

MARKET SERVICES AND THE PRODUCTIVITY RACE, 1850-2000: BRITAIN, THE UNITED STATES AND GERMANY

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Abstract: There was little change in the comparative labour productivity performance of UK industry between the mid-19th century and the late-20th century. To understand UK relative economic decline, it is therefore necessary to look at services, where comparative labour productivity trends do mirror aggregate economy trends. Furthermore, these trends were not simply the result of mis-measurement of output in public, non-market services. Rather, they reflect US and German overtaking in private, market services. The key to achieving high productivity was the “industrialisation” of market services, which involved the adoption of high-volume, low-margin methods to produce industrialised or mass market services. The uneven spread of industrialised services across sectors and across countries explains the shifting comparative productivity performance of Britain, the United States and Germany. A number of individual sector studies are provided, covering transport and communications, distribution and financial services.

The highly compressed argument of this paper is presented in more detail in *Market Services and the Productivity Race, 1850-2000: Britain in International Perspective*, Cambridge University Press (forthcoming, November 2006).

I. INTRODUCTION

In earlier work, I argued that there was little change in the comparative productivity performance of British manufacturing between the mid-nineteenth century and the late twentieth century (Broadberry, 1997a). In both 1870 and 1990, US labour productivity in manufacturing was about twice the British level, while German labour productivity in manufacturing was about the same as in Britain. I also noted that value added per employee varied between manufacturing and the rest of the economy, and that the size of the manufacturing sector differed across countries and over time. This meant that it was still possible for manufacturing to have contributed to Britain's relative economic decline, through, for example, greater de-industrialisation than in Germany (Broadberry and Crafts, 2003). Nevertheless, the central message of *The Productivity Race* was surely that to understand the relative decline in British productivity and living standards since the mid-nineteenth century, it is necessary to understand what happened in services.

This paper sets out an overview of Britain's productivity performance in services, focusing in particular on market services. Section II establishes the comparative productivity trends in services, and fits them into the patterns for the whole economy. I show that comparative productivity trends in services, unlike those in manufacturing, do mirror comparative productivity trends in the whole economy. Looking at Tables 1 and 2, in about 1870, Britain had a labour productivity lead in services over both the United States and Germany, and this was an important factor in explaining Britain's overall labour productivity leadership at this time. However, the United States overtook Britain in both services and the whole economy before World War I and continued to forge ahead until after World War II, since when Britain has been narrowing the gap slowly. German overtaking of Britain in both services and the whole economy occurred during the 1960s, and Germany continued to forge

ahead until the 1980s. Furthermore, looking at Tables 3 and 4, it is clear that Britain's loss of labour productivity leadership in services was not due to trends in public or non-market services, where it is difficult to measure output independently of inputs. Rather, it reflected US and German overtaking in private or market services, including transport and communications, distribution and finance.

Section III then provides a framework to explain this comparative productivity performance in services. The central theme concerns the "industrialisation" of market services, which involved the adoption of high-volume, low-margin methods to produce industrialised or mass market services. As with the related introduction of "mass production" in manufacturing, the industrialisation of services led to sustained growth of labour productivity. However, the gains from the introduction of the technology and organisation of industrialised service provision varied by sector and over time. Understanding the differential spread of industrialised service provision in Britain, the United States and Germany is crucial to understanding the patterns of comparative productivity performance in services.

Section IV then discusses ways of modelling the key features of the industrialisation of services, drawing out the implications for comparative productivity performance. Section V provides a more disaggregated picture of comparative productivity performance within market services, which helps to put the general argument more firmly in its historical context, while Section VI concludes.

II. COMPARATIVE PRODUCTIVITY IN SERVICES

We begin by examining the contribution of services to the productivity performance of the whole economy in an international comparative framework. Comparative labour productivity

figures have already been set out in Tables 1 and 2 for the economy as a whole and for a three-sector breakdown into agriculture, industry and services. Figures 1 and 2 provide a way of highlighting the key features. Dealing first with the US/UK comparison in Figure 1, whereas around 1870 US aggregate labour productivity was approximately 90 per cent of the British level, by 1990 this had risen to 133 per cent. Turning to the sectoral breakdown, it is clear that this owed little to developments in industry, where the US/UK comparative labour productivity level changed little between 1870 and 1990. Furthermore, although comparative labour productivity in agriculture changed in the right direction and by a substantial amount, it is important to remember that whereas agriculture accounted for 50 per cent of US employment in 1870, it accounted for less than 3 per cent in 1990. The most important development in understanding Britain's loss of overall labour productivity leadership was thus the US overtaking in services.

Figure 2 shows similarly the importance of developments in services to German overtaking of Britain. In 1871, German aggregate labour productivity was approximately 60 per cent of the British level, but by 1990 this had risen to approximately 125 per cent. Although there was some increase in Germany's comparative labour productivity position in industry, from about 92 per cent of the British level in 1871 to 111 per cent in 1990, the most important factor in German overtaking of Britain was the much greater increase in Germany's comparative labour productivity position in services from approximately 63 per cent of the British level in 1871 to 135 per cent in 1990. As in the US/UK case, there was a dramatic decline in the share of the labour force employed in agriculture in Germany, so that the increase in Germany's comparative labour productivity position in agriculture was of relatively minor significance for Germany's improving comparative labour productivity position in the economy as a whole.

Tables 3 and 4 provide a breakdown of the comparative labour productivity performance of services, focusing attention on the key market service sectors. Figure 3 shows developments between 1870 and 1990 for the US/UK case. The United States overtook Britain in distribution and financial services, and forged ahead in transport and communications. For the Germany/UK case in Figure 4, the picture is complicated by the fact that the historical data for distribution and finance in Germany are available only on a combined basis. But German overtaking occurred in all major market service sectors, including transport and communications and distribution and finance combined.

III. TECHNOLOGY AND ORGANISATION

1. Innovation and the industrialisation of services

This section provides an analytical framework to explain the patterns of comparative productivity performance outlined above. The “industrialisation” of services involved the transition from a world of customised, low-volume, high-margin business organised on the basis of networks to a world of standardised, high-volume, low-margin business with hierarchical management (Broadberry and Ghosal, 2002; 2005). This transformation from the world of the “counting house” to the world of the “modern office” depended on technologies to improve communications and information processing, including the telegraph, telephone, calculating machines, typewriters, duplicators and vertical filing systems (Yates, 1989; Rotella, 1981). The transition began in the United States and spread to Britain and Germany.

The British response involved patterns of large-scale company formation that were similar to those in the United States, but with a delay in the adoption of modern office technology and hence a delay in the increase of productivity (Broadberry and Ghosal, 2002:

977-983). Campbell-Kelly (1992; 1994; 1998) points to an apparent resistance to modern office technology in Britain. The Post Office Savings Bank, for example, did without calculating machines before 1914 by maintaining its interest rate at 2.5 per cent, which corresponded to a halfpenny per pound per month. Complicated calculations were avoided by paying the interest only on whole pounds for whole months and making the calculation only at the end of the year. Typewriters were also resisted by using hundreds of pre-printed letters responding to all conceivable enquiries (Campbell-Kelly, 1998: 22). Nevertheless, rapid adoption of modern technology was not always the best strategy, as the example of the Dutch Giro Service illustrates. After the introduction of punched card technology on 24 August 1923, the Giro Service lost track of balances and by the beginning of October account holders were having to inform the Giro Service of the amounts in their personal accounts! The system had to be closed on 4 October and did not reopen until the following October (de Wit and van den Ende, 2000: 105-107).

The contrast between Britain and Germany in market services before World War II can be understood largely in terms of the much larger agricultural sector in Germany. This delay in the release of labour from agriculture in Germany was encouraged by the protectionist policies pursued in Germany, and resulted in a much lower share of the population living in towns (Bairoch, 1976: 312). The large-scale modern business enterprise that developed in the United States and Britain to supply specialised services in an urban environment was thus much less developed in Germany (Broadberry, 2004a: 245-248). And in other parts of the commercial service sector, where large firms were less important, Britain's more international orientation generated external economies of scale, which helped to create higher levels of productivity.

The German service sector does, nevertheless, throw up an important but exceptional case of high productivity before World War II. The railways did develop on the basis of modern business enterprise before 1914, but this has to be seen within the context of the development of heavy industry in Germany, which was already achieving higher labour productivity than in Britain before World War I (Broadberry and Burhop, 2005). The promotion of heavy industry, with its need for bulk transport, created the conditions for a high productivity railway system. However, the railways were wholly exceptional, and the rest of the German service sector was characterised by relatively low productivity. Note that this applies to the financial service sector, where a lot of attention has been focused on the German universal banks, singled out for praise by Gerschenkron (1962: 13-16). Note that if the German universal banks are seen as successful in channelling resources to heavy industry, they can equally be seen as depriving light industry of financial resources (Tilly, 1986). Note further that the banking sector also comprised public savings banks, credit co-operatives, mortgage banks and other small institutions, characterised by low productivity (Guinnane, 2002: 81).

Germany caught up with Britain in most services only after World War II, as the share of labour force in agriculture declined sharply and the share of the population living in towns converged on the British level. The convergence process was accompanied by high levels of physical and human capital accumulation in Germany.

2. Investment in physical and human capital

To reap the benefits of the industrialisation of services, it is necessary to make the required investments in physical and human capital. Sectoral data on physical capital are available for services on only a very limited basis before World War II, particularly on an internationally

comparable basis. The available data in Table 5 suggest some role for physical capital in explaining the sectoral labour productivity gaps, but still leave substantial total factor productivity (TFP) gaps that require explanation. A closer look at sales of office machinery in Table 6 suggests a substantial US superiority in this crucial aspect of investment in high-volume service provision.

Turning to human capital, it is important to consider both education and vocational training, and to distinguish between higher (university degree) and intermediate (between secondary school leaving and degree) level vocational training (Prais, 1995: 17). Dealing first with formal education, Table 7 presents data on enrolments in primary, secondary and higher education per 1000 population under age 20. Separate data for each of the three components are presented in Broadberry and Ghosal (2002) and Broadberry (2004b), but the aggregate is sufficient to illustrate the main points of the story. Both Germany and the United States had a general educational advantage over Britain for most of the nineteenth century, with the laggard Britain achieving universal primary education only towards the end of the century. Between the wars the United States moved to universal secondary education, which was only achieved in Britain and Germany after World War II. At this point, the United States moved to mass higher education, a point arrived at in Britain and Germany only in very recent years. It may be expected that differences in education would be more significant for services than industry, since the “three R’s” of reading, (w)riting and (a)rithmetic are of more direct relevance to the clerical work typical of commercial services throughout this period. There may also be a general advantage arising from high levels of education that goes beyond the specific knowledge taught in class, with pupils learning social skills, teamwork and flexibility (Goldin, 2001). This appears to be what Abramovitz (1986) had in mind when seeing education as a key measurable indicator of the “social capabilities” of nations.

However, the apparent British and German disadvantage in formal education for much of the twentieth century was offset by a much greater provision of vocational training than in the United States (Broadberry, 2004b). Here, however, there was a difference of emphasis between the higher and intermediate levels in the two countries. Britain led in the provision of higher level training through membership of professional organisations, particularly before World War II, and many of these professionals worked in the service sector. Britain's early lead in the provision of qualified higher level accountants is shown here in Table 8. Germany, by contrast, developed an impressive system of intermediate level training through apprenticeship, shown in Table 9. Although this was initially focused on industry, it was extended into service sectors, particularly after World War II.

Putting together the different types of human capital formation, it is unlikely that Britain suffered a substantial overall human capital disadvantage relative to either Germany or the United States before World War II, especially in services. But reliance on vocational rather than general education meant that Britain's strengths were in traditional rather than mechanised mass market services. However, after World War II, any higher level advantage that Britain had enjoyed over the United States in services from the large number of qualified members of professional associations was offset by the spread of mass higher education in the United States. In the comparison between Britain and Germany, however, the crucial development was the spread of intermediate level qualifications in German services, leading to the emergence of a substantial German human capital advantage by the 1970s.

3. Competition and the institutional framework

So far, we have focused on the proximate causes of the changing comparative productivity performance in services, highlighting relatively low rates of accumulation of physical and human capital in Britain. This, however, merely raises the issue of why rates of accumulation were low, and points to an examination of competition and the institutional framework. To see the importance of these factors, consider first why changing comparative productivity in services has contributed more than changing comparative productivity in industry to the explanation of changing comparative productivity performance overall. The reason for this is that services have typically been more sheltered from competitive pressures than industry. Although there have also been periods when protection and regulatory policies have slowed down the exit of inefficient firms in industry, in the long run competitive forces have acted more effectively in industry than in services. In much of the service sector, competition from providers located abroad is impossible, while in other parts, firms typically have to obtain licences to operate and are required to submit to a high degree of official regulation. In these heavily regulated sectors, collusion between providers has been common. Whereas British manufacturers that failed to keep up with productivity growth abroad were ultimately replaced by imports, there was no such possibility of replacing the bulk of Britain's service providers. Hence poor performance by service sector firms tends to show up in the productivity figures, while poor performance by industrial firms tends to show up in the sectoral composition of economic activity.

Different approaches to the competitive environment can also be seen as having an important effect on the relative size of sectors in the different economies, with knock-on effects for productivity performance. The different attitudes of Britain and Germany to the protection of agriculture before World War II illustrate this point effectively. Tariff protection in late nineteenth century Germany was designed to slow down the decline of

agriculture and accelerate the development of heavy industry. The alliance of “rye and iron” in the newly formed German Reich meant that proportionally, at least, services had to be the loser. While German agricultural tariffs staved off a “grain invasion” from the United States, and retained workers in a low-value-added activity, British free trade meant that consumers benefited from cheap imported food and had more income to spend on services, which could be provided more efficiently on a larger scale.

More fundamentally, different institutional frameworks affect the incentives to accumulate and innovate. Whereas US governments have generally taken a strongly pro-competitive stance since the emergence of large-scale modern business enterprise in the late nineteenth century, British and German governments have been more equivocal. Before World War II, cartels were widely accepted in Germany, and British policy can at times be described as pro-trust rather than anti-trust, particularly during the interwar period (Lucas, 1937; Broadberry and Crafts, 1990). After World War II, corporatist postwar settlements provided very different incentives for accumulation of physical and human capital in Germany and Britain (Eichengreen, 1996; Bean and Crafts, 1996). Although both Britain and Germany were more “corporatist” than the United States, the greater centralisation of unions and employers’ organisations in Germany provided stronger incentives for accumulation of human and physical capital than in Britain (Carlin, 1996). First, the greater degree of centralisation in Germany facilitated a collective solution to the free-rider problem in vocational training. Second, decentralised labour market organisations in Britain made it harder to deliver on agreements concerning investment in new technology and wage restraint (Bean and Crafts, 1996; Olson, 1982; Crouch, 1993).

IV. MODELLING THE INDUSTRIALISATION OF SERVICES

This section now discusses ways of modelling the key features of the industrialisation of services, highlighting the implications for comparative productivity performance. The model was originally presented formally in Broadberry and Ghosal (2005), but here only a diagrammatic exposition is used, to convey the intuition behind the results. An example, based on British shipping in the late nineteenth century will help to clarify the situation being considered. As Boyce (1995) notes, shipping ventures at the time were usually conducted by networks. A group of agents would each make an initial investment, which would allow the purchase of a ship and other necessary items. The aim of the venture might be to take a cargo between two cities (say London and Buenos Aires), find a cargo for the return voyage and then sell the ship or undertake another venture. Agents may bring different skills and commercial contacts as well as initial capital. However, it may be extremely difficult to centralise decision making, since it is not really possible to monitor the actions that agents need to take and to verify that they have been carried out. This leaves scope for opportunistic behaviour by individuals. Suppose, for example, that there are difficulties in finding a return cargo in Buenos Aires, which reduces the profitability of the venture. This may not be the fault of the agent on the ground in Buenos Aires, but it is very difficult and costly for the other agents to verify this. Group reputation and the associated persistence of group membership, however, can be used to provide a solution to the incentive problem and deter opportunistic behaviour.

Now consider the case where there has been an increase in the scale of business between London and Buenos Aires and an improvement in communications, so that agents in London can keep in continuous contact with agents in Buenos Aires by telephone. It may now be feasible to establish a regular scheduled service between the two ports, requiring an investment in a fleet of ships, the establishment of a bureaucracy to run the regular service

and a marketing organisation to secure sufficient demand to fill the capacity. The establishment of a shipping line can therefore be seen as requiring Chandler's (1977) three-pronged investment in production, management and marketing. The key development is the standardisation of the business and the possibility of moving to a hierarchical form of organisation. The industrialisation of services requires this dual shift in technology and organisation. The entrepreneur can now specify more closely the actions to be taken by agents and verify that they have been carried out. Wage contracts can be used to ensure that appropriate actions are taken by venture members.

The small-scale, one-off tramp shipping venture can be characterised as a "customised venture", which can be run efficiently by a network, where each agent is paid in proportion to his initial investment. Individual agents need to take actions to deal with participant-specific shocks and cannot be directed from the centre. Opportunistic behaviour therefore has to be deterred by a group reputation mechanism, as in Figure 5. A network member tempted to behave opportunistically has to weigh up the costs and benefits. The benefits B_c^N are a one-shot gain and hence do not vary with the discount factor δ . However, the costs C_c^N are borne into the future because of the consequences of the collapse of the venture for future income and utility. So long as agents do not discount the future too heavily and the discount factor lies above the critical value δ_c^N , opportunistic behaviour is deterred and a customised venture can be run efficiently by a network.

The large-scale shipping line can be characterised as a "standardised venture", which can be run efficiently by a hierarchy. Activities have been broken down into standard tasks, which can be monitored from the centre, so long as the entrepreneur is prepared to pay a

fixed cost to invest in a monitoring technology. Opportunistic behaviour can now be monitored directly from the centre, and the entrepreneur's task in Figure 6 is to pay a sufficiently high wage w^* to equate the net utility cost of choosing the appropriate action $nu(w)$ to the reservation utility (u_R). However, there is a problem of achieving sufficient scale of activity to cover the fixed costs of investing in the monitoring technology (M). Otherwise per capita venture output net of monitoring costs will be lower than w^* , and the hierarchy will not be feasible.

The link between the scale of activity and the transition to standardised ventures run by hierarchies is shown explicitly in Figure 7, where a point represents a particular combination of scale and monitoring cost. For a hierarchy to be feasible, the venture technology must lie to the south east of the feasibility constraint, which is upward sloping, since higher fixed costs must be spread over a larger scale of venture output. Note that a fall in monitoring costs, as well as an increase in scale, will favour the transition to hierarchy.

Figure 8 allows us to explore the issue of adjustment costs in moving from a network to a hierarchy. One way of thinking about this is in terms of a loss of autonomy, as network members submit themselves to centralised decision-making in a hierarchy. An alternative interpretation would be a requirement for extra education or training in a standardised venture. Either way, an extra utility cost G could raise the wage needed to ensure efficient production (w'^*) above the feasible wage, determined by the per capita product net of monitoring costs. This would prevent the switch from network to hierarchy.

The model captures a number of the basic features of productivity performance in services in Britain, the United States and Germany during much of the twentieth century.

First, the industrialisation of services began in the United States, with growing scale of activity and falling monitoring costs, starting on the railways and spreading to other market services. Second, Germany's response was slower than Britain's before World War II, as a result of lower levels of urbanisation in Germany, lower per capita incomes and a smaller degree of openness. As a result, there was a lower level of service sector activity in Germany, limiting the possibilities of the adoption of high-volume methods. Third, the British resistance to modern office technology can be seen as reflecting earlier British success in market services with older forms of organisation and technology. High British adjustment costs reflected low levels of education and high levels of unionisation.

V. SECTORAL STUDIES

Table 10 provides benchmark estimates of US/UK comparative labour productivity levels for market services at a more disaggregated level than in Table 3. These estimates show the spread of industrialised market services. The industrialisation of services began on the US railways, raising US labour productivity and resulting in the emergence of a US productivity lead. As the general business model spread to other parts of the transport and communications sector, US productivity leadership emerged there too. The slower spread of modern business enterprise to distribution and finance meant the slower emergence of a US productivity lead in those sectors. Table 11 provides benchmark estimates of Germany/UK comparative labour productivity levels at a lower level of aggregation than in Table 4. Apart from the railways, German catching-up in services was delayed until the shift out of agriculture after World War II.

1. Transport and communications

The industrialisation of services started on the US railways during the late nineteenth century (Chandler, 1977: 81-121). Unlike roads or canals, railways required centralised operation because steam locomotives moved much faster than horse-drawn wagons or barges and operated on a single track. As the length of track extended beyond what a single person could manage personally, the railway was divided into geographical divisions, and each division further subdivided by function. This led to the emergence of managerial hierarchies (Chandler, 1980: 16). The railways led to the emergence of a mass market in passenger transport as well as further reducing freight costs, with a mass railway passenger market appearing in Britain around 1870 (Leunig, 2005). Britain still had a labour productivity lead over the United States on the railways as late as 1870, but had been overtaken by the United States by 1890. By 1910, the United States had a more than two-to-one labour productivity advantage on the railways. It seems likely that geography played some role here, since average distances travelled by both freight and passengers were much greater in the United States, making the terminal handling elements of less importance. Nevertheless, productivity was also higher in Germany, where the geography was more similar. This high productivity of the German railways before World War II should be seen as exceptional, with the railways forming part of the modernised part of the German economy, centred on heavy industry.

The modern corporate form had spread to other parts of the US transport and communications sector by the beginning of the twentieth century, including steamship lines, urban traction systems and the telegraph and telephone systems (Chandler, 1977: 189-203). In shipping, small-scale tramp shipping ventures were increasingly replaced by large-scale shipping lines during the first half of the twentieth century. The British continued to dominate in tramp shipping, but the sector was becoming less important. In the more

industrialised liner shipping, British firms adopted a defensive strategy of shipping “conferences” with rebates offered to customers who used only conference members (Deakin, 1973). In communications, the telegraph and then the telephone systems were operated by big business before being nationalised, in 1870 and 1912, respectively (Ashworth, 1960: 117).

2. Distribution

The industrialisation of transport and communications was accompanied by the emergence of modern business enterprise in US distribution. In the distribution of agricultural produce, commodity dealers were beginning to buy directly from farmers and sell directly to processors, replacing commission merchants. In the marketing of manufactures, commission merchants were beginning to be replaced by full-line wholesalers (Chandler, 1980: 19-20). Also, from the 1880s, wholesalers were starting to lose ground to direct links between manufacturers and newly emerging mass retailers such as department stores, chain stores and mail-order houses (Chandler, 1980: 20). Nevertheless, modern business enterprise did not diffuse as quickly in distribution as in transport and communications, so we do not see the same early emergence of productivity gaps in distribution. In Britain, Jefferys (1954: 29-30, 73-74) finds that large-scale retailers, including department stores, multiples and co-operatives, accounted for just 13.5 per cent of sales in 1900, and had still reached only 38.5 per cent by 1950. Without modern conveniences such as refrigeration or personal transport, people had to shop locally and frequently. Furthermore, small local shops could not be competed out of business by more efficient large stores because of the system of resale price maintenance (RPM), which was widely practised in the United States as well as in Britain, where it was only significantly challenged from the 1960s (Field, 1996; McCraw, 1996; Yamey, 1966).

The low productivity of the German distribution sector before World War II reflects the low levels of urbanisation. Jefferys (1954) sees the growth of large-scale retailing in Britain as dependent on the existence of a large, steady and consistent demand from a relatively homogeneous urban working class. The much lower levels of urbanisation in Germany meant the persistence of a large number of small, general shops (Mataja, 1910: 246-247). Furthermore, when large-scale department stores, chain stores and consumer co-operatives threatened to take market share from Germany's small-scale retailers in the interwar period, the latter pressed for legislation to limit the growth of large-scale retailers (Kopper, 2002: 15-19). Department stores and chain stores were even demonised as part of a Jewish world conspiracy, and were held back by National Socialist legislation, including extra tax burdens and limits on discounts (Kopper, 2000: 35-38). However, a voluntary "Aryanisation" of boards saved the department stores from extinction (Homburg, 2000: 175-176).

3. Finance and insurance

In finance, one factor limiting the adoption of high volume methods and mechanisation was the importance of asymmetric information and trust in this sector (Stiglitz and Weiss, 1981; Lamoreaux, 1994). Although simple routines have been developed for assessing risks on relatively small transactions, reputation and personal contact have usually remained important on large transactions. Hence standardisation and mechanisation have proceeded cautiously in retail banking, while low-volume, high-margin business conducted through networks of personal contacts has continued to be important in investment banking (Ackrill and Hannah, 2001: 327-357; Jones, 1993). In US banking, the emergence of modern business enterprise was held back by regulation. In particular, regulations prevented the growth of interstate banking, keeping concentration relatively low (White, 2000). Calomiris (1995) also

cites the Glass-Steagall Act and Regulation Q as helping to keep American banks small by keeping apart retail and investment banking and by setting a ceiling on interest rates that could be paid on bank deposits. So the absence of a substantial US productivity advantage in this sector is not surprising. In Britain, where retail banking was highly concentrated from 1918, with the emergence of the “Big Five”, the slow pace of mechanisation can partly be seen as a cautious response to security issues, but it should be noted that the cartelised nature of the sector also removed competitive pressure on the banks (Griffiths, 1973).

In international finance, the City of London operated as a Marshallian District, comprising a large number of firms that were individually small but collectively reaped external economies of scale. Networks of trust formed an important part of this sector (Cassis, 1994). The City of London’s position as a centre of international finance was boosted after World War II despite the declining role of sterling as an international currency, by the regulatory environment in the United States, which led to the establishment of the Eurodollar market in London (Tew, 1977: 154-157; Collins, 1988: 374-376).

Large-scale composite insurers were slow to emerge before World War II, and industrialised provision of insurance was largely limited to “industrial life assurance”, where premiums were collected on a weekly basis, creating a mass market amongst wage earners (Cockerell and Green, 1994: 67; Morrah, 1955: 25). This brought the major industrial life assurance companies such as the Prudential into direct and sometimes fierce competition with friendly societies and burial societies, and indeed doorstep fights between rival agents of insurance companies and friendly societies were not unknown before the formation of the Industrial Life Offices Association in 1901 put a stop to the practice of transferring policies between societies (Cockerell and Green, 1994: 69). Marine insurance, which expanded to

cover aviation and other transport risks after World War II, has continued to be dominated by small private underwriters operating through Lloyd's in London (Supple, 1970: 523-524).

4. Developments since 1990

Whereas technological change during most of the twentieth century tended to favour standardisation and hierarchical organisation, the information and communications technology (ICT) revolution of the 1990s has tended to favour customisation and networks, whilst preserving the high volume and high productivity of industrialised services. In earlier periods, the trend towards standardisation and hierarchy occurred unevenly between sectors, and similarly, the information revolution has had an uneven impact on different sectors. To the extent that these changes tap into social capabilities that have remained strong in Britain, this should lead to an expectation of improved relative performance. To some extent, this expectation has been borne out, with Britain beginning to catch-up with continental European countries during the 1990s (O'Mahony and de Boer, 2002). However, with the new technology coming largely from the United States, Anglo-American productivity gaps have been slow to narrow.

As Brynjolfsson and Hitt (2000: 26) note, a fall of more than 99.9 per cent in the cost of automated information processing since the 1960s has had a dramatic impact on efficient work practices, restoring autonomy to individual workers. However, this has happened within an "industrialised" environment of high-volume and low-margin provision of services. In the "New Economy", many routine tasks have been automated, most workers perform their own clerical tasks using personal computers and email, and most workers have access through the use of networked computers and the internet to information that was previously only available centrally. It is in the technology-intensive service sectors that the impact has been

greatest. However, as with the earlier innovations favouring standardisation and hierarchical forms of organisation, conditions have varied between sectors, affecting the pace at which the new ICT technologies have been adopted. Bresnahan et al. (2002) argue that investment in information technology has been greater in organisations that are decentralised and have a greater investment in human capital, while Brynjolfsson et al. (1994) argue that greater levels of investment in information technology are also associated with smaller firms and less vertical integration.

One interesting development since 1990 has been the transformation of Germany from a country perceived as being at the forefront of technology adoption into a country widely seen as lagging in the adoption of ICT. Of course Germany has faced the difficulties of reunification, but there have also been suggestions that Germany's postwar emphasis on intermediate level vocational skills has produced an inflexibility in the face of radical technological change. It is tempting here to see echoes of the apparent British resistance to new technology during the earlier industrialisation of services, when Britain could be characterised as having a shortfall of general education offset by a high level of vocational training.

VI. CONCLUSIONS

Britain's loss of overall productivity leadership between the mid-nineteenth century and the late-twentieth century owes more to developments in services than in industry. Britain's position in the mid-nineteenth century was more precarious than is usually realised. As the first industrial nation, Britain had a small agricultural sector, and a correspondingly high share of the labour force in the relatively high-value-added industrial and service sectors.

However, British industry was labour intensive, and industrial labour productivity was substantially higher in the United States and just as high in Germany. Only in services did Britain have a labour productivity lead over both Germany and the United States, and this owed much to the high levels of urbanisation in Britain, allowing the development of a large and highly specialised service sector. This British advantage was bound to disappear once other countries industrialised and urbanised.

However, there was more to Britain's loss of productivity leadership in services than catching-up by the United States and Germany. Britain also fell behind during the industrialisation of services. The adoption of a standardised, high-volume, low-margin approach to business, with hierarchical management, began on the US railroads and spread out to other parts of the market service sector at varying rates. The institutional framework conditioned the response of British and German services to these developments, affecting the speed of adoption of the new technology and organisation. Before World War II, the earlier industrialisation of services in Britain than in Germany reflected the contrast between the decline of agriculture in Britain and its protection in Germany, which seriously delayed the development of services in Germany. After World War II, although Germany as well as Britain adopted a corporatist institutional framework, Germany's more centralised system provided a better set of incentives for accumulation of human and physical capital. Britain's relative economic decline has been stemmed since the adoption of a more competitive institutional framework in the 1980s and a return to a technological system favouring a more customised approach to service provision during the 1990s.

TABLE 1: Comparative US/UK labour productivity levels by sector, 1869/71 to 1990 (UK=100)

	Agriculture	Industry	Services	Aggregate economy
1869/71	86.9	153.6	85.9	89.8
1889/91	102.1	164.1	84.2	94.1
1909/11	103.2	193.2	107.4	117.7
1919/20	128.0	198.0	118.9	133.3
1929	109.7	222.7	121.2	139.4
1937	103.3	190.6	120.0	132.6
1950	126.0	243.5	140.8	166.9
1973	131.2	214.8	137.4	152.3
1990	151.1	163.0	129.6	133.0

Source: Derived from Broadberry (1997b).

Notes: Benchmark estimates of comparative productivity levels for 1937 are projected to other years using time series for output and employment from historical national accounting sources.

TABLE 2: Comparative Germany/UK labour productivity levels by sector, 1871 to 1990 (UK=100)

	Agriculture	Industry	Services	Aggregate economy
1871	55.7	91.7	62.8	59.5
1891	53.7	99.3	64.4	60.5
1911	67.3	127.7	73.4	75.5
1925	53.8	92.3	76.5	69.0
1929	56.9	97.1	82.3	74.1
1935	57.2	99.1	85.7	75.7
1950	41.2	91.8	83.2	74.4
1973	50.8	121.1	120.1	114.0
1990	75.4	111.0	134.9	125.4

Source: Derived from Broadberry (1997c).

Notes: Benchmark estimates of comparative productivity levels for 1935 are projected to other years using time series for output and employment from historical national accounting sources.

TABLE 3: Comparative US/UK labour productivity levels in market services, 1869/71 to 1990 (UK=100)

	Transport & Comm -unications	Distribution	Finance, prof. & pers. services
1869/71	110.0	66.9	64.1
1889/91	167.1	97.0	53.2
1909/11	217.4	120.0	77.9
1919/20	250.6	109.0	103.6
1929	231.5	121.9	101.5
1937	283.4	119.8	96.1
1950	348.4	135.2	111.5
1973	303.3	149.6	118.0
1990	270.5	166.0	101.0

Source: Derived from Broadberry (1997b).

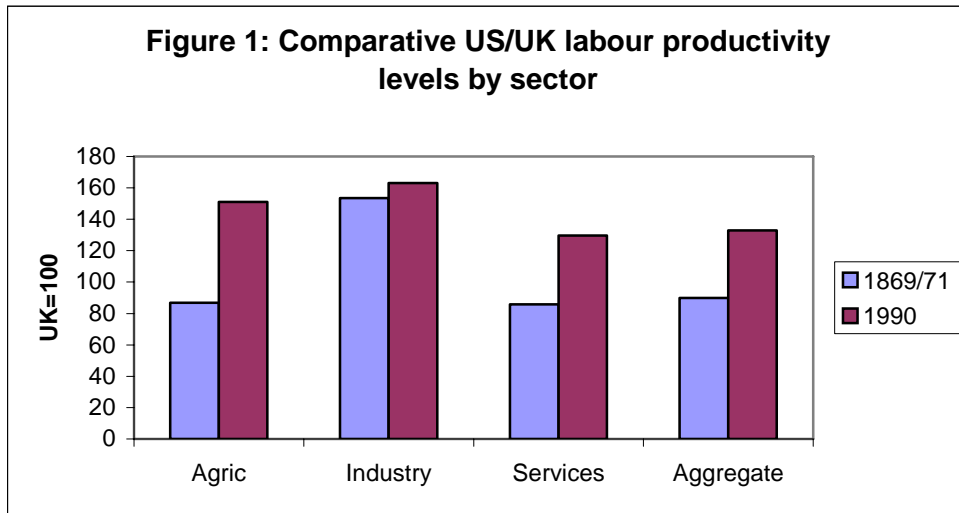
Notes: Benchmark estimates of comparative productivity levels for 1937 are projected to other years using time series for output and employment from historical national accounting sources.

TABLE 4: Comparative Germany/UK labour productivity levels in market services, 1871 to 1990 (UK=100)

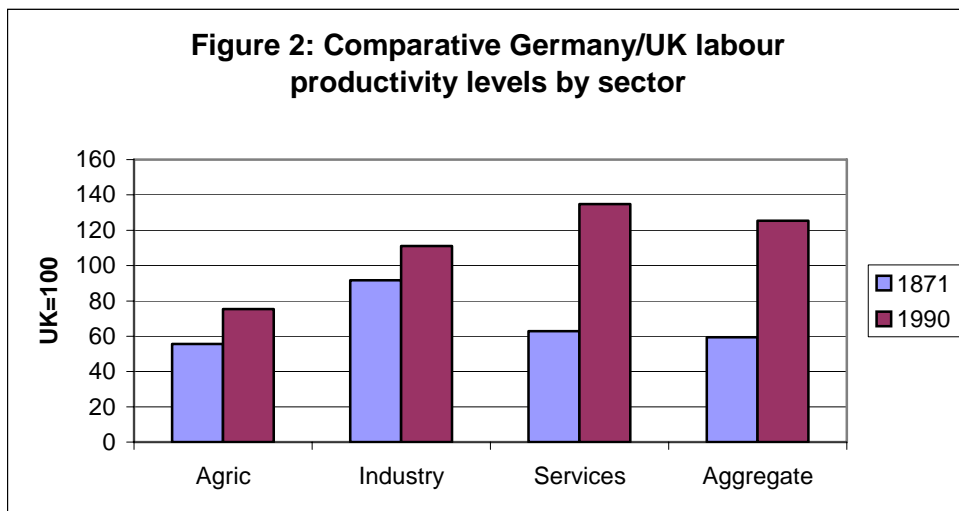
	Transport & comm -unications	Distribution & finance	Professional & personal services
1871	74.4	70.7	89.7
1891	113.5	45.9	77.0
1911	166.8	52.5	76.3
1925	140.0	47.1	86.7
1929	151.2	50.3	99.8
1935	132.4	54.3	105.6
1950	122.0	50.7	94.2
1973	119.5	88.0	98.4
1990	125.7	111.2	120.5

Source: Derived from Broadberry (1997c).

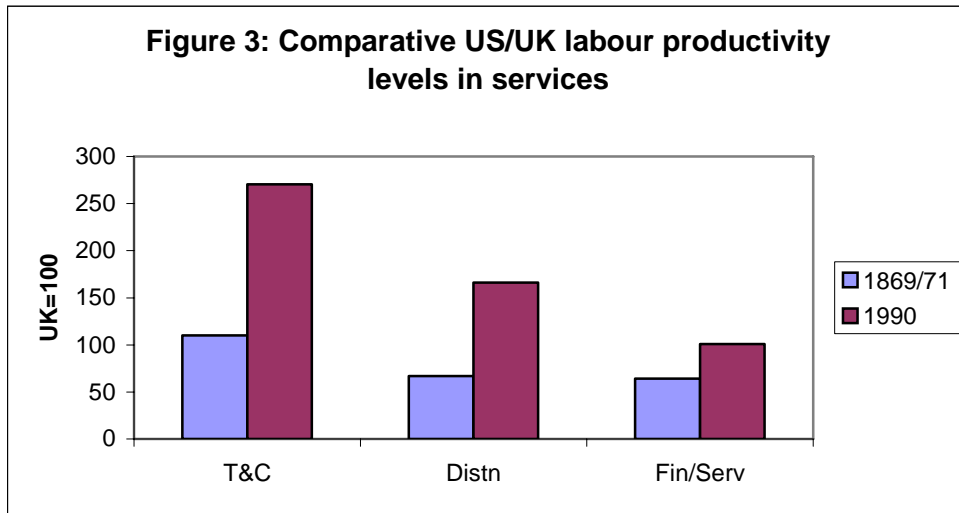
Notes: Benchmark estimates of comparative productivity levels for 1935 are projected to other years using time series for output and employment from historical national accounting sources.



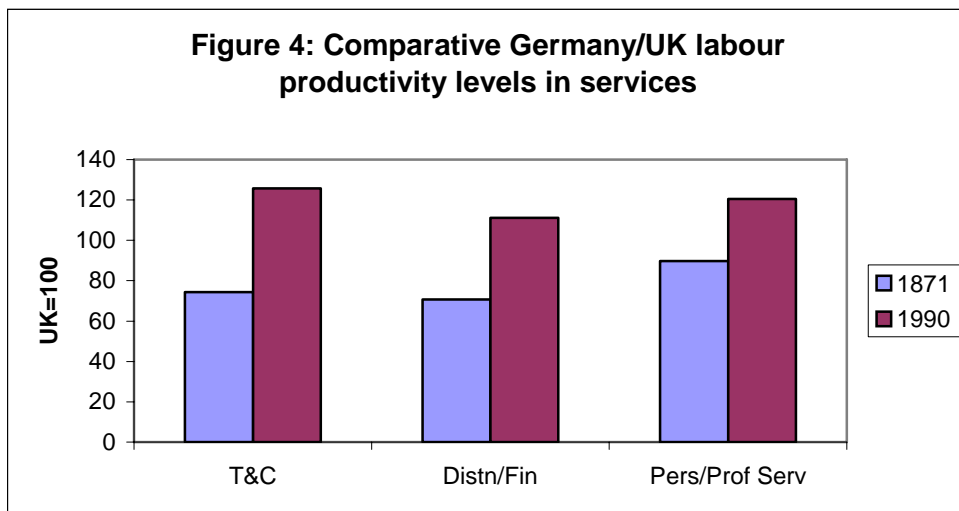
Source: Derived from Table 1



Source: Derived from Table 2



Source: Derived from Table 3



Source: Derived from Table 4

TABLE 5: Comparative US/UK and Germany/UK total factor productivity levels by sector, 1869/71 to 1990 (UK=100)**A. US/UK**

	Agriculture	Industry	Services	Aggregate economy
1869/71	99.5	154.2	86.5	95.2
1889/91	123.0	139.6	64.3	83.3
1909/11	118.7	150.9	71.6	90.5
1919/20	133.1	158.3	92.1	108.2
1929	118.0	187.8	92.0	112.7
1937	119.2	161.2	89.1	105.9
1950	132.6	217.6	110.2	138.1
1973	125.9	202.2	120.6	137.4
1990	138.8	157.3	119.8	125.3

B. Germany/UK

	Agriculture	Industry	Services	Aggregate economy
1871	58.4	90.5	67.2	61.6
1891	59.8	91.6	65.5	63.2
1911	71.6	106.1	76.4	75.4
1925	57.0	92.9	83.6	74.3
1929	59.3	96.0	90.0	78.5
1935	59.6	97.1	88.8	78.2
1950	44.7	89.4	89.3	76.2
1973	48.1	105.7	127.6	108.6
1990	65.4	98.5	139.0	116.5

Sources: Derived from Broadberry (1997b; 1997c; 1998).

TABLE 6: Office machine sales per 1000 population, 1908-1968

A. Typewriters (units)

	1908	1924	1930	1935	1948	1958	1968
UK	0.50	1.29	1.32	1.78	1.74	3.65	5.70
US	1.13	3.68	4.34	6.08	7.76	8.91	18.62
Germany					3.51	10.28	9.34

B. Cash registers, calculating machines and other office machinery (£ at constant 1929 prices)

	1930	1935	1948	1958	1968
UK	28.3	33.3	106.0	289.5	509.2
US	128.9	187.8	252.1	757.6	2,352.6
Germany		79.4	67.5	229.0	1,016.1

Source: Broadberry and Ghosal (2002: 982).

TABLE 7: Enrolments in primary, secondary and higher education per 1000 population under age 20

	Great Britain	United States	Germany
1870	118.6	394.8	375.0
1890	285.8	502.8	376.9
1910	389.0	518.2	385.6
1930	417.1	601.9	485.5
1950	496.2	586.8	469.8
1970	621.4	741.9	511.0
1990	659.0	838.5	577.8

Sources: Derived from Broadberry and Ghosal (2002: 986), Broadberry (2004b: 59) and Statistisches Bundesamt, *Statistisches Jahrbuch für die Bundesrepublik Deutschland*.

TABLE 8: Qualified higher level accountants

	UK	USA	Germany
1880	1,486		
1890	2,829		
1900	5,727	303	
1910	11,341	1,780	
1920	15,261	5,143	
1930	25,553	13,774	
1940	35,688	25,242	
1950	44,746	47,224	
1960	65,402	64,887	26,505

Source: Broadberry (2003: 118)

TABLE 9: Apprentices as a percentage of persons engaged

	Total economy			Services		
	GB	Germany	US	GB	Germany	US
1907	2.48	2.87	0.28	0.65	1.60	0.06
1925	2.54	3.18	0.34	0.50	0.40	0.06
1933		2.28	0.19		0.48	0.03
1951	1.87	4.75	0.26	0.59	3.89	0.03
1961	3.56	4.62	0.24	2.69	5.65	
1971	3.28	4.89	0.31	2.74	5.50	
1981	2.58	6.34	0.29	1.98	5.29	
1991		6.08	0.20		5.31	

Source: Broadberry (2003: 112)

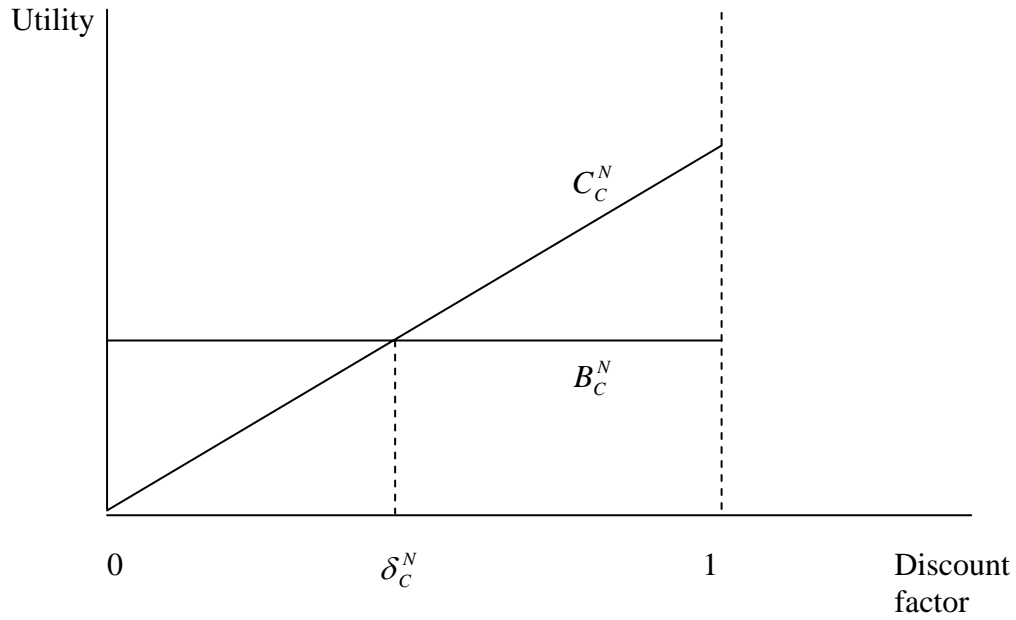
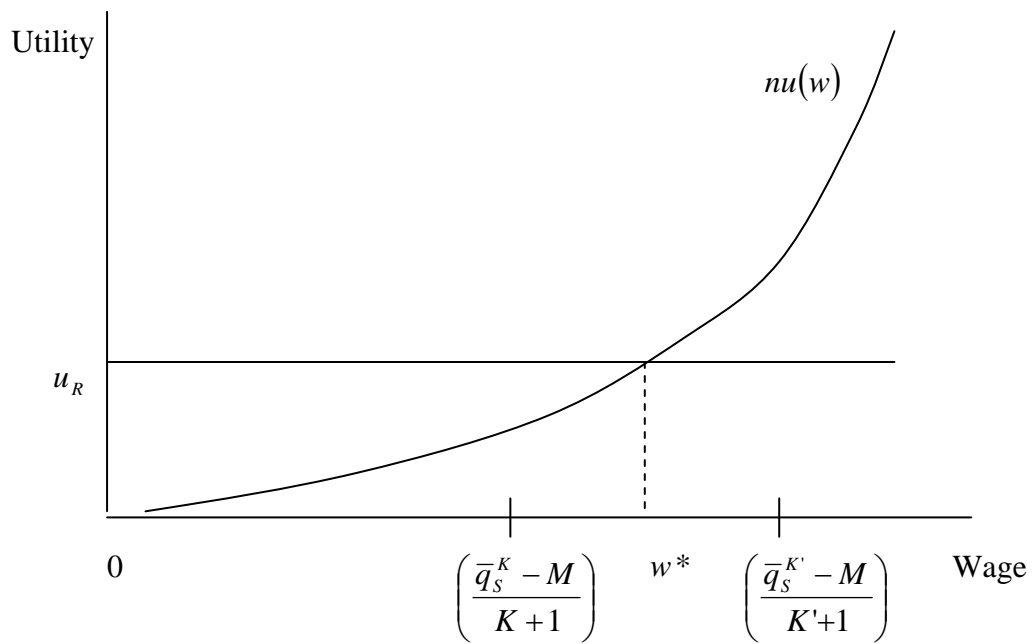
FIGURE 5: Customised venture**FIGURE 6: Standardised venture**

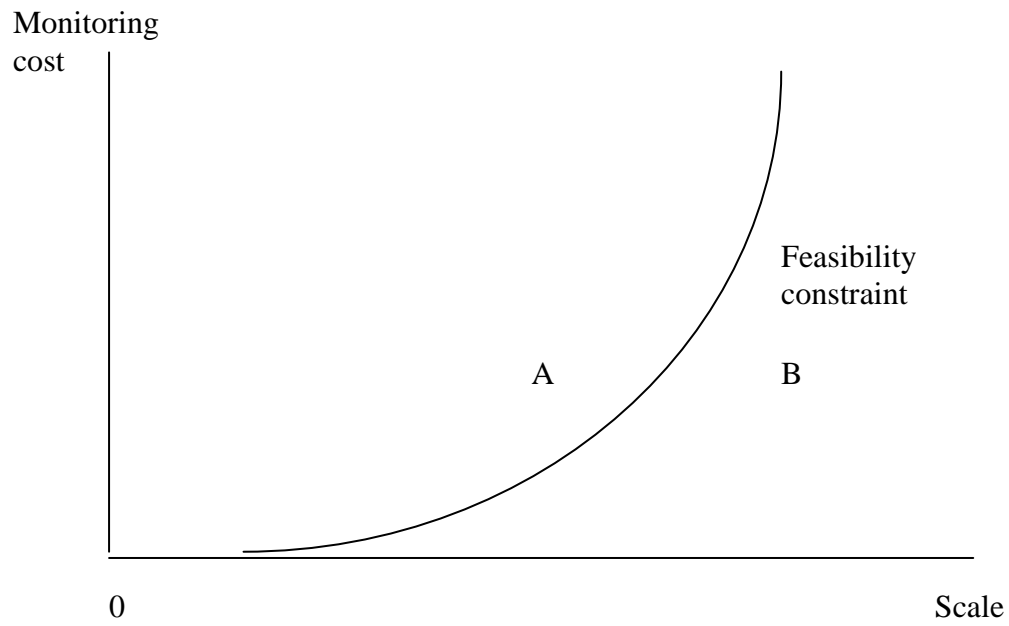
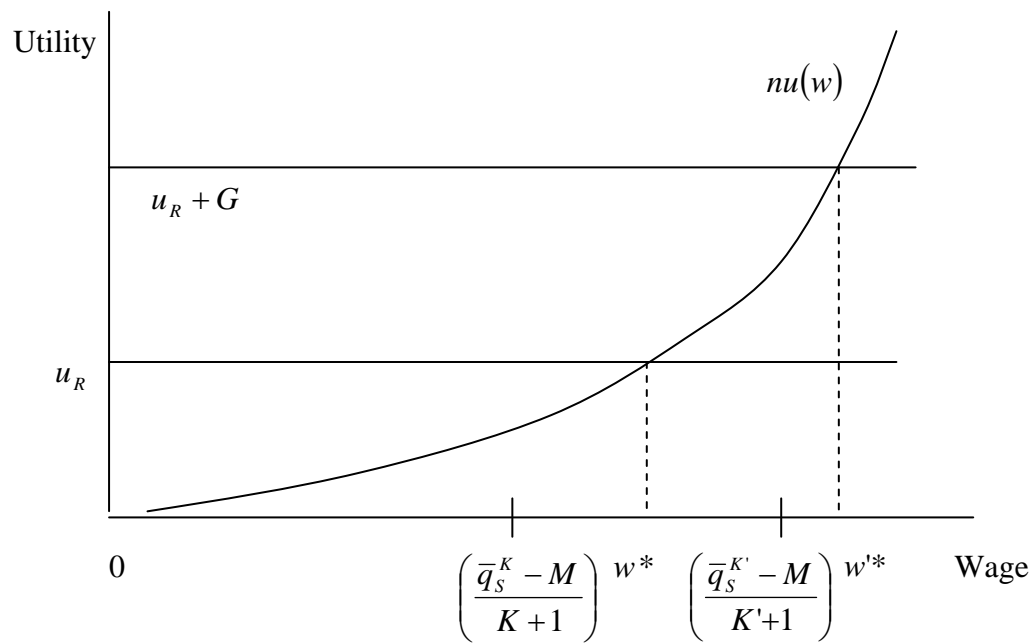
FIGURE 7: Interactions between scale and organisation**FIGURE 8: Adjustment costs**

TABLE 10: Benchmark estimates of US/UK comparative labour productivity levels in market services, 1870-1993 (UK=100)

	1870	1910	1930	1950	1968	1993
Railways	76	216	448	621	395	370
Road transport					167	
Shipping					170	
Air transport					152	
Communications		144	167	145	302	153
Total transport & communications		196	362	359	250	
Distribution		119		148		144
Finance	43	120	103	139		118
Total finance, prof. & pers. serv.		79	90	96		

Source: Broadberry (1997c).

TABLE 11: Benchmark estimates of comparative Germany/UK labour productivity levels in market services, 1935-1993 (UK=100)

	1935	1968	1973	1993
Railways	178.9	108.2		107.2
Road transport		129.8		
Shipping		190.0		
Air transport		113.0		
Communications	34.5	106.4		67.7
Total transport & communications	132.4	121.0		
Distribution	{54.3}		127.0	112.1
Finance				109.9
Prof./pers. services	105.6			

Source: Broadberry (1997b).

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