Where Is the Industrial Retardation?

Snigdha Chakrabarti

Ashok Rudra

A careful review of the relevant data does not lend support to the hypotheses of industrial retardation and slowing down of public sector investment which have been subjects of so much discussion among Indian economists.

AS is all too familiar to the readers of *Economic and Political Weekly*, there has been in the country a great deal of discussion from the mid-seventies till recent years about the possible explanations for an industrial retardation that everybody has been agreed had set in from the mid-sixties. An early detailed analysis of the problem was that by Shetty (1978) and a later comprehensive treatment of the phenomenon was that of I J Ahluwalia which drew much attention to its author. In between, a large number of the most distinguished economists of the country had their different say about the problem in a series of articles which were mostly published in the columns of this very journal. The problem being undeniably important, we thought of doing our own bit for unravelling the secrets of the phenomenon. We quickly appreciated that the different explanations offered by the different economists were mostly consistent with each other, so that there is no problem of deciding which is correct and which not. It appeared to us to be a question of deciding on the relative weights to be attached to the different factors which might have acted conjointly to give rise to the phenomenon. In order to make our own analysis, we thought of updating the data relating to industrial production and investments.

To our dismay, the modest statistical exercise that we undertook proved the undoing of our project. That is because the phenomenon of industrial retardation seems to disappear when searched for in the timespan of 1961 to the latest time point for which we have data which is 1985. The Cheshire cat seems to have evaporated without leaving behind its famous grin—unless we choose to treat as that grin the signs of definite decline in the trends of only a few industries and investment by the private sector. A slowing down of private investment may indeed be by itself a very serious matter; but what one has talked about till now is the slowing down of investment in the public sector and as a consequence that of industrial investment as a whole. Our disconcerting finding is that public sector investment, instead of slowing down, seems to have grown at an increasing rate tracing a smooth path over the entire period 1961 to 1985; and this, combined with a decelerating private sector investment, has given rise to a trend of overall investment that involves a constant rate growth of 4.32 per cent per year.

THE CONSENSUS

Before we present our results, let us have a quick view of how generally accepted the retardation thesis has been. One of the first salvoes was fired by K N Raj in 1976 when, in an article concerned with 'Growth and Stagnation in Indian Industry', he wrote about "a sharp decline in the rate of growth of industrial output since the middle sixties". In the following year, Srinivasan and Narayana (1977) observed that "since 1966 the Indian economy seems to have departed significantly from the growth trends established during the first three Plans". Vaidyanathan (1977) took up issue with Srinivasan and Narayana about the explanation for "...the sluggish growth of output and investment during the last decade". Shetty (1978) in his ambitious study set out to explain why "in comparison with the overall economic performance during the first fifteen years of planning... the performance of the Indian economy since the mid-sixties has been very unsatisfactory". Prabhat Patnaik in 1981 advanced "an explanatory hypothesis" for "industrial stagnation in particular and economic stagnation in general". Rangarajan in 1982 talked of "the deceleration of the industrial growth" as a "disturbing feature" calling "for serious attention". Ahluwalia in 1985 undertook a comprehensive study of "industrial stagnation in the organised sector after the mid-sixties".

One is, therefore, justified in recognising a general consensus among economists on there having been a slowing down of industrial growth. We do not, however, interpret our results as suggesting that these economists were all wrong in their interpretation of data. Our very different results refer to a very different time comparison. Most of the authors cited above have compared rates of growth of two periods, one prior to 1965-66 and the other posterior to that date. The second period in most cases extended to different years in the seventies, most of them not stretching beyond 1975 and the longest period being that of Ahluwalia extending to 1979-80. As one may see from Table 1, for those time comparisons the authors were entirely right about their judgment. We, on the other hand, have considered the 24-year period from 1961 to 1985. Within this quarter century we have failed to detect any tendency of general industrial retardation. We could not find any dependable data stretching over the entire period from 1950 to 1985. It is perfectly possible that the trend in the fifties was of a sharper industrial growth than during the 24-year period following 1961. However, it is definite that there has not been any deceleration since 1961. There have, of course, been serious fluctuations; if instead of taking data upto 1985 we stopped at some earlier date we might also obtain very different results consistent with the hypothesis of deceleration. It is apparent from all data relating to industrial production and investment that there were, in most industries, sharp downswings after the mid-sixties. The earlier analysts understandably interpreted the downswings as downward movement of the trend itself. However, when one takes data up to 1985 one sees that the downswings switched over to upswings and the long-term trend in most cases is one of constant rate of growth and in some cases even of increasing rate of growth. It is noteworthy that despite these swings the quality of fit of these trends with constant or increasing rates of growth, judged by the R^2 statistic, is mostly extremely good, the trend explaining in most cases more than 90 per cent of the variation. It is well known that the task of distinguishing between trend movements and cyclical movements poses one of the trickiest of statistical problems—what appears to be a trend movement may change to a cyclical movement with increased accumulation of data and vice versa. This is what seems to explain the extremely different results found by us from all our economist colleagues from Raj to Ahluwalia.

METHOD OF ANALYSIS

We may now explain the method of analysis used by us. Everybody before us has divided each time series into two parts on a priori considerations and has calculated two constant growth rates holding for the two segments, either with the help of separate fits or with the help of dummy variables. The periods used by these different authors and the growth rates estimated by them in their respective two segments are presented in Table 1, 2A, 2B and 4.

We, on our part, took the entire series from 1961 to 1985 as a single segment. We fitted in each case to the entire data a log-quadratic growth curve (of the form $\log Y^t = a + bt + ct^2$) and then tested for the significance of the quadratic term. In a large

number of cases we have found the term to be non-significant and we have interpreted these cases to be homogeneous over the entire period with a constant growth rate. In some cases the quadratic terms has been significant with negative sign. We have interpreted these cases to involve deceleration over the entire period. In some cases the quadratic term has been significant with positive sign and we have had no option but to treat those cases as involving growth with increasing rate. Our results are presented in Tables 2A, 2B and 3.

RESULTS

We shall now look at some of the cases in which our results are in striking contrast to those of other researchers who have worked before us.

In Tables 1 and 2 we present results relating to a few industry groups and industries which have been worked upon by some authors like Srinivasan and Narayana, Ahluwalia, Nayyar, Rangarajan, Shetty and ourselves. Srinivasan and Narayana did not present any rates of growth. They presented a few diagrams which showed in each case the observations for the period 1966-67 to 1972-73 to drop below a constant rate trend curve fitted to the period 1950-51 to 1965-66. Shetty's results, presented in columns 4 and 5 of Table 2A and columns 7 and 8 of Table 2B, are in the form of the overall percentage growth during two periods, namely, 1960-61 to 1965-66 and 1965-66 to 1976-77. All the other authors calculated constant annual rates of growth for their two periods, one prior to 1965 and the other following 1965. These rates are presented in Table 1. In each case the rate for the second period is lower than that for the first period. It is, therefore, not surprising at all that all

our researcher friends read into their data a slowing down of the rate of growth.

Our very different results are presented in Tables 2A and 2B. We did not work with the industry groups to which the results of Table 1 refer. We did not think it either necessary or very reliable to construct index numbers of production for these groups. We, instead, dealt with some series representing the physical output of a selected few individual industries. In Table 2A we present our results with respect to those industries for which we have found the rate of growth over the 24-year period to be constant. These industries include some extremely important ones, like finished steel, phosphatic fertiliser, power driven pumps, sugar, soap and few durable consumer goods like electric fans,

domestic refrigerators and cars. In all these cases, the tests of significance have rejected the quadratic term, so that one can say that there is neither an increasing nor a decreasing tendency in the rate of growth. The constant rates are presented in column 2 of Table 2A.

We have also found a few specific industries with diminishing rates of growth, the results for which are presented in Table 2B. The industries include nitrogenous fertiliser, petroleum products, aluminium, sulphuric acid and electric motors. For the cotton textile industry the rate of growth has diminished so fast that even before 1970 it had become negative and became highly negative by 1980. This is not a case of deceleration, but one of decline. In the same

TABLE 2A: RATES OF GROWTH—INDUSTRIES WITH STEADY GROWTH
(Our Results)

Industry (1)	Rate (Per Cent Per Year) 1961 to 1985* (2)	R^2 (DW) (3)	Shetty's Results (Per Cent Growth over the Period)	
			1960-61 to 1965-66 (4)	1965-66 to 1976-77 (5)
Finished steel	2.93	0.84 (1.10)	17.74	5.85
Pig iron	2.21	0.81 (0.72)	12.90	3.83
Phosphatic fertilisers	12.76	0.97 (1.21)	22.69	30.22
Power driven pumps	4.24	0.71 (0.78)	24.77	2.42
Soap	3.95	0.92 (1.47)	3.97	5.45
Electric fans	6.94	0.97 (1.51)	5.65	8.50
Domestic refrigerators	15.26	0.98 (0.57)	47.52	24.42
Car	3.60	0.56 (0.78)	—	—
Sugar	4.61	0.75 (1.48)	3.18	3.16

* In the case of Phosphatic fertilisers the fit is only over the period 1969 to 1985.

TABLE 1: RATES OF GROWTH OF INDUSTRIAL PRODUCTION
(Other Authors)

Industry Group (1)	Author (2)	Rate (Per Cent Per Year)	
		Period I (3)	Period II (4)
Textiles	Nayyar	2.0 (1955 to 1965)	−0.5 (1965 to 75)
	Ahluwalia	6.0 (1959-60 to 1965-66)	4.9 (1966-67 to 79-80)
Chemicals and chemical products	Nayyar	9.8 (1955 to 1965)	7.2 (1965 to 75)
	Ahluwalia	13.6 (1959-60 to 1965-66)	10.8 (1966-67 to 79-80)
Non-metallic mineral products	Nayyar	10.8 (1955 to 1965)	3.0 (1965 to 75)
	Ahluwalia	9.2 (1959-60 to 1965-66)	4.7 (1966-67 to 79-80)
	Srinivasan and Narayana*	11.5 (1950-51 to 65-66)	*** (1966-67 to 72-73)
Basic metal	Nayyar	13.0 (1955 to 65)	3.0 (1965 to 75)
	Ahluwalia	12.8 (1959-60 to 65-66)	6.7 (1966-67 to 79-80)
Non-electrical mechinery	Nayyar	24.6 (1955 to 65)	6.9 (1965 to 75)
	Ahluwalia	18.9 (1959-60 to 65-66)	8.3 (1966-67 to 79-80)
	Rangarajan	19.0 (1961 to 65)	9.4 (1966 to 70)
	Srinivasan and Narayana	20.0** (1950-51 to 65-66)	*** (1966-67 to 72-73)
Electrical machinery	Rangarajan	15.4 (1961 to 65)	12.2 (1966 to 70)
	Nayyar	15.6 (1955 to 65)	8.0 (1965 to 75)
	Ahluwalia	15.7 (1959-60 to 65-66)	10.6 (1966-67 to 79-80)
Transport equipment	Rangarajan	15.7 (1961 to 65)	−7.9 (1966 to 70)
	Nayyar	7.6 (1955 to 65)	−3.2 (1965 to 75)
	Ahluwalia	10.8 (1959-60 to 65-66)	5.6 (1966-67 to 79-80)
	Srinivasan and Narayana	13.8** (1950-51 to 65-66)	*** (1966-67 to 72-73)

Notes: The periods are different for the different authors and are mentioned in the brackets.
 * Srinivasan and Narayana have considered only cement.
 ** The rate is not stated by the authors, but has been read by us from diagram provided by them.
 *** The authors do not give any figures but state that the rates decline.

Industry	Fitted Function 1961 to 1985*	R^2 (DW)	Rate (Per Cent Per Year)			Shetty's Results (Per Cent Growth over the Period)	
			1961	1971	1981	1960-61 to 65-66	1965-66 to 76-77
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Deceleration							
Nitrogenous fertilisers	$a + 0.2555t - 0.0039t^2$	0.99 (0.98)	--	20.09	12.29	27.55	65.04
Petroleum products	$a + 0.1204t - 0.0020t^2$	0.97 (0.53)	11.64	7.64	3.64	—	—
Aluminium	$a + 0.2249t - 0.0055t^2$	0.92 (0.88)	21.39	10.39	-0.61	47.87	21.46
Sulphuric acid	$a + 0.1453t - 0.0034t^2$	0.98 (1.24)	13.85	7.05	0.25	15.98	13.57
Electric motors	$a + 0.1284t - 0.0023t^2$	0.97 (1.62)	12.38	7.78	3.18	28.16	10.00
Cloth	$a + 0.0077t - 0.0013t^2$	0.88 (1.58)	0.51	-2.09	-4.69	—	—
Acceleration							
Cement	$a + 0.0308t + 0.0010t^2$	0.95 (0.78)	3.28	5.28	7.28	7.00	6.73
Truck	$a - 0.0309t + 0.0031t^2$	0.86 (0.57)	-2.47	3.73	9.93	—	—

Notes: In all the fitted quadratic functions presented here coefficient of t^2 is significant.
* In the case of nitrogenous fertilisers the fit is over the period 1965 to 85 and in case of sulphuric acid the fit is over the period 1961 to 81.

TABLE 3: RATES OF GROWTH—GROSS FIXED CAPITAL FORMATION
(Our Results)

Gross Fixed Capital Formation	Fitted Function 1960-61 to 1984-85	R^2 (DW)	Rate (Per Cent Per Year)		
(1)	(2)	(3)	1960-61 (4)	1970-71 (5)	1980-81 (6)
Total	$a + 0.0432t$	0.97 (0.63)	4.32	4.32	4.32
Sectors					
Public sector	$a + 0.0084t + 0.0014t^2$	0.92 (0.88)	1.12	3.92	6.72
Private sector	$a + 0.0779t - 0.0014t^2$	0.97 (0.89)	7.57	4.71	1.91
Components					
Construction	$a + 0.0667t - 0.0014t^2$	0.92 (0.69)	6.39	3.59	0.79
Machinery and equipment	$a + 0.0257t + 0.0012t^2$	0.96 (0.70)	2.81	5.21	7.61
Industries					
Mining, quarrying, construction and manufacturing	$a + 0.0576t$	0.91 (1.09)	5.76	5.76	5.76
Electricity, gas and water supply	$a + 0.0707t$	0.94 (0.89)	7.07	7.07	7.07
Transport, storage, and communication	$a - 0.0152t + 0.0019t^2$	0.89 (0.68)	-1.14	2.66	6.46

Notes: (1) In all the fitted quadratic functions presented here the coefficient of t^2 is significant.
(2) The data used are all in the constant prices of 1970-71.

TABLE 4: RATES OF GROWTH OF FIXED CAPITAL FORMATION
(Other Authors)

Fixed Capital Formation	Author	Rate (Per Cent Per Year)	
(1)	(2)	Period I (3)	Period II (4)
Public sector	Srinivasan and Narayana	11.5 (1950-51 to 65-66)	** (1966-67 to 74-75)
	Ahluwalia	9.9 (1959-60 to 65-66)	5.2 (1966-67 to 79-80)
		9.9 (1959-60 to 65-66)	5.2 (1966-67 to 79-80)
	Patnaik	8.1 (1960-61 to 64-65)	0.7 (1964-65 to 73-74)
	Rangarajan	12.2 (1950-51 to 65-66)	8.0 (1970-71 to 77-78)
Private sector	Srinivasan and Narayana	6.9* (1950-51 to 65-66)	*** (1966-67 to 74-75)
	Ahluwalia	8.2 (1959-60 to 65-66)	3.1 (1966-67 to 79-80)
	Rangarajan	4.7 (1950-51 to 65-66)	4.5 (1970-71 to 77-78)
Total	Srinivasan and Narayana	9.2* (1950-51 to 65-66)	** (1966-67 to 74-75)
	Ahluwalia	9.0 (1959-60 to 65-66)	4.1 (1966-67 to 79-80)
	Rangarajan	7.4 (1950-51 to 65-66)	5.9 (1970-71 to 77-78)

Notes: Rangarajan also estimated the growth rate separately for the period 1965-66 to 1971-72.
* The rate is not stated by the authors, but has been read by us from the diagram provided by them.
** The authors do not give any figure but state that the rate declines.
*** The authors do not give any figure but state that the rate does not decline.
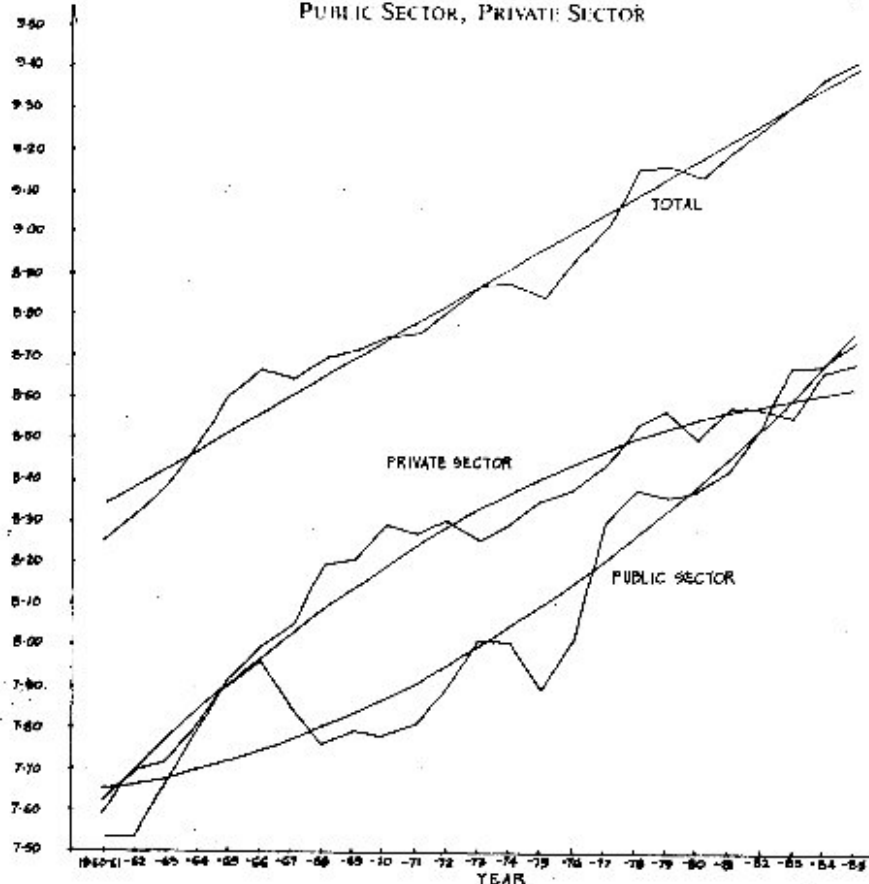
Table we show that one important industry, namely, cement, has grown over the entire period 1961 to 1985 at an increasing rate. The truck industry seems to have declined to start with, but began to grow at an increasing rate from the mid-sixties. The different decreasing and increasing rates are presented in columns 4, 5 and 6 of Table 2B.

We now turn to some important macro variables. One of the most important explanations for the alleged industrial retardation advanced by several economists is an alleged slowing down of public sector investment. Thus Ahluwalia cites four contributory factors to industrial stagnation and one of them is "the slow down in public investment after the mid-sixties...". Patnaik states, "the growth of public investment has slowed down since the mid-sixties". Similarly, talking of public investment, Srinivasan and Narayana wrote, "...the period after 1965-66 represents a departure in the downward direction from the trends established during the first three Plans".

But alas, our statistical fits with as high a R^2 as 0.92 belie all these prognoses. Our results show a rate of growth that has steadily increased from 1961 to 1985. The growth of investment in the private sector has, however, decelerated and the goodness of fit here is even better ($R^2 = 0.97$). The increasing and the decreasing tendencies in the two parts of investment cancel each other out,

so that investment in the economy as a whole grows at a steady rate of 4.32 per cent per year over the period 1961 to 1985 (see diagram).

Just as one part (namely, the private sector part) of overall investment has grown at a decreasing rate, another part, namely, the component of construction in capital formation, has also behaved similarly. The component of machinery and equipment has, however, grown at an increasing rate. Once again, the increasing and decreasing rates of the two parts cancel each other out. When we consider not all of investment, but only the part devoted to mining, construction and manufacturing we find once again a constant rate of growth, namely, 5.76 per cent per year. The same is true of the infrastructural sector of electricity, gas and water supply. By contrast, investment in transport and communication has grown at an increasing rate. The fitted functions and the rates of growth are presented in Table 3.

Our results are obviously in striking contrast to those who detected deceleration in the same macro variables. Their numerical results are presented in Table 4.

CONCLUSION

We thus see that neither for public sector investment nor for investment in industries nor for the growth of individual industries is one justified in talking about retardation

in general, though deceleration does mark certain individual industries. As we have mentioned before, we are not suggesting that the economists who debated industrial 'retrogression' were wrong. They were certainly right about their own time frames of comparison. Our different results clearly indicate that the retardation of seventies was not a durable feature of our economy's pattern of development.

Sources of Data

1 For the industrial production figures presented in Tables 2A and 2B: for 1961 to 1976—*Statistical Abstract*, different years; for 1977 to 1985—*Monthly Abstract of Statistics*, different issues.

2 For total fixed capital formation, their two components—construction and machinery—as well as fixed capital formation in the industries, all in constant prices of 1970-71, as presented in Table 3: *National Accounts Statistics*, different years.

3 For fixed capital formation in the public and private sectors in constant prices of 1970-71, as presented in Table 3: The data for these two components of fixed capital formation are available in *National Accounts Statistics* only at current prices. Following Srinivasan and Narayana, we have first calculated for each year the proportion of the two components in total fixed capital formation at current price and then applied that proportion to the total fixed capital formation at constant prices for that year.

References

Ahluwalia, I J (1985), *Industrial Growth in India—Stagnation since the Mid-Sixties*, Oxford University Press, Delhi.

Nayyar, D (1978), 'Industrial Development in India: Some Reflections on Growth and Stagnation', *Economic and Political Weekly*, Special Number, August.

Patnaik, P (1981), 'An Explanatory Hypothesis on the Indian Industrial Stagnation' in Bagchi, A K and Banerjee N (eds), *Change and Choice in Indian Industry*, Bagchi and Co, Calcutta.

—— (1986), 'New Turn in Economic Policy: Context and Prospects', *Economic and Political Weekly*, June 7.

Raj, K N (1976), 'Growth and Stagnation in Indian Industrial Development', *Economic and Political Weekly*, November 26.

Rangarajan, C (1982), 'Industrial Growth: Another Look', *Economic and Political Weekly*, Annual Number, April.

Shetty, S L (1978), 'Structural Retrogression in the Indian Economy since the Mid-Sixties', *Economic and Political Weekly*, Annual Number, February.

Srinivasan, T N and N S S Narayana (1977), 'Economic Performance since the Third Plan and Its Implications for Policy', *Economic and Political Weekly*, Annual Number, February.

Vaidyanathan, A (1977), 'Constraints on Growth and Policy Options', *Economic and Political Weekly*, September 17.