

International Comparison of Industrial Development in the European Context – the Problems

In the context of the European single market the question arises of how German industry is developing compared with industry in other major EU countries. What indicators are suitable to measure the cyclical and structural aspects of industry and its branches, and their relative positions in the European context? In this article indicators such as the index of production and real gross value added, which are generally used to describe industrial development, are analysed. In addition to Germany, the other major countries in the European Union – France, Italy and Great Britain – are considered. For statistical reasons it appears that the index of production alone, and real gross value added, taken in itself, are only partly suitable for the comparison.

The data used for the analysis and prognosis of the cyclical development of industry in different countries need to be as up to date as possible. Generally the index of production is used. However, the contribution of industry to the gross domestic product is not shown by production but by value added. So the central questions are how similar the curves for production and value added are and what differences are evident between individual countries. This study is based on the indices of production published quarterly by Eurostat for the big branches of manufacturing in Germany, France, Great Britain and Italy; they are now available from 1991 to 2001.

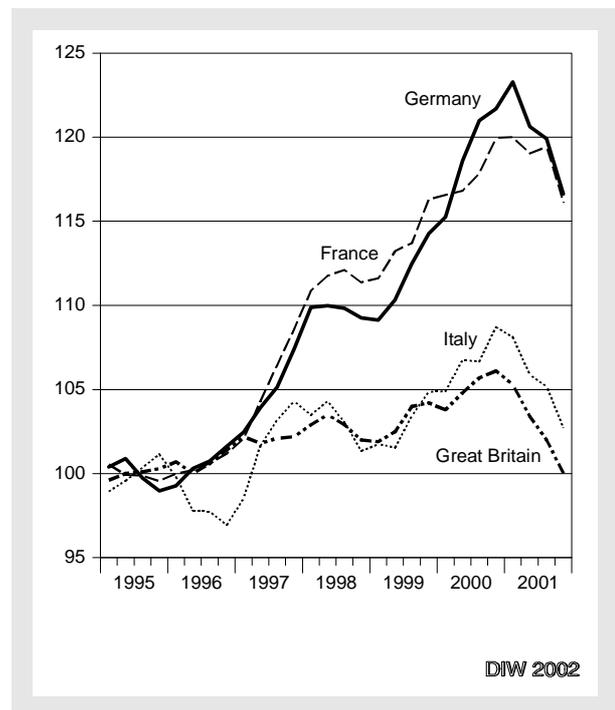
Early in 1999 the cyclical upswing in manufacturing started at almost the same time in all these countries (cf. figure 1). Also at almost the same time, in the spring of last year, the downswing that started in the United States spread to these countries as well. With the strong global integration of manufacturing this caused a deterioration in the world economic climate as a whole. The effect on manufacturing was about the same on average in Great Britain, Italy and Germany, but the manufacturing industry in France was less badly affected by the downward trend abroad.

This development gives a picture of close cyclical interdependence in Europe. But industry in the individual countries evidently profited to very different degrees from the dynamic growth, particularly in the upswing phases, as the production levels have clearly diverged. Measured by the indices of production, manufacturing

has grown most strongly in Germany and France since 1995; despite the losses at the end of 2001, some of which were heavy, production there was still clearly above the 1995 level in December 2001. The production indices for manufacturing in Great Britain and Italy, on the other hand, were about at the 1995 level in the fourth quarter of 2001.

The development in output, that is, the value added by branches over a longer period, is only partly described in the index of production, as it reflects the development in the real production value of a branch, and it also changes if the input of goods and services for consumption in the process of production (intermediate input) is higher or lower relative to production. Over the short term, the change in the ratio of intermediate input can be ignored; over the longer term, however, this will lead to distortions.¹ To calculate the real contribution made by the various sectors of the economy to the gross domestic product or gross value added the index of production alone is not enough; other indicators also need to be used.

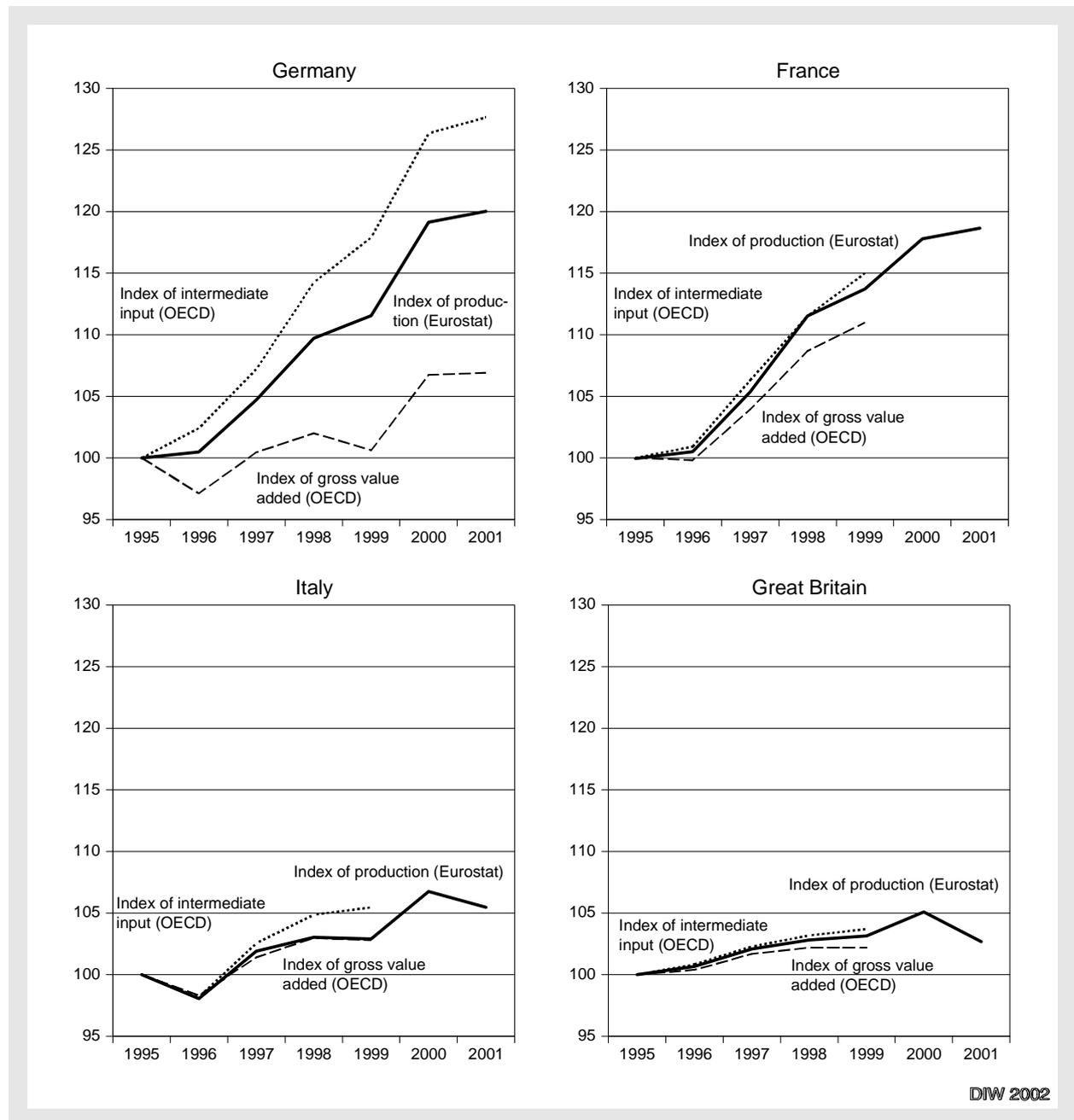
Figure 1
Production in Manufacturing
1995 = 100



Source: Eurostat.

¹ Cf. Michael Grömling, Produktivitätstrends der 90er Jahre, statistische Überzeichnung dämpft New Economy Hoffnungen, in: *iw-trends*, no. 2/2001, p. 21 ff.

Figure 2
Key Data in Manufacturing
 in 1995 prices, 1995 = 100



Sources: Federal Statistical Office; Eurostat; OECD; calculations by DIW Berlin.

For this the STAN database of the OECD² is appropriate, for it provides the data needed for international comparative analyses of economic development with deep sectoral divisions. It gives absolute nominal values

² OECD: STAN Database for Industrial Analysis, vol. 2002, release 02.

for production and values added, and indices of the real development in production and value added on the NACE-Rev.-1 two digit level.³ The annual figures now go up to 1999; the real values are given in 1995 prices, which is also the base year. So an index of the real development in the ratio of intermediate input in manufactur-

The Relation Between the Index of Production, the Real Value of Production and Real Gross Value Added

The index of production in the industrial statistics should reflect the current development in the value of production in a branch, adjusted for price effects. To enable indices of production to be published as close to the current year as possible a total survey is not carried out; the index is continued month by month on the basis of changes in quantities and values in selected major products. In this continuation method only companies employing more than 20 people are included in Germany. However, in the calculation of the real production value at branch level (national accounts) all companies are included. But this calculation is only made with a considerable time-lag and only on an annual basis. Thus, the indices of production and real production values given in the national accounts are not based on the same data.

The relation between the nominal value of production VP and nominal value added VA of a branch is given by

$$[1] VA = VP - IC,$$

with IC as nominal intermediate input. Real gross value added (VA^r) is calculated from

$$[2] VA^r = \frac{VP}{P^{VP}} - \frac{IC}{P^{IC}}.$$

P^{VP} is the price index of the production value of a branch and P^{IC} is the price index of the intermediate input entering that branch.¹ In the ideal case the price indices are not influenced by changes in quality. Countries use different methods in their attempts to filter out the changes in quality in their official statistics (see box 2), but these are not entirely successful.

Equation 2 can be reformulated as

$$[3] VA^r = VP^r (1 - RIC^r),$$

where the real ratio of intermediate input RIC^r is defined as

$$[4] RIC^r = RIC \cdot \frac{P^{VP}}{P^{IC}}.$$

The real production value and the real gross value added thus show the same trend if the real ratio of intermediate input is constant. This depends on the nominal ratio of intermediate input, RIC , that is, the relation of what companies in one branch purchase as intermediate input (IC) to the resultant production value in these companies after further processing (PW) and the relation of prices for production and intermediate input.

$$[5] RIC = \frac{IC}{VP}$$

¹ This method is known as the double deflation method, cf. Federal Statistical Office, National Accounts, Series 18, Notes.

ing and its branches in the various countries can be drawn up. It is also possible to calculate the nominal ratios of intermediate input.

³ 'Nomenclature des Activités de la Communauté Européennes' is the European classification of economic sectors. It assigns codes to economic sectors at various levels. The first level (sections) has letters (manufacturing, for example, has D), and the second level (departments) has two-digit numerical codes.

The data show that the real gross value added in manufacturing in Germany in 1999 was only slightly higher than in 1995. On the other hand, of all the countries considered, France had by far the highest growth from 1995 to 1999, as measured by the national accounts.

Clearly, real intermediate input increased very much more strongly relative to production in Germany than in

Different Methods of Dealing with Quality Changes in Calculating Price Indices

In Germany the overlapping method is used to calculate time flows for producer price indices. The individual indices are based on a survey of companies, which are asked to take adequate account of quality changes in reporting their prices.

The hedonic method used in France for EDP equipment is based on the idea that a commodity is characterised by a number of components. With the help of econometric estimates the price per item of each individual component is fixed and a volumes index is derived from this. The index of volume is then essentially a weighted average of the physical components that are weighted by their prices.

In the option price method the procedure is as follows: if the qualitative difference between two successive models of a commodity lies in a component for which there is a market price and customers have the option to purchase that extra, the current price of the old model is calculated by deducting the price of the component from the price of the new model. If a component has no market price the manufacturer is asked how much it costs.

The differences in the methods of price adjustment are reflected in the rates of price decline for data processing equipment. According to the data for France an 80% price collapse for EDP equipment was registered in the 1999, while prices in Germany fell by 20% and those in Great Britain by 40% (see European Commission, Economic Analysis no. 12, December 2000).

the other countries. It can be shown that the value of production and real gross value added show the same development if the ratio of real intermediate input remains constant. With optimal deflation for price movements, changes in quality should not be reflected in prices but should be reflected in real production (cf. box 1). If, for example, a PC becomes more efficient owing to technological development but the price remains the same, this ought to be reflected in a lower price index and the index of real production should rise. Price changes are often linked to changes in the quality of products; 'pure' price changes are hardly ever observed. Therefore, the influence of changes in quality has to be estimated, and a number of processes have been developed for this. The less it proves possible to identify changes in quality in this way the more will the real ratio of intermediate input be distorted by the relation between the output and input price indices (P^{VP}/P^{IC}), that is, a nominal figure.

The countries examined here use different methods of price adjustment for the branches to be compared (cf. box 2). Hence the data on real intermediate input ratios and real gross value added that one can take from the STAN data base for a branch in various countries have to be interpreted very cautiously.

According to the STAN data, the biggest changes in the real ratio of pre-products and services in the countries considered are to be found in the branch 'Production of office machines and data processing equipment.' While the real ratio of intermediate input in France fell from 70% in 1995 to 58% in 1999, it rose in Germany

from 66% to 76%. This suggests that in this branch different factors were influencing the changes in this item (cf. table 1).

The rise in the real ratio of intermediate input shown in Germany indicates a reduction of the value added content of production in this branch. This is supported by the far-reaching reorganisation undertaken by companies in the electrical industry proper in 1999, in which the production of data processing equipment was moved out to new companies. Production of electronic components that are needed for data processing equipment, among other things, was in turn transferred to specialist firms. IT services are also increasingly being outsourced to specialist firms. As a result, the value added by IT services is classified as value added in the tertiary sector.

However, the different methods of deflation for price changes used in France and Germany play a particularly big part in the differing developments in the real ratios of intermediate input in this branch in the two countries. Germany uses the overlapping method to adjust the prices of data processing equipment, while France uses the hedonic method and Great Britain relies on the option price method.⁴

The rates of change in real gross value added shown in table 2 for the countries considered are thus not only

⁴ Cf. also Deutsche Bundesbank: Probleme internationaler Wachstumsvergleiche aufgrund unterschiedlicher Deflationierungsmethoden – dargestellt am Beispiel der EDV-Ausrüstungen in Deutschland und den USA, in: *Monatsbericht*, August 2002, p. 8

Table 1

Real and Nominal Ratios of Intermediate Input in the Four Major EU Countries 1995 and 1999

	1995				1999							
	Germany	France	Italy	Great Britain	Germany		France		Italy		Great Britain	
	real / nominal				real	nominal	real	nominal	real	nominal	real	nominal
Manufacturing	0.63	0.67	0.69	0.63	0.67	0.64	0.68	0.67	0.70	0.68	0.64	0.62
of which:												
Chemical industry	0.61	0.68	0.70	0.62	0.68	0.64	(0.69)	(0.68)	0.70	0.69	(0.62)	(0.63)
Mechanical engineering	0.59	0.64	0.68	0.60	0.63	0.59	(0.63)	(0.62)	0.69	0.68	(0.60)	(0.59)
Production of office machines and data processing equipment	0.66	0.70	0.79	0.72	0.76	0.69	(0.58)	(0.70)	0.81	0.84	(0.75)	(0.74)
Production of electricity generation and distribution equipment	0.59	0.62	–	0.58	0.62	0.61	(0.63)	(0.63)	–	–	–	(0.59)
Media technology	0.65	0.68	–	0.63	0.62	0.65	(0.59)	(0.71)	–	–	–	(0.62)
Automotive construction	0.66	0.78	0.76	0.72	0.75	0.73	0.76	0.77	0.77	0.78	(0.72)	(0.72)

Note: The figures in brackets are the real ratios of pre-products and services for 1998, as the production figures for 1999 are not yet available for these branches. The real ratio of pre-products and services could not be calculated for some branches, as neither production figures nor figures for pre-products and services were available. Sources: OECD; calculations by DIW Berlin

a result of different developments in output in these branches, but also include changes in corporate organisation, and they are the expression of different national methods of price index construction.

The data bases for the automotive industry and the chemical industry in Germany also show a strong increase in the real and nominal ratios of intermediate input. In the automotive industry a considerable increase in vehicle fitments is evident. Cars are being fitted with ABS, ESP, electronic drives, airbags, air-conditioning, electronic anti-theft devices and other items, and as a result much of the value added with a vehicle is now produced by companies in the electrical engineering or electronic branch. Production stages have also been shifted out of Vehicle and Engine Production (WZ 34.1) to Production of vehicle parts and accessories (WZ 34.3), which is also part of automotive construction. The value added by automotive construction (WZ 34) has remained constant, but the production value has risen, so that the ratio of intermediate input has also increased. Nevertheless, the nominal ratio of intermediate input was still lower in Germany than in France in 1999. Firstly, this is due to the greater orientation of German commercial vehicle manufacturers to heavy lorries with a relatively high ratio of value added, and secondly the 'premium vehicles' segment is of greater importance in Germany than in France, with some vehicles still actually individually made. The automotive industry in France, on the other hand, is largely concentrated on

two manufacturers with mass production.

The increase in vehicle fitments is not only evident in Germany. In this connection, the fall in the real ratio of intermediate input in France does not fit in with this development. That is an indication that price effects have influenced or may even have dominated the development in the real ratio of intermediate input. What we can learn from the very different rates of change in real value added in automotive construction for an international comparison is limited. This scepticism is supported by the figures on the trend in employment. In Germany the automotive industry greatly increased its employment from 1995 to 1999, while the French manufacturers cut jobs.

The chemical industry is traditionally characterised, in Germany and on international comparison, by a high level of wages. In 1999 this caused German companies to hive off the less productive areas, such as bookkeeping, logistics and even their canteens, on a large scale. The fall in real value added (cf. table 2) is matched by an even greater fall in employment, so that the productivity of labour in the chemical industry rose above-average from 1995 to 1999 compared with manufacturing as a whole.⁵

⁵ From 1995 to 1999 labour productivity – calculated as the relation between real gross value added to the number employed according to the OECD STAN database – rose by just under 8% in the chemical industry and in manufacturing as a whole by 5.5%.

Table 2
Rates of Change in Real Value Added 1995 to 1999
in %

	Germany	France	Italy	Great Britain
Manufacturing	0.6	11.0	2.8	2.2
of which:				
Chemical industry	-2.9	13.0	8.3	7.7
Mechanical engineering	-2.9	9.9	-0.7	-10.0
Production of office machines and data processing equipment	23.4	137.6	-12.8	65.8
Production of electricity generation and distribution equipment	6.2	7.8	-	-
Media technology	40.4	120.5	-	-
Automotive construction	-1.0	46.2	13.8	9.0

Sources: OECD; calculations by DIW Berlin.

Conclusion

The index of production enables us to analyse current developments in the countries considered in the cyclical context, the information on real value added that is available for these branches of industry not being sufficiently up to date.

In 1999, the division of labour within industry and between industry and the services sector changed, both nationally and in the international context. There was a rise in the nominal and the real ratios of intermediate input. Our conclusion is that, at least in some branches, the structural changes between 1995 and 1999 were of greater importance in Germany than in the other countries. In view of such structural changes the index of production cannot adequately reflect the dynamic of these branches in an international comparison.

Different developments in the real ratios of intermediate input and divergent real developments in value added that are evident in the statistics are partly the result of the different methods of price deflation used in the countries and branches considered. The real value added gives a distorted picture of the development in output in these branches in the individual countries.

The development in the index of production probably overstates the dynamic of German industry compared with industry in the other countries considered for the period on which this article is based, while understating the trend in value added.

It follows from this that the indicators designed to measure output in economic sectors are not enough to give a realistic picture of the trend in output in branches of industry for international comparison. More information, e.g. the trends in employment and investment, also needs to be taken into account.

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