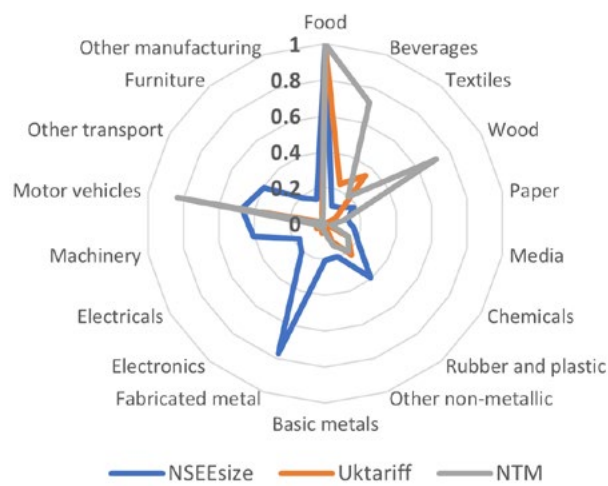
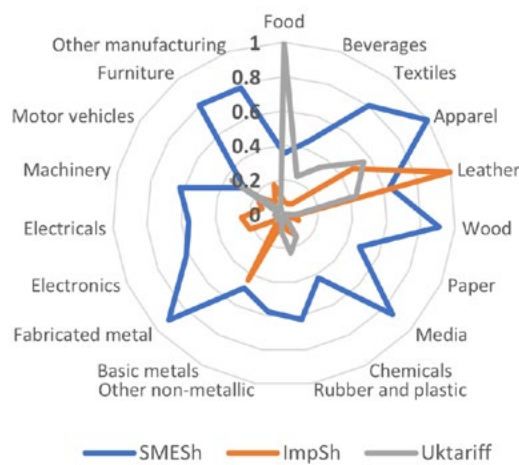


Figure 8: SME share, imports and tariffs



rubber & plastic products. Most of these 10 sectors are low-wage, labour-intensive sectors, some of which like food manufacturing are large, and others like apparel and leather are small. Tariff and non-tariff protection are significant for food and motor vehicles, less so for fabricated metal products and leather goods, and the significance of protection in many of these sectors suggests that our indicators are reflecting well the concerns of policymakers, but also underline the concern that indicators of protection may duplicate measures already included.

Similarly in Figure 5, the industries with the greatest strategic potential go from left to right. Once again, the differential role of the different factors emerges from this analysis – R&D intensity (motor vehicles, other transport equipment), non-tariff measures (computing and electronics, electrical equipment), and the SME share (fabricated metals, computing and electronics, rubber and plastics).

It is important to emphasise two sets of issues. Firstly, these rankings and the contribution of the different elements reveal that the sensitivity (whether on the import or on the export side) is driven by a range of factors. In turn that would suggest that the policy responses need to be varied and tailored. Secondly, we repeat our note of caution - these rankings aggregate the answers to different kinds of questions, give equal weight to statistics that might weigh very differently in policymakers' concerns, and may be distorted by extreme values. So while these aggregate indices are useful in themselves, they also help to identify sectors whose detailed rankings might be worth more detailed and careful scrutiny.⁴

A more focused approach

In this section, we further explore the relationship between indicators by focusing on a narrower range of sectors and indicators. First, we restrict attention to the 22 traded manufactures. We focus on regional levelling-up, multiplying the **Size** and **NSEESH** indicators to give **NSEESize** – the share of UK employment accounted for by the part of the sector located outside the greater SE.

Figure 6 depicts this single indicator across the 22 sectors. This highlights the importance of the regional dimension, in particular for food products, motor vehicles and fabricated metals. Now removing the 4 sectors whose **NSEESize** is less than 0.1: clothing, leather, refined petroleum, and pharmaceuticals; and bringing in information on trade barriers – UK tariffs, and non-tariff barriers - we see a varied sensitivity to trade restrictions among these regionally sensitive sectors: Food products have high barriers to trade,

while motor vehicles have tariffs that are lower than for food but non-tariff barriers to trade are high. Fabricated metals are also regionally sensitive, but this sector appears less sensitive to reductions in UK market access barriers.

In a similar vein, and again for illustrative purposes, Figure 8, takes the share of small and medium-sized enterprises as the primary issue of concern (and we have removed those sectors where the share of SMEs is less than 20%), and overlaid this measure with the import share and the UK tariff. This suggests that sectors with a higher share of SMEs such as clothing and leather also have a relatively high import share and UK tariff – all suggesting that SMEs in these sectors may be vulnerable to increase UK market access liberalisation. Other sectors with high SME shares, such as furniture or fabricated metals, appear less vulnerable.

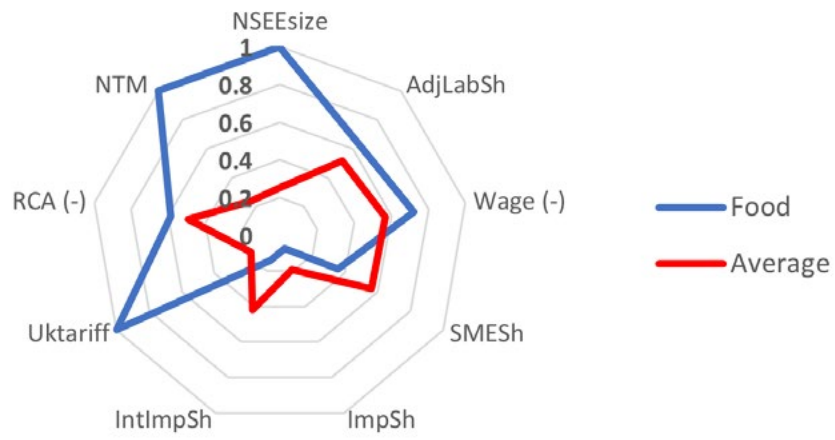
We finally focus from a different angle, looking at specific sectors across a range of indicators. In each of three sectors, food, pharmaceuticals, and motor vehicles, we compare the indicators for the specific industry (in blue) with the average across all industries for each indicator (this average being the same across the three graphs).

The food products sector is shown to be of above-average sensitivity on most measures; while pharmaceuticals is well below average on all indicators. The motor vehicles sector is closer to the average on most indicators except for non-tariff measures (though it is worth noting that the tariff indicator is strongly influenced by high tariffs on food – the motor vehicles tariff is high compared with other manufacturing sectors).

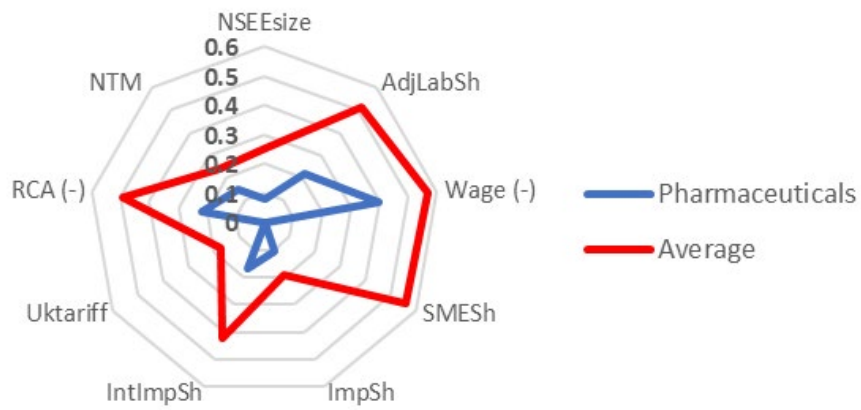
⁴ Please refer to the appendix to see the aggregate indices for all sectors: <http://blogs.sussex.ac.uk/uktpo/files/2022/12/IDENTIFYING-SENSITIVE-AND-STRATEGIC-SECTORS-APPENDIX.pdf>

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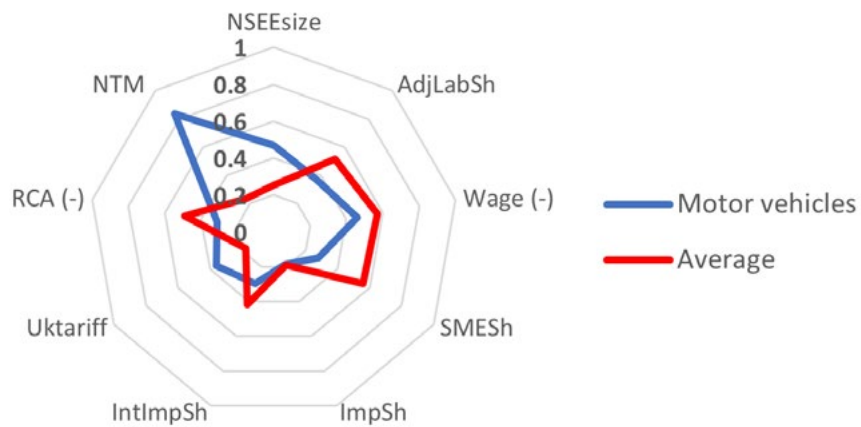
Food products



Pharmaceuticals



Motor Vehicles



CONCLUSIONS AND FUTURE DIRECTIONS

In this paper we have explored a number of possible indicators of import sensitivity and export opportunity. The multiplicity of the indicators poses something of a challenge; each has something to contribute and while there are overlaps, there are no obvious redundancies.

Perhaps the most important message is that 'sensitive' has different meanings, different kinds of meaning indeed. There cannot be one answer to different kinds of question, and aggregating indicators of different kinds of sensitivity has to be done with care. The same is true of 'strategic'.

There is no single correct way therefore to identify whether sectors are 'sensitive' to import competition or offer 'strategic' export opportunities. We have aimed to show how analysis of the indicators points to interesting conclusions: that many sectors which might be of particular concern to policymakers focussed on interregional 'levelling up' are not actually much exposed to import competition; that many of the high-wage services sectors concentrated in the SE are not particularly export-oriented; and that low-wage labour-intensive sectors subject to import competition tend to have relatively high levels of tariff and non-tariff protection but many manufacturing sectors are not heavily protected. There is much scope for further analysis of the data presented here.

We have derived simple aggregate rankings. Caution is needed when adding chalk and cheese but the aggregate rankings do at least point to sectors whose detailed rankings are worth exploration, as we have done.

All our analysis has been of data at the 2-digit SIC level. Many interesting issues arise at a more disaggregated level. Some relevant data may be available at the required level of disaggregation, but any sensitivity index will have to be a hybrid where some of the data relates to the disaggregated sector but some relates to the more aggregate sector of which it is a part; and such a hybrid index will have to be interpreted with care.

There is also scope for future refinement and development of the subject, for example considering

- whether all indicators can be extended to service sectors, including non-tariff measures
- which sensitive sectors are specific to some trading partners or world regions.
- more sophisticated measures of regional distribution, such as 'heat maps'
- novel kinds of sensitivities in the digital economy
- better measures of supply chain resilience
- within-industry sensitivity to changes in output and employment

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FURTHER INFORMATION

The UK Trade Policy Observatory (UKTPO), a partnership between the University of Sussex and Chatham House, is an independent expert group that:

- 1) initiates, comments on and analyses trade policy proposals for the UK; and
- 2) trains British policy makers, negotiators and other interested parties through tailored training packages.

The UKTPO is committed to engaging with a wide variety of stakeholders to ensure that the UK's international trading environment is reconstructed in a manner that benefits all in Britain and is fair to Britain, the EU and the world. The Observatory offers a wide range of expertise and services to help support government departments, international organisations and businesses to strategise and develop new trade policies in the post-Brexit era.

For further information on this theme or the work of the UK Trade Observatory, please contact:

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