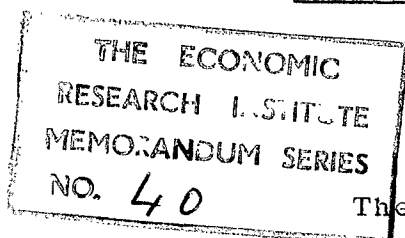# Industrialisation in developing countries.

By C. E. V. Leser.

There is much discussion in progress about
industrialisation and about developing countries, but it
is not self-evident what exactly these mean.   Conceptually
the most useful indicator of a country's state of
industrialisation may be the value added in manufacturing
per head of total population, reduced to a common currency
and to constant prices as required.   This has been estimated
by the U.N. Statistical Office for a large number of
countries with regard to 1958 and other bench-mark years,
expressed in 1953 U.S. dollars.   Only "market economies"
are covered; comparisons with the U.S.S.R. and Eastern
Europe are only possible on the basis of industrial
activity as a whole (incl. mining, electricity and gas),
and comparable data are lacking for mainland China and
several other countries.

On the basis of manufacturing value added per
capita of population in 1958, countries were classified
as industrialised or less industrialised; more recently,
a somewhat different classification into developed and
developing countries came into use.   Neither of these
classifications are satisfactory as they create anomalies
in border line cases.   However, the per capita value
added in manufacturing provides an obvious criterion for
dividing the countries of the world into three groups, as
there are two clearly marked breaks in the series.   The
three groups of countries are shown in Table 1: most of
the major countries not individually shown, apart from
the centrally planned economies , belong to the third
category.   There were thus, in 1958, 17 countries in
Group I and 16 countries in Group II; 42 Group III countries
are listed. Ireland is clearly in the middle group though
near its top.

Table 1. Value added in manufacturing per head of
population for 75 countries, 1958

Country	U.S.$.	Country	U.S.$.
Group I		Group III (selected countries)	
United States	828	Costa Rica	50
Luxemburg	663	Jamaica	49
Saar	625	Greece	48
Canada	592	Panama	46
United Kingdom	590	Colombia	44
Germany (Fed. Rep)	574	Brazil	41
Switzerland	569	Rhodesia & Nyasaland	36
West Berlin	559	Lebanon	34
Denmark	513	Turkey	33
Sweden	460	Algeria	31
New Zealand	457	Malaya	27
Norway	419	Ecuador	27
Australia	417	Peru	25
Belgium	377	Morocco	23
Austria	364	Nicaragua	20
France	353	Korea (Republic)	20
Netherlands	312	Honduras	20
		Libya	20
		El Salvador	19
		Guatemala	19
		Jordan	19
		China (Taiwan)	18
		Tunisia	18
		United Arab Republic	17
Group II		Syria	17
Israel	233	Iraq	16
Italy	208	Paraguay	16
Finland	179	Ceylon	15
Ireland	167	Philippines	15
South Africa	133	Congo (Leopoldville)	14
Puerto Rico	127	Kenya	12
Argentina	124	Iran	11
Yugoslavia	123	Mozambique	10
Japan	121	India	8
Uruguay	117	Thailand	8
Venezuela	115	Ghana	8
Spain	111	Pakistan	8
Trinidad & Tobago	103	Burma	7
Portugal	95	Uganda	6
Chile	75	Tanganyika	4
Mexico	72	Bolivia	4
		Indonesia	3

Source: U.N., The growth of world industry 1938-1961.

A low per capita manufacturing output may .
indicate either that the proportion of the total population
engaged in manufacturing is low, or that output per person
engaged is low; generally it will reflect both.   This
may be shown by computing, for the 75 countries listed
in Table 1, a double-logarithmic regression of manufacturing
employment L on output P.   Herein, P represents the $
values given in Table 1, and L the number of persons
engaged in manufacturing per 1,000 inhabitants obtained
from the same source. , The resulting equation for the
computed value L_c is

$$\log_{10} L_c = 0.554 + 0.573 \log_{10} P \quad (R^2 = .817)$$
$$(0.032)$$

or $$L_c = 3.58 \times P^{0.573}$$

Output per person engaged in $ is then represented by
the expression 1,000 P/L, and we have

$$\left(\frac{1,000 \ P}{L}\right)_c = 279 \times P^{0.427}$$

Thus manpower in manufacturing tends to rise slightly
faster than output per head with rising industrial
production.

A similar relationship, though referring not
to a point in time but to changes over time, is the
"Verdoorn Law" recently quoted by Kaldor (1966), who
applies it to annual exponential growth rates between
1953-4 and 1963-4 in 12 industrial countries.   The
result obtained is a 0.516% increase in employment and
a 0.484% increase in productivity associated with a 1%
increase in manufacturing output, apart from an autonomous
productivity rise and employment fall of 1.03% p.a.

However, the deviations from the relationship are as important as the relationship itself and may be studied for the 75 countries analysed here. Table 2 shows that there is a systematic regional element in these deviations which cuts across the grouping of countries by level of industrialisation. The averages shown here represent unweighted geometric means.

Table 2. Actual and expected number of persons
engaged in manufacturing by group of
of countries and region, 1958.

Countries	Number of countries	Average value added per inhabitant	Average persons engaged per 1,000 inhabitants		
			Actual	Expected on basis of regression	Actual (expected regression = 100)
Group I					
America & Oceania	4	553	91.2	133.4	68
Europe	13	478	139.8	122.8	114
Total	17	494	126.4	125.2	101
Group II					
America	7	102	43.2	50.8	85
Europe	6	142	73.3	61.2	120
Others	3	155	62.1	64.6	96
Total	16	125	56.4	57.0	99
Group III					
Africa	12	14	10.9	16.2	67
America	13	25	26.6	22.4	119
E & S.E. Asia	11	11	18.1	14.1	128
Middle East & Europe	6	26	22.3	22.9	97
Total	42	17	18.1	18.1	100
All countries	75	56	35.9	35.9	100

Source: Derived from U.N., The growth of world industry 1938 - 1961.

Thus in the European countries of groups I and II, employment makes a relatively large contribution and output per head a relatively small contribution to the level of manufacturing output attained, whilst the opposite is the case with regard to North America and Oceania in group I and the Latin American countries of group II. Similarly, the Asian and Latin American group III countries are characterised by relatively high employment and low output per head, whilst the opposite effect is very marked for the African countries.

These differences are clearly not accidental but in response to conditions such as population pressure or sparsity. One may therefore surmise that manpower shortage need not be an effective obstacle to industrial growth and may in fact facilitate rises in productivity. Of course, in most developing countries this is not a major issue.

Some further characteristics of the three groups of countries as a whole are presented in Table 3, which is based on totals, group III including countries not listed in Table I; in contrast to Table 2, the per head figures and proportions of heavy industries in total manufacturing thus represent weighted arithmetic means of individual country data. In accordance with the U.N. definition, light manufacturing includes food, beverages and tobacco; textiles; clothing, footwear and made-up textiles; wood products and furniture; printing and publishing; leather and leather products; rubber products; miscellaneous manufactures. Heavy manufacturing consists of: paper and paper products; chemicals and chemical, petroleum and coal products; non-metallic mineral products; basic metals; metal industries.

Table 3. Data for groups of countries by
level of industrialisation, 1958.

	Group			All market economies
	I	II	III	
Share of each group in % of all market economies				
Population	21.5	15.8	62.6	100.0
Gross domestic product	73.9	13.7	12.4	100.0
Value added in:				
All industrial activity	81.1	12.7	6.1	100.0
Manufacturing : total	82.7	12.3	5.0	100.0
light	78.2	13.9	7.9	100.0
heavy	85.7	11.2	3.0	100.0
Per head of population ($)				
Gross domestic product	1,707	432	98	498
Value added in				
Industrial activity	731.6	156.3	19.0	194.2
Manufacturing	638.2	129.0	13.2	166.1
Value added in heavy as % of all manufacturing	62.6	55.2	36.8	60.4

Source: Derived from U.N., The growth of world
industry 1938-1961.

The discrepancy between the distribution of
population and that of productive capacity is striking.
In 1958, about five people lived in group III countries
for every three in groups I and II countries.   On the
other hand, almost three-quarters of the value of goods
and services produced in the countries studied here
originated in group I countries alone.   The degree of
concentration becomes successively more marked when
attention is confined first to industrial activity, then
to manufacturing and finally to heavy manufacturing.

To put it in a different way, gross domestic
product per capita is more than 17 times as high in group
I than in group III countries: but the disparity is less
than with regard to manufacturing value added, for which
the corresponding ratio is more than 48 :1.   Thus as
industrialisation proceeds, growth in the non-manufacturing
sectors of the economy tends to accompany growth in

manufacturing, though at a lower rate. It is a matter
of definition whether this is interpreted as "balanced"
or "unbalanced" growth.

This relationship between growth of different
economic sectors does not say anything about cause and
effect. Manufacturing may well be considered as the
leading sector in many instances, but this need not be
universally true; in some countries, manufacturing growth
may be a secondary phenomenon following an expansion
of oil production or other mining. In relation to
agriculture, however, manufacturing is more likely to
be leading than the converse. This is so because in
the less developed countries, many industries are based
on domestic agricultural products and their expansion
will stimulate output. The linkage from agriculture
to industry is generally weaker, as in these countries
increased demand for farm machinery and fertilisers may
largely be met by imports.

Another striking feature of Table 3 is the
difference in composition of manufacturing output between
countries of dufferent levels of industrialisation.
For the market economies as a whole, light industries
account for about two-fifths and heavy industries for
about three-fifths of the output value. Similar
proportions are found for groups I and II as a whole,
but in group III the emphasis is very heavily on light
manufacturing.

Within each group, however, there are
considerable variations in composition of manufacturing
output. The proportion accounted for by heavy manuf-
acturing varies from 32.9% for Luxemburg to 40.9% for
Australia in group I, from 62.2% for Japan to 26.8%

for Ireland in group II, and from 86.8% for Iran to 8.6%
for Honduras in the specified group III countries.

A partial explanation of the variations in
broad manufacturing pattern is provided by the following
regression, estimated on the basis of 75 observations
for 1958.

$$H_c = -11.44 + 21.545 \log_{10} P + 9.426 \log_{10} N$$
$$(2.251) \qquad (2.354)$$
$$+ 0.3675 \, z \qquad (R^2 = .593)$$
$$(0.0736)$$

in which H_c indicates the computed percentage of heavy
manufacturing, P per capita manufacturing value added
in $, N total population in millions, and z the
percentage of mining in value added by all industrial
activity; z is used to indicate, even though im-
perfectly, the character of natural resources.

All the regression coefficients are highly
significant. The first two coefficients may be
interpreted when transformed into elasticity form,
together with complementary results for light manufacturing.
It is then found that, on the average, a 1% higher total
manufacturing value is accompanied by a 0.84% higher
value of light manufacturing and a 1.23% higher value
of heavy manufacturing. Similarly a 1% greater population
tends to be accompanied by a 0.93% higher light manuf-
acturing output and a 1.10% higher heavy manufacturing
output.

These findings tally with those of studies
by Chenery (1960) and U.N. (1963), which go into greater
detail as regards manufacturing groups analysed but
did not establish an influence of natural resources.
They show that a larger share of heavy industries is

associated not only with greater industrialisation but
also with larger population size for countries of equal
per capita manufacturing output.   This is in accordance
with expectation as most heavy industries require a
minimum scale of output and thus a minimum size of market for
economic production.

The last regression coefficient shows that
heavy industries, ceteris paribus, play a larger role
in countries with substantial mining resources and
activity than in others.   This is also what one should
expect to find.

Of course, the differences in level of
industrial output act as a statistical but not as a
logical explanation of differences in industrial pattern.
The low share of heavy industries in one of the less
developed countries could conceivably result from a
demand pattern in which capital goods and durable
consumer goods play a relatively minor role.   This is
true to some extent but not sufficiently to account for
the large variations in the proportions of light and
heavy manufacturing.   Their main explanation must be
sought in the greater difficulties with which the
establishment of most heavy industries is faced in the
initial stages of industrialisation.

Indeed, Hoffman (1958) uses a similar measure –
the ratio of consumer goods output to capital goods output –
as a criterion to determine the stage of industrialisation
which the presently developed countries had reached at
any given time.   Rigid application leads to somewhat
paradoxical results such as Britain still having been
in the first stage of industrialised by 1870.   As a
general rule, however, it seems true that the majority
of light industries develop at an early and the majority

of heavy industries at a late stage of industrialisation.

So far the discussion has been in static terms, describing the position at a particular point of time. It may now be supplemented by a brief analysis of recent trends, taking 1958 as the starting point. Table 4 shows the growth of manufacturing production between that date and 1965, contrasted with population growth, for those countries for which estimates in the form of production index numbers are available.

Table 4. Increase in manufacturing output and population, 43 countries, 1958 to 1965.

Count	1965 (1958 = 100)		
	Output	Population	Per capita output
Group I:			
Australia	148	115	128
Austria	147	104	142
Belgium	158	105	151
Canada	155	115	135
France	142	109	130
Germany: Fed. Rep.	162	109	148
W. Berlin	175	99	177
Luxemburg	127 L	107	119
Netherlands	163	110	148
Norway	151	106	143
Sweden	157	104	150
Switzerland	154	114	135
United Kingdom	134 L	105	127
United States	156	113	139
Group II:			
Argentina	120 L	112	107
Chile	153	117	131
Finland	172	106	163
Ireland	159	101	158
Israel	239 H	128	186
Italy	178	105	169
Japan	267 H	107	250
Mexico	174	127	137
Portugal	180	105	171
South Africa	171	118	145
Spain	189	106	178
Venezuela	191	128	150

Table 4 (continued)

	Output	Population	Per capita output
Group III:			
China (Taiwan)	270 H	126	214
El Salvador	226 H	126	179
Greece	155	105	143
Guatemala	134 L	124	108
India	168	118	143
Korea (Rep.)	207 H	122	170
Pakistan	236 H	116	204
Philippines	149	125	119
Rhodesia (Southern)	134 L	125	107
Senegal	120 L	118	102
Zambia	162	122	133
Centrally planned:			
Czechoslovakia	161	105	153
Germany (Dem. Rep.)	163	98	166
Hungary	189	103	184
Poland	185	109	169
Roumania	248 H	105	235
Yugoslavia	226 H	108	209

H: higher growth than 10% p.a.   (195 or more)

L: lower growth than 5% p.a.   (140 or less)

Source: U.N.   Monthly Bulletin of Statistics, or
derived therefrom.

The most striking feature of Table 4 is the
contrast between the high degree of uniformity observed
for the group I countries and the wide variety of
experiences in group III countries. In most of the
highly industrialised countries, the average annual
growth in manufacturing production between 1958 and 1965
was a little above 5%. But out of 11 countries listed
which belong to the least industrialised group,
manufacturing growth rates exceeded 10% in 4 and fell
short of 5% in 3 countries.

The countries in the intermediate group, to
which the centrally planned economies may be added,
also occupy an intermediate position as far as variations
between individual countries are concerned. In most
of these countries, manufacturing growth tended to be

somewhat higher than the group I norm, the chief exception being the Argentine which experienced a very severe depression in the early 1960s.

Population growth tends to be in inverse relation with level of industrialisation, and the experience of the group II and group III countries does not appear in the same favourable light if manufacturing output per head of population is considered instead of total volume. Indeed in some countries, the greater part of the output growth is absorbed by population increase, though this appears to be the exception rather than the rule on the limited basis of listed countries.

Furthermore, the impact of a high manufacturing growth rate is necessarily limited if it applies to a very narrow initial base, and it should be viewed in connection with the level of manufacturing output which results. Assuming the industrial production indices given in Table 4 to be applicable to the Table 1 value added figures for 1950, a similar set of figures may be obtained for 1965 as shown in Table 5.

Table 5.   Manufacturing value added per head of
population, 33 countries, 1958 and 1965 (U.S.$.).

Country	1958	1965
United States	828	1,151
Luxemburg	663	789
Canada	592	799
United Kingdom	590	749
Germany (Fed. Rep.)	575	851
Switzerland	569	768
Sweden	460	690
Norway	419	599
Australia	417	534
Belgium	377	569
Austria	364	517
France	353	459
Netherlands	312	462
Israel	233	433
Italy	208	352
Finland	179	292
Ireland	167	264
South Africa	133	193
Argentine	124	133
Japan	121	302
Venezuela	115	172
Spain	111	198
Portugal	95	162
Chile	75	98
Mexico	72	99
Greece	48	71
Korea (Rep.)	20	34
El Salvador	19	34
Guatemala	19	21
China (Taiwan)	18	39
Philippines	15	17
India	8	11
Pakistan	8	16

Source: Derived from Tables 1 and 4.

The grouping of countries which was based on
1958 still appears to be applicable in 1965, though the
break between groups I and II has become less marked
and one might be inclined to draw the boundary further
down the scale.   Within the groups there have been
some changes in position, the most spectacular one
being the upward movement of Japan.   However, it is
clear that differences between industrialisation levels
achieved in rich and poor countries remain as large
as ever.   For the countries shown in Table 5, the
upper and lower qualities are $ 418 and $ 60 in 1958,

whilst in 1965 they are $ 584 and $ 84.5 respectively

their ratio is about 7:1 in both years.   There is

thus no really substantial movement towards greater

equality.

When assessing the prospects of developing

countries, one has to specify clearly what kind of

developing country one is thinking of.   Broadly speaking,

countries in group II appear to have passed the "take-

off stage", and continued industrial progress appears

to be reasonably well assured.   For countries in group

III sustained progress seems to be less certain and

depending on their government policy and its effectiveness

as well as on aid from abroad.   There are disadvantages

as well as advantages for countries which experience or

try to promote an industrial revolution much later than

the countries of the Western world.

Industrialisation is not an end in itself,

but current thinking seems to be to the effect that it is

indispensable for a sustained rise in living standards,

if only to develop exports which are less vulnerable

to demand and supply fluctuations than primary products

and which are necessary to pay for imports.   The old

division of labour between primary producer countries

and workshops of the world is bound to disappear or

at least to become blurred.   A new international

division of labour, with industries which to some extent

follow the pattern of natural resources, still remains

to be worked out.

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