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A Comparison of Productivity in the Federal Republic of Germany, Japan and the USA

by Gundolf F. Hecker, Hamburg*

The rise in unemployment is often blamed not only on the slowdown in economic growth but also on the increasing pressure to rationalise. Greater rationalisation should, however, have led to an increase in labour productivity, but this has not happened in the Federal Republic of Germany nor in a series of other major industrial countries. Instead, there has been a marked slowdown in the rate of productivity advance. Why is this, and what is the outlook for the future?

Overall labour productivity in the Federal Republic of Germany was still rising at an annual average rate of 4.4 % from 1960 to 1973. Between 1973 and 1980 the rate of increase came to only 2.6 %. Although the pace of productivity gains is distorted by cyclical differences between the two periods, a comparison of years at similar points in the cycle confirms the decline in the rate of growth. For example, in 1973 productivity rose by 4.6 % in relation to the previous year, but in 1979 it increased by only 3.2 % in spite of the fact that both years saw an upswing of a similar magnitude. By the end of the seventies the productivity gain in a year of upswing was no larger than what had been achieved in downturns during the sixties. The tendency for productivity gains to diminish emerges even more clearly from a comparison of the recession years 1967, 1975 and 1981, in which real national product showed an absolute decline – the rates of labour productivity growth in these years were 3.2 %, 1.6 % and 0.6 % respectively.

As well as economic reasons, political and sociological factors are being given increasingly as the causes of this slowdown in productivity growth. The economic reasons include, for example, the structural shift in economic emphasis from the secondary to the tertiary sector, the slower expansion of the capital stock and its increasing obsolescence as a result of the weakness of investment, the lack of technological innovation and the absence of growth markets. The sociological and political attempts to explain the phenomenon can be grouped under the heading of social sclerosis: according to this view, the state, the workers and the employers in the industrial countries are no longer prepared or no longer able to respond flexibly to variations in economic conditions, so that the

necessary structural change is delayed or does not occur at all¹. In particular, governments are accused of impeding the necessary structural change that promotes productivity by pursuing a conservative structural policy. Moreover, their social and taxation policies are considered to be at fault for providing little incentive for a voluntary change in the economic structures determined by supply and demand.

This reasoning is carried a step further at the microeconomic level: it is claimed that the desire for greater certainty is bringing firms' time horizons ever closer, in other words that their profit strategies are being orientated towards increasingly short-term results. The long-term aspects of business decisions are being neglected, regardless of the fact that in the past it was precisely the long-term prospects that made large productivity gains possible.

Government measures on the one hand and the rise in living standards on the other have allegedly altered workers' behaviour patterns that determine productivity. They are less willing to be mobile in geographic and occupational terms and at the same time the quality of work has deteriorated. In the USA the extent of trade union organisation is also under discussion as a determining factor².

In view of the abundance of explanations for the change in productivity, there has been no lack of

¹ A comprehensive account is to be found in Edward F. Dennis: *Accounting for slower economic growth*, Washington D. C. 1979; and in Manfred Wegner: *Produktivitätsfortschritte in den 80ern* (Productivity gains in the eighties), in: *WIRTSCHAFTSDIENST*, No. 2, 1980, pp. 86-92.

² Cf. Richard B. Freeman, James L. Medoff: *The two faces of unionism*, in: *Public Interest*, Fall 1979, Vol. 57, pp. 69-93, quoted in Richard R. Nelson: *Research on productivity growth and productivity differences: Dead ends and new departures*, in: *Journal of Economic Literature*, Vol. 19, 1981, pp. 1029-1064.

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attempts to test selected determinants empirically for individual economies. Up to now this has been done mainly by examining individual countries in isolation, an exercise that has not brought satisfactory results. Many of the so-called explanations have entailed a greater or lesser degree of speculation. Hence, a multi-country comparison seeking to identify factors that might have had the same or similar effects on productivity growth in several economies would seem to offer a greater chance of success. In order to arrive at a better explanation of developments in Germany, it would seem appropriate to draw a comparison with the USA, the economic leader, and with Japan, the country universally regarded as having the most impressive record in recent years.

Narrowing Differences

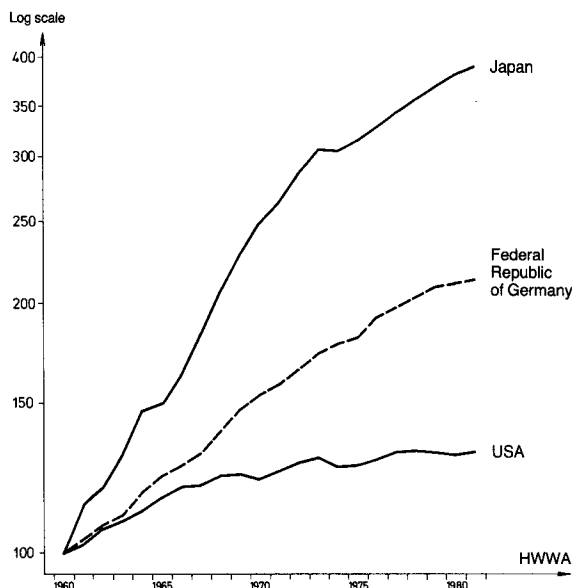
In the period from 1960 to 1973 the rise in labour productivity in Germany was 4.4 % a year, twice the rate recorded in the USA (2.1 %) but only half that in Japan (9.1 %). After 1973 the order remained the same, but productivity gains in the USA and Japan slowed down even more markedly than in Germany (see Figure 1). In the USA productivity all but stagnated, while in Japan it rose by 2.8 %, barely more than the gain recorded in Germany (2.6 %).

Rates of productivity growth should not, however, be viewed without reference to the level of productivity attained. In order to permit comparison, the American and Japanese productivity figures evaluated at 1970 prices must be converted into Deutsche Mark at an appropriate exchange rate. If the figures are converted on the basis of 1970 exchange rates, it will be seen that the USA ranks above Germany and Germany above Japan throughout the period, but that the differences have narrowed over time (see Figure 2).

A productivity comparison based on the purchasing power and exchange rates of a given year will only present a reliable picture, however, if exchange rate developments are in keeping with the differences in inflation rates, in other words if the real exchange rate remains constant³. This was not in fact the case. After 1970 the dollar was devalued against the Deutsche Mark and the yen by much more than would have been justified by the inflation differentials. If the level of productivity in the USA is converted not at the 1970 exchange rate but at the real exchange rate for each year, it emerges that productivity in Germany was already higher than in the USA by 1978. Even after the

³ The real exchange rate is defined as the product of the relevant exchange rate for a year (annual average) and the quotient obtained from the GDP price deflator for the USA (Japan) and that for Germany.

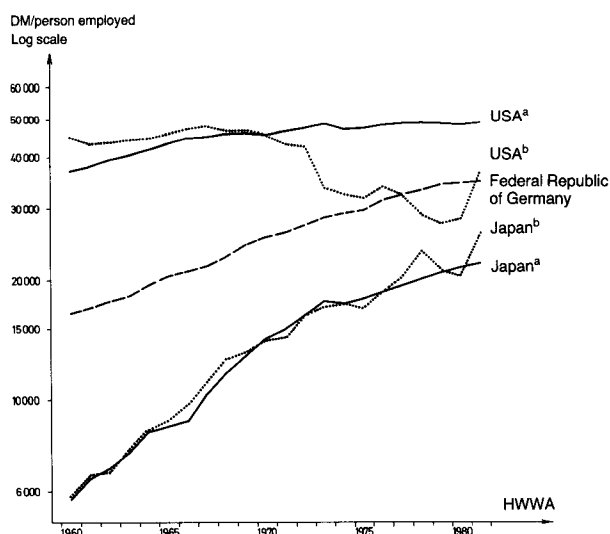
Figure 1
Development of Labour Productivity^a in the Federal Republic of Germany, Japan and the USA
(1960 = 100)



^a Gross domestic product per person employed, at constant prices.

Sources: Deutsche Bundesbank: Statistische Beihette zu den Monatsberichten (Statistical Supplements to the Monthly Reports), Series 3; Statistisches Bundesamt (Federal Statistical Office): Set 18, Series 1, 1980, and Wirtschaft und Statistik, No. 1, 1982; Statistics Bureau, Prime Minister's Office: Monthly Statistics of Japan, various years; Economic Report of the President, transmitted to the Congress January 1982, Washington D. C. 1982; author's own calculations.

Figure 2
Development of Labour Productivity in the Federal Republic of Germany, Japan and the USA
(at constant prices; figures for Japan and the USA converted into Deutsche Mark)



^a Converted at the exchange rate ruling in 1970; ^b Converted on the basis of the real exchange rate (the prevailing exchange rate multiplied by the GDP price deflator of the foreign country and divided by the GDP price deflator of the Federal Republic of Germany).

Sources: see Figure 1.

real appreciation of the dollar in 1981, it can be concluded that average labour productivity in the German economy as a whole has reached the American level. Whereas in the past the greater productivity gains in Germany could be explained in terms of closing the gap with the USA, it remains unexplained why the rise in productivity has continued to be far more rapid in the Federal Republic than in the United States in recent years.

Again calculated on the basis of real exchange rates, productivity in Japan is still 25 % lower than in Germany. Since this lag gives Japan even greater scope for productivity gains, the question has to be asked why overall productivity growth in Japan has been scarcely higher than in Germany in recent years. A preliminary answer is obtained if productivity and employment trends are examined on a sectoral basis and if investment activity and research and development efforts are taken into account.

Sectoral Productivity

Sectoral productivity trends show that Germany's favourable overall position is attributable to agriculture and the services sector (see Table 1). Labour productivity in agriculture has risen much faster in

Germany than in the USA and in the services sector in Germany it has been raised almost as fast as in Germany's manufacturing industry, whereas in the USA it has all but stagnated. In manufacturing industry, which usually receives the greatest attention in international comparisons because world market competition mainly concerns industrial goods, productivity growth in Germany was only slightly higher than in the USA in the seventies⁴. On the other hand, in Japan's manufacturing industry the pace of productivity growth continued to outstrip that of Germany even after 1973. This was not apparent in the figures for the economy as a whole, however, as the productivity of the agricultural and services sectors rose more slowly in Japan than in Germany from 1973 onwards.

In principle, it makes no difference which sector of an economy shows productivity gains. Nonetheless, before the good productivity performance in agriculture and services is interpreted as a mark of the exceptional quality of the German economy, developments on the employment front should be brought into the equation.

Whereas in Germany the total number of persons employed contracted by about 0.8 million during the seventies, in Japan it increased by 4.4 million and in the United States by as much as 18.6 million (see Table 2). Although in the USA the number employed in manufacturing industry also rose, whereas it remained unchanged in Japan and fell by 1.1 million in Germany, the tremendous increase in employment occurred predominantly in the services sector. The Japanese and Americans, particularly the latter, thus succeeded in creating and filling a substantial number of new jobs in spite of the slower rate of economic growth. If job-creation is taken as an indicator of economic success, then Japan and the United States are in a better position than Germany.

The creation of new jobs in the services sector can even be used to explain these countries' poor performance on the productivity front. The change in average productivity in two countries differs not only if the workers' output is increased to differing degrees through the exploitation of technological progress but also if in one country workers who would otherwise be unemployed are given jobs with below-average productivity but in the other country only high-productivity posts can be offered or filled. It seems likely that a large part of the additional employment opportunities in Japan and the USA was provided for workers with below-average qualifications, whereas in

Table 1
Development of Sectoral Labour Productivity
in the Federal Republic of Germany, Japan
and the USA for Selected Years^a

	Federal Republic of Germany	Japan	USA
Agriculture			
1970	100.0	100.0	100.0
1973	129.8	143.0	102.4 ^b
1978	164.3	151.4	110.1
1980	170.6	—	120.1
Manufacturing industry			
1970	100.0	100.0	100.0
1973	113.0	124.9	116.9 ^b
1978	134.5	171.0	131.8
1980	139.2	—	129.0
Services			
1970	100.0	100.0	100.0
1973	108.5	118.3	101.4 ^b
1978	123.4	129.7	104.3
1980	129.1	—	104.7
Economy as a whole			
1970	100.0	100.0	100.0
1973	111.9	123.9	104.4 ^b
1978	130.8	141.8	107.7
1980	136.1	151.8	106.8

^a In the constant prices of each country, 1970 = 100; ^b Figure for 1972.
Sources: see Figure 1; in addition, Statistical Abstract of the United States, various years; Economic Planning Agency (Japan); author's own calculations.

⁴ The decline recorded in the USA in 1980 is attributable to the fact that the recession set in earlier and with greater force than in Germany.

Germany there are very few openings for such workers. It would also appear to be easier to create and fill jobs with flexible working hours in the United States than it is in Germany, where a corresponding expansion in the supply of jobs, especially in the services sector, is hampered by institutional constraints.

Investment and Labour Productivity

In the Federal Republic of Germany a larger share of gross domestic product is invested than in the USA, but it is used primarily to finance home-building and public-sector capital expenditure. If we look solely at corporate investment, where the link with productivity changes is much closer, we see that Germany's investment ratio has declined slightly and is now only a shade higher than the American ratio, which has remained almost constant for 15 years (see Table 3). The fact that in spite of this the difference between the rates of productivity increase did not narrow can be taken as an indication that the balance of profitability tips towards job-creating investment in the USA but towards labour-saving investment in Germany.

Japan's high rate of productivity growth in the past was the result of intensive investment (see Table 3). In this way many sectors of the Japanese economy have accumulated a technologically up-to-date capital stock. The investment ratio did fall sharply after 1973, but it still remains considerably higher than those of Germany or

the United States. The fact that labour productivity has nevertheless risen hardly more rapidly in Japan than in Germany in recent years is probably due partly to the above-mentioned sectoral characteristics and partly to Japan's high dependence on imported energy, especially oil, which has forced Japan to invest even more strongly than other countries in energy conservation and oil substitution.

Technological Advance

Apart from the assimilation of technological progress through investment, there is also the question of the provision of new potential for innovation. Unfortunately this cannot be measured. Expenditure on research and development is often taken as an approximation, but this has no direct influence on productivity growth, firstly because R & D projects are long-term affairs and secondly because they measure only the input and not the output of R & D activities.

An indication of a country's ability to produce advances in technological knowledge and to translate them into marketable products can be obtained by breaking down its foreign trade according to technological intensity. This exercise shows that the proportion of German exports to the USA and Japan that fall into the categories of state-of-the-art technology and high technology remained more or less constant throughout the sixties and seventies. Among

Table 2
Distribution of Employed Persons
by Sector in the Federal Republic of Germany, Japan and the USA for Selected Years

	Federal Republic of Germany		Japan		USA	
	in thousands	percentage share ^a	in thousands	percentage share ^a	in thousands	percentage share ^a
Agriculture						
1970	2,258	8.5	8,864	17.4	3,538	4.5
1973	1,945	7.3	7,012	13.4	3,595 ^b	4.4 ^b
1978	1,612	6.4	6,327	11.7	3,492	3.7
1980	1,519	5.9	5,813	10.5	3,502	3.6
Manufacturing industry						
1970	10,123	38.1	13,754	27.0	20,758	26.4
1973	9,913	37.2	14,338	27.4	19,854 ^b	24.3 ^b
1978	8,864	35.2	13,250	24.5	21,517	22.8
1980	9,009	35.0	13,674	24.7	22,178	22.8
Services						
1970	11,239	42.3	24,146	47.4	48,985	62.3
1973	11,778	44.2	26,165	50.0	52,371 ^b	64.1 ^b
1978	12,011	47.7	29,149	53.9	62,475	66.2
1980	12,356	48.0	30,337	54.8	65,463	67.3
Economy as a whole						
1970	26,570	100.0	50,940	100.0	78,627	100.0
1973	26,648	100.0	52,330	100.0	81,702 ^b	100.0
1978	25,181	100.0	54,080	100.0	94,373	100.0
1980	25,741	100.0	55,360	100.0	97,270	100.0

^a Number of persons employed in the sector as a percentage of employment in the economy as a whole in each year; ^b Figure for 1972.

Sources: see Figure 1 and Table 1; author's own calculations.

Germany's imports from these countries, on the other hand, there was an increase in the proportion of state-of-the-art products and, in the case of Japan, even high-technology products (see Table 4). This suggests that Germany has fallen somewhat behind Japan and the United States, that these two countries have implemented more innovations than Germany⁵.

Prospects for Productivity Growth

Finally, the question arises as to how Germany's overall productivity will develop in the future in relation to that of the other two countries. In estimating labour productivity for the purposes of medium and long-term forecasting, economists do little more than extrapolate the existing trend, as in principle technological progress cannot be predicted. Such trend extrapolation would lead to a surprising change in the order of the three countries: if the productivity level of 1981 is projected forward at the average rate of productivity growth recorded between 1973 and 1981 and if it is assumed that exchange rate movements will henceforth reflect the inflation differentials, then in the year 2000 German labour productivity would be 50 % higher than that of the USA and 25 % higher than the Japanese figure.

Insofar as this extrapolation implies that Germany will make greater technological progress and translate it into products or that the climate for growth and structural change will be better in Germany than in Japan or the USA, these results can be treated with some degree of scepticism. The potential for productivity gains in the United States should be greater than in the past owing to the fact that the American economy no longer has to act simply as the driving force behind worldwide productivity growth but can also exploit the innovations of other countries. Vice versa, the other countries must produce technological progress to a greater extent from their own resources, which would suggest that the rate of productivity growth in Germany and, somewhat later, in Japan will draw closer to the American trend. Indeed, in the seventies the share of R & D expenditure in gross domestic product became more or less equal in the three countries, whereas in the sixties the USA had been spending much more than Germany or Japan.

On the other hand, insofar as the extrapolation implies that production in Germany is now profitable only if highly qualified workers are used while openings for simple forms of work are disappearing without being replaced so that unemployment will rise more rapidly, it may be assumed that economic policy and the two sides

of industry will strive to counter such a development. That will require training schemes, restrictions on the rise in real wages, particularly for the groups of workers at risk, and the removal of institutional constraints on the creation and structural adaptation of jobs.

There are therefore good grounds for believing that productivity in the three countries will not diverge as widely as the mechanical extrapolation suggests. It is more likely that growth rates will be fairly similar once Japan has closed the remaining gap between itself and the other two countries.

Table 3
Investment Ratios in the Federal Republic of Germany, Japan and the USA for Selected Years^a

	Federal Republic of Germany	Japan	USA
Economy as a whole			
1965	26.1	29.9	18.8
1970	25.6	35.5	17.3
1973	24.5	36.4	18.5
1979	22.7	32.0	18.1
Firms ^c			
1965	14.3	19.4	11.5
1970	14.6	24.1	11.2
1973	13.0	22.0	11.5
1979	12.7	18.3	11.5 ^b

^a Percentage figures calculated as quotients of sectoral investment volumes and gross domestic product; ^b Figure for 1978; ^c Excluding home-building.

Sources: OECD: National Accounts of OECD countries 1962-1979, Vol. 2, Paris 1981; author's own calculations.

Table 4
Germany's Foreign Trade with Japan and the USA by Technology Classes^a

Year	Technology class	Exports to Japan	Exports to USA	Imports from Japan	Imports from USA
1964	I	2.4	2.6	1.3	5.6
	II	28.7	46.4	8.5	10.0
	III	68.9	51.0	90.1	84.4
1969	I	2.7	2.2	3.7	10.8
	II	27.7	45.3	18.4	11.8
	III	69.5	52.5	77.9	77.3
1973	I	2.9	2.1	7.0	14.6
	II	23.8	48.1	22.2	8.9
	III	73.4	49.8	70.8	76.5
1978	I	3.6	2.1	7.8	20.6
	II	28.5	41.4	31.4	10.6
	III	67.9	56.5	60.8	68.8

^a Share for the technology class expressed as a percentage of total exports to Japan/the USA or of total imports from Japan/the USA; technology classes: I = state-of-the-art technology, II = high technology, III = remainder.

Sources: HWWA-Institut für Wirtschaftsforschung: Analyse der strukturellen Entwicklung der deutschen Wirtschaft (Analysis of the Structural Development of the German Economy), Hamburg 1981, p. 138.

⁵ Cf. HWWA-Institut für Wirtschaftsforschung: Analyse der strukturellen Entwicklung der deutschen Wirtschaft (Analysis of the Structural Development of the German Economy), Hamburg 1981, pp. 136-140.