Productivity Growth in West Germany and the UK, 1950-1990.
A British Perspective

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1. Introduction

For most of the postwar period the British economy experienced a relative economic decline. Although growth and productivity were higher than at any time previously in the quarter century before OPEC I, other western countries far outperformed the UK with the result that by the 1960s slow British growth had become a major political worry and by the 1970s Britain had been overtaken in terms of GDP per person by much of the OECD. The late 1970s saw an apparent intensification of relative decline and on all major macroeconomic indicators (growth, inflation, unemployment) performance deteriorated culminating in the traumatic stagflationary recession of 1979-81.

By contrast the German experience was one of outstandingly rapid recovery from the war in the years of the Wirtschaftswunder followed by consolidation which maintained rapid economic growth together with low inflation and unemployment through to 1973 and came through the very difficult later 1970s as well, if not better, than the rest of Europe. In each of the successive periods 1950-64, 1965-73 and 1974-81 Germany had a much better record than the UK on growth and inflation and, despite the priority given to full employment by British politicians, in the last two periods Germany also had distinctly lower unemployment (Crafts and Woodward, 1991).

By the second half of the 1980s things looked rather different to many commentators. Certainly German inflation was still lower than that in Britain but on unemployment and especially on growth the favourable impact of the "Thatcher

Revolution" was frequently contrasted with a sclerotic German economy failing to embrace the benefits of supply-side reform. Newsweek proclaimed "Britain is back" while the Financial Times headed the first of a series on German economy "The Slow Man of Europe" (August 10, 1988).

Since the present concern is with productivity and thus growth it is appropriate to quantify these aspects of relative economic performance. Recent years have seen a notable research effort in this area, particularly by Maddison (1982) (1989) and his team at Groningen which is heavily reflected in Tables **1 and 2**.

Table 1a reports recent experience in growth of real output per worker employed abstracting from the government sector which is notoriously hard to measure accurately. Several well-known points figure prominently in the table. The UK has relatively low productivity growth prior to 1979 but in the 1979-88 business cycle moves up the league table while still not recapturing the growth rate of the 1960s. The general slowdown in productivity growth since the 1960s is apparent, as is the relatively sluggish productivity performance of the German economy after 1979 in contrast not only with the UK but also, of course, Japan.

Table 1b and Table 2 are concerned with productivity levels rather than growth and here measurement problems are rather greater. In particular, it is necessary to confront the index number problem of what prices to use in valuing output in different countries given that it is known that comparisons at prevailing exchange rates are often seriously misleading. There is room for some doubts on the details here, although the broad trends are probably quite reliable, and in **Table 2** I have presented alternative estimates resulting from the employment of rival methodologies, the pros and cons of which are well discussed in Kravis (1984) and Maddison and Van Ark (1988).

Britain's relative economic decline shows up clearly enough in these tables. Before World War II there emerged a major productivity gap with the USA while the European overtaking of the UK is clearly revealed as a new development of the 1960s and 1970s. Some evidence of at least a temporary reversal of this long run tendency since 1979 can also be seen. The huge American productivity lead of the 1950s over the rest of the OECD has been much reduced. The very strong German performance in manufacturing through 1979 is notable and at the end of the 1980s

Table I

Productivity Performance in Advanced Countries

a. Labour Productivity Growth in the Business Sector. (% per year)

	1960-73	1973-79	1979-88
Japan	8.6	3.0	3.2
France	5.4	3.0	2.6
UK	3.6	1.5	2.4
Belgium	5.3	2.8	2.3
Sweden	4.1	1.5	1.8
Denmark	4.3	2.6	1.7
Italy	6.3	3.0	1.6
Netherlands	4.8	2.7	1.6
Germany	4.5	3.1	1.6
USA	2.2	0.0	0.8

Source: OECD Economic Outlook, June 1990.

b. Relative Levels of Real GDP per Hour Worked. (UK = 100)

	France	Germany	USA
1870	48	50	97
1890	49	55	113
1913	60	65	135
1929	70	65	158
1938	82	73	154
1950	70	54	185
1960	84	84	188
1973	105	100	156
1979	114	113	150
1986	119	105	133

Source: derived from Madison (1989).

Table 2

Manufacturing Output Per Hour Worked. (UK = 100)

Basis:	Industry of Origin				Expenditure			
	France	Germany	Japan	USA	France	Germany	Japan	USA
1911	60	85		172				
1929	61	76		235				
1937	56[a]	76		197				
1950	64	74		247				
1960	81	105		242	103	118	50	242
1973	113	133	125[b]	220	134	145	105	212
1979	142	162		226	166	173	133	214
1988	126	137	175[c]	207	147[d]	146[d]	139[d]	195

Notes:
a: 1938; b: 1975; c: 1985; d: 1987

Sources: based on Broadberry (1990), Hooper and Larin (1989), Szirmai and Pilat (1990) and Van Ark (1990).

Table 3

Share of World Manufactured Exports (%)

	1950	1960	1970	1979	1988
France	9.9	9.6	8.7	10.5	9.1
Germany	7.3	19.3	19.8	20.9	20.6
Japan	3.4	6.9	11.7	13.7	18.1
UK	25.5	16.5	10.8	9.1	8.3
USA	27.3	21.6	18.6	16.0	14.9

Sources: Brown and Sheriff (1979) and DTI (1989).

there still seems to have been a sizeable productivity gap between Germany and Britain. On the other hand, Japan may well have overtaken both Germany and Britain in the past 20 years in manufacturing productivity. It is also worth noting that the British lag relative to Germany has come predominantly in manufacturing; comparison of Table 1b with Table 2 implies that in services, even in the 1970s, there was little or no productivity gap between the UK and Germany.

Germany's lead over Britain in manufacturing productivity has been accompanied by a lesser tendency to deindustrialization of the labour force and a much larger share of manufactured exports. In 1987 29.8% of British employment was in industry with 67.8% in services whereas in West Germany the percentages were 40.5 and 54.3 respectively. In 1970 the share of industrial employment was 44.8% in the UK and 48.5% in West Germany. **Table 3** shows a sustained high German share of world manufactured exports which contrasts with a marked fall in the UK's share which has not been reversed in the 1980s. It should, however, be remembered that the British balance of payments position has been affected by developments in other sectors, notably oil but also agriculture (Rowthorn and Wells, 1987).

In seeking to understand the different productivity performances of Britain and Germany it may be useful to examine the pre- and post-1979 experiences separately but it is more important to recognize that the two periods help to illuminate each other. Thus, in examining the 1980s, it is helpful to ask which of the factors making for faster German growth previously had altered and whether the change is likely to be permanent. Similarly, in discriminating between explanations of relative British economic decline during the "Golden Age", its reversal during the 1980s gives valuable guidance which has not generally been integrated even into well-received textbook accounts such as Alford (1988).

Hypotheses to explain the superior German productivity growth of the 1950s through the 1970s can conveniently be grouped in three categories for my purposes, as follows:

1) catch-up and reconstruction
2) structural aspects of the macroeconomy
3) institutional differences.

These are, of course, not mutually exclusive and the goal of research is to establish their relative importance.

The catch-up hypothesis has been well set out by Abramovitz (1986) and Feinstein (1990). They stress a tendency towards ultimate convergence of productivity levels among OECD countries, as predicted by simple neoclassical models, and predict that growth will be a positive function of the size of the productivity gap between a country and the leading country of the time. In this view much of the recent European slowdown in productivity growth comes as a result of the elimination of most of the gap between Europe and the United States. Moreover, the relatively poor performance of the UK in the 1950s and 1960s and its relative improvement in the 1980s are also seen to stem largely from this source. In the German case catch-up is often seen as especially rapid in the early postwar period because of the recovery from war-induced shocks to a normal growth path during a period of reconstruction, although the length and strength of this effect are disputed somewhat (Abelshauser, 1983; Brems, 1983; Dumke, 1990; Rohwer, 1988).

The macrostructural analyses were especially popular during the 1960s and 1970s and come in several variants. Perhaps the most important in the context of Anglo-German comparisons looks to a different balance of payments constraint on growth. Hennings (1982) stresses the role of export-led growth for Germany while Thirlwall (1986, ch.11) is a good version of the argument that balance of payments problems have seriously impeded British growth. While some accounts stress the contrast between a generally undervalued and a generally overvalued exchange rate per se, the most powerful version of the hypothesis emphasizes the advantage of a higher world income elasticity of demand for German than for British exports in permitting steady, fast growth (Thirlwall, 1979).

There are, of course, a wide variety of potential supply-side differences which may seem to affect growth and productivity. Among the factors which seemed to vary significantly in Germany's favour at least prior to 1979 it has been argued were the stifling effects of too large a government sector in the UK (Bacon and Eltis, 1976), the skills and training of the workforce (Prais, 1981), the contrasting industrial relations systems of the two countries (Batstone, 1986), the qualifications and abilities of management (Swords-Isherford, 1980) and a different level of commitment to effective research and development (Patel and Pavitt, 1987b). Of course, these arguments are not new - they were certainly well-known to British policymakers of the 1960s.

If these supply-side differences did matter in the long run, then institutional arrangements must have played a significant part in that, in economists' terms, there were market failures which were more serious in Britain than in Germany and/or were less well corrected by government. In other words it needs to be spelled out why pursuit of rational self-interest failed to prevent relative economic decline. One obvious possibility is the difference in capital market arrangements between the two countries (Franks and Meyer, 1990). Another is the Olson (1982) hypothesis that stable democracies develop a large number of special interest groups which retard growth and induce "sclerotic tendencies"; given the Nazi period and the outcome of the war, early in the postwar period this would have affected Britain more than Germany but by the 1980s this was perhaps less the case.

Discussion of the post-1979 period is, of course, found in many of the items cited above. Both the sclerosis and the catch-up hypotheses would purport to explain at least some of the change in relative performance in this period. The added, and controversial ingredient, is how much was contributed by the vigorous attempt to reform the British supply-side and whether this amounts to anything more than a temporary catch-up induced by an one-off shock. What is not at issue is that this episode was one of marked contrast in governmental approaches to the productivity problem; despite the initial rhetoric, structural and political constraints have prevented Chancellor Kohl "from enacting more than a half-hearted imitation of the Thatcherite model" (Humphreys, 1989, p.128).

2. Catch-up, Convergence and Reconstruction.

Regression analysis offers a way of normalizing growth performance for the impact of catch-up and reconstruction. I shall follow a procedure similar to that of Dowrick and Nguyen (1989) and Dumke (1990). The approach allows for the impact on output growth of investment and employment growth and models the catch-up and reconstruction effects as raising total factor productivity. The residuals from the regression provide an estimate of the relative success of institutional factors in promoting growth. The potential for catch-up in the regressions is proxied by the logarithm of initial real GDP per hour worked relative to the USA (Loglag) and reconstruction effect by variables relating prewar to immediate postwar income levels.

The estimated equation [1] is

$$\Delta Y/Y = \underset{(5.231)}{6.054} + \underset{(4.686)}{0.090}\, I/Y + \underset{(7.751)}{0.861}\, \text{Empt} - \underset{(-4.941)}{1.350}\, \text{Loglag}$$

$$+ \underset{(1.722)}{1.281}\, \text{RELYPW} - \underset{(-2.509)}{1.282}\, \text{RELYPWSQ} + \underset{(5.267)}{1.450}\, \text{DUM50s}$$

$$+ \underset{(8.240)}{2.280}\, \text{DUM60s} \qquad R^2 = 0.827;\ N = 71.$$

The main findings derived from this equation are reported for selected countries in **Table 4**. (The results for 1979-88 are based on the estimated equation and the values of the independent variables for this period rather than being separately estimated.) Column (3) reports the estimated catch-up and reconstruction bonus calculated relative to the United States where these effects are taken to be zero. The impact is large in the 1950s, especially for the defeated countries, as Dumke (1990) stressed, and a considerable part of the slowdown in productivity growth in recent years, particularly in Germany, seems to have come from the exhaustion of these opportunities.

Allowing for these effects is obviously important in comparing British and German growth but it appears that the turnaround of the 1980s is by no means fully explicable this way. Column (4) reinforces this point - the UK did much worse than might have been expected in the 1950-73 period but much better in 1979-88, prima facie evidence of some success for the Thatcher reforms. Any evidence of outstandingly good performance arising from German institutional arrangements is on the evidence of column (4) confined to the 1950s.

Finally, column (2) suggests that lower investment in the UK could be expected to explain some part of the lower growth of the 1950-73 period and in the 1960s may have mattered more than catch-up potential. In the 1980s, as other countries including Germany experienced greater falls in I/Y than did the UK the expected differential from this factor lessened somewhat.

Table 4

Growth Rate of Real GDP/Hour Worked: Actual, Contribution of Investment, Bonus from Catch-Up and Reconstruction, and Residual

	Actual	Investment	Bonus	Residual
1950-60				
Japan	5.8	1.7	4.0	0.37
France	4.5	2.1	2.1	0.19
UK	2.3	1.3	1.6	-0.80
Belgium	3.2	1.6	2.1	-0.66
Sweden	3.5	2.0	1.3	0.05
Denmark	3.1	2.4	1.9	-1.41
Italy	4.2	1.7	2.4	0.16
Netherlands	4.1	2.2	1.9	-0.16
Germany	7.0	2.1	2.9	1.97
USA	2.4	1.6	0.0	0.69
1960-73				
Japan	9.9	3.2	2.2	2.17
France	5.5	2.1	1.0	0.58
UK	3.8	1.7	0.8	-0.63
Belgium	5.3	1.9	1.1	0.31
Sweden	4.7	2.1	0.8	0.33
Denmark	5.2	2.1	1.1	0.09
Italy	6.4	2.2	1.2	0.83
Netherlands	4.6	2.2	0.8	-0.33
Germany	5.3	2.2	1.0	-0.34
USA	2.5	1.6	0.0	0.07
1979-88				
Japan	3.5	2.6	0.9	0.16
France	3.2	1.9	0.3	1.10
UK	2.8	1.6	0.5	0.84
Belgium	2.7	1.6	0.4	0.80
Sweden	1.3	1.7	0.3	-0.30
Denmark	1.0	1.6	0.6	-0.92
Italy	2.2	1.9	0.4	0.07
Netherlands	2.6	1.8	0.2	0.58
Germany	2.2	1.9	0.3	0.09
USA	1.8	1.6	0.0	0.26

Sources: derived from the equations in the Text based on data in Maddison (1982) (1989), Mitchell (1981) (1983) and OECD (1990b).

3. Macrostructural Hypotheses

The basic source of the balance of payments constraint on growth is usually portrayed by the following simple formula [2]

$$\Delta Y/Y_h = (\Delta Y/Y_{rw} \cdot e_x) / e_m$$

The formula shows the home growth rate consistent with balance in external payments, if there are no changes in the real exchange rate (international competitiveness). This will be less, and the worse will tend to be stop-go problems, the lower is e_x relative to e_m. If, in addition, as Kaldor (1966) supposed, productivity growth in manufacturing is enhanced by faster output growth, a vicious circle argument can be developed in which slow growth arising from a tight balance of payments constraint retards productivity growth which in turn reduces the prospect of loosening the constraint through increased competitiveness etc..

Export volume certainly grew much more slowly for Britain at 4.1% per year than for Germany at 10.8% per year during 1951-73. Early estimates of income elasticities seemed to suggest major differences between Germany and the UK particularly in terms of e_x; Houthakker and Magee's (1969) estimates were 2.08 for Germany and only 0.86 for the UK. More sophisticated recent work has rejected these results, however, and in effect sees most of the greater German export growth as a reflection of supply-side factors endogenous to the two countries rather than exogenous demand conditions. Moreover, the 1980s has not seen a switch to more favourable elasticities for the UK relative to Germany. Thus the OECD estimates the mid 1970s value for $e_x - e_m$ as 0.18 for Germany and -0.11 for the UK and the mid 1980s values as 0.17 and -0.16 respectively (1989b, p. 129).

Empirical research has also not been very supportive of other aspects of the arguments outlined above. For example, despite the agonizing of the time over stop-go, detailed study demonstrated that the UK experienced decidedly milder fluctuations than the fast growing economies (NEDO, 1976a). Perhaps more seriously, Chatterji and Wickens (1982) (1983), showed that time series evidence denied Kaldor's (Verdoorn's Law) proposition that there was any long run relationship running from faster growth of output to productivity in manufacturing in most major economies including Britain and Germany during the 1960s and 1970s.

All in all it seems reasonable to suggest that the macrostructural accounts of growth differences between countries are largely unpersuasive as applied to the UK and Germany.

4. Supply - Side Factors.

4.1. The Bacon and Eltis Hypothesis.

An argument with great appeal to the British Conservative Party is that the sheer size of government spending has been a major impediment to growth in the UK particularly through the associated high tax burden and through the effective crowding out of private sector investment. Bacon and Eltis (1976) provided a well-known model of this latter hypothesis and in their analysis the growth of the state sector created a profits squeeze, as workers successfully passed on the higher taxes imposed, which lowered investment and thus growth.

This model is not, however, very convincing either in terms of explaining difference in growth rates over time or across countries. Two quite important reasons appear in **Table 5**. First, it is clear that the British government budget was of similar size to that of other European countries in the 1960s and second, the recov-

Table 5

Government Outlays and Employment

	Government Outlays (% GDP)			Government Employment (% employment)			
	1960-73	1974-79	1980-88	1960	1975	1980	1986
France	38.0	43.3	50.6	13.1	14.3	15.6	18.1
Germany	37.5	47.5	47.8	8.0	13.9	14.9	16.1
Japan	19.5	28.4	33.2	na	6.5	6.7	6.4
UK	36.8	44.3	46.3	14.8	20.8	21.1	21.8
USA	29.5	32.6	35.9	15.7	17.8	16.5	15.8

Source: OECD (1970), (1989b).

ery in productivity growth in the Thatcher period has not been based on a reduction in government outlays as a share of GDP.

Further consideration of the crowding out hypothesis also tends to reject the Bacon and Eltis model. Crafts (1991a) shows that over the long run in the UK the growth of government activity has displaced not privately financed investment but privately financed consumption. Evidence for the period 1964-79 shows that investment as a share of manufacturing output was very similar in the UK and Germany (Hill, 1979); the difference between the economies much more in the productivity of investment. Thus in 1958-72 the increase in net output per unit of investment in Germany was 1.9 times that in the UK (CBI, 1977). Finally, in Europe as a whole but in Britain in particular, the profits squeeze of the 1970s has been seen to

Table 6

Fixed Capital Formation as a Share of GDP (%)

	1960-73	1979-88
Australia	25.3	24.4
Austria	27.0	23.6
Belgium	21.6	17.5
Canada	22.5	21.6
Denmark	23.8	18.2
Finland	26.6	24.5
France	23.8	20.6
Germany	24.9	20.6
Italy	24.6	21.5
Japan	36.1	29.4
Netherlands	25.0	19.7
Norway	28.6	26.5
Sweden	23.6	18.8
Switzerland	28.0	24.0
UK	18.4	17.4
USA	18.2	18.1

Source: OECD (1990b)

to be a temporary phenomenon such that by the second half of the 1980s the share of profits was back to the level of the mid 1960s.

The 1980s has been a period of generally lower investment rates, as Table 6 reports, in which the gap in investment rates between Britain and other European countries narrowed. This case needs to be refined in the British case, however, to take account of a large shift in the composition of investment. The small fall in I/Y in the UK was entirely due to a declining rate of government investment as private investment sector rose from 10.8% of GDP in 1960-73 to 13.6% 1979-88 and the level of real private investment in 1989 was 71.5% higher than in 1979 (Economic Trends, 1990). Given the dubious quality of British public sector investment decisions in the 1960s and 1970s this switch has probably been favourable to growth and represents an important change which was not, however, contingent on reducing government outlays.

4.2. Education and Training

A very longstanding criticism of Britain is that its education and training system has been markedly inferior to that of Germany in terms of educational standards, output of engineers and technologists, production of vocationally trained workers etc. Such complaints can be found in each generation since the 1860s (NEDO, 1983a; Sanderson, 1988) and the relative weakness of industrial training in Britain was well documented in Ministry of Labour reports in the early postwar period (Sheldrake and Vickerstaff, 1987, pp. 29-31). **Table 7** provides some indicative statistics.

There is no doubt that the German system was distinctly superior to the British in the 1960s and 1970s and equally it is clear that no-one would attribute the relative improvement in British productivity growth in the 1980s to a relative advance in British human capital formation. For example, Prais and Wagner (1985, p.64) report that for the lower half of the ability range English secondary school pupils were about two years behind their German counterparts in both 1964 and 1984; the same authors (1988, p. 41) note that the main supervisory qualification for British foremen is still taken by only about 15% of those taking the German Meister qualification.

Table 7

Education and Training: Some Comparisons

a. Enrolment Rates for 15 - 19 Years Age Group in 1986-87 (%)

Australia	49.3 (a)	Italy	na
Austria	na	Japan	71.0 (a)
Belgium	78.6	Netherlands	72.8
Canada	72.7	Norway	72.8
Denmark	76.0	Sweden	64.5
Finland	72.0	Switzerland	77.6
France	73.4	UK	54.3
Germany	76.2	USA	78.8

Source: OECD (1989c, Chart VB)

b. Share of Labour Force with Intermediate Vocational Qualifications

	1979	1988
France	32	40
Germany	61	64
UK	23	26(b)

Sources: NEDO (1983a); Steedman (1990)

c. Numbers Qualifying in Engineering, c. 1985. (thousands)

	PhD	MSc (c)	BSc	Technicians	Craftsmen
France	0.3	6	15	35	92
Germany	1.0	4	21	44	120
UK	0.7	2	14	29	35

Source: Prais (1988)

Notes.

a. Not including Third Level enrolments.
b. On a comparable basis including only examined qualifications would be 19 (Steedman, 1990, p. 52).
c. Includes "enhanced" bachelor degrees.

What is extremely hard to quantify, however, is the impact that education and training systems actually have on productivity. Different methodologies produce varying results none of which should be given too much credence. The traditional growth accounting approach (Denison, 1967) measured the contribution of education by years of schooling weighted for their apparent effect on earnings a procedure which concludes that very little of the differences in growth rates or productivity levels between countries came from this source (Crafts (1991b) gives more details). This is in effect, however, to take a narrow and restrictive view - no allowance is made for quality of education or vocational training or externalities.

By contrast, econometric and case study comparisons at industry level have tended to find much bigger roles for human capital variables in explaining productivity gaps. Several reports from NIESR have suggested large impacts on relative productivity levels in Britain and Germany accruing from skills differences; for example, a gap of 63% in the metal working trades was found to result almost entirely from a lack of technical expertise and training above all at the foreman level (Daly et al., 1985). Davies and Caves's regression analysis of 1967/68 Anglo-American productivity found that equalizing educational inputs to the labour force would have removed about 22% of the productivity gap. Unfortunately, it is not clear that the observed outcomes are simply the result of differences in formal education and training arrangements per se or really reflect "shop-floor politics". Indeed few firms, in Britain at least, appear to have any idea of the rate of return on training expenditures and in 1987 only 19% are reported as trying to assess the benefits of these investments (Department of Employment, 1989).

4.3. Research and Development and the Capital Market

Measured as a proportion of GDP British expenditure on research and development exceeded that of Germany until the mid 1970s and was high by international standards, as **Table 8** reports.

The effectiveness of this greater R & D effort can be seriously questioned, however. A relatively high fraction of British expenditure was by government, was unduly concentrated on defence related sectors (Freeman, 1982; Pavitt, 1976) while the growth of industry financed R & D relative to output or profits was much slower than in Germany (Patel and Pavitt, 1987b). NEDO concluded that "The UK put emphasis on science and in particular "big science"...at the expense of engineering. The sectoral distribution of R & D efforts appears inappropriate to patterns of world demand and export growth" (1983b).

As **Table 8** shows, the outcome was a decline in patenting relative to Germany. The impact of this on comparative growth rates should not be thought necessarily to be very large, however. Englander and Mittelstadt (1988) find that an increase of 1 percentage point in the growth rate of the stock of R & D raises output growth in OECD countries by 0.05 percentage points approximately. This suggests that during the 1960s and 1970s the faster growth in R & D in Germany would be expected per se to have accounted for perhaps 0.3 percentage points of the German growth advantage over the UK. There is, however, considerable evidence to suggest that trade performance has been strongly affected by these relative levels of R & D expenditures (Mayes and Buxton, 1988).

A recent assessment of technological activity concluded that Germany was a strong performer with a dynamic system compared with the relatively myotic system in the UK (Patel and Pavitt, 1988). This judgement was based on managerial capabilities, educational standards, established in-house expertise and commitment to particular technologies against a background of capital market institutions less prone to short-termism. Together with the data in Table 8 this suggests that it is unlikely that the improvement in British economic growth relative to Germany has been based on enhanced technological capabilities. Similarly, Porter's celebrated (1990) investigation of international competitiveness concluded that Germany was still far ahead of Britain in most major industries, a conclusion supported by **Table 9.**

An important reason for differences in private sector investment in R & D between Britain and Germany may be found in the capital market. This is for two reasons. First, both in the 1970s and still recently the relative cost of capital for long term R & D projects has been about 60% higher in the UK than in Germany (McCauley and Zimmer, 1989). Second, there is a high level of hostile take-over activity in the UK but not in Germany. The British arrangements might be thought relatively more likely to correct managerial failure but less likely to encourage managers loath to lose the benefits of firm-specific investments through a change in ownership to forego current earnings for long term R & D (Franks and Mayer, 1990).

Table 8

Research and Development and Patenting

a. Expenditure on R & D as a Share of GDP (%)

	1970	1980	1988
Australia	1.23	0.98	1 19
Austria	0.61	1 10	1.32
Belgium	1.31	1.36	1.61
Canada	1.36	1 15	1.32
Denmark	0.96	1.04	1.43
Finland	0.78	1.07	1.76
France	1.91	1.84	2.31
Germany	2.06	2.41	2.83
Italy	0.88	0.86	1.34
Japan	1.85	2.18	2.92
Netherlands	2.01	1.89	2.30
Norway	1 10	1.27	1.81
Sweden	na	na	2.99
Switzerland	2.25	2.31	2.88
UK	2.18	2.24	2.27
USA	2.65	2.39	2.86

Sources: Englander and Mittelstadt (1988, Table 14) and OECD (1990c, Table 5)

b. Share of Western European Patents in the USA (%)

	1965	1973	1979	1985
France	13.8	14.7	14.5	15.2
Germany	33.3	38.1	40.9	42.2
UK	26.0	19.7	17.3	15.8

Sources: Pavitt and Soete (1982); Patel and Pavitt (1987a)

In practise, the effectiveness of German banks as monitors of company performance (Cable, 1985) and the apparent ineffectiveness of the British takeover mechanism in singling out poor performers and leading to efficiency gains post-merger (Cowling et al., 1980; Meeks, 1977; Singh, 1975) may have made the German capital market unambiguously superior, at least during the 1960s and 1970s. Indeed the ineffectiveness of the British capital market in eliminating bad management may well be a major factor in explaining the persistence of poor performance in the UK for so many decades.

Table 9

Relative Sectoral Productivity in German Manufacturing, 1987 (UK = 100)

Electrical & Electronic	154	Office & DP Machines	122
Chemical/Pharmaceutical	139	Transport Equipment	261
Food, Drink and Tobacco	84	Paper and Printing	177
Machinery	230	Metal Products	142
Ferrous & Non Ferrous M.	139	Textiles/Clothing	120
Non-Metallic Minerals	178		
		Total	**155**

Source: Emerson (1988, Table 1.1.3)

4.4 Industrial Relations

The industrial relations system in the UK during the 1950s to the 1970s has generally been regarded as distinctly less conducive to high productivity than that of Germany. **Table 10**, for example, finds that "behavioural causes", essentially stemming from industrial relations, accounted for nearly half the Anglo-German productivity gap experienced by companies operating in both countries. These estimates are essentially impressionistic but they are supported by very many case studies (Pratten and Atkinson, 1976; Prais, 1981).

German advantages in this area are usually seen as originating from the creation of the 16 industrial unions in 1949 (Berghahn and Karsten, 1987). This may be a concrete example of an advantage of loosing the war in the way that Olson's sclerosis hypothesis suggests. In Britain by contrast, the vast array of craft unions etc entered the post-1945 economy in a position of unprecedented potential strength with their legal immunities intact, high membership levels and the labour market at a very low level of unemployment. Governments pursued cooperation with the TUC; for instance, in return for a tacit incomes policy the Conservatives in the 1950s forswore deflation and labour legislation (Flanagan et al., 1983, pp. 374-407). The pursuit of cooperation was a major constraint through to the 1970s on any

Table 10

Reasons for Labour Productivity Differentials in International Companies (1972)

	German Advantage over UK (%)	North American Advantage over UK (%)
"Economic" Causes		
Length of Production Runs	5.5	20.5
Plant and Machinery	5.0	6.0
Other (a)	2.0	6.0
"Behavioural" Causes		
Strikes, Restrictive Practices	3.5	5.0
Manning and Efficieny	8.5	6.0
Total Differential (b)	27	50

Notes:
a: Includes differences in product mix, capacity utilization and quality of materials
b: Contributions are multiplicative not additive.

Source: adapted from Pratten (1976, Table 9.1)

attempt to reform industrial relations to obtain better productivity outcomes (Metcalf, 1989).

Power in German unions has been heavily centralized and organisational fragmentation has been avoided (Flanagan et al., 1983, pp. 256-7). By contrast Britain has been heavily prone to multi-unionism and in the 1960s and 1970s shop-stewards increasingly became the locus of bargaining power. Batstone (1986) has described this as an industrial relations characterized by narrow scope and low sophistication in complete contrast to German arrangements. Unions with narrow scope represent the interests of small sub-groups of workers and can be expected to be more obstructive of productivity improvements than all-encompassing unions who would have more reason to fear the costs of such actions. Formal modelling by Bean and Symons (1989) confirms this intuition. Sophistication involves the ability to

Table 11

Industrial Relations and Labour Productivity Growth, 1950-73 (% per year, GDP/hour worked)

High Sclerosis			
a. Broad Scope High Sophistication		b. Narrow Scope Low Sophistication	
Belgium	4.4	Australia	2.6
Netherlands	4.4	Canada	3.0
Norway	4.2	UK	3.1
Sweden	4.2	USA	2.6
Low Sclerosis			
c. Broad Scope High Sophistication		d. Broad Scope Low Sophistication	
Austria	5.9	France	5.1
Finland	5.2	Italy	5.8
Germany	6.0	Japan	8.0

Source: adapted from Batstone (1986, Table 1) co-ordinate interests and to develop and implement strategy. As **Table 11** reports, Batstone argued that narrow scope unionism was bad for productivity growth during the "Golden Age".

The 1980s has not seen a major change in the structure of British industrial relations (Batstone, 1988) which still appear much less favourable to high productivity than in Germany. There has, however, been a major change in the conduct of British industrial relations with a considerable fall in restrictive practises and elimination of overmanning (Metcalf, 1989), i.e., a substantial reduction in Pratten's behavioural causes of German advantage. Recent empirical work has come to a broad consensus that this change was contingent on a reduction in trade union bargaining power which was given a great impetus by the shock of severe recession at the start of the decade (as the full employment policies of the era of cooperation were abandoned) leading to a productivity surge in manufacturing through the mid-1980s (Bean and Symons, 1989; Brown and Wadwhani, 1990; Layard and Nickell, 1989; Metcalf, 1989). Bean and Symons show formally that this is a predictable outcome in a multi-union industrial relations situation and the problems of the early 1980s could therefore be expected to reduce the Anglo-German productivity gap.

Table 12 reports some regressions using two different data sets which seek to confirm this difference between Britain and Germany. Both analyses permit the same inferences, namely that the impact of unemployment shocks on productivity growth is different in the UK compared with France and Germany. The time series data imply that unemployment shocks would have raised the labour productivity growth rate in manufacturing by about 1 percentage point in 1979-87 (2 percentage points in 1979-84) relative to 1960-73. This bonus was sufficient to account for about half of the UK's excess productivity growth relative to the average of France and Germany in 1979-87. The cross-section data give somewhat similar results. There is virtually no effect of employment shocks for France and Germany while British productivity would have been boosted by about 2.2 percentage points per year during 1982-86.

4.5 Supply - Side Policy .

In both Germany and Britain there has been reform of supply-side policy in the 1980s with a shift of emphasis towards lower personal taxation, privatization and deregulation. It is apparent that the British reforms have been substantially greater. OECD (1989b) emphasizes the contrast in the vigour of policy reform and this has also informed many suggestions that Germany has become the more sclerotic of the two economies as political institutions have resisted any attempt at Thatcherism.

The British economy has undoubtedly achieved some of the reduction in the productivity gap from this change in policy stance which has, in particular, promoted reductions in organizational slacks through the intensification of pressures on managers to achieve better performance and has reinforced the move towards new bargaining equilibria between unions and management (Brown and Wadwhani, 1990). This has noticeably been true in the case of the nationalized industries of the 1970s which were characterized by lax government control in which politicians' incentives often led to the condoning of overmanning and/or overinvestment and in which the rules were ignored in the absence of any credible commitment to enforce them (NEDO, 1976b; Vickers and Yarrow, 1988).

A calculation based on the data in Bishop and Kay (1988) shows that the major nationalized industries of 1979 accounted for about 17% of labour productivity growth in Britain between 1979-88 although only amounting to 5.7% of 1979 employment. Privatization appears strictly to have been neither necessary or sufficient for the revival of productivity growth, however, and in principle a better monitoring and control could have achieved as much (Vickers and Yarrow, 1988). In the much studied British Telecom case inadequate liberalization and a lenient regulatory formula seem to have resulted in continued weak productivity performance (Foreman-Peck, 1989).

By contrast, in the new situation after the government had defeated major strikes in coal (1984/85) and steel (1980), there was in each case dramatic productivity advance though in each case the industry remained in public ownership with no immediate prospect of privatization. In both steel and coal, the 1970s background was one of a large German productivity lead (Smith et al., 1982). Given poor initial productivity and the much larger size of the nationalized sector in Britain, the potential gains from a shift in policy were much greater than in Germany.

Table 12

Unemployment Shocks and Manufacturing Productivity

a. Time Series Equations (Dependent Variable is dln (Y/L))

	France 1956-87	Germany 1960-87	UK 1956-87
Constant	0.168	0.419	0.239
	(2.650)	(3.296)	(3.058)
dln (K/L)	0.467	-0.101	0.887
	(1.793)	(-0.415)	(10.949)
dln Avhrs	0.490	1.680	0.049
	(1.712)	(5.467)	(0.201)
d Unempt	-0.003	0.006	0.015
	(-0.299)	(0.982)	(6.473)
Ln Rel Prod	-0.035	-0.088	-0.055
	(-2.307)	(-3018)	(-2.655)
R^2	0.473	0.706	0.916
S	0.018	0.017	0.010
DW	1.858	2.216	1.430
Chow (1979)	1.58	2.55	0.34

Sources: K/L is net capital stock in manufacturing (OECD, 1983,1989a) divided by total hours worked, Avhrs is average hours per person, Unempt is the standardized unemployment rate from Maddison (1982), OECD (1982,1990a), Relprod is average manufacturing labour productivity relative to the United States for the past 5 years derived using Hooper and Larin (1989). Hours and output data are from Bureau of Labour Statistics (1989).

b. Cross Section Estimates for Sample of Industries from 5 European Countries, 1982-6

$$\Delta Y/Y = \underset{(0.858)}{13.629} + \underset{(4.259)}{0.756\ I/Y} + \underset{(5.636)}{0.870\ \text{Emptgr}} + \underset{(3.007)}{0.500\ \text{Shock}}$$

$$- \underset{(-2.239)}{0.618\ \text{FGShock}} \qquad R^2 = 0.512;\ N = 57 \qquad S = 8.267$$

Sources: all data from Eurostat (1983) (1989) and relate to Belgium , France, Germany, Italy and UK; Δ Y/Y is percentage change in real output by sector 1982-86, Emptgr is percentage change in employment 1982-6, Shock is percentage fall in employment, 1979-82 and FGShock is Shock multiplied by a dummy variable taking 1 for France and Germany.

Table 13 reveals the much larger change in the structure of personal income taxation in Britain than in Germany since the 1970s when Britain had exeptionally high marginal tax rates at the top end. So far, however, research in this notoriously difficult area has tended to suggest only small effects of this relative large change.At present the most relevant overall measure of the impact of top rate tax cuts is that of Dilnot and Kell, based on analysis of a model of tax revenue, who found an upper bound impact on tax receipts of 1.2n (3%) from the 1979/80 changes (1988, p.90).

Table 13 also shows that the UK has become less protectionist relative to Germany (and the rest of the OECD) since the 1970s. In particular, the British stance has toughened relative to Germany in the case of declining industries such as mining, shipbuilding and steel and it seems probable that this has helped in the short term to accelerate structural change in British manufacturing relative to that in Germany (OECD, 1989b, Table 4.7). It should be noted, however, that arithmetically structural change has contributed very little to overall British manufacturing productivity growth during 1979-87 (Blackaby and Hunt, 1989); it is the improvement of intra-sectoral performance that accounts for the productivity advance compared with the 1970s.

Table 13

Personal Income Tax, Subsidy and Effective Tariff Rates

a. Changes in Personal Income Tax Rates

	Central Government Tax Rates Lowest - Highest Marginal			Overall Top Rate (incl. local taxes)
	1975	1983	1988/9	1988/89
Australia	20-65	30-60	24-49	49
Austria	23-62	21-62	10-50	50
Belgium	17-60	17-72	25-55	59
Canada	9-47	6-34	17-29	45
Denmark	19-44	19-44	22-40	68
Finland	10-51	6-51	11-44	60
France	5-60	5-65	5-57	57
Germany	22-56	22-56	19-53	53
Italy	10-72	18-65	10-50	50
Japan	10-75	10-70	10-50	65
Netherlands	20-71	17-72	35-60	60
Norway	6-48	4-41	10-29	54
Sweden	7-56	3-54	5-42	72
Switzerland	1-13	1-13	1-13	47
UK	35-83	30-60	25-40	40
USA	14-70	11-50	15-28	38

Source: OECD (1989b, p. 177)

b. Total Subsidies Relative to GDP (%)

	1975-9	1985-8		1975-9	1985-8
Australia	1.3	1.5	Italy	3.2	3.3
Austria	3.0	3.0	Japan	1.3	1.1
Belgium	1.4	1.3	Netherlands	2.4	3.7
Canada	2.0	2.2	Norway	7.0	5.6
Denmark	3.1	3.1	Sweden	3.9	4.7
Finland	3.6	2.9	Switzerland	1.2	1.4
France	2.5	3.0	UK	2.7	1.7
Germany	2.1	2.2	USA	0.4	0.7

Source: Ford and Snyker (1990, Table 2)

c. Effective Tariff Rates (Unweighted sectoral averages)		
	1979	1986
Germany	10.7	8.3
UK	4.7	1 2

Notes a. 1978; b. 1985

Sources: Ennew et al. (1990); Klodt (1988)

5. Some Implications.

The experience of the 1980s suggests that Britain was able to reduce the productivity gap with Germany through the implementation of a "Thatcher shock", especially in manufacturing. In particular, this led to changes in conduct, notably in industrial relations and in parts of the nationalized industry sector. The resultant productivity surge demonstrates the initial existence of a good deal of inefficiency and appears to have owed little to greater investment in plant, people or research and development but primarily to have come from more efficient use of existing factors of production. Earlier political and institutional configurations had led to reduced productivity growth and a build up of the inefficiencies squeezed out by the Thatcherite approach.

Nevertheless, a high part of the British productivity improvement of the 1980s has come from a once and for all shakeout of labour and for the future it is quite possible that institutional arrangements in Germany will once again prove more amenable to long-run growth than those in Britain. There are three areas in which this may be the case: industrial relations, technology, and training.

The triumph of Thatcherism lay in changing the conduct of industrial relations rather than reforming their structure. It is therefore possible that a future shift in bargaining power perhaps under changed labour market conditions or under a different government will lead to a reversion to less attractive bargaining equilibria in the UK (Metcalf, 1989).

Both technological capability and vocational training seem at present to be considerably more advanced in Germany. Short termism will probably continue relatively to impair British R & D, although this may depend on the evolution of EC competition policy. It remains to be seen whether recent reforms in education and training in Britain in the guise of the 1988 Education Act, the restructuring of vocational qualifications under the NCVQ and the establishment of TECs eventually redress the balance.

On balance, therefore, the very optimistic assessments of Britain's future growth potential which became the vogue around 1987/88 seem likely to have been mistaken. In the 1990s it is quite possible that West German productivity growth will exceed that in the UK as the transitory elements of the "Thatcher shock" boost to UK productivity subside and the long run strength of German skills and technology reassert themselves.

Notes

[1] Estimation was for a pooled sample of 16 countries for 1900-13 (11 countries only), 1923-38 (12), 1950-60, 1960-73 and 1973-1988 and t-statistics are in parenthesis. The dependent variable is the growth of real GDP and I/Y is the share of investment in national income, Empt is the growth rate of the number of hours worked,RELYPW is the income postwar relative to prewar multiplied by a dummy variable = 1 for 1923-38 and 1950-60, RELYPWSQ is RELYPW squared, DUM50s is a dummy variable taking the value 1 for 1950-60 and 0 elsewhere and DUM60s is a dummy variable taking the value 1 for 1960-73 only. Dummies for 1900-13 and 1973-88 were statistically insignificant and dropped on the basis of an F-test.

[2] Y is income, $_h$ is home and $_{rw}$ is the rest of the world; e_x and e_m are respectively the income elasticities of the rest of the world's demand for the home country's exports and of the home country's demand for imports.