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DATA NEEDS FOR STUDY OF STRUCTURAL CHANGES IN THE MANUFACTURING SECTOR *

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prepared by the

Global and Conceptual Studies Branch

Division for Industrial Studies

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Introduction

Structural changes are long-term trends, generally irreversible. Though the structure of an economy or its components can be described in terms of a number of variables, structural changes need not occur in all of them. For some variables may undergo considerable structural changes, while others not. The same applies to rates of structural change. For example, during 1963-1980 the share the of manufacturing sector in GDP rose sharply for a number of developing countries, though labour productivity remained almost static or changed at a very slow pace.

Two aspects of data needed to study structural changes call for attention. First, only relative changes are relevant and these changes should be measured in quantitative terms, that is, value data should be compiled in constant prices. Current price measures are likely to lead to spurious or distorted results. The fact, however, that only a few variables can be measured meaningfully in constant prices imposes a limit on the nature and extent of studies which can be carried out to analyse structural changes. The most commonly used variables are value added, gross output, manufactured exports and imports, labour service and capital. The "flow" concept of the last variable, that is, gross/net capital formation is generally used. Measurement of stock of capital poses both conceptual and statistical problems, and therefore the "stock" concept is used very sparingly.

A second aspect of data equally important for study of structural changes is its availability over a long span of time, say 15 to 20 years or even more. This, in addition to filling the gaps in the time series, raises the problem of consistency and comparability. In earlier periods statistical systems were particularly weak in most of the developing countries. They also did not follow international concepts, definitions and classifications rigorously, thus making the process of building time-series data long and slow. The first step in the process should be to set-up some minimum data base. Efforts should then be made to extend it in the desired directions.

In most of the developing countries the manufacturing sector even at present is not well diversified. Traditional activities like food processing, tobacco products and beverages, textiles and leather and leather goods industries are still dominating the sector. From the view point of

investment, for instance, food processing claims the bulk of manufacturing investment in a number of developing countries, like Cameroon, Central African Republic, Chile, Congo, Costa Rica, Cuba, Ecuador, Fiji, Guatemala, Kenya, Malawi, Nicaragua, Panama, Senegal, Swaziland, Uganda and Uruguay, to name just a few. In these countries the branch's share in manufacturing investment exceeded 25 per cent in the latest year of reporting. Incidently, most of the developing countries have agriculture based economies. Apparently, they are trying to set up capacity for processing of their agricultural products before these are exported and also to meet the changing domestic demand in favour of processed food. (A study of the extent to which processing is done in developing countries vis-à-vis developed countries would be interesting and useful as the former group of countries is expected to gradually establish capacity for more intensive processing of their agricultural products. One simple way of carrying out the study is through comparison of value added-gross output ratios obtaining in various food products in the two groups of countries).

Textiles is yet another branch which claimed a big share of manufacturing investment. In Algeria, Cameroon, Central African Republic, Congo, Cuba, Egypt, El Salvador, Ethiopia, Hong Kong, Indonesia, Iran, Malawi, Mozambique, Nigeria, Pakistan, Peru, Philippines, Somalia, Sri Lanka, Turkey, Uganda, Tanzania, Uruguay and Zimbabwe, the branch's share was more than 10 per cent. The two branches together, namely, food processing and textiles, accounted for even more than 50 per cent of manufacturing investment of many developing countries.

Other important branches from the view point of investment are again resource-based, such as beverages - especially in Africa and Latin America, and non-metalic mineral products, more particularly cement.

Only few developing countries seem to have made sizeable investments in chemicals, machinery and transport equipment branches. An analysis in terms of other variables like value added and employment will lead to similar observations. Such restricted development of the manufacturing sector in the group of developing countries narrows down the area of estimation. The technique of using parameters of a "reference country" may also be employed.

In the context of the above background the present study is devoted to examing available data series for sample countries (listed in Appendix 1) with a view to suggesting methods which can be used to fill the gaps and to prepare estimates in constant prices. The variables covered are:

(1) Labour services at constant prices
(2) Gross output at constant prices
(3) Value added-gross output ratio
(4) Gross fixed capital formation at constant prices
(5) Stock of fixed assets at constant prices.

In the last case an attempt, the main part of the paper, has been made to prepare estimates of capital stock at the end of 1981 at 1975 prices. The countries selected for the exercise are (a) Finland, (b) Zimbabwe, (c) Colombia, (d) Turkey, (e) Hungary, (f) Chile, (g) Ecuador, (h) Panama, (i) Korea, Rep. of, and (j) Philippines. These countries posed different types of problems regarding availability of data and the method was suitably adjusted to meet the changed situation. The estimates of capital stock, it may be pointed out, are preliminary in character and offer scope for improvements as one would see from the section covering the topic.

Finally, determinants of growth of the manufacturing sector based on capital, namely, capital-output ratio and capital-employment ratio have been computed and compared for the selected countries.

1. Labour Services at Constant Prices

There are two ways in which the expression "at constant prices" may be interpreted. The first is by valuing flows of goods or services at the prices at which those same goods and services were valued in some base year. The second is by valuing monetary flows in terms of their real purchasing power over designated sets of goods and services, that is, by deflating monetary flows by price indices relating to quite separate flows of goods and services. In accordance with the second concept labour services at constant prices, that is, compensations of employees (wages and salaries + supplement to wages and salaries) at constant prices may be obtained by deflating current price "compensation of employees" by suitable sets of a consumer price index. However, this interpretation of "constant prices" is not accepted in the System of National Accounts. Deflated values of compensation of employees may

be used in the study of movement of "real wages", but cannot be treated, even as a proxy, as the contribution of labour to value added in constant prices.

The first interpretation calls for direct factoring of the monetary value of compensation of employees into its own price and quantity components, so that the quantities involved can be compared with that recorded in the base year. The most direct and convenient factors are (1) numbers of hours worked and (2) hourly wage rates. Calculations will not pose any great technical problem provided adequate data are available. However, a review of industrial statistics will immediately show that data on the first component are not available, though some developed countries do collect and compile data on number of hours worked by operators. Most of the countries provide information on "number of employees" and/or "number of persons engaged". Thus from the available industrial statistics compensation of employees can possibly be factored into (1) number of employees or number of persons engaged and (2) wages and salaries plus supplements to wages and salaries per employee/or per person engaged. Again information on "supplements to wages and salaries" is provided in the case of few countries only. Thus for a majority of countries wages and salaries per employee can be considered the price component of compensation of employees. The calculation may take various forms as follows:

Let V_o and V_t represent value added in current prices in the base year and year t,
W_o and W_t are compensation of employees (in the limited sense),
L_o and L_t, are number of employees in the two periods, and $\hat{}$ represents values at constant prices.

Then $\hat{V}_{tL}$, which is labour share in value added (in constant prices), may be obtained as

$$\hat{V}_{tL} = \frac{W_o}{L_o} \times L_t \left(\frac{\hat{V}_t}{L_t} - \frac{V_o}{L_o} \right)$$ the term in brackets denotes increase in labour productivity

$$= \frac{W_o}{L_o} \times L_t \times \frac{\hat{V}_t}{L_t} \times \frac{L_o}{V_o} = W_o \times \frac{\hat{V}_t}{V_o} \text{ or } \frac{\hat{V}_{tL}}{W_o} = \frac{\hat{V}_t}{V_o}$$

This implies that value added and labour share in value added, both measured in constant prices, move in perfect consonance.

Labour share at constant prices may also be computed by using shares in current prices, that is,

$$W_t = \hat{V}_t \times \frac{W_t}{V_t} = W_t \times \frac{\hat{V}_t}{V_t} = W_t \div \frac{V_t}{\hat{V}_t}$$

In other words, we are using the implicit price deflator of value added.

The third method involves computing average wages and salaries per unit of labour service (a quantitative measure of labour service) in the base year and multiplying it by a quantitative measure of labour services in the current year. Thus

$$W_o = \frac{W_o}{L_o} \times L_t,$$

L_o and L_t being the proxy for quantitative measure of labour service in the base year and the current year.

The formula assumes no change in quality and composition of labour over time. The assumption may not be very realistic, especially when time involved is long. However, of all the formulae discussed above, this formula seems to be more appropriate. Some improvement can possibly be made by using a "linking" process in computing the index of labour share in constant prices. However, such linking is not possible at a more aggregated level of ISIC classification than 3-digit as the basic data are available at the 3-digit level only.

A word of caution in the use of these figures is however necessary. The most appropriate measure of value added at constant prices is the excess of gross output over intermediate consumption, both measured at constant prices. The method is known as the "double deflation" method. Only few countries use this method to derive estimates of value added in constant prices. Most of the countries use an index of industrial production for the purpose. In the UNIDO data base estimates of value added at constant prices are obtained by moving the base year figures, using the index of industrial production. Value added figures at current prices as available from the Yearbook of Industrial

Statistics, the only source providing data at 3-digit level of ISIC, are not uniformly valued. In many cases they are at producers' prices, that is, inclusive of net indirect taxes (indirect taxes less subsidies), while in others they are in factor prices. Similarly, there is variation in the concept of value added as well. Some countries follow the "census value added" concept, while others use the "national accounts value added" concept. Obviously, variations in concepts and valuations are also inherited by the estimates of value added at constant prices. Estimates of labour share too have their own limitations. Thus, operating surplus if obtained as a residual may carry the cumulative effect of errors in measurement of value added and labour share at constant prices.

Moreover, developing countries do not collect and compile data on "supplements to wages and salaries". These supplements are also payments for labour services and their exclusion will under-estimate the share of labour in value added. No adjustment is perhaps possible at this stage as it is not known which of the developing countries make supplementary payments.

2. Gross Output at Constant Prices:

Estimates of gross output at constant prices may be prepared, as in the case of value added at constant prices, by moving the base year figures of gross output, using the Laspeyre's type index of gross output, that is,

$$\Sigma P_o Q_t = \Sigma P_o Q_o \times \frac{\Sigma P_o Q_o \frac{Q_t}{Q_o}}{\Sigma P_o Q_o}$$

the quantities of output in the base year and the current year; and P_o is the unit price of gross output in the base year. Thus weights at all stages of aggregation are to be assigned in proportion to value of gross output in the base year. The index will differ from the index of industrial production which measures changes over time in the value added in industrial activity expressed in constant prices (quantum of production). The weights for the index of industrial production should conceptually be based on value added in

the base year. Country practices, however, vary. Some national series - in particular those of the USSR and the countries of European centrally planned economies - relate to the value, at constant prices, of gross output. Within industry groups, weights based on value of gross output or its equivalent are quite common. The countries which use value of gross output as weights for combining the elementary series of production relatives (current production divided by base year production) into indices of sub-groups are:

	Country	Remarks
1.	Argentina	
2.	Belgium	Only in case of few elementary series.
3.	Canada	
4.	Cyprus	
5.	Dominican Rep.	
6.	Egypt	Value added estimated by applying a fixed percentage.
7.	El Salvador	
8.	Germany, FR.	The weights for combining individual products within a sub-group are derived by applying the ratio of value added to value of gross output for the sub-group to the value of gross output of each product.
9.	India	
10.	Iran	
11.	Italy	
12.	Japan	
13.	Malaysia	
14.	Malta	Value of Gross output at all stages.
15.	Mexico	
16.	New Zealand	
17.	Norway	
18.	Panama	Value of Gross output at all stages.
19.	Peru	
20.	Singapore	
21.	South Africa	Value of Gross output at all stages
22.	Spain	Only some sub groups.
23.	Sweden	
24.	Switzerland	
25.	Turkey	
26.	Uruguay	
27.	Zambia	For some groups only.

For these countries it may be assumed that scope and coverage of sub-groups (groups or detailed categories) of activities which are the first stages of aggregating production series of individual products more or less coincide with 3-digit level classification of ISIC. With this assumption estimates of gross output at constant prices may be prepared at the 3-digit level on the basis of the indices of industrial production as available from the Yearbook of Industrial Statistics.

For other countries which base the weights on value added at all stages, use of index of industrial production to derive value of gross output at constant prices will give a distorted picture, especially when value added-gross output ratio in the base year varies widely among different commodities. The problem can be reduced to an extent by combining 3-digit indices of industrial production into 2-digit and reassigning weights in proportion of value of gross output of each 3-digit branch. The exercise will, however, lead to estimates of gross output at constant prices for 2-digit groups of ISIC.

3. Value added-gross output ratio:

The ratio of value added to gross output has various uses in the study of structural changes and export performance or import substitution. Changes over time in the ratio are brought about by a number of factors, such as widely different movements of prices of intermediate consumption and output of a branch or a sub-branch of manufacturing, horizontal integration of processing activities, import substitution and changes in the scale of operation. Ratio measured at constant prices would provide a better indicator of structural changes. Data will, however, pose a great problem. If the same index of production is used to estimate value added and gross output at constant prices, it will lead to a constant value added-gross output ratio for

$V_t = V_o \times I_t$ (I_t is the index of production), and

$G_t = G_o \times I_t$, where G_o represents value of gross output in the base year and G_t is gross output at constant prices in year t.

Thus,

Value added-gross output ratio at constant prices would be

$$= \frac{\hat{V}_t}{\hat{G}_t} = \frac{V_o}{G_o}$$

Technically, the most appropriate method of computing value added-gross output ratio at constant prices would be through estimation of intermediate consumption at constant prices. The available statistics however do not permit such estimation.

Another important use to which the ratio of value added to gross output may be put is in cross-country study of export performance of a particular branch. Comparison of values of exports may not project a correct picture, especially when value added gross-output ratios in the countries are widely different.

4. Gross Fixed Capital Formation at Constant Prices:

Figures of gross fixed capital formation by 3-digit branches of manufacturing for a large number of countries are provided in the Yearbook of Industrial Statistics. The data are, however, at current prices, and for their conversion into constant prices we need proper a set of price deflators. Such deflators in sufficient detail are simply not available. The only recourse is to build up time series of broad deflators, implicit in the current and constant price series of gross fixed capital formation available from the Yearbook of National Accounts Statistics. The Yearbook provides the following data:

1. Gross fixed capital formation for a whole economy, as an expenditure item in tables 1.1 and 1.2 on expenditure on the gross domestic product, in current and constant prices. Gross fixed capital formation in few countries in divided into 3 categories of (a) residential construction, (b) other construction, land development, etc., and (c) other, representing machinery and equipment.

2. Gross capital formation by type of good and owner (tables 2.7 and 2.8). The categories of types of good are (a) residential buildings, (b) non-residential buildings, (c) other construction, (d) land improvement and plantation and orchard development, (e) producers' durable goods, and (f) breeding stock, dairy cattle, etc. The ownership categories are (a) total private, (b) public enterprises and (c) general government.

3. Gross capital formation by kind of activity of owner, ISIC major divisions (Tables 2.9 and 2.10).

4. Gross fixed capital formation by kind of activity of owner, ISIC divisions (Tables 2.11 and 2.12).

Obviously, Tables 2.11 and 2.12 provide the most detailed and relevant data for computing the price deflators for use in converting current price figures of gross fixed capital formation at 3-digit level of ISIC into constant price series. However, the detailed data are available in respect of three countries only, namely, Federal Republic of Germany, Sweden and U.K.

For many countries figures of gross fixed capital formation of the manufacturing sector are available in current and constant prices. These countries are: Belgium, Botswana (gross capital formation) Cyprus, Denmark, El Salvador, Finland, Greece, Guatemala, Iceland, India, Iran, Iraq, Ireland Israel, Japan, Kenya, Korea, Rep. of, Libya, Luxembourg, Mauritius, Netherlands, Norway, South Africa, Syria, Venezuela and Zimbabwe. In their case the price deflator implicit in the current and constant price series may be applied uniformly to 3-digit branches of ISIC.

In case of Australia, Canada, Panama and Sri Lanka, on implicit price deflator may be based on information contained in Tables 2.9 and 2.10. The categories of type of ownership which would be relevant to manufacturing sector are "total private" and "public corporations" while the categories of type of good to be considered are (a) non-residential buildings, (b) other construction and (c) producers' durable goods.

For other countries the price deflator is to be derived from data in Tables 1.1 and 1.2 The countries are Argentina, Austria, Benin, Bolivia, Brazil, Burma, Chad, Chile, Colombia, Costa Rica, Dominica, Dominican Republic, Ecuador, Egypt, Ghana, Guyana, Honduras, Hong Kong, Indonesia, Italy, Ivory Coast, Kuwait, Liberia, Malawi, Malaysia, Malta, Mexico, Morocco, Nicaragua, Pakistan, Papua New Guinea, Paraguay, Peru, Philippines, Puerto Rico, Senegal, Singapore, Spain, Switzerland, Swaziland, Thailand, Togo, Tunisia, Turkey, Cameroon, Uruguay, Zaire and Zambia.

For few countries like Tanzania and USA, estimates of gross fixed capital formation at constant prices are not available at all.

The position in regard to implicit price deflators for the sample countries is reviewed below:

Country	National Accounts Statistics Table
1. Algeria	NA
2. Argentina	1.1 and 1.2
3. Australia	1.1 and 1.2
4. Austria	1.1 and 1.2
5. Belgium	2.9 and 2.10
6. Bolivia	1.1 and 1.2
7. Brazil	1.1 and 1.2
8. Bulgaria	NA
9. Canada	2.7 and 2.8
10. Chile	1.1 and 1.2
11. Colombia	1.1 and 1.2
12. Czechoslovakia	6a and 6b
13. Denmark	2.9 and 2.10
14. Ecuador	1.1 and 1.2
15. Egypt	1.1 and 1.2
16. Ethiopia	NA
17. Finland	2.9 and 2.10
18. France	1.1 and 1.2
19. Germany, Fed. Rep.	2.11 and 2.12
20. Ghana	1.2 and 1.2
21. Greece	2.9 and 2.10
22. Hong Kong	1.1 and 1.2
23. Hungary	6a and 6b
24. India	2.9 and 2.10
25. Indonesia	1.1 and 1.2
26. Iran	2.9 and 2.1
27. Italy	1.1 and 1.2
28. Japan	2.9 and 2.10
29. Kenya	2.9 and 2.10
30. Korea, Rep of	2.9 and 2.10
31. Kuwait	1.1 and 1.2
32. Malaysia	1.1 and 1.2
33. Morocco	1.1 and 1.2
34. Mexico	1.1 and 1.2
35. Netherlands	2.9 and 2.10
36. Nigeria	NA
37. Norway	2.9 and 2.10
38. Pakistan	1.1 and 1.2
39. Panama	2.7 and 2.8
40. Peru	1.1 and 1.2
41. Philippines	1.1 and 1.2
42. Portugal	2.9 and 2.10
43. Singapore	1.1 and 1.2
44. Swaziland	1.1 and 1.2
45. Sweden	2.11 and 2.12
46. Thailand	1.1 and 1.2
47. Tunesia	1.1 and 1.2
48. Turkey	1.1 and 1.2
49. Tanzania	NA
50. USSR	NA
51. U.K.	2.11 and 2.12
52. U.S.A.	1.1 and 1.2
53. Venezuela	1.1 and 1.2
54. Zambia	1.1 and 1.2
55. Zimbabwe	2.9 and 2.10

The above analysis shows that an improved price deflator can be constructed for about 40 per cent of the countries in the sample.

(a) Gaps in implicit price deflators:- The gaps are of two types - (i) the price deflator can not be computed for some initial years of the time series and (ii) the price deflator cannot be computed at all as the country concerned does not compile estimates at constant prices. In the first case the price deflator the implicit in gross value added of manufacturing sector or in gross domestic product may be used after linking it with implicit price deflator of gross fixed capital formation. In other cases, as linking will not be possible, the implicit price deflator of manufacturing value added or GDP is to be used as such.

(b) Gaps in time series of gross fixed capital formation at constant prices:- Estimates of gross fixed capital formation at constant prices are based on two variables - current price data of gross fixed capital formation and price deflators. Method for filling the gaps in the time series of price deflators has been dealt with above. Gaps in time series of gross fixed capital formation at current prices may be filled in two ways - direct estimation of missing figures or first estimating figures at constant prices and then converting them, if needed, into current prices with the help of price deflators. For obvious reasons the later method should be preferred over the former, as it eliminates at least one source of variation in the variables. The method will have yet another advantage. It would lead to the same results whether estimation is done using data in national currency or in constant US dollar.

Use of investment functions - A number of functions have already been evolved and tried in the Global and Conceptual Studies Branch. These functions are:

1) $I_t = ay_t + by_{t-1}$

2) $I_t = c + ay_t + by_{t-1}$

3) $I_t = a + by_t + cI_{t-1}$

4) $I_t = a + bI_{t-1}$

5) $I_t = a + bt$

6) $I_t = a + bt + ct^2 + dt^3$

where I_t is fixed capital formation at constant prices
Y_t is value added at constant prices
Y_{t-1} and I_{t-1} are the respective lagged variables
t is time

A glance at data on gross fixed capital formation however, will make it clear that there is hardly any branch of manufacturing where investment displays a strong time trend. The last two functions may therefore not lead to usable estimates. Instead, the following two functions may be tried:

1) $I_t = a_{yt} + by_{t-1} + cy_{t-2}$
2) $I_t = a_{yt+1} + by_t + cy_{t-1}$

The parameters in the functions were estimated, using figures of gross fixed capital formation in constant dollar which were obtained by deflating current price data by an overall price index implicit in gross fixed capital formation for the economy as a whole. Change in the data base on the lines as suggested in the preceeding paragraphs will give a new set of parameters.

Before undertaking exercise of actual estimation, it will be useful to take stock of the available data on gross fixed capital formation at current prices. The position for sample countries is summerized below:

	Country	Period for which series is available.	Missing Years
1.	Algeria	1964 - 1969	1968
2.	Argentina	-	All
3.	Australia	1963 - 1982	1971
4.	Austria	1969 - 1981	-
5.	Belgium	1963 - 1979	-
6.	Bolivia	1965 - 1977	1967, 1968
7.	Brazil	1963 - 1978	1970
8.	Bulgaria	1963 - 1982	-
9.	Canada	1963 - 1982	-
10.	Chile	1963 - 1979	-
11.	Colombia	1963 - 1980	-
12.	Czechoslovakia	1963 - 1982	-
13.	Denmark	1963 - 1982	-
14.	Ecuador	1963 - 1979	-
15.	Egypt	1967 - 1977	-
16.	Ethiopia	1965 - 1981	1968
17.	Finland	1963 - 1981	-
18.	France	1963 - 1981	-

19.	Germany, Fed.Rep.	1964 - 1981	-
20.	Ghana	1963 - 1968	-
21.	Greece	1963 - 1980	1978, 1979
22.	Hong Kong	1973 - 1980	1974, 1975
23.	Hungary	1963 - 1982	-
24.	India	1970 - 1978	1976
25.	Indonesia	1970 - 1980	1974
26.	Iran	1963 - 1980	1975, 1976
27.	Italy	1965 - 1981	-
28.	Japan	1963 - 1982	-
29.	Kenya	1967 - 1971	-
30.	Korea, Rep of	1963 - 1980	1964,1965
31.	Kuwait	1966 - 1977	1967
32.	Malaysia	"	All
33.	Morocco	1/	All
34.	Mexico	1963 - 1981	1967, 1968
35.	Netherlands	1963 - 1982	-
36.	Nigeria	1963 - 1978	1969,1970
37.	Norway	1963 - 1982	-
38.	Pakistan	1965 - 1976	1967/68, 1972/73
39.	Panama	1963 - 1979	-
40.	Peru	1963 - 1973	1964, 1970
41.	Philippines	1963 - 1979	1967, 1978
42.	Portugal	1967 - 1980	-
43.	Singapore	1963 - 1981	-
44.	Swaziland	1968 - 1981	1969, 1974, 1975
45.	Sweden	1963 - 1982	-
46.	Thailand	-	All
47.	Tunisia	1963 - 1981	-
48.	Turkey	1963 - 1981	1971, 1972
49.	Tanzania	1964 - 1974	All
50.	USSR	1969 - 1982	-
51.	U.K.	1963 - 1981	1964, 1965
52.	U.S.A.	1963 - 1981	-
53.	Venezuela	1974 - 1979	1975
54.	Zambia	1963 - 1974	-
55.	Zimbabwe	1963 - 1980	-

Assuming that 10 to 12 years data will lead to significant estimates of values of parameters in the investment functions, time series may be completed for many countries of the sample. This will leave Algeria, Argentina, Ghana, Hong Kong, India, Kenya, Malaysia, Morocco, Mexico (some branches), Pakistan, Peru and Thailand, where investment functions cannot be employed directly. In most of these countries only few branches are important either from the point of view of their contributions to manufacturing value added or growth rates. For these branches investment functions may be borrowed from other countries. The remaining branches may be aggregated and estimates may be prepared on the basis of an aggregate function for the region, sub-region or reference country, and distributed, if needed, on the basis of average incremental

capital-output ratics. Table 1 gives an idea of branches which claimed bulk of gross fixed capital formation in the latest year of reporting.

Although investment patterns would have changed in more recent years, traditional branches still occupy important places in the industrial structure of developing countries. The list may, however, be extended by including fast growing branches in each of these countries.

TABLE 1: Branches which claimed bulk of manufacturing investment

Country	Latest reporting year	ISIC branches	Percentage share of manufacturing gross fixed capital formation.
1. Algeria	1969	311, 321, 323, 361	51
2. Ghana	1968	311, 313, 321, 322, 331, 352	72
3. Hong Kong	1980	321, 322, 356, 381, 383	65
4. India	1978	321, 351, 371, 384	63
5. Kenya	1971	311, 313, 355, 369, 381	78
6. Morocco	1969	311, 321, 353, 369, 381	70
7. Pakistan	1976	311, 321, 351	61
8. Peru	1973	311, 313, 321, 356	55

5. Stock of Fixed Assets at Constant Prices

5.1 General methods of estimation and the data

Fixed assets here refer to reproducible tangible assets such as residential buildings, non-residential buildings, other construction works, land improvement and plantation and orchard development; plants, machinery and equipment, and breeding stock, draught animals, dairy cattle and the like. For manufacturing sector, however, the most relevant categories are non-residential buildings and other construction works and plants machinery and equipment. The Yearbook of National Accounts Statistics provides for collection and compilation of statistics of stocks of reproducible fixed assets. Tables 2.13 and 2.14 relate to stocks of reproducible fixed assets, by type of goods and owner, in current and constant prices respectively. The types of goods are (1) structures, divided into (a) residential buildings, (b)

non-residential buildings and (c) other construction, (2) land improvement and plantation and orchard development, (3) producers' durable goods, classified into (a) transport equipment, and (b) machinery and equipment, and (4) breeding stock, dairy cattle, etc. Tables 2.15 and 2.16 provide information on stocks of fixed assets by kind of activity, respectively in current and constant prices. Kind of activity follows 1-digit level of ISIC, that is, major divisions. Thus for the manufacturing sector as a whole data on stocks of reproducible fixed assets can be obtained directly from these tables of the Yearbook of National Accounts Statistics. However, a review of available statistics will immediately reveal that only five countries have provided data on stocks, with varying degree of detail. These countries are the following:

1.	Germany, Fed. Rep.	Gross and net assets in Tables 2.13, 2.14, 2.15 and 2.16.
2.	Japan	Net assets in Tables 2.13 and 2.14.
3.	Sweden	Gross assets in Tables 2.14 and 2.16.
4.	U.K.	Gross and net assets in Tables 2.13, 2.14, 2.15 and 2.16.
5.	U.S.A.	Gross and net assets in Tables 2.13, 2.14, 2.15 and 2.16.

Thus, even for the manufacturing sector as a whole, information on stocks is available in respect of Germany, Fed. Rep., Sweden, U.K. and U.S.A. only; for other countries estimates have to be prepared by following the indirect method, popularly known as "perpetual-inventory" method. The method is used to extrapolate bench-mark estimates of stock of fixed assets and even to build up the bench-mark data. Ideally, relatively detailed statistics on annual gross fixed capital formation and expected lifetimes of use as well as annual price indices, classified according to type of fixed assets, and according to kind of economic activity, are needed for this purpose. In many countries detailed data on gross fixed capital formation for a retrospective period long enough to apply the perpetual inventory method are however, not available. In those cases a rough estimate has to be made of the capital stock in the first year for which capital formation figures are available. For Uruguay, Harberger and Wisecarver [1/] followed a simple method, assuming certain rates of depreciation and growth rate of stock of assets in the initial period of the time series of gross fixed capital formation. The method in brief is based on the relationship -

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1/ Arnold C. Harberger and Daniel L. Wisecarver, "Private and Social Rates of Return to Capital in Uruguay", Economic Development and Cultural Change, Vol.25 (April 1977), pp 411-45.

$I_t = (d + r)\, K_{t-1}$, where

t denotes the middle year of a period of three years,

I denotes annual investment in a given asset category,

K denotes the year-end stock of that category of assets,

d denotes the relevant depreciation rate, and

r denotes the growth rate of capital stock during the three year period.

This relationship simply indicates that the amount of gross investment that occurs during a given year will consist of two general components, (1) replacement, representing that capital which is lost during the production process through year's depreciation (consumption of fixed capital), and (2) growth of capital stock. The equation tells us that if gross investment in fixed assets is 15, say, and if we assume that the rate of depreciation is 10 percent and that of growth of capital stock 5 percent, then we infer that the initial stock of capital was 100.

Thus, from the equation capital stock at the end of year t -

$K_t = \frac{I_{t+1}}{d+r}$ and stock at the end of year t+1

K_{t+1} = (1-d) times stock at the end of year t plus investment during t+1, that is

$K_{t+1} = (1+d)\frac{I_{t+1}}{d+r} + I_{t+1} = \left(\frac{(1-d)}{d+r} + 1\right) I_{t+1} = \frac{1+r}{d+r} I_{t+1}$

Values of capital stock emerge readily as function of d, r, (during the initial period), and successive values of I. It is also worth noting that assumptions regarding d and r which are to be made to build-up initial estimates of capital stock will have a diminishing impact on calculations as the year of estimation moves away from the bench-mark year.

Building-up of estimates of capital stock by perpetual inventory method thus involves two important steps:

(i) Setting-up of a bench-mark year, and

(ii) Making assumption regarding d and r for the initial period.

It is considered that for the manufacturing sector a year at a distance of 18 to 20 years would provide a good bench-mark. Thus, a bench-mark set at, say, 1961 should give usable estimates of capital stock at the end of 1981 and onwards. Need for making assumptions regarding d in the years other than the initial period will arise only if data on capital consumption are not available directly as it is the case. The method also presupposes the availability of figures of gross fixed capital formation at current prices if relevant price indices are available, otherwise at constant prices.

As rates of depreciation and growth of capital stock would normally be different for different categories of assets it would be appropriate to prepare estimates of stocks, at least by two categories, namely (1) construction works (non-residential buildings plus other construction works), and (2) plants, machinery and equipment, including transport equipment. However, only few countries provide the required details and in their absence proper weights would have to be assigned in the initial period to the two categories of assets.

Figures of capital stock are compiled by following two concepts, "gross" and "net". Gross capital stock represents the total volume of the existing physical productive assets available in a country. It reflects the original new cost of capital revalued at a suitable common base reference year's replacement prices. Net capital stock on the other hand represents the cumulated "depreciated" value of the existing gross stock of capital. Thus, the difference in the two concepts lies in the cumulated capital consumption, that is, gross capital stock minus cumulated capital consumption will give net stock of capital. Gross concept is useful in studies of capital as input in production, while net concept is more relevant for estimation of replacement requirements of capital stock.

Before embarking upon actual estimation of figures of capital stock it would be interesting and useful to analyse relations and behaviour of concerned variables in the economies for which data are directly available. Any general pattern emerging from the analysis would greatly help in making assumptions regarding d and r for the initial period. Table 2 gives capital-output ratios, worked out from constant price data, for manufacturing sector of Germany Fed. Rep., Sweden and U.K. and U.S.A. Capital refers to gross stocks at the end of the year, while output is gross value added during the year, both measured in constant prices.

TABLE 2: Capital-output ratio in manufacturing sector

Year	Germany Fed. Rep.	Sweden	U.K.	U.S.A.
1970	1.586	2.750	2.916	1.484
1972	1.740	2.962	3.062	1.395
1973	1.723	2.882	2.876	1.287
1974	1.798	2.856	2.994	1.397
1975	1.943	2.989	3.292	1.554
1976	1.836	3.126	3.301	1.469
1977	1.828	3.459	3.303	1.431
1978	1.842	3.658	3.353	1.414
1979	1.789	3.505	3.439	1.441
1980	1.816	3.559	3.824	1.567
1981	1.897	3.769	4.106	1.582

The figures immediately reveal differences in the structures of manufacturing sector of these countries. The ratio is the least in U.S.A. and highest in U.K. Also the figures show that capital-output ratio (ICOR) has a tendency to increase over time. In other words, capital stock grows faster than output. Capital output ratio is influenced among other factors by changes in technology - a higher technology associated with higher capital-output ratio. As developing countries endeavour to shift to higher levels of technology there is a tendency of increasing ICOR and consequently increasing capital-output ratio may be expected in their case also.

Further analysis in terms of composition of capital stocks and rates of capital consumption is likely to shed some more light on differences in capital-output ratios. This is done in Tables 3 and 4.

Figures in Table 3 lead to two general observations. First, stocks of construction works constitute smaller part of total stocks, whether we go by "gross" concept or "net" concept. Second, the share has a declining trend, though sharper in some countries than others.

Capital consumption does not seem to project a general pattern. Its ratio in terms of net capital stock reveal an increasing trend in the case of Germany Fed. Rep., and U.K., but a declining trend in U.S.A. In terms of value added tendency to increase seems to be very weak.

Data on capital consumption are not available separately for construction works and producers' goods. The combined data puts the average useful life of assets at about 16 years in U.K. and 10 years in Germany and U.S.A. Thus, rate of capital consumption is much higher in the latter countries as compared with U.K., though in terms of value added it is much closer. Thus, it may be said that rate of capital consumption in terms of value added would not be a guide to estimation of life span of fixed assets.

Estimates of capital stock in the manufacturing sector: An attempt is made here to estimate figures of capital stock for few selected countries by following the perpetual inventory method as described in the preceeding section. Quality of estimates will obviously depend on quality and details of available data. Only few countries provide break-down of gross fixed capital formation into types of assets. Similarly, figures of capital consumption are available in respect of very few countries only. Moreover, data on these variables are mostly at current prices. This raises the need of finding suitable price indices. Then, data on gross fixed capital formation and value added as available from the Yearbook of National Accounts Statistics and the Yearbook of Industrial Statistics are generally at variance, partly due to differences in coverage of establishments and partly due to differences in concepts. Whatever figures of capital consumption are available, they are from National Accounts Statistics. This poses the problem of linking them with industrial statistics.

If figures of capital stock have got to be prepared at the 3-digit level of ISIC, the only source of data on gross fixed capital formation in required details is the Yearbook of Industrial Statistics, which, however, does not contain figures of capital consumption. Even the Yearbook of National Accounts Statistics does not provide data in such detail. Computation of price indices will be yet another problem. National Accounts Statistics provides statistics of gross fixed capital formation in current and at constant prices at the most at 2-digit level of ISIC. In view of many adjustments which have to be carried out to available data as well as involved assumptions it would be only desirable to estimate figures of capital stock for the manufacturing sector as a whole, at least to begin with. This exercise may be extended to 2-digit or 3-digit level of ISIC later when time series data on gross fixed capital formation in constant prices has been prepared at 3-digit levels on the lines as suggested in the earlier section.

TABLE 3: Share of construction works in capital stocks 1/ of manufacturing sector

(Percentage)

Year	Gross Concept				Net Concept		
	FRG	Sweden	U.K.	U.S.A.	FRG	U.K.	U.S.A.
1970	40.7	45.2	37.2	45.8	44.2	32.8	44.6
1972	39.5	44.3	36.3	44.6	42.5	32.4	43.6
1973	39.1	43.8	35.8	43.8	42.0	32.2	42.5
1974	38.9	43.2	35.3	42.8	41.9	31.8	41.1
1975	38.8	42.7	34.8	41.7	41.9	31.5	40.0
1976	38.8	42.5	34.4	40.8	42.0	31.2	38.9
1977	38.7	42.2	34.0	39.6	41.8	30.9	37.5
1978	38.8	42.1	33.5	38.5	41.7	30.6	36.5
1979	39.0	42.0	33.2	37.2	41.4	30.2	35.1
1980	38.8	41.8	32.8	36.2	41.0	29.9	34.4
1981	38.8	41.6	32.6	35.4	40.5	30.0	33.8

TABLE 4: Rates 2/ of capital consumption of manufacturing sector

Year	As percent of net capital stock			As percent of value added		
	FRG 3/	U.K.	U.S.A.	FRG	U.K.	U.S.A.
1970	9.5	4.4	11.8	8.4	7.5	8.9
1972	9.1	5.2	11.9	9.3	9.0	8.6
1973	9.4	4.9	11.4	9.1	8.9	8.2
1974	9.7	5.0	9.8	9.4	10.2	8.7
1975	10.0	5.2	10.0	10.3	10.5	8.9
1976	10.2	5.4	10.0	10.0	11.0	8.3
1977	10.3	5.7	10.2	9.7	10.9	8.4
1978	10.5	5.8	9.9	9.5	10.9	8.3
1979	10.7	5.7	9.7	9.3	11.4	8.7
1980	-	5.8	9.7	10.5	12.2	9.6
1981	-	6.1	10.3	11.0	13.1	10.1

Source: Yearbook of National Accounts Statistics 1981 and 1982.

1/ Capital stocks refer to the sum of stocks of construction works and producers' durable goods, both measured in constant prices.

2/ Rates derived from data in current prices.

3/ Data for Germany, FR has been taken from Yearbook of National Accounts Statistics, 1981. 1982 Edition of the Yearbook does not contain data on capital stock in current prices.

5.2 Description of the estimation of capital stocks for selected countries

In the following a detailed descriptions of the procedure followed in estimating the capital stock of Finland, Zimbabwe, Colombia, Turkey, Hungary, Chile, Ecuador, Panama, Republic of Korea, Philippines, and are presented in the order of the calculation.

First, the available statistical information necessary for the estimation, i.e., time-series of capital formation, price-indices, value-added, are published together with their sources and then, the results of the estimation. In the explicit forms of the equations used in the estimation also are presented.

1. Finland

During 1960 - 1962, the value added in the manufacturing sector of Finland increased at an average rate of 7.5 percent per annum. Assuming the same growth rate for capital stocks and a 9 percent rate of capital consumption (as in the Federal Republic of Germany), the estimate of capital stock of fixed assets at the end of 1961 in 1975 prices will come to:

$$K_{61} = \frac{1 + 0.075}{0.090 + 0.075} \times 3307$$ where 3307 is the average yearly fixed capital formation during 1960-1962.

= 21546 mill markkaa at 1975 prices.

Once the bench-mark figure has been estimated, capital stocks at other points of time can be computed by adding gross or net investment to the bench-mark figure. Thus, capital stock at the end of 1981 will work out:

$$\text{Gross } K_{81} = 21546 + \sum_{1962}^{1981} \text{gross fixed capital formation}$$

= 21546 + 92498 = 114044 mill markkaa at 1975 prices

$$\text{Net } K_{81} = 114044 - \sum_{1961}^{1981} \text{capital consumption}$$

= 114044 - 49739 = 64305 mill markkaa at 1975 prices

The tigure of gross stock, however, needs slight adjustment on account of capital consumption which has accumulated over a period of 21 years instead of 11 years, the assumed average life of assets. The adjusted figure will come to:

$$114044 - \sum_{1961}^{1971} \text{capital consumption}$$

= 114044 - 20194 = 93850 mill markkaa at 1975 prices

Table A: Gross fixed capital formation in manufacturing sector

(mill Finnish Markkaa)

Year	GFCF in current prices 1/	Implicit price index of GFCF 2/	GFCF in 1975 prices
1960	780	27.1	2878
1961	1048	28.0	3743
1962	954	28.9	3301
1963	959	31.3	3064
1964	1119	32.4	3401
1965	1273	34.2	3722
1966	1347	35.1	3838
1967	1159	36.9	3141
1968	1307	41.0	3188
1969	1676	43.1	3889
1970	2553	47.7	5352
1971	3124	53.3	5861
1972	3340	60.2	5528
1973	3515	70.7	4972
1974	5704	87.3	6534
1975	6499	100.0	6499
1976	6279	110.4	5687
1977	5962	123.8	4816
1978	4810	126.6	3799
1979	5730	134.8	4251
1980	8460	149.5	5659
1981	9833	164.0	5996

1/ Industrial Statistics
2/ National Accounts

Table B: Net fixed capital formation in manufacturing sector
(mill Finish Markaa)

Year	Value added in current prices 1/	Capital Consumption in current prices (10% of value added)	Capital Consumption in 1975	NFCF in 1975 prices
1960	3722	372	1373	1505
1961	4190	419	1496	2247
1962	4426	443	1533	1768
1963	4590	459	1466	1598
1964	5200	520	1605	1796
1965	5620	562	1643	2079
1966	6040	604	1721	2117
1967	6650	665	1802	1339
1968	8260	826	2015	1173
1969	9730	973	2258	1631
1970	11340	1134	2377	2975
1971	12140	1214	2278	3583
1972	14470	1447	2404	3124
1973	17910	1791	2533	2439
1974	25040	2504	2878	3656
1975	27050	2705	2705	3794
1976	30780	3078	2788	2899
1977	32800	3280	2649	2167
1978	37940	3794	2997	802
1979	45840	4584	3401	850
1980	53500	5350	3579	2080
1981	59180	5918	3609	2387

Sources: UNIDO data base for GFCF in current prices and value added in current prices; Yearbook of National Accounts Statistics (various issues) for derivation of implicit price indexies of GFCF in manufacturing sector. Yearbook of National Accounts Statistics does not provide data on capital consumption in manufacturing sector. The series in current prices has been computed on the assumption that capital consumption is 10 percent of value added. The constant price estimates have been obtained by deflating the current price figures, using the implicit index of GFCF.

1/ Industrial Statistics

2. Zimbabwe

Some issues of the Census of Production provide information on the book value of fixed assets. Analysis of data shows that in the early sixties the average useful life of land and buildings was about 33 years, that of plant and machinery about 10 years and of vehicles 3.5 years. However, most of reported balance sheet figures reflect a cumulation of historical prices and as such do not represent current replacement values of assets. In the absence of any objective basis for fixing useful life of different categories of assets it is assumed though somewhat arbitrarily, that buildings and other construction works had an economic life span of 60 years and machinery and equipment, including vehicles, a life span of 16 years. It is also assumed that in early sixties stocks of fixed assets in the form of land and buildings constituted 40 percent of total stocks of the manufacturing sector. Thus 60 percent of total stocks were in the form of machinery and equipment. As there is no depreciation of land, we have to exclude it from the wintage of capital assets, before we set to prepare an estimate of the rate of capital consumption during 1960 - 1962. Again there is no basis for making adjustment for land. It is, however, considered that in the early sixties the value of land should not have made more than 33.3 percent of land and buildings or 13 percent of total stocks of assets. These assumptions lead to the following calculations of capital consumption on a linear scale:

(1) yearly capital consumption of construction works = $\frac{30}{60} = 0.5$

(2) yearly capital consumption of machinery and equipment = $\frac{60}{16} = 3.75$

(3) Total capital consumption = 0.5 + 3.75 = 4.25, putting the average useful life of reproducible assets at about 21 years.

As, however, data on share of land in capital formation are not available, estimates of stocks of assets would have to be prepared, inclusive of land. The rate of capital consumption in 1961 - the bench-mark year of our calculations - can roughly be taken as 4.25 percent per annum of total stocks.

Manufacturing value added in Zimbabwe increased by 10.2 percent in 1961 over 1960. However, the growth rate slowed down to 6.1 percent in 1962. In 1963 value added declined below the level of 1962 by 1.6 percent. We can thus put the average growth rate of value added in early sixties at 5.0 percent per annum. Assuming the same growth rate for capital stock the bench-mark figure will work out as

$$K_{61} = \frac{1 + 0.0500}{0.0425 + 0.0500} \times 55,$$ where 55 is the average yearly capital formation during 1960-1972.

= 624 mill Zim. dollars at 1975 prices

From the bench-mark estimate we can prepare the estimate of gross stocks and net stocks at the end of 1981. Thus

$$\text{Gross } K_{81} = \text{bench-mark estimate} + \sum_{1962}^{1981} \text{gross fixed capital formation}$$

= 624 + 1150 = 1744 mill Zim. dollars at 1975 prices and

$$\text{Net } K_{81} = \text{gross } K_{81} - \sum_{1961}^{1981} \text{capital consumption}$$

= 1774-651 = 1123 mill Zim. dollars at 1975 prices.

Use of the above figures, however, need some caution. First, land which is included in the estimates of stocks is not a reproducible asset. According to national accounts concepts neither it should be included in the estimates of capital formation. Therefore, in cross-country studies or in working out replacement requirements of capital stocks this factor should be borne in mind. Second, assumptions made in the preceeding paragraphs put the average life of assets at 21 years. In out calculation of gross stock at the end of 1981 we have also included depreciation for 21 years. Any variation in the life span of assets would make the figure either an over-estimate or an under-estimate.

TABLE A: Gross fixed capital formation 1/ in the manufacturing sector
(mill Zimbabwean Dollars at 1975 prices)

Year	GFCF in current prices 2/	Implicit price index of GFCF 2/	GFCF in 1975 prices
1960	33.6	55.0	61.1
1961	33.1	55.3	59.9
1962	23.3	56.1	41.5
1963	29.6	57.4	51.6
1964	14.2	57.6	24.7
1965	13.8	57.9	23.8
1966	15.6	59.8	26.1
1967	17.5	59.9	29.2
1968	34.4	60.7	56.7
1969	34.3	61.3	55.9
1970	32.2	66.7	48.3
1971	38.5	71.9	53.5
1972	42.2	94.8	44.5
1973	73.0	76.1	95.9
1974	102.2	88.1	116.0
1975	124.6	100.0	124.6
1976	79.3	112.0	70.8
1977	57.3	120.0	47.7
1978	45.2	127.6	35.4
1979	50.7	151.5	33.5
1980	123.6	171.9	71.9
1981	205.2	208.6	98.4

1/ It refers to "net capital expenditure" as given in Census of Production. The Census uses the term "net" to mean total capital expenditure after deducting sale value of assets sold out during the year. The figures are thus gross of capital consumption, that is, they are estimates of gross fixed capital formation.

2/ Industrial Statistics

3/ National Accounts

Table B: Net fixed capital formation in the manufacturing sector at 1975 prices (mill Zimbabwean dollars)

Year	Capital Consumption in current prices	Capital Consumption in 1975	NFCF in 1975 prices
1960	8.2	14.9	46.2
1961	10.0	18.1	41.8
1962	12.3	21.9	19.6
1963	11.5	20.0	31.6
1964	10.9	18.9	5.8
1965	12.3	21.2	2.6
1966	12.8	21.4	4.7
1967	12.9	21.5	7.7
1968	14.3	23.6	33.1
1969	16.5	26.9	29.0
1970	20.2	30.3	18.0
1971	23.5	32.7	20.8
1972	26.6	28.1	16.4
1973	31.0	40.7	55.2
1974	38.2	43 3	72.7
1975	42.4	42.4	82.2
1976	43.4	38.7	32.1
1977	46.6	35.5	12.2
1978	48.2	37.8	(-)2.4 1/
1979	58.0	38.3	(-)4.8 1/
1980	76.1	44.3	27.6
1981	95.7	45.9	52.5

Source: GFCF figures are from Census of Production (various issues), Central Statistical Office, Zimbabwe, figures of capital consumption for some years have been culled out from Census of Production, while for others they have been estimated by linking capital consumption to value added; price index for 1969 through 1981 is implicit index in the figures of GFCF of manufacturing sector at current and constant prices. For back years it is based on GFCF of the economy as a whole, linked at 1970.

1/ Negative values of net fixed capital formation in 1978 and 1979 are not considered abnormal, though not very likely.

3. Colombia

Yearbook of National Account Statistics does not provide information on capital consumption for the manufacturing sector. Capital consumption in Chile and Venezuela in the Seventies constituted about 10.5 percent of value added at current prices. If, however, the same rates of capital concumption are applied to Colombia, we arrive at negative figures of net capital formation for most of the years. Apparently, the rate of capital consumption in that country should have been much lower. In case of Colombia, therefore, we use the alternative method, that is, capital consumption is to be estimated on the basis of assumptions about the life span of capital assets.

Extension of assumptions which were made in case of Zimbabwe to Colombia will give a rate of capital consumption of 4.42 pecent per annum. Value added of the manufacturing sector of Colombia was increasing at a rate of about 5 percent per annum in early Sixties. Assuming the same growth rate of capital stock the bench-mark figure works out as

$$K_{61} = \frac{1 + 0.050}{0.0442 + 0.050} \times 4458,$$

where 4458 is the average yearly fixed capital formation in 1960-1962.

= 4961 mill pesos in 1975 prices.

Table A: Gross fixed capital formation of the manufacturing sector

(mill Pesos)

Year	GFCF in current prices 1/	Implicit price index 2/ of GFCF 3/	GFCF in 1975 prices
1960	525 4/	12.3	4268
1961	603 4/	13.3	4534
1962	663 4/	14.5	4572
1963	774	18.5	4184
1964	1248	19.8	6303
1965	1632	22.7	7189
1966	2095	27.6	7591
1967	2367	31.0	7635
1968	1833	34.4	5328
1969	2463	37.9	6603
1970	2847	41.1	6927
1971	4189	46.2	9067
1972	3941	51.0	7727
1973	4903	59.9	8185
1974	4345	82.7	5254
1975	5531	100.0	5531
1976	13213	121.5	10875
1977	19552	160.4	12190
1978	16079	198.9	8084
1979	24415	251.2	9719
1980	23198	318.8	7277
1981	36881	398.6	9253

Source: UNIDO data base for GFCF of manufacturing sector; Yearbook of National Accounts Statistics for deriving implicit price index.

1/ Industrial Statistics

2/ Implicit price index of GFCF for 1970 through 1981 is based on current price values and 1975 price values of fixed investment, excluding residential buildings, of the whole economy. For other years it is based on total gross fixed capital formation of the economy.

3/ National Accounts

4/ UNIDO data base or Yearbook of Industrial Statistics does not provide figures of gross fixed capital information for 1960 through 1962. They have been estimated in current prices, using average ICOR.

Estimates of capital consumption and net capital stocks are worked out in Table B, which also gives figures of gross stock in 1975 prices.

Table B: Estimates of capital consumption and capital stocks of the manufacturing sector in 1975 prices

(mill Pesos)

Year	Capital Consumption[1/]	Gross Stocks	Net Stocks
1960			
1961	2021	49691	47670
1962	2107	54263	50135
1963	2216	58447	52103
1964	2303	64750	56103
1965	2480	71939	60812
1966	2688	79530	65716
1967	2905	87165	70445
1968	3114	92493	72659
1969	3203	99096	76059
1970	3362	106023	79624
1971	3703	115090	84988
1972	3952	122817	88763
1973	4127	131002	92821
1974	4316	136256	93759
1975	4360	141787	94930
1976	4414	152662	101391
1977	4715	164852	108866
1978	5062	172936	111888
1979	5203	182635	116384
1980	5412	189932	118269
1981	5500	199185	122049

It may be emphasized once again that the reliability of estimates of capital stock by the perpetual inventory method increases as the year of estimation moves away from the bench-mark and as such the estimate for 1981 only, may be usable.

1/ For the years 1960-1970 capital consumption has been taken as 4.42 percent of net stock of assets, assuming stocks of construction works to form 40 percent of total stocks. For later years, however, the proportion has been reduced to 35 percent. Keeping life span of assets unaltered. Capital consumption rate works out 4.65 percent of stock.

4. Turkey

The value added of the manufacturing sector of Turkey registered a fast growth rate of about 10 percent in early Sixties. Assuming the same growth rate of fixed assets and maintaining other assumptions regarding the life span of assets and their composition as in Zimbabwe, the bench-mark figure of stock of fixed assets will come to:

$$K_{61} = \frac{1 + 0.1000}{0.0425 + 0.1000} \times 3582,$$ where 3582 is the average fixed capital formation during 1960-1962.

= 27651 mill Liras in 1975 prices, and

Gross K_{81} = 27651 + $\sum_{1962}^{1981}$ gross fixed capital formation

= 27651 + 240886 = 268537 mill Liras in 1975 prices

Net K_{81} = 268537 - $\sum_{1962}^{1981}$ capital consumption

= 268537 - 105157 = 163380 mill Liras in 1975 prices.

The Yearbook of National Accounts Statistics does not provide for Turkey any information on capital consumption of the manufacturing sector. Some issues of the Yearbook, however, contain data on capital consumption for the whole economy. Analysis shows that in Turkey capital consumption constituted about 6 percent of GDP. Assuming the same rate of capital consumption in the manufacturing sector figures of net fixed capital formation have been worked out in Table B.

Table A: Gross fixed capital formation of the manufacturing sector

(mill Lira)

Year	GFCF in current prices 1/	Implicit price index 2/ of GFCF 3/	GFCF in 1975 prices
1960	537	230	2335
1961	548	23.5	2332
1962	1465	24.1	6079
1963	1115	25.5	4773
1964	2073	25.9	8004
1965	1626	27.9	5828
1966	1666	31.2	5340
1967	2222	33.3	6673
1968	2491	33.9	7348
1969	1969	34.6	5691
1970	4094	40.0	10235
1971	5033 3/	49.5	10167
1972	6054 3/	51.1	11847
1973	9243	61.2	15103
1974	10693	78.1	13691
1975	14904	100.0	14904
1976	17123	101.5	16870
1977	22283	103.6	21509
1978	30437	141.4	21525
1979	51944	226.2	22963
1980	72220	465.5	15515
1981	133018	790.8	16821

Source: UNIDO data base for GFCF in current prices for 1963 through 1981, excluding 1971 and 1972; Yearbook of Industrial Statistics for 1960 through 1962.

1/ Industrial Statistics

2/ Implicit price index of GFCF for 1973 through 1977 derived from current and 1973 price values of gross fixed capital formation in machinery and equipment in the economy, while for other years it is based on total GFCF in the economy.

3/ GFCF for 1971 and 1972 estimated on the basis of average ICOR.

Table B: Net fixed capital formation of the manufacturing sector
(mill Liras)

Year	Capital Consumption in current prices	Capital Consumption in 1975 prices	NFCF in 1975 prices
1960	372	1617	718
1961	414	1762	570
1962	462	1917	4162
1963	398	1561	3212
1964	483	1865	6139
1965	694	2487	3341
1966	783	2510	2830
1967	1094	3285	3388
1968	1228	3622	3726
1969	1168	3376	2315
1970	1708	4270	5965
1971	2106	4255	5912
1972	2513	4918	6929
1973	3298	5389	9714
1974	4521	5789	7902
1975	5265	5265	9639
1976	6752	6652	10218
1977	8808	8502	13007
1978	14274	10095	11430
1979	22122	9780	13183
1980	42720	9177	6338
1981	68640	8680	8141

5. Hungary

Manufacturing value added in Hungary was increasing at a rate of about 7.5 percent per annum in early Sixties. Assuming the same rate of growth of capital stock and taking 16 years average life of assets (same as in the U.K.) the figure of stocks at the end of 1961 will work out:

$$K_{61} = \frac{1 + 0.0750}{0.0625 + 0.0750} \times 11.8,$$

where 11.8 is the average gross fixed capital formation during 1960-1962.

= 92.3 billion forints at 1975 prices and

$$\text{Gross } K_{81} = 92.3 + \sum_{1962}^{1981} \text{gross fixed capital formation}$$

= 92.3 + 612.7 = 705.0 billion forints at 1975 prices.

The figure, however, needs some adjustment. As the average life of assets has been assumed 16 years, capital consumption should cumulate only over that period and, therefore, cumulated capital consumption over the period 1961-1965 should be taken out from the above figure. Thus the adjusted figure of gross capital stock at the end of 1981 will come to:

Net capital stock at the end of 1981 will be

$$\text{Net } K_{81} = 705.0 - \sum_{1961}^{1981} \text{capital consumption}$$

= 705.0 - 388.3 = 316.7 billion forints at 1975 prices.

It should be noted that two sources of data, namely, industrial statistics and national accounts statistics reveal large differences in the figures of gross fixed capital formation, the former giving much lower figures. Therefore, figures of capital consumption based on national accounts statistics would be over-estimates or under-estimates and should be adjusted. The adjustment carried out on the basis of value added (net material product) gives an estimate of net capital stock equal to:

$$\text{Net } K_{81} = 310.7 - 10.5 = 300.2 \text{ billion forints at 1975 prices}$$

Table A: Gross fixed capital formation of the manufacturing sector

(000 bill forint)

Year	GFCF in current prices 1/	Implicit price index of GFCF in industrial activity (1975=100)	GFCF in 1975 prices
1960	9.5	86.6	11.0
1961	9.5	84.8	11.2
1962	11.1	83.8	13.2
1963	11.5	82.7	13.9
1964	12.3	82.7	14.9
1965	11.6	78.8	14.7
1966	14.2	77.1	18.4
1967	18.9	75.5	25.0
1968	15.5	86.6	17.9
1969	20.7	87.7	23.6
1970	23.4	88.4	26.5
1971	27.8	89.3	31.1
1972	30.9	92.2	33.5
1973	31.1	94.6	32.9
1974	33.9	97.2	34.9
1975	38.8	100.0	38.8
1976	43.1	103.2	41.8
1977	56.5	107.4	52.6
1978	59.1	110.4	53.5
1979	56.0	113.4	49.4
1980	44.8	114.7	39.1
1981	42.6	115.1	37.0

1/ Industrial Statistics

Table B: Net fixed capital formation of the manufacturing sector

(000 bill Forint)

Year	Capital Consumption in current prices	Capital Consumption in 1975 prices
1960	7.8	3.6
1961	8.3	2.9
1962	9.1	4.1
1963	9.8	4.1
1964	10.6	4.3
1965	11.8	2.9
1966	12.7	5.7
1967	13.6	11.4
1968	14.6	3.3
1969	15.3	8.3
1970	16.0	6.9
1971	16.9	9.6
1972	18.0	13.8
1973	19.1	14.4
1974	20.2	12.7
1975	21.8	17.0
1976	23.6	18.2
1977	25.0	27.6
1978	27.3	26.2
1979	29.1	20.3
1980	31.6	7.5
1981	33.9	3.1

Source: UNIDO data base and Yearbook of Industrial Statistics for GFCF; Yearbook of Accounts Statistics for implicit price index of GFCF in industrial activity.

Note: Figures of capital consumption have been derived from constant price data of gross fixed capital formation and net fixed capital formation as available from Yearbook of National Accounts Statistics. They are thus unadjusted for differences in coverage of establishments for industrial statistics.

6. Chile

Assuming a growth rate of 7.5 percent per annum of capital stock in early Sixties, based on the value added growth rate and the same useful life as in Colombia, the estimate of capital stock of fixed assets of the manufacturing sector at the end of bench-mark year 1961 will be equal to:

$$K_{61} = \frac{1 + 0.0750}{0.0442 + 0.0750} \times 512,$$

where 512 is the average gross fixed capital formation in 1960-1962.

= 4617 mill pesos in 1975 prices

On this basis, the estimate of fixed capital stock at the end of 1981 comes to:

$$\text{Gross } K_{81} = 4617 + \sum_{1962}^{1981} \text{gross fixed capital formation}$$

=4617 + 16968 = 21585 mill pesos in 1975 prices.

Figures of capital consumption in the manufacturing sector are available for the period 1974 - 1981 from the Yearbook of National Accounts Statistics. A quick analysis of the figures shows that during this period capital consumption contributed 10 percent on an average to gross value added. Application of this rate uniformly throughout the period makes net fixed capital formation negative for most of the years - a situation not tenable on practical grounds. Therefore, figures of capital consumption of the Yearbook of National Accounts Statistics were rejected. Instead, estimates of capital consumption were obtained by following the technique used in case of Colombia. These estimates along with figures of net fixed capital formation are given in Table B.

Table A: Gross fixed capital formation of the manufacturing sector
(mill Pesos)

Year	GFCF in current prices 1/	Implicit price index of GFCF (1975=100)	GFCF in 1975 prices
1960	0.024	0.00532	450
1961	0.053	0.01273	534
1962	0.075	0.01359	551
1963	0.110	0.02079	529
1964	0.173	0.03160	547
1965	0.284	0.04093	694
1966	0.401	0.05354	749
1967	0.590	0.06627	890
1968	1.04	0.08632	1205
1969	1.34	0.11927	1124
1970	1.47	0.16	919
1971	1.62	0.14	1157
1972	2.88	0.43	670
1973	32.33	2.16	1497
1974	64.00	19.20	333
1975	934.00	100.0	934
1976	1708.00	319.6	534
1977	2745.00	621.9	441
1978	6994.00	989.4	707
1979	12887.00	1360.1	947
1980	21113.00	1735.7	1216
1981	26738.00	2019.3	1324

1/ Industrial Statistics

Table B: Net fixed capital formation of the manufacturing sector

(mill Pesos)

Year	Capital Consumption 1/ in 1975 prices	Net fixed capital formation in 1975 prices
1961	196	338
1962	210	341
1963	224	305
1964	238	309
1965	257	437
1966	278	471
1967	304	586
1968	342	863
1969	375	749
1970	398	521
1971	451	706
1972	461	209
1973	507	990
1974	499	(-)166
1975	519	415
1976	519	15
1977	515	(-)74
1978	524	183
1979	544	403
1980	574	642
1981	607	717

Net capital stock of fixed assets at the end of 1981 will be equal to

Net K_{81} = 21585 - $\sum_{1961}^{1981}$ capital consumption

= 21585 - 8542

= 13043 mill pesos in 1975 prices

1/ For 1961 through 1970 capital consumption rate has been taken at 4.42 percent per annum, while for other years it is 4.65 percent of net capital stock of fixed assets.

7. Ecuador

The manufacturing value added in Ecuador in early Sixties increased at an average rate of 4 percent per annum. Assuming the rate of growth of capital stock also at 4 percent and keeping the assumptions of life span and composition of assets the same as in Zimbabwe, the capital stock at the end of 1961 will be:

$$K_{61} = \frac{1 + 0.0400}{0.0442 + 0.0400} \times 749.7,$$

where 749.7 is the average gross fixed capital formation in 1960-1962.

= 9260 mill. sucres in 1975 prices, and

$$\text{Gross } K_{81} = 9260 + \sum_{1962}^{1981} \text{gross fixed capital formation.}$$

The figures of capital consumption for Ecuador are not available. They can be worked out on the basis of the assumption made above. This has been done in Table B.

The estimate of net capital stocks at the end of 1981 will be:

$$\text{Net } K_{81} = 61912 - \sum_{1961}^{1981} \text{capital consumption}$$

= 61912 - 18643 = 43269 mill sucres in 1975 prices

It may be noted that in the case of Ecuador rate of growth of fixed capital formation gathered momentum in the Seventies. Therefore, the cumulated capital consumption is a small proportion of either gross capital stock or net capital stock in comparison with what it works out in other developing countries.

Table A: Gross fixed capital formation of the manufacturing sector

(mill Sucres)

Year	GFCF in current prices 1/	GFCF price index 2/	GFCF in 1975 prices
1960	218 3/	28.2	773
1961	235 3/	29.6	794
1962	225 3/	30.3	682
1963	243	31.5	771
1964	308	32.6	945
1965	288	33.8	852
1966	365	35.1	1040
1967	485	36.9	1314
1968	607	38.1	1593
1969	840	38.4	2187
1970	905	43.0	2105
1971	605	47.3	1279
1972	960	59.9	1603
1973	1443	68.2	2116
1974	2501	83.5	2995
1975	3152	100.0	3152
1976	3962	116.6	3398
1977	5606	134.6	4164
1978	6831	151.5	4509
1979	7703	168.2	4580
1980	13245	198.2	6683
1981	15338 3/	230.1	6666

1/ Industrial Statistics

2/ Based on GFCF in the economy as a whole.

3/ Estimated on the basis of average ICOR.

Table B: Net fixed capital formation of the manufacturing sector

(mill Sucres)

Year	Capital Consumption in 1975 prices	NFCF in 1975 prices
1961	392	402
1962	404	278
1963	420	351
1964	442	503
1965	459	393
1966	484	556
1967	519	795
1968	565	1028
1969	633	1554
1970	695	1410
1971	756	523
1972	794	809
1973	852	1264
1974	948	2047
1975	1046	2106
1976	1150	2248
1977	1284	2880
1978	1427	3082
1979	1567	3013
1980	1795	4888
1981	2011	4655

Source: UNIDO data base for gross fixed capital formation in current prices; Yearbook of National Accounts Statistics for derivation of GFCF index of prices.

8. Panama

The manufacturing value added in Panama registered an annual increase of 16 percent during the early Sixties. Assuming the same growth rate for capital stock during the period and maintaining other assumptions as in Zimbabwe, the estimate of capital stock at the end of 1961 will work out to:

$$K_{61} = \frac{1 + 0.1600}{0.0442 + 0.1600} \times 958,$$

where 958 is the average gross fixed capital formation during 1960-1962.

= 54.421 mill balboas in 1975 prices, and

$$\text{Gross } K_{81} = 54.421 + \sum_{1962}^{1981} \text{gross fixed capital formation}$$

= 54.421 + 716.102 = 770.523 mill. balboas in 1975 prices.

The estimate of net capital stock may be computed on the lines as in Ecuador.

Table A: Gross fixed capital formation of the manufacturing sector

(000 Balboas)

Year	GFCF in current prices 1/	GFCF price index 2/	GFCF in 1975 prices
1960	3185	63.5	5016
1961	6821	65.4	10430
1962	8655	65.1	13295
1963	9515	64.0	14867
1964	9597	65.6	14630
1965	10146	65.4	15514
1966	15978	66.8	23919
1967	26539	68.0	39028
1968	13402	68.4	19594
1969	12060	69.5	17353
1970	23056	73.2	31497
1971	22575	84.5	26716
1972	28911	70.3	41125
1973	49785	80.5	61845
1974	34367	89.5	38399
1975	32866	100.0	32866
1976	35198	109.3	32203
1977	87394	126.6	69032
1978	128731	151.4	85027
1979	51122	154.4	33110
1980	71079 3/	156.3	45476
1981	99273	163.8	60606

1/ Industrial Statistics

2/ Implicit price index of GFCF is based on current and constant price values of GFCF of the manufacturing sector.

3/ GFCF figures for 1960, 1961 and 1962 are not available in the Yearbook of Industrial Statistics. Figures as given in the Yearbook of National Accounts Statistics have been adopted without any adjustment.

9. Republic of Korea

The manufacturing value added in Korea has been growing at an annual rate of 6.5 percent in the early Sixties. Assuming the same rate of growth of capital stock during that period and keeping other assumptions unaltered, we get capital stock at the end of 1961 equal to:

$$K_{61} = \frac{1 + 0.0650}{0.0442 + 0.0650} \times 62.0,$$

where 62.0 is the average yearly gross fixed capital formation in 1960-1962.
= 604.70000 mill wons in 1975 prices, and

$$\text{Gross } K_{81} = 604.7 + \sum_{1982}^{1981} \text{gross fixed capital formation}$$

= 604.7 + 14592.1 = 15196.8000 mill won in 1975 prices.

Table A. Gross fixed capital formation of the manufacturing sector

(bill Won)

Year	GFCF in current prices 1/	GFCF price index	GFCF in 1975 prices
1960	5.3	8.8	60.2
1961	7.0	12.7	55.1
1962	10.0	14.1	70.9
1963	13.2	15.6	84.6
1964	19.2	19.9	96.5
1965	30.5	24.1	126.6
1966	22.0	27.9	78.9
1967	48.2	30.3	159.1
1968	69.0	31.3	220.4
1969	124.2	31.4	395.5
1970	106.5	35.2	302.6
1971	169.4	37.0	457.8
1972	255.2	42.0	607.6
1973	575.0	55.5	1036.0
1974	588.8	79.0	745.3
1975	837.9	100.0	837.9
1976	1118.3	104.7	1068.1
1977	1335.4	118.1	1130.7
1978	1820.4	126.6	1437.9
1979	3393.9	144.8	2343.9
1980	3457.2	190.4	1815.8
1981	3804.4	241.4	1576.0

Source: UNIDO data base for GFCF; Yearbook of National Accounts for derivation of implicit price index of GFCF.

1/ Industrial Statistics.

10. Philippines

The manufacturing sector of Philippines registered a growth of 7.5 percent per annum in the early Sixties. Taking the same growth rate for capital stock during that period and keeping other assumptions of Zimbabwe in tact, the figure of capital stock at the end of 1961 will work out as:

$$K_{61} = \frac{1 + 0.0750}{0.0442 + 0.0750} \times 1186,$$

where 1186 is the average yearly gross fixed capital formation in 1960-1962.
= 10696 mill pesos in 1975 prices, and

$$\text{Gross } K_{81} = 10696 + \sum_{1962}^{1981} \text{gross fixed capital formation}$$

= 10696 + 54025 = 64721 mill pesos in 1975 prices.

Table A. Gross fixed capital formation of the manufacturing sector

(mill Pesos)

Year	GFCF in current prices 1/	GFCF price index	GFCF in 1975 prices 2/
1960	241	23.3	1034
1961	382	29.3	1304
1962	432	35.4	1220
1963	341	30.5	1118
1964	409	31.6	1294
1965	453	32.4	1398
1966	602	33.5	1797
1967	698	34.7	2012
1968	668	35.6	1871
1969	818	37.0	2211
1970	1341	46.9	2859
1971	1179	52.0	2267
1972	1718	55.2	3113
1973	1462	68.0	2150
1974	2131	82.9	2571
1975	3296	100.0	3296
1976	2526	108.5	2328
1977	3026	111.8	2707
1978	4465	113.0	3951
1979	5440	126.8	4290
1980	8915	145.7	6119
1981	8721	159.9	5454

Source: UNIDO data base for GFCF; Yearbook of National Accounts Statistics for derivation of implicit price index.

1/ Industrial Statistics.

2/ Price index for 1970 through 1980 is based on current and constant price values of GFCF in producer's durable goods, while for other years it is based on GFCF for the economy as a whole, linked at 1970 and 1980.

5.3 Suggestions on the possible improvements of the methodology

The tentative nature of the estimates of capital stock would have become obvious by now. The weakness particularly lies in the derivation of price indices to convert current price figures of gross fixed capital formation into base year prices and in the assumptions which form the basis of computation of bench mark year estimates. Some improvement in the estimates can possibly be made by more judicous use of existing data. However this will need concerted efforts extended over a longer period than it was available for preparing the present set of estimates. Improvements can be effected on the following lines:

(1) For many countries details of fixed capital formation by type of assets are available for some years, at least. For these years implicit price indices should be based on (a) construction works, other than residential buildings, and (b) producers' durable goods. The two indices may be combined by assigning special weights to the two categories of assets.

(2) For some countries time series data on fixed capital formation are available over a much longer period than that used in the present exercise. Employment of long time-series data either will eliminate the need of the first step that is, preparing the bench-mark year estimate, or will greatly help in making assumptions about the growth rates of capital stock in the initial years of the time-series.

(3) The Yearbook of National Accounts statistics provides data on capital consumption for a few countries only and that too for the manufacturing sector as a whole. It is just possible that country sources may contain some details which would help in fixing capital consumption rate in the bench-mark year.

(4) For estimating figures of capital stock by manufacturing branches assumptions about growth rates of capital stock and capital consumption rates in the initial years of the time series would have to be based on country sources, as international sources hardly provide informaton in desired details. In a number of developing countries many branches such as industrial chemicals, machinery and transport equipment are of recent origin. Capital stock of these

branches in the initial years of the long time-series would not be of considerable magnitude. Thus lack of details in respect of these branches in initial period should not prove to be a major handicap. What is needed is to first undertake a study of the economies of developing countries with a view to locating branches which were of consequence in the bench-mark year set up for the purpose and make a thorough search of detailed data in their respect.

In the end it may be added that there are capital losses in every country due to calamities. Such losses are not included in capital consumption and need to be adjusted explicitly while making estimates of capital stock. Adjustment could not be possible due to complete lack of data. It is considered that such losses should only be a very small fraction of capital stock.

5.4 One possible use of the capital stock data defined the determinants of growth

Estimates of capital stock prepared and presented in the preceeding section have been used in Table 5 to compute some determinants of growth of the manufacturing sector namely, capital-output ratio and capital-employment ratio. The figures of capital stock which were compiled in national currencies have been brought to common valuation by using average foreign exchange rates prevailing in 1975.

Cross-country variations in values of determinants of growth of the manufacturing sector reveal interesting differences in structures of the sector. For instance, Sweden had the highest gross fixed capital per worker associated with the highest gross fixed capital per worker associated with the highest value added per employment ratio. On the other hand, gross fixed capital per worker is much higher in Germany than in USA, though value added per worker is almost the same in the two countries. High value of gross fixed capital per worker in UK does not seem to be associated with high labour producitivity. In fact, labour productivity in UK is as low as in many developing countries, though they have much lower values of gross fixed capital per worker. However, because of the sample size being small it is difficult to draw general conclusions. Moreover, the two variables in the

exercise namely, value added and employment (as a measure of labour service) are "flows" conceptually and their values relate to the whole year 1981. The Value of capital stock on the other hand represents the position as at the end of 1981. There is generally a time lag inbetween investment and production. Distortion, if any, in the results due to this factor may be ironed out to an extent by averaging value added and employment over a period of, say, three years, 1981-1982.

Table 5: Determinants of growth of the manufacturing sector - 1981

Selected Countries

Country	Value added (in mills)	Employment (in 000 nos.)	Gross fixed capital stock (in	Capital output ratio	Value added per worker	Gross fixed capital per worker
1. Germany, F.R.	154177	7056.0	310175	2.012	21850	43959
2. Japan	174834	10522.0	NA	-	16614	-
3. Sweden	18082	825.5	60860	3.366	21904	73725
4. U.K.	51087	5799.0	226000	4.424	8810	38974
5. U.S.A.	410734	18832.0	714000	1.738	21810	37913
6. Finland	8953	533.8	25558	2.855	16772	47879
7. Chile	3303	206.9	4395	1.331	15964	21242
8. Colombia	3699	500.7	6450	1.744	7388	12882
9. Ecuador	1017	126.8	2476	2.435	8021	19527
10. Korea, Rep. of	10574	2044.2	31397	2.969	5173	15359
11. Panama	341	35.2	771	2.261	9683	21893
12. Philippines	6286	1363.6	8938	1.422	4610	6555
13. Turkey	6802	830.0	18612	2.736	8195	8195
14. Zimbabwe	977	173.0	3096	3.169	5647	5647
15. Hungary	10945	1352.0	34491	3.151	8095	8095

Source:

1. UNIDO data base for value added.
2. Yearbook of Industrial Statistics - 1982 for employment.
3. Yearbook of National Accounts Statistics - 1982 for gross fixed capital stock for Federal Republic of Germany, Sweden, UK, and USA. Estimates prepared for other countries.

Notes:

1. Employment refers to "persons engaged" in all countries, except USA and Zimbabwe. In these two countries it refers to "employees".

2. For Chile, Ecuador and Philippines employment figures are not available for 1981. They have been estimated on the basis of 1980 figures.

Appendix

Provisional list of countries considered as elements of the sample

Algeria
Argentina
Australia
Austria
Belgium
Bolivia
Brazil
Bulgaria
Canada
Chile
China
Colombia
Czechoslovakia
Denmark
Ecuador
Egypt
Ethiopia
Finland
France
Germany, Dem. Rep.
Germany, Fed. Rep.
Ghana
Greece
Hungary
Hong Kong
Indonesia
India
Iran
Ireland
Italy
Japan
Kenya
Kuwait
Morocco
Mexico
Malaysia
Netherlands
New Zealand
Nigeria
Norway
Peru
Philippines
Portugal
Korea, Rep. of
Panama
Pakistan
Singapore
Swaziland
Sweden
Thailand
Tunisia
Turkey
Tanzania
USSR
United Kingdom
USA
Venezuela
Yugoslavia
Zambia
Zimbabwe