BULLETIN 1580

AN INTERNATIONAL COMPARISON OF UNIT LABOR COST IN THE IRON AND STEEL INDUSTRY, 1964: UNITED STATES, FRANCE, GERMANY, UNITED KINGDOM

UNITED STATES DEPARTMENT OF LABOR, Bureau of Labor Statistics

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U.S. DEPARTMENT OF LABOR, Willard Wirtz, Secretary
Bureau of Labor Statistics, Arthur M. Ross, Commissioner

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Preface

The Bureau of Labor Statistics has had an increasing interest in comparing labor costs per unit of output by industry in different countries as one of the basic factors determining international trade flows in manufactured products. The Bureau published an article in the May 1963 Monthly Labor Review describing the technical problems of defining and measuring unit labor cost and has issued several reports (April 1964 and September 1965 issues of the Monthly Labor Review, and BLS Bulletin 1518, 1966) showing the time trend indexes of unit labor cost in all manufacturing for industrial countries. The present bulletin compares, for the first time, the absolute levels of unit labor cost in the primary iron and steel industry of the United States and the three largest steel producing countries of Western Europe in 1964. A study of unit cost in the Japanese industry and a companion study of trends in unit labor cost in the iron and steel industry for the same five countries are in progress.

The steel industry was selected for this first absolute measurement project because it ranks high among basic industries in terms of size, public interest, and availability and comparability of data. United States imports of steel products and the volume of international trade in steel products in general have reached record levels in recent years, resulting in sharpened interest in the findings of this study. Great interest also attaches to the method of the present study and to the fact that sufficient data could be assembled to complete an international comparison at the industry level.

The bulletin was prepared by David A. Wise and reviewed by John H. Chandler and William C. Shelton in the Office of Foreign Labor and Trade.

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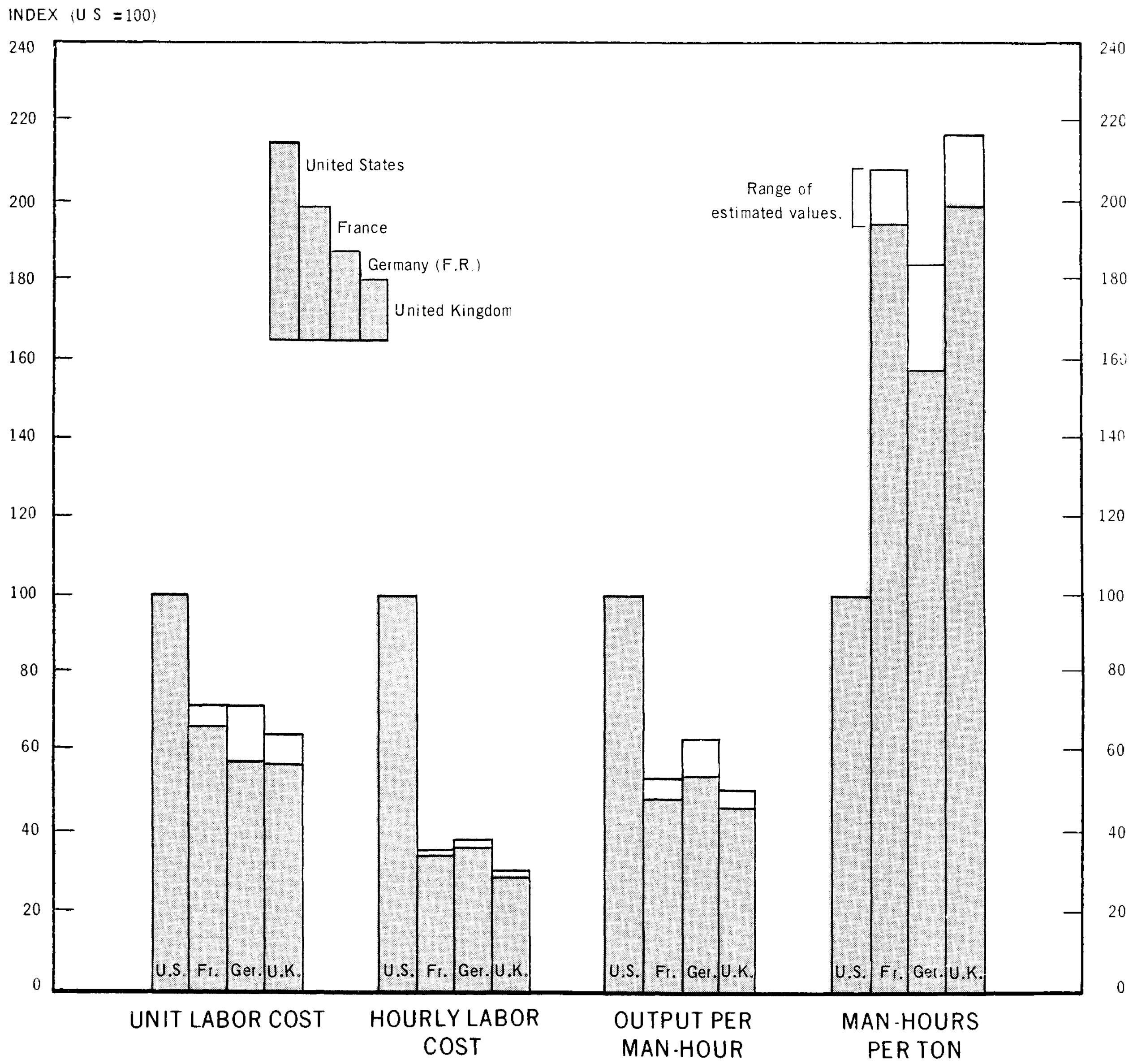

Introduction

The international competitive position of the iron and steel industry in the United States is affected greatly by cost as reflected in price. Other factors such as product design, quality, and promptness of delivery are also important, but because the market for steel products is highly competitive, price is an important factor in the international market for these products.

Although development of intercountry comparisons of total cost per unit of output has not been attempted, sufficient data have been compiled to make comparisions of labor cost, which is a sizable part of total cost in the iron and steel industry. In the United States in recent years, labor cost has been about 40 percent of total cost. In France, the Federal Republic of Germany, and the United Kingdom, labor cost is between 20 and 30 percent of total cost. [1]

The present study compares unit labor cost in the United States with that in France, the Federal Republic of Germany, and the United Kingdom. These three countries of Western Europe have the largest and most fully integrated iron and steel industries. Together, these countries exported about 2.2 million short tons of steel mill products to the United States in 1966. [2] The study also compares output per man-hour and hourly labor cost in these four countries. The results are summarized in figure 1.

Data limitations have prevented the development of precise comparisons. Thus the results for the countries of Western Europe are presented as ranges (high and low estimates) in order to account for possible variations stemming from gaps in available published data. The results for the United States are not presented in the form of a range since available data are much more complete.

Unit labor cost in the United States, at $58.77 per ton of finished steel in 1964, was considerably higher than that in any of the other three countries. Estimates of total labor cost per unit of output in France, Germany, and the United Kingdom ranged from 57 to 72 percent of the cost in the United States. It is not possible to indicate with certainty the relative standing of the three foreign countries considered, but the cost in the United Kingdom was probably somewhat lower than the cost in France. If the actual cost in Germany fell near the middle of the range of estimates for Germany, the cost would have been approximately midway between the cost in France and the United Kingdom.

As can be seen in figure 1, hourly labor cost in the United States was much higher than in any of the other three countries; total cost for wage earners and salaried employees in the European countries was about one-third of the cost in the United States.

Although hourly labor cost was much higher in the United States than in the other three countries, more man-hours were required per ton of output in each of the European countries than in the United States, partially offsetting the lower hourly labor cost advantage in these countries. About twice as many man-hours were required per ton of output in France and the United Kingdom as in the United States; the requirement in Germany was somewhat less.

It must not be inferred from the results obtained for unit labor cost that differences among the four countries in other costs of production are of the same magnitude or even in the same direction. The prices of some inputs such as coal and electricity are certainly higher in Europe than in the United States, although other prices probably are lower abroad than in the United States. The prices of some inputs are determined largely by world commodity prices and may not vary greatly among countries. The impact of individual price differences on production cost is hard to evaluate, however, because of differences in the efficiency of utilization of material inputs and the extent to which other inputs may be substituted. In any event, unit labor cost alone cannot measure the cost competitiveness of an industry in international trade.

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[1] Annual Statistical Reports (New York, American Iron and Steel Institute); Unternehmen und Arbeitsstatten, Reihe 1, Die Kostenstruktur in der Wirtschaft, I. Industrie und Energiewirtschaft, 1962 (Wiesbaden, Statistisches Bundesamt); and unpublished estimates. The German study indicates that labor cost accounted for approximately 24 percent of total cost in the German steel industry in 1962, on the basis of the German industry definition. The cost of materials and work contracted out (excluding maintenance) accounted for approximately 53 percent of total cost.

[2] 1.4 million short tons in 1964. The United States exports very little steel to these countries.

It must be remembered, also, that international competition takes place not at steel mills but where the steel consuming industries are located. Therefore, the cost of transportation is an important factor in assessing the competitive position of a particular country in international markets. This study does not attempt to evaluate transportation and distribution costs for the different countries or market areas.

In addition, the fact that unit labor cost in the primary iron and steel industry is higher in the United States than in Western Europe by no means implies that this is true for every steel mill product or for every plant in each country. The partial comparative data available on list prices show that prices are generally lower in Europe than in the United States, but data are not available for all products. No information can be obtained on actual transaction prices, which often differ greatly from list prices and which normally might be expected to reflect production costs over an extended period of time. Moreover, the efficiency of plants and companies may vary greatly in the same country. The most efficient, of course, are likely to be the more important in international trade. The comparison of unit labor cost by product or for individual companies or plants has not been attempted.

The methods used in this study are explained in considerable detail. A section on the general method[3] precedes the presentation of results in the belief that some knowledge of the procedures followed will lead to greater understanding of the results. A detailed discussion of the weighting system employed and an explanation of the data used in the calculation of figures for each country have been included in a final section devoted entirely to methods. This latter section also includes some discussion of the quality of steel produced by the countries and possible means of allowing for quality differences among the countries. A short explanation of the production processes of the iron and steel industry and the definition of the industry used in this study is included in the section entitled "The Iron and Steel Industry." This explanation will be helpful to persons who desire a full understanding of the study but are not well acquainted with the production processes and products of the iron and steel industry.

[3] The general approach followed in this study is outlined in a technical note prepared by William C. Shelton and John H. Chandler. See "International Comparisons of Unit Labor Cost: Concepts and Methods," Monthly Labor Review, May 1963, pp. 538-546.

General Method

Definition of Unit Labor Cost

Unit labor cost is the ratio of total labor cost, in money terms, to total output produced by labor (in concert with other factors of production), in physical terms. In this study, the unit of measure is dollars per short ton of final steel products.[4] Unit labor cost can be obtained also from hourly labor cost and output per man-hour (or man-hours per unit of output). Algebraically, these relationships may be expressed as follows:

Let:

Q = quantity of output

E = aggregate labor cost (or expenditure)

L = man-hours of labor

then,

$$\text{Hourly labor cost} = \frac{E}{L}$$

$$\text{Output per man-hour} = \frac{Q}{L}$$

$$\text{Man-hours per unit of output} = \frac{L}{Q}$$

$$\text{Unit labor cost} = \frac{E}{Q} = \frac{E/L}{Q/L} = \frac{E}{L} \cdot \frac{L}{Q}$$

From these relationships it can be seen that unit labor cost equals hourly labor cost divided by output per man-hour and also equals hourly labor cost times man-hours per unit of output. The method used in this study to derive unit labor cost figures is explained in detail in appendix A.

Labor Expenditure

Labor expenditure includes direct payment for the services of all production and nonproduction[5] labor employed within the industry and the cost of all supplementary benefits. Only those workers who are contributing to the production and sale of goods included in the definition of the industry are covered by the expenditure data.

[4] Products shipped out of the industry, as defined.

[5] Such as maintenance workers, janitors, salaried employees, and other workers not directly involved in producing a product of the industry.

Table 1. Items Included in Labor Cost, by Country, 1964

Item	United States	France	Germany	United Kingdom
Direct payments:				
Regular wage or salary	x	x	x	x
Shift differential	x	x	x	x
Overtime and other premiums [1]	x	x	x	x
Productivity bonuses or payments based on production	[2] x	x	x	x
Cost-of-living allowance	x	x	x	x
Bonuses and gratuities	x	x	x	x
Holiday pay	x	x	x	x
Vacation pay	x	x	x	x
Legally required social insurance costs [3]	x	x	x	[4] x
Contractual [5] or voluntary social insurance costs [6]	x	x	x	x
Family allowances [7]	([8])	x	x	x
Payment in kind	([8])	x	x	x
Recruitment and training expense	([9])	[10] x	[10] x	[10] x
Tax on wages and salaries		[11] x		
Subsidized services	([12])	[13] x	[13] x	[13] x

[1] For work on Sundays and holidays and for dangerous or inordinately arduous work, etc.

[2] Would be included if incurred by employer.

[3] Such costs in the United States include taxes for old-age, survivors, and disability insurance; unemployment insurance; and State sickness insurance.

[4] Excluding the National Health Insurance Plan.

[5] Included in a labor-management contract.

[6] Such as supplemental unemployment benefit plans and company pension and insurance plans.

[7] May be a direct payment to worker and may be legally required, contractual, or voluntary.

[8] Not incurred.

[9] Largely covered in the form of wages and salaries to apprentices and instructors.

[10] About 2.2 percent of total labor cost in France; 1.6 percent in Germany, including wages and salaries of apprentices and instructors; and 0.4 percent in the United Kingdom.

[11] 5 percent.

[12] Partly covered in wages and salaries.

[13] Possible 1 percent of total labor cost in France and Germany, including wages and salaries; and 0.8 percent in the United Kingdom.

Labor expenditure in this study includes the following costs: All monetary remuneration paid directly to the worker, including bonuses, premium pay, and holiday and vacation pay; family allowances; employer social insurance payments to both public and private funds; and payments in kind. The French, German, and United Kingdom data (as collected by survey and reported) also include small expenditures for recruitment and training and subsidized services; the French data include the cost of a 5-percent tax on wages and salaries.[6] Family allowances, the payroll tax as in France, and payments in kind are, of course, costs that generally are not incurred by U. S. employers. Labor cost items considered in the study and the countries in which each item is incurred are indicated in table 1.

Reference in this study to "wages" or "salaries" means monetary remuneration excluding nonproduction bonuses[7] and holiday and vacation pay. "Total labor cost" for wage earners or salaried employees means all costs associated with the employment of workers, as shown in table 1.

In the United Kingdom, some social costs are incurred indirectly by employers and therefore are not considered as labor cost; in other countries they normally would be included as direct social insurance payments and thus would be included in labor expenditure. This is true particularly of costs related to the National Insurance Program, which is financed out of general tax revenue, part of which comes from industry taxes. Employer labor cost in the United Kingdom would be higher if a portion of employer income tax payments were treated as a direct expenditure for labor.

The Need for Weighting

Since the output of the steel industry comprises a large variety of products and since labor input (and thus cost) requirements vary greatly from one product to another, the output of each product must be weighted in such a way that more value is given to those products requiring relatively greater labor input and less value to those requiring less labor input. If this were not done, the unit labor cost in a country producing only products requiring little labor input would be understated relative to the unit labor cost in a country producing only products requiring a high labor input. Thus, the output figure used in the calculation of unit labor cost is a weighted combination of the outputs of all the products of the industry.

The weights are based on the experience of the United States steel industry and reflect relative man-hour requirements per ton of each product; that is, if twice as many man-hours are required to produce a ton of product A as to produce a ton of product B, the weight for product A is twice the weight for product B. The weight for any given product reflects man-hour requirements in the final process used to make that product, in addition to all man-hours in prior processes beginning with the production of coke.

The weights were derived from relative man-hour weights compiled for use by the Bureau of Labor Statistics in measuring output per man-hour in the United States steel industry. This derivation is described fully in the section on "Methods and Data Used."[8]

The total weighted output figure is obtained by multiplying the output of each product by the weight for that product and then summing the resulting figures. Thus, weighted output for a foreign country is not the actual tonnage output of that country but the output measured in United States composite tons. It approximates the output that would have been produced if the foreign country had produced steel products in the same proportions as the United States.[9]

Minimum and Maximum Estimates

Data for France, Germany, and the United Kingdom are often not as detailed as data for the United States. For example, the output of each product in the United States is distributed among three grades of steel—carbon, alloy, and stainless—whereas a similar breakdown for the other countries is usually not available, except in the United Kingdom. The output of pipe and tubing in the United States is classified in five or six categories according to the use for which it is intended, such as pressure tubing, oil-country goods, and line pipe; for the other countries, data are normally available only according to method of production—welded or seamless.

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[6] This is not a payroll tax as normally understood in the United States, but is in addition to (or other than) social insurance payments.

[7] Not production incentives, such as payments based on output, which are a part of day-to-day compensation.

[8] The weights used in the calculation are such that, for the United States, $\sum Q_i W_i' = \sum Q_i$, where Q_i = the output of the ith product and W_i' = the weight for the ith product.

[9] Assuming that relative man-hour requirements are the same in the foreign country as in the United States. See section on "Methods and Data Used" and appendix A.

In addition, complete labor expenditure data are not available for every country, and that which is available may not pertain precisely to the industry as defined for this study.

In order to make allowances for these and other data limitations, the results for France, Germany, and the United Kingdom have been presented in the form of a range based on high and low estimates. If, for example, the distribution of a country's pipe and tubing production among the several functional classifications of pipe and tubing is not known, two different distributions have been developed, the first placing as much of the total output as would appear possible—after examination of available data—in categories requiring relatively few man-hours, and the second placing as much of the total as would seem possible in categories with relatively high man-hour requirements. The total weighted output in the first case would be smaller than the weighted output in the second case. The same procedure was followed in making two distributions of alloy and stainless steel and in other cases—both on the output and labor expenditure sides of the unit labor cost equation—where complete information is not available.

In estimating maximum and minimum figures, the following procedure was used: (1) Where the possible error—resulting from definitional differences or gaps in the data—in a given figure is small (say, of the order of 1 percent of the figure or less), a single figure has been used; (2) where the possible error is somewhat larger, a deliberately broad range has been allowed; and (3) in aggregating items, the maximum and minimum figures have been combined in such a way as to produce the broadest possible resulting range. The range does not allow for certain differences among the countries, such as in the degree of vertical integration or in the quality of steel produced. These differences, however, as indicated in later discussion, appear to be quite small.

For France, the minimum estimate of unit labor cost is about 8 percent lower than the maximum estimate; for the United Kingdom, the difference in the two figures is about 10 percent. In Germany, however, the minimum figure is approximately 19 percent less than the maximum figure. The ranges, of course, reflect the availability or comparability of data from each country.

Results

Since unit labor cost can be determined from hourly labor cost and man-hours per ton (or output per man-hour), the results of the study are presented in such a way as to separate out these two components. The first section discusses unit labor cost, followed by sections on hourly labor cost and man-hours per unit of output and, finally, a summary section on all three measures.

Unit Labor Cost

Figures on unit labor cost have been calculated first from aggregate labor expenditures measured in country currencies and then converted to U. S. dollars at the average annual spot rate of exchange (1964), which corresponds very closely to the par value exchange rate for each country.[10]

Unit labor cost figures for France, Germany, and the United Kingdom do not represent the cost of producing a national composite ton of steel in each country but approximate the cost of producing a U. S. composite ton.[11] If relative man-hour requirements are the same in a foreign country as in the United States, then the unit labor cost figure for this country would be equal to the cost of producing a U. S. composite ton of steel. (See appendix A.)

Unit labor cost figures converted to U. S. dollars are presented in table 2. As is evident from the table, unit labor cost in the United States, at $58.77 per ton in 1964, was considerably higher than that in any of the other three countries. Estimates of total labor cost per unit of output in France, Germany, and the United Kingdom range from 57 to 72 percent of the cost in the United States. Because the range in estimates for Germany is rather broad, it is not possible to indicate with certainty the relative standing of the three foreign countries considered,

[10] Since unit labor cost is a cost of making a product to be marketed, international comparisons of this cost should reflect commercial rates of exchange. The commercial rate is, of course, relevant in analyzing the cost competitiveness of an industry in international trade, which is the primary interest in international comparisons of unit labor cost.

[11] Or, what unit labor cost would have been if the U. S. product distribution had been produced instead of the distribution which was in fact produced. Of course, comparisons on the basis of composite tons of other countries would be useful, but product weights necessary for these comparisons are not available.

Table 2. Unit Labor Cost in the Iron and Steel Industries of the United States, France, Germany (Federal Republic), and the United Kingdom, by Worker Category, U.S. Industry Definition,[1] 1964

Worker category	United States	France		Germany		United Kingdom	
		Minimum	Maximum	Minimum	Maximum	Minimum	Maximum
	In U.S. dollars[2] per short ton						
Wage earners:							
Wages	34.01	15.09	16.10	17.93	22.30	23.89	26.71
Total cost[3]	43.17	27.29	29.56	26.35	32.77	27.59	30.85
Salaried employees:							
Salaries	12.25	7.03	7.50	5.38	6.59	5.32	5.91
Total cost[3]	15.60	11.70	12.67	7.65	9.36	6.14	6.82
Wage earners and salaried employees:							
Wages and salaries	46.26	22.12	23.61	23.31	28.89	29.21	32.62
Total cost[3]	58.77	38.99	42.23	33.99	42.13	33.73	37.67
	As percent of U.S. cost						
Wage earners:							
Wages	100.0	44.4	47.3	52.7	65.6	70.2	78.5
Total cost[3]	100.0	63.2	68.5	61.0	75.9	63.9	71.5
Salaried employees:							
Salaries	100.0	57.4	61.2	43.9	53.8	43.4	48.2
Total cost[3]	100.0	75.0	81.2	49.0	60.0	39.4	43.7
Wage earners and salaried employees:							
Wages and salaries	100.0	47.8	51.0	50.4	62.5	63.1	70.5
Total cost[3]	100.0	66.3	71.9	57.8	71.7	57.4	64.1

[1] Excluding wire and wire products in the United Kingdom and wheels and axles in Germany. The ranges in estimates for the European countries do not allow for differences between the countries in the degree of vertical integration or the quality of steel produced.

[2] Exchange rates: US $1 = 4.90 new francs, 3.977 deutsche marks, 0.3584 pound.

[3] Including supplementary benefits.

but the cost in the United Kingdom was probably somewhat lower than the cost in France. If the true cost in Germany, however, falls near the middle of the estimated range for this country, it would be slightly less than the cost in France and larger than the cost in the United Kingdom.

If the unit cost of wages and salaries, excluding supplementary costs, is considered, the cost in France, Germany, and the United Kingdom ranges between 48 and 71 percent of the cost in the United States, and the relative ranking of the three foreign countries shows greater contrast. On this basis, France has the lowest unit cost, the United Kingdom the highest cost, and the cost in Germany lies between these two. The difference between results obtained considering wages and salaries only and those obtained considering total labor-related expenditures is attributable to the different importance of supplementary benefits as a proportion of total labor expenditure in each country. Supplementary benefits are highest in France and lowest in the United Kingdom.

Unit labor cost for all employees includes cost for wage earners and cost for salaried employees. The relative ranking of the three foreign countries is significantly different for each group. Estimates of wage earner cost per ton fall between $26.35 and $32.77 for all three countries; the lower estimate in all of them falls between $26.35 and $27.59. For salaried employees, however, total cost per ton differs greatly among the three countries, being about twice as high in France, $11.70 to $12.67, as in the United Kingdom, $6.14 to $6.82.[12] The cost in Germany falls approximately midway between these two. The low cost in the United Kingdom is attributable primarily to low hourly labor cost for salaried employees. Hourly labor cost for salaried employees in France was only slightly higher than in Germany, but salary earners constitute a larger percentage of the labor force in France (about 20 percent) than in Germany (about 17 percent). Salaried employees account for about 19 percent of the steel employment in the United Kingdom and about 22 percent in the United States.

The range in unit labor cost for salaried employees in the three countries is also much wider than the comparable range for all workers. Whereas for all workers, unit labor cost in these countries ranged between 57 and 72 percent of the United States cost, unit cost for salaried employees ranged from 39 percent of U. S. cost, the low estimate in the United Kingdom, to 81 percent of U. S. cost, the high estimate for France.

Hourly Labor Cost

For international comparisons of production costs, unit labor cost is a factor of major significance; but since hourly labor cost is one component of unit cost, comparisons of hourly cost contribute toward understanding the differences in unit labor cost among countries.

Table 3 presents hourly labor cost figures expressed in U.S. dollars converted from national currencies at the 1964 spot rates of exchange. The hourly data represent cost per hour worked rather than cost per hour paid. The wage and salary figures represent pay for hours actually worked plus cost-of-living allowances, and total hourly cost figures represent all costs associated with employment of labor.

Because salaried employees usually are paid by the month or year, attention is not always given to actual hours worked by salaried employees and such data are not collected by all countries. Data on hours worked by salaried employees, however, are available for the United States (American Iron and Steel Institute) and the United Kingdom (Iron and Steel Board and the British Iron and Steel Federation). For France and Germany, where these data are not available, hourly cost figures for salaried employees are based on an estimate that the number of hours worked per year by salaried employees is the same as the number worked by wage earners.

Hourly labor cost in the United States was much higher than in any of the other three countries, total cost for wage earners and salaried employees in those countries ranging between 29 and 39 percent of this cost in the United States. Also, among the three foreign countries, there is considerable variation in total hourly cost and in the composition—wages and salaries versus supplemental costs—of labor cost.

Total cost per hour for wage and salary workers combined in the United Kingdom ($1.33–$1.37) was much lower than in Germany ($1.69–$1.80) and in France ($1.57–$1.60). If only salaried employees are considered, the difference between the United Kingdom, on the one hand, and France and Germany, on the other, is even more pronounced. The cost in the United Kingdom

[12] The figure for the United Kingdom is affected slightly by the omission from statistical coverage of some central administrative offices and research and development plants (estimated at 2 to 3 percent of total labor expenditure).

Table 3. Hourly Labor Cost in the Iron and Steel Industries of the United States, France, Germany (Federal Republic), and the United Kingdom, by Worker Category, U.S. Industry Definition, [1] 1964

Worker category	United States	France		Germany		United Kingdom	
		Minimum	Maximum	Minimum	Maximum	Minimum	Maximum
	In U.S. dollars [2]						
Wage earners:							
Wages	3.43	0.76	0.76	1.08	1.15	1.13	1.16
Total cost [3]	4.36	1.38	1.40	1.59	1.69	1.31	1.34
Salaried employees:							
Salaries	4.39	1.41	1.41	1.55	1.62	1.25	1.30
Total cost [3]	5.59	2.34	2.38	2.20	2.30	1.44	1.50
Wage earners and salaried employees:							
Wages and salaries	3.64	.89	.89	1.16	1.23	1.15	1.19
Total cost [3]	4.63	1.57	1.60	1.69	1.80	1.33	1.37
	As percent of U.S. cost						
Wage earners:							
Wages	100.0	22.2	22.2	31.5	33.5	32.9	33.8
Total cost [3]	100.0	31.7	32.1	36.8	38.8	30.0	30.7
Salaried employees:							
Salaries	100.0	32.1	32.1	35.3	36.9	28.5	29.6
Total cost [3]	100.0	41.9	42.6	39.4	41.1	25.8	26.8
Wage earners and salaried employees:							
Wages and salaries	100.0	24.5	24.5	31.9	33.8	31.6	32.7
Total cost [3]	100.0	33.9	34.6	36.5	38.9	28.7	29.6

[1] Excluding wire and wire products in the United Kingdom and wheels and axles in Germany.

[2] Exchange rates: US $1 = 4.90 new francs, 3.977 deutsche marks, 0.3584 pound.

[3] Including supplementary benefits.

is 62 and 65 percent, respectively, of the cost in France and Germany. This difference is explained by the fact that the differential in hourly cost between salaried employees and wage earners is much lower in the United Kingdom than in the other countries. In the United Kingdom, the hourly cost of employing wage earners was about 90 percent of the cost of employing salaried workers ($1.31—$1.34 an hour for wage earners versus $1.44—$1.50 for salaried employees), but in France the cost for wage earners was only about 59 percent of the cost for salaried employees. In Germany and the United States, these percentages were 73 and 78, respectively.

For all workers the proportion of total hourly labor cost accounted for by supplementary benefits ranged from a low of approximately 13 percent in the United Kingdom to a high of about 44 percent in France. This proportion is about 32 percent in Germany and 21 percent in the United States. The low proportion in the United Kingdom undoubtedly is due in part to the fact that employer costs which are related to the National Insurance Program are excluded from labor expenditures.

The differences in hourly labor cost (or in wages and salaries) which have been described do not necessarily reflect differences in purchasing power of workers or in their general welfare. From the point of view of worker welfare, international comparisons must take into account the relative prices of goods and services among countries and also differences in the types of goods and services purchased. These factors have not been considered in this study since they do not pertain to labor cost in the context of production cost comparisons.

The study does not attempt to make comparisons between the countries in the "quality of labor," as might be determined by some objective standard such as the proportion of workers in given occupations or professions, the length and type of education received by workers, or the level of performance in relation to job standards. The purpose of the study is not to compare wages or salaries paid for given types of work or to persons with a certain level of education in one country with those paid in another. The purpose is to compare the cost of labor required to produce a given unit of output in the different countries, regardless of any special qualities of the labor employed in each country. Hourly labor cost is considered because of its inherent relationship to unit labor cost.

Man-Hours per Unit of Output

The second component of unit labor cost is output per man-hour or its reciprocal, man-hours per unit of output. In the discussion which follows, the latter concept is used, since man-hours required by wage earners and by salaried employees may be added together to obtain total man-hour requirements and each may be discussed separately in a meaningful manner. Both types of data are presented in table 4.

Although hourly labor cost was much higher in the United States than in the other three countries, more man-hours were required per ton of output in each of these countries than in the United States, partially offsetting their lower hourly labor cost advantage. About twice as many man-hours were required per ton of output in France and the United Kingdom as in the United States. The requirement in Germany was somewhat less, the estimates ranging from 1.58 to 1.85 times the requirement in the United States.

In comparing labor productivity levels, the most important measure is total labor requirements per unit of output (or its reciprocal); but differences in the total figure among the countries are explained further if the magnitude of differences in the labor requirements for different groups of the labor force is known. Thus, data are presented for wage earners and salaried employees separately. The breakdown is not meant to compare the productivity of one group with that of the other. The proportion of wage earners to salaried employees is, of course, affected by different technological and social conditions in the various countries.

For wage earners alone, the relationship among countries is similar to the relationship for all workers, since most workers are wage earners; for salaried employees alone, the relationship is quite different. The lowest man-hour requirement for salaried workers, as for all workers, is in the United States. The requirement in France is much higher for salaried workers than in the United Kingdom, although the all-worker requirements of these two countries are quite similar. Among the three foreign countries, Germany has the lowest requirements for both salaried and all workers, but the relationship between the German and the U. S. requirements is much closer for salaried workers (from 1.25 to 1.46 times the U.S. requirement) than it is for all workers (1.58 to 1.85 times the U.S. requirement).

Table 4. Output per Man-Hour and Man-Hours per Ton in the Iron and Steel Industries of the United States, France, Germany (Federal Republic), and the United Kingdom, U.S. Industry Definition,[1] 1964

Worker category and unit of measure	United States	France		Germany		United Kingdom	
		Minimum	Maximum	Minimum	Maximum	Minimum	Maximum
	Output per 1,000 man-hours						
In short tons:							
Wage earners	100.89	47.42	50.61	51.65	60.32	43.51	47.44
Wage earners and salaried employees	78.73	37.85	40.39	42.68	49.85	36.33	39.47
Relative output per man-hour (U.S. = 100):							
Wage earners	100.0	47.0	52.0	51.2	59.8	43.1	47.0
Wage earners and salaried employees	100.0	48.1	53.2	54.2	63.3	46.1	50.1
	Man-hours per ton						
Short ton:							
Wage earners	9.91	19.76	21.08	16.58	19.36	21.09	22.99
Salaried employees	2.79	5.00	5.33	3.48	4.07	4.23	4.54
Wage earners and salaried employees	12.70	24.76	26.42	20.06	23.43	25.34	27.52
Relative man-hour requirements (U.S. = 100):							
Wage earners	100.0	199.4	212.8	167.3	195.4	212.8	232.0
Salaried employees	100.0	179.2	191.0	124.7	145.9	151.6	162.7
Wage earners and salaried employees	100.0	195.0	208.0	158.0	184.5	199.5	216.7

[1] Excluding wire and wire products in the United Kingdom and wheels and axles in Germany. The ranges in estimates for the European countries do not allow for differences between the countries in the degree of vertical integration or the quality of steel produced.

The salaried employee man-hour requirement is about 22 percent of total labor requirements in the United States, 20 percent in France, and 17 percent in Germany and the United Kingdom. The relationships reflect the proportions of salaried workers to total employment in Germany, France, and the United States, since average yearly hours worked by wage earners and by salaried employees are estimated to be about the same in these countries. In the United Kingdom, however, salaried employees work approximately 16 percent fewer hours a year than wage earners.

When productivity is measured in terms of output per man-hour, the reciprocal of man-hours per ton, the United States figures are, of course, higher than those for the other countries. For convenience, the data in table 4 are expressed as output (in short tons) per 1,000 man-hours.

Summary

The relationship of unit labor cost to hourly labor cost and output per man-hour is summarized for all workers in table 5 and presented graphically in figure 1. Although output per man-hour is higher in the United States than in France, Germany, or the United Kingdom, this advantage is more than offset by higher hourly labor cost, resulting in substantially higher unit labor cost in the United States than in the other countries.

Interpretation and Qualifications

Labor Cost and Total Cost

As mentioned earlier, labor expenditure, although an important cost, is only one of several costs of production. The differences in unit labor cost between the United States and the European countries studied should not be interpreted to mean that differences in other costs are of the same magnitude or even in the same direction. Thus, unit labor cost alone cannot measure the cost competitiveness of the steel industries of these countries in international trade.[13] It is only a measure of one of the primary costs of production.

A complete evaluation of total cost would have to take into account all other inputs contributing to final production and distribution of steel products. This would be an undertaking equally as complex as the measurement of unit labor cost itself, and it is far beyond the scope of this study.

Geographic influences also have an important bearing on both the cost structure and the trading position of individual producers. Proximity to raw materials and availability of labor supply have long been regarded as basic to production. Recently, several countries have located plants at oceanside so that bulk materials can be brought in at low cost from distant sources and finished products can be shipped readily to distant markets. The vast area of the U.S. market itself contributes to a variety of trade patterns. The measurement of these geographical influences on cost and trade, like the measurement of nonlabor cost, is outside the scope of this study.

The Year 1964 Versus Other Years

Differences in unit labor cost between countries are affected by several factors which are subject to change from year to year. Figures for a single year, therefore, may not reflect precisely the situation over an extended period of time. Changes in hourly labor cost, output per man-hour, and operating rate (through its effect on output per man-hour) can significantly affect unit labor cost from one year to the next. The tabulation below gives some indication of the situation in other years. These data are based on a preliminary investigation of unit labor cost trends in the iron and steel industry. Thus, they should not be considered as precise indicators of changes in absolute labor cost as presented for 1964 but as general measures of movement in unit labor cost in each country over the 4-year period 1963–66 (1964 = 100).

Country	1963	1964	1965	1966
United States[1]	104	100	97	99
France	103	100	100	-
Germany	108	100	110	112
United Kingdom	105	100	101	107

[1] The U.S. data are those developed in the Bureau's Office of Productivity, Technology, and Growth.

[13] See William C. Shelton and John H. Chandler, "The Role of Labor Cost in Foreign Trade," Monthly Labor Review, May 1963, pp. 485-490.

Table 5. Hourly Labor Cost, Output per Man-Hour and Man-Hours per Ton, and Unit Labor Cost in the Steel Industries of the United States, France, Germany (Federal Republic), and the United Kingdom, Wage Earners and Salaried Employees, U.S. Industry Definition,[1] 1964

Item	United States	France		Germany		United Kingdom	
		Minimum	Maximum	Minimum	Maximum	Minimum	Maximum
	In absolute terms						
Labor cost per hour, total (in U.S. dollars[2])	4.63	1.57	1.60	1.69	1.80	1.33	1.37
Man-hours per short ton (all workers)	12.70	24.76	26.43	20.06	23.43	25.34	27.52
Output per 1,000 man-hours, all workers (short tons)	78.73	37.85	40.39	42.68	49.85	36.33	39.47
Unit labor cost (U.S. dollars per short ton)	58.77	38.99	42.23	33.99	42.13	33.73	37.67
	U.S. figure = 100						
Labor cost per hour, total (in U.S. dollars[2])	100.0	33.9	34.6	36.5	38.9	28.7	29.6
Man-hours per short ton (all workers)	100.0	195.0	208.0	158.0	184.5	199.5	216.7
Output per 1,000 man-hours, all workers (short tons)	100.0	48.1	51.3	54.2	63.3	46.1	50.1
Unit labor cost (U.S. dollars per short ton)	100.0	66.3	71.9	57.8	71.7	57.4	64.1

[1] Excluding wire and wire products in the United Kingdom and wheels and axles in Germany. The ranges in estimates for the European countries do not allow for differences between the countries in the degree of vertical integration or the quality of steel produced.

[2] Exchange rates: US $1 = 4.90 new francs, 3.977 deutsche marks, 0.3584 pound.

Vertical Integration

In using product weights which reflect labor embodied in all production from coke through the final product (cumulative weights), the implicit assumption is made that the U.S. industry and the foreign industries, adjusted to the U.S. definition, are equally integrated; that is, the production processes included in the industry and the extent (relative amount) of contracting out of services are assumed to be the same in all the countries.[14] This assumption is not always true, but apparent differences in the extent of vertical integration appear to have only a small effect upon the unit labor cost comparison.

The most important case is coke production. In 1964, almost all of the coke consumed in the steel industries of the United States and the United Kingdom (93 percent) was produced by the industry,[15] but the proportion produced by the industry was less than one-third of the total in France (about 30 percent) and Germany (about 28 percent). Thus, French and German labor expenditure is understated to the extent that the expenditure to produce the purchased coke is not included in total labor expenditure. If the labor expenditure to produce purchased coke in France and Germany were included in total labor expenditure, it is estimated that the expenditure figure in both countries would be increased by about 4 percent and unit labor cost would be increased by approximately the same amount.

Adjustment for imports of steel into the industry would affect unit labor cost in a similar manner. For example, intermediate products such as steel ingots, semifinished steel, or wire rods could be purchased by an industry from abroad and then further processed in the industry. Again the final product would be weighted as if all labor starting with the coke process were embodied in it, whereas the expenditure for labor through the intermediate stage would be excluded from total labor expenditure. Imports of products most likely to be further processed within the steel industry in 1964 were, by country, as follows:

	Ingots and semifinished products (including coils for rolling)	Wire rod
	(Thousands of short tons)	
United States	346	955
France	1,311	191
Germany	1,218	583
United Kingdom	705	95

SOURCE: Quarterly Bulletin of Steel Statistics for Europe, vol. XVII, No. 2 (New York, United Nations Economic Commission for Europe.)

It cannot be assumed that all steel imported in this form was rolled within the steel industry, although it is likely that much of it was. Ingots and semis (semifinished products), for example, could be purchased by foundries or for iron and steel forgings and, in the United States at least, much of the imported wire rod was shipped to producers of wire products not included in the "steel production" statistics used.[16] It is, therefore, impossible to determine the effect of imports on unit labor cost in a quantitative manner. Nevertheless, an example of their effect may be useful. If, for instance, 5 percent of steel rolled in the French industry were purchased from abroad as crude steel and an adjustment were made on the expenditure side of the unit labor cost equation, French expenditure would be increased by about 1 percent and unit cost increased by about 1 percent. If the imports were entirely in semis, the change would be somewhat greater.[17] The effect of this factor on unit labor cost is probably small in any case.

Other differences in the degree of vertical integration which may affect unit labor cost relationships are (a) the extent to which maintenance work and research and development projects are contracted out, (b) the degree to which imputs such as electricity and oxygen are produced by the industry or purchased, (c) the amount of construction undertaken by employees of the iron and steel industry, (d) the extent of sales through warehousing firms, and (e) the prevalence of ore preparation processes (primarily for production of agglomerated products such as sinter, pellets, and briquettes) at iron and steel plants. Most maintenance work is done by employees of the iron and steel industry in all the countries, but there are instances in which work, such as the relining of furnaces, is contracted out. Research and development projects also are conducted primarily by employees of the iron and steel industry in all the countries, but again there are likely to be exceptions. (Some research and development workers are excluded from United Kingdom data because of gaps in statistical coverage.[18]) The extent

[14] See Shelton and Chandler, "International Comparisons of Unit Labor Cost: Concept and Methods," op. cit., p. 545.

[15] Calculated on the basis of production and consumption by the iron and steel industry.

[16] As reported by the American Iron and Steel Institute.

[17] An adjustment producing similar results also could be made on the output side of the equation.

[18] These workers and those excluded from central administrative offices account for an estimated 2 to 3 percent of total labor expenditure.

to which electric power is purchased by the industry varies somewhat between countries; in 1964, about 67 percent of electricity consumed in the U.S. industry was purchased, 51 percent in France, and 79 percent in the United Kingdom. The percentage figure for Germany is not known, but it is probably similar to the percentage in France. Most oxygen is purchased (89 percent in 1964) in the United States, and a similar practice appears to prevail in the other countries, although exact figures are not available. Some in-plant (force account) construction is conducted by employees of the iron and steel industry in the United States, although this is not the usual case; the extent of force account construction in the other countries is not known. Sales usually are made by the steel producer directly to the consumer in all the countries, but there are somewhat more sales through intermediaries in France and Germany than in the United States or the United Kingdom. Ore preparation processes are common to iron and steel plants in all the countries. [19] In general, therefore, practices involving the above factors are similar in the four countries.

In addition, the U.S. figures (and industry definition) include the production of ferroalloys made in electric furnaces as well as those made in blast furnaces, but figures for the other countries include only the production of blast furnace ferroalloys. The effect of this factor on unit labor cost, however, is very small.

The possible effect on unit cost of quantitative adjustment for differences in the extent of vertical integration and for other differences between the countries is summarized in table 6.

Capacity Utilization

Man-hour requirements per unit of output in the iron and steel industry tend to fall when output rises and to increase when output falls. They also tend to rise when output is at or near capacity for a long period and to fall when a low level of operations is prolonged. These changes may affect unit labor cost, also, depending upon parallel movements in hourly labor cost. The effect may be even more pronounced in the European countries than in the United States, because European producers are less inclined to dismiss workers during periods of low output than is the case in the United States. In 1964, the rate of capacity utilization was approximately 92 percent in France, 91 percent in Germany, and 88 percent in the United Kingdom, but only 77 percent [20] in the United States. Consequently, a comparison between the United States and other countries in another year, with different relative rates of capacity utilization, might show somewhat different results. In fact, unit labor cost comparisons for 1965 relative to 1964, for example, could be affected appreciably by this factor, as the operating rate between 1964 and 1965 increased considerably in the United States, but fell to 87 percent in France and 83 percent in Germany, and remained the same in the United Kingdom. (Estimated changes in unit labor cost over the period 1963–66 are shown on page 11.)

Variation in Cost by Product and Enterprise

The higher U.S. unit labor cost for the iron and steel industry as a whole does not mean that unit labor cost by product would show comparable differences in every case. Quite possibly the U.S. cost would compare more favorably with foreign cost for certain products and may even be lower than foreign cost in a few cases. This is especially pertinent to the analysis of international trade, since international competition is normally conducted by products, not industries. Labor cost relative to total cost may also vary by product, and therefore the labor cost factor may vary in importance, depending on the particular steel product being traded.

In addition, some enterprises or mills are more or less efficient than others. This is particularly significant with respect to foreign trade, since the most efficient companies are likely to be of greatest importance in international trade.

New Processes

Relative unit labor costs in the countries considered may, depending on movements in wages and salaries, be altered by the adoption of more efficient production processes. Particularly important is the increasing use of oxygen steel furnaces, which use far fewer man-hours to produce a ton of crude steel than conventional furnaces do. The continuous casting process by which semifinished products are produced directly from molten crude steel, although not employed widely at present, will become increasingly prevalent in the steel industry and may have a significant

19 Pellets, however, usually are produced at ore mines.

20 Wall Street Journal estimate. Official figures are not published currently by the iron and steel industry.

Table 6. Summary of Items Which Could Affect Relative Unit Labor Cost Figures But Which Are Not Incorporated in the Range of Estimates

Item	United States	France	Germany	United Kingdom
Coke: Largely produced	x	[1] +4%	[1] +4%	x
Maintenance: By company workers	x	x	x	x
Research and development: By company workers	x	x	x	x
Electricity: [2]	x	x	x	x
Oxygen: Purchased	x	x	x	x
Construction: Usually contracted out	x	x	x	x
Ore preparation processes: Included	x	x	x	x
Sales practices: Direct or through warehousing firm [3]	x	x	x	x
Imports	([4])	([4])	([4])	([4])
Statistical omission	x	x	x	[5] +2-3%
Labor expenditure items:				
Recruitment and training	([6])	[6] -1%	[6] -1%	[6] -0.4%
Subsidized services	([7])	[7] -1%	[7] -1%	[7] -0.8%

x signifies that any differences between countries would have little effect on unit labor cost.

Numbers indicate possible effect on unit labor cost of allowance for differences, relative to the United States.

[1] Coke is largely purchased in France and Germany. If the total amount were produced in those countries, their unit labor cost would be raised by about 4 percent.

[2] 67 percent purchased in the United States, about 51 percent in France and Germany, and 79 percent in the United Kingdom.

[3] Usually direct in all countries, but there is somewhat more selling through intermediaries in France and Germany than the United States or the United Kingdom.

[4] Allowance for imports would raise unit labor cost by an undetermined amount, but probably not more than 1 or 2 percent in any country.

[5] Some administrative and research and development workers are excluded from the data for the United Kingdom. Inclusion of these workers might raise unit labor cost in the United Kingdom by 2 or 3 percent.

[6] Exclusion of all but wages and salaries from this item would lower unit labor cost by about 0.4 percent in the United Kingdom and possibly by 1 percent in France and Germany.

[7] Exclusion of all but wages and salaries from this item would lower unit labor cost by about 0.8 percent in the United Kingdom and probably less than 1 percent in France and Germany.

effect on man-hour requirements. Other techniques, such as the use of beneficiated ores (especially pellets), have lowered man-hour requirements, and their expanded use will continue to affect labor requirements.

Quality Differences

Differences in the quality of steel products—as measured by chemical content, usefulness, or stringency of specification, etc.—have not been taken into account in the measurements in this study, because no operational method of defining and measuring these differences has been developed. There may be differences in quality, however, that are not reflected in the distribution of steel by product category and that could affect relative unit labor cost levels in the four countries studied. (See "Quality Differences" under the later section on "Methods and Data Used.")

Other Factors

Other factors which could affect the results of the study are the use of shipments data instead of production data, the use of man-hour weights instead of unit cost weights, and the use of U.S. weights instead of foreign weights. The latter two factors are discussed in detail in the section on "Methods and Data Used."

Shipments data, instead of production data, have been used in most cases to measure output in the United States and the United Kingdom. Shipments data also have been used to supplement production data for France and Germany. Thus, to the extent that inventories of finished products changed over the year 1964, the output figures for the United States and the United Kingdom could be overstated or understated, and even the figures for France and Germany could be affected slightly.[21] In 1964, however, the inventory changes were not large enough in any of the countries to affect appreciably the unit labor cost estimates. In the United States, the value of inventories of finished goods and work in process changed—increased—by only about 5 percent during 1964. In the United Kingdom, stocks of ingots and semifinished products increased by about 114,000 short tons (6 percent) and finished products, by about 24,000 short tons (less than 2 percent). Corresponding figures for France and Germany are not available, but judging from production and shipments data, their inventory changes were not large. In any case, the effect would be small, because most output data used for these two countries relate to production.

21 Final production figures also could affect output figures to the extent that inventories of goods in process changed.

The Iron and Steel Industry

The definition of the iron and steel industry differs somewhat from country to country, just as the steelmaking and finishing operations differ among countries. The principal production processes are well known, however, and are generally similar in each country.

Production Processes

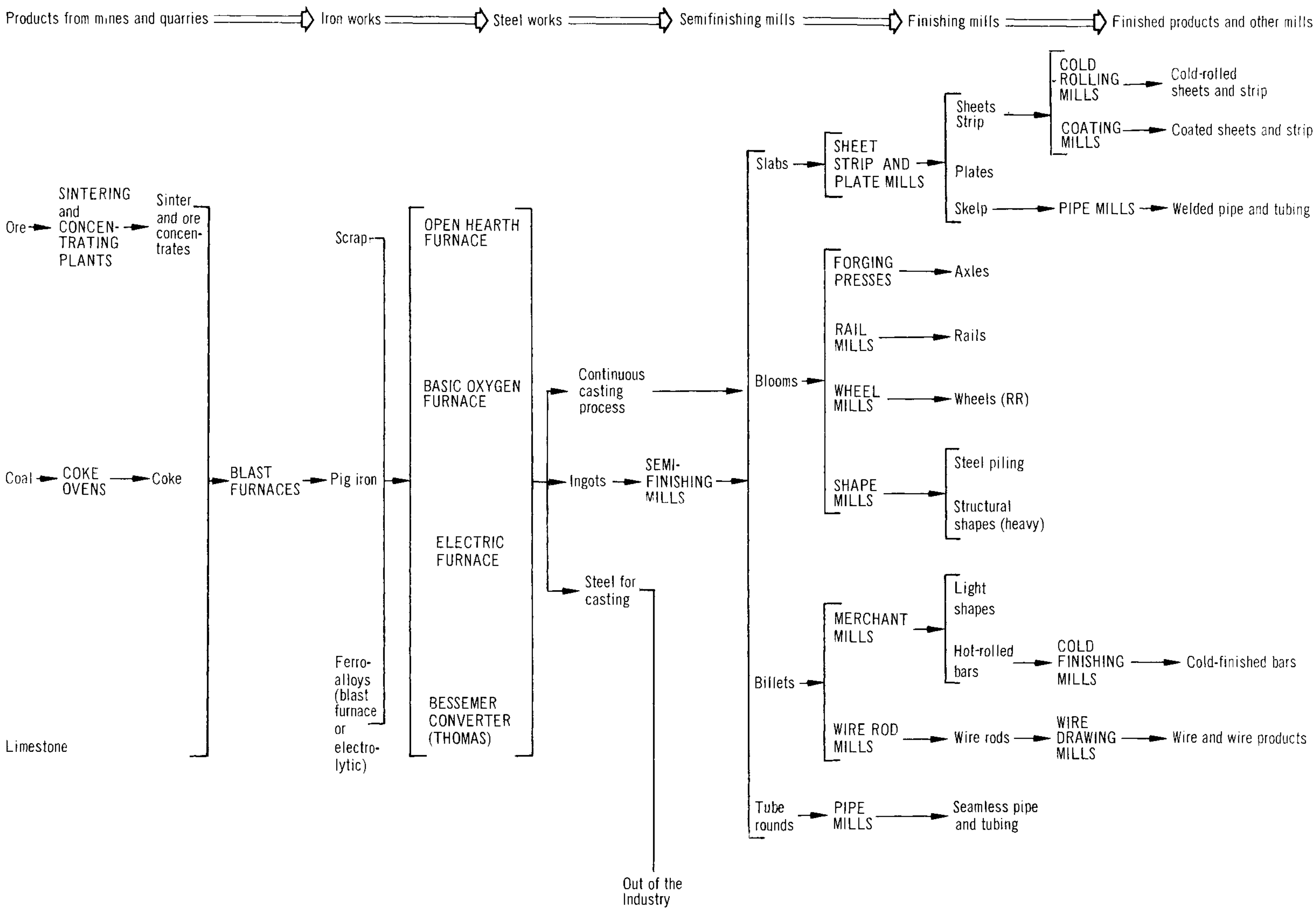
The primary iron and steelmaking processes and their relationship to finished products (based on the U.S. definition) are illustrated in figure 2. Iron ore usually is screened or concentrated and converted to sinter or pellets before being combined with coke and limestone in the blast furnace to form pig iron. Pig iron is combined with scrap and ferroalloys in steel furnaces to produce ingots and steel for castings.[22] Ingots are rolled into semifinished products (blooms, slabs, billets, etc.) on semifinishing mills or roughing mills. A small proportion of semifinished products also are made directly from molten steel by the continuous casting process. From semifinished products, end products such as structural shapes, sheets, strip, bars, and seamless pipe and tubing are made on hot rolling mills or pipe mills. Some of the end products are further processed on cold rolling mills, or made into welded pipe, tin plate, or other coated products, or, in the case of wire rod, drawn into wire and ultimately made into wire products (nails, barbed wire, woven wire fence, and others).

Crude Steel Production

The four major processes for manufacturing crude steel—open-hearth, basic Bessemer (or Thomas), electric, and oxygen—

22 For the purposes of this study, steel for castings is treated as if it were shipped out of the industry as such, although some finished castings may be made in plants engaged primarily in the production of iron and steel products.

Figure 2. PRINCIPAL PROCESSES AND PRODUCTS OF THE IRON AND STEEL INDUSTRY



are used in different degrees by each country.[23] In 1964, the proportions produced by open-hearth and Thomas processes, especially, varied considerably among the countries under study (table 7). The percentage of total crude steel produced by electric and oxygen processes, on the other hand, varied only slightly among the countries. In the United States and the United Kingdom, over 70 percent of crude steel was produced by open-hearth furnaces, but in France, about 54 percent of crude steel was produced by the Thomas process and only 26 percent by the the open-hearth process. In Germany, about 33 percent of crude steel was produced by the Thomas process and 45 percent by the open-hearth process.[24]

The oxygen processes are being adopted increasingly in the United States and other countries because of lower production and capital costs, lower labor requirements, a faster production rate, and high product quality. By 1966, about one-fourth of total crude steel was produced by oxygen processes in the United States,[25] and Germany, and one-fifth of the total was produced by this process in the United Kingdom. The adoption of oxygen processes has been less rapid in France.

There are, of course, many other differences in production techniques, but the variations among countries do not seem to be as significant as those at the crude steel stage. A detailed analysis of these differences would require extensive descriptions which are beyond the scope of this study.[26]

Definition of the Industry

In the United States. The United States iron and steel industry, for the purpose of this study, is defined to conform with reporting practices of the American Iron and Steel Institute (the source of U. S. data used in the study). It includes blast furnaces (including coke ovens), steel works, and rolling and finishing mills. It also may be defined as including those processes involved in the output of the product classes listed below:[27]

Coke produced at iron and steel plants[1]	Oil-country goods
Pig iron and ferroalloys	Line pipe
Ingots and steel for castings	Mechanical tubing
Blooms, slabs, billets, tube rounds, skelp, etc.	Pressure tubing
Wire rods	Wire—drawn
Structural shapes (heavy) and steel piling	Wire products
Plates	Black plate
Rails—standard and all other	Tin and terne plate—hot dipped
Joint bars, tie plates, and track spikes	Tin plate—electrolytic
Wheels and axles	Sheets—hot rolled
Bars—hot rolled (including light shapes)	Sheets—cold rolled
Bars—reinforcing	Sheets—galvanized
Bars—cold finished	Strip—hot rolled
Bars—tool steel	Strip—cold rolled
Standard pipe	Sheets—all other coated
	Electrical sheets and strip

[1] SIC 331 includes all coke production.

In addition, the definition includes processes related indirectly to the production of these products such as ore concentrating and sintering plants at iron and steel works, oxygen and electric power plants at iron and steel works, and other auxiliary processes at the plant that are necessary for the production of iron and steel. The processing of coke byproducts and slag, however, is not included in the industry.

In France, Germany, and the United Kingdom. The industry as defined in France excludes the following products included in the U. S. definition: Pipe and tubing, wire and wire products, cold-rolled strip, cold-finished bars, and wheels and axles.

The German definition includes forgings, which are excluded from the U. S. definition, but excludes wire and wire products, cold-rolled strip, cold-finished bars, and some pipe and tubing.

The United Kingdom definition includes iron ore, forgings, steel castings, and wrought iron, which are excluded from the U. S. definition, but excludes wire and wire products and pipe over 16 inches in diameter.[28]

---

23 In the open-hearth process, a charge of varying proportions of scrap and pig iron is refined by heating for a period of several hours in an open-hearth furnace. In the basic Bessemer process, liquid iron in a "converter" is refined by blowing air, oxygen, or other gas through the molten metal. In electric furnaces, which often are used to make stainless and other alloy steels, metal (usually scrap) is refined by current-induced heating. In the oxygen processes (basic oxygen process in the United States), molten metal is refined by blowing high purity oxygen on the surface of the metal.

24 The proportion of steel produced by the Thomas process is sometimes of different quality than steel produced by the other processes. Quality differences among the countries may affect relative unit labor cost levels, but in this case, the effect is not thought to be significant, as explained in a later section of the study.

25 Over 30 percent of production was by this process in February 1967.

26 For a more detailed discussion of new techniques being adopted in the United States, see Technological Trends in Major American Industries (Bureau of Labor Statistics Bulletin 1474, 1966).

27 The industry is defined in the 1957 and 1967 editions of the Standard Industrial Classification Manual (U. S. Bureau of the Budget) under the title "Blast Furnaces, Steel Works, and Rolling and Finishing Mills" (SIC 331). There are a few products, however, for which output figures used in this study do not equal total U. S. production. These cases are noted in the section on "Methods and Data Used."

28 Based on statistical coverage of the Iron and Steel Board and the British Iron and Steel Federation. Their definition does not correspond exactly to the United Kingdom's 1958 Standard Industrial Classification of the iron and steel industry, which includes steel castings and heavy forgings but excludes wire and wire products and all pipe and tubing.

Table 7. Crude Steel Production and Percent Distribution by Manufacturing Process in the Iron and Steel Industries of the United States, France, Germany, and the United Kingdom, 1964 and 1966

Country	Crude steel production (thousands of short tons)	Percent distribution by manufacturing process					
		Open hearth	Basic Bessemer (Thomas)	Acid Bessemer	Electric furnace	Oxygen blown	Other
	1964						
United States	127,075	77.2	-	0.6	10.0	12.2	-
France	21,805	26.2	53.6	.5	8.5	11.2	-
Germany	41,159	45.1	32.8	.1	8.0	14.0	-
United Kingdom	29,377	70.5	5.5	1.1	11.2	11.4	0.3
	1966						
United States	134,101	63.4	-	0.2	11.1	25.3	-
France	21,587	22.9	52.6	.3	9.5	14.7	-
Germany	38,929	39.2	27.7	-	8.7	24.5	-
United Kingdom	27,233	59.1	[1] 5.3	-	13.8	21.9	-

[1] Includes acid Bessemer.

NOTE: Because of rounding, sums of individual items may not equal totals.

One of the purposes of this study is to present results on the basis of the U.S. industry definition. Hence, it has been necessary to subtract from or make additions to data based on foreign industry definitions to make the data comparable to U.S. data. The procedures used to make these adjustments are explained in later sections on data used for each country. The only significant gap in the coverage as adjusted is that output and labor expenditure data for wire and wire products could not be included in figures for the United Kingdom because necessary information was not available. The effect of this omission on unit labor cost figures is thought to be quite small.[29] Also, data on wheels and axles are omitted from the German figures, but this product category represents only a very small proportion (0.6 percent) of total output.

[29] The extent to which this omission could affect the results is discussed under weights in the section on "Methods and Data Used."

Methods and Data Used

Weighting

The weights used in this report to express aggregate output in U.S. composite tons are derived from 1961 relative man-hour weights compiled for the use of the Bureau of Labor Statistics through arrangements made by the American Iron and Steel Institute (AISI). The relative weights, which were originally furnished for preparing the BLS index of output per man-hour in the domestic steel industry, are expressed in terms of man-hour requirements per ton of each product relative to the man-hour requirements per ton of coke. They were based on data reported by companies which accounted for 82 percent of the 1961 total shipments of steel reported to AISI. For deriving these original weights, the man-hours reported for each steel mill product included only those man-hours required beyond the ingot stage. The man-hours reported for coke included the total man-hours required in each company's coke and chemical plants. The man-hours required for pig iron and ferroalloys and steel for ingots and castings included only those man-hours allocated to these specific operations, thus excluding man-hours in prior processes. The relative weight for each product was obtained by dividing its man-hour requirements per ton by the man-hour requirements per ton of coke. In addition to weights for coke, pig iron and ferroalloys, and ingots and steel for castings, weights were compiled for 28 carbon steel products, 18 alloy steel products, and 15 stainless steel products.[30]

For the purposes of this study, the original weights have been adjusted to be cumulative throughout, that is, they reflect all stages of production within the industry from coke through the end products. (See appendix table B-1). For example, the weight for wire rods reflects man-hours embodied in the production of coke, pig iron, crude steel, and semifinished steel, as well as the labor required to make wire rods from semifinished steel. The weights have been adjusted in this manner in order to calculate the absolute unit labor cost to produce a composite ton of finished products rather than the cost in each incremental stage of production.

If incremental weights are used for a country-to-country comparison, some distortion results because of variation between countries in tonnage yields from one stage of production to another. If, for example, more wire rod is made from a ton of crude steel in country A than in country B, incremental weights would result in an overstatement of the weighted output of country B relative to country A. If both countries produced the same amount of wire rod, the sum of weighted output for crude steel and wire rod would be higher in country B than in country A because country B would have to produce more crude steel per ton of rod. This difficulty is avoided if cumulative weights are used.[31] Only output not consumed in further production is credited in the aggregate output figure for an industry.

However, there is a practical disadvantage to using cumulative weights when the industries of the various countries are not integrated to approximately the same degree (as for example, differences in the extent to which coke is purchased or produced by the industry, or in the percentage of steel which is imported for further processing within the steel industry). Incremental weights may be more appropriate if these differences are large, since weighted output derived with incremental weights reflects only production by the industry in question.

[30] For a more detailed description of the derivation of these weights, see Indexes of Output per Man-Hour, Steel Industry, 1957–63 (Bureau of Labor Statistics, 1964).

[31] This statement is true given that only one country's (i.e., the United States) weights are available and can be used in the study. Somewhat different results might be obtained, of course, if weights of another country were used.

The adjustment of the original weights, making them cumulative throughout, is based on the following assumptions:

1. Carbon, alloy, and stainless qualities of steel contain different amounts of pig iron (and thus scrap) per ton of crude steel. Stainless crude steel contains almost no pig iron (estimated at 0.03 ton per ton of crude steel) because it is made almost entirely from scrap in electric furnaces. Approximately 0.63 ton of pig iron is required per ton of carbon crude steel and 0.43 ton per ton of alloy crude steel.[32] The other major component in the production of carbon and alloy crude steel is scrap.

2. Each carbon end product, each alloy end product, and each stainless end product contains, on the average, an equal amount of pig iron.[33] This means that the weight for each carbon end product should embody the same man-hour requirements for the coke and pig iron stages of production. The same is true for alloy and stainless products.

3. Finally, the pig iron requirement per ton of end product has been determined from the estimated pig iron used in the production of each of the three qualities of steel divided by shipments of each quality.[34]

The original weights and the cumulated weights, in addition to notes on the adjustment procedures, are presented in appendix table B-1. The relative weight for coke (1.0) remains the same. The cumulated weight for pig iron and ferroalloys (2.1) has been obtained by adding the weight for coke times the coke requirement per ton of pig iron (0.68) to the original (incremental) weight for pig iron and ferroalloys (1.4). The cumulated weight for carbon crude steel (3.3) has been obtained by adding the cumulated weight for pig iron and ferroalloys (2.1) times the estimated pig iron requirement per ton of carbon crude steel (0.63) to the original weight assigned to carbon crude steel (2.0). The same procedure has been followed to obtain the cumulated weights for alloy and stainless crude steel. The cumulated weight for any carbon final product has been obtained by adding to the original weight for the product (a) the estimated quantity of pig iron per ton of carbon end product times the cumulated weight for pig iron and ferroalloys (0.91 x 2.1) plus (b) the original weight for carbon crude steel divided by the yield factor for the product (2.0 divided by yield factor). The same procedure has been followed for alloy and stainless end products. The yield factors used have been estimated from 1947 data furnished by the U.S. steel industry, together with more recent information. Since it takes more than a ton of crude steel to produce a ton of end product, the yield factors are always less than one.

These cumulated product weights were then multiplied by 1964 net shipments from the U.S. industry and summed to derive an aggregate weighted output for the year. The weighted output, however, is many times greater than the unweighted output figure. Since the purpose of this study is to present unit labor cost comparisons in absolute terms, it is useful to scale or "deflate" the weights in such a way that the weighted output in the base year and country is the same as the unweighted output. This process is shown in appendix table B-2, and the deflated weights are listed in table 8. The deflated weights, when used with any output distributed among the various products in the same proportion as in the base country (United States) in the base year (1964), will yield a "weighted output" equal to the unweighted output. If the output of a country is concentrated in low-weight products, the weighted output will be less than the unweighted output, and vice versa.

The U.S. weighted output for the year 1964 can be thought of as U.S. output expressed in composite tons, and it follows from the preceding remarks that this output is equal to the unweighted output. The weighted output of another country can be thought of as equal to the unweighted output of that country in tons converted to (or measured in) U.S. base year composite tons, or simply composite tons. A "composite ton," in this case, means the equivalent of one ton of steel end products distributed according to the U.S. output proportions in 1964.

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32 These ratios may be different in other countries.

33 This condition follows from the fact that a certain amount of scrap (trimmings, rejects, etc.) is generated for each end product. The amount of scrap depends on the yield of a given product from a ton of crude steel. If 100 tons of end product can be made from 130 tons of crude steel, then approximately 30 tons of scrap are generated in the production of 100 tons of this product. A plant continuously making only this one end product, for example, will use about 100 tons of pig iron and 30 tons of scrap to make 130 tons of crude steel. (Actually, more than 130 tons of input are required to obtain 130 tons of crude steel, and to the extent that scrap is purchased from outside the industry, less pig iron and more scrap would be used.) A plant making another product that requires, for example, 140 tons of crude steel per ton of end product would generate 40 tons of scrap for every 100 tons of end product produced. This plant would use the same amount of pig iron, 100 tons, but more scrap, 40 tons, in making the crude steel necessary to produce 100 tons of end product. Thus, the production of these two different products will involve the same amount of pig iron but different amounts of scrap. The situation is much more complex when many products are produced in the same plant, but, on the average, the rule will still hold.

34 All data pertaining to 1961.

Table 8. United States 1961 Relative Man-Hour Weights,[1] Iron and Steel Industry, by Product and Grade of Steel

Product category	Carbon	Alloy	Stainless
Coke	[2].06	([2])	([2])
Pig iron and ferroalloys	[2].13	([2])	([2])
Ingots and steel for castings	.20	.27	.45
Blooms, slabs, billets, tube rounds, skelp, etc	.57	1.09	2.15
Wire rods	.80	1.67	6.06
Structural shapes (heavy) and steel pilings	.71	1.49	5.85
Plates	.67	1.43	5.60
Rails—standard and all other	.70	1.56	-
Joint bars, tie plates, and track spikes	1.46	-	-
Wheels and axles	1.90	2.90	-
Bars—hot rolled (including light shapes)	.94	1.47	7.18
Bars—reinforcing	.68	1.44	-
Bars—cold finished	1.44	2.43	10.27
Bars—tool steel	5.81	10.45	-
Standard pipe	1.26	1.73	8.13
Oil-country goods	1.53	2.12	[3]10.35
Line pipe	1.12	1.72	-
Mechanical tubing	2.13	3.46	18.33
Pressure tubing	3.17	5.18	18.93
Wire—drawn	1.75	2.88	10.54
Wire products	2.22	-	10.80
Black plate	.94	-	-
Tin and terne plate—hot dipped	1.47	-	-
Tin plate—electrolytic	1.08	-	-
Sheets—hot rolled	.59	1.14	1.78
Sheets—cold rolled	.73	1.30	6.76
Sheets—galvanized	.94	1.61	-
Strip—hot rolled	1.01	1.30	3.52
Strip—cold rolled	1.74	12.74	5.85
Sheets—all other coated	1.01	-	-
Electrical sheets and strip	1.76	1.94	-

[1] After adjustment as explained in the text.
[2] A breakdown by grade of steel is not applicable.
[3] Estimated by the Bureau of Labor Statistics.

As already indicated, man-hour weights have been used in this study. For the purpose of unit labor cost comparisons, however, weights that reflect the relative labor expenditure required to produce different products of the industry would be preferable.[35] Implicit in the use of these man-hour weights is the assumption that labor cost per hour worked to produce one product is the same as labor cost per hour worked to produce any other product. This assumption is not entirely true, since wage rates vary from one task to another. Average hourly earnings, however, seem to bear no systematic relationship to stages of the production process. Examination of census data on man-hours and wages in various stages of production in the industry indicates that the use of labor cost rather than man-hour weights would have no appreciable effect upon the results.

The use of weights based on the production experience of another country's industry or the use of some average of weights from several countries also could affect the results.[36] If each of the steel industries concentrates on the manufacture of products in which it has a comparative labor requirements advantage, the weighting system used would tend to disfavor the country from whose production experience the weights are derived.[37]

Also, since wire and wire products have not been included in the United Kingdom industry data, some distortion could result in unit labor cost figures for this country. If the relative man-hour requirements by product in the United Kingdom are the same as those in the United States, then no distortion results;[38] but to the extent that this is not true, the figures for the United Kingdom could be affected.[39] Wire and wire products are not a large part of the industry, however, and any distortion resulting from their exclusion is not likely to be substantial.

Quality Differences

In addition to differences between countries in the distribution of total output among the many products of the industry, there may be differences in the quality of some of the products produced. Stainless steel strip produced in one country, for example, may not be as "good" as stainless steel strip produced in another. As explained in the preceding pages, the basic question that the study attempts to answer is the cost in other countries to produce a composite ton of steel comparable to that produced in the United States. Comparability should be interpreted to denote not only a like product mix but also a like quality steel. The question is, How much does it cost in country A to produce not only the U. S. product mix but also the U. S. quality of steel? The weights allow for cost differences due to variations in product mix, but do not allow for cost differences due to variations in the quality of individual product categories. To the extent that there also would be a labor cost difference due to quality differences, this difference should be reflected in the comparative figures of unit labor cost. The problem is to determine (a) the extent to which quality differences exist and (b) the labor cost differences which are associated with any quality differences.

It is difficult to determine what constitutes a quality difference, since judgments on performance, utility, and substitutability are often involved. And it is even more difficult to determine if quality differences, once defined, do in fact exist. Even if these two unknowns are identified, the determination of labor cost related to quality variation, which is a necessary component for this study, still remains to be made. Since no operational method for determining and measuring quality differences in iron and steel products has been found, no quality adjustment has been made in this study. However, an example of one possible quality difference, as well

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35 See Shelton and Chandler, "International Comparisons of Unit Labor Cost: Concepts and Methods," op. cit., p. 544.

36 Ibid.

37 The rationale is that if two sets of weights from countries producing different products were compared, the weights for products making up the majority of the first country's total production would tend to be lower in this country than the weights for the same products in the second country if these products accounted for only a small portion of total production in the second country. Therefore, unit labor cost in the United Kingdom (or another country) relative to the cost in the United States would probably be higher if weights from the United Kingdom (which are not available) were used. However, unless the pattern of man-hour requirements by product were very different in the United Kingdom and the United States, any increase in U. K. cost relative to U. S. cost would be small.

38 Available data indicate that average hourly earnings of wage earners producing wire and wire rope are about the same as those in the steel industry as defined in the United Kingdom.

39 For example, if twice as many man-hours are required to make wire as to make wire rod in the United States as well as in the United Kingdom and if similar relative relationships hold for other products, no distortion results when wire and wire products are excluded. The addition of output and labor expenditure for wire and wire products would not change the unit labor cost results obtained for the United Kingdom with these products excluded. But if, for example, the production of wire and wire products in the United Kingdom requires more man-hours relative to the production of other products than is the case in the United States, the inclusion of wire and wire products in the United Kingdom data would raise unit labor cost.

as two possible methods for making an adjustment for such a difference, is presented below.

The example chosen is the difference in "quality" of steel produced by the Thomas (basic Bessemer) process and steel produced by the open-hearth process. This example is, of course, only one possible quality variation. There may be differences also in the quality of end products resulting from differences in other production processes, but they are difficult to isolate and to quantify. In fact, differences in quality resulting from processing after the crude steel stage of production, e.g., the amount of cold rolling, stringency of specifications and product control, or tolerances allowed, may be more important than those resulting from variations in crude steel production processes.

About 54 percent (1964) of French crude steel, for example, is produced by the Thomas process, whereas the bulk of crude steel in the United States is produced by the open-hearth process. In the Thomas process, liquid iron in a "converter" is refined by blowing air, oxygen, or other gas through the molten metal. In the open-hearth process, a charge of varying proportions of scrap and pig iron is refined by heating for a period of several hours in an open-hearth furnace.

The chemical composition of Thomas steel usually differs from the chemical composition of open-hearth steel, although it is often technically possible to produce like steel by both processes. In most instances, depending on the Thomas process used, Thomas steel has a higher content of nitrogen, phosphorus, and oxygen and also a higher content of sulphur and hydrogen than open-hearth steel. The influence of these chemicals, especially nitrogen, tends to give Thomas steel greater strength, as measured by yield point, tensile strength, and hardness, but less ductility and toughness than open-hearth steel. The presence of nitrogen (as well as phosphorus and oxygen) also leads to decreased ductility and toughness with age and at lower temperatures. In addition, the yield point and hardness of Thomas steel are increased and tensile strength is decreased with much less cold working, cold drawing, or cold rolling than is the case with open-hearth steel. For these reasons, Thomas steel sometimes does not lend itself to these processes as readily as open-hearth steel. In fact, Thomas steel is normally not used at all for cold drawing. For other purposes, however, the strength characteristics may not be detrimental and may even be beneficial. Most technical experts consulted feel that Thomas steel is used largely or entirely for products or in uses for which it is the practical equivalent of the corresponding open-hearth product.

If the assumption is made that the difference between Thomas and open-hearth steel does represent a quality difference, an approach to measuring this difference would be to determine how much more labor expenditure would be involved, and thus how much higher unit labor cost would be, if France were to produce steel of open-hearth quality in addition to the U.S. product mix. [40]

There appear to be at least two methods for determining the labor expenditure associated with an assumed quality difference. The first approach is based on the relative labor requirements to produce steel by the two processes. If this approach were used, the relative man-hour weights could be adjusted (or additional weights added) to allow for different labor requirements in the crude steel production process, so that differences in the two qualities of steel stemming from differences in crude steel would be accounted for in the same manner that allowance is made for different product distributions. Following this method, it is estimated that French unit labor cost in 1964 would have been about 2 percent higher if the French industry had produced open-hearth steel in place of its Thomas steel products. [41]

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[40] Or, if man-hour weights reflecting quality differences were available, in addition to those reflecting man-hour requirements to produce different product categories, how much would French weighted output be reduced relative to U.S. weighted output because of quality differences, in addition to product mix differences.

[41] United Nations information indicates that the man-hour requirements per ton in the Thomas crude steel process are only half as great as the requirements for the open-hearth process. If each product weight used with the French output is adjusted to reflect the fewer man-hours required at the crude steel stage, the French aggregate weighted output on the high cost side would be reduced. The reduction would be modest, however, because the crude steel stage of production is not very labor intensive. The reduction becomes even smaller when consideration is given to the fact that more pig iron and less scrap (only about 5 percent of total charge) are used in Thomas steel, and hence blast-furnace (where pig iron is produced) man-hours per ton of finished steel are higher for Thomas steel. No man-hour weight is allowed for scrap, because scrap is either purchased from outside the industry or is generated as a concomitant of the production of steel products. In fact, the adjusted weighted output figure would be only about 2 percent less than the unadjusted figure, and the estimate of French unit labor cost would be about 2 percent higher than the present figure. This method does not indicate that labor expenditure would necessarily have to be 2 percent higher to produce a product with the additional quality, but only that the additional quality could be obtained by making the additional expenditure which would be involved in producing steel in open-hearth furnaces instead of Thomas converters. The additional quality also could be obtained by other means of production, such as oxygen processes.

The second possible method of estimating the affect of this assumed quality difference on unit labor cost is based on the price differential which exists between open-hearth and Thomas steel products. List prices in France for basic quality (type usually produced) steel indicate that Thomas steel is, on the average, about 9 percent less expensive than open-hearth steel. Unfortunately, transaction prices are not available. If it is assumed that the list price differential reflects a difference in qualtity, and also different labor requirements, then the French weighted output for Thomas steel should be reduced by the amount of the price difference.[42] Following this method, it is estimated that French unit labor cost would have been about 5 percent higher in 1964.

The preceding analysis is limited to only one example of a quality difference and possible methods of adjusting for it. There may be, and undoubtedly are, many other differences. Even at the crude steel stage of production, allowances would have to be made for varying proportions of different crude steels in each country. It is possible also that crude steel produced in electric furnaces should be valued higher than any other, since the chemical content of steel produced in electric furnaces can be controlled closely and the process often is used to make alloy steels.

Although a precise measure of relative unit labor costs should allow for quality differences if they exist, it has not been shown that these differences are so great as to affect significantly the results of this study.

United States

Output. Output data for the United States have been obtained from the Annual Statistical Report of the American Iron and Steel Institute.[43] Since net production figures are not available for all products of the industry, net shipments data which cover all products except coke have been substituted. (See column 1, appendix table B-2.) Net shipments of coke have been estimated from production and consumption data reported in the AISI Report.[44] These data were used as a basis for deflating the cumulated weights, as shown in appendix table B-2.

When the shipments data are weighted using the deflated weights, the aggregate weighted output is equal to the unweighted output but the weighted output of individual products is different from the unweighted output. Thus, it is not necessary for the calculation of unit labor cost to weight the output of the base country (United States) in the base year (1964). If the deflated weights were used with U. S. output in another year, however, the weighted output and the unweighted output would differ.

Expenditure. Expenditure figures for the United States (appendix table B-3) also have been taken from the AISI Annual Statistical Report or estimated from data in that report.[45] Labor expenditure covers both

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42 The assumption is that it takes 9 percent fewer man-hours to produce Thomas steel end products. Thus, since 54 percent of French crude steel is produced by the Thomas process, about 54 percent of French finished output would be reduced by 9 percent, or the total output would be reduced by 4.9 percent. Reflecting this decrease, the high estimates of unit labor cost for France would be increased by about 5 percent.

List prices, however, often differ substantially from actual transaction prices, and it is the latter prices which indicate the extent to which one type of steel is valued over another. Even differences in transaction prices may not reflect differences in the labor cost of production. Price differences could result from amortized investment in old Bessemer converters or from the scale of production (although the latter does not seem to be the case in France). Since this study uses the United States as a base for comparison, it would be useful also to know what the difference would be in the price of the two steels in the United States. This information is not available since Thomas steel (basic Bessemer) is not produced in the United States and only a very small amount (less than 1 percent) of acid Bessemer (fairly comparable to Thomas steel) is produced.

43 The production of some wire and wire products is not reported in AISI statistics, because some producers of these products do not report production to AISI and because a substantial proportion of this production is in products not considered primary iron and steel products. (Wire products included in AISI data are: Barbed and twisted wire, coiled baling wire, bale ties, woven wire fence, wire staples, and wire nails.) The production of some electrometallurgical products (ferroalloys) also is excluded from AISI coverage.

44 For the BLS measures of productivity, gross coke production data from the Bureau of Mines are used. However, this study, which presents results in absolute terms, requires net production data (final products shipped from the industry) for all products of the industry. Also, in measuring U. S. output, the Bureau's productivity studies utilize AISI gross production data for pig iron and crude steel.

45 Although the BLS Office of Productivity, Technology, and Growth uses BLS employment, hours, and earnings data whenever possible, AISI data have been used in this study for the following reasons: (a) There appears to be close comparability between AISI input and output data, which is of major importance for an absolute comparison (whereas there is some difference in coverage between AISI output and BLS input data). In the past, the AISI has said that some of the establishments which report output data do not report employment and earnings data, but recent information from AISI indicates that the current (and for 1964) small differences in output and input coverage tend to offset one another. (b) The AISI data are based on hours worked (whereas BLS reports hours paid), which is the concept used by European countries being compared with the United States. (c) AISI publishes the needed data on total compensation, which include supplementary benefits for wage employees and all employees and also the earnings of salaried employees. Figures on hours worked by salaried employees are also available. (d) The definitional distinction between wage and salary workers used by AISI is similar to that used by European countries being compared with the United States. (e) The man-hour weights used are based on the experience of producers reporting to AISI.

production and nonproduction workers and includes both cash earnings and employer expenditures for supplementary benefits. The AISI defines wage earners as all persons paid an hourly or a piece rate, and salaried employees as all persons paid by the week or by the month regardless of their part in the production process.

Expenditure for wages equals total hours worked by wage earners multiplied by average "pay per hour worked" by wage earners. Pay for hours worked comprises the regular wage rate (including cost-of-living adjustment and incentives), shift differentials, premiums for overtime, and premiums for work on Sunday and holidays. Total labor expenditure, including supplementary benefits, for wage earners equals hours worked by wage earners multiplied by total employment cost per hour. Total labor expenditure for wage earners comprises, in addition to pay for hours worked, pay for holidays not worked, vacation pay, and adjustments, plus the cost of supplementary unemployment benefits, pensions, insurance, savings and vacation plans, and employer social security payments.

For salaried employees, AISI reports only "total salaries," which include pay for holidays not worked, vacation pay, and adjustments. It has been estimated that the expenditure for the latter three items is the same proportion of "total salaries" as of "total wages" (pay for hours worked plus pay for holidays not worked, vacation pay, and adjustments), which AISI data indicate to be 7.27 percent. Thus, in order to maintain the breakdown into wages and salaries and supplementary benefits, the total expenditure for salaries in this report is estimated at 92.73 percent of AISI "total salaries." (See appendix tables B-3 and B-4.) By excluding the cost of pay for holidays not worked, vacation pay, and adjustments from salary expenditure, the latter is comparable to pay for hours worked by wage earners, which is used for wage expenditure in this study. The total labor expenditure for salaried employees is based on "total salaries" reported by AISI, plus the estimated cost of additional supplementary benefits (pensions, insurance, supplementary unemployment benefits, savings and vacation plans, and social security payments) for salaried employees. The estimated cost of these supplementary benefits, 15.3 percent of total employment cost (appendix table B-4), is based on AISI financial data for all steel companies, including affiliated interests.[46]

Hours Worked, Hourly Labor Cost, and Productivity. Hours worked for wage earners and salaried employees and hourly labor cost for wage earners are reported in the AISI Annual Statistical Report. Hourly earnings of salaried employees also have been derived from data in the report. Hours worked, hourly labor cost, and productivity data are presented in appendix tables B-5 and B-7.

France

As mentioned previously, data for the French industry are presented in the form of a range. A high estimate and a low estimate of weighted production and a high and a low estimate of labor expenditure have been developed. Estimates of labor expenditure have been made for wage earners, salaried employees, and wage and salaried employees together. Combining high expenditure estimates with the low weighted output estimates gives a high unit labor cost figure, and vice versa.

Output. The French industry definition (equivalent to the European Coal and Steel Community (ECSC) definition) excludes pipe and tubing, wire and wire products, cold-rolled strip, cold-finished bars, and wheels and axles. Hence, it was necessary to incorporate output figures for these products into the data for the rest of the industry to make the broadened coverage comparable to the U.S. industry definition.

Output data for the French "industry" were obtained primarily from Sidérurgie (Iron and Steel), published by the Statistical Office of the European Communities, which reports net production of products, except coated and electrical sheets, included in the French definition. Coated and electrical sheets are counted both in their final form and as regular sheets, hot or cold rolled. In addition, the net production of ingots and semifinished products is not reported. Output figures (primarily shipments) for products not included in the French definition are reported as supplementary data in Sidérurgie and also in French sources.

Production figures for the "French products" include output that is intended for conversion into the excluded products, so that adjustment must be made for double counting when the excluded products are added. Adjustment also must be made for the double counting of coated and electrical sheets.

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46 An alternative would be to assume supplementary benefits for salaried employees to be the same proportion of total cost for salaried employees as supplementary benefits for wage earners are of the total cost for wage earners. Such an assumption would make little difference in the results.

Seamless pipe normally derives from semi-finished products or ingots; welded pipe from hot-rolled strip (partially skelp, following U.S. definitions); wire and wire products from wire rods; cold-rolled strip from hot-rolled strip; and wheels and axles from semi-finished products or ingots. To correct for double counting when these products are added to the French definition, shipments figures minus shipments for conversion into other steel products have been used, instead of production data, for semis and ingots, hot-rolled strip, and wire rods. The output figure for cold-finished bars was subtracted from the ECSC production figure for hot-rolled bars (and light sections), which includes material for conversion into cold-finished bars, with allowance for some yield loss. ECSC production figures for coated and electrical sheets were subtracted from ECSC production data for hot- and cold-rolled sheets.

The primary obstacle to comparing U.S. and French output is that the reporting of French production is much less detailed than that of the United States. The AISI reports carbon, alloy (excluding stainless), and stainless steel shipments of each product category; for France, this distribution is normally not available. Partial information, however, is available from several sources, including the United Nations,[47] which report shipments of all alloy (including stainless) steel for certain product categories. The AISI reports shipments of four categories of bars, whereas the ECSC reports separately only the production of reinforcing bars and of all bars (merchant bars) including reinforcing bars. In addition, French output of pipe and tubing usually is reported as seamless or welded; U.S. shipments of pipe and tubing are reported for five categories according to use, i.e., standard pipe, oil-country goods, etc. There are also some other less important differences in definition and reporting which are noted in appendix table B-8.

In order to derive minimum and maximum estimates of weighted output for France, two independent distributions of total output among the various product categories have been developed. (See appendix table B-8.) The first distribution is intended to emphasize low-weight products and the second distribution, high-weight products. For a few products, separate data on alloy (including stainless) production are available,[48] and for some other products, it has been possible to estimate the amount of alloy production. Some data were obtained also on the distribution of pipe and tubing by functional classification, although information covering total production of pipe and tubing was not available. The amount of stainless steel produced, however, was available only for crude steel and a few end products.[49] In these cases, and in others where information is incomplete, the two distributions of the products or product in question have been made primarily on the basis of the U.S. distribution, unless more pertinent indications were available. Thus, for example, after considering the U.S. percent distribution of stainless steel among end products, the two distributions for France have been made so that as much stainless steel as would seem at all possible was put into low-weight product categories, on the one hand, and as much into high-weight categories, on the other. Consequently, the two distributions for France are on opposite sides of the U.S. distribution. The procedures and data used to make these and other estimates are described in detail in appendix table B-8.

Labor Expenditure—ECSC Definition. Detailed data on wages and total labor cost per hour or month for wage earners and salaried employees (1964) in the ECSC are obtained by survey and reported in Salaires CECA (Earnings in the ECSC), published annually by the Statistical Office of the European Communities.[50] Hours worked by wage earners are reported in Sidérurgie and relate to hours of work involved in the production of iron and steel products covered by the ECSC industry definition. Thus, total wages and total labor cost for wage earners may be calculated by multiplying, respectively, wage cost per hour and total cost per hour by hours worked by wage earners during the year. (See appendix table B-9.)

Wage cost (direct salaries) is here the equivalent of AISI pay for hours worked, which has been used for "wage expenditure" in the United States. Total labor expenditure for wage earners (and salaried employees), however, includes some costs which generally are not incurred by employers in the United States. In the case of France, the most important of these are family allowances, payroll tax, and payments in kind. Total cost in France also includes some small recruitment and professional development (e.g., apprenticeship training) expenses.

Hourly data on wages which exclude bonuses and holiday and vacation pay are available for wage earners; however, monthly data

47 Quarterly Bulletin of Steel Statistics for Europe.

48 Primarily in Annuaire de Statistique Industrielle (Paris, Bureau Central de Statistique Industrielle).

49 Ibid.

50 The survey covers plants employing 99 percent of all wage earners in the French steel industry.

on salaries [51] include bonuses and holiday and vacation pay. Total labor cost for salaried employees, nevertheless, is comparable to total cost for wage earners. In order to obtain expenditure data on direct salaries for time worked, equivalent to the expenditure for wages, it has been estimated that bonuses and holiday and vacation pay account for the same proportion of total monetary remuneration of salaried employees as of wage earners (16 percent); this amount has been subtracted from the ECSC monthly salary figure. (The cost of these items, however, is included in total cost for salaried employees.) Aggregate salary expenditure and total labor expenditure (including all supplements) for salaried employees were obtained by multiplying the appropriate monthly figure by 12 and multiplying the product by salaried employment. ECSC data indicate that salaried employment is 20.3 percent of total employment. The derivation of total labor expenditure for wage earners and salaried employees according to the French (ECSC) industry definition is shown in appendix table B-9.

Labor Expenditure—U.S. Definition. When the U.S. industry definition is used, estimates must be made of labor cost to produce products not included in the French (ECSC) definition. Data on expenditure for wages and salaries related to the production of these products were obtained for 1964, but information on supplementary benefits was not available. Based on similar data for the iron and steel industry as defined by the ECSC, supplementary benefits were estimated to be between 43 and 47 percent of total labor cost for wage earners and between 38 and 42 percent of total labor cost for salaried employees. (See appendix table B-10.)

Estimates of labor expenditure to produce all products covered by the U.S. definition and of expenditure to produce the excluded products are presented in appendix table B-11.

Hours Worked, Hourly Labor Cost, and Productivity. Statistics on hours worked by wage earners in the ECSC industry are published in Sidérurgie. Data on hours worked by salaried employees are not collected by the ECSC, since these employees are paid on a monthly or yearly basis. Nevertheless, to make intercountry comparisons of output per all employee man-hour (and all employee man-hours per unit of output), it has been estimated that salaried employees work the same number of hours a year as wage earners. Annual hours worked by employees making products outside the ECSC definition are estimated to be the same as in the ECSC industry. (See appendix table B-12.)

Hourly labor cost figures were obtained, as shown in appendix table B-13, by dividing aggregate labor expenditure estimates by estimates of hours worked. The hourly labor cost figures for salaried employees may not be completely accurate, however, because of the difficulty in determining exact hours worked by this group.

Estimates of man-hours per ton of output and output per 1,000 man-hours were made by combining weighted output and hours worked estimates as shown in appendix table B-15.

Germany

Data for Germany also have been prepared in the form of a range. Both high and low estimates of weighted output and high and low estimates of labor expenditure have been developed.

Output. The German industry definition as set forth in the German Standard Industrial Classification (Systematisches Warenverzeichnis für die Industriestatistik, 1963) differs from both the U.S. definition and the ECSC definition. It includes forgings, which are excluded from both the ECSC and the U.S. definitions, but excludes wire and wire products, cold-rolled strip, cold-finished bars, and some pipe and tubing (mostly precision tubing). Output figures for all products of the U.S. industry are available, however, although the coverage in some cases is not as detailed as for the United States and some product categories differ from comparable U.S. categories. The output of wheels and axles (about 175,000 metric tons) has been excluded from the coverage for Germany because it was not possible to determine the labor expenditure related to this category. The effect of this exclusion on unit labor cost is insignificant because of the small percentage of total output involved and because data have been excluded from both the expenditure and output sides of the unit labor cost equation.

Output data for Germany, as for France, were obtained primarily from Sidérurgie and supplemented with national and United Nations statistics. Because the adjustments for double counting of coated and electrical sheets and products excluded from ECSC coverage were identical or similar to adjustments made in output data for France, they will not be discussed here; but a detailed explanation of all adjustments made in the data is contained in the footnotes to appendix table B-16.

51 Data on the average monthly labor cost for salaried employees were obtained for the first time by the ECSC for the year 1964.

Again, as with France, the primary difficulty in comparing the German and United States output is that statistics on the output of the German industry are much less detailed than those for the United States; in some cases, even less detail is available than is the case for France. Production figures for alloy and stainless steel are available only for crude steel, and data on shipments, which include both alloy and special carbon steels, are available only for a few product categories as reported by the United Nations (Quarterly Bulletin of Steel Statistics for Europe). Production figures for pipe and tubing distinguish only between welded and seamless pipe, and no information on output by functional classification is available. In addition, the output of bars (including light shapes) is available only in total and for one category of bars (reinforcing bars). Other differences in definitions and reporting and the basis for establishing minimum and maximum estimates of weighted output are described in detail in appendix table B-16. Where complete information was not available, two distributions of the products in question were made, primarily, on the basis of the U.S. distribution as described for France. Because of the large differences between Germany and the United States in the reporting of output, the range between high and low estimates of weighted output is considerably broader than for France (or for the United Kingdom).

Labor Expenditure. Minimum and maximum estimates of labor expenditure for Germany are based primarily on employment data from the German publication Industrie und Handwerk, Reihe I (Wiesbaden, Statistisches Bundesamt), hourly and monthly labor cost data from Salaires CECA (Statistical Office of the European Communities), and hours worked figures from Industrie und Handwerk and Sidérurgie.

The employment figures from Industrie und Handwerk used in this study relate only to wage earners, salaried employees, and apprentices actually engaged in activities related to the production and sale of iron and steel products. The data cover two separate industries as defined in Germany—"blast furnaces, steel mills, and hot rolling mills" (German Standard Industrial Classification number 2710) and "drawing and cold rolling mills" (number 3010). The latter industry includes cold-finished bars and some pipe and tubing not included in the first industry (and a small quantity of cold-formed sections). Wheels and axles have been left out because they are included in statistics for forgings and are not covered separately. The number of apprentices has been estimated from data published by the Wirtschaftsvereinigung Eisen- und Stahlindustrie (Statistisches Jahrbuch) and subtracted from the total employment figure.

Based on hours worked data in Sidérurgie and Industrie und Handwerk, average yearly hours worked by wage earners were determined to be between 1,950 and 1,990. Minimum and maximum figures for wage cost per hour and total labor cost per hour for wage earners were determined on the basis of figures from Salaires CECA covering the ECSC portion of the industry, the maximum figures being the same as those reported for the ECSC industry and the minimum figures being somewhat lower. Aggregate figures for labor expenditure for wages and total labor cost for wage earners were obtained, first, by multiplying employment by the minimum hours worked per year times the appropriate minimum hourly labor cost figure and, second, by multiplying employment by the maximum hours worked per year times the appropriate maximum hourly labor cost figure.

Figures on the average monthly cost per salaried employee for salaries and total labor cost per month per salaried employee are based on figures reported in Salaires CECA covering the ECSC portion of the industry. The monthly figures for salary cost used in this study exclude, as for France, the estimated cost of bonuses and vacation and holiday pay, which are included, however, in the total monthly labor cost figures. The maximum average monthly expenditures per salaried employee, for salaries alone and for total labor cost, are the same as the respective figures reported for the ECSC portion of the industry (but excluding bonuses and holiday and vacation pay from the salary figure). The minimum figures are somewhat lower than those pertaining to the ECSC industry. Aggregate figures for labor expenditure for salaried employees, both salaries and total labor cost, were obtained by multiplying salaried employment by the appropriate monthly figure times 12. The derivation and basis for these figures are described in detail in appendix table B-17.

Hours Worked, Hourly Labor Cost, and Productivity. Hours worked data are shown in appendix table B-18. The figures on hours worked by wage earners are the same as those used to derive aggregate labor expenditure. Average annual hours worked by salaried employees were estimated to be the same as for wage earners, and total hours worked by salaried employees were estimated by combining these figures with the employment figures used to derive aggregate labor expenditure for salaried employees.

Hourly labor cost figures, as shown in appendix table B-19, for wage earners are the same as those used to calculate total wage earner labor expenditure. Hourly figures for salaried employees were obtained by combining hours worked and aggregate expenditure for salaried employees. Figures for wage earners and salaried employees together were derived by combining aggregate expenditure and hours worked figures for the two groups.

Estimates of output per man-hour and man-hours per unit of output (appendix table B-21) are based on hours worked and weighted output data, combined so as to obtain minimum and maximum estimates.

United Kingdom

Data for the United Kingdom are based almost entirely on statistics from Iron and Steel Annual Statistics (Iron and Steel Board and the British Iron and Steel Federation). The industry, according to the statistical coverage of this publication, includes iron ore, forgings, steel castings, and wrought iron, which are excluded from the U.S. definition, but excludes wire and wire products and pipe over 16 inches in diameter. The latter items have not been added to the United Kingdom "industry" because the necessary data are not available, but the former items, excluded from the U.S. definition, have been removed from the United Kingdom data. The omission of data on wire and wire products probably has only a slight effect on the unit labor cost figures as described earlier under weighting.

Output. Most of the output data used to develop minimum and maximum weighted output for the United Kingdom are statistics on shipments. The range is considerably smaller than for either France or Germany, since the detail of output statistics (by categories of output) available for the United Kingdom is closer to that in the United States. Although there are many rather small differences in definition, only in the case of pipe and tubing (assuming the exclusion of wire and wire products) was it necessary to allow a broad range. The output of pipe and tubing in the United Kingdom is reported only by method of production, seamless or welded (of which electric conduit [52] is reported separately). In a few cases it was necessary to allow a range in the distribution of alloy steel by product, since product classifications are not always the same as in the United States, but United Kingdom statistics do distinguish output of final products by quality, both alloy and stainless. Appendix table B-22 notes the source of each figure used in estimating weighted output for the United Kingdom and gives the basis for estimates and adjustments in United Kingdom figures.

All United Kingdom output data pertain to a 53-week year, whereas labor expenditure estimates described below are based on a 52-week year; therefore, weighted output (appendix table B-22) has been reduced by one fifty-third to calculate unit labor cost and productivity figures.

Labor Expenditure. Estimates of labor expenditure for wages and salaries in the United Kingdom are based on employment and weekly earnings data reported in Iron and Steel Annual Statistics or Monthly Statistics. United Kingdom data for process workers are collected and published for each production process included in the United Kingdom industry definition; data on general and maintenance workers and administrative, technical, and clerical employees associated with these processes are reported only for all processes together. To exclude iron ore, forgings, steel castings, and wrought iron production processes from United Kingdom data, it was necessary to estimate the number of general, maintenance, and salaried employees associated with these processes. [53]

Weekly earnings estimates for both wage earners and salaried employees are based on earnings in 1 week in December 1963 and 1 week in December 1964. Aggregate labor expenditure figures for wages and salaries were then estimated from employment and weekly earnings estimates, [54] with allowance for days not worked but paid for because of sickness, holidays, or vacation. These calculations are presented and explained in detail in appendix table B-23.

52 Electric conduit is considered a fabricated product and is not included in the U.S. industry, but this difference in coverage is considered insignificant.

53 These estimates were provided by the British Iron and Steel Board.

54 In conjunction with aggregate data provided by the Iron and Steel Board.

A recent survey by the United Kingdom Ministry of Labour indicates that supplementary benefits in 1964 accounted for 13.4 percent of total labor expenditure for wage earners and salaried employees together in the iron and steel industry. This figure has been used for estimating both wage earner and salaried employee supplements. To obtain estimates of total labor expenditure, both the minimum and maximum aggregate wages and salaries were inflated to allow for supplementary benefits amounting to 13.4 percent of total labor cost. (See appendix table B-23.)

Hours Worked, Hourly Labor Cost, and Productivity. Total hours worked by wage earners and salaried employees (appendix table B-24) are based on employment figures used to calculate labor expenditure and average weekly hours worked in 1 week in December 1964,[55] with allowance for days not worked because of sickness, holidays, and vacations. Minimum and maximum estimates of average hourly labor cost were calculated from aggregate labor expenditure and aggregate hours worked figures, as shown in appendix table B-25. Estimates of output per man-hour and man-hours per ton of output were derived from weighted output and hours worked data, as shown in appendix table B-27.

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55 Ibid.

Appendix A

As discussed in the body of the study, the most appropriate weights for use in a unit labor cost study would be unit labor cost weights (those which reflect the different labor cost requirements involved in the production of different products). In the absence of unit labor cost weights, man-hour weights have been used. The justification for using man-hour weights is that labor cost per hour worked is assumed to be a constant ($\overline{c}$) for all products. Thus, if we let,

W_i = Man-hours required to produce 1 ton of the i^{th} product,

U_i = Labor cost to produce 1 ton of the i^{th} product,

then $\frac{W_i}{W_1} = \frac{W_i\overline{c}}{W_1\overline{c}} = \frac{U_i}{U_1}$. The W_i in this relationship may be equated with the weight for the i^{th} product in column (2) of table B—2, although the weight for the i^{th} product in the table represents $W_i \div W_1$ (where W_1 = man-hours required to produce 1 ton of coke).

To derive unit labor cost for France, as an example, let:

ULC = Unit labor cost
f = France
us = United States
E = Aggregate labor expenditure
Q_i = Output in tons of the i^{th} product.

Using superscripts to indicate the country and subscripts to indicate product,

$$E^f = \Sigma Q_i^f \; U_i^f$$

$$E^{us} = \Sigma Q_i^{us} \; U_i^{us}$$

$$\frac{E^f}{E^{us}} = \frac{\Sigma Q_i^f \; U_i^f}{\Sigma Q_i^{us} \; U_i^{us}}$$

In fact, neither U_i^f nor U_i^{us} are known, but aggregate labor expenditure—E^f and E^{us}—can be determined from available data.

If the aggregate outputs of the two countries were comparable (if the product mix were the same in both countries), the ratio of unit labor cost in the countries could be expressed as follows:

$$\frac{ULC^f}{ULC^{us}} = \frac{E^f}{\Sigma Q_i^f} \div \frac{E^{us}}{\Sigma Q_i^{us}} = \frac{E^f}{E^{us}} \div \frac{\Sigma Q_i^f}{\Sigma Q_i^{us}}$$

The aggregate outputs are not comparable, however, due to differences in product mix. To obtain "comparable" aggregate output measures, man-hour weights may be used in conjunction with each country's output figures. U.S. weights have been used in this study since comparable data are not available for France (or for other countries). The use of French man-hour weights would undoubtedly yield somewhat different results. However, since the industries in the countries being compared are integrated to approximately the same extent and generally produce the same products with similar plant layout and equipment, the assumption has been made that, $\frac{W_i^{us}}{W_1^{us}} = \frac{W_i^f}{W_1^f}$. In other words, $W_i^f = k\,W_i^{us}$ for all i, where k is a constant. Under this assumption, either U.S. or French man-hour weights may be used and the results will be the same. If (0) represents aggregate output weighted by U.S. man-hour weights,

$$O^{us} = \Sigma Q_i^{us} \ W_i^{us}$$
$$O^{f} = \Sigma Q_i^{f} \ W_i^{us}$$
$$\frac{O^f}{O^{us}} = \frac{\Sigma Q_i^f \ W_i^{us}}{\Sigma Q_i^{us} \ W_i^{us}}$$

The ratio of unit labor cost in France to that in the United States, when French and United States outputs are expressed in common terms through the use of U.S. man-hour weights, may be represented as follows:

$$\frac{ULC^f}{ULC^{us}} = \frac{E^f}{E^{us}} \div \frac{O^f}{O^{us}} = \frac{\Sigma Q_i^f \ U_i^f}{\Sigma Q_i^{us} U_i^{us}} \cdot \frac{\Sigma Q_i^{us} \ W_i^{us}}{\Sigma Q_i^f \ W_i^{us}}$$

The absolute value (in dollars) of unit labor cost in France is given by $\frac{ULC^f}{ULC^{us}} \cdot ULC^{us*}$

where (*) indicates absolute value in dollars. Since, in the base year, $ULC^{us*} = \frac{\Sigma Q_i^{us} \ U_i^{us}}{\Sigma Q_i^{us}}$,

$$ULC^{f*} = \frac{\Sigma Q_i^f \ U_i^f}{\Sigma Q_i^{us} U_i^{us}} \cdot \frac{\Sigma Q_i^{us} W_i^{us}}{\Sigma Q_i^f \ W_i^{us}} \cdot \frac{\Sigma Q_i^{us} U_i^{us}}{\Sigma Q_i^{us}},$$

and letting $\Sigma Q_i^f \ U_i^f = E^f$,

$$ULC^{f*} = \frac{E^f}{\Sigma Q_i^{us}} \cdot \frac{\Sigma Q_i^{us} W_i^{us}}{\Sigma Q_i^f \ W_i^{us}}.$$

Since the numerator and denominator of the ratio of summations may be multiplied by a constant without changing the value of the relationship, a constant $\bar{m}$ may be chosen such that $\Sigma Q_i^{us} \ W_i^{us} \ \bar{m} = \Sigma Q_i^{us}$. The constant $\bar{m}$ must equal $\frac{\Sigma Q_i^{us}}{\Sigma Q_i^{us} \ W_i^{us}}$ This is the process carried out in table B-2. The term $W_i^{us} \ \bar{m}$ represents the deflated weight for the i^{th} product, as shown in column (4) of table B-2. Thus:

$$ULC^{f*} = \frac{E^f}{\Sigma Q_i^{us}} \cdot \frac{\Sigma Q_i^{us} \ W_i^{us} \bar{m}}{\Sigma Q_i^f \ W_i^{us} \bar{m}} = \frac{E^f}{\Sigma Q_i^{us}} \cdot \frac{\Sigma Q_i^{us}}{\Sigma Q_i^f \ W_i^{us} \ \bar{m}}$$

$$= \frac{E^f}{\Sigma Q_i^f W_i^{us} \bar{m}} = \frac{E^f}{\Sigma Q_i^f W_i^{us\prime}}, \quad \text{where } W_i^{us} \bar{m} = W_i^{us\prime}$$

For the purpose of this paper, $\frac{E^f}{\Sigma Q_i^f W_i^{us\prime}}$ has been called the labor cost in France to produce a "U.S. composite ton" of steel. Although an artificial term, it helps to verbalize the results obtained in the study and is mathematically justifiable if the assumption is made that $\frac{W_i^{us}}{W_1^{us}} = \frac{W_i^f}{W_1^f}$.

Using this assumption, it can be shown that $\Sigma Q_i^f \ W_i^{us\prime}$ equals the output which would have been produced in France if France had produced the U.S. product distribution. Or, the French output expressed in U.S. composite tons. If $\Sigma Q_i^{us} \ W_i^{us}$ equals total man-hours in the United States, then $\frac{\Sigma Q_i^{us} \ W_i^{us}}{\Sigma Q_i^{us}}$ equals total man-hours per U.S. composite ton in the United States. The number of U.S. composite tons which could have been produced in France may be represented as follows:

$$\frac{\Sigma Q_i^f \ W_i^{us} \left(\frac{\Sigma Q_i^f \ W_i^f}{\Sigma Q_i^{us} W_i^{us}} \right)}{\frac{\Sigma Q_i^{us} W_i^{us}}{\Sigma Q_i^{us}} \left(\frac{\Sigma Q_i^{us} W_i^f}{\Sigma Q_i^{us} W_i^{us}} \right)}$$

The factors $\left(\frac{\Sigma Q_i^f \; W_i^f}{\Sigma Q_i^f \; W_i^{us}}\right)$ and $\left(\frac{\Sigma Q_i^{us} \; W_i^f}{\Sigma Q_i^{us} \; W_i^{us}}\right)$ have been inserted in the numerator and denominator, respectively, to indicate the result of allowing for different absolute man-hour requirements (as opposed to $\frac{W_i^{us}}{W_1^{us}} = \frac{W_i^f}{W_1^f}$) in France and the United States. But $\frac{\Sigma Q_i^f \; W_i^f}{\Sigma Q_i^f \; W_i^{us}} = \frac{\Sigma Q_i^{us} \; W_i^f}{\Sigma Q_i^{us} \; W_i^{us}}$ if $\frac{W_i^{us}}{W_1^{us}} = \frac{W_i^f}{W_1^f}$.

Thus, the above quantity may be written as

$$\frac{\Sigma Q_i^f \; W_i^{us}}{\Sigma Q_i^{us} W_i^{us}} \cdot \Sigma Q_i^{us}$$

and if $\bar{m}$ is again chosen such that $\Sigma Q_i^{us} \; W_i^{us} \; \bar{m} = \Sigma Q_i^{us}$, this becomes

$$\frac{\Sigma Q_i^f \; W_i^{us} \bar{m}}{\Sigma Q_i^{us}} \cdot \Sigma Q_i^{us} \quad \text{which equals} \quad \Sigma Q_i^f \; W_i^{us\prime}, \text{ where } W_i^{us\prime} = W_i^{us} \bar{m}.$$

It is also of interest to note that, given the assumptions $\frac{W_i^f}{W_1^f} = \frac{W_i^{us}}{W_1^{us}}$ and $\frac{U_i^{us}}{U_1^{us}} = \frac{W_i^{us}}{W_1^{us}}$,

$$\frac{ULC^f}{ULC^{us}} = \frac{\Sigma Q_i^f \; U_i^f}{\Sigma Q_i^f \; U_i^{us}} = \frac{\Sigma Q_i^{us} \; U_i^f}{\Sigma Q_i^{us} \; U_i^{us}}.$$

In this absolute comparisons study, the question of whether the ratio between French unit labor cost and U.S. unit labor cost represents a Laspeyres- or Paasche-type relationship is not of particular relevance, but since it compares the cost in a foreign country to produce a "U.S. composite ton" of steel, it may be appropriate to consider the study as a Laspeyres-type comparison.

Table B-1. BLS 1961 Relative Man-Hour Weights Converted to Relative Cumulative Weights, Iron and Steel Industry

Product category	Yield of final carbon product per ton of ingot (percent)[1]	Quality of steel					
		Carbon		Alloy		Stainless	
		BLS weight	Cumulative weight[2]	BLS weight	Cumulative weight[3]	BLS weight	Cumulative weight[4]
Coke		1.0	1.0	-	-	-	-
Pig iron and ferroalloys		1.4	[5]2.1	-	-	-	-
Ingots and steel for castings		2.0	[6]3.3	3.5	[7]4.4	7.2	[8]7.3
Blooms, slabs, billets, tube rounds, skelp, etc	0.78	4.8	9.3	10.9	17.7	24.1	34.8
Wire rods	.76	8.5	13.0	20.2	27.1	87.1	98.1
Structural shapes (heavy) and steel piling	.81	7.1	11.5	17.6	24.2	84.5	94.8
Plates	.69	6.1	10.9	15.5	23.1	78.4	90.7
Rails—standard and all other	.74	6.7	11.3	18.1	25.2	-	-
Joint bars, tie plates, and track spikes	.76	19.1	23.6	-	-	-	-
Wheels and axles	.55	25.3	30.8	37.6	47.0	-	-
Bars—hot rolled (including light shapes)	.74	10.7	15.3	16.7	23.8	104.9	116.3
Bars—reinforcing	.81	6.6	11.0	16.7	23.3	-	-
Bars—cold finished	.70	18.5	23.3	31.8	39.3	154.2	166.3
Bars—tool steel	.70	89.3	94.1	161.8	169.3	-	-
Standard pipe	.76	15.9	20.4	21.1	28.0	120.7	131.7
Oil-country goods	.76	20.3	24.8	27.4	34.3	156.7	167.7
Line pipe	.78	13.7	18.2	21.1	27.9	-	-
Mechanical tubing	.69	32.6	37.4	48.4	56.0	284.5	296.8
Pressure tubing	.69	46.6	51.4	76.3	83.9	294.3	306.6
Wire—drawn	.74	23.7	28.3	39.5	46.6	159.3	170.7
Wire products	.71	31.3	36.0	-	-	163.0	174.9
Black plate	.69	10.5	15.3	-	-	-	-
Tin and terne plate—hot dipped	.66	18.9	23.8	-	-	-	-
Tin plate—electrolytic	.66	12.6	17.5	-	-	-	-
Sheets—hot rolled	.72	4.8	9.5	11.2	18.5	17.1	28.8
Sheets—cold rolled	.68	6.9	11.8	13.4	21.1	97.0	109.5
Sheets—galvanized	.66	10.4	15.3	18.1	26.0	-	-
Strip—hot rolled	.67	11.4	16.3	14.3	22.1	44.2	57.0
Strip—cold rolled	.65	23.2	28.2	198.3	206.3	81.5	94.7
Sheets—all other coated	.68	11.4	16.3	-	-	-	-
Electrical sheets and strip	.68	23.6	28.5	23.8	31.5	-	-

[1] Estimates based on data pertaining to the 1946-47 experience of a few companies considered to be representative of the industry at that time, and on other more recent information.

[2] The cumulative weight for any carbon final product equals the estimated quantity of pig iron per ton of carbon end product times the cumulative weight for pig iron and ferroalloys (0.91 x 2.1) plus the BLS weight for carbon crude steel divided by the yield factor for the product (2.0/yield factor) plus the BLS weight for the product.

[3] The yield factor for an alloy steel final product is assumed to be 10 points less than the carbon factor for that product. The cumulative weight for any alloy final product equals the estimated quantity of pig iron per ton of alloy end product times the cumulative weight for pig iron and ferroalloys (0.78 x 2.1) plus the BLS weight for alloy crude steel divided by the yield factor for the product (3.5/yield factor) plus the BLS weight for the product.

[4] The yield factor for a stainless steel final product is assumed to be 10 points less than the carbon factor for that product. The cumulative weight for any stainless final product equals the estimated quantity of pig iron per ton of stainless end product times the cumulative weight for pig iron and ferroalloys (0.06 x 2.1) plus the BLS weight for stainless crude steel divided by the yield factor for the product (7.2/yield factor) plus the BLS weight for the product.

[5] BLS weight assigned to pig iron and ferroalloys plus the product of the estimated coke requirement per ton of pig iron times the BLS weight for coke. [1.4 + (0.68 x 1)]

[6] BLS weight assigned to carbon crude steel plus the product of the cumulative weight for pig iron and ferroalloys times the estimated pig iron requirement per ton of carbon crude steel. [2.0 + (2.1 x 0.63)]

[7] BLS weight assigned to alloy crude steel plus the product of the cumulative weight for pig iron and ferroalloys times the estimated pig iron requirement per ton of alloy crude steel. [3.5 + (2.1 x 0.43)]

[8] BLS weight assigned to stainless crude steel plus the product of the cumulative weight for pig iron and ferroalloys times the estimated pig iron requirement per ton of stainless crude steel. [7.2 + (2.1 x 0.03)]

Table B-2. Deflation of Relative Cumulative Weights From Table B-1, Using U.S. Shipments, 1964

Product category	Shipments (thousands of short tons)	Cumulative weight	Col. (1) x Col. (2)	Deflated weight $\frac{\Sigma(1)}{\Sigma(3)} \times (2)$[1]	Col. (4) x Col. (1)
	(1)	(2)	(3)	(4)	(5)
All product categories	87,716.3		1,420,682.0		87,716.3
Coke	(2)	1.0	-	0.06	-
Pig iron and ferroalloys	[3] 2,771.4	2.1	5,820.0	.13	359.5
Ingots and steel for castings:					
Carbon	179.7	3.3	593.0	.20	36.6
Alloy	144.8	4.4	637.0	.27	39.3
Stainless	5.3	7.3	38.6	.45	2.4
Blooms, slabs, billets, tube rounds, skelp, etc.:					
Carbon	2,156.6	9.3	20,056.3	.57	1,238.3
Alloy	508.6	17.7	9,002.5	1.09	555.8
Stainless	38.6	34.8	1,343.4	2.15	82.9
Wire rods:					
Carbon	1,148.1	13.0	14,925.7	.80	921.6
Alloy	39.4	27.1	1,067.5	1.67	65.9
Stainless	7.9	98.1	778.4	6.06	48.1
Structural shapes (heavy) and steel piling:					
Carbon	5,780.9	11.5	66,480.3	.71	4,104.4
Alloy	304.3	24.2	7,363.3	1.49	454.6
Stainless	0.1	94.8	10.9	5.85	.7
Plates:					
Carbon	7,605.8	10.9	82,902.8	.67	5,118.7
Alloy	825.7	23.1	19,074.0	1.43	1,177.6
Stainless	59.1	90.7	5,362.6	5.60	331.1
Rails—standard and all other:					
Carbon	648.9	11.3	7,332.6	.70	452.7
Alloy	26.5	25.2	666.5	1.56	41.2
Joint bars, tie plates, and track spikes:					
Carbon	222.6	23.6	5,253.5	1.46	324.4
Wheels and axles:					
Carbon	493.1	30.8	15,188.3	1.90	937.8
Alloy	3.8	47.0	176.4	2.90	10.9
Bars—hot rolled (including light shapes):					
Carbon	6,279.2	15.3	96,071.9	.94	5,932.0
Alloy	2,076.0	23.8	49,408.3	1.47	3,050.7
Stainless	45.7	116.3	5,320.6	7.18	328.5
Bars—reinforcing:					
Carbon	3,228.4	11.0	35,512.8	.68	2,192.8
Alloy	.6	23.3	12.7	1.44	.9
Bars—cold finished:					
Carbon	1,173.9	23.3	27,351.6	1.44	1,688.8
Alloy	222.4	39.3	8,740.5	2.43	539.7
Stainless	70.5	166.3	11,732.1	10.27	724.4
Bars—tool steel:					
Carbon	-	94.1	-	5.81	-
Alloy	102.4	169.3	17,332.8	10.45	1,070.2
Standard pipe:					
Carbon	[4] 2,567.1	20.4	52,369.3	1.26	3,233.3
Alloy	[4] 2.4	28.0	66.8	1.73	4.1
Stainless	-	131.7	-	8.13	-
Oil-country goods:					
Carbon	1,290.4	24.8	32,002.1	1.53	1,975.9
Alloy	345.9	34.3	11,862.7	2.12	732.4
Stainless	.3	167.7	41.9	10.35	2.6
Line pipe:					
Carbon	2,141.4	18.2	38,972.8	1.12	2,406.3
Alloy	492.8	27.9	13,748.2	1.72	848.9
Mechanical tubing:					
Carbon	670.7	37.4	25,083.3	2.31	1,548.7
Alloy	334.7	56.0	18,742.9	3.46	1,157.2
Stainless	3.3	296.8	987.2	18.33	60.9
Pressure tubing:					
Carbon	216.7	51.4	11,136.9	3.17	687.6
Alloy	44.4	83.9	3,724.6	5.18	230.0
Stainless	26.9	306.6	8,239.3	18.93	508.7
Wire—drawn:					
Carbon	2,466.6	28.3	59,803.9	1.75	4,309.8
Alloy	26.7	46.6	1,246.3	2.88	77.0
Stainless	24.9	170.7	4,252.8	10.54	262.6
Wire products:					
Carbon	586.8	36.0	21,126.0	2.22	1,304.4
Stainless	(5)	174.9	2.3	10.80	.1

See footnotes at end of table.

Table B-2. Delation of Relative Cumulative Weights From Table B-1, Using U.S. Shipments, 1964—Continued

Product category	Shipments (thousands of short tons)	Cumulative weight	Col. (1) x Col. (2)	Deflated weight $\frac{\Sigma(1)}{\Sigma(3)} \times (2)$ [1]	Col. (4) x Col. (1)
	(1)	(2)	(3)	(4)	(5)
Black plate:					
Carbon	431.1	15.3	6,596.0	.94	407.3
Tin and terne plate—hot dipped:					
Carbon	150.1	23.8	3,571.9	1.47	220.5
Tin plate—electrolytic:					
Carbon	5,501.4	17.5	96,274.8	1.08	5,944.3
Sheets—hot rolled:					
Carbon	9,530.6	9.5	90,541.2	.59	5,590.7
Alloy	379.3	18.5	7,017.5	1.14	433.3
Stainless	38.0	28.8	1,093.9	1.78	67.5
Sheets—cold rolled:					
Carbon	15,496.9	11.8	182,863.3	.73	11,291.0
Alloy	30.0	21.1	632.4	1.30	39.0
Stainless	172.2	109.5	18,854.7	6.76	1,164.1
Sheets—galvanized:					
Carbon	4,367.9	15.3	66,829.1	.94	4,126.4
Alloy	-	26.0	-	1.61	-
Strip—hot rolled:					
Carbon	1,605.6	16.3	26,170.8	1.01	1,615.8
Alloy	30.9	22.1	651.5	1.30	40.2
Stainless	23.6	57.0	1,342.7	3.52	82.9
Strip—cold rolled:					
Carbon	1,102.6	28.2	31,092.2	1.74	1,919.8
Alloy	26.3	206.3	5,434.1	12.74	335.5
Stainless	254.8	94.7	24,127.7	5.85	1,489.7
Sheets—all other coated:					
Carbon	512.3	16.3	8,351.2	1.01	515.6
Electrical sheets and strip:					
Carbon	52.6	28.5	1,498.2	1.76	92.5
Alloy	595.0	31.5	18,741.6	1.94	1,157.2

[1] $\frac{\Sigma(1)}{\Sigma(3)} = 0.061742388$.

[2] There were no net shipments of coke from the industry; there was a net purchase of about 2.9 million tons.

[3] Pig iron shipments outside the steel industry.

[4] Includes structural pipe and tubing.

[5] 12 tons of stainless and 1 ton of alloy.

NOTE: Because of rounding, sums of individual items may not equal totals.

SOURCE: Shipments from the Annual Statistical Report, 1964 (New York, American Iron and Steel Institute, 1965).

Table B-3. United States. Estimate of Supplementary Benefits for Salaried Employees, Iron and Steel Industry, 1964

(In U.S. dollars)

Item	Cost
A. AISI financial data:[1]	
1. Employee exclusive of force account labor:[2]	
Total employment cost	6, 136, 131, 495
Wages and salaries	5, 208, 825, 331
Supplementary benefits (15. 11 percent of total)	927, 306, 164
Social security taxes	220, 064, 672
Pensions	192, 701, 125
Insurance	227, 756, 802
Savings and vacation type plans	186, 582, 102
Supplemental unemployment costs	42, 758, 863
Other employment costs	57, 442, 600
2. Employee inclusive of force account labor:[3]	
Wages and salaries	5, 306, 617, 587
Wages (72. 11 percent of total)	3, 826, 620, 752
Salaries (27. 89 percent of total)	1, 479, 996, 835
B. AISI employment and wage data for the "steel industry":	
1. Annual payroll cost	4, 376, 121, 495
Wages	3, 217, 048, 623
Salaries	1, 159, 072, 872
2. Hourly employment cost for wage earners, total	4. 335
Payroll cost	3. 700
Pay for hours worked[4] (92. 73 percent of payroll cost; 78. 78 percent of total employment cost).	3. 431
Pay for holidays not worked, vacation pay, and adjustments (7. 27 percent of payroll cost).	. 269
Supplementary benefits included under A-1 (15. 04 percent of total employment cost).	. 655
C. Estimate of fringe benefits, assuming percentages in A-2 and B-2 apply to figures under A-1:	
Wages = 72. 11 percent of $5, 208, 825, 331	3, 756, 083, 924
Salaries = $5, 208, 825, 331 - $3, 756, 083, 924	1, 452, 741, 407
Total employment cost:	
Wage earners = $3, 756, 083, 924 ÷ (1 - 0. 1504)	4, 421, 000, 896
Salaried employees = $6, 136, 131, 495 - $4, 421, 000, 896	1, 715, 130, 599
Supplementary benefits (included under A-1) for salaried employees:	
$1, 715, 130, 599 - $1, 452, 741, 407	262, 389, 192
As a percent of total employment cost for salaried employees	15. 30
D. Estimated cost of pay for holidays not worked, vacation pay, and adjustments for salaried employees (based on same percentage for wage earners) as a percent of payroll cost for salaried employees	7. 27

[1] Covering the consolidated statements, including all of the affiliated interests of the parent companies which report these data to the AISI.
[2] Excludes portion of payroll charged to own construction or other nonoperating accounts.
[3] Includes portion of payroll charged to own construction or other nonoperating accounts.
[4] Equivalent to BLS "average hourly earnings" and ECSC "salaire direct."

SOURCE: Based on data from the Annual Statistical Report, 1965 (New York, American Iron and Steel Institute, 1966).

Table B-4. United States. Employment Cost for Wage Earners and Salaried Employees, Iron and Steel Industry, 1964

[In U.S. dollars]

Worker category	Cost
Wage earners:	
Wages [1]	2, 983, 072, 760
Total cost [2]	3, 786, 441, 816
Salaried employees:	
Salaries [3]	1, 074, 805, 055
Total cost [4]	1, 368, 420, 011
Wage earners and salaried employees:	
Wages and salaries	4, 057, 877, 815
Total cost	5, 154, 861, 827

[1] Pay for hours worked, AISI. Includes shift differentials and premiums for overtime and Sunday and holiday work.
[2] Includes wages plus pay for holidays not worked, vacation pay, adjustments, and all fringe benefits listed in table B-3.
[3] Estimated to be 92.73 percent of total payroll cost (i.e., AISI "salaries"). (See table B-3.) Pay for holidays not worked, vacation pay, and adjustments are thus excluded.
[4] Estimating that AISI salaries are 84.70 percent of total employment cost for salaried employees. See table B-3.

Table B-5. United States. Total Hours Worked and Average Hourly Labor Cost, Iron and Steel Industry, 1964

Worker category	Total hours worked
Wage earners	869, 447, 030
Salaried employees	244, 658, 383
Wage earners and salaried employees	1, 114, 105, 413
	Hourly labor cost
Wage earners:	
Pay for hours worked	$3. 431
Total cost	4. 355
Salaried employees:	
Salaries [1]	4. 393
Total cost [2]	5. 593
Wage earners and salaried employees:	
Wages and salaries	3. 642
Total cost	4. 627

[1] Aggregate salary cost from table B-4 divided by total hours worked by salaried employees.
[2] Total employment cost for salaried employees from table B-4 divided by total hours worked by salaried employees.

SOURCE: Based on data from the Annual Statistical Report, 1965 (New York, American Iron and Steel Institute, 1966).

Table B-6. United States. Calculation of Unit Labor Cost for Wage Earners and Salaried Employees, Iron and Steel Industry, 1964

Worker category	Employment cost (U. S. dollars) [1]	Output (thousands of short tons) [2]	Unit labor cost (U. S. dollars) per—	
			Short ton [3]	Metric ton [4]
	(1)	(2)	(3)	(4)
Wage earners:				
Wages	2, 983, 072, 760	87, 716. 3	34. 01	37. 49
Total cost	3, 786, 441, 816	87, 716. 3	43. 17	47. 59
Salaried employees:				
Salaries	1, 074, 805, 055	87, 716. 3	12. 25	13. 51
Total cost	1, 368, 420, 011	87, 716. 3	15. 60	17. 20
Wage earners and salaried employees:				
Wages and salaries	4, 057, 877, 815	87, 716. 3	46. 26	50. 99
Total cost	5, 154, 861, 827	87, 716. 3	58. 77	64. 78

[1] From table B-3.
[2] Weighted output from table B-2.
[3] Col. 1 ÷ col. 2.
[4] 1 metric ton = 1. 1023 short tons.

Table B-7. United States. Man-Hours per Ton and Output per 1, 000 Man-Hours, Iron and Steel Industry, 1964

Worker category	Man-hours per— [1]	
	Short ton	Metric ton [2]
Wage earners	9. 91	10. 93
Salaried employees	2. 79	3. 07
Wage earners and salaried employees	12. 70	14. 00
	Output per 1, 000 man-hours [1]	
	Short tons	Metric tons [2]
Wage earners	100. 89	91. 53
Salaried employees	358. 53	325. 26
Wage earners and salaried employees	78. 73	71. 42

[1] Using output from table B-2 and hours worked from table B-5.
[2] 1 metric ton = 1. 1023 short tons.

Table B-8. France. Estimate of Minimum and Maximum Weighted Output, Iron and Steel Industry, U.S. Industry Definition,[1] 1964

(In thousands of metric tons)

Product category	Minimum			Maximum		
	Production distribution emphazing low-weight products	Weight	Weighted output	Production distribution emphazing high-weight products	Weight	Weighted output
All product categories	16,994		15,628.5	16,994		17,306.3
Coke	([2])	0.06	-	([2])	0.06	-
Pig iron and ferroalloys	[3] 1,277	.13	166.0	[3] 1,277	.13	166.0
Ingots and steel for castings:						
Carbon	[4] 300	.20	60.0	[4] 100	.20	20.0
Alloy	[4,5] 100	.27	27.0	[4,5] 50	.27	13.5
Stainless	[4,5] 25	.45	11.3	([4,5])	.45	-
Blooms, slabs, billets, tube rounds, skelp, etc:						
Carbon	[4] 598	.57	340.9	[4] 798	.57	454.9
Alloy	[4,5] 25	1.09	27.3	[4,5] 125	1.09	136.3
Stainless	[4,5] 25	2.15	53.8	([4,5])	2.15	-
Wire rods:						
Carbon	[6] 1,010	.80	808.0	[6] 1,010	.80	808.0
Alloy	[5,6] 25	1.67	41.8	[5,6] 16	1.67	26.7
Stainless	[5,6] 1	6.06	6.1	[5,6] 10	6.06	60.6
Structural shapes (heavy) and steel piling:						
Carbon	[7] 957	.71	679.5	[7] 1,030	.71	731.3
Alloy	[5] 73	1.49	108.8	([5])	1.49	-
Stainless	-	5.85	-	-	5.85	-
Plates:						
Carbon	[8] 1,197	.67	802.0	[8] 1,197	.67	802.0
Alloy	[5] 32	1.43	45.8	[5] 39	1.43	55.8
Stainless	[5] 30	5.60	168.0	[5] 23	5.60	128.8
Rails, standard and all other:						
Carbon	[9] 323	.70	226.1	[9] 323	.70	226.1
Alloy	-	1.56	-	-	1.56	-
Joint bars, tie plates, and track spikes:						
Carbon	[10] 30	1.46	43.8	[10] 30	1.46	43.8
Wheels and axles:						
Carbon	[11] 37	1.90	70.3	[11] 37	1.90	70.3
Alloy	-	2.90	-	-	2.90	-
Bars—hot rolled (including light shapes):						
Carbon	[12] 1,842	.94	1,731.5	[12] 1,769	.94	1,662.9
Alloy	[5] 130	1.47	191.1	[5] 183	1.47	269.0
Stainless	([5])	7.18	-	[5] 20	7.18	143.6
Bars—reinforcing:						
Carbon	[13] 1,239	.68	842.5	[13] 1,239	.68	842.5
Alloy	-	1.44	-	-	1.44	-
Bars—cold finished:						
Carbon	[14] 209	1.44	301.0	[14] 209	1.44	301.0
Alloy	[15] 29	2.43	70.5	[15] 19	2.43	46.2
Stainless	[5] [5] 2	10.27	20.5	[5] 12	10.27	123.2
Bars—tool steel:						
Carbon	[16] 10	5.81	58.1	[16] 10	5.81	58.1
Alloy	[17] 36	10.45	376.2	[17] 36	10.45	376.2
Standard pipe:						
Carbon	[18] 497	1.26	626.2	[18] 414	1.26	521.6
Alloy	[5] 2	1.73	3.5	([5])	1.73	-
Stainless	-	8.13	-	-	8.13	-
Oil-country goods:						
Carbon	[18] 125	1.53	191.3	[18] 219	1.53	335.1
Alloy	[5] 10	2.12	21.2	[5] 18	2.12	38.2
Stainless	([5])	10.35	-	[5] 4	10.35	41.4
Line pipe:						
Carbon	[18] 334	1.12	374.1	[18] 155	1.12	173.6
Alloy	[5] 30	1.72	51.6	[5] 6	1.72	10.3
Mechanical tubing:						
Carbon	[18] 213	2.31	492.0	[18] 319	2.31	736.9
Alloy	[5] 7	3.46	24.2	[5] 19	3.46	65.7
Stainless	([5])	18.33	-	[5] 4	18.33	73.3
Pressure tubing:						
Carbon	([18])	3.17	-	[18] 54	3.17	171.2
Alloy	([5])	5.18	-	[5] 2	5.18	10.4
Stainless	([5])	18.93	-	[5] 4	18.93	75.7
Wire—drawn:						
Carbon	[14] 408	1.75	714.0	[14] 408	1.75	714.0
Alloy	[15] 12	2.88	34.6	[15] 4	2.88	11.5
Stainless	[5] 2	10.54	21.1	[5] 10	10.54	105.4

See footnotes at end of table.

Table B-8. France. Estimate of Minimum and Maximum Weighted Output, Iron and Steel Industry, U.S. Industry Definition,[1] 1964—Continued

(In thousands of metric tons)

Product category	Minimum			Maximum		
	Production distribution emphazing low-weight products	Weight	Weighted output	Production distribution emphazing high-weight products	Weight	Weighted output
Wire products:						
Carbon	[14]410	2.22	910.2	[14]410	2.22	910.2
Stainless	[15]1	10.80	10.8	[15]1	10.80	10.8
Black plate:						
Carbon	[13]18	.94	16.9	[13]18	.94	16.9
Tin and terne plate—hot dipped:						
Carbon	[19]156	1.47	229.3	[19]312	1.47	458.6
Tin plate—electrolytic:						
Carbon	[19]469	1.08	506.5	[19]313	1.08	338.0
Sheets—hot rolled:						
Carbon	[20]1,066	.59	628.9	[20]371	.59	218.9
Alloy	[5]25	1.14	28.5	[5]23	1.14	26.2
Stainless	[5]23	1.78	40.9	[5]7	1.78	3.6
Sheets—cold rolled:						
Carbon	[20]2,279	.73	1,663.7	[20]2,974	.73	2,171.0
Alloy	[5]2	1.30	2.6	([5])	1.30	-
Stainless	[5]10	6.76	67.6	[5]30	6.76	202.8
Sheets—galvanized:						
Carbon	[21]445	.94	418.3	[21]445	.94	418.3
Alloy	-	1.61	-	-	1.61	-
Strip—hot rolled:						
Carbon	[22]425	1.01	429.3	[22]433	1.01	437.3
Alloy	[5]2	1.30	2.6	([5])	1.30	-
Stainless	[5]6	3.52	21.1	([5])	3.52	-
Strip—cold rolled:						
Carbon	[14]181	1.74	314.9	[14]181	1.74	314.9
Alloy	[15]2	12.74	25.5	([15])	12.74	-
Stainless	[5]4	5.85	23.4	[5]6	5.85	35.1
Sheets—all other coated:						
Carbon	[21]61	1.01	61.6	[21]61	1.01	61.6
Electrical sheets and strip:						
Carbon	[23]41	1.76	72.2	([23])	1.76	-
Alloy	[23]166	1.94	322.0	[23]207	1.94	401.6

[1] Includes the following product categories not included in the European Coal and Steel Community (ECSC) industry definition (equivalent to the French definition): Wheels and axles; pipe and tubing (all varieties); wire—drawn; wire products; strip—cold rolled; and bars—cold finished.

It has been assumed that wheels and axles derive from semis and ingots; seamless pipe from semis and ingots; welded pipe from hot-rolled strip (partially skelp, following U.S. definition); wire and wire products from wire rods; cold-rolled strip from hot-rolled strip; and cold-finished bars from hot-rolled bars (including light shapes). In order to avoid double counting, shipments figures minus shipments for conversion into other steel products, instead of production figures, have been used for semis and ingots, hot-rolled strip, and wire rods. A yield loss has been allowed from hot-rolled bars to cold-finished bars.

[2] All coke produced by the steel industry is assumed to be consumed by the industry, since consumption totaled 14,330 thousand metric tons (hereafter referred to as MMT) and industry production 4,323 MMT.

[3] Production of pig iron and ferroalloys (15,840 MMT) minus consumption (14,563 MMT) in steelmaking processes.

[4] Derived from United Nations shipments data (Quarterly Bulletin of Steel Statistics for Europe, vol. XV, No. 4). Source lists shipments of semis and ingots, other than for conversion into other steel products, totaling 1,073 MMT, of which 175 MMT are alloy. On the minimum output side, 425 MMT are assumed to be ingots and 648 MMT, semis; on the maximum output side, 150 MMT are assumed to be ingots and 923 MMT, semis.

[5] The distribution of alloy steel, including stainless, among end products has been made on the basis of the following data:

Special crude steel	Production (thousands of metric tons)
Alloy tool	42.7
High speed	8.1
Carbon tool	16.9
Stainless	234.5

SOURCE: Metal Bulletin, Mar. 16, 1966.

Alloy, including stainless	Shipments (thousands of metric tons)
Group A:	
Solids for seamless tubes	52
Other ingots and semis	175
Sections, hot rolled (including bars)	273
Wire rods	41
Strip, hot rolled	22
Plates (3 mm. or more)	62
Sheets (less than 3 mm.)	60

(Continued on following page)

Table B-8. Footnotes—Continued

Alloy, including stainless	Shipments (thousands of metric tons)
Group B:	
Wire—drawn	14
Wire products	1
Bars—cold finished	31
Strip—cold rolled	6

SOURCE: Group A, from Quarterly Bulletin of Steel Statistics for Europe (New York, United Nations Economic Commission for Europe), vol. XV, No. 4; and group B, from Annuaire de Statistique Industrielle, 1965 (Paris, Bureau Central de Statistique Industrielle).

From the above data, two distributions of alloy steel, including stainless, have been made; the first emphasizes low-weight products, and the second, high-weight products, as follows:

Product category	Minimum output (thousands of metric tons)	Maximum output
Ingots and steel for castings	125	50
Blooms, stabs, billets, tube rounds, skelp, etc	50	125
Wire products	1	1
Wire—drawn	14	14
Bars—cold finished	31	31
Strip—hot rolled	a/8	(a/)
Strip—cold rolled	6	6
Pipe and tubing	b/49	b/57
Bars—tool steel	c/36	c/36
Bars—hot rolled (including light shapes)	d/130	d/203
Structural shapes (heavy) and steel piling	d/73	(d/)
Plates	62	62
Sheets—cold rolled	12	30
Sheets—hot rolled	48	30
Wire rods	e/26	e/26

a/ The hot-rolled strip total of 22 required to make the cold-rolled strip is estimated at 1.09 x 6 = 7. On the minimum side, 7 MMT are assumed to go into making pipe, and on the maximum side, 15 MMT.

b/ The amount of pipe and tubing made from the shipments of solids for seamless tubes is estimated at 52÷1.22 = 43. The amount made from strip is estimated at 7÷1.10 = 6 on the minimum side and 15÷1.10 = 14 on the maximum side.

c/ Alloy tool and high-speed crude steel (50.8) x 0.70.

d/ The hot-rolled sections (total 273) required to make the cold-finished bars is estimated at 1.09 x 31 = 34. The amount in tool steel is 36 MMT. On the minimum side, it is assumed that 73 MMT are in structural shapes (heavy), and on the maximum side, that no alloy is in this category.

e/ Shipments of wire rods minus the estimated requirement to make wire and wire products (1.03 x 15).

The alloy in pipe and tubing has been distributed among the various categories on the minimum and maximum sides as follows:

Pipe and tubing	Minimum output (thousands of metric tons)	Maximum output
Total	49	57
Standard pipe	2	-
Oil-country goods	10	22
Line pipe	30	6
Mechanical tubing	7	23
Pressure tubing	-	6

Stainless steel in end products is assumed to total 129 MMT on the minimum side (234 times an average yield from crude steel of 0.55) and 152 MMT (234 x 0.65) on the maximum side. It has been estimated that 50 percent of the total, on both sides, is in plates and sheets (based on data in La reconversion de la mine de Chapagnac, Luxembourg, ECSC, 1964). Within this framework, distributions have been made to emphasize low-weight products on the minimum side and high-weight products on the maximum side, as follows:

Product category	Minimum output (thousands of metric tons)	Maximum output
All categories	129	152
Ingots and steel for castings	25	
Blooms, slabs, billets, tube rounds skelp, etc	25	5
Wire rods	1	10
Plates	30	39
Bars—hot rolled	-	20
Bars—cold finished	2	12
Oil-country goods	-	4
Mechanical tubing	-	4
Pressure tubing	-	4
Wire—drawn	2	10
Wire products	1	1
Sheets—hot rolled	23	7
Sheets—cold rolled	10	30
Strip—hot rolled	6	-
Strip—cold rolled	4	6

(Continued on following page)

Table B-8. Footnotes—Continued

[6] United Nations shipments figure minus the amount for conversion into other steel products.
[7] Production figure as given (ECSC) minus the estimated amount in alloy.
[8] Production figure as given (ECSC) for large plates plus plates over 4.75 mm. minus the estimated amount in alloy.
[9] Production figure as given (Annuaire de statistique industrielle). Includes rails and sleepers.
[10] Production figure as given (Annuaire de statistique industrielle). Includes joint bars and tie plates.
[11] Production figure as given (ECSC). Includes wheel bands, wheels, axles, and wheel centers.
[12] Production figure as given (ECSC) minus the estimated quantity in alloy and in cold-finished bars and tool steel.
[13] Production figure as given (ECSC).
[14] Shipments figure as given (Annuaire de statistique industrielle).
[15] Shipments figure as given (Annuaire de statistique industrielle) minus the estimated amount in stainless steel.
[16] Crude steel figure (Metal Bulletin, Mar. 18, 1966) times 0.70.
[17] Crude steel figure (Metal Bulletin, Mar. 18, 1966) times 0.60.
[18] The Chambre Syndicale des Fabricants de Tubes d'Acier recorded total pipe and tubing production of 1,218 MMT in 1964. Of this amount, at least 330 MMT were in standard pipe, 220 MMT in mechanical tubing, 130 MMT in line pipes, and 70 MMT in oil-country goods. Within this framework, estimates of the distribution of pipe and tubing among the various categories have been made as follows:

Pipe and tubing	Minimum output (thousands of metric tons)	Maximum output (thousands of metric tons)
Standard pipe	499	414
Oil-country goods	135	241
Line pipe	364	161
Mechanical tubing	220	342
Pressure tubing	-	60

The amount of carbon steel in any category represents the appropriate figure from above minus the estimated amount in alloy steel.
[19] The ECSC production figure for all tin and terne plate is 625 MMT. On the minimum side, 25 percent has been placed in the hot-dipped category and 75 percent in electrolytic; on the maximum side, 50 percent has been placed in each category.
[20] ECSC production figure for sheets 4.75 mm. or less (coils have been added to hot-rolled sheets) minus the estimated amount used to produce coated products and electrical sheets and strip; this procedure avoids double counting. Relevant production figures are as follows:

Product category	Production (thousands of metric tons)
Sheets—hot rolled ≤ 4.75 mm	1,114
Sheets—cold rolled ≤ 4.75 mm	3,647
Tin and terne plate	625
Black plate	18
Galvanized sheets	445
Other coated sheets	61
Electrical sheets and strip	207

Coated and electrical sheets and strip are assumed to derive from hot- and cold-rolled sheets, as follows:

Product category	Minimum output (thousands of metric tons)		Maximum output (thousands of metric tons)	
	Cold-rolled sheets	Hot-rolled sheets	Cold-rolled sheets	Hot-rolled sheets
Total	1,356	-	643	713
Black plate	18	-	18	-
Tin and terne plate	625	-	625	-
Galvanized sheets	445	-	-	445
Other coated sheets	61	-	-	61
Electrical sheets and strip	207	-	-	207

These totals must be subtracted from the total production figures for hot- and cold-rolled sheets, and the estimated amount of alloy and stainless must be subtracted from this figure to arrive at the figure listed for carbon steel. No yield loss from hot- and cold-rolled sheets to coated sheets has been allowed.
[21] Production figure as given (Bulletin de la Chambre Syndicale de la Sidérurgie Française).
[22] United Nations shipments figure minus amount for conversion into other steel products less the estimated amount in alloy and stainless.
[23] The production of electrical sheets and strip (207—ECSC) has been placed entirely in the alloy category on the maximum side; on the minimum side, 20 percent has been placed in the carbon category and 80 percent in the alloy category. Electrical sheets and strip are not classified as alloy steel according to French definitions, but U.S. definitions classify almost all of this product as alloy steel.

SOURCE: Sidérurgie (Luxembourg, Statistical Office of the European Communities), 1966-No. 3; Annuaire de statistique industrielle, 1965 (Paris, Bureau Central de Statistique Industrielle); Quarterly Bulletin of Steel Statistics for Europe (New York, United Nations Economic Commission for Europe) vol. XV, No. 4; Bulletin de la Chambre Syndicale de la Sidérurgie Française (Paris, Chambre Syndicale de la Sidérurgie Française), série Rouge, No. 489; and Metal Bulletin, Mar. 18, 1966.

Table B-9. France. Employment Cost for Wage Earners and Salaried Employees, ECSC Industry Definition, Iron and Steel Industry, 1964

(In new francs[1])

Worker category	Cost
Wage earners:[2]	
Wages[3] = Cost per hour (3.77 NF[4]) x total hours worked (286.4 million[5])	1,079,728,000
Total cost[6] = Cost per hour (6.87 NF[4]) x total hours worked (286.4 million[5])	1,967,568,000
Salaried employees:[7]	
Salaries = Cost per month (1,239 NF[8]) x 12 x salaried employment (33,155[9])	492,948,540
Total cost = Cost per month (2,080 NF[10]) x 12 x salaried employment (33,155[9])	827,548,800
Wage earners and salaried employees:	
Wages and salaried	1,572,676,540
Total cost	2,795,116,800

[1] US$1 = 4.9 NF.
[2] Includes workers engaged primarily in manual tasks; excludes nonmanual workers such as foremen under any method of payment.
[3] Pay for time worked, at hourly and piece rates, including premiums for overtime, hazardous work, etc., cost-of-living allowances, and payment for excused absence for attendance at union meetings.
[4] From Salaires CECA.
[5] From Sidérurgie.
[6] Wages ("salaire direct") plus bonuses (including productivity bonuses), holiday and vacation pay, social security payments, payment in kind, and other employment costs.
[7] Includes all nonmanual workers except corporation presidents.
[8] The ECSC (Salaires CECA) figure for monthly monetary remuneration (1,475 NF) includes bonuses and holiday and vacation pay. These items account for approximately 16 percent of the monetary remuneration of wage earners. The same percentage is estimated to apply to salaried employees and has been subtracted from the ECSC figure in order to attain comparability between "wages" and "salaries."
[9] Salaires CECA indicates that 20.3 percent of total employment is salaried. Average annual wage earner employment from Sidérurgie (130,169) divided by 0.797 yields a total employment of 163,324 (or salaried employment of 33,155).
[10] Includes same employment costs as for wage earners. See footnote 6.

SOURCE: Salaires CECA, 1964, Social Statistics series, 1966-No. 2, and Sidérurgie, 1966-No. 3 (Luxembourg, Statistical Office of the European Communities).

Table B-10. France. Estimates of Employment Cost for Wage Earners and Salaried Employees to Manufacture Products Not Included in the ECSC Iron and Steel Industry But Included in the U.S. Industry,[1] 1964

(In new francs[2])

Worker category	Cost
Wage earners:	
Wages	279,500,000
Total cost, if supplementary benefits for wage earners are between 43 and 47 percent of total employment cost:[3]	
Minimum	490,351,000
Maximum	527,358,000
Salaried employees:	
Salaries	140,400,000
Total cost, if supplementary benefits for salaried employees are between 38 and 42 percent of total employment cost:[3]	
Minimum	226,452,000
Maximum	242,069,000
Wage earners and salaried employees:	
Wages and salaries	419,900,000
Total cost:	
Minimum	716,803,000
Maximum	769,427,000

[1] Wire—drawn and wire products; pipe and tubing; wheels and axles; strip—cold rolled; and bars—cold finished.
[2] US$1 = 4.9 NF.
[3] Range based on similar data for the iron and steel industry as defined by the ECSC. See table B—9.

SOURCE: Figures on wages and salaries from the Institut National de la Statistique et des Etudes Economiques.

Table B-11. France. Estimates of Employment Cost for Wage Earners and Salaried Employees, U.S. Industry Definition, Iron and Steel Industry, 1964[1]

(In new francs[2])

Worker category	Cost
Wage earners:	
Wages	1,359,228,000
Total cost:	
Minimum	2,457,919,000
Maximum	2,494,926,000
Salaried employees:	
Salaries	633,348,540
Total cost:	
Minimum	1,054,000,800
Maximum	1,069,617,800
Wage earners and salaried employees:	
Wages and salaries	1,992,576,540
Total cost:	
Minimum	3,511,919,800
Maximum	3,564,543,800

[1] Combining figures from tables B-9 and B-10.
[2] US$1 = 4.9 NF.

Table B-12. France. Estimates of Total Hours Worked, ECSC Industry Definition and U.S. Industry Definition, Iron and Steel Industry, 1964

Industry definition and worker category	Total hours worked
ECSC Industry Definition	
Wage earners	[1] 286,400,000
Salaried employees	[2] 72,941,000
Wage earners and salaried employees	359,341,000
U.S. Industry Definition	
Wage earners	[3] 363,286,000
Salaried employees	[3] 91,901,000
Wage earners and salaried employees	455,187,000

[1] From Sidérurgie.
[2] Based on the estimate that there are 33,155 salaried employees (table B-9) and that they work an average of 2,200 hours a year (derived from data of the United Nations Economic Commission for Europe).
[3] Employment of wage and salary earners related to the production of products excluded from the ECSC definition was 34,948 and 8,618, respectively, in 1964. Based on the estimate that wage earners worked the same number of hours a year as in the ECSC steel industry (2,200) and that salaried employees also worked 2,200 hours a year, hours worked to produce these excluded products were 76,886,000 by wage earners and 18,960,000 by salaried employees. These totals must be added to the ECSC totals to obtain figures based on the U.S. industry definition.

SOURCE: Based on data from Sidérurgie, 1966-No. 3, and Salaires CECA, 1964, Social Statistics series, 1966-No. 2 (Luxembourg, Statistical Office of the European Communities); and the Institut National de la Statistique et des Etudes Economiques.

Table B-13. France. Estimates of Average Hourly Labor Cost for Wage Earners and Salaried Employees, U.S. Industry Definition, Iron and Steel Industry, 1964

Worker category	Employment cost (in new francs[1])[2]	Hours worked[3]	Average hourly labor cost	
			In new francs[1] [4]	In dollars
	(1)	(2)	(3)	(4)
Wage earners:				
Wages	1,359,228,000	363,286,000	3.74	0.76
Total cost:				
Minimum	2,457,919,000	363,286,000	6.77	1.38
Maximum	2,494,926,000	363,286,000	6.87	1.40
Salaried employees:				
Salaries	633,348,540	91,901,000	6.89	1.41
Total cost:				
Minimum	1,054,000,800	91,901,000	11.47	2.34
Maximum	1,069,617,800	91,901,000	11.64	2.38
Wage earners and salaried employees:				
Wages and salaries	1,992,576,540	455,187,000	4.38	.89
Total cost:				
Minimum	3,511,919,800	455,187,000	7.72	1.57
Maximum	3,564,543,800	455,187,000	7.83	1.60

1 US$1 = 4.9 NF.
2 From table B-11.
3 From table B-12.
4 Col. 1 ÷ col. 2.

Table B-14. France. Calculation of Unit Labor Cost for Wage Earners and Salaried Employees, Iron and Steel Industry, 1964

Worker category	Employment cost (in new francs[1])[2]	Weighted output (thousands of metric tons[3])	Unit labor cost			
			Metric tons[3]		Short tons[3]	
			In new francs[1] [4]	In dollars	In new francs[1] [4]	In dollars
	(1)	(2)	(3)	(4)	(5)	(6)
Wage earners:						
Wages:						
Minimum	1,359,228,000	16,676.9	81.50	16.63	73.94	15.09
Maximum	1,359,228,000	15,628.5	86.97	17.75	78.90	16.10
Total cost:						
Minimum	2,457,919,000	16,676.9	147.38	30.08	133.70	27.29
Maximum	2,494,926,000	15,628.5	159.64	32.58	144.83	29.56
Salaried employees:						
Salaries:						
Minimum	633,348,540	16,676.9	37.98	7.75	34.46	7.03
Maximum	633,348,540	15,628.5	40.53	8.27	36.77	7.50
Total cost:						
Minimum	1,054,000,800	16,676.9	63.20	12.90	57.34	11.70
Maximum	1,069,617,800	15,628.5	58.44	13.97	62.09	12.67
Wage earners and salaried employees:						
Wages and salaries:						
Minimum	1,992,576,540	16,676.9	119.48	24.38	108.39	22.12
Maximum	1,992,576,540	15,628.5	127.50	26.02	115.67	23.61
Total cost:						
Minimum	3,511,919,800	16,676.9	210.59	42.98	191.05	38.99
Maximum	3,564,543,800	15,628.5	228.08	46.55	206.91	42.23

1 US$1 = 4.9 NF.
2 From table B-11.
3 1 short ton = 0.9072 metric ton, or 1 metric ton = 1.1023 short tons.
4 Col. 1 ÷ col. 2.

Table B–15. France. Man-Hours per Ton and Output per 1,000 Man-Hours, Iron and Steel Industry, 1964

Worker category	Calculation of man-hours per ton			
	Hours worked [1]	Weighted output (thousands of metric tons [2])	Man-hours per ton	
			Metric ton [2] [3]	Short ton [2]
	(1)	(2)	(3)	(4)
Wage earners:				
Minimum	363,286,000	16,676.9	21.78	19.76
Maximum	363,286,000	15,628.5	23.24	21.08
Salaried employees:				
Minimum	91,901,000	16,676.9	5.51	5.00
Maximum	91,901,000	15,628.5	5.88	5.33
Wage earners and salaried employees:				
Minimum	455,187,000	16,676.9	27.29	24.76
Maximum	455,187,000	15,628.5	29.13	26.43
	Calculation of output per 1,000 man-hours			
	Weighted output (thousands of metric tons [2])	Hours worked [1]	Output per 1,000 man-hours	
			Metric tons [2] [3]	Short tons [2]
	(1)	(2)	(3)	(4)
Wage earners:				
Minimum	15,628.5	363,286.0	43.02	47.42
Maximum	16,676.9	363,286.0	45.91	50.61
Salaried employees:				
Minimum	15,628.5	91,901.0	170.06	187.46
Maximum	16,676.9	91,901.0	181.47	200.03
Wage earners and salaried employees:				
Minimum	15,628.5	455,187.0	34.33	37.85
Maximum	16,676.9	455,187.0	36.64	40.39

[1] From table B–12.
[2] 1 short ton = 0.9072 metric ton, or 1 metric ton = 1.1023 short tons.
[3] Col. 1 ÷ col. 2.

Table B-16. Germany (Federal Republic). Estimate of Minimum and Maximum Weighted Output, Iron and Steel Industry, U.S. Industry Definition,[1] 1964

(In thousands of metric tons)

Product category	Minimum			Maximum		
	Production distribution emphazing low-weight products	Weight	Weighted output	Production distribution emphazing high-weight products	Weight	Weighted output
All product categories	30,555		27,783.27	30,555		31,797.03
Coke	([2])	0.06	-	([2])	0.06	-
Pig iron and ferroalloys	[3]2,208	.13	287.05	[3]2,208	.13	287.05
Ingots and steel for castings:						
Carbon	[4]1,014	.20	202.08	[4]664	.20	132.80
Alloy	[4 5]290	.27	78.30	[4 5]90	.27	24.30
Stainless	[4 5]34	.45	15.30	[4 5]34	.45	15.30
Blooms, slabs, billets, tube rounds, skelp, etc:						
Carbon	[4]1,639	.57	934.23	[4]2,240	.57	1,276.80
Alloy	[4 5]482	1.09	525.38	[4 5]528	1.09	575.52
Stainless	[4 5]97	2.15	208.55	([4 5])	2.15	-
Wire rods:						
Carbon	[6]815	.80	625.00	[6]815	.80	625.00
Alloy	[5 6]41	1.67	68.47	[5 6]41	1.67	68.47
Stainless	([5 6])	6.06	-	([5 6])	6.06	-
Structural shapes (heavy) and steel piling:						
Carbon	[7]2,022	.71	1,435.62	[7]2,187	.71	1,552.77
Alloy	[5]165	1.49	245.85	([5])	1.49	-
Stainless	-	5.85	-	-	5.85	-
Plates:						
Carbon	[8]3,617	.67	2,423.39	[8]3,617	.67	2,423.39
Alloy	[5]58	1.43	82.94	[5]56	1.43	80.08
Stainless	([5])	5.60	-	[5]2	5.60	11.20
Rails, standard and all other:						
Carbon	[9]466	.70	326.20	[9]466	.70	326.20
Alloy	-	1.56	-	-	1.56	-
Joint bars, tie plates, and track spikes:						
Carbon	[10]50	1.46	73.00	[10]50	1.46	73.00
Wheels and axles:						
Carbon	([11])	1.90	-	([11])	1.90	-
Alloy	-	2.90	-	-	2.90	-
Bars—hot rolled (including light shapes):						
Carbon	[12]3,299	.94	3,101.06	[12]2,983	.94	2,804.02
Alloy	[5]297	1.47	436.59	[5]456	1.47	670.32
Stainless	[5]3	7.18	21.54	[5]10	7.18	71.80
Bars—reinforcing:						
Carbon	[13]1,636	.68	1,112.48	[13]1,636	.68	1,112.48
Alloy	-	1.44	-	-	1.44	-
Bars—cold finished:						
Carbon	[13]638	1.44	918.72	[13]538	1.44	774.72
Alloy	([5])	2.43	-	[5]60	2.43	145.80
Stainless	([5])	10.27	-	[5]40	10.27	410.80
Bars—tool steel:						
Carbon	([14])	5.81	-	([14])	5.81	-
Alloy	([5])	10.45	-	[5]150	10.45	1,567.50
Standard pipe:						
Carbon	[15]1,150	1.26	1,449.00	[15]517	1.26	651.42
Alloy	([5])	1.73	-	([5])	1.73	-
Stainless	([5])	8.13	-	([5])	8.13	-
Oil-country goods:						
Carbon	[15]300	1.53	459.00	[15]780	1.53	1,193.40
Alloy	([5])	2.12	-	[5]10	2.12	21.20
Line pipe:						
Carbon	[15]1,149	1.12	1,286.88	[15]517	1.12	579.04
Alloy	([5])	1.72	-	([5])	1.72	-
Mechanical tubing:						
Carbon	[15]124	2.31	286.44	[15]643	2.31	1,485.33
Alloy	([5])	3.46	-	[5]11	3.46	38.06
Stainless	([5])	18.33	-	([5])	18.33	([5])
Pressure tubing:						
Carbon	([15])	3.17	-	[15]237	3.17	751.29
Alloy	([5])	5.18	-	[5]3	5.18	15.54
Stainless	([5])	18.93	-	[5]5	18.93	94.65
Wire—drawn:						
Carbon	[16]205	1.75	358.75	[16]210	1.75	367.50
Alloy	[5]105	2.88	302.40	[5]55	2.88	158.40
Stainless	[5]25	10.54	263.50	[5]70	10.54	737.80

See footnotes at end of table.

Table B-16. Germany (Federal Republic). Estimate of Minimum and Maximum Weighted Output, Iron and Steel Industry, U.S. Industry Definition,[1] 1964—Continued

(In thousands of metric tons)

Product category	Minimum			Maximum		
	Production distribution emphazing low-weight products	Weight	Weighted output	Production distribution emphazing high-weight products	Weight	Weighted output
Wire products:						
Carbon	[17] 1,285	2.22	2,852.70	[17] 1,280	2.22	2,841.60
Stainless	([5])	10.80		[5] 5	10.80	54.00
Black plate:						
Carbon	[3] 50	.94	47.00	[3] 50	.94	47.00
Tin and terne plate—hot dipped:						
Carbon	[18] 133	1.47	195.51	[18] 133	1.47	195.51
Tin plate—electrolytic:						
Carbon	[18] 396	1.08	427.68	[18] 396	1.08	427.68
Sheets—hot rolled:						
Carbon	[19] 1,719	.59	1,014.21	[19] 1,142	.59	673.78
Alloy	[5] 75	1.14	85.50	[5] 31	1.14	35.34
Stainless	([5])	1.78		[5] 9	1.78	16.02
Sheets—cold rolled:						
Carbon	[19] 2,266	.73	1,654.18	[19] 2,843	.73	2,075.39
Alloy	([5])	1.30		[5] 6	1.30	7.80
Stainless	[5] 6	6.76	40.56	[5] 35	6.76	236.60
Sheets—galvanized:						
Carbon	[20] 301	.94	282.94	[20] 301	.94	282.94
Alloy	-	1.61		-	1.61	-
Strip—hot rolled:						
Carbon	[21] 899	1.01	907.99	[21] 928	1.01	937.28
Alloy	29	1.30	37.70	-	1.30	-
Stainless	-	3.52		-	3.52	-
Strip—cold rolled:						
Carbon	[7] 1,127	1.74	1,960.98	[7] 1,127	1.74	1,960.98
Alloy	([5])	12.74	-	[5] 18	12.74	229.32
Stainless	[5] 29	5.85	169.65	[5] 11	5.85	64.35
Sheets—all other coated:						
Carbon	[20] 45	1.01	45.45	[20] 45	1.01	45.45
Electrical sheets and strip:						
Carbon	[22] 53	1.76	93.28	([22])	1.76	-
Alloy	[22] 213	1.94	413.22	[22] 266	1.94	516.04

[1] Excluding wheels and axles, because the labor cost data used do not cover this category. Since there is double counting in both German and ECSC production statistics when all products of the U.S. industry definition are included, United Nations shipments data, minus shipments for conversion into other steel products, have been substituted for production figures in certain cases, e.g., ingots and semis, wire rod, and hot-rolled strip. In other cases, the production figure for a final production (e.g., coated sheets, cold-finished bars) has been subtracted from the production figure for the product from which it derives, as noted in the footnotes relating to individual products.

[2] All coke produced by the steel industry is assumed to be consumed by the industry, since consumption totaled 21,178 thousand metric tons (hereafter referred to as MMT) and industry production 5,955 MMT.

[3] Production of pig iron and ferroalloys (27,182 MMT) minus consumption (24,974 MMT) in steelmaking processes.

[4] The ECSC figure for the production of steel for castings is 638 MMT (including the production of independent foundries), of which 124 MMT (excluding the production of independent foundries) are alloy. United Nations data (Quarterly Bulletin of Steel Statistics for Europe, vol. XV, No. 4) list shipments of ingots and semis, excluding shipments for conversion into other steel products, totaling 2,918 MMT. The total of steel for castings and shipments of ingots and semis is then 3,556 MMT. On the minimum output side, 1,338 MMT are assumed to be ingots and 2,218 MMT, semis; on the maximum side, 788 are assumed to be ingots and 2,768, semis.

[5] The distribution of alloy steel, including stainless, among end products has been made on the basis of the following data:

Product category	Production (thousands of metric tons)
Special crude steels:	
Special carbon ingots	697.2
Alloy ingots	2,225.8
Alloy steel for castings	124.0
Stainless steel:	
Ingots	267.2
Steel for casting	33.9

SOURCE: For special crude steels, from Sidérurgie (ECSC); and for stainless steel, from Metal Bulletin, February 26, 1965.

Relevant United Nations shipments data for special steels (alloy and special carbon) are presented in col. 1 of the following tabulation. If the average yield of special carbon steel from ingots to end products is estimated at 0.72, there are approximately 502 MMT of special carbon steels included in United Nations shipments figures. On the minimum output side, it has been assumed that this amount is divided equally among the categories "other ingots and semis" and "sections, hot-rolled (including bars)," leaving shipments figures, excluding special carbon steels, as shown in col. 2. On the maximum side, it has been assumed that this amount is all in the category "other ingots and semis," leaving shipments figures as shown in col. 3.

Table B-16. Footnotes—Continued

Product category	Shipments of special steels (thousands of metric tons) (1)	Estimated shipments of alloy steel, including stainless (thousands of metric tons): Minimum output (2)	Maximum output (3)
Total	2,118	1,616	1,616
Solids for seamless tubes	-	-	-
Other ingots and semis	1,030	779	528
Sections, hot rolled (including bars)	716	465	716
Wire rods	175	175	175
Strip—hot rolled	58	58	58
Plates (3 mm. or more)	58	58	58
Sheets (less than 3 mm.)	81	81	81

From the above data, two distributions of alloy steel, including stainless, have been made; the first emphasizes low-weight products and the second, high-weight products, as follows:

Product category	Minimum output (thousands of metric tons)	Maximum output
Total	1,736	1,736
Ingots and steel for castings	a/324	a/124
Bloom, slabs, billets, tube, rounds, skelp, etc	a/579	a/528
Wire rods	b/41	b/41
Wire—drawn	b/130	b/125
Wire products	(b/)	b/5
Structural shapes (heavy) and steel piling	c/165	(c/)
Bars—hot rolled (including light shapes)	c/300	c/466
Bars—cold finished	(c/)	c/100

Product category—Continued	Minimum output (thousands of metric tons)	Maximum output
Bars—tool steel	(c/)	c/150
Plates	58	58
Sheets—hot rolled	75	40
Sheets—cold rolled	6	41
Strip—hot rolled	d/29	(d/)
Strip—cold rolled	d/29	d/29
Pipe and tubing	(d/)	d/29
Standard pipe	-	-
Oil-country goods	-	10
Line pipe	-	-
Mechanical tubing	-	11
Pressure tubing	-	8

a/ Alloy crude steel for castings (124) has been placed in the "ingots and steel for castings" category on both sides. Shipments of "other ingots and semis" from cols. 2 and 3 in the previous tabulation have been distributed among the ingots and semis categories to emphasize low-weight products on the minimum side and high-weight products on the maximum side.

b/ 41 MMT of wire rods were exported (ECSC data). If the remainder of wire rods were used to make wire and wire products, output of these products was approximately 130 MMT (allowing for a yield loss of 3 percent).

c/ Based on data for hot-rolled sections in cols. 2 and 3 above.

d/ Based on United Nations shipments data for hot-rolled strip. No allowance has been made for yield loss from hot-rolled strip to cold-rolled strip and pipe and tubing.

Stainless steel in end products, excluding stainless steel for castings, is assumed to total 160 MMT on the minimum side (267 times an average yield from crude steel of 0.60) and 187 MMT (267 x 0.70) on the maximum side. Stainless steel for castings has been placed in the "ingots and steel for castings" category and is assumed to be shipped out of the industry in that form. Within this framework, distributions have been made to emphasize low-weight products on the minimum side and high-weight products on the maximum side, as follows:

Product category	Minimum output (thousands of metric tons)	Maximum output
Total	194	221
Ingots and steel castings	34	34
Blooms, slabs, billets, tube rounds, skelp, etc	97	-
Wire rods	-	-
Wire—drawn	25	70
Wire products	-	5
Structural shapes (heavy) and steel piling		-
Bars—hot rolled (including light shapes)	3	10
Bars—cold finished	-	40

Product category—Continued	Minimum output (thousands of metric tons)	Maximum output
Bars—tool steel	-	-
Plates	-	2
Sheets—hot rolled	-	9
Sheets—cold rolled	6	35
Strip—hot rolled	-	-
Strip—cold rolled	29	11
Pipe and tubing	-	5
Standard pipe	-	-
Oil-country goods	-	-
Line pipe		-
Mechanical tubing	-	-
Pressure tubing	-	5

[6] United Nations shipments figure minus shipments for conversion into other steel products.

[7] Production figure as given (ECSC) minus estimated amount in alloy.

[8] Production figure as given (ECSC) for large plates plus plates over 4.75 mm. minus estimated amount in alloy and amount used to make welded pipe and tubing, 246 MMT (United Nations figure for shipments of plates and sheets 3 mm. and over to make pipe and tubing).

[9] Production figure as given (ECSC) for railway material minus amount in joint bars and tie plates (figure provided by the ECSC).

[10] Figure as provided by the ECSC. Includes joint bars and tie plates.

[11] Wheels and axles are included in the forgings industry and are not covered by labor cost data used for this study. Thus, production (175 MMT) has not been included.

[12] Production figure as given (ECSC) minus estimated amount in alloy and tool steel and estimated amount used to produce cold-finished bars (production figure, 638, times 1.10).

[13] Production figure as given (ECSC).

Table B-16. Footnotes—Continued

[14] Production figures for tool steel are not given in ECSC statistics or in German statistics. On the minimum side, no tool steel has been allowed (in bars), but 150 MMT (all alloy) have been allowed for on the maximum side.

[15] The ECSC production figure for pipe and tubing (all qualities) is 2,723 MMT, of which 1,510 MMT are seamless and 1,213 MMT are welded. The total has been distributed among the various U.S. functional categories emphasizing low-weight categories on the minimum side and high-weight categories on the maximum side, as follows:

Pipe and tubing	Minimum output (thousands of metric tons)	Maximum output (thousands of metric tons)
Standard pipe	1,150	517
Oil-country goods	300	790
Line pipe	1,149	517
Mechanical tubing	124	654
Pressure tubing	-	245

Where some alloy steel has been assumed, the alloy figure has been subtracted from the appropriate figure for all qualities as shown above.

[16] Production figure for drawn wire (Industrie und Handwerk, Reihe 3) minus production of wire products and estimated amount in alloy.

[17] Production figure as given (Industrie und Handwerk, Reihe 3).

[18] The ECSC production figure for tin and terne plate is 529 MMT. The relative distribution between the hot-dip and electrolytic processes has been estimated to be the same as the 1965 distribution, which was provided by the ECSC.

[19] The ECSC production figure for sheets 4.75 mm. or less plus coils, which have been added to hot-rolled sheets, minus the estimated amounts used to produce coated products, electrical sheets and strip, and cold-rolled strip. This avoids double counting. Relevant production figures are as follows:

Product category	Production (thousands of metric tons)
Sheets—hot rolled ≥4.75 mm	2,066
Sheets—cold rolled ≤4.75 mm	3,463
Tin and terne plate	529
Black plate	50
Galvanized sheets	301
Other coated sheets	45
Electrical sheets and strip	266

Coated and electrical sheets and strips are assumed to derive from hot- and cold-rolled sheets as follows:

Product category	Minimum output (thousands of metric tons)		Maximum output (thousands of metric tons)	
	Cold-rolled sheets	Hot-rolled sheets	Cold-rolled sheets	Hot-rolled sheets
Total	1,191	-	579	612
Black plate	50	-	50	-
Tin and terne plate	529	-	529	-
Galvanized sheets	301		-	301
Other coated sheets	45	-	-	45
Electrical sheets and strip	266	-	-	266

United Nations shipments data indicate that 426 MMT of plates and sheets 3 mm. and over were used to make pipe and tubing and 272 MMT to make cold-rolled strip. It has been assumed that plates were used to make pipe and tubing, and hot-rolled sheets to make cold-rolled strip.

These totals must be subtracted from the total production figures for hot- and cold-rolled sheets, and the estimated amount of alloy and stainless must be subtracted from this figure to arrive at the figures listed for carbon steel. No yield loss from hot- and cold-rolled sheets to coated sheets has been allowed.

[20] Figure as given (Statistisches Bundesamt).

[21] United Nations shipments figure minus amount for conversion into other steel products less the estimated amount in alloy and stainless.

[22] The production of electrical sheets and strip (266—ECSC) has been placed entirely in the alloy category on the maximum side; on the minimum side, 20 percent has been placed in the carbon category and 80 percent in the alloy category. Electrical sheets and strip are not classified as alloy steel according to German definitions, but U.S. definitions classify almost all of this product as alloy steel.

SOURCE: Sidérurgie (Luxembourg, Statistical Office of the European Communities), 1966-No. 3; Quarterly Bulletin of Steel Statistics for Europe (New York, U.N. Economic Commission for Europe), vol. XV, No. 4; Eisen und Stahl, 4. Vierteljahresheft 1965 (Dusseldorf, Statistisches Bundesamt, Aussenstelle Dusseldorf); Metal Bulletin, February 26, 1965; and Industrie und Handwerk, Reihe 3, 1965 (Wiesbaden, Statistisches Bundesamt).

Table B-17. Germany (Federal Republic). Estimates of Employment Cost for Wage Earners and Salaried Employees, U.S. Industry Definition,[1] Iron and Steel Industry, 1964

(Cost figures in deutsche marks [2])

Worker category	Minimum estimate	Maximum estimate
Wage earners:		
Employment [3]	297,990	297,990
Hours worked per year [4]	1,950	1,990
Total hours worked [5]	581,080,500	593,000,100
Labor cost per hour:		
Wage [6]	4.30	4.58
Total cost [7]	6.32	6.73
Wages, total	2,498,646,150	2,715,940,458
Total labor cost	3,672,428,760	3,990,890,673
Salaried employees:		
Employment [8]	62,611	62,611
Labor cost per month:		
Salary [9]	999	1,069
Total labor cost [10]	1,419	1,518
Salaries, total [11]	750,580,668	803,173,908
Total labor cost [11]	1,066,140,108	1,140,521,976
Wage earners and salaried employees:		
Wages and salaries	3,249,226,818	3,519,114,366
Total labor cost	4,738,568,868	5,131,412,649

1 But excluding wheels and axles.

2 US$1 = 3.977 DM.

3 Based on data in Industrie und Handwerk, Reihe 1, pertaining to employees producing iron and steel products only (i.e., the data in this series which are on a "beteiligten" basis). The source gives average yearly wage earner employment, including apprentices, of 240,186 for "blast furnaces, steel mills, and hot rolling mills" (Standard Industrial Classification—Systematisches Warenverzeichis für die Industriestatistik 1963—number 2710) and 66,262 for "drawing and cold rolling mills" (number 3010).

According to data in the Statistisches Jahrbuch der Eisen- und Stahlindustrie für 1965, approximately 2.76 percent (average of December 1963 and December 1964 figures) of wage earners in the iron and steel industry, including forgings and locally connected establishments, were apprentices.

Total wage earner employment is then estimated to be 240,186 plus 66,262 minus the estimated number of apprentices.

4 Based on data in Industrie und Handwerk, Reihe 1, pertaining to all employees in establishments primarily engaged in the production of iron and steel products (i.e., the data in this series which are on a "hauptbeteiligten" basis), and data on employment and hours worked from Sidérurgie, pertaining to the ECSC portion of the steel industry. The former source indicated average yearly hours worked by wage earners, including apprentices, in "blast furnaces, steel mills, and hot rolling mills" and in "drawing and cold rolling mills" of 1,971 and 2,010, respectively. Sidérurgie indicates average yearly hours worked by wage earners, excluding apprentices, to be 1,964.

5 Employment times estimated hours worked per year.

6 Includes pay for time worked, at hourly and piece rates, including premiums for overtime, hazardous work, etc., cost-of-living allowances, and payment for excused absence for attendance at union meetings. The maximum estimate is the ECSC (Salaires CECA) figure for direct wages, pertaining to the ECSC portion of the industry. Industrie und Handwerk, Reihe 1, indicates that gross earnings (including bonuses) of wage earners in "drawing and cold rolling mills" were approximately 14 percent less than those in "blast furnaces, steel mills, and hot rolling mills." Thus, it is assumed that the average figure for the total industry must be somewhat less than the ECSC figure.

7 Includes wages plus bonuses (including productivity bonuses), holiday and vacation pay, social security payments, payment in kind, and other employment costs. The maximum estimate is the ECSC figure for total cost, pertaining to the ECSC portion of the industry. The minimum estimate is assumed to be lower than this figure to the same extent that the minimum wage figure is lower than the maximum wage figure, as explained in footnote 6.

8 Based on data in Industrie und Handwerk, Reihe 1, which indicate salaried employment, including apprentices, in "blast furnaces, steel mills, and hot rolling mills" and "drawing and cold rolling mills" of 50,934 and 14,972, respectively. (The data are comparable to that used for wage earners, footnote 3.)

According to data in the Statistisches Jahrbuch der Eisen- und Stahlindustrie fur 1965, approximately 5 percent (average of December 1963 and December 1964 figures) of salaried employees in the iron and steel industries, including forgings and locally connected establishments, were apprentices.

Total salaried employment is then estimated to be 50,934 plus 14,972 minus the estimated number of apprentices (5 percent).

9 The maximum estimate is the ECSC (Salaries CECA) figure for monthly monetary remuneration (1,249 DM) pertaining to the ECSC portion of the industry minus the estimated portion of this figure which related to bonuses and holiday and vacation pay, which is not included in "wages." These items have been estimated to account for the same percentage of monetary remuneration of salaried employees as of wage earners (14.4 percent). Industrie und Handwerk, Reihe 1, indicates that gross earnings (including bonuses) of salaried employees in "drawing and cold rolling mills" were approximately 14.5 percent less than those in "blast furnaces, steel mills, and hot rolling mills." Thus, as in the case of wages (footnote 6), it is assumed that the average figure for the total industry must be somewhat less than the ECSC figure.

10 The maximum estimate is the ECSC figure for total cost, pertaining to the ECSC portion of the industry. The minimum estimate is assumed to be lower than this figure to the same extent that the minimum salary figure is lower than the maximum salary figure.

11 Monthly cost x 12 x employment.

SOURCE: Based on data in Salaires CECA, 1964, Social Statistics series, 1966-No. 2, and Sidérurgie, 1966-No. 3 (Luxembourg, Statistical Office of the European Communities); and Industrie und Handwerk, Reihe 1, 1965 (Wiesbaden, Statistisches Bundesamt).

Table B-18. Germany (Federal Republic). Estimates of Total Hours Worked, U.S. Industry Definition,[1] Iron and Steel Industry, 1964

Worker category	Total hours worked
Wage earners:	
Minimum[2]	581,080,500
Maximum[2]	593,000,100
Salaried employees:	
Minimum[3]	122,091,450
Maximum[3]	124,595,890
Wage earners and salaried employees:	
Minimum	703,171,950
Maximum	717,595,990

[1] But excluding wheels and axles.
[2] From table B-17.
[3] Using employment figures from table B-17 and the estimate that salaried employees work the same number of hours per year as wage earners.

Table B-19. Germany (Federal Republic). Estimates of Average Hourly Labor Cost for Wage Earners and Salaried Employees, U.S. Industry Definition,[1] Iron and Steel Industry, 1964

Worker category	Employment cost (in deutsche marks[2])[3]	Hours worked[4]	Average hourly labor cost	
			In deutsche marks[2 5]	In dollars
	(1)	(2)	(3)	(4)
Wage earners:				
Wages:				
Minimum	2,498,646,150	581,080,500	4.30	1.08
Maximum	2,715,940,458	593,000,100	4.58	1.15
Total cost:				
Minimum	3,672,428,760	581,080,500	6.32	1.59
Maximum	3,990,890,673	593,000,100	6.73	1.69
Salaried employees:				
Salaries:				
Minimum	750,580,668	122,091,450	6.15	1.55
Maximum	803,173,908	124,595,890	6.45	1.62
Total cost:				
Minimum	1,066,140,108	122,091,450	8.73	2.20
Maximum	1,140,521,976	124,595,890	9.15	2.30
Wage earners and salaried employees:				
Wages and salaries:				
Minimum	3,249,226,818	703,171,950	4.62	1.16
Maximum	3,519,114,366	717,595,990	4.90	1.23
Total cost:				
Minimum	4,738,568,868	703,171,950	6.74	1.69
Maximum	5,131,412,649	717,595,990	7.15	1.80

[1] But excluding wheels and axles.
[2] US$1 = 3.977 DM.
[3] From table B-17.
[4] From table B-18.
[5] Col. 1 ÷ col. 2.

Table B–20. Germany (Federal Republic). Calculation of Unit Labor Cost for Wage Earners and Salaried Employees, U.S. Industry Definition,[1] Iron and Steel Industry, 1964

Worker category	Employment cost (in deutsche marks[2])[3]	Weighted output (thousands of metric tons[4])	Unit labor cost per ton			
			Metric tons[4 5]		Short tons[4]	
			In deutsche marks[2]	In dollars[2]	In deutsche marks[2]	In dollars[2]
	(1)	(2)	(3)	(4)	(5)	(6)
Wage earners:						
Wages:						
Minimum	2,498,646,150	31,797.0	78.58	19.76	71.29	17.93
Maximum	2,715,940,458	27,783.3	97.75	24.58	88.68	22.30
Total cost:						
Minimum	3,672,428,760	31,797.0	115.50	29.04	104.78	26.35
Maximum	3,990,890,673	27,783.3	143.64	36.12	130.31	32.77
Salaried employees:						
Salaries:						
Minimum	750,580,668	31,797.0	23.61	5.94	21.41	5.38
Maximum	803,173,908	27,783.3	28.91	7.27	26.22	6.59
Total cost:						
Minimum	1,066,140,108	31,797.0	33.53	8.43	30.42	7.65
Maximum	1,140,521,976	27,783.3	41.05	10.32	37.24	9.36
Wage earners and salaried employees:						
Wages and salaries:						
Minimum	3,249,226,818	31,797.0	102.19	25.69	92.70	23.31
Maximum	3,519,114,366	27,783.3	126.66	31.85	114.91	28.89
Total cost:						
Minimum	4,738,568,868	31,797.0	149.03	37.47	135.20	33.99
Maximum	5,131,412,649	27,783.3	184.69	46.44	167.55	42.13

[1] But excluding wheels and axles.
[2] US$1 = 3.977 DM.
[3] From table B–17.
[4] 1 short ton = 0.9072 metric tons, or 1 metric ton = 1.1023 short tons.
[5] Col. 1 ÷ col. 2.

Table B-21. Germany (Federal Republic). Estimates of Man-Hours per Ton and Output per 1,000 Man-Hours, U.S. Industry Definition,[1] Iron and Steel Industry, 1964

Worker category	Calculation of man-hours per ton			
	Hours worked[2]	Weighted output (thousands of metric tons[3])	Man-hours per ton	
			Metric ton[3 4]	Short ton[3]
	(1)	(2)	(3)	(4)
Wage earners:				
Minimum	581,080,500	31,797.0	18.27	16.58
Maximum	593,000,100	27,783.3	21.34	19.36
Salaried employees:				
Minimum	122,091,450	31,797.0	3.84	3.48
Maximum	124,595,890	27,783.3	4.48	4.07
Wage earners and salaried employees:				
Minimum	703,171,950	31,797.0	22.11	20.06
Maximum	717,595,990	27,783.3	25.83	23.43
	Calculation of output per 1,000 man-hours			
	Weighted output (thousands of metric tons[3])	Hours worked[2]	Output per 1,000 man-hours	
			Metric tons[3 4]	Short tons[3]
	(1)	(2)	(3)	(4)
Wage earners:				
Minimum	27,783.3	593,000.1	46.85	51.65
Maximum	31,797.0	581,080.5	54.72	60.32
Salaried employees:				
Minimum	27,783.3	124,595.9	222.99	245.80
Maximum	31,797.0	122,091.5	260.44	287.08
Wage earners and salaried employees:				
Minimum	27,783.3	717,596.0	38.72	42.68
Maximum	31,797.0	703,172.0	45.22	49.85

[1] But excluding wheels and axles.
[2] From table B-18.
[3] 1 short ton = 0.9072 metric ton, or 1 metric ton = 1.1023 short tons.
[4] Col. 1 ÷ col. 2.

Table B-22. United Kingdom. Estimate of Minimum and Maximum Weighted Output, Iron and Steel Industry, U.S. Industry Definition,[1] 1964[2]

(In thousands of British standard tons[3])

Product category	Minimum: Production distribution emphazing low-weight products	Minimum: Weight	Minimum: Weighted output	Maximum: Production distribution emphazing high-weight products	Maximum: Weight	Maximum: Weighted output
All product categories	20,950.1		18,632.0	20,950.1		19,699.8
Coke	(4)	0.06	-	(4)	0.06	-
Pig iron and ferroalloys	[5] 1,824.1	.13	237.1	[5] 1,824.1	.13	237.1
Ingots and steel for castings:						
Carbon	[6] 1.5	.20	.3	[6] 1.5	.20	.3
Alloy	[6] .6	.27	.2	[6] .6	.27	.2
Stainless	-	.45	-	-	.45	-
Blooms, slabs, billets, tube rounds, skelp, etc:						
Carbon	[7] 552.2	.57	314.8	[7] 552.2	.57	314.8
Alloy	[7] 521.6	1.09	568.5	[7] 521.6	1.09	568.5
Stainless	[7] 11.9	2.15	25.6	[7] 11.9	2.15	25.6
Wire rods:						
Carbon	[8] 1,504.7	.80	1,203.8	[8] 1,504.7	.80	1,203.8
Alloy	[8] 33.1	1.67	55.3	[8] 33.1	1.67	55.3
Stainless	[8] 4.6	6.06	27.9	[8] 4.6	6.06	27.9
Structural shapes (heavy) and steel piling:						
Carbon	[9] 2,135.6	.71	1,516.3	[9] 2,135.6	.71	1,516.3
Alloy	[10] 48.7	1.49	72.6	(10)	1.49	-
Stainless	-	5.85	-	-	5.85	-
Plates:						
Carbon	[11] 3,191.6	.67	2,138.4	[11] 3,191.6	.67	2,138.4
Alloy	[12] 31.2	1.43	44.6	[12] 31.2	1.43	44.6
Stainless	[12] 19.3	5.60	108.1	[12] 19.3	5.60	108.1
Rails, standard and all other:						
Carbon	[13] 317.8	.70	222.5	[13] 317.8	.70	222.5
Alloy	-	1.56	-	-	1.56	-
Joint bars, tie plates, and track spikes:						
Carbon	[14] 18.1	1.46	26.4	[14] 18.1	1.46	26.4
Wheels and axles:						
Carbon	[15] 59.2	1.90	112.5	[15] 59.2	1.90	112.5
Alloy	[15] 4.7	2.90	13.6	[15] 4.7	2.90	13.6
Bars—hot rolled (including light shapes):						
Carbon	[16] 1,941.0	.94	1,824.5	[16] 1,941.0	.94	1,824.5
Alloy	[16] 195.0	1.47	286.7	[16] 243.7	1.47	358.2
Stainless	[16] 26.0	7.18	186.7	[16] 26.0	7.18	186.7
Bars—reinforcing:						
Carbon	[17] 617.9	.68	420.2	[17] 617.9	.68	420.2
Alloy	-	1.44	-	-	1.44	-
Bars—cold finished:						
Carbon	[17] 552.9	1.44	796.2	[17] 552.9	1.44	796.2
Alloy	[17] 71.8	2.43	174.5	[17] 71.8	2.43	174.5
Stainless	[17] 4.8	10.27	49.3	[17] 4.8	10.27	49.3
Bars—tool steel:						
Carbon	[18] 10.4	5.81	60.4	[18] 10.4	5.81	60.4
Alloy	[18] 33.1	10.45	345.9	[18] 33.1	10.45	345.9
Standard pipe:						
Carbon	[19] 619.8	1.26	780.9	[19] 247.9	1.26	312.4
Alloy	(19)	1.73	-	(19)	1.73	-
Stainless	(19)	8.13	-	(19)	8.13	-
Oil-country goods:						
Carbon	(19)	1.53	-	[19] 371.9	1.53	569.0
Alloy	(19)	2.12	-	[19] 22.1	2.12	46.9
Line pipe:						
Carbon	[19] 619.8	1.12	694.2	[19] 247.9	1.12	277.6
Alloy	[19] 120.6	1.72	207.4	[19] 22.1	1.72	38.0
Mechanical tubing:						
Carbon	[19] 69.3	2.31	160.1	[19] 317.2	2.31	732.7
Alloy	(19)	3.46	-	[19] 55.3	3.46	191.3
Stainless	(19)	18.33	-	(19)	18.33	-
Pressure tubing:						
Carbon	(19)	3.17	-	[19] 124.0	3.17	393.1
Alloy	(19)	5.18	-	[19] 11.1	5.18	57.5
Stainless	(19)	18.93	-	[19] 10.0	18.93	189.3
Wire—drawn:						
Carbon	(20)	1.75	-	(20)	1.75	-
Alloy	(20)	2.88	-	(20)	2.88	-
Stainless	(20)	10.54	-	(20)	10.54	-

See footnotes at end of table.

Table B-22. United Kingdom. Estimate of Minimum and Maximum Weighted Output, Iron and Steel Industry, U.S. Industry Definition,[1] 1964[2]—Continued

(In thousands of British standard tons[3])

Product category	Minimum			Maximum		
	Production distribution emphazing low-weight products	Weight	Weighted output	Production distribution emphazing high-weight products	Weight	Weighted output
Wire products:						
Carbon	([20])	2.22	-	([20])	2.22	
Stainless	([20])	10.80	-	([20])	10.80	-
Black plate:						
Carbon	[17] 30.8	.94	29.0	[17] 30.8	.94	29.0
Tin and terne plate—hot dipped:						
Carbon	[17] 231.1	1.47	339.7	[17] 231.1	1.47	339.7
Tin plate—electrolytic:						
Carbon	[17] 922.7	1.08	996.5	[17] 922.7	1.08	996.5
Sheets—hot rolled:						
Carbon	[21] 429.4	.59	253.3	[21] 429.4	.59	253.3
Alloy	[22] 2.2	1.14	2.5	[22] 2.2	1.14	2.5
Stainless	[23] 19.2	1.78	34.2	([23])	1.78	-
Sheets—cold rolled:						
Carbon	[24] 2,350.1	.73	1,715.6	[24] 2,350.1	.73	1,715.6
Alloy	[25] 2.0	1.30	2.6	[25] 2.0	1.30	2.6
Stainless	[23] 19.3	6.76	130.5	[23] 38.5	6.76	260.3
Sheets—galvanized:						
Carbon	[17] 311.1	.94	292.4	[17] 311.1	.94	292.4
Alloy	-	1.61	-	-	1.61	-
Strip—hot rolled:						
Carbon	[26] 520.2	1.01	525.4	[26] 520.2	1.01	525.4
Alloy	[27] 2.5	1.30	3.3	[27] 2.5	1.30	3.3
Stainless	([28])	3.52	-	([28])	3.52	-
Strip—cold rolled:						
Carbon	[26] 529.5	1.74	921.3	[26] 529.5	1.74	921.3
Alloy	[29] 1.7	12.74	21.7	[29] 1.7	12.74	21.7
Stainless	[30] 14.1	5.85	82.5	[30] 14.1	5.85	82.5
Sheets—all other coated:						
Carbon	[17] 176.8	1.01	176.8	[17] 178.6	1.01	178.6
Electrical sheets and strip:						
Carbon	[31] 44.9	1.76	79.0	([31])	1.76	-
Alloy	[31] 179.6	1.94	348.4	[31] 224.5	1.94	435.5

[1] The following processes, included in the U.K. industry definition but not included in the U.S. definition, have been excluded from the U.K. data for the purposes of this study: Iron ore mines and quarries, forges and ancillary processes (other than drop forges), steel foundries and ancillary processes (including melting for manufacture of steel castings), and wrought iron manufacture. Wire and wire products are excluded from the U.K. definition but are included in the U.S. definition. These 2 categories, however, have not been added to the U.K. definition, since the necessary data are not available.

[2] 53 weeks.

[3] 1 British standard ton = 1.016 metric tons or 1.120 short tons.

[4] No net shipments of coke out of the industry are allowed, since consumption by the industry was 12,364 thousand British standard tons (hereafter referred to as MBT), while production by the steel industry totaled 11,530 MBT.

[5] Production of pig iron (17,105.2 MBT) plus imports (335.8 MBT) minus consumption in the steel industry (15,616.9 MBT).

[6] Exports of ingots.

[7] Shipments of ingots and semifinished products out of the steel industry, excluding shipments to make "forgings (excluding drop forgings)," from U.K. source (Iron and Steel Annual Statistics), plus estimated quantity shipped to make "forgings (excluding drop forgings)" minus exports of ingots.

[8] Total shipments minus shipments for intraindustry conversion (other than for wire and wire products). It has been estimated that the ratio of shipments for conversion (144.1 MBT—all qualities) to total shipments (1,685.7 MBT—all qualities) is the same for carbon, alloy, and stainless wire rods.

[9] U.K. shipments figure for "other heavy-rolled products" minus shipments for intraindustry conversion.

[10] On the minimum output side, 20 percent of alloy steel (minus shipments for conversion) reported in U.K. data under "other light-rolled sections and hot-rolled bars" has been placed in the structural shapes category. See footnote 16.

[11] U.K. shipments figure for carbon plates 3 mm. and over minus shipments of plates (all qualities) for intraindustry conversion (81.1 MBT).

[12] U.K. shipments figure for plates over 0.176 inches.

[13] U.K. shipments figures for heavy rails plus shipments of light rails and accessories and sleepers.

[14] Includes fishplates and soleplates.

[15] U.K. shipments figure for tires, wheels, axles, and rolled rings.

[16] U.K. shipments figure for "other light-rolled sections and hot-rolled bars" plus shipments of "arches" minus shipments for intraindustry conversion. Of total shipments of "arches, light rails and accessories" (353.7 MBT), 337.1 MBT were in arches and 16.6 MBT in light rails and accessories. Of total shipments for conversion (639.6 MBT), 512.4 MBT were for bright steel bars, 126.6 MBT for tubes, and 0.6 MBT for other purposes. It has been estimated that of the 512.4 MBT for bright steel bars, 63.0 MBT were alloy (excluding stainless) and 4.1 MBT were stainless. Of the 126.6 MBT for tubes, an estimated 120 MBT were alloy. The result is as follows:

Bars—hot rolled	Without deduction for conversion	With deduction for conversion
	(thousands of British standard tons)	
Total	2,850.3	2,210.7
Carbon	2,393.5	1,941.0
Alloy	426.7	243.7
Stainless	30.1	26.0

Table B—22. Footnotes—Continued

U.K. data include shipments of alloy steel heavy structural shapes ("other heavy-rolled products") with figures for hot-rolled bars and light shapes ("other light-rolled sections and hot-rolled bars"). Therefore, on the minimum output side, 20 percent of the alloy figure (243.7 MBT) has been placed in the structural shapes category; on the maximum output side, all alloy has been placed in the hot-rolled bars and light sections category.

[17] U.K. shipments figure as given.

[18] U.K. shipments figure for "high-speed and other tool and magnet steel."

[19] U.K. shipments data on pipe and tubing are as follows:

Pipe and tubing	Shipments (thousands of British standard tons)
Carbon tubes and pipes (excluding welded tubes over 16 inches outside diameter)	1,288.0
Electric conduit	48.4
Other:	
Welded	767.5
Weldless	472.1
Carbon tube and pipe fittings (excluding flanges)	20.9
Alloy tubes and pipes (including stainless)	120.6

On both the minimum and maximum output sides, electric conduit and tube and pipe fittings have been placed in the mechanical tubing category. On the minimum side, the remainder of the carbon pipe and tubing (welded and weldless) has been divided evenly between standard and line pipe. All alloy steel has been placed in the line pipe category, and no stainless steel has been allowed. On the maximum side, 10 MBT of stainless have been allowed and the remainder of alloy and carbon steel has been distributed to emphasize high-weight products. The 2 distributions are as follows:

Pipe and tubing	Minimum output (thousands of British standard tons)		Maximum output		
	Carbon	Alloy	Carbon	Alloy	Stainless
Total	1,308.9	120.6	1,308.9	110.6	10
Standard pipe	619.8	-	247.9	-	-
Oil-country goods	-	-	371.9	22.1	-
Line pipe	619.8	120.6	247.9	22.1	-
Mechanical tubing	69.3	-	317.2	55.3	-
Pressure tubing	-	-	124.0	11.1	10

[20] Wire and wire products are not within the U.K. definition of the steel industry, and appropriate data are not available for these products. Material for conversion to wire and wire products is included in shipments of wire rods.

[21] U.K. shipments figure for hot-rolled uncoated sheets under 3 mm. minus shipments for conversion into other steel products (484.3 MBT).

[22] U.K. shipments figure for alloy hot-rolled sheets 0.176 inches and under.

[23] U.K. shipments figure for stainless hot- and cold-rolled sheets 0.176 inches and under minus shipments for intra-industry conversion (7.4 MBT) is 38.5 MBT. On the minimum side, this amount has been divided equally between hot- and cold-rolled sheets. On the maximum side, the total amount has been placed in the cold-rolled category.

[24] U.K. shipments figure for cold-rolled uncoated sheets under 3 mm. (excluding electrical) minus shipments for conversion into other steel products (5.4 MBT).

[25] U.K. shipments figure for alloy cold-rolled sheets 0.176 inches and under.

[26] U.K. shipments figure as given minus shipments for conversion into other steel products (171.1 MBT).

[27] Estimated shipments minus estimated shipments for conversion into other steel products.

[28] All stainless strip has been placed in the cold-rolled category.

[29] Shipments estimated from production data.

[30] U.K. shipments of stainless strip, minus shipments for conversion into other steel products (2.1 MBT).

[31] Electrical sheets do not fall within the U.K. definition of alloy steel, but almost all electrical steel in the United States falls within the U.S. definition of alloy steel. On the minimum side, 20 percent of the U.K. shipments figure (224.5 MBT) has been placed in the carbon category, and on the maximum side, the total amount has been placed in the alloy category.

SOURCE: Iron and Steel Annual Statistics, 1964 (London, Iron and Steel Board and the British Iron and Steel Federation, 1965).

Table B–23. United Kingdom. Estimates of Employment Cost for Wage Earners and Salaried Employees, U.S. Industry Definition,[1] Iron and Steel Industry, 1964

(Earnings and employment cost in pounds[2])

Worker category and process	Average number of persons at work[3]	Average weekly earnings[4]				Aggregate employment cost			
		December 1963[5]	December 1964[6]	Estimated minimum annual average[7]	Estimated maximum annual average[8]	Wages and salaries		Total cost	
						Minimum estimate[9]	Maximum estimate[10]	Minimum estimate[11]	Maximum estimate[11]
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
Process workers	119,856	-	-	-	-	108,766,755	114,993,922	-	
Coke ovens at blast furnaces	4,866	17.15	18.60	17.52	18.24	4,109,146	4,411,173	-	
Blast furnaces and sintering plants	10,808	17.40	18.15	17.59	17.97	9,163,345	9,652,734	-	
Steel melting furnaces and ancillary processes (excluding melting for manufacture of steel castings	20,559	20.15	20.50	20.24	20.42	20,056,695	20,864,806	-	
Rolling mills and ancillary processes (excluding wrought iron, sheet, and tinplate rolling, but including bright bars)	49,386	18.70	19.65	18.94	19.42	45,084,882	47,666,077	-	
Sheet mills	12,832	20.20	21.35	20.49	21.07	12,673,313	13,437,389	-	
Tinplate manufacture	3,142	20.05	21.00	20.25	20.87	3,066,773	3,259,028	-	
Steel tubes, pipes, and fittings (excluding welded tubes over 16 inches outside diameter)	18,263	16.25	17.65	16.60	17.30	14,612,601	15,702,715	-	
General and maintenance workers associated with above processes	[12]89,134	[13]17.80	[13]18.70	18.02	18.48	76,615,502	81,042,204	-	-
Wage earners, total	208,990	-	-	-	-	185,382,257	196,036,126	214,067,200	226,369,600
Salaried employees, total: Administrative, technical, and clerical employees associated with above processes[14]	[12]50,017	[13]17.15	[13]18.60	17.52	18.24	41,273,636	43,334,725	47,660,100	50,040,100
Wage earners and salaried employees, total	259,007	-				226,655,893	239,370,851	261,727,300	276,409,700

[1] But excluding wire and wire products.

[2] US$1 = 0.3584 pound.

[3] Average of figures relating to 1 week in each month.

[4] Gross average payments to persons at work (during any part of the survey week), including cost-of-living allowance and premiums for overtime and weekend work, etc.

[5] Week ended December 7.

[6] Week ended December 5.

[7] $\left(\frac{\text{December 1963 + December 1964}}{2}\right) - \left(\frac{\text{December 1964 - December 1963}}{4}\right)$.

[8] $\left(\frac{\text{December 1963 + December 1964}}{2}\right) + \left(\frac{\text{December 1964 - December 1963}}{4}\right)$.

[9] For process workers, col. 1 x col. 4 x 48.2; for general and maintenance workers, col. 1 x col. 4 x 47.7; and for salaried employees, col. 1 x col. 2 x 47.1. To the extent that 48.2, 47.7, and 47.1 are less than 52, allowance is made for days not worked but paid for because of sickness, holidays, or vacations.

[10] For process workers, col. 1 x col. 5 x 49.7; for general and maintenance workers, col. 1 x col. 5 x 49.2; and for salaried employees, col. 1 x col. 5 x 47.5. To the extent that 49.7, 49.2, and 47.5 are less than 52, the allowance is made for days not worked but paid for because of sickness, holidays, or vacations.

[11] A survey by the Ministry of Labour indicates that supplementary benefits accounted for 13.4 percent of total labor cost for wage earners and salaried employees together in 1964. The following items were included in the survey as supplementary benefits: Holidays and vacations, absence due to sickness and injury, statutory National Insurance contributions, private social welfare payments, payments in kind, subsidized services, recruitment and training expenses, profit sharing bonuses and payments, and other labor cost. It is assumed here that 13.4 percent of both wage earner labor cost and salaried employee labor cost is in supplementary benefits.

[12] Partially estimated on the basis of data furnished by the Iron and Steel Board.

[13] Includes approximately 6,000 workers in processes not covered by this study, but included in the U.K. definition of the steel industry.

[14] Excludes some central administrative offices.

SOURCE: Based on data from Iron and Steel Annual Statistics, 1964 (London, Iron and Steel Board and the British Iron and Steel Federation), and from the Ministry of Labour, in conjunction with aggregate data furnished by the British Iron and Steel Board.

Table B-24. United Kingdom. Estimates of Total Hours Worked, U.S. Industry Definition,[1] Iron and Steel Industry, 1964

Worker category	Average number of persons at work[2]	Average weekly hours worked December 1964[3]	Total hours worked	
			Minimum estimate[4]	Maximum estimate[5]
	(1)	(2)	(3)	(4)
Process workers	119,856	-	260,347,046	268,449,135
Coke ovens at blast furnaces	4,866	42.8	10,038,373	10,350,771
Blast furnaces and sintering plants	10,808	43.1	22,452,765	23,151,503
Steel melting furnaces and ancillary processes (excluding melting for manufacture of steel castings)	20,559	43.3	42,907,881	44,243,189
Rolling mills and ancillary processes (excluding wrought iron, sheet, and tin plate rolling but including bright bars)	49,386	45.9	109,260,579	112,660,805
Sheet mills	12,832	45.0	27,832,608	28,698,768
Tinplate manufacture	3,142	42.8	6,481,840	6,683,557
Steel tubes, pipes, and fittings (excluding welded tubes over 16 inches outside diameter)	18,263	47.0	41,373,000	42,660,542
General and maintenance workers associated with above processes	[6]89,134	[7]46.1	196,002,973	202,166,588
Total wage earners	208,990	-	456,350,019	470,615,723
Salaried employees:				
Administrative, technical, and clerical employees associated with above processes[8]	[6]50,017	[7]39.1	92,111,822	92,894,088
Wage earners and salaried employees, total	259,007	-	548,461,841	563,509,811

[1] But excluding wire and wire products.
[2] Average of figures relating to 1 week in each month.
[3] Week ended December 5.
[4] For process workers, col. 1 x col. 2 x 48.2; for general and maintenance workers, col. 1 x col. 2 x 47.7; and for salaried employees, col. 1 x col. 2 x 47.1. To the extent that 48.2, 47.7, and 47.1 are less than 52, allowance is made for days not worked because of sickness, holidays, or vacations.
[5] For process workers, col. 1 x col. 2 x 49.7; for general and maintenance workers, col. 1 x col. 2 x 49.2; and for salaried employees, col. 1 x col. 2 x 47.5. To the extent that 49.7, 49.2, and 47.5 are less than 52, allowance is made for days not worked because of sickness, holidays, or vacations.
[6] Partially estimated, on the basis of data furnished by the Iron and Steel Board.
[7] Includes approximately 6,000 workers in processes not covered by this study, but included in the U.K. definition of the steel industry.
[8] Excludes some central administrative offices.

SOURCE: Based on data from Iron and Steel Annual Statistics, 1964 (London, Iron and Steel Board and the British Iron and Steel Federation), in conjunction with aggregate data furnished by the British Iron and Steel Board.

Table B-25. United Kingdom. Estimates of Average Hourly Labor Cost for Wage Earners and Salaried Employees, U.S. Industry Definition,[1] Iron and Steel Industry, 1964

Worker category	Employment cost (thousands of pounds [2]) [3]	Hours worked (thousands) [4]	Average hourly labor cost: In pounds [2]	Average hourly labor cost: In shillings and pence [2]		Average hourly labor cost: In U.S. dollars [2]
				s.	d.	
Wage earners:						
Wages:						
Minimum	185,382.3	456,350.0	0.4062	8	1	1.13
Maximum	196,036.1	470,615.7	.4166	8	4	1.16
Total cost:						
Minimum	214,067.2	456,350.0	.4691	9	5	1.31
Maximum	226,369.6	470,615.7	.4810	9	7	1.34
Salaried employees:						
Salaries:						
Minimum	41,273.6	92,111.8	.4481	8	12	1.25
Maximum	43,334.7	92,894.1	.4665	9	4	1.30
Total cost:						
Minimum	47,660.1	92,111.8	.5174	10	4	1.44
Maximum	50,040.1	92,894.1	.5387	10	9	1.50
Wage earners and salaried employees:						
Wages and salaries:						
Minimum	226,655.9	548,461.8	.4133	8	3	1.15
Maximum	239,370.9	563,509.8	.4248	8	6	1.19
Total cost:						
Minimum	261,727.3	548,461.8	.4772	9	6	1.33
Maximum	276,409.7	563,509.8	.4905	9	10	1.37

[1] But excluding wire and wire products.
[2] US$1 = 0.3584 pound; 1 pound = 20 shillings; 1 shilling = 12 pence.
[3] From table B-23.
[4] From table B-24.

Table B-26. United Kingdom. Calculation of Unit Labor Cost for Wage Earners and Salaried Employees, U.S. Industry Definition,[1] Iron and Steel Industry, 1964

Worker category	Employment cost (pounds [2]) [3]	Weighted output (thousands of British standard tons [4]) [5]	Unit labor cost per ton: British standard ton [4]: In pounds [2] [6]	British standard ton [4]: In U.S. dollars [2]	Short ton [4]: In pounds [2]	Short ton [4]: In U.S. dollars [2]
	(1)	(2)	(3)	(4)	(5)	(6)
Wage earners:						
Wages:						
Minimum	185,382,300	19,328.1	9.59	26.76	8.56	23.89
Maximum	196,036,100	18,280.5	10.74	29.92	9.58	26.71
Total cost:						
Minimum	214,067,200	19,328.1	11.08	30.90	9.89	27.59
Maximum	226,369,600	18,280.5	12.38	34.55	11.06	30.85
Salaried employees:						
Salaries:						
Minimum	41,273,600	19,328.1	2.14	5.96	1.91	5.32
Maximum	43,334,700	18,280.5	2.37	6.62	2.12	5.91
Total cost:						
Minimum	47,660,100	19,328.1	2.47	6.88	2.20	6.14
Maximum	50,040,100	18,280.5	2.74	7.64	2.44	6.82
Wage earners and salaried employees:						
Wages and salaries:						
Minimum	226,655,900	19,328.1	11.73	32.72	10.47	29.21
Maximum	239,370,900	18,280.5	13.09	36.53	11.69	32.62
Total cost:						
Minimum	261,727,300	19,328.1	13.54	37.78	12.09	33.73
Maximum	276,409,700	18,280.5	15.12	42.19	13.50	37.67

[1] But excluding wire and wire products.
[2] US$1 = 0.3584 pound.
[3] From table B-23.
[4] 1 British standard ton = 1.12 short tons, or 1 short ton = 0.8929 British standard ton.
[5] Figures from table B-22 reduced by 1/53, to adjust for 53-week year to which the output data apply.
[6] Col. 1 ÷ col. 2.

Table B-27. United Kingdom. Man-Hours per Ton and Output per 1,000 Man-Hours, U.S. Industry Definition,[1] Iron and Steel Industry, 1964

Worker category	Calculation of man-hours per ton			
	Hours worked[2]	Weighted output (thousands of British standard tons[3])[4]	Man-hours per ton	
			British standard ton[3 5]	Short ton[3]
	(1)	(2)	(3)	(4)
Wage earners:				
Minimum	456,350,019	19,328.1	23.61	21.09
Maximum	470,615,723	18,280.5	25.74	22.99
Salaried employees:				
Minimum	92,111,822	19,328.1	4.77	4.23
Maximum	92,894,088	18,280.5	5.08	4.54
Wage earners and salaried employees:				
Minimum	548,461,841	19,328.1	28.38	25.34
Maximum	563,509,811	18,280.5	30.83	27.52
	Calculation of output per 1,000 man-hours			
	Weighted output (thousands of British standard tons[3])[4]	Hours worked[2]	Output per 1,000 man-hours	
			British standard tons[3 5]	Short tons[3]
	(1)	(2)	(3)	(4)
Wage earners:				
Minimum	18,280.5	470,615.7	32.84	43.51
Maximum	19,328.1	456,350.0	42.35	47.44
Salaried employees:				
Minimum	18,280.5	92,894.1	196.79	220.40
Maximum	19,328.1	92,111.8	209.83	235.01
Wage earners and salaried employees:				
Minimum	18,280.5	563,509.8	32.44	36.33
Maximum	19,328.1	548,461.8	35.24	39.47

[1] But excluding wire and wire products.
[2] From table B-24.
[3] 1 British standard ton = 1.12 short tons, or 1 short ton = 0.8929 British standard ton.
[4] Figures from table B-22 reduced by 1/53, to adjust for 53-week year to which the output data apply.
[5] Col. 1 ÷ col. 2.

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