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Herman J. de Jong Catching up twice

The nature of Dutch industrial growth during the 20th century in a comparative perspective



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Chapter 1: The development of Dutch manufacturing in an international perspective 1913–1965

1.1. Introduction

New evidence on 19th and 20th century manufacturing performance shows that there are wide and sustained differences in productivity levels between the advanced industrial countries. In *The Productivity Race* Stephen Broadberry documented a persistent manufacturing productivity gap between the U.S. and Europe, which has existed for already 150 years. According to Broadberry this transatlantic productivity gap can be explained by differences in accumulation strategies and in diverging demand patterns between the economies of the U.S. and the European countries. However, within the European context comparative levels of manufacturing productivity (that is between Germany and the U.K.) were found to be on a par. One important conclusion of this analysis is that during the 20th century the transfer of technology in manufacturing cannot explain convergence of GDP per worker across European countries. Convergence was rather driven by the shift of employment out of agriculture and by changes in comparative productivity performance in services.¹

This book fills up the picture by presenting evidence on the comparative productivity performance in manufacturing in four industrial countries: the United Kingdom, Germany, Belgium and the Netherlands. Within this comparison the Dutch manufacturing sector is the central point of reference. Taking the industrial performance of the Netherlands as a starting point it will be shown that during much of the twentieth century the manufacturing sector was the most rapidly growing sector of the Dutch economy.

The present study examines the development of the Dutch manufacturing industry between 1913 and 1965. This period includes the two world wars, the depression of the 1930s and the period of reconstruction after 1945. The two wars are generally regarded – and not only in economic history – as external shocks that caused breaks in the country's long-term development. But many studies fail to give an adequate analysis of the effects of the two wars on the long-term development of the economy, because of lack of data on economic performance.² The starting point for this study is therefore to include the periods of the wars, and to bridge these years with consistent data for industrial output and employment. The most important statistical source in this study is the Statistics

¹ Broadberry, Manufacturing, p. 772-795. Ibid., The Productivity Race.

² A number of studies that explicitly sought to bridge the war periods in quantitative terms were published only recently. See Knibbe, *Agriculture*; De Jong & Albers, Industrial ouput; Van der Bie, *Economische*; Klemann, niederländische Wirtschaft, Van Ark & De Jong, Accounting.

of Production produced by the Central Statistical Office (CBS, or 'Statistics Netherlands'). This source, which has still not been subject to much systematic study, brings together a large amount of quantitative data on industrial output and the associated inputs such as raw materials, intermediate products and labour. From 1913, the Statistics of Production include economic data from about 30 percent of all manufacturing industries. Estimates of the output and employment levels in each year have been drawn up on the basis of this source, continuing through to 1965. Around this year the continuity of the production and price series for the diverse industries became steadily more complicated, because of changes in the reporting of source data. These statistical limitations are in part due to real changes in Dutch industry. In the mid-1960s, industrial development reached a turning point. Already before 1960 post-war reconstruction had been completed. General wage increases in the early 1960s changed the international competitive position, which in turn transformed industrial investment. The discovery of natural gas amplified the changes, because of the availability of cheap fuel. This set in motion structural changes, resulting in a rapid transformation of industry. This complex process requires a separate study.³

The period covered by my study follows on from the period that J.A. de Jonge examined in his work on industrialisation in the Netherlands from 1850 and 1914.⁴ In this work, which is still considered authoritative, De Jonge claims that the process of industrialisation in the Netherlands only accelerated just before the turn of the century. Thus industrialisation took place later than in the surrounding countries. Since then, studies as part of the 'Reconstruction of the Dutch National Accounts' project of Van Zanden, Smits and Horlings have shown that the Dutch industrialisation process had already taken shape by about the 1860s.

To place the 1913–1965 period in a somewhat longer perspective, Figure 1.1 shows the output of manufacturing industries in the Netherlands in constant prices between 1880 and 1990, as compared to the long-term movement in the real gross domestic product (GDP).

The vertical axis has a logarithmic scale; the slope of the lines indicates the rate of growth. The two variables are shown in index numbers, with the value for 1938 being set at 100. The figure shows that the industrial growth was clearly faster than that of the economy as a whole, especially between 1913 and 1970. However the two curves reveal the same turning points. In both world wars there was an absolute decline in GDP and industrial value added. The turbulent period between 1914 and 1945 is striking. In addition to declining output during both wars, it is also notable that in the early 1930s the GDP declined for five successive years, while industrial production fell less markedly and for a shorter period. Between 1945 and 1973 the rate of growth in GDP was very high, although the first half of this period was characterised by rather marked cyclical fluctuations. Growth after 1973 was much more modest, with industrial production growing more slowly than GDP until about 1980. This means that in the 1970s, industry's

³ See for example Van Zanden, Economic history; CPB (1970), Nederlandse economie; Ibid. (1976), Nederlandse economie.

⁴ J.A. de Jonge, De industrialisatie van Nederland tussen 1850 en 1914.



Figure 1.1. Gross domestic product for the total economy and industrial value added in the Netherlands in constant prices 1880–1990

Sources: Total economy: 1880–1913: Smits, Horlings & Van Zanden, Dutch GNP, 219–221; 1913–1921: Van der Bie, Economische, 86 and the revision by J. P. Smits; 1921–1990: Van Ark & De Jong, Accounting, Appendix C, based in part on Van Bochove & Huitker, National accounting, and CBS, Nationale Rekeningen (National Accounts).

Industry: 1880-1913: Smits, Horlings & Van Zanden, Dutch GNP, 157-159; 1913-1921: Van der Bie, Economische, 86 and the revision by J. P. Smits; 1921-1939 kindly made available by Gert den Bakker of the CBS; 1945-1990: CBS, Nationale Rekeningen (National Accounts). Note: The figures from 1921 refer to manufacturing industry; figures before 1921 refer to total industry (including the construction industry, mining and utilities).

share of the total economy declined. Nevertheless over the period 1900–1990 industrial production grew at an average 3.78 percent per year, as compared to 2.95 percent for the economy as a whole. Table 1.1 shows the growth rates for a number of periods.

In the period that we are focusing on here, 1913–1965, there was an even greater difference between the growth rates of the two variables, with GDP growing at a calculated 3.1 percent and industry at 4.3 percent. In terms of total volumes, the result of this was that GDP in 1965 was almost five times the volume of 1913, while industrial production grew by a factor of almost ten.

The exceptional growth of industry can also be clearly seen in the development of the structure of the Dutch economy. The share of the manufacturing industry (i.e. excluding mining, construction and utilities) increased markedly from 1913.

	GDP	Industry
1900–1913	2.28	3.52
1913-1929	3.66	4.68
1929–1938	0.33	1.60
1938-1950	2.41	2.15
1950-1960	4.61	7.24
1960-1973	4.83	6.30
1973–1990	2.19	1.58
Long periods		
1900-1950	2.39	3.21
1950-1990	3.64	4.50
19001990	2.95	3.78
1913–1965	3.07	4.25

 Table 1.1. Annual growth rates for GDP and industrial value added

 in constant prices, 1900–1990

Sources: See Figure 1.1.

Table 1.2. Share of	manufacturing	industry in	GDP ar	nd in	total
employment, 1913-	1965				

	% GDP	% employment
1913	21.4	24.2 (1909)
1921	21.1	24.8 (1920)
1938	28.1	24.2
1950	27.3	27.9
1965	38.6	29.2 (1960)

Sources: See Figure 1.1 and CBS (1984), Productiestructuur, 39ff.

In the table, the real value added of industry is expressed as a percentage of the real gross domestic product, so that both values are adjusted for price movements. The greatest rise in industrial production took place in the period 1921–1938 and between 1950 and 1965. The total rise was more than 17 percentage points. The share of manufacturing in employment also increased from 1913 to 1965, but the increase, from about 24 percent to 29 percent, is much less.

In 1913 the relative productivity of industry was still below the average for the whole economy; the percentage of the workforce working in manufacturing in 1913 was greater than the proportion of value added produced in this sector. By 1965 this relationship had been reversed: the productivity level in manufacturing was then apparently higher than in the total economy, since the percentage of the working population who were in industry was lower than the proportion of GDP attributable to the value added of industry. In short, the average labour productivity in manufacturing at the beginning of this period was lower than that of the sectors (agriculture, industry and services) combined, and at the end of this period it was higher.

A comparison with industrial development in neighbouring countries reveals the exceptional character of the Dutch industrial expansion. Because the populations of the four countries did not grow at the same rate, a correction has been made: the industrial production has been divided by the total population to give industrial production per head of population, which is not the same as the average labour productivity. Table 1.3 shows industrial production per capita for the four countries, with the level for 1913 being set at 100.

Year	Netherlands	U.K.	Germany	Belgium	
1913	100	100	100	100	
1921	114	80	59	66	
1938	189	151	163	95	
1950	207	196	130	115	
1965	485	376	415	198	

 Table 1.3. Industrial production per capita in the Netherlands, the United Kingdom,

 Germany and Belgium, 1913–1965 (1913 = 100)

Sources: Industrial production: the Netherlands, See Figure 1.1. United Kingdom 1913–1950, Feinstein, Statistical, T 112–T 113; 1950–1965 Broadberry. Manufacturing 788–790. Germany 1913–1950: Hoffmann, Wachstum, 392–395; 1950–1965 Broadberry, Manufacturing, 788–790. Belgium 1913–1938: Cassiers, Croissance, 233; 1938–1965 Soete, Evolution.

Population figures from Maddison, Dynamic, Appendix B.

The table shows that the growth in industrial production per capita in the three neighbouring countries clearly lagged behind the Dutch growth rate. In contrast to the other three countries, there was no decline in production per capita after the First World War. Dutch industry apparently profited from the country's neutrality. Dutch industry also enjoyed strong growth after the Second World War.⁵

To obtain a more accurate picture of the industrial performances of the four countries, Figure 1.2 compares the average production per worker in Dutch industry, year by year for the period 1913–1965, with production per industrial worker in the United Kingdom, Germany and Belgium. The time series of comparative productivity are based on the extensive comparisons of industries dealt with in Chapters 2 and 3. The figure shows that Dutch industrial productivity has not caught up in a steady, linear process; rather there were alternate periods of high and low comparative levels. Prior to 1921 we have only one observation, that for 1913. Changes in the comparative productivity in the intervening years cannot be calculated. We can see that in 1913 Dutch productivity was very low in comparison to British and German levels, reached a higher comparative level in the inter-war period, but after the Second World War it was again substantially lower. This lost ground was largely made up during the 1950s and 1960s. What factors deter-

⁵ The scant growth of industry in Belgium is striking. Nevertheless, in 1938 Belgium still had a much larger industrial sector than the Netherlands, with industry accounting for 33% of employment. De Jong and Soete, Comparative, 29.

mined the changes in industrial labour productivity, and how can we explain differences in levels between the countries? Much of this book is devoted to determining the nature of this development process.

Figure 1.2. Comparative labour productivity in manufacturing in the U.K., Germany and Belgium, 1913–1965 (Netherlands = 100)



Sources: Netherlands: Appendix C. United Kingdom 1913–1950 Feinstein, Statistical, T112–T113 and T129–T130; 1950–1965 Broadberry, Manufacturing, 789–790. Germany 1913–1950: Hoffmann, Wachstum, Part 2, Tables 15 and 76; 1950–1965 Broadberry, Manufacturing, 788–790. Belgium 1921–1965: De Jong and Soete, Comparative, 48.

Average labour productivity is used in this study as an indicator of industrial performance and of changes in the structure of industrial production. However it is not synonymous with production efficiency or the competitive position of a country, sector or industry. Labour productivity is the production expressed in comparison to the input factor 'labour'. High labour productivity may indicate high efficiency in production, but may also be an effect of disproportionately large inputs of other factors of production such as capital goods, especially the use of labour-saving machines. The high productivity is then mainly the result of using larger amounts of capital (in the form of machines, buildings and vehicles) in the production process and of differences in labour input.

Productivity should also not be confused with competitiveness, which refers to the degree to which a country or industry is able to sell its products at a competitive price on

the world market. Competitiveness depends among other things on factors such as exchange rates, but also on cost of inputs such as raw materials and labour.⁶ However in the long term one would expect to see a relationship between the degree of competitiveness and the level of labour productivity.⁷

1.2. The structure of the study

The structure of this study is as follows. The remainder of this chapter shows how the various industrial sectors developed between 1913 and 1965, using figures originating from the national accounts (i.e., the CBS's *Nationale Rekeningen*). I explore how the data in the principal source used in this study, the Statistics of Production, relates to the figures in the national accounts.

The second, third and fourth chapters focus on international comparisons. Chapter 2 presents detailed comparisons of industries, focusing on the period just before the Second World War. The comparisons provide a picture of the average labour productivity in the diverse industries of the four countries, and of differences in their industrial structures. In the following chapter (3) the synchronic comparisons are extended backward and forward using time series on industrial productivity. This puts the industrial performances of these countries in a dynamic perspective, giving a picture of similarities and differences in their long-term development. Chapter 4 analyses the causes of differences in productivity by relating cross-sections of variations between industries in the Netherlands and in the three neighbouring countries to comparative levels of possible explanatory factors such as wages, capital intensity, market size and plant size.

Chapters 5, 6 and 7 focus on explaining changes in productivity in Dutch industry. Chapter 5 examines the extent to which the development of productivity in manufacturing industry as a whole can be attributed to growth within the diverse industries or to structural shifts between industries. Chapters 6 and 7 look at the influence of the amount and quality of two factors of production, labour and capital, respectively. Diverse indicators are used, such as wage rates, categories of labour, installed machinery capacities, electrification rates, and the capital stock. Once again, the approach used considers both synchronic perspectives and changes over the long-term. Chapter 7 concludes with an examination of the extent to which shifts in the relative prices of the factors of production has had demonstrable effects on changes in labour productivity.

Chapters 8 and 9 provide a chronological overview of industrial developments in the period covered by our study, which is divided into two periods: 1913-1938 and

⁶ For example, low wage levels can temporarily improve the competitive position, and compensate for other factors such as low labour productivity. At the same time, in an open economy low wages cannot provide a lasting basis for retaining competitiveness, because increasing productivity also raises living standards. See for example Rostas, *Comparative*, 6.

⁷ Broadberry and Crafts have shown that for the United Kingdom in the 1930s the comparative productivity per industry is closely related to export performance. Broadberry and Crafts, Britain's, 542.

1938–1965. The analysis focusses on the impact of the two world wars and the Depression on manufacturing performance and on the effects of government policies. Finally, Chapter 10 summarises the most important conclusions of the study.

1.3. Industrial development by sector between 1913 and 1965

Production data for industry as a whole is provided in the Dutch national accounts drawn up by the Central Statistical Office (CBS). The national accounts provide a quantitative record of all economic activities in the country during a particular period (generally a calendar year). National record-keeping systems describe the formation, distribution and spending of national production and national income in a country. Income and production can be measured in various ways. Here we are interested only in industrial production. In the Dutch national accounts, the manufacturing industry is divided into a number of industrial sectors. These are listed in Table 1.4.

SBI classification *		1913†	1921	1938	1950	1960	1965
20/21	Food and beverages	35.0	24.2	35.9	21.2	20.8	20.1
22	Textiles	11.1	10.5	7.8	11.8	6.2	4.8
23	Clothing	9.5	12.8	8.3	5.5	3.4	3.0
24	Leather and footwear	3.7	2.9	2.5	3.2	2.3	1.9
25	Wood and furniture	6.2	5.6	3.2	4.0	3.1	3.2
26	Рарег	1.5	1.2	2.5	2.6	3.1	3.1
27	Printing and publishing	3.3	5.6	4.6	5.0	4.8	4.9
28/31	Petrochemicals	2.2	5.1	5.7	11.9	15.5	16.9
32	Construction materials	4.7	4.8	3.0	3.5	3.7	4.1
33/37	Metals & engineering	20.5	25.4	25.2	27.9	34.2	35.1
38/39	Other	2.7	1.9	1.3	3.4	2.9	2.9
Total		100	100	100	100	100	100
Value (x	million guilders, current prices)	602	1,452	1,416	5,865	14,241	22,267

Table 1.4. Gross value added shares (%) in manufacturing in current prices, 1913-1965

* Standard industrial classification of the CBS

† Figures for 1913 are net rather than gross value added

Sources: Year 1913: Smits, Horlings & Van Zanden, *Dutch GNP*, 130–141. Years 1921, 1938: De Jong, Measuring, 216. (Based on figures made kindly available by Gert den Bakker of the CBS.) Years 1950, 1960 and 1965: CBS, *National Accounts.*

The classification of industries has not always been the same. Before 1945, the classification system used was the same as the classification in the census of population and employment. From 1945 however, the United Nations' International System of Industrial Classification was used. From 1969 onwards, the classification of industrial sectors was again changed, this time under the CBS's own standard classification of industries (SBI). The reconstruction of the distribution of the value added in the inter-war period also employs the SBI classification system. These changes in the system complicate comparisons over time. The problem is largely confined to the classification of the clothing, footwear, leather and rubber industries.⁸ To make the data series consistent, I have recalculated them for 1950, 1960 and 1965 using the 'new' SBI system, so that they correspond to the classification of the inter-war years. The recalculation is based on tables given in the CBS's overviews of national accounts that are detailed at the level of industrial sectors and individual industries (*bedrijfsklassen* and *bedrijfstakken* respectively). To relate this data to the situation before the First World War, a column has been added for 1913.

The table gives the percentage distribution of the total value added (the value of production minus the value of raw materials and other items consumed) in manufacturing industries. Total value added in current prices is also presented. At the beginning of the period, about 75 percent of total value added in the industry was produced in the food and beverage industry, metals and engineering and the clothing and textile industry. In the course of the period, the relative position of the food and beverage sector declined, although in 1965 it was still the second largest sector, accounting for 20 percent of production. The share of the textile and clothing sector declined markedly, especially between 1950 and 1965. Its place in the top three was taken by the rapidly growing petrochemical industry. The latter developed strongly during and after the First World War, with products such as rubber and fertiliser. During the inter-war period, a chemicals industry linked to coal mining (coal tar, coke, etc.) was established. After the Second World War this sector expanded with oil refining, bulk chemicals, plastics and pharmaceuticals. Over the period as a whole, the metals and engineering industry is the largest sector. After 1950 its share increased from about 28 percent to 35 percent of total value added. Growth was especially strong in electrical and mechanical engineering and in the vehicle industry. If we look at the sectoral classification used here, it is striking that sectors 20/21 and 33/37, i.e. food and metals, together account for some 50 percent or more of industry during the whole period. At first sight this indicates a considerable specialisation of Dutch manufacturing, which also fits with the picture of an open economy. However there is a wide diversity within the two largest classes. The products of the food and beverage industry in the Netherlands include dairy products, sugar, flour, margarine, cocoa, potato starch, beer, tobacco and preserved food, fruit and fish. The metal industry can be subdivided into metallurgy (iron and steel production, zinc, tin and aluminium), metal products (wire, sheet metal processing), machine construction and steel construction, the manufacture of means of transport (shipbuilding and vehicles, including bicycles, coachwork and cars) and electro-technical products.

The importance of the diverse industries can also be judged from their relative employment levels. However there is a problem, in that the figures in the national

⁸ In the former classification, clothing and footwear were considered together, along with nonfootwear leather products and rubber products. In the new classification, clothing is a separate category (sector 23), leather and footwear are combined (sector 24) and rubber is included under the petrochemical industry (sectors 28/31).

surveys for labour volume per industry for the period 1913–1965 do not have the same statistical basis and classification as the figures for value added. We are therefore forced to use other sources such as the census of employment. Table 1.5 shows percentage distributions for the years 1938 and 1960.

		Employment		Relative Productivity	
SBI clas	sification*	1938	1960	1938 ratio **	1960 ratio
20/21	Food and beverages	23.5	15.0	1.5	1.4
22	Textiles	12.2	9.2	0.6	0.7
23	Clothing	11.1	7.5	0.8	0.5
24	Leather and footwear	2.8	2.5	0.9	0.9
25	Wood and furniture	5.2	5.2	0.6	0.6
26	Paper	2.5	2.6	1.0	1.2
27	Printing and publishing	5.6	5.3	0.8	0.9
28/31	Petrochemicals	4.4	8.3	1.3	1.9
32	Construction materials	4.4	4.5	0.7	0.8
33/37	Metals and engineering	27.1	37.7	0.9	0.9
38/39	Other industry	1.3	2.2	1.0	1.3
Total		100	100	1	1

Table 1.5.	Employment shares	(%) and relative labou	r productivity	by sector in	manufacturing
in 1938 and	i 1960				

* Standard industrial classification of the CBS

** The percentage of value added divided by the percentage of employment.9

Sources: Employment 1938, measured in total working hours: Den Bakker & De Gijt, Labour force. Employment 1960, measured in number of workers: CBS (1966) results of the 13th national census. Relative productivity: see Table 1.4.

The figures for 1938 are obtained by extrapolation from the results of the census of employment of 1930. They indicate the percentage distribution of wage and salary earners. That is, they do not include the self-employed.¹⁰ The employment figures for 1960 are based on the census of employment of that year. To make the comparison with 1938

⁹ This is a very crude approach, because the percentage shares of value added are calculated from ratios of nominal values and not from real values, which would be the ideal procedure. However the CBS does not have price indices available for all industrial sectors.

¹⁰ See Den Bakker and De Gijt, Labour force. The researchers took the 1930 census of employment as a starting point. They then corrected the wage-earning population for each sector of industry to allow for the unemployment for each sector, giving a figure for employment volume. Then employment levels over the course of the 1930s were extrapolated on the basis of the recorded labour years (of wage and salary earners) for each sector, as given in the accident statistics of the National Insurance Bank. The figure for 1938 therefore shows the number of recorded labour years worked in that year.

as accurate as possible I have deducted the self-employed and unemployed from the recorded working population for each sector of industry, so that both columns refer only to the employment of wage and salary earners. Nevertheless there is still a difference between the two estimates, in that the results of 1938 should be interpreted in terms of labour volume (total hours worked) and those for 1960 in terms of number of workers. Therefore it would not make sense to compare the absolute numbers with one another. The relative numbers can be compared, supposing that the relationship between labour volume and number of workers has not changed very much over time or between industries in this period. Part-time work was almost unknown in these years.

It can also be seen from these figures that Dutch manufacturing was dominated by the food and metals industries. Nevertheless, employment in the textile and clothing industry was still considerable, while the chemicals industry played a much more modest role in this distribution. In 1960 the percentage of realised value added in the chemical industry was larger than its share of employment. The ratio between the two percentages provides an indicator of the relative labour productivity. For the chemicals industry this ratio is greater than one, i.e. that average value added per person working in this sector is higher than for manufacturing as a whole. The relative labour productivity for the textile and clothing industry is less than one. In Table 1.5, the relative labour productivity for 1938 and 1960 is given in the last two columns.

A high relative labour productivity is apparent in the food and beverage, paper and chemicals industries, for both 1938 and 1960. The other industries have values that are lower than one. These industries are characterised by a relatively labour-intensive production process, whereas the first group of industries is more capital-intensive. It is striking that the metals industry also has a below-average relative labour productivity. However the range of values between industries is enormous. On the basis of the underlying data one can calculate values of about 1.5 for the metals processing and electrical engineering industries, while the value for the vehicle industry is less than 0.7.

1.4. The Dutch Statistics of Production

The results presented here flow from a process in which individual industries and companies grow or decline. In studying the process of industrial development and the rise in average labour productivity in industry, it is very important to obtain an understanding of the structure of value added and of the associated employment. The level of aggregation of the national accounts is too high for the purpose. Moreover we have seen that the figures for value added and employment do not have the same statistical basis. Furthermore the portion of production that cannot be directly measured is estimated in the national accounts on the basis of employment figures. This means that quantitative analyses based on the outcomes of the national accounts are unavoidably superficial. This study is based only on the directly measured production, as that can be found in the official Statistics of Production.

The data in the production statistics is central to this study. From 1921 this source provides detailed annual information for some twenty-five industries, covering produc-

tion, inputs and value added. The data is collected by means of the CBS's direct company surveys. Detailed information is also available about the corresponding annual labour inputs. However one limitation of the statistics of production is that the information covers only part of total manufacturing.¹¹

Ivational Accounts in 1999					
SBI classification		1950			
20/21	Food and beverages	12			
22	Textiles	99			
23	Clothing	55			
24	Leather and footwear	60			
25	Wood and furniture	0			
26	Paper industry	57			
27	Printing and publishing	0			
28/31	Petrochemicals	13			
32	Construction materials	68			
33/37	Metals and engineering	85			
38/39	Other industry	0			
Total		49			

 Table 1.6. Production reported in the Statistics of Production, as a percentage of total industrial production in the National Accounts in 1950

Sources: Appendix A and CBS, National Accounts.

Table 1.6 indicates the relationship between the data from the Statistics of Production and those from the national accounts for 1950. The percentages indicate the proportion of the value added per industrial sector in the national accounts that is covered by the figures given in the Statistics of Production. In 1950 the Statistics of Production covered almost half of industrial value added. However there are considerable differences between the various industrial sectors. The percentages in the food and beverages industry, which is an important industry in the Netherlands, are low. The chemicals industry is also represented only very modestly in the Statistics of Production. In contrast, a large portion of the value added in the textile and metallurgical industries appears in the statistics, along with more than half the value added in the clothing, leather, footwear, paper and construction materials industries. The wood and furniture industry, and printing and publishing are not represented.

At least three reasons can be suggested to explain the difference in the figures of the Statistics of Production and those in the national accounts. In the first place, the Statistics of Production do not give an equally good picture of all sectors of manufactur-

¹¹ However the data available from the two sources is not independent. In both the national accounts after 1945 and the reconstruction of the accounts for the period between 1913 and 1939, the data in the Statistics of Production is the most important element in the estimates of aggregated industrial production.

ing. From 1921 on the CBS chose to gather its data annually, but they did not have the resources to cover all industries: at that time about twenty industrial sectors were included in the statistics. More industrial sectors were added over the course of time. Just before the Second World War the 'sample' consisted or twenty-five industrial sectors. In 1960 the Statistics of Production included fifty industrial sectors.

Second, the Statistics of Production relate only to medium-size and large companies, to facilitate the efficient processing of the data by the CBS. The criterion for including companies within the selected industrial sectors in the statistics was in most cases the number of workers, but sometimes also the volume of production. For instance, the mechanical engineering industry in the statistics for 1950 included only firms with 25 or more workers, and after 1950 it included only those with more than 49 workers. Elsewhere I have indicated the effects of these changes on the total recorded production and productivity in the statistics of the relevant sectors. It will be clear that there may be sudden changes in recorded production and employment that are not due to cyclical effects, but simply to statistical redefinitions.¹²

The third reason why the figures presented here differ from those in the national accounts is that I chose to base my analysis of industrial production on consistent times series for both the individual industrial branches and the total production calculated from the Statistics of Production. If newly added industries were also included in the calculations, this would produce an artificial appearance of growth in the statistics that would make it more difficult to evaluate the effects of the wars and the Depression. For example, to ensure the consistency of the data over time, the industrial sectors added to the Statistics of Production after 1945 are not included in the analyses.

This general outline of the reasons for differences between the data in the Statistics of Production and the national accounts highlights the question of how representative the sample used in the Statistics of Production is of manufacturing as a whole. In the first place, particular industrial sectors and groups of companies are entirely omitted from the Statistics of Production. In the second place there is a bias in favour of larger companies. Moreover it is clear that these industries are not a random sample from the total population of Dutch industries. This limits the role of stochastic theory in making reliable judgements about industry as a whole. On the other hand, the high degree of detail in the data available from the Statistics of Production offers a good insight into the forces lying behind the processes of industrial growth and changes in productivity. On the basis of these insights we can reach conclusions that have validity extending beyond the industries included in the statistics.

The working methods in this study are based on data collection and analysis at the level of aggregation of individual industrial branches rather than industrial sectors, as in the national accounts. This 'industry-of-origin' approach was first used systematically by Rostas in a comparative analysis of the British and American manufacturing industries. Paige and Bombach later refined this approach by basing comparisons of productivity between the industries in two countries on the value of the total production in an in-

¹² De Jong, Nederlandse industrie, 421–423.

dustry rather than on quantities of some of typical goods, as Rostas did.¹³ My estimates of production and labour productivity in Dutch industry are based on the approach described here, both in comparing and explaining industrial performance in the Netherlands over the long term and in comparing that performance with manufacturing of the neighbouring countries, Belgium, Germany and the United Kingdom. The new comparisons enable us to form a much better picture of differences in productivity and changes over time than was previously possible.

¹³ When translating the value of production into a common unit (which, incidentally, is always expressed in the currency of the country concerned), the official exchange rate is not used, but rather a value ratio calculated from the data in the Statistics of Production itself, i.e., this method is based on an industry-specific 'exchange rate', and guarantees much more representative value ratios in comparisons between the production figures in two different countries. Van Ark and Maddison's 'International Comparisons of Output and Productivity' project at the Faculty of Economics in Groningen has made many systematic comparisons of the level of labour productivity in diverse countries using this method. See Maddison and Van Ark, International.