SIZE AND CAPITAL INTENSITY IN INDIAN INDUSTRY SINCE 1950

Conceptually, size and capital intensity have been recognized as important parameters in the evolution of any industry. While the importance of the size of an industry has always been a part of the conventional wisdom, analytical growth models have also underscored, early on, (*e.g.*, Solow-Swam model, 1956) the importance of capital intensity. Yet, operationalisation of these notions is beset with a number of practical difficulties. In both cases, a menu approach is followed in measurement. Industry size is measured, variously, in terms of levels of sales, assets, value-added, capital deployed and employment. Likewise, capital intensity is measured, as amount of fixed capital used in relation to other inputs (especially labour) or the overall output. Typically, capital-labour ratio or capital-output ratio are seen as alternative measures of capital intensity of an industry.

Before Independence, the British Government in India had provided discriminating protection to some selected industries accompanied by the most favoured nation clause for the British goods. Despite this, a number of domestic industries, *viz.*, cotton textiles, sugar, paper and iron and steel expanded. No effort was, however, made to foster the development of capital good industry in India. Not surprisingly, on the eve of India's Independence in 1947, the Indian industrial sector was characterized by low levels of capital intensity marked by high concentration of employment either in the lowest size group, *i.e.,* household enterprises and small factories or in the highest size group, *i.e.*, large factories. The medium size factories were virtually absent in the Indian industrial sector. Low capital intensity in the Indian industry was primarily due to the prevalence of low wages and small size of domestic market on account of low per capita income. According to a study by United Nations in 1958, capital intensity, as measured by capital employed per worker, was substantially lower in India as compared to the US and other advanced economies. Moreover, low capital intensity was reflected not only in consumer

goods industries, *viz.*, textiles and sugar but also in capital goods industries such as iron and steel.

One of the early studies on the size and capital intensity of the Indian industry *i.e.*, Rosen (1958) attributed smaller size and lower capital intensity in India *vis-à-vis* the advanced economies, to the difference in availability of factors and lack of access to capital market which generally encourages the use capital intensive methods. According to Rosen (1958), "While there has been some apparent trend toward greater capital intensity in India, there is a tendency toward more widespread introduction of labour saving equipment; this trend has not been so great as to result in any clear positive relationship between size of firm and capital output ratios" . Subsequently, on the basis of a comprehensive analysis of 22 industries during the period, 1953-58, Sandesara (1969) concluded that while small sized units in some industries are labour intensive, in some others they turn out to be capital intensive. In other words, there was little evidence on a clear and uniform relationship between size and capital intensity.

Data on the size of industries for the subsequent period, *i.e.*, from 1970-71 onwards are presented in Table 1:

Table 1: Size of Factories Based on Different Parameters (1993-94 Prices)

(Rs. Million)

Criteria/ Period	1970-71 to 1979-80	1980-81 to 1989-90	1990-91 to 1999-2000	2000-01 to 2001-02
1	2	3	4	5
Assets	8.7	11.6	19.8	20.2
Output	16.7	23.5	38.8	45.9
Value Added	3.7	4.6	7.5	7.0
Employment (No.)	86	78	71	60

Source: Calculations based on data from Annual Survey of Industries, Government of India.

Evidently the average size of factories in terms of assets, output and valued added has increased consistently since the 1970s. In contrast, average employment in Indian factories witnessed a decline from 86 per factory during the 1970s to 78 during the 1980s. Clearly, output growth during the 1980s was

not accompanied by a corresponding step up in generation of employment. The declining trend in employment persisted during the 1990s and was pronounced further during 2000-01 and 2001-02. This was perhaps, symptomatic of greater use of capital in the production process leading to higher capital intensity over time. In fact, increase in real wages and job security regulations in the late 1970s seem to have induced entrepreneurs to shift over to capital intensive techniques (Ahluwalia 1991, Ghose 1994 and Thomas, 2002). It has also been argued that overhang of employment that existed in the 1970s set a limit to the additional employment opportunities in the 1980s and beyond (Nagaraj, 1994). Structural ratios calculated on the basis of data from Annual Survey of Industries provide evidence to support this. Almost all the indicators used as proxy for capital intensity show that that production processes in the Indian industry have increasingly become more capital oriented. Capital employed per worker (K/L) has increased substantially since the 1970s. Capital-wages ratio (K/W) increased marginally from 7.3 in 1970s to 8.3 in 1980s but increased substantially in the post 1991 period. On the other hand, it needs to be noted that capital employed per unit of output (K/Y) has not undergone much change during the three decades *i.e.*, 1970-2000, reflecting thereby greater efficiency in the use of capital in the production processes (Table 2).

Table 2 : Structural Ratios and Technical Coefficients

Period	K/Y (Ratio)	K/W (Ratio)	K/L (in Rs)
1	2	3	4
1970-71 to 1979-80	0.52	7.29	128,784
1980-81 to 1989-90	0.49	8.33	192,150
1990-91 to 1990-2000	0.51	12.64	366,136
2000-01 to 2001-02	0.44	14.25	433,905

K = Value of Fixed Capital.
L = No. of Workers.
W = Value of wages.
Source: Calculations based on Annual Survey of Industries; data converted at 1993-94 prices.

A disaggregated industry-wise analysis by Thomas (2002) showed that capital intensity varies widely across different industries. It has been the lowest in jute textiles while being the highest in electricity generation, transmission and distribution. Industry group-wise, *viz.*, basic metals, chemicals, rubber and petroleum have highest capital intensity while jute, beverages, textile products, leather, wood products, and food products continue to be the least capital intensive sectors in the Indian manufacturing.

The relationship between size and capital intensity in Indian industrial sector also seems to have witnessed a noticeable transformation since the 1970s. With the increase in size of factories (in terms of output), capital per head of worker increased during 1970s. Correlation coefficients between output (size factor) and capital-labour ratio demonstrate that the covariation got strengthened further in the 1980s and in the post 1991 period. In contrast, the capital-labour ratio was inversely related to size of the labour force in factories. The covariation of capital-output ratio and total output has been negative since the 1970s probably due to the fact that growth in output in most of the years since 1970s has been higher than growth in capital indicating efficient use of capital by Indian industries (Table 3).

Table 3: Correlation between Size and Capital Intensity

Period	Size Indicators	Capital Intensity Indicator	
		K/Y	K/L
1	2	3	4
1970s	Output	-0.40	0.44
1980s		-0.16	0.96
Post 1991		-0.57	0.95
1970s	Employment	-0.20	-0.76
1980s		0.17	-0.52
Post 1991		0.86	-0.71

Source: Calculations based on data from Annual Survey of Industries, Government of India

In retrospect, the Indian industry has been undergoing a structural transformation since Independence. With the State initially adopting an industrial development strategy heavy, capital-intensive industries, size indicators in the Indian industrial sector expanded substantially facilitated by the evolving industrial policy and increased domestic and external demand. Thus, the predominance of primary raw material based industries in the 1950s was gradually replaced by the emergence and faster growth of metal based and heavy industries. The industrial policy initiatives since 1991 have led to a diversified Indian industrial structure. While the transition process has led to greater use of capital in relation to labour force, productivity enhancements have resulted in a gradual decline in the capital-output ratio in the recent years.

References:

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