



The UK Productivity Gap & The Importance Of The Service Sectors

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- KNOWLEDGE TRANSFER
- STRUCTURE
- SKILLED INNOVATION
- RECASTING PRODUCTIVITY
- ADOPTING FOREIGN PRACTICES

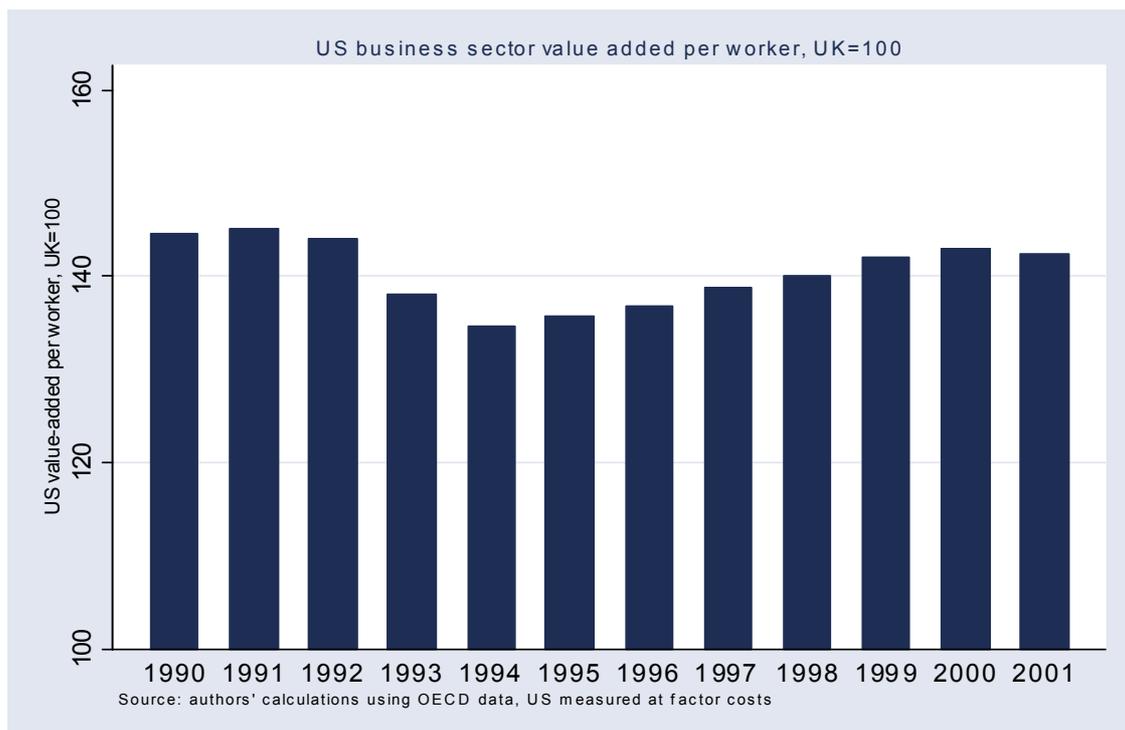
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1 INTRODUCTION

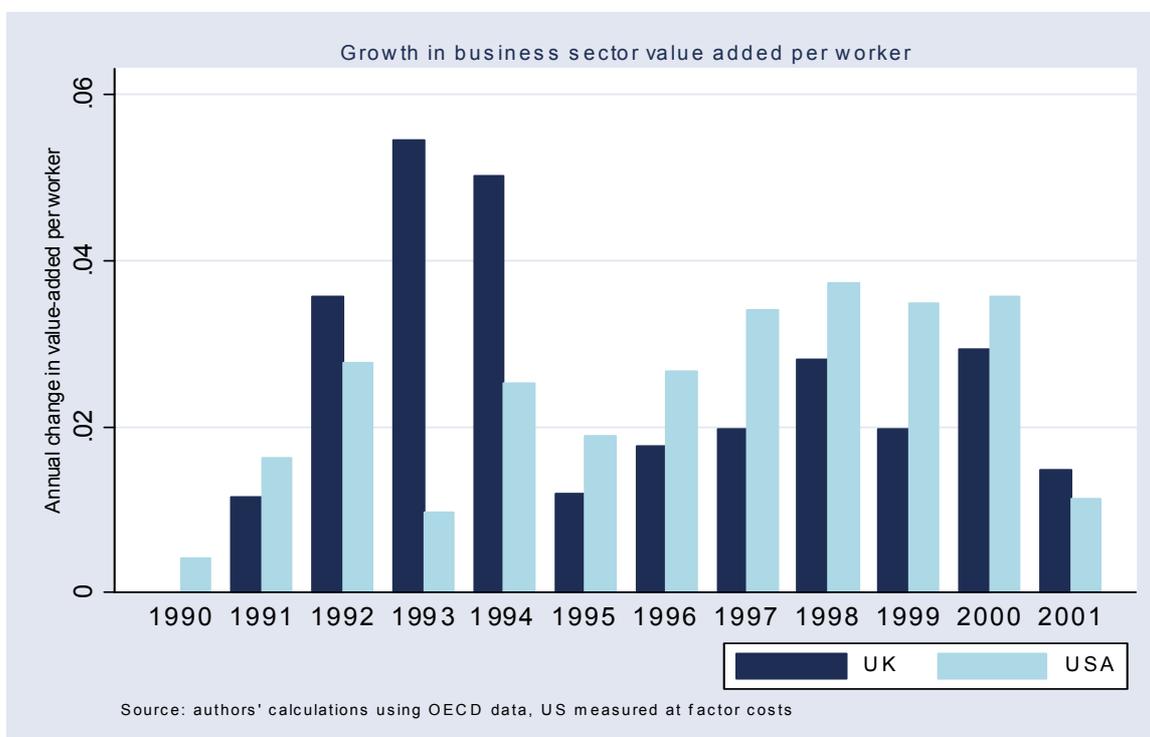
The UK's poor productivity performance relative to the US has been a focus for government policy and analysis in recent Budgets and Pre-Budget Reports. Figure 1, where the UK business sector is scaled to 100, shows that US business sector labour productivity (value-added per worker) was just over 40% higher than the UK level in 2001, about the same as it was at the beginning of the 1990s. The labour productivity gap fell over the early 1990s, when the UK experienced relatively faster growth in business sector labour productivity than the US, but it has since increased again as productivity growth slowed in the UK and accelerated in the US.

FIGURE 1



The annual change in aggregate labour productivity is shown in Figure 2.

FIGURE 2



This aggregate picture hides considerable variation at the industry level. In some industries the gap has narrowed substantially over the past decade, while in others it has widened. As a result, although the total size of the productivity gap did not change very much over the 1990s, the industries that account for the majority of the gap have changed considerably. An understanding of where the productivity gap arises is essential to be able to target policy effectively. Yet to date most work has considered the aggregate performance of the UK, or has focussed on the manufacturing sector despite the fact that most employment is in the service sectors.¹

In this briefing note we document the fact that:

1. regarding the gap in 2001
 - over half of the gap in 2001 is attributable to three sectors: “wholesale and retail”, “financial intermediation” and “machinery and equipment”;

¹ An exception being work by researchers at NIESR, for example: O’Mahoney and de Boer (2002), “Britain’s relative productivity performance: Updates to 1999”, National Institute of Economic and Social Research

- most of the gap can be explained by lower labour productivity within broad sectors of the economy, with just under 10% of the gap explained by the fact that the UK has more employees in lower productivity sectors;
2. regarding changes in the gap since 1990
- although the total productivity gap has changed very little between 1990 and 2001, the sectoral composition of the gap has changed considerably;
 - the UK has narrowed the gap in the network industries: “electricity, gas and water” and “post and telecommunications”;
 - the UK has also narrowed the gap in manufacturing (excluding machinery and equipment) and “business services”; meanwhile employment has fallen in the former and risen in the latter;
 - the gap has increased over the past decade in “wholesale and retail”, “financial intermediation”, “hotels and restaurants” and “machinery and equipment”;
 - over the 1990s the UK shifted employment into “hotels and restaurants” and “wholesale and retail”, two of the lowest productivity sectors;
 - in many sectors the UK’s poor relative performance is due to an acceleration in labour productivity growth in the US, rather than a slowdown in productivity growth in the UK.

After documenting these facts we consider some of the reasons that might explain this relatively poor performance. We then outline some of the areas that we plan to investigate over the next three years under the AIM programme.² Among other issues, we plan to look at: whether the dispersion in productivity within sectors is unusually high in the UK; how productivity vary across UK regions; whether rates of entry and exit in the UK are lower than in other countries; whether outsourcing has been a significant driver of productivity growth; what the joint impact of management practices and public policies have on productivity.

The structure of this note is as follows: the next section shows the relative productivity situation in 2001, compares it to 1990 and 1995, and considers some specific industries in detail. Section 3 looks specifically at micro data on entry in the retail sectors. Section 4 concludes and points to some avenues of future research, which a number of AIM researchers will be taking up. An Appendix gives technical details of the calculations discussed in the note.

² AIM is a national research programme with a £20 million budget, co-funded by the Economic and Social Research Council (ESRC) and the Engineering and Physical Sciences Research Council (EPSRC). AIM’s mission is to improve understanding of management’s contribution to organizational performance, and thus UK well-being. AIM is initially focusing on three issues of particular relevance to management practice, government policy, and academic expertise: Productivity and other measures of performance for the 21st century; Innovation sustained in a competitive and social environment; Adaptation of promising practices in new settings.

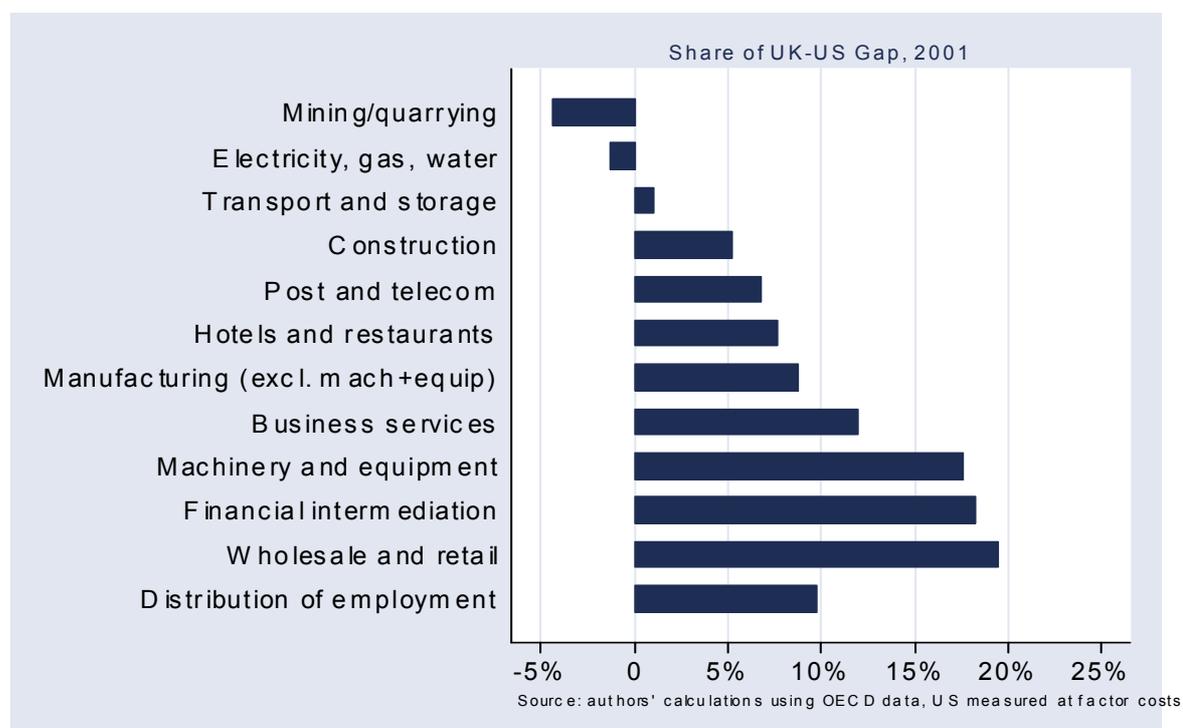
2 DECOMPOSING THE PRODUCTIVITY GAP BY SECTOR

2.1 Industry Breakdown of the Productivity Gap in 2001

To see what contribution each sector makes to the total productivity gap we ask: “what proportion of the total business sector labour productivity gap would be eliminated if labour productivity in this sector increased to the same level as in the USA?” Sectors with a high share of employment and/or a large productivity gap will account for a large proportion of the total gap, while those with a small share of employment and/or a small productivity gap will account for a small proportion.

The contribution made by each of the eleven broad sectors that make up the non-agricultural business sector is shown in Figure 3. Three industries stand out as making the largest contribution to the total productivity gap: the “wholesale and retail” sector (19%), followed by “financial intermediation” (18%) and “machinery and equipment” (17%). Together these three sectors account for more than half the total business sector productivity gap.

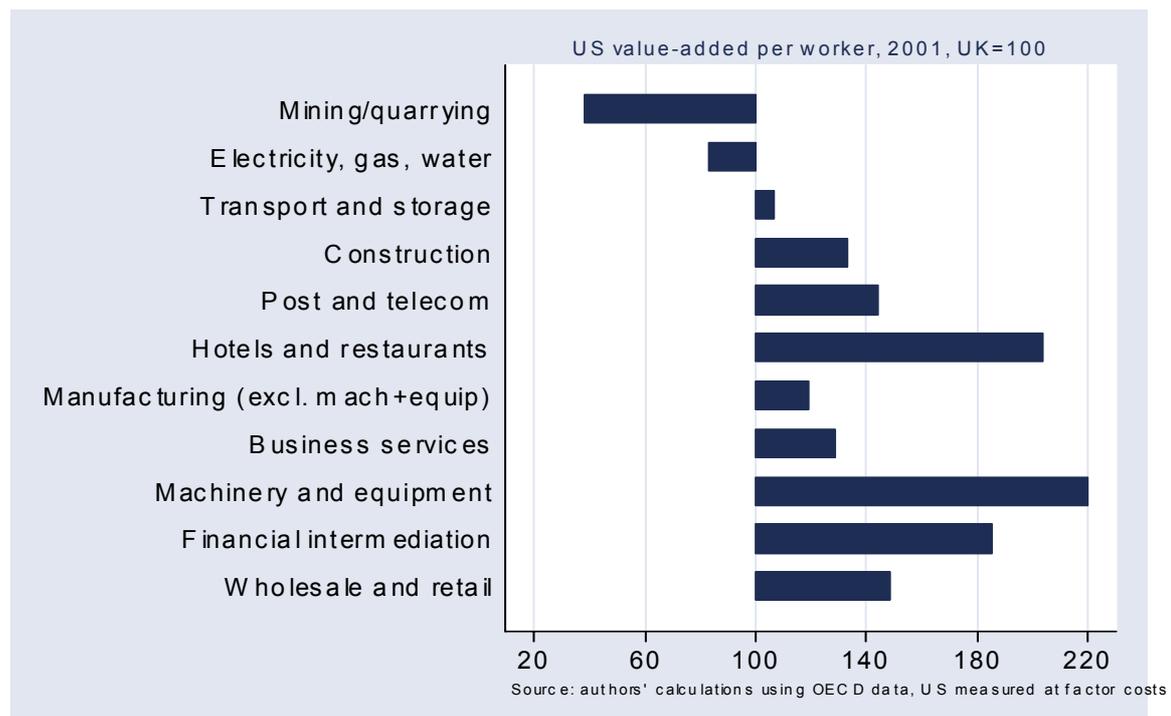
FIGURE 3



The share of the total labour productivity gap is calculated by combining information on the productivity gap within each sector with its share of total employment. The “distribution of employment” component is the part of the gap that can be explained by a different distribution of employment across sectors. For example, a country that has a higher proportion of employment in low productivity sectors will have lower average productivity (see discussion in Section 2.9 and the Appendix).

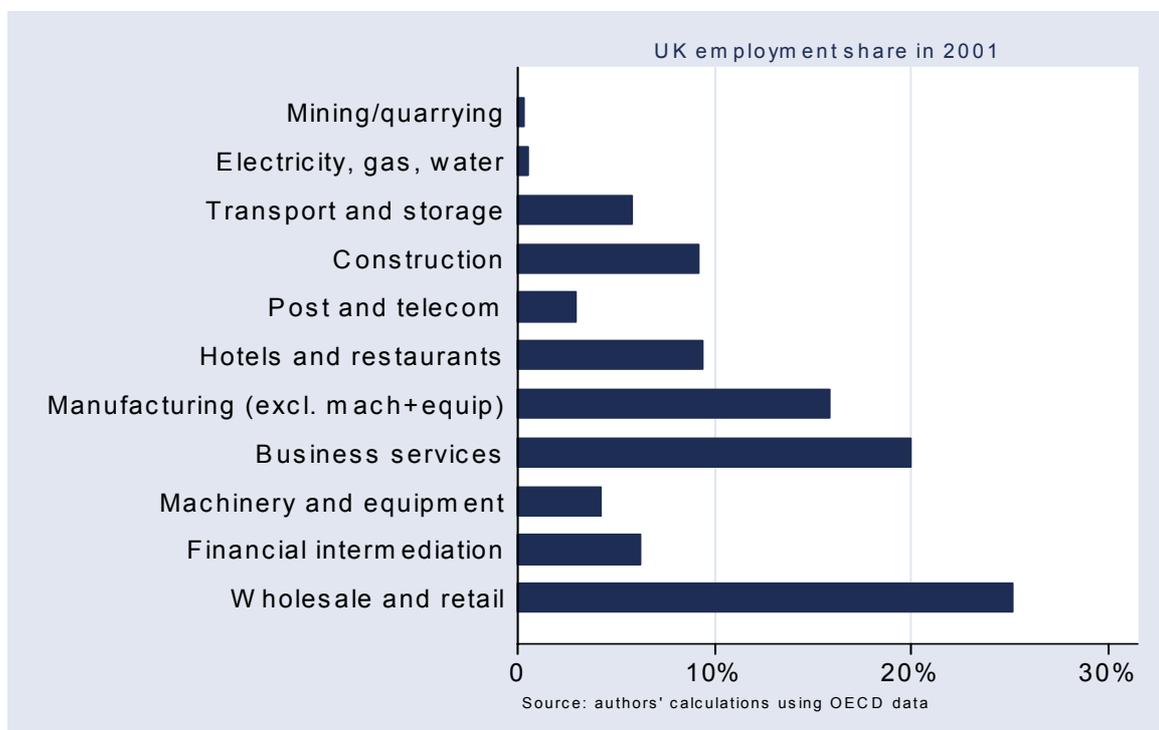
A sector can be responsible for a large part of the gap because it has a large share of employment or because there is a particularly large productivity gap within the sector. Value added per worker in the USA relative to the UK (where value-added in the UK has been rescaled to equal 100) is shown for each sector in Figure 4. The USA is more productive than the UK in every sector except “mining and quarrying” and “electricity, gas and water”. The size of the productivity gap varies considerably across sectors. The gap is largest in “machinery and equipment”, where the USA is more than twice as productive as the UK. Next largest are the gaps in “hotels and restaurants” and “financial intermediation”.

FIGURE 4



The employment share of each sector is shown in Figure 5. The sector with the largest share of employment (25%) is “wholesale and retail”, followed by “business services” (20%) and “manufacturing excluding machinery and equipment” (16%). The proportion of the total productivity gap attributable to the “wholesale and retail” sector is similar to its share of total employment. In contrast, “financial intermediation” and “machinery and equipment” represent a much larger share of the gap than their share in employment (compare Figure 3 with Figure 5). The large contribution of these sectors to the total productivity gap is a result of the fact that labour productivity in the USA is much higher than in the UK.

FIGURE 5



2.2 Differences Between 1990, 1995 and 2001

How does this situation compare to a decade ago? While the size of the total productivity gap was very similar in 1990 (see Figure 1), the industries that accounted for that gap were different. Figure 6 shows the productivity gap within each sector in 1990, 1995 and 2001. The sectors are ordered as in Figure 3, so that those sectors that account for the largest part of the gap in 2001 are towards the bottom. It is clear that there have been significant changes across sectors over the period, with seven of the sectors narrowing the gap with the USA and four sectors falling further behind the US: “gas, electricity and water” for example has turned the productivity lag into a productivity lead.

FIGURE 6

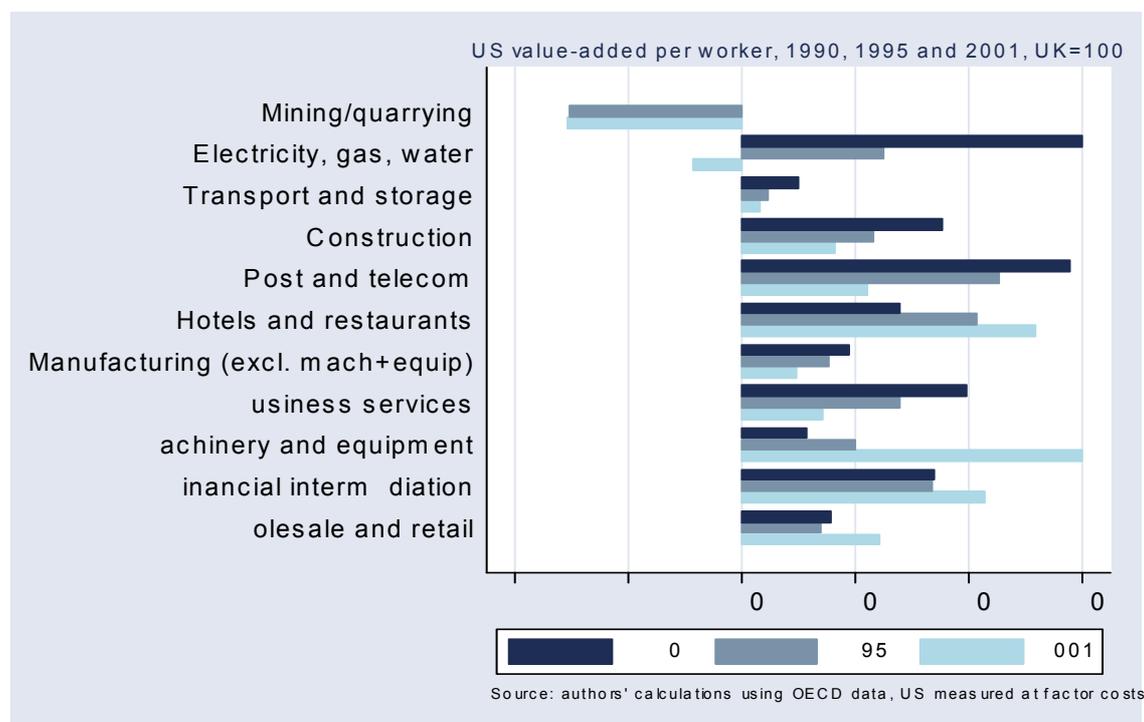
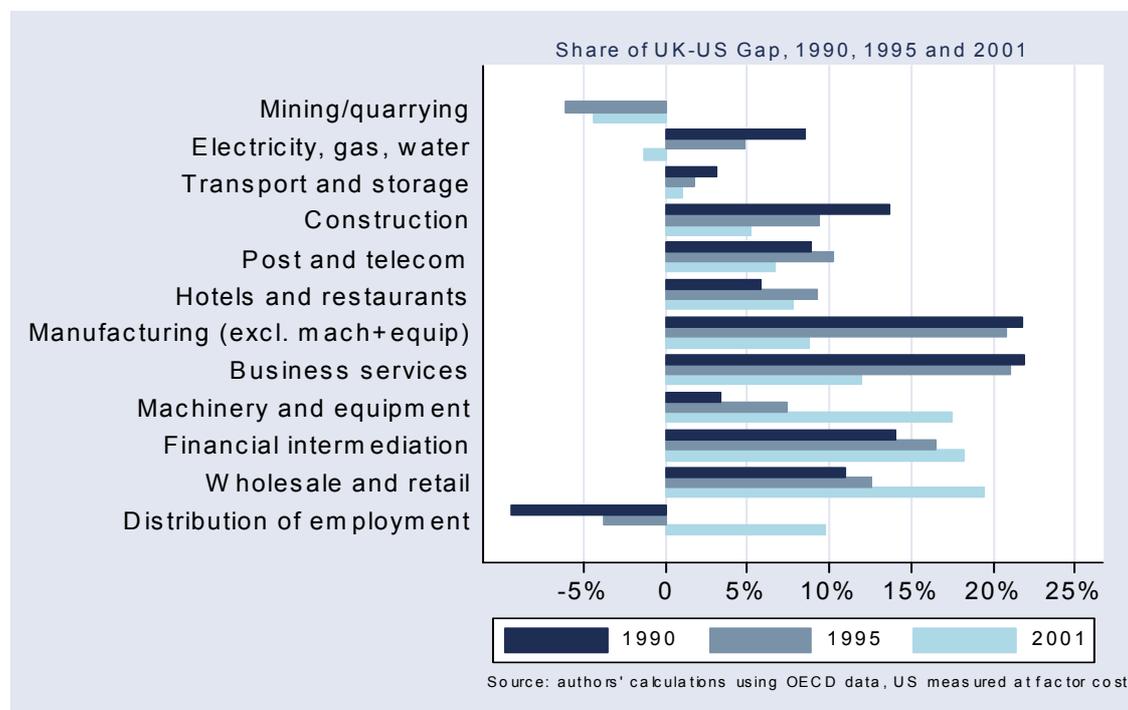


Figure 7 shows the share of the total labour productivity gap accounted for by each sector in 1990, 1995 and 2001. The sectors are ordered as above, so that those that account for the largest part of the gap in 2001 are towards the bottom. Although we saw above that the size of the total labour productivity gap has changed very little between 1990 and 2001, Figure 7 shows that the sectoral composition of the gap has changed considerably. Seven sectors contributed less in 2001 to the total gap than in 1990, while four contributed more. In addition, the “distribution of employment” component has changed the most – this is discussed further in section 2.9 below. We

first discuss the individual sectors that have contributed the most, or that have significantly changed their contribution over the period.

FIGURE 7



2.3 Network Industries

The UK has narrowed the gap considerably in the “network” industries (“electricity, gas and water” and “post and telecoms”), and even overtook the USA in “electricity, gas and water”. The UK undertook significant privatisations and liberalisation in these sectors over the period, and there is a large literature relating these developments to changes in employment and productivity.³

In “electricity, gas and water”, labour productivity improvements can be explained largely by considerable labour shedding that occurred during the 1990s. However, increased competition due to privatisation and deregulation also had productivity-enhancing effects through mechanisms other than labour shedding. In electricity, for example, the shift from coal-fired to gas-fired generation is generally believed to be a reason behind dramatic productivity improvements in the UK (Electricity Industry Review 2003). In “post and telecoms”, UK employment share actually rose slightly,

³ See for example: Megginson and Netter (2001) “From State to Market: A Survey of Empirical Studies on Privatization” *The Journal of Economic Literature*, Vol. 39, No. 2.

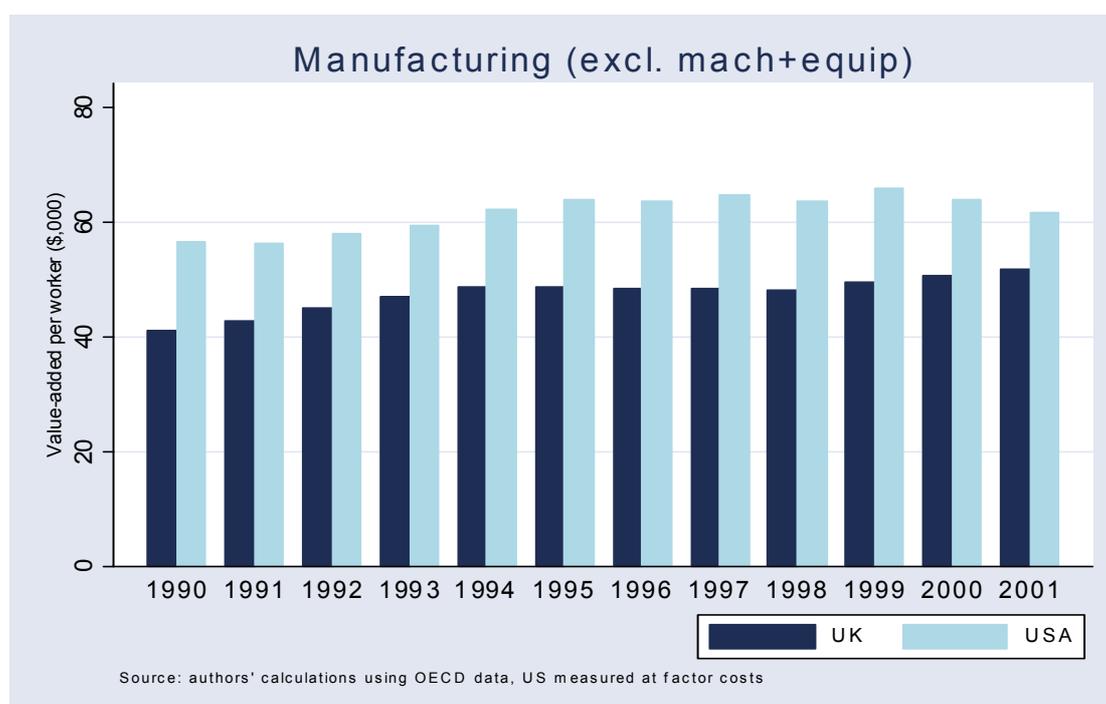
so that the narrowing of the UK-US productivity gap is entirely due to a relative improvement in value-added per worker.

2.4 Manufacturing

The share of the total productivity gap accounted for by manufacturing industries (excluding machinery and equipment) declined by more than any other sector between 1990 and 2001, with almost all of the change coming after 1995. Figure 8 shows the level of labour productivity in this sector over the 1990-2001 period in both the UK and US. Both countries experienced steady labour productivity growth in the sector between 1990 and 1995, with little change in the productivity gap. After 1995 labour productivity was fairly flat in both countries until 1999 when it began to fall slightly in the US and to grow again in the UK, resulting in a narrowing of the gap between 1999 and 2001.

The reduction in manufacturing industries' share of the total gap has been at least partly a result of large scale labour shedding. Manufacturing (excluding machinery and equipment) accounted for about 19.8% of UK business sector employment in 1990, 18.3% in 1995, and 15.9% in 2001, with almost all the decline in the second half of the decade coming after 1998. The US experienced a similar decline from 17.9% to 14.2% between 1990 and 2001. Given that UK manufacturing's (excluding machinery and equipment) share of employment decreased by 20% and its share of the total gap decreased by about 60%, this suggests that about a third of the reduction in its share of the total gap can be directly accounted for by the reduction in its share of employment. The rest is accounted for by the narrowing of the productivity gap within the sector.

FIGURE 8



Within “manufacturing (excluding machinery and equipment)” the industries that reduced their share of the total productivity gap include “Food, beverages and tobacco”, “Chemicals, rubber, plastics and fuel”, “Other transport equipment” (which is largely aerospace), and “Pulp, paper, printing and publishing”. All of these industries narrowed the productivity gap with the US over the period, with “Food, beverages and tobacco” actually overtaking the US. Two manufacturing industries fell further behind the US but reduced their share of the gap because their share of UK employment fell by even more: “Textiles, leather and footwear” and “Basic metals and metal products”. Finally, only the residual category “Manufacturing not elsewhere classified; recycling” increased its share of the total gap. Its level of labour productivity fell significantly behind the US, having started the decade at about the same level.

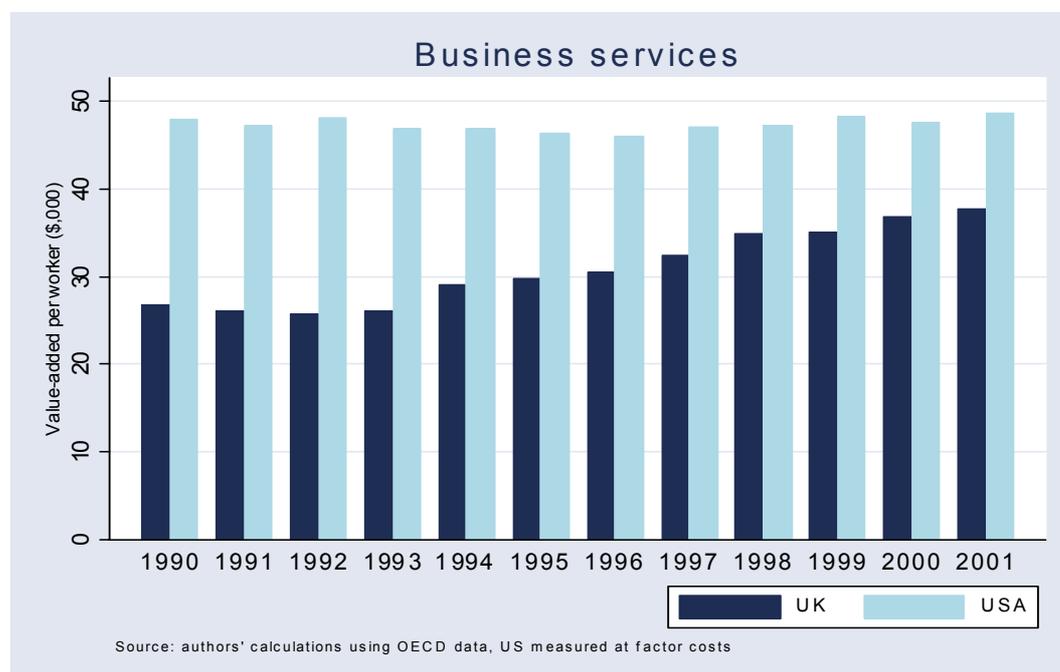
At this level of disaggregation, “chemicals/rubber/plastics/fuel”, “basic metals and metal products”, and “motor vehicles” were the sectors accounting for the top three largest shares of the UK-US productivity gap in manufacturing (excluding machinery and equipment) in 2001.

2.5 Business Services

In contrast to manufacturing, “business services” in the UK experienced a rapid rise in employment share from under 15% to 20%, as well as rising productivity levels (see Figure 9). The sector experienced a similar rise in employment share in the US, but labour productivity was roughly constant over the period. Business services is comprised of four sub-sectors, for which we have data for the UK but not the US. They are: “Renting of machinery and equipment”, “Computer and related activities”, “Research and development” and “Other business activities”. This last sub-sector, which includes professional services such as accounting, consulting, advertising and legal services, is by far the largest of the four in the UK, with 80% of the sector’s employment in 2001 (making about 16% of total business sector employment). Labour productivity in this sub-sector grew fairly slowly between 1990 and 1995, and then rapidly between 1995 and 1999 (we don’t have data for 2000 or 2001), rising by more than 20% in four years.

“Computer and related activities” is the next largest sub-sector with 13% of the sector’s employment in 2001, up from 9% in 1995 and 8% in 1990. This sub-sector experienced rapid growth in labour productivity in the first half of the 1990s but not after 1995. Employment levels in this sub-sector almost doubled between 1995 and 2001.

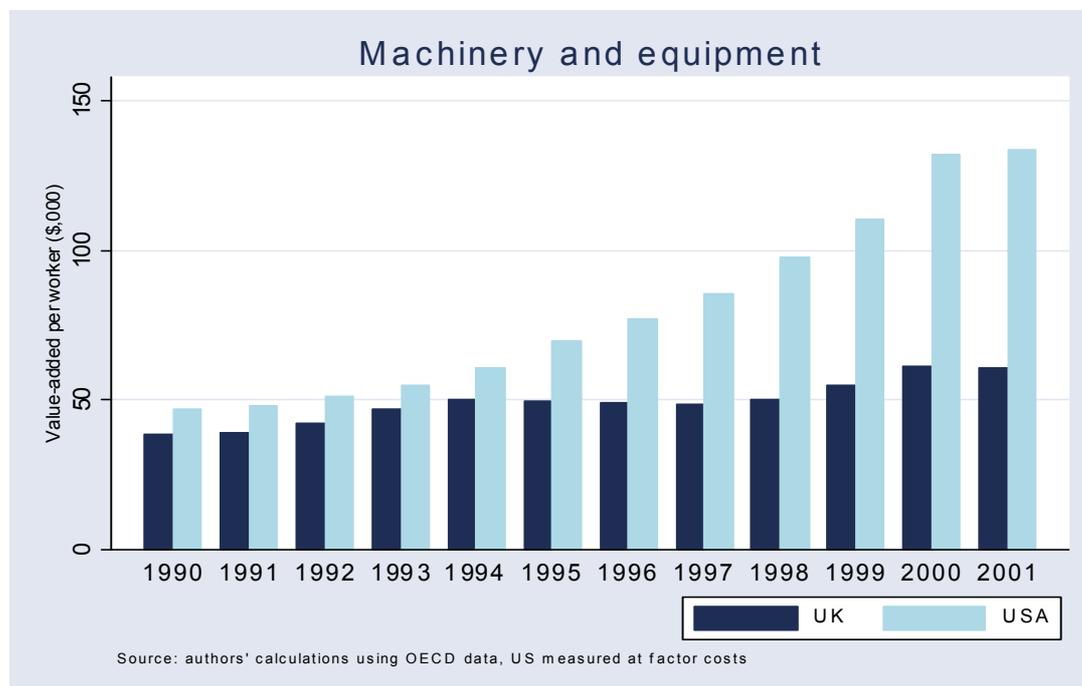
FIGURE 9



2.6 Machinery and Equipment

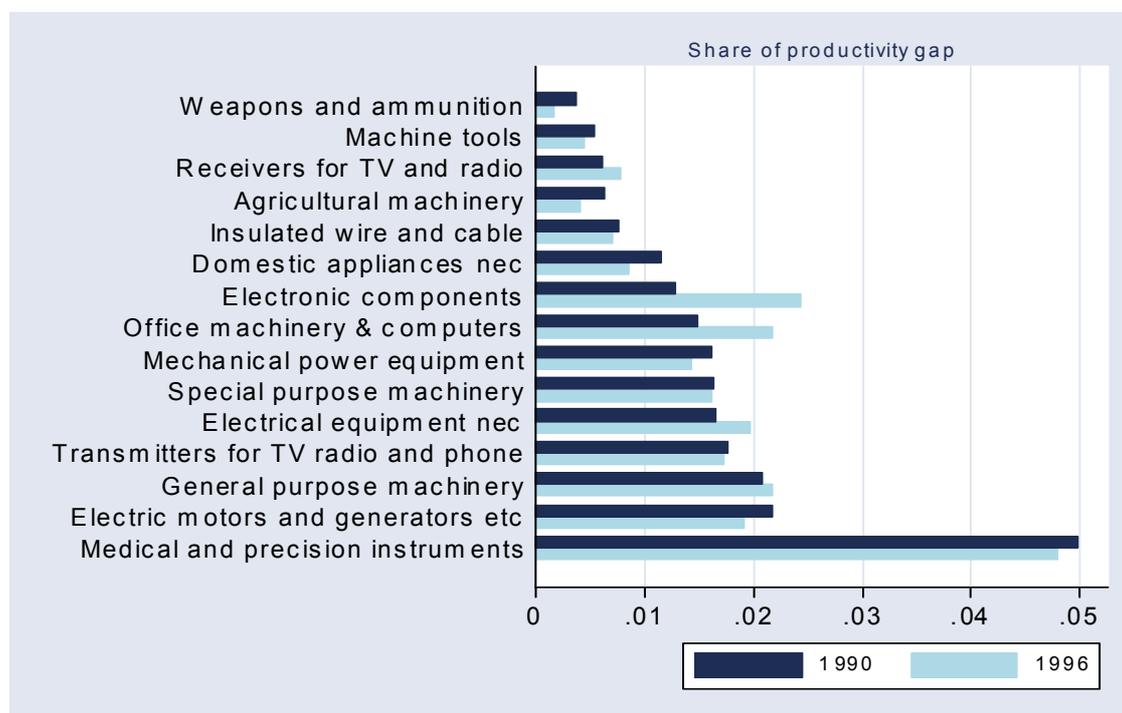
The share of the total productivity gap accounted for by “Machinery and equipment” increased from less than 4% in 1990 to over 17% in 2001, so that it accounted for the third largest share of any sector in 2001. This is despite the sector accounting for only 4% of UK business sector employment. Figure 10 shows the level of labour productivity in this sector over 1990-2001 for the UK and the US. While labour productivity in the UK grew gradually over the period, productivity growth in the US accelerated dramatically after 1995, resulting in a significant widening of the productivity gap.

FIGURE 10



This sector can be broken down into more disaggregated sectors for the first half of the 1990s. Figure 11 shows the proportion of the total productivity gap accounted for by each of these sub-sectors in 1990 and 1996, the most recent year for which comparable data is available. “Medical and precision instruments” accounts for the largest single proportion, but “Electronic components” and “Office machinery and computers” have increased their shares the most. The increased share of the gap accounted for by these two sectors is likely to be associated with information technology developments in the US, as documented elsewhere (e.g. Jorgensen, 2003).

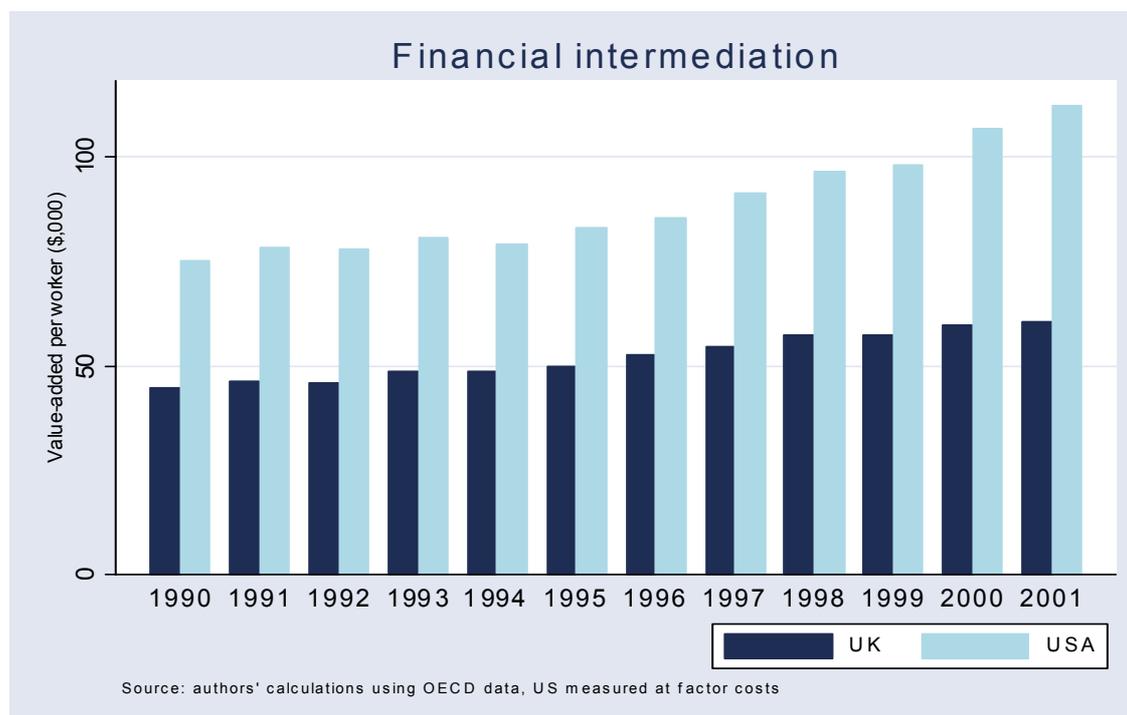
FIGURE 11



2.7 Financial Intermediation

The share of the total productivity gap accounted for by “Financial intermediation” rose from about 14% in 1990 to almost 18% in 2001, despite the employment share staying more or less constant at 7% (CHECK), so that it accounted for the second largest share of any sector in 2001. Figure 12 shows the level of labour productivity in this sector over 1990-2001 for the UK and the US. Both countries experienced productivity growth throughout the period, but productivity growth in the US clearly accelerated after 1995, resulting in a widening of the gap by 2001.

FIGURE 12



“Financial intermediation” is comprised of three sub-sectors: “Financial intermediation except insurance and pension funding”, “Insurance and pension funding” and “Activities relating to financial intermediation”. The first of these is the largest, accounting for about 55% of the sector’s employment in 2001, with the other two sub-sectors accounting for about 22% each. The UK has roughly the same labour productivity as the US in “Insurance and pension funding”, but there is a substantial productivity gap in the other two sub-sectors. In particular, the US is now more than four times as productive as the UK in “Activities relating to financial intermediation”, and this sub-sector accounts for all of the increase in the share of the total productivity gap that can be attributed to “financial intermediation”. The US almost doubled its labour productivity in this sub-sector between 1995 and 2001, while labour productivity in the UK remained fairly constant.

2.8 Wholesale and Retail

The share of the total productivity gap accounted for by “Wholesale and retail” rose from about 11% on 1990 to almost 20% in 2001, making it the sector with the largest share of the gap. Figure 7 shows that almost all of the increase occurred after 1995. Figure 13 shows the level of labour productivity in this sector over 1990-2001 for the UK and the US. Labour productivity grew throughout the period in both countries. However, productivity growth in the US accelerated over the second half of the 1990s, resulting in a widening of the gap by 2001.

FIGURE 13



At the same time the share of employment accounted for by this sector in the UK increased from 23% to 25%, with all of the increase occurring before 1995. The share in the US declined very slightly from 37% to 36%. Total sector employment in the UK was steady between 1990 and 1995 at about 4.7m, increasing after 1995 to 5.1m in 2001. However, US employment in the sector increased by a very similar proportion between 1995 and 2001, so employment growth is unlikely to explain the diverging growth rates of labour productivity after 1995.

Data from the National Institute of Economic and Social Research (NIESR) suggests that the labour productivity gap between the UK and the US is about 20% larger in retail than wholesale. Retail also accounted for about 73% of “Wholesale and retail” sector employment in 1999, so the largest part of the sector’s productivity gap is accounted for by retail.

2.9 Shifts in Employment Across Sectors

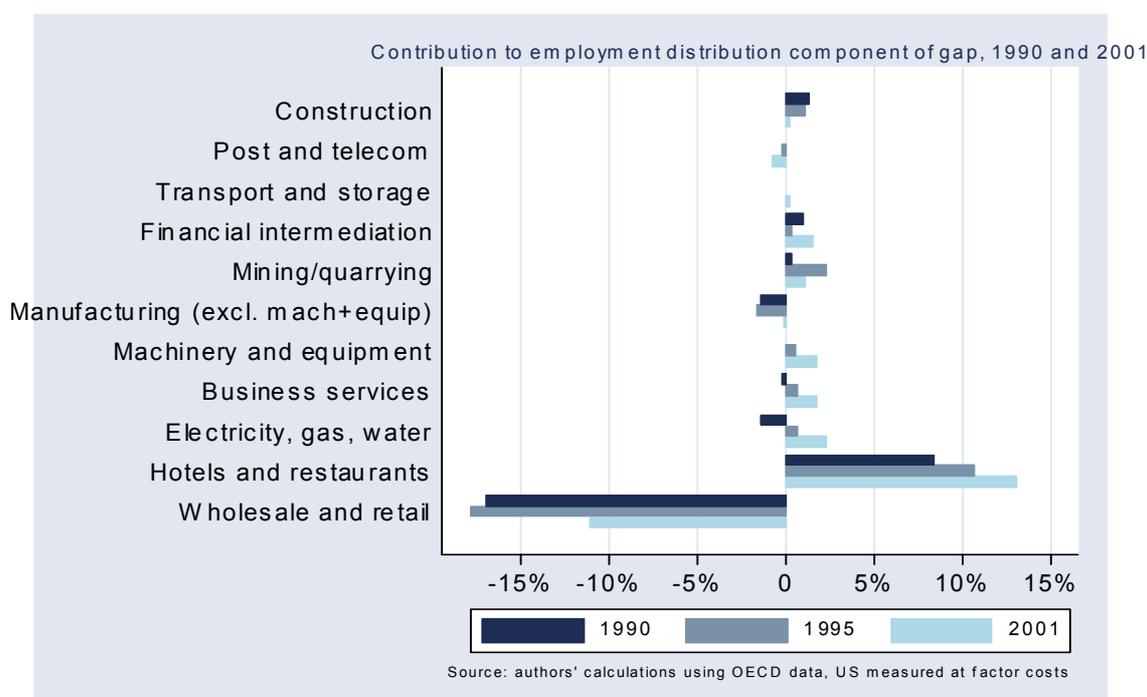
The sum of all the sectors’ contributions to the total productivity gap with the USA shown above does not add up to 100% because of differences in the distribution of employment. For example, if the UK had a higher share of employment than the USA in sectors with low productivity, then this would result in lower aggregate productivity in the UK than in the USA even if the productivity gap with the USA was equal to zero in each individual sector. A positive contribution of the “distribution of employment” component to the total productivity gap indicates that differences in the distribution of

employment across sectors between the UK and US economies explain part of the productivity gap, while a negative value indicates that employment differences go some way to reducing the productivity gap.

We saw in Figure 7 that the “distribution of employment” component of the business sector productivity gap increased significantly from -10% to almost 10% of the gap between 1990 and 2001. Thus the sectoral distribution of employment went some way towards reducing the total productivity gap at the beginning of the decade, but was a substantial contributor to the gap by the end of the decade.

Figure 14 shows each sector’s contribution to the overall “distribution of employment” component in 1990, 1995 and 2001. The sectors are ordered so that those sectors whose contribution to the “distribution of employment” component became more negative are towards the top, and those whose contribution became more positive are towards the bottom. A positive contribution for a sector means one of two things: either the sector has above average labour productivity (in the USA) and the share of employment in the sector is lower in the UK than in the USA, or the sector has below average productivity and the share of employment in the sector is higher in the UK than in the USA. Thus “hotels and restaurants” has a positive contribution in all three years because it has below average labour productivity (in fact the lowest of all sectors) and its share of employment is higher in the UK than in the USA (9% in the UK in 2001 compared to only 2% in the USA). Its contribution became more positive between 1990 and 2001 because its share of UK employment rose from 8% to 9%, while its share of US employment remained constant at 2%.

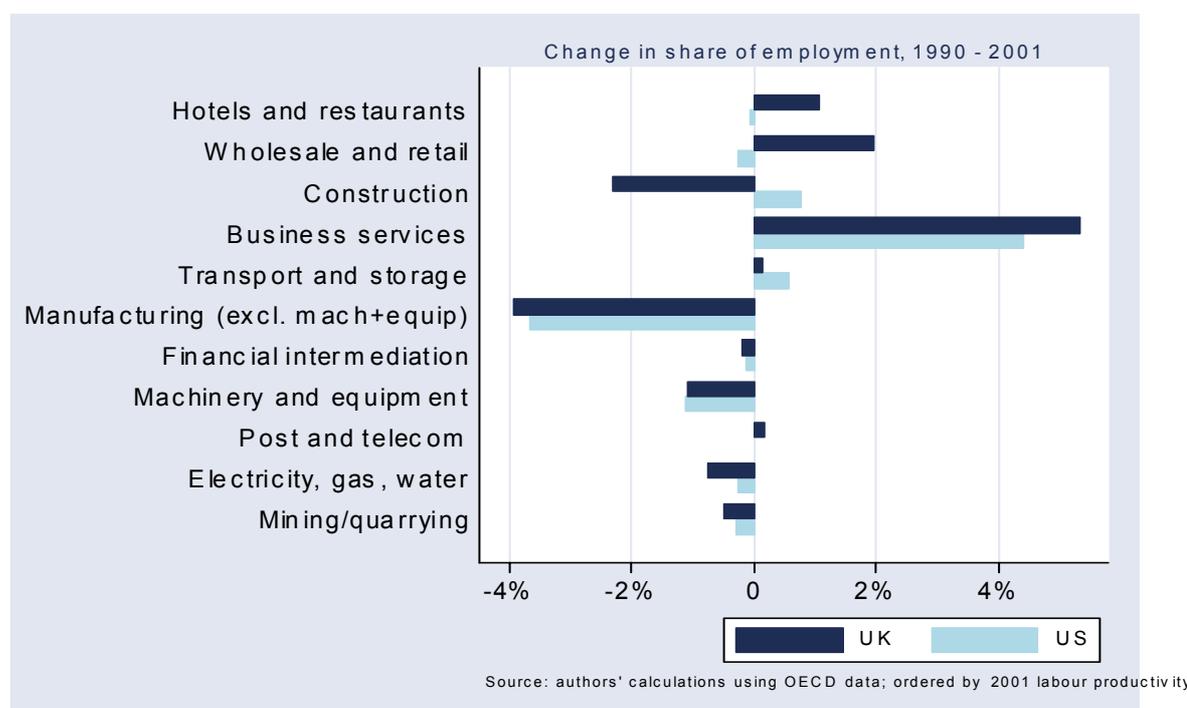
FIGURE 14



The other big contributor to the increase in the “distribution of employment” component was “wholesale and retail”, another low productivity sector. The UK started the decade with a lower share of employment than the US in this sector, resulting in a negative contribution to the structural component. However, the share of UK employment in the sector increased by about 2% over the period while it decreased slightly in the US.

Figure 15 shows each sector’s change in employment share over the period in the UK and the US. The sectors are ordered by labour productivity in the UK, with the lowest productivity sectors at the top. The four sectors at the top have productivity below the average labour productivity for the total business sector. Over this period the UK increased its share of employment in all of the four below average productivity sectors except for construction, while it reduced the share of employment in almost all of the above average productivity sectors, particularly the two manufacturing sectors.

FIGURE 15



The USA has experienced a similar shift away from manufacturing and towards “business services”, but no comparable increases in “hotels and restaurants” or “wholesale and retail”.

A shift in employment from manufacturing towards “business services” could indicate greater outsourcing of business activities over time. Whereas in the past, companies managed their own maintenance and servicing of machinery and ICT equipment, more firms are outsourcing such activity. Similarly, there has been a tendency to increase the outsourcing of business services, ranging from professional services to

more labour-intensive operations such as customer care, telemarketing, and claims processing, in call centres.

3 RETAILING

As we have seen, the service sector, and particularly retailing, makes up a significant part of the UK productivity gap with the US. It is also a major part of the US acceleration in productivity growth in the late 1990s.

What might the factors be that led to such fast growth in the US or that held back UK growth? A number of factors have featured in the debate - poor management, a low skilled labour force and lack of competition. But there are two additional ingredients, crucial to policy, that may be important in this sector - land regulation/ planning and the use and adoption of information and communication technologies (ICT).

There are at least two ways in which planning may affect productivity. First, planning regulations might result in retail stores operating below minimum efficient scale and thus lead to lower productivity levels. Second, regulation might hinder the opening of new stores and closure of old ones. To the extent that retailing productivity growth is due to firms closing older, low productivity stores, and opening newer, high productivity shops to replace them, this might result in lower productivity growth.

Of course regulation and planning are likely to have beneficial effects – on land use, the environment, the quality of life etc. However, it is worth knowing the full cost of these regulations so that their overall impact can be accurately assessed.

Recent work has suggested that the adoption and use of ICT has been an important contributor to the US productivity acceleration of the late 1990s. It is likely that ICT usage is higher and more effective in larger and newer shops.

Thus, in order to help us understand what lies behind the UK's poor productivity performance in the retail sector it is interesting to ask two questions: are UK shops smaller than US shops and is there a productivity disadvantage to having smaller shops? Is there less entry and exit in UK retailing and how much have entry and exit contributed to productivity growth in retailing?

3.1 Are UK Shops Too Small?

One difficulty with answering this question is gathering evidence on economies of scale, particularly since retailing covers such a broad range of sectors, and international evidence on store sizes. The recent Competition Commission (2000) report into supermarkets however does present a wealth of data and so we draw on this.

First, the CC survey the literature on economies of scale and argue that there are indeed economies of scale up to 3,000 sq. m in supermarkets, but not after that. The

economies of scale were especially in staff costs, which, the CC shows, are the bulk of value added in retailing.⁴

Second, the CC present data on international comparisons of supermarket shop size, reproduced in Table 1. Britain has significantly fewer supermarkets and they are much smaller than the US, but they are larger than Continental Europe. In addition, US supermarkets are, on average just over 3,000 sq metres, which is just above the minimum scale required to achieve the highest levels of labour productivity. UK supermarkets are below that, suggesting that this might account for part of our productivity disadvantage.

Table 1: Comparisons of Food Retailing Density, 1999

	Spain	France	Italy	UK	Germany	USA
Supermarkets						
# stores	5,670	8,820	6,073	4,720	23,680	22,000
# Sq. m (000)	4,540	10,350	5,491	7,600	16,908	85,000
Avg. store size ('000 sq. m)	0.8	1.17	0.9	1.61	0.71	3.86
Sq. meter/1000 population	113	173	98	127	201	340

Source: Deutsche Bank Research, 1999, cited in Competition Commission, 2000, Table 10-7

⁴ The vast majority, 83% of supermarket costs, are buying in goods for resale. Staff costs are 3/4 of the remaining 17% of costs (which is value added) (Source: Competition Commission, 2000, para 10.3).

3.2 Is UK Productivity Held Back by Lower Entry and Exit?

Our second question is the extent to which productivity growth is helped by the opening of new efficient stores and closing of old inefficient ones. To gather some evidence on this, Haskel and Khawaja (2003)⁵ use newly-released micro data from the ONS for retailing and this part of the paper summarises their results. With these data we are able to track retailing firms over time and calculate their productivity. One can then separate productivity growth into two effects. The first is the part of productivity growth due to productivity growth in retailing firms that remain throughout the period. The second is the part of productivity growth due to the opening of new firms and closure of old ones. If firms that open are above average productivity this raises productivity growth, and of course if firms who close are below average productivity this also raises productivity growth (the appendix sets this out more precisely). Thus we can answer the question: what share of productivity growth in UK retailing is due to opening and closing of retail firms.

What would we expect? If regulations held back the ability of UK firms to enter and exit then we would expect the fraction of productivity accounted for by entry and exit to be less in the UK than in the US. Of course this fraction might be less for other reasons, such as a taste in Europe for old shops for example. Nonetheless, if it were more than the US it would at least suggest that the alleged problems of planning and the like may have been overstated.

3.3 Data and Results

The data set used in this analysis comes from the Annual Business Inquiry (ABI) performed by the Office for National Statistics (ONS). The method for calculating the impact of entry and exit is explained in the Appendix.

An important limitation of these data is that to economise on collection costs, the figures are not at shop level. Thus entry and exit do not consist of shops opening and closing, which is ideally what we would like to study (and has been studied in the US). Instead the data are held at the enterprise level, which roughly corresponds to a firm in a particular chain (for example if a supermarket chain owns supermarkets and DIY stores, these are two separate enterprises). In fact in our data about 66% of retailing enterprises are single shops. But they are predominately small; they account for 26% of total employment in 2001. In fact in 2001 just 160 enterprises, consisting of 100 or more shops, accounted for 54% of employment in all retailing; with 36 such enterprises accounting for 75% of employment in the supermarkets sector.

⁵ Haskel and Khawaja (2003)

Productivity is measured as real output per unit of labour input. It is important in retailing to measure labour input as worker hours since there is such a lot of part-time working. We use two output measures, sales and value added (where value added is essentially sales less value of bought in materials). Outputs are deflated by ONS provided retail price indices.

Table 2 sets out the results. Over this period, 57% of value added productivity growth was accounted for by productivity growth within the firms that remained in the industry over the whole period (see Row 1). The rest of the growth in productivity, 43%, has come from the low productivity firms exiting and high productivity firms entering. When we define productivity as sales per person hour, almost all of it is accounted for by continuing firms (row 2). How do these numbers compare with the US data? The lower panel sets out the US Data from Foster et al (1997).⁶ They have provided two calculations, for stores and for firms. The store calculation shows that almost 100% of productivity growth between 1987-97 is due to entry and exit. For firms, about 60% is due to entry and exit. The comparison with row 2 is striking, where only 7% is due to entry and exit. This is consistent with the idea that limited opportunities for entry and exit hold back UK productivity growth in retailing.⁷

Whether this is directly due to planning is a matter for further work. However, we regard the data as at least suggestive that this is an area that needs investigating.

Table 2 Results of the FHK decomposition

	Share of productivity growth due to	
	Continuing firms	Entry and exit
UK		
All retailing (va/person hour)	57	43
All retailing (sales/person hour)	93	7
US		
All retailing (sales/person hour): shops	0	100
All retailing (sales/person hour): firms	40	60

Notes: UK productivity is per person hour, for 1998 and 2001, for enterprises. US productivity is sales per person hour, 1987-97.

⁶ Foster, ??, et al (1997) ????

⁷ One must be somewhat cautious here since the US results are for a different time period and sample more small establishments than the UK. However the results are at least suggestive.

4 CONCLUSIONS AND FUTURE RESEARCH

This briefing note has shown that whilst the overall productivity gap between the UK and US has remained stable, at just over 40%, in the 1990s, the sectoral composition of this gap has changed considerably. During 1990 and 2001, the UK narrowed the productivity gap in network industries (“electricity, gas and water” and “post and telecoms”), “business services”, and “manufacturing excluding machinery and equipment”. At the same time, the gap widened in “wholesale and retail”, “financial intermediation”, “hotels and restaurants”, and “machinery and equipment”. This transformation in the sectoral share of productivity gap points to the importance of understanding the UK productivity problem at the sectoral level, not just at the aggregate economy level.

By 2001, over half of the UK-US gap was attributable to three sectors: “wholesale and retail”, “financial intermediation”, and “machinery and equipment”. In all three sectors, productivity growth accelerated in the US in the second half of the 1990s, leaving the UK in a relatively worse situation. Moreover, in both the US and the UK, during the 1990s, employment shifted away from manufacturing into services. But what is peculiar to the UK is that employment shifted not only into “business services”, a sector in which the UK closed its productivity gap with the US, but also into “hotels and restaurants” and “wholesale and retail”, key sectors with a widening productivity gap. No similar inflow of employment occurred in these latter two sectors in the US.

These findings, along with other considerations, raise a number of key questions for further research, as follows:

Why the shift in sectors?

The briefing note shows that the UK has narrowed the gap in a number of sectors, notably the network industries (“electricity, gas and water” and “post and telecoms”), and “business services”, as well as manufacturing outside of the “machinery and equipment” sector; but that the gap has increased substantially in “wholesale and retail”, “financial intermediation”, “hotels and restaurants” and “machinery and equipment”. What factors have led to this shift? Are the changes a function of changing business practices and/or changing Government policies?

Comparisons of UK productivity gap with other (major European) countries:

would the comparison reach the same conclusions if we compared the UK to other countries (e.g. Germany, France), in particular, would the ‘positive contributor’ sectors (namely electricity, gas and water, post and telecoms, business services) and the ‘negative drag’ sectors (wholesale and retail, financial intermediation, machinery

and equipment) remain the same? Can differences in cross-country comparisons, in combination with differences in institutions (such as planning regulation) help us to identify the major factors driving the UK's performance?

Comparisons of UK-US productivity gap since the mid-1990s, and since the 1980s:
Much of the productivity take-off in key US sectors has happened in 1994/5. Would a comparison of the UK with the US for a short-run period and/or a much longer-run period help us to identify the factors driving growth?

Controlling for other factors:

How much of the productivity gap is explained by differences in capital intensity, R&D investment, the quality of labour and other factors? If they are important, what is behind the UK's lower investment in physical, intangible and human capital?

Is the dispersion in productivity within a sector unusually high in the UK?

Does the UK have a low average productivity within a specific sector, due for example to an unusually long tail of low performers? Are the best UK firms as good as the best international firms?

How does productivity vary across the UK's regions?

Given Government policy is to increasingly devolve power to the regions, it becomes ever more important that we are able accurately to understand the relative ability of UK regions to generate wealth. How can regional productivity be measured and how are the patterns in regional productivity shifting over time? What factors are driving these regional differences? In particular, what roles does planning regulation play in explaining regional difference in entry rates and the impact of entry.

Are rates of entry and exit in the UK lower than in other countries, do these account for a low average productivity in the UK?

Business regulation and financial markets, amongst other factors, may have a significant impact on entry and exit rates in specific sectors of the economy.

What has been the impact of outsourcing on productivity?

Companies outsource the production of goods and services (e.g. business services recently), domestically and overseas, to improve their financial performance. The ways in which outsourcing is managed clearly affects a firm's cost base, but for products it also affects the levels of inventory, which in turn, affects productivity. Analysis of outsourcing will also have to take account of the co-ordination costs associated with geographically dispersed operations.

What is the joint impact of management practices and public policies on productivity?

Instead of focusing on a single factor account of productivity growth, this study aims to identify complementarities among a bundle of management practices (in human resources, R&D, supply chain, etc.) and public policies that may jointly account for changes in productivity.

The drivers of plant level productivity.

Much of the analysis of productivity takes place at the macro level, but ultimately the productivity of a nation is a function of the productivity achieved by the multitude of businesses that make up that nation. Understanding productivity at the plant level

and what determines it will therefore be important to enriching our understanding of national productivity.

The AIM researchers intend to investigate these issues, by examining plant-level data that can inform productivity debates that typically take place at the national economy level. We aim to study specific industrial sectors, both in manufacturing and services, in order to identify the reasons why certain sectors have contributed more to UK productivity growth, and other sectors have been responsible for widening the productivity gap. We will also identify some international firms with plants/operations in a number of countries, to investigate the sources of performance differences between plants owned by the same corporation.

Appendix A: Technical aspects of the decomposition

The aggregate productivity decomposition

For any country, aggregate labour productivity ' P ' is a weighted average of individual sectors' labour productivity, with the weight for each sector ' i ' equal to the sector's share in total employment.

$$(1) \quad P = \left(\frac{Y}{L} \right) = \sum_i \left(\frac{Y_i}{L_i} \right) \left(\frac{L_i}{L} \right) = \sum_i P_i S_i$$

Where Y_i and L_i are value added and employment in sector ' i '.

The productivity gap between the UK and the US can then be decomposed as follows

$$(2) \quad P^{US} - P^{UK} = \sum_i P_i^{US} S_i^{US} - \sum_i P_i^{UK} S_i^{UK}$$
$$(3) \quad = \sum_i (P_i^{US} - P_i^{UK}) S_i^{UK} + \sum_i P_i^{US} (S_i^{US} - S_i^{UK})$$
$$(4) \quad = \sum_i (P_i^{US} - P_i^{UK}) S_i^{UK} + \sum_i (P_i^{US} - P^{US}) (S_i^{US} - S_i^{UK})$$

Where the final equality holds because $\sum_i S_i^{US} = \sum_i S_i^{UK} = 1$.

The first expression in line (4) represents that part of the gap that would be eliminated if labour productivity within each sector in the UK was raised to the level in the same sector in the US, holding each sector's share of UK employment fixed. This is the "within sector" component of the gap. The second expression represents the remaining part of the gap that would be eliminated if each sector's share of employment in the UK was made equal to the same sector's share of employment in the US, holding each sector's labour productivity fixed. This "distribution of employment" term reflects the fact that, even if labour productivity within each sector was the same in the UK and the US, the UK might still have lower aggregate labour productivity if it had a higher share of total employment in sectors with below-average labour productivity.

The above decomposition can be applied to each sector to give the “within sector” and “distribution of employment” components of the sector’s contribution to the total gap.

$$(5) \quad \frac{P_i^{US} S_i^{US} - P_i^{UK} S_i^{UK}}{P^{US} - P^{UK}} = \underbrace{\frac{(P_i^{US} - P_i^{UK}) S_i^{UK}}{P^{US} - P^{UK}}}_{\text{“within sector”}} + \underbrace{\frac{(P_i^{US} - P^{US})(S_i^{US} - S_i^{UK})}{P^{US} - P^{UK}}}_{\text{“distribution of employment”}}$$

For each sector, the “within sector” component is equal to the proportion of the total gap that would be eliminated if labour productivity in that sector in the UK rose to the US level, holding constant the sector’s share of UK employment. Sectors with a high share of UK employment and a large productivity gap will account for a large proportion of the total gap, while those with a small share of employment and/or a small productivity gap will account for a small proportion.

The “distribution of employment” component is the residual contribution to the total gap that is a result of different distributions of employment across sectors. For each sector this component can be positive (i.e. it explains some of the total gap) for one of two reasons: either the sector has above average labour productivity (in the US) and the sector’s share of total employment is lower in the UK than in the US, or the sector has below average labour productivity and the sector’s share of total employment is higher in the UK than in the US. Thus a positive component indicates that the sector’s share of employment is contributing to the total productivity gap, while a negative component indicates that the sector’s share of employment is going some way towards reducing the total productivity gap.

One thing to note is that the share of the total gap attributed to the “within” and “distribution of employment” components will vary with the level of aggregation. At a high level of aggregation (i.e. broadly defined sectors) some part of each sector’s “within” component may in fact be due to different distributions of employment between high and low productivity activities within the sector. Thus the share of the total gap that is attributed to the “distribution of employment” component will increase as the level of aggregation becomes smaller, or in other words as sectors become more narrowly defined.]

The Productivity Growth Decomposition For Retailing

The formal method of understanding the effects of entry and exit on productivity growth follows Foster, Haltiwanger, and Krizan (FHK, 1998). Start by writing manufacturing-wide productivity in year t , P_t as:

$$P_t = \sum_i \theta_{it} p_{it} \quad (1)$$

where θ_i is the share of establishment i (an employment share for example) and p_{it} is the log of a productivity measure, output per head. The change in manufacturing-wide labour productivity between $t-k$ and t , ΔP_t can be written

$$\begin{aligned} \Delta P_t = & \sum_{i \in S} \theta_{i,t-k} \Delta p_{it} + \sum_{i \in S} \Delta \theta_{it} (p_{i,t-k} - P_{t-k}) + \sum_{i \in S} \Delta \theta_{it} \Delta p_{it} \\ & + \sum_{i \in N} \theta_{it} (p_{it} - P_{t-k}) - \sum_{i \in X} \theta_{i,t-k} (p_{i,t-k} - P_{t-k}) \end{aligned} \quad \text{FHK (2)}$$

where S , N and X denotes the establishments that survive, enter and exit respectively between t and $t-k$. We denote this the FHK decomposition. The first three terms in (2) are the contributions to productivity growth of surviving firms; respectively the growth within the surviving establishments, the changes in market shares of the survivors weighted by initial productivity relative to the average and the effect when market share changes for firms with changing productivity. The fourth and fifth terms show the contribution of entry and exit. They are positive when there is entry (exit) of above- (below-) average productivity establishments.

Appendix B: Data and Measurement

The data for the decompositions in section 2 comes from the OECD STAN database. US value-added is measured at factor costs rather than market prices (compared to basic prices in the UK). This will tend to understate the contribution of “wholesale and retail” as the difference between the two prices is biggest in this sector.

NIESR have published similar decompositions for 1999 using a slightly higher level of aggregation (e.g. wholesale, retail and hotels and restaurants are included in one “distributive trades” category) for 1999.

Data for the disaggregation of Machinery and Equipment comes from PACSTAT (see ONS web site) and NBER Productivity Database (see NBER web site).

Sector	ISIC revision 3
Agriculture, hunting, forestry and fishing	01-05
Mining and quarrying	10-14
Manufacturing (excl. machinery and equipment)	15-28, 34-37
Machinery and equipment	29-33
Electricity, gas and water	40-41
Construction	45
Wholesale and retail	50-52
Hotels and restaurants	55
Transport and storage	60-63
Post and telecommunications	64
Financial intermediation	65-67
Real estate activities	70
Business services	71-74
Community, social and personal services	75-99

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