

## FEATURE

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# Analysis of international trade and productivity, using the EUKLEMS database

## SUMMARY

This article presents analysis on the possible impact of international trade on industrial productivity in the UK using the new EUKLEMS analytical database, in conjunction with Office for National Statistics Input-Output Supply Use tables. The aim is to also illustrate the breadth of opportunities the database offers potential users for a wide variety of economic research.

The KLEMS project, funded by the European Union and coordinated by the University of Groningen and the National Institute of Economic and Social Research, was a three-year project initiated with the objective of creating an internationally comparable database of measures relating to economic growth, employment, productivity, capital formation and technological change, for all member states. A handful of other competing economies were also included for comparison, primarily the US, Japan, Korea and Canada. Particular attention has been paid to producing data suitable for growth accounting analysis, with the name of the project being derived from the factor and intermediate inputs to production (capital, labour, energy, materials and services). The inclusion of energy, materials and services means that growth-accounting techniques can be used to estimate the contributions of intermediate inputs to output growth, in addition to those of capital and labour in more traditional analysis, resulting in a finer assessment of multi-factor productivity (MFP) growth, that is, output growth not attributable to the factors and intermediate inputs to production. The database<sup>1</sup> was released in March 2008.

The next phase of the project is to transfer the management and population of the database to Eurostat and the National Statistical Institutes, creating the 'statistical' database, which should be constructed with more statistically rigorous data. This second phase is at its inception now, and is expected to become live by late-2009 or 2010.

The analysis in this article uses KLEMS output, employment and productivity data alongside industrial trade data from the Input-Output (I-O) Supply Use tables to assess theories on the impact of international trade on domestic productivity, including those put forward by Balassa and Samuelson and the original theories of Adam Smith and David Ricardo.

However, the database also contains a vast amount of data on labour input (including labour composition or 'quality'), capital services and intermediate inputs at a detailed industrial level, which could be used for a wide range of productivity and economic analyses. One of the main advantages of the database is that common methodologies have been applied across data from different member states, based on the System of National Accounts (SNA93), allowing meaningful international comparisons to be made and allowing research to be replicated for different countries (or groups of countries).

## Theory

The acceptance of the mutual benefits acquired through free trade in terms of improved productivity and increased living standards goes all the way back to Adam Smith and, later, David Ricardo. More recently, similar arguments have been put forward by Balassa and Samuelson who, in other work on relative prices and exchange rates, argued that the most productive industries are those exposed to greater competition from international markets. By having to compete on an international basis,

in both domestic and foreign markets, firms are forced to improve efficiency and price more competitively, compared with those that operate in industries relatively closed to international trade.

The Balassa-Samuelson hypothesis states that, where output can be internationally traded, prices will conform to a 'world price' and countries with a productivity advantage will specialise in that industry and supply the world market. Therefore, it is reasonable to expect a firm or industry that produces exports to experience higher productivity relative to more closed sectors. In contrast, firms or industries producing non-tradeable products will not face the same intensity of competition, since the transaction naturally takes place at a more local level. In general, more cases of non-tradeable output are found in the service sector, with an obvious example being a haircut. An illustration of the effect can be seen in the differential between alcohol prices in pubs and supermarkets – the former is a local transaction with limited competition while the latter is subject to much greater competition due to transport and distribution networks.

It is also intuitive that international exposure will force firms to increase productivity in a number of ways. As well as competing with domestic firms, they will also have to compete with the most productive firms from other markets. This will, among other things, encourage them to improve the quality of their labour, invest in greater quantities and qualities of capital, improve their management and organisational structure, improve the efficiency of their business processes and adopt best international practice. In turn, this will serve to reduce costs in order to remain competitive, and as a result improve productivity. Indeed, competition has been identified by HM Treasury and the Department for Business, Enterprise & Regulatory Reform as a key driver of productivity growth, as have investment, innovation, skills and enterprise.

As mentioned above, the benefits of international trade to domestic productivity have been recognised since Adam Smith proposed his theory of 'Absolute Advantage', stating that a country should specialise in, and export, products in which it is most productive, and import those goods which the country can produce less efficiently (Smith 1776). Therefore, the country will gain by purchasing some goods for less than they would have cost to produce domestically, and selling more of what it can produce more efficiently abroad. As

a result, the value of consumption and production will increase, resulting in higher national income and living standards, and international market forces will help allocate capital and labour to industries where the productive advantage lies.

Ricardo built on Smith's model, stating that there will be mutual gains from trade even if one country does not have an absolute advantage in any particular industry, provided it specialises where it has the greatest comparative advantage (or, put another way, least absolute disadvantage). The immediate implication of Smith and Ricardo's work is that countries will specialise in industries where they have a natural productivity advantage, and hence productivity will be higher in the more trade-intensive and export-intensive sectors.

Although Ricardo improved on Smith's theory by introducing the element of relative productivity, his model was quite static. However, Smith's work had other, more dynamic, implications for productivity. International trade serves to increase the size of the potential market which, Smith argued, provides the only limit to the division (or specialisation) of labour. He argued that specialisation increases productivity by improving the skill level, and competence, of labour, saving time and facilitating invention and innovation, with the latter being the key to increased productivity and economic growth. This creates a virtuous circle where increased trade leads to increased consumption and investment, greater enterprise, increased capital formation, further division of labour, increased productivity and more trade.

Therefore, in more modern terms, Smith proposed that trade would help increase productivity by allowing firms to benefit from increasing returns to (and economies of) scale by increasing the size of the market, which would allow increased division of labour, thereby improving the efficiency of business

processes and facilitating technological change by providing greater returns to capital investment. So, according to Smith, international trade promotes what are now considered the key drivers of productivity growth – skills, investment, innovation, competition and enterprise.

### Data source

All data used have been taken from the EUKLEMS database and supplemented with trade figures from the I-O Supply Use tables in the National Accounts. To allow comparisons over time, all current price data have been deflated to remove price effects. Also, all analysis refers to 1992 to 2004, using the full period for which I-O tables are available, to reduce volatility and eliminate cyclical effects as far as possible. **Table 1** lists all variables used and their source.

### Analysis

The following analysis will assess whether industrial-level data support the theories outlined above in terms of the associations between trade intensity, export intensity, labour productivity and the contribution of multi-factor productivity. The data are presented mainly at two-digit industry level, according to the Standard Industrial Classification (SIC), and split into 30 separate industries. A description and list of the industries is provided in **Table A1** in the Appendix.

To help identify industries where trade is most significant, **Figure 1** plots the trade intensity ranking of each industry between 1992 and 2004. The measure used for trade intensity is simply the sum of exports and imports expressed as a ratio to gross output, for that particular industry.

As can be seen, the rankings are fairly stable across years and the most trade-intensive industries are consistently located in the manufacturing sector, in particular Office and computing machinery, communication and medical equipment; Textiles, leather and footwear; Motor

**Table 1**  
**Input data**

Source	Series name	Description
EUKLEMS database	VA	Gross value added at current basic prices (£ million)
	H_EMP	Total hours worked by persons engaged (millions)
	GO	Gross output at current basic prices (£ million)
	GO_P	Gross output, price indices, 1995=100
	LP_I	Gross value added per hour worked, volume indices, 1995=100
	GOConTFP	Contribution of total factor productivity (TFP) to output growth (percentage points)
	TFPgo_I	TFP (gross output based) growth, 1995=100
	GO_QI	Gross output, volume indices, 1995=100
I-O supply use	Total exports of goods and services	Total exports by product/industry (£ million)
	Total imports of goods and services	Total imports by product/industry (£ million)

vehicles and other transport equipment; Chemicals; Coke, petroleum and nuclear fuel; and Machinery. Also within production, fairly high levels of trade intensity exist in Mining and quarrying. In the service sector, the highest ranking industries are Transport, Business services, Financial intermediation and, perhaps surprisingly, Hotels and restaurants. However, these services are ranked between 15 and 20 out of all 30 industry groups, compared with manufacturing, where the average ranking is approximately 8.

Figure 2 is presented in the same

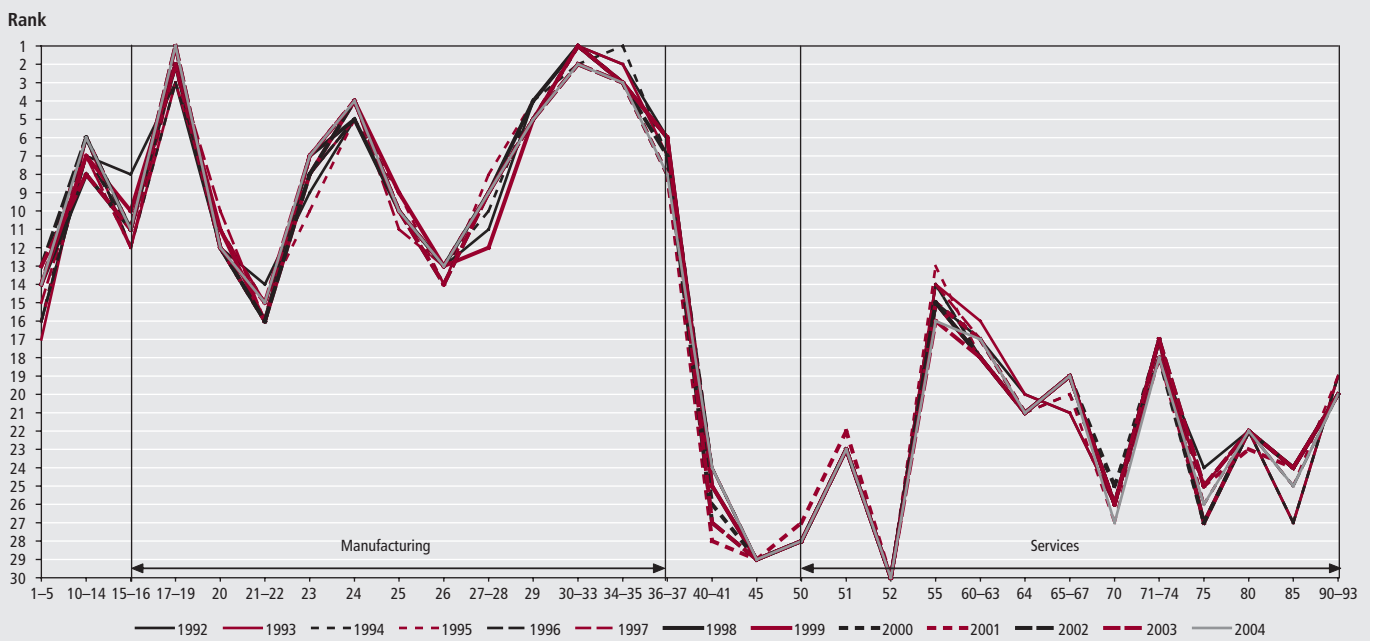
format, only this time ranking the labour productivity (real gross value added (GVA) per hour) performance of each industry over the same period.

Closer inspection of the graphs shows that there does appear to be some correlation between the most trade intensive and the most productive industries, but there are a number of exceptions. The most notable are Real estate and Utilities, where the high productivity levels are a reflection of the high property and energy prices, and industry profits, seen in recent years, generating very high

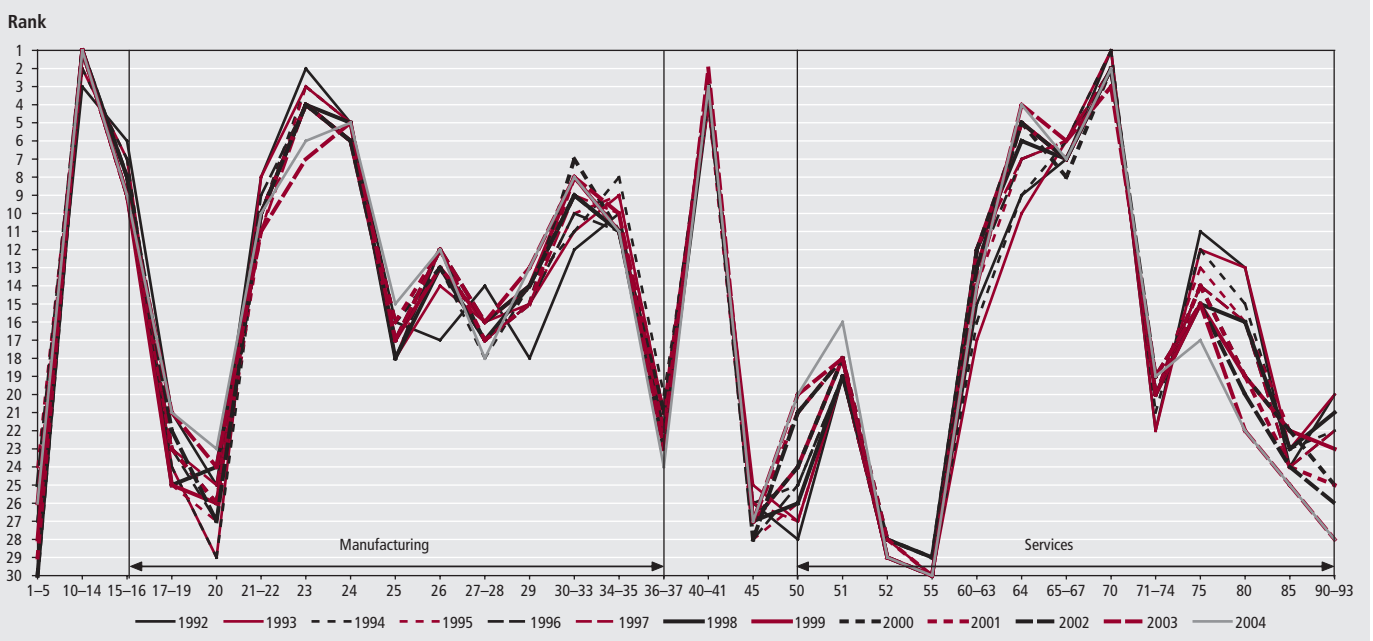
levels of GVA. In the case of Utilities, the situation is exacerbated by the creation of private monopolies at around the start of the period studies. Also, due to their domestic nature, the scope for any impact of trade in either industry is limited. High prices and profits, as well as the industries' capital-intensive nature, have also affected GVA in Mining and quarrying, although there is also a significant volume of trade in this industry.

After taking account of these anomalies, in general, the most productive industries tend to be in manufacturing, in particular

**Figure 1**  
Trade intensity rankings: by two-digit SIC group



**Figure 2**  
Labour productivity rankings: by two-digit SIC group



Coke, petroleum and nuclear fuel; Chemicals; Food, beverages and tobacco; Office and computing machinery, communication and medical equipment; and Motor vehicles and other transport equipment, with most of these industries having high levels of trade intensity, particularly Chemicals; Office and computing machinery, communication and medical equipment; and Motor vehicles and other transport equipment. Again, recent trends in energy-related industries will have had some effect in the case of Coke, petroleum and nuclear fuel.

In terms of services (leaving aside Real estate), the more productive industries – Post and telecommunications, Financial intermediation, and Transport – again largely match the most trade intensive industries in the service sector.

Overall, of the ten industries that are consistently the most trade-intensive, four are among the most productive – Motor vehicles and other transport equipment; Chemicals; Mining and quarrying; and Coke, petroleum and nuclear fuel. **Figure 3** plots the average trade intensity by industry alongside the average productivity level to show this a little more clearly.

Figure 3 illustrates more starkly the difference in trade intensity between manufacturing and services, with an average industry value of 0.82 in manufacturing, compared with 0.11 in the services sector. The bold lines represent average productivity and trade intensity for the whole economy between 1992 and 2004 to show the relative position of

each industry. Almost all of the industries in manufacturing are above the whole economy measures for both trade intensity and productivity, while the opposite is true for most industries in the service sector. There also appears to be a correlation between average trade and productivity levels in industries previously mentioned, such as Mining and quarrying; Chemicals; and Coke, petroleum and nuclear fuel, which all experience relatively high levels of both trade intensity and labour productivity. There are also a number of industries, where trade is at a similar level to the whole economy average, which experience similar productivity levels to the whole economy, such as Paper, printing and publishing; Other non-metallic minerals; Transport; and Business services.

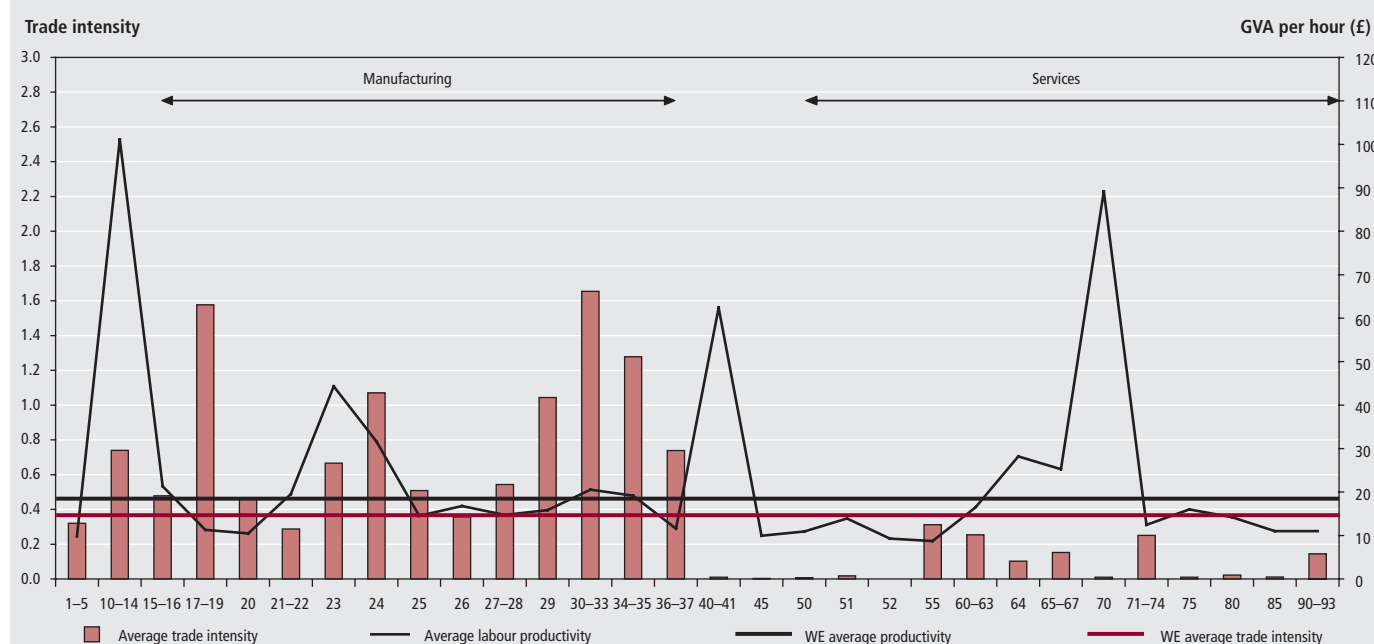
However, there are a number of industries which do not conform to this pattern, although in some cases there are a number of industry-specific issues which may be contributing. For instance, although there is a significant volume of trade in Textiles, leather and footwear, the amount that consists of imports has grown due to the decline of the domestic industry. Naturally, a domestic industry that has experienced a fall in output would not be expected to be particularly productive. One industry that is particularly trade-intensive that might be expected to show higher levels of productivity is Office and computing machinery, communication and medical equipment, but again a number of industry factors may be preventing this. Firstly, it is an industry where there

are inherent issues in the measurement of quality and therefore price and output. Secondly, international competition may be squeezing margins in an industry where there is a very clearly defined value chain. This also applies to other technology industries such as Machinery. Thirdly, there may be an under-recording of some of the investment that takes place in the industry (for example, software investment). Other industries with characteristics that inhibit any relationship, such as Mining and quarrying, Real estate and Utilities have already been discussed.

Although the relationship is far from clear cut, it should be borne in mind that Figure 3 includes industries where trade is limited by the nature of the industry (for example, Public administration, Education, Health), where productivity may be lower due to the fact that most activity is outside the market and output is often inadequately measured and based on the volume of inputs. However, even after removing these and other almost entirely domestically-oriented industries (for example, Real estate and Construction), a correlation coefficient between series for trade intensity and labour productivity levels shows an association of only +0.1, which is certainly not statistically significant.

It should also be noted that any productivity gap between manufacturing and services should not be attributed to differing levels of trade intensity. In general, services tend to exhibit lower productivity, commonly referred to as ‘Baumol’s Disease’ or the ‘Baumol Effect’ (Baumol and Bowen

**Figure 3**  
**Average trade intensity and average labour productivity, 1992 to 2004**



1966). This is a reflection of services generally being more labour intensive than production industries and therefore benefiting less from technological advance. Rather than a means to production, the product of labour is often the service itself, with Baumol's example being that it takes the same number of musicians to play a Beethoven string quartet today as it did in the 19th century. This applies to various service sector industries; for instance, it is hard to conceive of how productivity improvements among hairdressers could be as significant as those among manufacturers, where capital intensity and the scope for automation are far greater. It is also difficult for service delivery, which often includes a tailored or personalised service, to benefit from the division of labour in the same way as a production/assembly line might in a manufacturing firm.

However, for some service sector industries, this lack of ability to benefit from capital formation and technical progress appears to be changing with developments in information and communication technology (ICT) resulting in considerable product and process innovation, particularly in finance and business services (OECD 2007). Linking back to Baumol's observations, the output of a string quartet increases exponentially if the performance is either broadcast or recorded and distributed. It should also be borne in mind that improvements in the quality of service sector output are often not adequately captured in

official data, meaning productivity in this sector is actually understated. Although frequently mentioned when discussing services provided by the public sector, it is sometimes forgotten that this issue also applies to many private sector services. The problem is particularly acute in financial services, although it is envisaged that measurement of output in this sector will improve with the new methodology for financial intermediation services indirectly measured, introduced in the National Accounts in *Blue Book 2008*. Another possible factor may be that as the UK economy, and therefore labour, is constantly shifting away from manufacturing, the remaining labour force being drawn into services is less productive, causing any inherent productivity gap to widen slightly.

Therefore, there does appear to be some evidence to support the theory that trade and greater market exposure encourages gains in productivity due to more intense competitive pressures. However, the evidence is relatively limited, even though at the aggregate sector level – manufacturing versus services – the evidence is a bit more convincing.

The following analysis, illustrated in **Figure 4**, takes a closer look at export intensity in the context of the theories proposed by Smith and Ricardo.

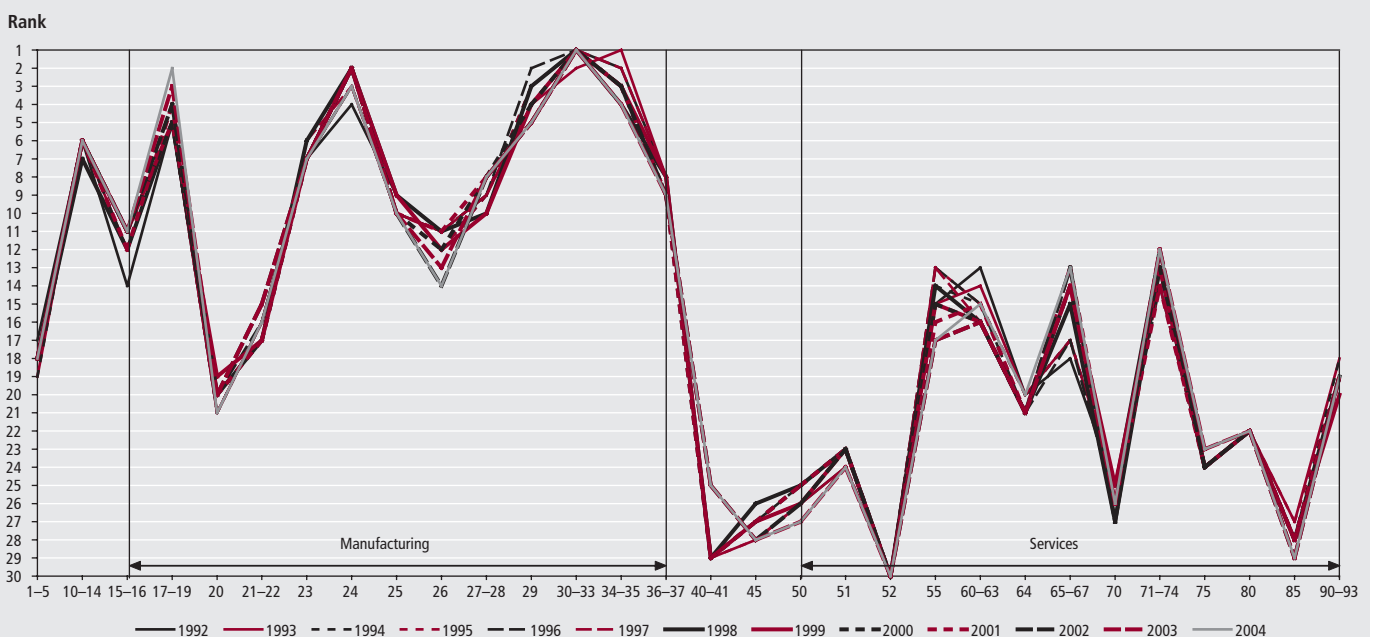
Figure 4 again illustrates the stark contrast between manufacturing and services, this time in the context of export intensity. However, there is also considerable variation within manufacturing. The following industries

are among the most export intensive: Office and computing machinery, communication and medical equipment; Chemicals; Motor vehicles and other transport equipment; Machinery; Textiles, leather and footwear; and Mining and quarrying. In services, the most prominent exporters are Business services, Financial intermediation and Transport. The former two are not surprising given the resources allocated to these industries in the last decade or so.

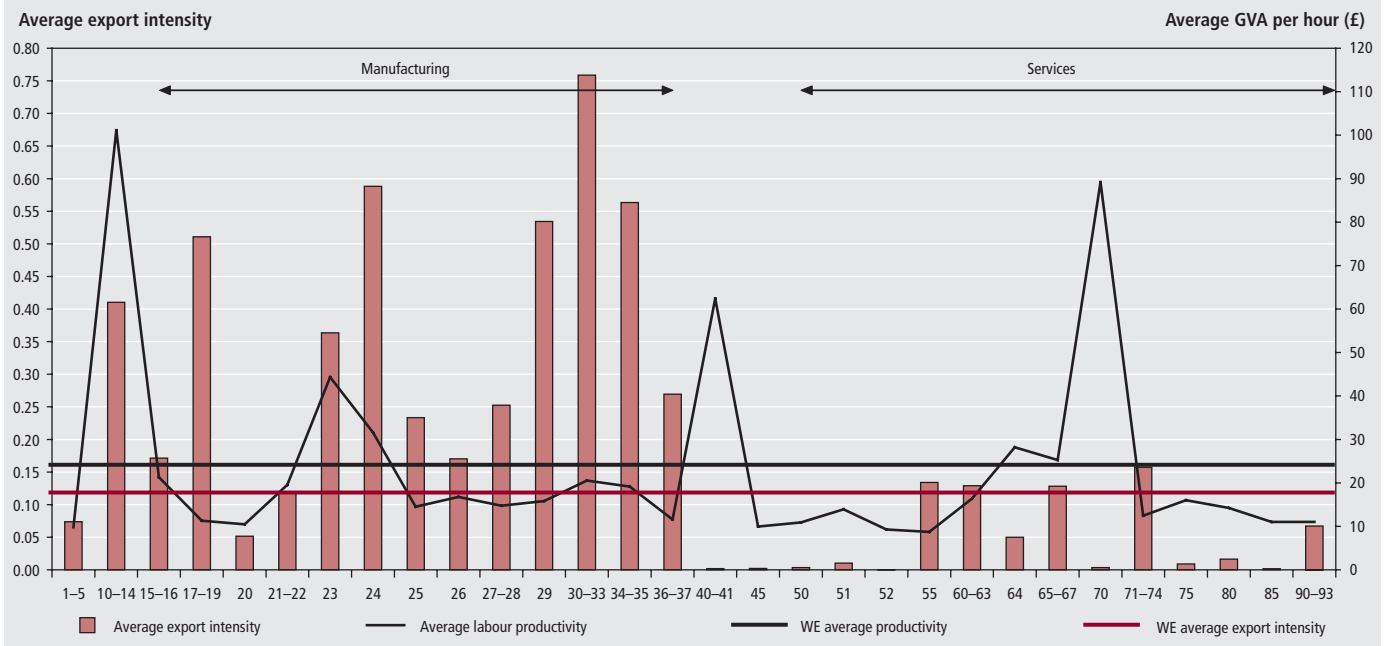
Again, there is some correlation between the most export-intensive and most productive industries, especially in the cases of Chemicals, Mining, Financial intermediation, Transport, and Office and computing machinery, but perhaps not as much as might be expected. To illustrate the relationship, or lack of one, **Figure 5** plots average export intensity against average GVA per hour.

As can be seen, the evidence is mixed. For instance, industries such as Agriculture and fishing, Wood and cork, Wholesale, and Other services conform to the theory in that they have a lower level of export intensity than the whole economy, and a lower level of labour productivity. Additionally, industries such as Mining and quarrying; Coke, petroleum and nuclear fuel; and Chemicals have relatively high levels of export intensity and experience high labour productivity. Others, including Food, beverages and tobacco; Other non-metallic minerals; Transport; and Business services have a similar level of export intensity to the whole economy and a similar level of labour productivity to the

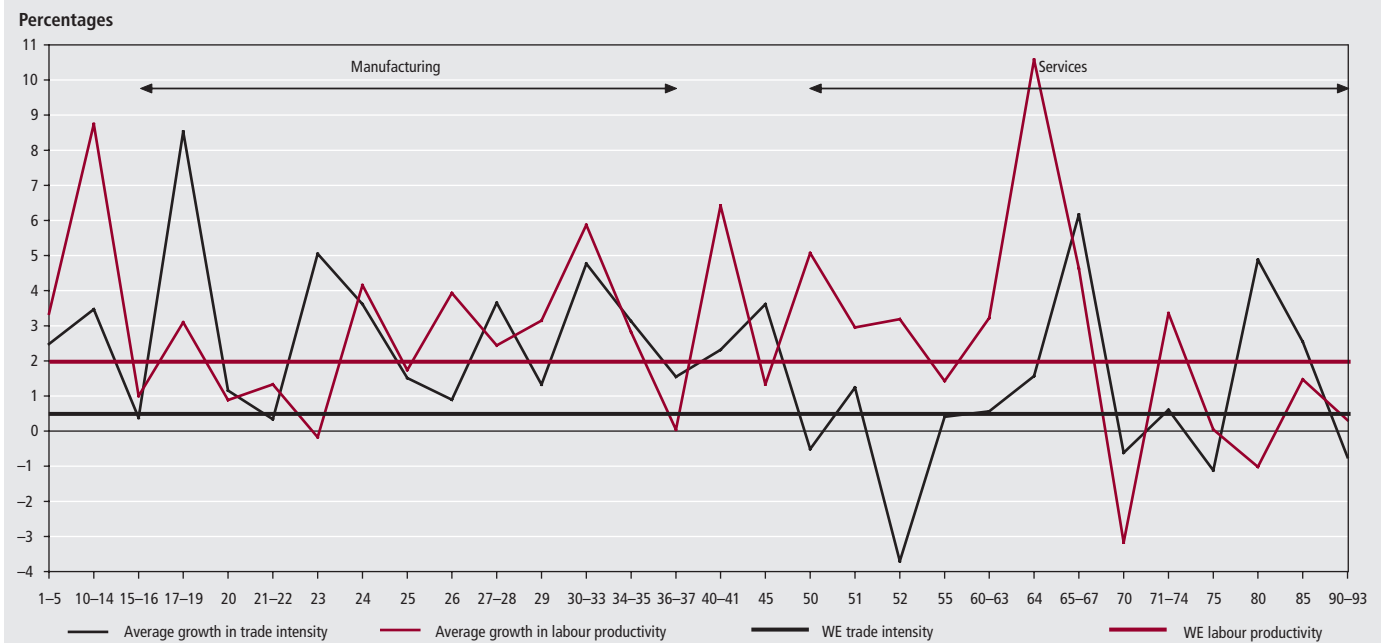
**Figure 4**  
**Export intensity rankings**



**Figure 5**  
Average export intensity and average labour productivity, 1992 to 2004



**Figure 6**  
Trade intensity and labour productivity, average annual growth, 1992 to 2004



whole economy. However, there are also several industries that do not conform to this pattern, for example, Textiles, leather and footwear; Machinery; Office and computing machinery, communication and medical equipment; and Motor vehicles and other transport equipment have low levels of labour productivity than would not be expected given their relatively high levels of export intensity. In the case of Textiles, leather and footwear, there have been changes to the structure of the industry while both measurement and industry-specific factors may play a role

in the technology industries, as explained previously.

In terms of correlation, after removing industries where the nature of the market means it is not really appropriate to consider export volumes, the correlation coefficient between the two measures is +0.25, again positive, but not strong.

Again, the data do not appear to show a strong link between export intensity and labour productivity levels, though there are reasons for some of the exceptions.

However, in some respects, this is not unreasonable. It does not necessarily

always follow that an industry with a high level of trade intensity should generate high levels of value added per unit of labour, and it is possible that a sector can generate high levels of value added but not be conducive to trade (for example, Real estate). Alternatively, the added competition resulting from trade may squeeze margins to the extent that value added is relatively low, and current technology does not allow for further productivity improvements. In terms of the impact that trade will have, it seems possible that any correlation between trade

intensity and productivity will exist more in growth rates rather than levels.

Figure 6 plots average annual growth rates of trade intensity alongside average growth rates in labour productivity, by industry, and shows their position relative to the whole economy. For the majority of industries, approximately two-thirds, high growth in trade intensity is associated with strong growth in labour productivity, and vice versa. The clearest cases of this include Mining and quarrying; Chemicals; Office and computing machinery; Utilities; Post and telecommunications; and Financial intermediation. Cases where relatively low growth in trade is associated with low growth in productivity include Food, beverages and tobacco; Paper, printing and publishing; Hotels and restaurants; and Other services. (As noted earlier, Real estate and public sector activities should be discounted in this context). In the cases of the energy and telecommunication markets, growth in trade and productivity has increased due to the structural change that has taken place in terms of both privatisation and the opening of markets.

The main exceptions to the pattern include Coke, petroleum and nuclear fuel; Construction; Motor vehicle distribution; and Retail trade. Therefore, although the picture is fairly mixed, in the majority of cases the expected association holds true, and appears slightly stronger than when comparing levels.

Figure 7 is similar to Figure 6, except that average growth rates in export intensity are compared with labour productivity growth.

This time, the pattern is slightly less obvious but, again, in the majority of cases, there is an association between export-intensive and more productive sectors and vice versa. After discounting industries where trade is naturally almost entirely domestically-oriented, the association becomes a little stronger. Also, although trade may be more limited in certain industries, it is still possible that productivity is higher as a result of international 'openness' in the form of international firms physically entering the domestic market. The obvious example here would be in Retail trade which, despite the increase in sales over the internet (often in domestic firms), is still relatively closed to international competition compared with the service sector as a whole. However, the entry of successful productive firms from abroad into the domestic market can help achieve the same result.

Obviously, most of the trade-intensive industries are also the most export-intensive and so any link is found mainly in the industries mentioned above in relation to growth in overall trade. There are some differences, though, including Food, beverages and tobacco and Paper, printing and publishing, which have experienced relatively high growth in export intensity and relatively low growth in labour productivity.

Returning to Adam Smith's hypotheses discussed earlier, perhaps the most dynamic and insightful aspect was the idea that large increases in the extent of the potential market made it more profitable to invent and innovate, thus increasing productivity.

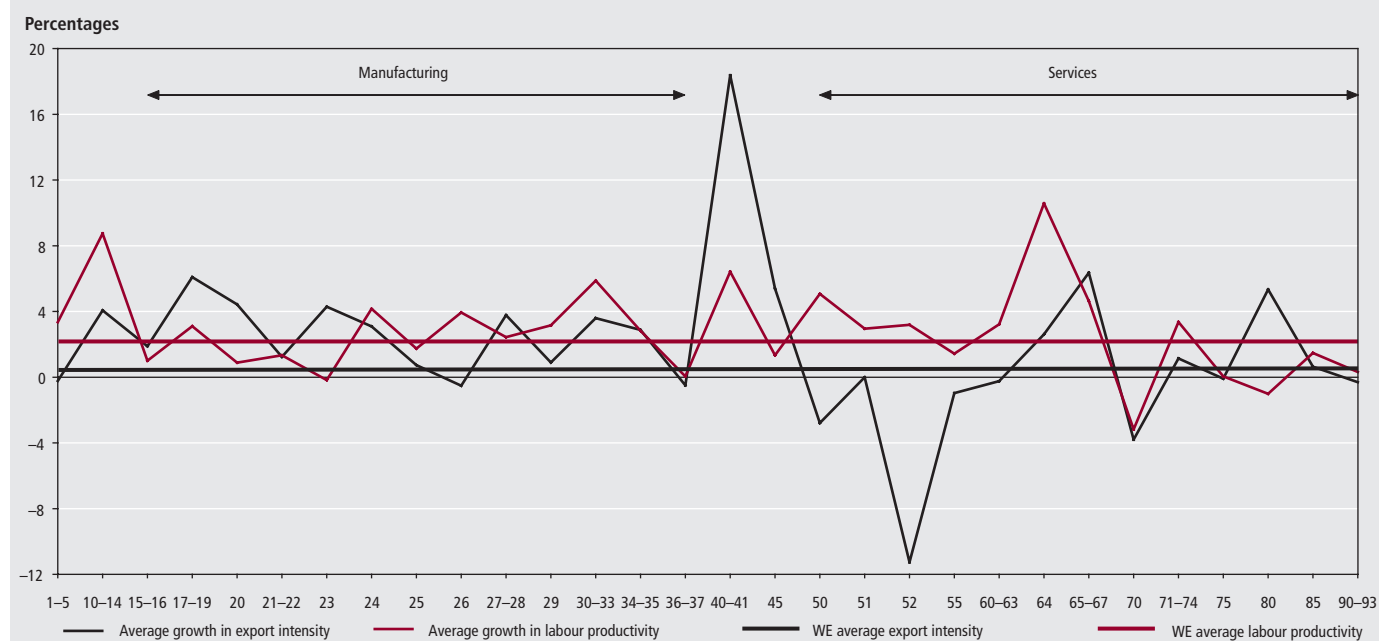
Bearing this in mind, it seems reasonable that industries experiencing high growth in export intensity will have both the incentive and ability to benefit from technological change to a greater extent.

In growth-accounting analyses, output growth is assigned to growth in inputs, with the residual referred to as MFP, which is considered to be an approximation of disembodied technical change (examples could include increased knowledge and improved technology as a result of R&D, or improved management/organisational structures). In general, it captures any growth in output not explained by growth in inputs. Embodied technical change, in the form of capital improvements, will already be captured in the investment/capital data.

Table 2 compares growth of export intensity with MFP growth to see if there is any correlation between the two, to test the theory that increased access to international markets provides firms with the incentive (in the form of economies of scale) to develop and benefit from new technologies and improved business processes, thus increasing MFP growth in that industry.

As can be seen, it does seem that MFP growth makes its biggest contribution to output growth in industries most engaged in international markets and growing in terms of export intensity, with the most notable cases including those previously mentioned in terms of their level of trade intensity and productivity performance (that is, Mining, Chemicals, Office and computing machinery. Other industries

Figure 7  
Export intensity and labour productivity, mean annual growth, 1992 to 2004



**Table 2**  
**MFP growth and export intensity**

Percentages, except where indicated					
SIC	MFP growth (mean)	Percentage point contribution of MFP to output growth (mean)	Output growth (mean)	MFP growth as a percentage of output growth (mean)	Growth in export intensity (mean)
1-5	1.06	1.01	-0.73		-0.24
10-14	1.65	1.54	0.45	341.72	4.06
15-16	-0.07	-0.08	0.72		1.88
17-19	0.42	0.40	-3.77		6.08
20	-0.28	-0.29	1.10		4.43
21-22	0.01	0.01	1.31	0.52	1.24
23	-0.20	-0.20	1.61		4.29
24	0.91	0.90	2.45	36.64	3.09
25	0.31	0.29	2.39	12.31	0.73
26	1.02	1.00	1.47	67.70	-0.52
27-28	0.50	0.50	-0.04		3.77
29	0.57	0.56	0.65	85.62	0.90
30-33	1.31	1.28	3.19	40.21	3.59
34-35	0.50	0.49	2.98	16.58	2.87
36-37	-0.58	-0.60	3.47		-0.49
40-41	0.48	0.47	1.86	25.31	18.38
45	0.31	0.30	2.62	11.54	5.39
50	1.12	1.09	4.64	23.57	-2.79
51	0.86	0.84	4.23	19.86	-0.01
52	0.60	0.58	4.84	11.94	-11.26
55	-0.17	-0.17	6.13		-0.97
60-63	0.79	0.78	4.94	15.76	-0.24
64	3.91	3.79	9.59	39.53	2.61
65-67	0.80	0.78	4.11	19.04	6.35
70	-1.16	-1.19	2.72		-3.80
71-74	0.13	0.11	7.07	1.61	1.14
75	-0.57	-0.58	1.93		-0.09
80	-1.02	-1.06	2.78		5.34
85	0.26	0.26	4.51	5.72	0.64
90-93	-0.64	-0.66	4.00		-0.30

**Note:**

Positive association in white; negative association shaded grey.

with relatively strong growth in both export intensity and MFP include Textiles, leather and footwear; Basic and fabricated metals; and Post and telecommunications. Additionally, many of the sectors with low or negative MFP growth are those not experiencing increased growth in export intensity – the clearest examples of this are Paper, printing and publishing; Rubber and plastics; and Manufacturing not elsewhere classified. The expected positive association holds in two-thirds of industries considered.

However, again, there are a number of exceptions. For instance, Food, beverages and tobacco; Wood and cork; and Coke, petroleum and nuclear fuel have all experienced strong growth in export intensity but negative growth in MFP.

It is likely that any effect here is transmitted in various ways. As well as the competitive element and profit incentive already discussed, industries and markets that are more internationally open are also more likely to achieve MFP growth as a result of firms building international networks in areas of mutual interest,

increased collaboration and the diffusion of best practice, as well as via increased activity of multinational firms.

**Conclusions**

This article has examined the relationship between trade/export intensity and productivity growth – both labour and MFP. While there is some evidence to support the relevant theories (Balassa-Samuelson, Smith and Ricardo), the evidence is not overwhelming – some industries exhibit the relationship, but others do not. In broad terms, there does seem to be some correlation especially in terms of the difference between manufacturing and services, but at a more detailed industry level, the evidence is more mixed. For some sectors, consumption and production are both almost entirely domestic, for example, public sector services, construction and distribution. If these sectors are removed from the analysis, the correlation between trade or export intensity and productivity is stronger.

It should be noted that any relationship between trade and productivity should

be thought of as circular, and causation should not be implied – the positive effects of trade will improve the productivity of the domestic industry, which will improve prospects for trade, increasing the potential for further profits, investment and productivity growth in a virtuous circle, as Smith argued in his original theories. It should be noted, though, that the increase in the size of the market may simply allow a small number of firms to overcome high barriers to entry and the market may not necessarily be competitive.

However, in general, trade improves the competitive environment, encouraging enterprise and innovation by increasing opportunities for, and potential returns to, investment, improving the possibilities to achieve economies of scale, encouraging the adoption of best practice and more. This seems increasingly relevant in light of recent trade negotiations and the continued presence of protectionist policies and highlights that, although useful, the Solow growth model and traditional growth analyses tend to neglect the possible contribution of trade to growth in productivity and living standards.

**Notes**

- 1 For further information, see [www.euklems.net](http://www.euklems.net)

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## APPENDIX

Table A1  
**Industry descriptions**

Description	SIC
Agriculture, hunting, forestry and fishing (AB)	1–5
Mining and quarrying (C)	10–14
<b>Manufacturing (D, 15-37)</b>	
Food, beverages and tobacco	15–16
Textiles, wearing apparel, fur, leather and footwear	17–19
Wood and cork	20
Pulp, paper, printing, publishing and reproduction	21–22
Coke, refined petroleum and nuclear fuel	23
Chemicals and chemical products	24
Rubber and plastics	25
Other non-metallic minerals	26
Basic and fabricated metals	27–28
Machinery	29
Office machinery; electrical machinery; communications equipment; medical instruments	30–33
Motor vehicles and trailers; other transport equipment	34–35
Manufacturing not elsewhere classified; recycling	36–37
Electricity, gas and water (E)	40–41
Construction (F)	45
<b>Services (50+)</b>	
Sale and maintenance of vehicles; retail sale of fuel	50
Wholesale and commission trade, except vehicles	51
Retail trade, except vehicles; repair of household goods	52
Hotels and restaurants (H)	55
Inland, water and air transport; auxiliary transport activities; travel agencies	60–63
Post and telecommunications	64
Financial intermediation; insurance and pensions (J)	65–67
Real estate	70
Renting of machinery and equipment, computer and related; R&D; other business activities	71–74
Public administration and defence (L)	75
Education (M)	80
Health and social work (N)	85
Sewage and refuse; recreational and other service activities (O)	90–93