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ARTICLES Page

BOOK REVIEWS

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On the Economic Performance of Major Eastern States of India : Some Issues

B. K. Bhoi*

The objective of the paper is to study some of the issues concerning the growth of the State Domestic Product (SDP) of the four major Eastern States of India viz., Assam, Bihar, Orissa and West Bengal *vis-a-vis* the growth of the Net Domestic Product (NDP) at the all-India level. The paper shows that the momentum of growth in the SDP of the major Eastern States continued to lag behind that of NDP at the all-India level, although some improvement was discernible in the first six years of the 1980s (Period II) as compared with the performance in the 1970s (Period I). Sector-wise, all the Eastern States except Assam experienced higher growth rates of agriculture in Period II over Period I as against stagnation at the all-India level. However, high rates of growth in agriculture in Eastern States were accompanied by a high degree of instability. As regards the manufacturing sector, Orissa and West Bengal witnessed decelerated activity in Period II over Period I, while Assam and Bihar, despite some improvement during the same period, experienced high degree of instability.

INTRODUCTION

THE major Eastern States of India, comprising Assam, Bihar, Orissa and West Bengal accounted for 15 per cent of geographical area of India: 25 per cent of the Indian population and 21 per cent of India's Net Domestic Product (NDP) in 1970-71. During the subsequent 17 years, the contribution of these States to NDP declined to 19 per cent by 1986-87, even as other parameters remained more or less constant. This gives *prima facie* evidence of relatively slow growth rates of State Domestic Product (SDP) in these States *vis-a-vis* that of NDP at the All-India level. This is a matter of serious concern because growing at a rate less than that commensurate with the national average means gradual widening of regional disparities. What then has gone wrong with the economies of these States under consideration, over the years? Was the slow growth rate reflected in all sectors of activity? If not, which sector of each of the State economies has lagged, resulting in decelerated growth rates?

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2. To inquire into these questions, it would be necessary to identify the sectors which have grown slowly. It would also be necessary to see whether the sectors which have grown relatively fast have been influenced by transitory or more enduring factors. To find out whether growth rates, especially of the leading sectors, have decelerated due to transitory factors, it may be useful to study their variability at the aggregate as well as the sectoral levels. With the varying growth rates of different sectors it may be further asked as to whether there has been a structural shift in these economies. Finally, there is also a question whether it is possible to establish any linkages between two commodity producing sectors namely, agriculture and industry. This paper makes an attempt to study some of the critical issues that arise in analysing the slowdown in the economic activities of the four Eastern States. In the process, it goes beyond the S.R. Sen Committee Report on Agricultural Productivity in Eastern India (1984) which examined only one aspect, i.e., agricultural productivity of the Eastern region*. Our Study will go a little further to comment on all the major sectors of these four State economies. Moreover, as one of the objectives of planning is to reduce regional disparity, a sectoral analysis of SDP of a group of relatively poorer States in the Eastern region would perhaps be necessary.

3. The organisation of this paper is as follows: Section I would discuss data base and methodology of the Study. Section II is devoted to analysis of growth rates together with variability as well as trends indicating acceleration or deceleration. Section III would focus on the structural change. Section IV will study the linkages between agriculture and manufacturing sectors. Finally, Section V would present the summary and conclusions of the Study.

Section I
Data Base and Methodology

4. Data released on an annual basis by the C.S.O. on estimates of State Domestic Product (SDP) are the basis for studying

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* S.R. Sen Committee defined Eastern Region as West Bengal, Bihar, Orissa and Eastern U.P. In our Study, we excluded Eastern U.P. and included Assam. Assam has been included here even though it has, after the reorganisation of North Eastern States, not been the same as it was in the early seventies. The main economic activities of Assam, however, have not undergone any significant changes. The economy of Assam has been considered traditionally as contiguous with the economies of West Bengal, Bihar and Orissa.

the performance of the State economies because they represent uniformity in data collection and afford comparability among the States' performance. As the SDP data are compiled on net basis, the corresponding data at the national level, taken for the purpose of the Study, are obviously Net Domestic Product (i.e.net of depreciation). All data on SDP as well as NDP are at 1970-71 prices. For purposes of convenience, the period of Study, which spans over 17 years from 1970-71 to 1986-87, has also been viewed in terms of two sub-periods, i.e., from 1970-71 to 1979-80 (Period I) and from 1980-81 to 1986-87 (Period II) in respect of most aspects of the Study.

5. NDP for 1986-87, however, is not available at 1970-71 prices due to the change of base to 1980-81. Therefore, the NDP data for 1986-87 (at 1980-81 prices) have been converted to old base by applying growth rates of the new series (for that year) at the sectoral level.

6. For the study of growth rates of the respective State SDPs, and also regional/national SDP/NDP, the following two trend equations have been considered:

$$\text{Log } Y = a+bt \quad \ldots\ldots (1)$$

$$\text{Log } Y = a+bt+ct^2 \quad \ldots\ldots (2)$$

where 'Y' represents SDP/NDP from different sectors and 't' represents time.

7. While equation 1 is chosen to get the compound growth rates over time, the second equation is to study acceleration (where 'c' would be positive and significant) or deceleration (where 'c' would be negative and significant). In order to estimate the parameters, these two equations have been fitted to the data on agriculture, manufacturing, electricity, services and total SDP of each State, Eastern region as well as corresponding data at the all-India level for all the three periods, viz., from 1970-71 to 1986-87, 1970-71 to 1979-80 and from 1980-81 to 1986-87.

8. The structural shifts are generally studied in terms of percentage contribution of different sectors to the aggregate

SDP/NDP on a point-to-point basis. In an examination of the structural changes at the State level, however, period averages, instead of point-to-point analysis, are taken so as to avoid the impact of an exceptionally unusual year which might coincide with any of the reference years under study.

Section II
Analysis of the Growth Rates

Overall Growth Rates and Variability

9. The overall growth rates of the four Eastern States put together were lower than the all-India growth rates for the whole 17-year Period as well as in both the Periods I and II (Statement I). The average annual compound growth rate over the entire 17-year period for the Eastern region was 3.2 per cent as against the all-India average of 4.0 per cent. In Periods I and II, the average annual compound growth rates were 2.9 per cent and 4.2 per cent, respectively for the Eastern region as compared with those for all-India at 3.6 per cent and about 5.0 per cent.

10. One of the striking features with the data at the all-India level is that, while there was relatively higher growth rate in Period II over Period I, the variability has come down to 9.7 per cent from 10.9 per cent (Statement II). This implies that the Indian economy has developed resilience over time and therefore, relatively higher rate of growth is perhaps possible on a long term basis. On the other hand, although SDP growth rates for the Eastern region have improved, variability continued to be high and has in fact shown an increase, albeit marginally, from 8.80 per cent to 8.86 per cent during the same period. This is shown in Table-1.

11. A perusal of Table 1 reveals that although the Eastern States as a group as well as individually have improved their SDP growth rates in Period II over Period I, they remained below the national average growth rates in both the periods. Broadly speaking, variability continued to be high in the Eastern region together with higher growth rate in Period II over Period I. As regards overall variability, only Bihar and West Bengal experienced a fall whereas in other two States it went up. The fall in variability in the case of

Table-1 : Growth and Variability of Aggregate SDP/NDP

(Percent per annum)

States	Period I		Period II	
	Growth Rate	Co-efficient of variation	Growth Rate	Co-efficient of variation
Assam	2.66	7.89	4.91 (H)	9.71 (H)
Bihar	2.99	9.05	3.99 (H)	8.16 (L)
Orissa	2.40	10.29	4.50 (H)	10.40 (H)
West Bengal	3.01	9.19	4.16 (H)	9.17 (L)
Eastern Region	2.90	8.80	4.23 (H)	8.86 (H)
All India	3.61	10.86	4.95 (H)	9.68 (L)

Note : 'L' for lower, 'H' for higher growth rate/ variability in period II over period I.
Source : Same as for Statements I & II.

West Bengal is very marginal while for Bihar, it is modest. In the case of Bihar, the fall in variability may have to do with its stagnant nature of growth which is the lowest in the region in period II as compared with the other States. A sectoral analysis would help to identify the sectors which are responsible for lower growth rates of Eastern States compared with the national average.

Growth and Variability in Agriculture

12. The secular trend rate of growth of agriculture at the all-India level was approximately 2.1 per cent per annum as against 2.2 per cent for Assam, 1.7 per cent for Bihar, 1.8 per cent for Orissa, 2.8 per cent for West Bengal and 2.2 per cent for the Eastern region as a whole during 1970-71 to 1986-87. But the secular trend rate of growth could be somewhat misleading as the growth momentum is different in the 1980s from that in the 1970s. In fact, agriculture in Eastern States, except Assam, was found to have grown between 4.0 and 4.6 per cent in Period II

compared with only 1.8 per cent at the all-India level. The performance of agricultural sector in Assam, however, was woefully low because of greater incidence of natural calamities in the 1980s. The high rates of growth of agriculture in the other three Eastern States have been accompanied by a high degree of instability, as Table-2 would show.

Table-2 : Growth and Variability of Agriculture

(Percent per annum)

States	Period I		Period II	
	Compound Growth Rate	Co-efficient of Variation	Compound Growth Rate	Co-efficient of Variation
Assam	2.02	7.30	0.44 (L)	4.88 (L)
Bihar	0.72	6.10	3.97 (H)	10.35 (H)
Orissa	1.06	12.29	4.42 (H)	13.69 (H)
West Bengal	2.66	9.72	4.62 (H)	12.21 (H)
Eastern Region	1.70	7.35	3.82 (H)	9.79 (H)
All India	1.81	7.86	1.81 (-)	4.69 (L)

Note : 'L' for lower, 'H' for higher growth rate/ variability in period II over period I.
Source : Same as for Statements I & II.

13. At the all-India level, although growth rate of agriculture remained unchanged in both the periods, variability has come down significantly implying thereby the resilience of agriculture to withstand monsoon distortions. In contrast, barring Assam, all the Eastern States witnessed high growth rates together with high variability. One should therefore be cautious in being enthusiastic about the high growth rates of agriculture in the region, since they may not be maintained on a long term basis so long as there is marked instability.

14. There are no major studies on the reasons for high

instability of the agricultural output in the Eastern States. However, a number of studies are available on the instability of Indian agriculture. Mention may be made about Shakuntala Mehra's work on 'Instability in Indian Agriculture in the context of New Technology' (1981), which concluded that the use of chemical and biological technology has led to increase in production instability. However, this conclusion was somewhat modified by Peter B.R. Hazell in his research report on 'Instability in Indian Foodgrain Production' (1982). While analysing the reasons for instability, he argued that the "more likely causes are changes in weather patterns and the more widespread use of irrigation and fertilizers at a time when the suppliers of fertilizers and electric power for irrigation pumps become less reliable". Hazell's observation appears to be more relevant in the context of the Eastern region's agricultural instability. Monsoon-dependent agriculture would be more prone to instability than command area agriculture. The implication that may be drawn from these studies is that absence of assured irrigation programmes in the Eastern region has led to the continuation of instability in agricultural performance. It may be noted here that despite tremendous potential for the use of ground water, the Eastern States have not reached the potential level of irrigation.

Growth and Variability in Manufacturing Sector

15. Unlike in the case of agriculture at the all-India level, the growth rate of country's manufacturing sector has improved significantly from 5.2 per cent in the 1970s to more than 6.3 per cent in the first seven years of the 1980s, with variability coming down from 14.8 per cent to 12.4 per cent per annum during the comparable periods. The picture, however, is entirely different in the Eastern States. While Orissa and West Bengal showed declines in the growth rates of manufacturing sector in Period II, Assam and Bihar posted higher growth rates. Assam's conspicuous manufacturing growth rate at 9.9 per cent per annum in Period II could be attributed to the negative base in Period I.

16. As evident from Table-3, high growth rates of manufacturing sector in Assam and Bihar are again accompanied by high degree of instability indicating that the attainment of such high growth rates may not be possible on a long term basis. It may,

Table-3 : Growth and Variability of Manufacturing Sector

(Percent per annum)

States	Period I		Period II	
	Growth Rate	Co-efficient of Variation	Growth Rate	Co-efficient of Variation
Assam	-4.17	19.79	9.93 (H)	19.82 (H)
Bihar	4.28	12.41	6.54 (H)	14.82 (H)
Orissa	7.05	22.96	5.58 (L)	13.93 (L)
West Bengal	2.16	7.30	1.04 (L)	2.93 (L)
Eastern Region	2.75	8.34	3.71 (H)	7.85 (L)
All India	5.15	14.79	6.32 (H)	12.41 (L)

Note : 'L' for lower, 'H' for higher growth rate/ variability in period II over period I.
Source : Same as for Statements I & II.

however, be noted that fall in the variability in West Bengal and Orissa would not be much relevant since there had been a sharp deceleration in the growth rates of the manufacturing sector in these two States in Period II.

17. One of the important reasons for the lagged growth of manufacturing sector in the region could be found in inadequate infrastructure. The single most important infrastructure for industrial growth is the availability of power. Although the growth of power sector is reasonably high in Period II in Assam and West Bengal, they are again accompanied by high degree of instability. Bihar and Orissa have in fact witnessed declines in the growth rates of power sector. The dependence on thermal power which has been unreliable in the Eastern region, (except for Orissa), underscores the need to strengthen the power profile of Eastern India by drawing a long term policy, to take care of the anticipated demand so that the manufacturing sector can take-off in the Eastern States.

18. The Eastern States have also shown a number of other characteristics: a low absorptive capacity (of funds), absence of widespread markets throughout the region and lack of entrepreneurial skill which all go to explain their unimpressive industrial performance. The general trend of increase in developmental expenditure to total disbursements, which was witnessed in the second half of the seventies, has been recently reversed. The ratio in fact declined in the Eastern States barring Assam during the recent period, and remained on an average below the all-States' average level (except Orissa) during 1974-75 to 1987-88 as indicated in Table-4 shown below:

Table-4 : Development Expenditure as Percentage of Total Disbursements at Current Prices

(Percent per annum)

States	1974-75	1979-80	1987-88	Average of 1974-75 to 1987-88
Assam	71	67	70	68
Bihar	67	73	69	66
Orissa	69	73	70	71
West Bengal	70	65	63	66
All States	69	73	71	71

Source : 'Finances of State Governments' published in various issues of RBI Bulletin.

19. Per capita developmental expenditure, which is often used as a better indicator for the purpose of gauging developmental efforts, also lagged significantly behind the all-States' average as evident from Table - 5.

Table-5 : Per Capita Developmental Expenditure at Current Prices

(Rupees)

States	1980-81	1984-85	1987-88	Average of 1980-81 to 1987-88
Assam	200	378	544	342
Bihar	149	223	338	232
Orissa	239	322	471	326
West Bengal	197	308	402	293
All States	236	380	543	369

Source : Various issues of RBI Bulletin and Reports on Currency and Finance, Reserve Bank of India.

Growth and Variability in Services Sector

20. There has been a perceptible shift in the growth rate of the services sector at the all-India level from 5.4 per cent in Period I to 7.6 per cent in Period II together with variability coming down from 15.4 per cent to 14.6 per cent during the same period (Table-6)

21. Similar to the all-India trend, all the Eastern States (except Bihar) witnessed higher growth rates of the services sector in Period II over Period I. Except in the case of Assam, the variability has also come down in all other States. Broadly speaking, the services sector has grown systematically in the region, similar to that at the all-India level; although growth rates in the Eastern States in Period II are relatively less pronounced (except Assam) than that at the national level.

Acceleration/Deceleration

22. The co-efficient of time-square (t^2) has been found to be positive and significant only in limited cases (denoted by £ in Statement I), meaning, thereby, that acceleration in growth rates was

Table-6 : Growth and Variability of Services Sector

(Percent per annum)

States	Period I		Period II	
	Growth Rates	Co-efficient of Variation	Growth Rates	Co-efficient of Variation
Assam	5.00	14.21	9.77 (H)	18.82 (H)
Bihar	6.12	19.28	3.28 (L)	6.61 (L)
Orissa	3.40	10.43	5.12 (H)	10.28 (L)
West Bengal	3.82	10.95	4.81 (H)	9.63 (L)
Eastern Region	4.50	12.97	4.93 (H)	9.71 (L)
All India	5.37	15.42	7.60 (H)	14.61 (L)

Note : 'L' for lower, 'H' for higher growth rate/ variability in period II over period I.

Source : Same as for Statements I & II.

seen only in a few cases. Similarly, in certain cases, the co-efficients of time-square have been found to be negative and significant which have been obviously interpreted as cases of marked deceleration in the growth rates (denoted by $). Both acceleration and deceleration have been summarised in Table - 7 shown below :

23. It is evident from the table that while acceleration in the growth rates for the whole period in case of agriculture, manufacturing and electricity was limited to Bihar, Assam, and West Bengal respectively, it was the case for all the Eastern States (except Bihar) in the case of services. This further corroborates the earlier observation that the services sector in the Eastern region has grown systematically over time. Period-wise analysis further confirms the view that the services sector of the Eastern region as a whole continued to grow at an accelerated rate in both the Periods. On the other hand, there has been no indication of acceleration in the growth rates of the manufacturing sector as well as total SDPs in any of the Eastern States in Period II. This apart, Assam

Table-7 : Acceleration/Deceleration in Growth Rates

Sectors		Whole period	Period I	Period II
1. Agriculture	A	Bihar	-	Orissa
	D	-	Assam	-
2. Manufacturing	A	Assam	Bihar	-
	D	-	Assam	-
3. Electricity	A	West Bengal	Orissa	West Bengal and All-India
	D	-	Assam	Assam
4. Services	A	Assam, Orissa, West Bengal, Eastern Region, and All-India	Bihar, Eastern Region and All-India	Eastern Region
	D	-	-	-
5. Total SDP/NDP	A	Assam, Bihar and All-India	-	-
	D	-	Assam	-

Note : 'A' for acceleration (Coefficient of time-square is positive and significant) and 'D' for deceleration (Coefficient of time-square is negative and significant) derived from the equation $\text{Log } Y = a + bt + ct^2$

witnessed a marked deceleration in the growth rates of all the sectors in Period I (except services) and of electricity in Period II. As indicated earlier, such a result may be on account of the lower base in the 1970s and therefore, its higher growth rates of most of the sectors in Period II cannot obviously be considered as notable achievements.

Section III

Structural Change

24. A change in the economic structure is a natural concomitant of economic development. With economic progress, it should not be surprising if the primary sector contributes gradually less and less to the national income. In India as well as in the four Eastern States, this phenomenon was clearly in evidence. What is more important to note is that the tertiary sector has taken a lead role before the secondary sector accounted for a substantial proportion in the national basket. This may be seen with reference to the contribution of agriculture, manufacturing and services to State Domestic Product of the four Eastern States as well as those at the all-India level. Statement III provides the period-wise trends.

25. There has been a sharp decline in the contribution of agriculture to NDP at the all-India level as the share declined from 43.4 per cent during the 1970s to 37.1 per cent in the next seven years. The order of decline for the Eastern region, on the other hand, was more modest, at about 8.0 per cent as the share declined from 48.5 per cent in Period I to 44.7 per cent in Period II. The position in respect of individual States is relatively more revealing. Agriculture continued to claim, on an average, a share of more than 50 per cent in the SDP of Assam and Orissa in the first seven years of the eighties, although modestly declining trends are discernible from the levels shown for the 1970s. Despite the sharpest fall in percentage term, Bihar's agriculture claims a share of 44.7 per cent of the SDP in the second period which is much higher than that at the all-India level. Agriculture in West Bengal has the lowest contribution to SDP in both the periods as compared to those of other States. This is understandable since the State has an industrial base built over years from the beginning of this century. The rate of decline in the contribution of agriculture to SDP in Period II was also the lowest in West Bengal as the share came down marginally from 40.6 per cent in the 1970s to 39.8 per cent in the 1980s, so far. The broad conclusion that emerges thus from the data of the region as a whole is that agriculture still continues to be the mainstay of the people.

26. As regards the manufacturing sector, the performance of the Eastern region was dismal. The contribution of manufacturing sector to NDP at the all-India level improved by 4.1 per cent in Period II. In sharp contrast, during the same period, the ratio declined by 2.9 per cent for the Eastern region as a whole. The state-wise picture is somewhat contrasting in nature. While manufacturing sector's share in the SDP has improved in Assam and Bihar considerably, it has declined in Orissa and West Bengal. As West Bengal's manufacturing sector accounts for more than 50 per cent of the Eastern region's net value added in manufacturing, it would more than offset the improvements in shares of Assam and Bihar. The apparent improvement in Assam's share, it may be cautioned, could be on account of a low base. The improvement in the case of Bihar was only marginal. One would, therefore, be able to come to the conclusion that not only there has been little structural change in the Eastern region, but also there has been industrial retrogression in Orissa and West Bengal.

27. Similar to the all-India experience, all the Eastern States witnessed significant positive shifts in the contribution of service sector to their respective SDPs in Period II. The changes in the contribution of services to SDP were faster in cases of Assam and Bihar and relatively slow for Orissa and West Bengal as compared to that at the all-India level.

28. The structural changes discussed above give a clue to the fact that the manufacturing sector deserves more attention not only for faster growth but also for generation of more employment.

Relative Position

29. The relative position of the States has deteriorated, as may be seen from the decline in the contribution of the Eastern region to the NDP from about 20.7 per cent in the 1970s to 19.3 per cent in the first seven years of the 1980s (Statement IV). Among the four States, the erosion was as high as 10.0 per cent for Orissa, followed by West Bengal (8.9 per cent) and Bihar (4.2 per cent). Only Assam could maintain its position by contributing 2.3 per cent to all-India NDP in both the Periods. The sectors responsible for the erosion of relative positions of the

States in Period II were agriculture for Bihar, all sectors for Orissa and manufacturing and services sectors for West Bengal.

Section IV

Agriculture – Industry Linkages

30. There is plenty of literature exploring and quantifying the various linkages between agriculture and industry in India. Rangarajan (1982), for example, has shown for the period 1961 to 1972 that "a one per cent growth in agricultural output increases industrial production by about 0.5 per cent." Since then, there has been a greater diversification of industries at the all-India level. This has led to the erosion of the relative position of the agro-based industries in the whole spectrum of industrial structure of the country. Nevertheless, the linkages between agriculture and industry do exist which is traced through the role of agriculture as (a) a supplier of wage goods to the industrial sector, (b) a provider of raw materials for the agro-based industries and (c) a generator of agricultural income which creates final demand for industrial output. Isher Ahluwalia (1985) has stated that "While the growth of wage goods was not a retarding factor on the growth of the industrial sector, and the slowdown in the growth of commercial crops may have held back the growth of agro-based industries only to a limited extent, the slow growth of agricultural incomes leading to slow generation of demands for consumer goods was a factor constraining the growth of consumer goods".

31. It has been discussed earlier that the growth of agriculture and services sectors in the Eastern region is quite impressive in Period II and, therefore, it is not out of place to presume that sufficient demand for industrial products might have been generated. Nevertheless, the growth of the manufacturing sector in the Eastern region has been tardy which leads one to believe that a greater part of the demand might have been met by industrial products coming from the neighbouring States. Under this presumption, an attempt has been made to indicate supply-based linkages between manufacturing and agriculture in the Eastern region. Table - 8 given below brings out the responsiveness of manufacturing

growth to agricultural growth in the Eastern States during the period from 1970-71 to 1986-87*

Table-8 : Selected Equations on Agriculture-Industry Linkages

Sl. No.	Equation	$\bar{R}^2$	DW
1.	Log (AM) = -3.550 + 2.007 Log (AAG) (3.281)	0.38	0.86
2.	Log (BM) = - 2.045 + 1.443 Log (BAG) (3.289)	0.38	1.45
3.	Log (OM) = 0.305 + 0.588 Log (OAG) (1.866)	0.13	1.44
4.	Log (WBM) = 1.386 + 0.443 Log (WBAG) (4.901)	0.59	1.40
5.	Log (EM) = - 0.443 + 0.965 Log (EAG) (5.738)	0.67	1.95

Note : Figures in the parentheses are 't' statistics.
Variables ending 'M' stand for manufacturing net value added of respective States : Assam (A), Bihar (B), Orissa (O), West Bengal (WB) and also Eastern Region (E) which are assumed to depend on variables ending 'AG' representing agriculture of the respective geographical entities.

32. It appears from the above table that a one per cent increase in agriculture in the Eastern region would lead to almost a

* It is necessary to exercise caution while interpreting the results of the table. This is because, it focuses only on the supply side of the picture and ignores completely the demand side. A fairer thing to do would be to evolve a system of equations where both demand and supply aspects are considered. However, this could not be done is view of the paucity of data relating to the demand aspects concerning the Eastern States.

one per cent increase in manufacturing sector. Of these four States, the linkages between manufacturing and agriculture are the weakest in Orissa. This in a sense reflects the fact that the Rourkela Steel Plant (which is non-agro-based) alone accounts for about 50 per cent of the total net value added by the manufacturing sector in the State. In West Bengal, the linkages appear to be somewhat low because of mainly two reasons; first, there has been considerable diversification of industries and secondly, agro-based industries, mainly jute industries, are shrinking due to inadequate demand for them. Linkages are relatively higher in Bihar and the highest in Assam. In the case of Assam, although equation (1) has the limitation of poor DW statistics, it has been retained due to the highest linkages (between manufacturing and agriculture) among the Eastern States. As a rule of thumb, one can visualise that tea and jute are the major agricultural raw material in Assam which are responsible for high degree of linkages between manufacturing and agriculture in the State. The linkages between manufacturing and agriculture, in general, is weak in the Eastern region where agriculture is the mainstay. This would suggest that industrial growth would accelerate if activities besides agriculture are undertaken. Given the large mineral resources of these States, it would be possible for industries to grow on the basis of improvements in agriculture and minerals in this region. A relatively faster growth rate of industries can bring about a structural change and improve the relative position of the region in India.

Section V

Summary and Conclusions

33. The overall growth rates of the Eastern States' SDP in Period II were relatively higher than those in Period I, but they were still below that at the all-India level. The momentum of growth in the Eastern region was not satisfactory which, in fact, led to the erosion of the relative positions of Eastern States (except Assam) in the NDP. The relatively higher growth rate of the Eastern region SDP in Period II over Period I was, however, accompanied by a high degree of instability. The instability emanated mainly from agriculture and partly from the manufaturing sector. The Eastern region is yet to reach a stage where growth rates would be high

and variability would be low. Moreover, there is no indication of significant acceleration in the growth rates except in the service sector.

34. All the Eastern States except Assam experienced higher growth rates of agriculture in Period II over Period I as against stagnation at the all-India level. However, high rates of growth in agriculture in Eastern States in Period II were accompanied by a high degree of instability over Period I primarily due to dependence on monsoon.

35. As regards the manufacturing sector, although growth rates have gone up in the cases of Assam (from a low base) and Bihar, variability has also increased. In the case of Orissa and West Bengal, the growth rates were lower in Period II than in Period I as compared to a rising trend in the growth rate of manufacturing sector at the all-India level. Inadequate infrastructure, low absorption capacity, absence of broadbased market (except Calcutta), lack of entrepreneurial skills and inadequate developmental expenditure may have contributed to the dismal performance of the manufacturing sector in the Eastern region.

36. The services sector grew systematically in the Eastern States with relatively higher growth rates (except Bihar) and low variability (except Assam) in Period II over Period I. However, the growth rates of the services sector of all the Eastern States (except Assam) were lower than that for the country as a whole in Period II.

37. The structural changes have been modest in the Eastern region during 1970-71 to 1986-87. Despite a declining trend, agriculture continued to be the major contributor to the SDPs of all the Eastern States, accounting on an average, 44.7 per cent of the region's SDP as compared with an average of 37.1 per cent at the all-India level during 1980-81 to 1986-87. As regards the manufacturing sector, while the share in respective SDPs has improved in Assam and Bihar, it has fallen in Orissa and West Bengal in Period II over Period I. The overall contribution of the manufacturing sector to total regional SDP has shrunk from 12.8 per cent to 12.4 per cent as against the modest increase at the all-India level

from 14.6 per cent to 15.2 per cent during the same period. The shares of the services sector to their respective SDPs in the Eastern States, which ranged between 22.6 per cent and 33.6 per cent in Period I, improved to 26.3 per cent and 36.7 per cent in Period II as compared to the corresponding share at the all-India level which rose from 33.1 per cent to 39.4 per cent during the same period. Despite the rising trend in the contribution to SDP, the services sector in any of the Eastern States has neither become the major contributor to respective SDPs as yet nor exceeded the level for the country as a whole in Period II.

38. In the process, the relative position of the region in terms of contribution to NDP has been eroded to the extent of 6.6 per cent in Period II over Period I. All the States under consideration, except Assam, witnessed erosion in their relative positions ranging between 4.2 and 10.0 per cent which could be traced to relatively slow growth rates of SDPs in the Eastern States.

39. The agriculture-industry linkages have been generally weak in the Eastern region. However, there is scope for improvement in the growth rate of manufacturing sector which would bring about structural change and augment their relative positions.

40. The problems discussed above have a number of policy implications, on which some attention may have to be paid if a more even regional development should be pursued as a goal of development. For example, the instability in the growth rate of agriculture has to be reduced; whether this could be brought down by bringing more and more cultivable land under irrigation is a question that needs to be addressed. Again, the poor performance of the manufacturing sector would need to be reversed. Increasing investments both in the public and private sectors could well be an answer but it should be ensured that in the process employment also increases. This may be rendered possible if agro-based and small-scale and cottage industries, which are mostly labour-intensive in nature, are encouraged.

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STATEMENT - I

Growth Rates of SDP/NDP

(Percent per annum)

Sector/States	Whole period	Period I	Period II
1. Agriculture			
Assam	2.24	2.02$	0.44
Bihar	1.67£	0.72	3.97
Orissa	1.84	1.06	4.42£
West Bengal	2.80	2.66	4.62
Eastern Region	2.21	1.70	3.82
All-India	2.09	1.81	1.81
2. Manufacturing			
Assam	5.17£	-4.17$	9.93
Bihar	4.79	4.28£	6.54
Orissa	2.54	7.05	5.58
West Bengal	1.67	2.16	1.04
Eastern Region	2.92	2.75	3.71
All-India	4.81	5.15	6.32
3. Electricity			
Assam	17.87	15.64$	24.82$
Bihar	4.45	6.89	5.37
Orissa	5.51	7.87£	6.32
West Bengal	3.37£	2.31	7.75£
Eastern Region	4.88	4.88	8.19
All-India	7.94	8.44	8.84£
4. Services			
Assam	6.56£	5.00	9.77
Bihar	6.39	6.12£	3.28
Orissa	4.06£	3.40	5.12
West Bengal	4.04£	3.82	4.81
Eastern Region	4.93£	4.50£	4.93£
All-India	6.17£	5.37£	7.60
5. Total SDP/NDP			
Assam	3.78£	2.66$	4.91
Bihar	3.49£	2.99	3.99
Orissa	2.83	2.40	4.50
West Bengal	3.04	3.01	4.16
Eastern Region	3.23	2.90	4.23
All-India	4.04£	3.61	4.95

Note: 1. Growth rates are computed from the equation Log Y = a + bt, and it is given by the expression r = (Antilog (b)- 1) x 100

2. '£' represents acceleration (co-efficient of time square is +ve and significant) and '$' represents deceleration in the growth rates (co-efficient of time square is -ve and significant).

STATEMENT - II

Co-efficient of Variations in SDP/NDP

(Percent per annum)

Sector/States	Period I 1970-71 to 1979-80	Period II 1980-81 to 1986-87
1. Agriculture		
Assam	7.30	4.88
Bihar	6.10	10.35
Orissa	12.29	13.69
West Bengal	9.72	12.21
Eastern Region	7.35	9.79
All-India	7.86	4.69
2. Manufacturing		
Assam	19.79	19.82
Bihar	12.41	14.82
Orissa	22.96	13.93
West Bengal	7.30	2.93
Eastern Region	8.34	7.85
All-India	14.79	12.41
3. Electricity		
Assam	38.08	39.34
Bihar	20.47	12.41
Orissa	24.33	13.21
West Bengal	7.10	16.13
Eastern Region	14.49	15.97
All-India	23.89	17.32
4. Services		
Assam	14.21	18.82
Bihar	19.28	6.61
Orissa	10.43	10.28
West Bengal	10.95	9.63
Eastern Region	12.97	9.71
All-India	15.42	14.61
5. Total SDP/NDP		
Assam	7.89	9.71
Bihar	9.05	8.16
Orissa	10.29	10.40
West Bengal	9.19	9.17
Eastern Region	8.80	8.86
All-India	10.86	9.68

Source : Compiled from the original data taken from
(1) *Estimates of State Domestic Product*. C.S.O and
(2) Report on Currency and Finance. RBI. various issues.

STATEMENT - III

Sectoral Contribution to Respective SDP/NDP

(Percent per annum)

Sector/States	Average of Period I	Average of Period II	Percentagbe increase (+) or decre-ase (-) of Period II over Period I
1. **Agriculture**			
Assam	56.74	50.07	-11.76
Bihar	51.90	44.71	-13.85
Orissa	60.22	55.58	-7.71
West Bengal	40.58	39.84	-1.82
Eastern Region	48.52	44.65	-7.98
All-India	43.41	37.12	-14.49
2. **Manufacturing**			
Assam	7.98	10.53	+31.95
Bihar	10.44	11.60	+11.11
Orissa	8.58	7.28	-15.15
West Bengal	16.84	15.04	-10.67
Eastern Region	12.77	12.40	-2.90
All-India	14.57	15.16	+4.05
3. **Services**			
Assam	24.04	30.08	+25.12
Bihar	22.63	28.91	+27.75
Orissa	23.73	26.31	+10.87
West Bengal	33.60	36.71	+9.26
Eastern Region	27.82	32.12	+15.46
All-India	33.06	39.36	+19.06

Source : Compiled from

(1) Estimate of State Domestic Products, C.S.O., various issues and

(2) Report on Currency & Finance, RBI, various issues.

STATEMENT – IV

Relative Position of States

Sector/States	Average of Period I		Average of Period II		Percentage Increase (+)/ Decrease (–) of Period II over Period I
	Absolute SDP Rs. crores	% contribution to All India	Absolute SDP Rs. crores	% contribution to All India	
1. Agriculture					
Assam	507.16	2.98	625.09	3.06	+2.68
Bihar	1301.62	7.65	1509.73	7.39	-3.40
Orissa	660.56	3.88	771.08	3.77	-2.84
West Bengal	1464.06	8.60	1837.93	9.00	+4.65
Eastern Region	3933.40	23.11	4743.83	23.22	+0.48
All-India	17021.90	100.00	20431.14	100.00	-
2. Manufacturing					
Assam	71.30	1.25	131.51	1.58	+26.40
Bihar	261.93	4.58	391.52	4.69	+2.40
Orissa	94.10	1.65	100.98	1.21	-26.67
West Bengal	607.63	10.63	693.85	8.32	-21.73
Eastern Region	1034.96	18.11	1317.85	15.80	-12.76
All-India	5714.50	100.00	8341.86	100.00	-
3. Services					
Assam	214.90	1.66	375.60	1.73	+4.22
Bihar	567.67	4.38	976.06	4.50	+2.74
Orissa	260.35	2.01	368.03	1.70	-15.42
West Bengal	1212.16	9.35	1693.42	7.82	-16.36
Eastern Region	2255.08	17.40	3413.11	15.75	-9.48
All-India	12962.10	100.00	21667.00	100.00	-
4. Total SDP/NDP					
Assam	893.79	2.27	1248.47	2.27	-
Bihar	2508 02	6.40	3376 41	6.13	-4.22
Orissa	1096 92	2.80	1387.29	2.52	-10.00
West Bengal	3607.67	9.20	4613.03	8.38	-8.91
Eastern Region	8106 40	20 67	10625.21	19.30	-6.63
All-India	39209 80	100 00	55043 29	100.00	-

Source : Compiled from
(1) Estimates of State Domestic Product, C S O., various issues and
(2) Report on Currency and Finance, RBI, various issues

ATTACHMENT - 1

SDP/NDP at Factor Cost by Industry of Origin at 1970-71 Prices

(Rs. crores)

Year	Assam					Bihar					Orissa				
	Agriculture	Manufacturing	Electricity	Services	Total	Agriculture	Manufacturing	Electricity	Services	Total	Agriculture	Manufacturing	Electricity	Services	Total
1970-1971	444.10	70.20	1.10	170.60	771.40	1265.16	221.77	17.23	458.22	2245.44	656.02	83.31	3.56	231.72	1037.43
1971-1972	446.80	73.60	1.50	179.50	807.10	1304.08	227.86	18.65	467.31	2309.29	574.52	68.88	3.67	233.11	945.15
1972-1973	493.30	76.60	2.10	191.40	844.40	1265.20	229.71	19.72	480.38	2299.85	660.79	65 91	3.75	239.15	1042.26
1973-1974	504.20	80.30	2.20	199.90	865.90	1199.23	243.59	18.44	486.36	2260.44	706.11	83 23	4.13	244.14	1110.52
1974-1975	489.60	83.70	2.40	206.10	861.80	1250.48	243.93	22.67	516.15	2376.09	557.35	91.66	5.46	231.44	958.91
1975-1976	553.30	86.80	2.80	209.70	938.60	1325.68	258.73	28.26	547.09	2533.36	709.07	75 46	6.69	264.47	1132.49
1976-1977	528.10	87.40	3.80	225.00	932.10	1347.25	279.30	29.05	605.53	2650.18	585.74	109.15	6.79	267.87	1055.74
1977-1978	550.70	48.70	3.90	247.20	982.00	1435.69	291.35	28.35	623.52	2788.66	763.11	108 79	6.43	289.03	1244.84
1978-1979	532.80	56.80	4.10	255.00	989.20	1426.85	311.50	30.55	667.83	2853.43	807.58	125.97	6.47	304.07	1328.17
1979-1980	528.70	48.90	4.20	264.60	945.40	1196.60	311.57	27.28	824.31	2763.44	585.32	128 63	5.63	298.50	1113.71
1980-1981	643.60	92.00	4.10	282.30	1095.10	1490.16	255.99	27.64	863.87	3053.07	742.37	93.14	6.31	323.00	1249.47
1981-1982	573.60	116.00	4.90	297.50	1081.90	1337.77	414.99	30.13	933 38	3152 35	745.49	87 61	6.96	328.15	1269.11
1982-1983 (P)	619.00	122.50	14.00	339.90	1192.20	1246.21	389.71	31.49	968 39	3079 42	666.15	91 78	6.50	341.42	1201.69
1983-1984 (P)	654.00	112.10	13.90	372.20	1268.60	1515 13	399.65	28.50	957 09	3353.51	627.81	85.17	7 82	370.31	1492.60
1984-1985 (P)	606.40	148.70	15.60	414.30	1305.80	1608.41	407.79	31.73	995.44	3524.82	774.08	109.71	8.60	374.01	1359.23
1985-1986 (P)	670.10	163.60	14.50	425.20	1393 90	1677.02	424.00	36.24	1037 28	3676.76	929.67	123.68	8 11	407.24	1568.87
1986-1987 (P)	608 90	165.70	15.20	497.80	1401.80	1693.40	448.48	39.68	1076 95	3794 97	911.99	115.76	9.20	432.11	1570.07

P = Provisional.

Source :1. Estimate of State Domestic Products, C.S.O., various issues and

2. Report on Currency and Finance, Reserve Bank of India, various issues.

ATTACHMENT - 1 (Cont. . .)

SDP/NDP at Factor Cost by Industry of Origin at 1970-71 Prices

(Rs. crores)

Year	West Bengal					Eastern Region					All India				
	Agriculture	Manufacturing	Electricity	Services	Total	Agriculture	Manufacturing	Electricity	Services	Total	Agriculture	Manufacturing	Electricity	Services	Total
1970-1971	1313.40	555.87	28.80	1020.63	3168.10	3678.68	931 15	50.69	1881.17	7222.37	16354.00	4619 00	318.00	10422.00	34519.00
1971-1972	1397.82	565.18	30.17	1073.53	3315.68	3723.22	935 52	53.99	1953.45	7377.22	16209.00	4750.00	337.00	10868.00	35028.00
1972-1973	1242.51	582.23	31.90	1094 52	3229.40	3661.80	954 45	57.47	2005.45	7415.91	15118.00	4954.00	355.00	11161.00	34502.00
1973-1974	1332.82	585.83	30.97	1118.15	3340 13	3742.36	992 95	55 74	2048.55	7576.99	16298.00	5252 00	364.00	11524.00	36203.00
1974-1975	1440.24	567.52	31.13	1151 96	3457.43	3737.67	986 81	61.66	2105.65	7654.23	15934.00	5468 00	392 00	12085.00	36624.00
1975-1976	1571.71	579.08	33.95	1222.54	3698 03	4159.76	1000 07	71.70	2243 80	8302.48	18066 00	5557.00	449.00	13030.00	40155.00
1976-1977	1485.27	658.43	35.62	1292.87	3818.45	3946.36	1134 28	75.26	2391.27	8456.47	16808.00	6040 00	518 00	13731.00	40355.00
1977-1978	1714.14	680.24	35.03	1368.21	4121.06	4463.64	1129 08	73.71	2527.96	9136.56	18977.00	6427.00	537.00	14613.00	44012.00
1978-1979	1645.74	656.59	35.38	1387.42	4047.81	4412.97	1150 86	76.50	2614.32	9218.61	19569.00	7106.00	609.00	15870.00	46606.00
1979-1980	1496.95	645.33	34.61	1391.74	3880.63	3807.57	1134 43	71 72	2779.15	8703.18	16886.00	6972.00	617.00	16317.00	44094.00
1980-1981	1783.66	670.51	35.21	1507.05	4310.52	4659.79	1111 64	73.26	2976.22	9708.16	19071.00	6923.00	648 00	17254.00	47326.00
1981-1982	1565.98	681 46	38.22	1509.04	4138 28	4222.84	1300 06	80.21	3068.07	9641.64	19880.00	7328 00	699 00	18472.00	49936.00
1982-1983 (P)	1455.68	693 70	39.16	1563.53	4032.55	3987.04	1297 69	91 15	3213.24	9505.86	19215.00	7835.00	747.00	19985.00	51350.00
1983-1984 (P)	1969.07	699 01	40.78	1697.76	4725.53	4766.01	1295 93	91.00	3397 36	10840.24	21461.00	8229.00	796.00	21384.00	55581.00
1984-1985 (P)	2001.27	669 67	44.63	1765.54	4835.54	4990.16	1335 87	100.56	3549.29	11025.39	21218.00	8673.00	892.00	23010.00	57654.00
1985-1986 (P)	2036.21	727 17	49.11	1852.90	5042.24	5313.00	1438 45	107.96	3722.62	11681.77	21450.00	9270.00	969.00	24815.00	60548.00
1986-1987 (P)	2053.67	715 40	57.23	1958.11	5206 54	5267.96	1445 34	121.31	3964.97	11973.38	20723.00	10135 00	1084.00	26749.00	62908.00

P = Provisional.

Source :1. Estimate of State Domestic Products, C.S.O., various issues and

2. Report on Currency and Finance, Reserve Bank of India, various issues.

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Bank Credit for the Chemical Industry [1970-71 to 1984-85]

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In this paper an attempt has been made to present a comparative analysis of the actual bank credit deployed by the commercial banks *vis-a-vis* the credit permissible under the Tandon Committee norms during the period, 1970-71 through 1984-85. Empirical results reveal that the composition of the inventory in terms of raw materials, finished goods and work-in-progress drifted in favour of the latter two components over the time period. The inventory-output ratio showed a decline over the sample period, with the decline being more pronounced during the post-Tandon Committee period. From the empirical results, it appears that banks are still following Method-I of the Tandon Committee norms for evaluating the credit requirements.

INTRODUCTION

ONE of the objectives of monetary policy is to ensure that credit provided by commercial and co-operative banks contribute to maximum production possible, and keep inflationary forces under control. In pursuance of these objectives, the Reserve Bank of India attempts to determine as to what constitutes the genuine working capital needs of industrial units and see as to how far these could be met by commercial banks. This matter was perhaps for the first time most systematically examined about two decades back by the Dehejia Committee. The Dehejia Committee in its report submitted in 1969 stated that in the corporate sector, the rate of increase in nominal industrial output was far below the rate of increase in the level of inventory held with the help of bank credit. The Committee thereby came to the view that bank credit in the case of many industries was much in excess of their genuine productive needs. But the Committee did not go into the issue of evaluating norms relating to the short-term bank credit needs. This was the subject of inquiry of a number of study/working groups that were set up in the seventies and eighties. Of the study/working

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groups, one of the early ones to focus on the issue were the reports of the Tandon Committee (1975) and Chore Committee (1979). These were followed by Marathe Committee (1983) and recently by Vaghul Committee (1987). Again, of all these reports, the Tandon Committee report is perhaps the most comprehensive as it suggested a scientific approach for evaluating the short-term credit needs of the corporate sector. The Tandon Committee came to the view that there is a need to link credit with production requirements and envisaged that eventually the entire system of credit planning should be dovetailed with production planning, both to make good use of banking as a facility, and also to create better management of cash, materials and receivables. Accordingly, the Tandon Committee proposed certain norms for maximum levels of holdings of inventory and receivables in each industry. The Tandon Committee expected that borrowers would not hold more than the prescribed levels.

2. The present study is an attempt to make an analysis of the actual credit deployed by the commercial banks to the chemical industry during the period 1970-71 to 1984-85, vis-a-vis the credit permissible under the Tandon Committee norms. The study is essentially empirical in nature. First, we discuss the sources and coverage of the data and then we provide an empirical analysis.

SOURCES AND COVERAGE OF THE DATA

3. The study is based on the time series data from 1970-71 to 1984-85 relating to the medium and large public limited companies (except for 1984-85 which also includes small companies) covering medicine and pharmaceutical companies, chemical fertilizers, dyes and dyestuffs, man-made fibres, plastic raw materials, paints, varnishes and other chemical products.

4. The data have been collected from the annual studies of the Reserve Bank relating to medium and large public limited companies. Over the period, the coverage of sample data in terms of number of companies has varied. To bring about uniformity, the output growth rate in the year the sample size differed from the original sample size was applied to the previous year's output as the initial sample to obtain output that would be consistent for the entire period in question. To maintain the original characteristics of the relationships between output and bank credit and output and inventory level, the adjusted output data were applied to the

quotients expressing the above relationships in order to derive adjusted data on bank credit and inventory level. We have also worked out output of chemicals at constant prices by deflating the adjusted nominal output series by the wholesale price index for the chemical industry. This procedure was applied since in the chemical industry, chemical products themselves are the major input. Bank credit at constant prices was worked out by deflating the adjusted bank credit series by the price index for chemical output, as in India, bank credit is mainly meant to enable the companies to maintain desired levels of inventory.

EMPIRICAL ANALYSIS

(A) Inventory-Output Relationships

5. Before proceeding to study the relationships between bank credit and inventory levels, it may be useful to examine the changing pattern in the composition of inventory, changes in the inventory output ratio over the time period and changes in the inventory-output ratio with respect to scale of output.

i) Composition of Inventory

6. Table 1 shows the composition of the inventory in terms of its percentage share of raw materials, finished goods and work-in-progress.

Broadly, raw material component of inventory continued to account for 50 to 60 per cent of the total inventory. The percentage share of finished goods to inventory fluctuated in between 28 to 37 per cent, though was more stable around 33 per cent. As regards the work-in-progress, its percentage share slowly rose from 10 to about 13 per cent over the period.

(ii) Changing Pattern of Inventory - Output Ratio

7. In Table 2, the inventory-output ratio and the ratio of raw materials with respect to output are presented. To make a comparative analysis of the inventory-output ratio in the pre-and post-Tandon Committee period, we have enlarged the coverage of the period beginning from 1960-61.

Table 1 : Composition of Inventory-Chemical Industry (at Current Prices)

Year	Percentage Share in Total Inventory		
	Raw Materials@	Finished Goods	Work-in-Progress
1.	2.	3.	4.
1970-71	56.23	34.02	9.75
1971-72	56.89	33.59	9.53
1972-73	60.48	29 19	10.33
1973-74	60.72	28.17	11.12
1974-75	57.65	30.54	11.81
1975-76	53.19	33.46	13.34
1976-77	53.76	33.79	12.45
1977-78	55.42	31.41	13.16
1978-79	56.02	30.71	13.27
1979-80	59.27	28.57	12.16
1980-81	55.21	32.97	11.81
1981-82	52.62	35.55	11.83
1982-83	50.30	37.04	12.64
1983-84	51.48	35.05	13.40
1984-85	51.52	35.54	12.93
Average	55 38	32.64	11.97

@ Also includes stores, spares and others.

8. As may be seen from Table-2, the inventory-output ratio declined almost continuously over the period from 32 per cent in 1960-61 to around 24 per cent in 1984-85. In the post-Tandon Committee period, the average of the inventory-output ratio worked out to be only 26.28 per cent, as against 30.63 per cent in the pre-Tandon Committee period. This may be a reflection of the positive impact of the inventory norms laid down by the Tandon Committee

Table 2 : Changing Pattern of the Inventory-Output Ratio
(At current prices)

(Percentage)

Year	Inventory -Output Ratio	Raw Material -Output Ratio
1.	2.	3.
1960-61	32.05	18.04
1961-62	33.74	18.42
1962-63	34.15	20.19
1963-64	33.41	18.85
1964-65	31.06	17.81
1965-66	30.10	17.48
1966-67	29.81	16.71
1967-68	31.88	18.05
1968-69	31.05	17.25
1969-70	27.90	14.98
1970-71	28.99	16.30
1971-72	28.62	16.27
1972-73	28.15	17.02
1973-74	28.01	17.00
1974-75	30.53	17 60
1975-76	28.46	15.13
1976-77	26.05	14.01
1977-78	25.68	14.23
1978-79	25.32	14.19
1979-80	28.11	16.65
1980-81	27.74	15.32
1981-82	25.91	13.63
1982-83	25.80	12.97
1983-84	25.46	13.11
1984-85	24.32	12.53

9. To verify statistically whether after the recommendations of the Tandon Committee norms, there has been any structural

shift in the inventory-output ratio and raw material-output ratio, regression equations have been estimated in respect of the inventory-output ratio and raw material-output ratio with respct to time. To identify the structural shift, we have included a dummy variable having value one for the years 1975-76 to 1978-79 and for the years 1981-82 to 1984-85 and zero for the remaining years. For the years 1979-80 and 1980-81, the dummy variable was given the value zero as the spurt in inventory stocks during these years was attributable to external factors such as the infrastructural bottlenecks and the uncertainties created by the second oil crises and the sharp fall in agricultural output. The estimated equations are given below :

$$(S/O)_t = 33.38320 - 0.34548\ T \quad \ldots\ldots\ldots\ldots \quad (1)$$
$$t \qquad\qquad 9.89$$
$$E \qquad\qquad -0.16$$

$$\bar{R}^2 = 0.80 \quad DW = 2.47 \quad SEE = 1.26 \quad Mean = 28.89$$

$$(S/O)_t = 33.02597 - 1.27581\ D - 0.28659\ T \quad \ldots\ldots \quad (2)$$
$$t \qquad\qquad 1.73 \qquad\qquad 5.99$$
$$E \qquad\qquad -0.01 \qquad\qquad -0.13$$

$$\bar{R}^2 = 0.82 \quad DW = 1.31 \quad SEE = 1.21 \quad Mean = 28.89$$

$$(R/O)_t = 19.27800 - 0.24065\ T \quad \ldots\ldots\ldots \quad (3)$$
$$t \qquad\qquad 8.39$$
$$E \qquad\qquad -0.19$$

$$\bar{R}^2 = 0.74 \quad DW = 1.41 \quad SEE = 1.03 \quad Mean = 16.15$$

$$(R/O)_t = 1.75821 - 1.85641\ D - 0.15497\ T \quad \ldots\ldots\ldots \quad (4)$$
$$t \qquad\qquad 3.67 \qquad\qquad 4.68$$
$$E \qquad\qquad -0.04 \qquad\qquad -0.12$$

$$\bar{R}^2 = 0.83 \quad DW = 1.38 \quad SEE = 0.84 \quad Mean = 16.15$$

S/O, R/O represent inventory - output ratio; raw material (inventory) - output ratio, respectively, T is time-trend and D is the dummy variable. The equations show that over time, the inventory

economisation has been achieved. The negative sign for the regression coefficients of the dummy variable and the relatively significant t-values in the equations which employ the dummy variable, suggest that after 1974-75 there has been a downward drift in the inventory-output ratio and more particularly, in the raw material-output ratio.

10. We have also made an effort to verify the impact of the size of industrial units, in terms of output, on the inventory. For this purpose, cross-section data on inventory and output for 25 medium and large public limited companies (of the medicine and pharmaceutical group for 1981-82) was compiled and the following equation has been estimated:

$$LnS_t = A_1 + B_1 \, LnO_t \quad \ldots\ldots\ldots \quad (5)$$

If $B_1 < 1$, it will indicate that the inventory requirements per unit of output would decline, with the increase in the size of the company while $B_1 < 1$ will indicate that inventory requirements would increase if the size of a industrial unit is larger. The results we get are:

$$\underset{t}{Ln\, S_t} = \underset{}{0.8549} + \underset{2.71}{0.79841}\, LnO_t \quad \ldots\ldots\ldots\ldots \quad (6)$$

$$\bar{R}^2 = 0.83 \quad SEE = 0.48 \quad Mean = 8.88$$

11. The results of the equation (6) suggest that with the increase in the size of the industrial unit, economies of scale operate. The t-value obtained to test whether B_1 is different than 1 turned out to be as high as 2.71 and significant.

(iii) Inventory Levels According to the Tandon Committee Norms

12. The Tandon Committee stipulated norms for the maintenance of desired level of raw materials (including stores and other spares), stocks-in-progress, finished goods and receivable and bills purchased and discounted in respect of 15 industries. This covered as many as five groups from the chemical industry, viz., chemical fertilizers, dyes and dyestuffs, man-made fibres, basic

industrial chemicals and medicine and pharmaceutical preparations. But we have in our Study computed aggregate norms for the chemical industry as a whole on the basis of the norms provided for each sub-group[1]. To arrive at the aggregate norms in respect of raw materials (store & spare parts included), work-in-progress, finished goods and receivables for the overall chemical industry, the percentage shares of raw materials, finished goods, work-in progress and receivables have been worked out from their respective totals for each sub-group for the years 1975-76 and 1976-77, to even out the impact of any random fluctuation. The percentage shares so worked out have been used as weights for each sub-group and arrived at the aggregate norms for the overall chemical industry. Table-3 indicates the norms for each sub-group level and for the overall chemical industry.

13. Based on the aggregate norms as indicated in Table-3, the desired inventory for the overall chemical industry has been worked out and their ratio with respect to the actual inventory is given in Table 4.

14. Table 4 shows that the inventory levels in the case of chemical industry have been brought almost within norms, after 1982-83. In 1975-76, there was a sharp cut in the raw material component of the inventory, as the ratio of actual raw material stocks to the raw materials according to the Tandon Committee norms, came down from 157 per cent to 133 per cent. As regards stocks of finished goods, the same has been almost within norms after 1976-77 onwards. The stock component of the work-in-progress has been almost in accordance with the Tandon Committee norms since 1980-81. The total inventory stood lower at 98 per cent of the norm in 1984-85 from its level of 134 per cent in 1970-71.

(iv) Factors Behind the Determination of Inventory Levels

15. After surveying the composition of inventory and the trends in inventory-output ratios during the period, we would now turn to finding out the factors that determine the inventory level, from an analytical point of view A.K.Sen (1964) considered the inventory level as a function of value added of the manufacturing

Table 3 : Inventory Norms – Chemical Industry

Months of consumption of Inventory

	Chemical fertilisers	Dyes & dyestuffs	Man-made fibres	Plastic raw materials	Basic industrial chemicals	Medicine and Pharmaceutical preparation	Paints & allied products	Other chemical products	Overall chemical industry
1.	2.	3.	4.	5.	6.	7.	8.	9.	10.
1. Raw Materials including stores and other items used	2-1/2 (19.76)	2-1/4 (6.35)	1-1/2 (12.59)	2-3/4 (2.68)	2-3/4 (17.69)	2-3/4 (14.12)	2-3/4 (3.29)	2-3/4 (23.51)	2-1/2
2. Stocks-in-progress	Nil (6.27)	1 (17.62)	-1/2 (16.88)	-1/4 (2.38)	-1/4 (10.72)	-1/2 (25.50)	-1/4 (2.58)	-1/4 (18.01)	-1/2
3. Finished goods	1-1/2 (12.73)	1-1/2 (6.44)	-1/2 (14.74)	1 (2.97)	1 (14.40)	2 (19.38)	1 (5.03)	1 (24.27)	1-1/4
4. Receivable and bills purchased and discounted	1-1/4 (17.30)	2 (7.74)	1-1/2 (14.39)	1-3/4 (4.32)	1-3/4 (16.81)	1-1/4 (16.81)	1-3/4 (5.94)	1-3/4 (17.70)	

Notes :

1. Raw materials are expressed as so many months' consumption of raw materials. Raw materials includes stores and spares also as separate data on spares is not available.
2. Stocks-in-progress are expressed as so many months' cost of production.
3. Finished goods are expressed as so many months' cost of sale.
4. Receivable are expressed as so many months' sale.
5. In the absence of norms for plastic raw materials, paints and allied products, and other chemical products norms for these industries have been taken as those for Basic Industrial Chemicals.
6. Figures in brackets indicate percentage share of the total industry.
7. **Cost of production**
   (a) Raw materials consumption (b) Power & fuel (c) Salaries & wages (d) Consumable stores (e) Repairs and Maintenance (f) Other manufacturing expenses (g) Depreciation (h) Adjusted for the variation in stocks-in-progress.
8. **Cost of Sales**
   Cost of Production is adjusted for the opening stocks-in-Finished goods & closing stocks-in-Finished goods.

Source : Report of the Study Group to Frame Guidelines for Follow-up of Bank Credit (page 32, 33 & 34).

Table 4 : Ratio of Actual Inventory with respect to Inventory as per the Tandon Committee Norms

Year	Raw Material Com-ponents@	Finished Goods	Work-in-Progress	Total In-ventory	Sundry Receivable
1.	2.	3.	4.	5.	6.
1970-71	150.39	130.30	97.06	133.62	116.14
1971-72	152.73	126.93	94.30	134.02	106.92
1972-73	161.20	107.07	100.78	133.25	102.32
1973-74	158.92	102.40	106.32	130.24	90.62
1974-75	157.43	127.22	122.24	135.86	83.53
1975-76	132.86	123.10	126.94	126.12	94.85
1976-77	120.22	108.98	106.49	114.16	107.67
1977-78	119.92	99.49	109.09	110.87	109.95
1978-79	119.72	95.96	109.09	109.10	106.56
1979-80	139.75	99.12	110.91	119.90	100.73
1980-81	123.66	110.38	101.91	113.61	101.89
1981-82	108.82	109.55	94.58	105.32	99.22
1982-83	105.77	112.85	100.65	105.75	106.62
1983-84	105.96	101.31	103.20	103.67	115.08
1984-85	99.85	100.20	95.61	98.01	107.99

@ Also includes stores, spare parts and others.

sector. Paul Borrows (1971) estimated the equilibrium inventory as a linear function of expected sales of the next period. Krishnamurthy and Sastry (1966) have made use of output as an explanatory variable to estimate inventory level for selected industries.

16. We attempt to estimate the marginal coefficient of inventory with respect to output by using the following simple regression equation

$$S_t = A_2 + B_2 O_t + U_t \quad \ldots\ldots\ldots \quad (7)$$

Where S_t and O_t are respectively the inventory and output at period t, and B_2 is the marginal coefficient of inventory with respect to output. U_t is the error term having usual stochastic properties.

17. The results are given in equations 8 and 9. They suggest that in the long-run, inventory levels bear a stable relationship with output, whether the variables are expressed at current prices or at constant prices. The elasticity of inventory with respect to output works out to 0.91 for the data at current prices and 0.78 for the data at constant prices.

At Current Prices

$$S_t = 6568.00 + 0.24\ O_t \quad \ldots\ldots \qquad (8)$$
$$\begin{matrix} t & & 37.21 \\ E & & 0.91 \end{matrix}$$

$\bar{R}^2$ =0.99 DW = 1.24 SEE = 3561.63 Mean = 75443.21

At Constant Prices

$$S_t = 8245.00 + 0.21\ O_t \quad \ldots\ldots \qquad (9)$$
$$\begin{matrix} t & & 17.98 \\ E & & 0.78 \end{matrix}$$

$\bar{R}^2$ = 0.96 DW = 1.44 SEE = 1341.00 Mean = 36726.00

18. It is, however, necessary to caution that inventory levels may not get completely adjusted to the output levels during the same year. Equation (7) therefore would need to be modified to introduce the element of dynamic inventory adjustment. If the inventory level is partially adjusted to the equilibrium level within each period, equation (7) may be modified as:

$$S^*_t = A_3 + B_3\ O_t + U_t \quad \ldots\ldots \qquad (10)$$

where S^*_t is the desired level of inventory Since S^*_t is not directly observable, a restriction has to be imposed to find out the values of the regression coefficients. This may be done by assuming that

$$S_t - S_{t-1} = d(S^*_t - S_{t-1}) \quad \ldots\ldots\ldots \quad (11)$$

Where d stands for the adjustment coefficient, with the value of d being anywhere between 0 and 1. The higher the value of the adjustment coefficient d, the quicker is the adjustment in the inventory level, Rearranging the equations (10) and (11), the following equation can be derived :

$$S_t = A_3\, d + B_3 d\ O_t + (1-d)\, S_{t-1} + d\, U_t \quad \ldots\ldots \quad (12)$$

The empirical results for the above equation are given below :

At Current Prices

$$S_t = 5787.74 + 0.17\ S_{t-1} + 0.20\ O_t \quad \ldots\ldots\ldots \quad (13)$$

t	0.77	4.09
E	0.15	0.77

$\bar{R}^2 = 0.99$ DW = 1.31 SEE = 3624.24 Mean = 75443.21

At Constant Prices

$$S_t = 4693.00 + 0.37\ S_{t-1} + 0.14\ O_t \quad \ldots\ldots\ldots \quad (14)$$

t	3.21	5.82
E	0.36	0.52

$\bar{R}^2 = 0.98$ DW = 2.52 SEE = 1006.00 Mean = 36726.00

19. The adjustment coefficient works out to be 0.83 for the data at current prices and 0.63 for the data at constant prices. The short-term elasticity of the inventory level with respect to output works out to be 0.77 in the case of current prices and 0.52 in the case of constant prices.

20. Besides output, there are other factors which have a bearing on inventory levels. If there are expectations of rise in prices, there would be a tendency to accumulate raw materials as hedge against inflation, since the general price rise may also have its effect on the raw material cost. Similarly, a rise in interest rate

may induce firms to bring down their inventory levels. The data on expected price rise, however, is not readily available. Hence its influence on inventory levels could not be empirically tested. With regard to short-term interest rate, it could be taken as the weighted average of interest rates worked out on the basis of distribution of loans to chemical industry according to the interest ranges as reported in Basic Statistical Returns (BSR). The impact of output (O_t) and the real interest rate (RI_t) on the inventory level could be found out in the dynamic sense, as per equation (15) given below :

$$S_t = A_4\, d + (B_4\, d)\, O_t + (C_4 d)\, RI_t + (1-d)\, S_{t-1} \quad \ldots\ldots \quad (15)$$

Equation (15) has been estimated for the data at constant prices. RIt is obtained by deducting the inflation rate (based on the wholesale price index) from the nominal interest rate.

At Constant Prices

$$S_t = 4881.00 + 0.31\, S_{t-1} - 0.46 RI_t + 0.16\, O_t \quad \ldots\ldots \quad (16)$$

t	2.28	1.12	5.44
E	0.29	-0.01	0.58

$\bar{R}^2 = 0.99$ DW = 2.35 SEE = 995.00 Mean = 36726.00

The results of the regression equation (16) suggest that the real interest rate shows the desired sign, though its impact is not very significant.

(B) Pattern of Bank Credit and Inventory Levels

(i) The Actual and Permissible Bank Credit

21: One of the questions that would often crop up is whether the actual bank credit for the chemical industry is anywhere near the permissible credit levels. For addressing this, one should know as to how the maximum permissible short-term credit for closing the working capital gap is worked out. The Tandon Committee has set out three methods in this regard. The first method required short - term bank credit (B_t) to be limited to 75 per cent of the "working

capital" gap between current asets (CA) and current liabilities other than bank credit (CL). The second method stipulated a tighter limit to bank credit (B_t), since under this method, current liabilities other than bank credit (CL) would have to be deducted from the 75 per cent of the current assets (CA), to arrive at the limit of bank credit. The third method requires an estimate of "core" current assets to be deducted from the total current asset figures before applying the second method to increase larger stake of the promoters of firms, companies. The core current assets are to be financed by equity and long-term loans.

These three methods can be summarised by the following equations

Method I : $B_t = 0.75 (CA - CL)$ ..... (17)
Method II : $B_t = 0.75 CA - CL$ ..... (18)
Method III : $B_t = 0.75 (1 - \alpha CA-CL$ ..... (19)

Where "α" represents the fraction of current assets estimated to be "core" current assets. In 1975 the Tandon Committee report recommended that one should make a beginning with the first method, then move to the second and finally to the third method.

22. It may be useful to study the ex-post relationships between the actual bank credit and the maximum permissible bank borrowings. It may be recalled that the Tandon Committee set out the norms for the inventory level and receivables and banks were advised to lend credit in relation to the desired inventory according to the stipulated norms or the actual inventory whichever is less. It is not easy to work out the aggregate permisible bank credit according to Method III, since the "core assets" vary from firm to firm. In view of this limitation, the permissible bank credit is worked out according to Methods I and II and is presented in Table-5.

23. The concept of 'permissible bank credit' used in Table 5 would be synonymous with 'credit limit'. At the micro-level, utilization of bank credit below one hundred per cent may be construed as unutilized portion of bank credit. However, at the aggregate level, utilization of bank credit with respect to the permissible bank credit would normally be below one hundred per cent. This is on

Table-5 : Ratios of the Actual and Permissible Levels of Bank Credit

Year	Ratio of Actual Bank Credit to Permissible Levels of bank Credit		Credit Utilisation Ratio as per BSR data@
	Method I	Method II	
1.	2.	3.	4.
1970-71	70.80	85.72	-
1971-72	65.00	76.34	-
1972-73	57.50	68.43	53.79
1973-74	56 31	67.70	55.81
1974-75	49 10	58.94	63.22
1975-76	50 31	59.69	60.14
1976-77	48.21	57.93	59.76
1977-78	49.36	60.99	62.28
1978-79	51.66	65.35	63.44
1979-80	56.11	72.66	63.26
1980-81	64 50	91.98	62.15
1981-82	70.53	95.73	68.64
1982-83	69 56	95.53	67.87
1983-84	74.43	112.02	68.17
1984-85	79.70	124.50	-

@ Credit utilization ratio for 1970-71 and 1971-72 as per BSR data could not be presented as the system came into existence only from 1972-73 and onwards.

account of the fact that peak borrowing requirements of individual customers occur at different times, since the banks' customers as a whole would never take up all their facilities at the same time. This is because all the industrial units would not be able to maintain the maximum projected level of production at the same time and hence they would not be utilising their full limits simultaneously. In view of this, the gap between the permissible bank credit and actual bank credit, as shown in Table 5 reflects the fact that medium and large companies of the chemical industry have been making use

of their permissible bank credit, estimated as per Method II, upto optimal level.

(ii) Bank Credit and Inventory Linkages

24. We have so far studied the inventory-output links and the factors behind the determination of overall inventory levels. We have also seen that the actual credit is set against the exercise of working capital requirement. But the strength of the link between bank credit (B_t) and inventory level (S_t) reflects the developments in the output of the industry concerned and the prices of the products of the industry. According to the Tandon Committee, the permissible bank credit is expected to rise with the rise in the value of current assets (of which inventory stock forms a major component) as it will strengthen the borrowing power of the firms. The rise in the value of inventory stock may be due to the actual rise in the inventory in physical terms, necessitated by rise in output. The value of inventory stock may also get inflated because of the rise in the prices of chemical products. The impact of these two components on bank credit can be estimated expressing bank credit (at current prices) as a function of physical inventory (i.e. inventory at constant prices) and wholesale price index of chemical products. Accordingly, a relationship between bank credit, physical inventory i.e. inventory level at constant prices and wholesale price index (for chemical industry) (WPCM) has been estimated in the following form:

$$B_t = A_5 + B_5 \, WPCM_t + C_5 \, S_t + U_t \qquad \ldots\ldots \quad (20)$$

Expressing equation (20) in the reduced form, the following equation has been obtained :

$$B_t = A_6 + B_6 \, WPCM_t + C_6 O_t + e_t U_t \qquad \ldots\ldots \quad (21)$$

where O_t is output and is at constant prices.

Empirical results of equations (20) and (21) are given below

$$B_t = -29544.66 + 181.83 \; WPCM_t + 0.7814 \; S_t \qquad (22)$$

$$\begin{array}{ll} t & 3.20 \quad\quad 1.47 \\ E & 1.04 \quad\quad 0.85 \end{array}$$

$\bar{R}^2$ = 0.92 DW = 0.39 SEE = 5046.37 Mean = 32893.33

B_t = -25238.62 + 172.76 $WPCM_t$ + 0.1901 O_t .... (23)
t 3.71 2.01
E 0.99 0.78

$\bar{R}^2$ = 0.93 DW = 0.29 SEE = 4717.25 Mean = 32893.33

The results of equation (20) estimated through the recursive form (RF) i.e. making use of estimated inventory level (S^e_t) are given below :

(RF) B_t = -32807.30 + 172.76 $WPCM_t$ + 0.92 S^e_t
t 3.71 2.05 .... (24)
E 0.99 1.00

$\bar{R}^2$ = 0.93 DW = 0.29 SEE = 4717.29 Mean = 32893.33

In all these three equations the value of DW is found to be significantly lower than the desired value, indicating the existence of positive auto-correlation in error terms. To eliminate the auto-correlation, Cochrane-Orcutt procedure has been used and the results of the regression equations so obtained are as follows :-

(OLS) B_t = -10477.84 + 203.41 $WPCM_t$ + 1.1694 S_t ....(25)
t 5.03 3.32
E 1.03 1.03

$\bar{R}^2$ = 0.78 DW = 2.30 $\hat{P}$ = 0.805 SEE = 2854.23 Mean = 9848.79

(OLS) B_t = -8115.71 + 224.25 $WPCM_t$ + 0.2813 O_t .... (26)

t 7.23 5.63
E 1.09 0.92

$\bar{R}^2$ = 0.85 DW = 2.43 $\hat{P}$ = 0.855 SEE = 2018.74 Mean = 8029.71

$$(RF)B_t = -9684\ 61 + 224.26\ WPCM_t + 1.36\ S^e_t \quad \ldots\ldots \quad 27$$

t 7.23 5.62

E 1.09 1.11

$\bar{R}^2 = 0.85$ DW = 2.43 $\hat{P} = 0.855$ SEE = 2018.58 Mean = 8029.71

The results of these equations suggest that there is a very significant impact of prices on the demand for credit. What is more, one could make use of the three equations to work out the impact of the rise in output, inventory level and prices on the bank credit separately.

CONCLUSIONS

25. The empirical results of this study suggest that composition of the inventory in terms of raw materials, finished goods and work-in-progress shifted over time in favour of the latter two components. Though there has been a declining trend in the inventory-ouput ratio over the period 1960-61 to 1984-85, the decline was more significant during the post-Tandon Committee period. It appears that banks are still following Method I for evaluating the inventory norms because actual credit as per Method II is higher than the permissible credit during later years.

26. The overall inventory bears a positive relationship with output. Its marginal coefficient is 24 per cent and 21 per cent for the data at current prices and constant prices, respectively. The elasticity of inventory with respect to output is 0.91 and 0.78 for the data at current prices and constant prices, respectively. The evidence presented in the paper suggests that in normal circumstances, variation in inventory is caused in response to output. Bank credit rises almost in the same proportion as the rise in the prices and output of the chemical industry, their elasticities being 1.09 and 0 92, respectively.

Notes.

1. The Tandon Committee has not prescribed any norms for plastic raw materials, paints and allied products and other chemical products that are covered in this study. Norms for these three sub-groups have been adopted as those of 'basic industrial chemicals'.

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Indian Exports : Diversification and Instability

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Export instability assumes considerable importance for India because of significant fluctuations in its export earnings. The study finds that the total export instability declined over the period from 1956-57 to 1984-85, with a sharp fall during 1975-85, mainly because of the commodity diversification and introduction of an exchange rate system based on a basket of currencies. The geographical diversification, on the other hand, had not contributed much towards reducing export instability. Due to increased instability and high relative proportionate contributions of exports to non-major countries, the study argues for more exports to major countries. Among the selected commodities, the instability of exports of tea and jute had increased and that of exports of jute, cashew kernel, tobacco, coffee, leather and machinery and transport equipments had declined. Country-wise, the instabilities of exports to the U.K., Australia, Japan and F.R.G. had decreased and that of exports to the U.S.A., the U.S.S.R. and Canada had increased.

INTRODUCTION

MANY less developed countries (LDCs) face constraints in pursuing their cherished long-term strategies of economic growth and development. One such constraint could be seen in their export earnings. Export instability in particular introduces an element of uncertainty in long-term policy planning. As such, the problem of export instability has been an important source of concern for policy makers. The issue is of considerable importance and relevance to India as well because of significant fluctuations in its export earnings. This necessitates a rigorous analysis to examine a few important relevant issues : How was the behaviour of instability in India's export earnings during the last four decades? Was there any diversification in exports? What was the impact of diversification on export instability? The present paper attempts to resolve some of these issues relating to the instability in export earnings in India.

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Evaluation of Established Methods

2. Traditionally, commodity and geographic concentration are regarded *prima facie* as the main factors contributing to the instability in the export earnings of a country. The technique conventionally used in cross-country analysis in order to establish relationship between concentration and instability is regression analysis. This approach necessitates a measurement of concentration, on the one hand and instability on the other. The most commonly used measure of concentration is Gini-Hirschman index, which defines commodity concentration in a country's exports, C_{xt}, as

$$C_{xt} = \sqrt{\sum_{t=1}^{n} \left(\frac{Xit}{Xt}\right)^2}$$

where, X_{it} is the value of exports of commodity i in the year t and X_t is total export earnings in that year. The same method is deployed to estimate index of georgraphical concentration.

3. While Gini-Hirschman index is used as a common measure of concentration for calculating instability index, various authors used different types of instability indexes, mainly, (a) standard error from exponential trend (Massel, 1970), (b) log-variance (Coppock, 1962), and (c) arithmetic measure based on first-order deviations (IMF, 1969: UNCTAD, 1979).

4. The common form of regression in cross-country analysis using the Gini-Hirschman Concentration index and instability index can be written as.

$$I_m = a_o + C_{xtm} + G_{xtm} + e$$

where I_m is the index selected to measure the degree of instability in total export earnings of the country m, C_{xtm} is the coefficient of commodity concentration for country m, G_{xtm} is the coefficient of geographical concentration for country m and e is the error term.

5. The above-mentioned regression equation form is beset with many statistical inconsistencies. First, if various types of instability indices are used, the regression analysis will give different numerical values for the same series of data. Secondly, whereas the above-mentioned instability indices provide one statistic which

measures instability for-the whole period-under the study, the Gini-Hirschman Coefficient gives a measure of concentration for one year. As such, these two variables, i.e, concentration and instability indices, are not reconcilable. Some authors have arbitrarily chosen one year of concentration coefficient. But the problem is that the value of the concentration coefficient may not remain stable, especially when a country embarks upon a drive towards diversification of commodity-group and country-destination of exports.

6. Naya (1973) has tried to overcome, at least, partially, the possible biases arising out of chosing arbitrarily any single year. He has averaged the concentration coefficients of two years, 1962 and 1967. But this averaging does not solve the fundamental problem of assigning different weights by exporting countries for different export items and different export destinations. In fact, countries attach different weights to their export items and importing countries. The differences in weights imply that greater concentration is not necessarily associated with greater instability. Let us take one hypothetical case. The export of commodity X of country A is substantially greater relative to its total exports than is the case of export of Y of country B. So, the concentration index will be higher for commodity X of country A than for commodity Y of country B. However, because of factors, such as, relative demand and supply position, international price movements of commodities and international commodity agreements, earnings from the export of the commodity X may be less unstable than earnings from the export of commodity Y. As such, the instability index will be less in case of commodity X than in case of commodity Y. This shows that higher concentration may not be necessarily associated with higher instability. The application of regression analysis may not, therefore, give a correct picture of the relationship between concentration and instability.

7. The earlier studies on export instability, however, provided conflicting results with regards to the relationship between concentration and instability. MacBean (1966) found that "all the correlation analysis yielded roughly the same answer of a very weak, if any, association between commodity concentration and export fluctuations. Further, if any association exists between geographical concentration and exports fluctuations it is negative". This conclusion was supported by others, like Naya (1973) and Kingston (1973). On the other hand, the study by Massel (1970)

established a significant relationship between concentration and instability using the same Gini-Hirschman coefficients. In a recent study on empirical analysis of India's exports over the last two decades, Das and Pant (1989) found that commodity diversification has done little to promote export earnings stability though geographical diversification seems to have been in the right direction. In another study, Kaur and Singhal (1989) showed that the traditional commodities exhibited the highest degree of instability. Kannan (1983) found that neither commodity concentration nor geographical concentration was a significant factor in influencing instability in exports.

8. The foregoing discussion outlines the limitations that may arise from the use of Gini-Hirschman coefficients and instability indices in regression analysis, and it follows as Love (1979) has stated that the significant results of the empirical studies may reflect these problems rather than, as many authors have suggested, the absence of causal relationship. Consequently, this paper does not employ regression analysis using Gini-Hirschman's concentration coefficient and the above-mentioned instability indices. Rather, the decomposition property of variance of export earnings forms the basis of this paper to examine the relationship between concentration and instability.

Methodology of the Study

9. The basic postulate of the paper is that concentration and instability may not necessarily be proportionate. In a total export basket (E), a particular commodity (E1) and the rest of the export basket (E2) may constitute 25 per cent and 75 per cent, but they may account for 45 per cent and 55 per cent of the total instability.

10. Export instability is defined here in terms of fluctuations around the trend[2] of export earnings. The measure selected is the weighted mean standard deviation based on deviations of predicted values (trend values) from the actual time series. Prediction operator is defined as a function which associates with each time series of total exports (E) a predicted time series pE subject to the requirement that for any constant, K,

if Et = K for all t, then pEt = K for all t

Given such a prediction operator $\dot{p}$, the arithmetic measure of instability[3] based on mean standard deviation takes the functional form :

$$I(E) = \sqrt{1/n \sum_{t=1}^{n} \left[(E_t - pE_t) / \bar{E} \right]^2}$$

Where n is the number of observations in the time series, E, and $\bar{E}$ is the average of E used as a scaling factor to ensure that measurement of instability becomes invariant to the choice of units in which the time series E is measured.

The use of $\bar{E}$ as a scaling factor makes it possible for I (E) to be a normalised measure of instability.

11. Variance of total export earnings (E) is not simply a linear combination of the variance of a particular commodity (E1) and the variance of the rest of the export basket (E2), it also depends on the degree to which these sources vary together, i.e., their covariance. In fact, one can interpret the covariance term here as a measure of diversification (Knudsen and Harbert, 1983). A positive covariance indicates that commodity trade flows tend to move in unison and thus, contributes towards overall instability-a drawback of diversification; a negative covariance indicates that trade flows tend to cancel and thus, contribute towards overall stability in aggregate export earnings - a benefit of diversification. As such,

if E = E1 + E2, equation (1) can be decomposed into

$$\text{Var (E)} = \text{Var (E1)} + \text{Var (E2)} + 2 \text{ Cov (E1E2)} \qquad (2)$$

Defining correlation coefficient γ_{E1E2} by

$$\gamma_{E1E2} = \text{Cov (E1E2)} / \text{Sd (E1)}. \text{ Sd(E2)} \qquad (3)$$

Substituting equation (3) into equation (2), one gets

$$\text{Var(E)} = \text{Var (E1)} + \text{Var (E2)} + 2 \text{ sd (E1) Sd(E2)} \gamma_{E1E2} \qquad (4)$$

Defining instability as in equation (1), equation (2) is then written as

$$I^2(E) = I^2(E1) + I^2(E2) + 2\,Cov\,(E1E2) \qquad (2a)$$

and equation (4) can be written as

$$I^2(E) = I^2(E1) + I^2(E2) + 2I(E1)\,I(E2)\,\gamma_{E1E2} \qquad (4a)$$

By expressing equation (2) in terms of equation (4), one can measure the significance of the effect of diversification, i.e., Cov (E1E2) by measuring the statistical significance of γ_{E1E2} by the 't' statistic test where

$$'t' = r.\frac{\sqrt{n-2}}{\sqrt{1-r^2}} \qquad (5)$$

It can easily be shown that no normalised measure can satisfy the decomposition property[4]. This difficulty can be overcome by measuring the variances of E1 and E2 with respect to the magnitude of the composite variable (E) rather than with respect to their own magnitudes. In other words, variance of E1 (or E2) cannot be scaled by $\bar{E}1^2$ (or $\bar{E}2^2$) rather it is to be scaled by $\bar{E}^2$ Since

$$Var\,(E1)/\bar{E}^2 = Var\,(E1)/\bar{E}1^2 \times 1/W1^2 \qquad (6)$$

the square root of the expression $var(E1)/\bar{E}1^2$ is defined here as normalised measure of instability in terms of mean standard deviation; multiplying it with W1 provides a weighted mean square deviation which is used as a measure of instability of commodity E1 (or E2). As such, by scaling Var (E1) by $\bar{E}^2$, one invariably arrives at weighted mean square deviation.

Equations (2) can also be expressed as

$$Var(E) = [Var(E1) + Cov\,(E1E2)] + [Var(E2) + Cov\,(E1E2)] \qquad (7)$$

Giving a notation as CE1 to the first term of the right hand side equation, one gets

$$CE1 = Var(E1) + Cov(E1E2) \quad (8)$$

(A different notation of CE2 can be used for commodity E2). Here, the value of CE1 can be positive or negative depending on the interaction between the individual values of Var (E1) and Cov (E1, E2), because while the value of variance is always non-negative, the value of co-variance can be positive, zero or negative. Mathematically

$$-CE1 = Var(E1) + Cov(E1E2) \quad (9)$$

if (i) $Cov(E1E2) < O$ and

(ii) $Cov(E1E2) > Var(E1)$

The practical implication of a negative value of CE1 means that the effect of diversification outweighs the instability of a particular commodity or, in other words, the variable in question contributes positively towards overall stability.

But the possibility that the commodity's contribution towards total instability may be proportionately more than its share can be examined by developing a suitable statistic. This paper developed one such statistic, called 'Relative Contribution Statistic' (RE1) which is defined for commodity E1 as

$$RE1 = CE1/Var(E1) \times 1/W1 \quad 10$$

If the value of CE1 is negative

$$-RE1 = -CE1/Var(E1) \times 1/W1 \quad (11)$$

Objective and Scope of the Study

12. Policy makers of a country are not only interested in the degree of instability in total export earnings as well as of individual commodities, but are also interested in the extent to which fluctuations in their export earnings are the result of commodity and /or geographic concentration, i.e., whether commodity and/or geographic diversification helped reducing export instability. Keeping this objective in view, the present paper makes an attempt to measure total instability as well as individual instability and the

contributions of exports, of commodity and/or country, towards fluctuations in total export earnings. The paper, therefore, discusses commodity-wise, country-wise and commodity-country-wise contributions towards overall instability.

13. The paper covered the period between 1956-57 and 1984-85. The whole period is divided into three decennial sub-periods-Period I (1956-57 to 1965-66) is the pre-devaluation period, 1966 being the year of devaluation; Period II (1966-67 to 1974-75) is the post-devaluation period but upto the introduction of exchange rate system based on a basket of currency, 1975 being the year of introduction of a basket of currency exchange rate system and Period III (1975-76 to 1984-85) covers till the end of the Sixth Plan.

Agricultural and allied Vs. Non-agricultural Commodities[5]

14. As can be read from Table 1, the share of agricultural and allied commodities in India's total exports (W1) declined by almost 30 per cent during the three decades ending with 1984-85 from 0.37 during Period I to 0.32 during Period II and further to 0.26 during Period III. This reflects the fact that India's exports have structurally been diversifying, shifting from agricultural to non-agricultural commodities. The effect of the commodity diversification on India's exports can be studied from the correlation coefficient between agricultural and non-agricultural commodity exports which is a substitute measure of diversification (or of covariance) as derived from equations (3) and (4). The relevant values of correlation coefficient and 't' statistic are given in Table 1.

15. The correlation coefficient was significantly positive during Period I and Period II, indicating that commodity diversification had taken place. But at the same time, there was decline in total instability (TI) from 0.1661 during Period I to 0.1293 during Period II. This can be explained by decline in instabilities of both agricultural exports (I1) and non-agricultural exports (I2); the former declining from 0.0651 during Period I to 0.0582 during Period II and the latter from 0.1071 during Period I to 0.0783 during Period II (Table 1). Further, one should recognise the fact that the

outcome of Period II could well be a reflection of the impact of devaluation on stability in export earnings. During the same two periods (i.e., Period I and II), the relative contribution of agricultural commodities in proportion to its export share (R1) increased from 1.00 during Period I to 1.35 during Period II, but in the case of the non-agricultural commodities it decreased to 0.94 times of its export share from the unit level of Period I.

16. It was during Period III that there was a sharp decline in total export instability by almost 3.4 times-from 0.1293 during Period II to 0.0377 during Period III (Table 1). The sharp decline in total instability can be attributed to two major factors. First, the introduction of a basket of currency exchange rate system in 1975 with the objective of stabilizing exchange rate might have helped achieve stability in export earnings. Second, the correlation coefficient was found significantly negative confirming the fact that during Period III, commodity diversification was moving in the right direction by contributing towards total stability. A similar conclusion on India's export instability was also drawn by Knudsen and Harbert (1983). They found out that commodity diversification contributed positively towards total export stability of India during the seventies. Their coefficient of total instability was almost of same value as derived in this study for Period III. Period III also experienced major fall in the instabilities of agricultural and non-agricultural exports - 0.0203 and 0.0478 respectively. The relative contribution of agricultural exports towards total instability (R1) took a negative value of 0.62 which means contributions towards total stability and the non-agricultural exports instability was 1.57 times of its exports share during Period III.

17. Table 1 also provides relevant values for some selected agricultural and non-agricultural commodities. Among the group of agricultural and allied commodities, the instability of tea exports (I3) declined from 0.0254 during Period I to 0.0142 during Period II, but increased marginally to 0.0150 during Period III. While it contributed negatively towards total instability (R3) during the first two periods, it contributed positively during Period III which was 1.43 times of its export share. The same scenario was experienced in case of spices exports (I5 and R5). The instability of exports of jute (I4) and cashew kernel (I7) showed declining

tendency and so were their positive contributions (R4 and R7) towards total stability. While the instability of exports of tobacco (I6) and coffee (I8) had increased during Period III, they had continuously been contributing positively (R6 and R8) towards total stability.

18. Among the group of non-agricultural commodities the instabilites of exports of leather (I9) and machinery and transport equipments (I11) had declined during the three periods and their contributions remained positive throughout the periods under study. In case of exports of iron ore, the instability (I10) increased considerably during Period II after which it declined in Period III and contributed towards total instability only during Period III.

Major Vs Non-major Countries[6]

19. Table 2 contains the values of relevant measures of instability, weights or shares and relative contribution statistic. Though major countries occupy half of India's total exports, their share did not continue to be as large in the mid-eighties as was in the immediate post-independence period. The average ratio (W12) of exports to major countries had fallen from 0.60 during Period I to 0.56 during Period II and further to 0.50 during Period III. Though the decline in the share of major countries (17 per cent) was not as high as that of agricultural commodities in the total (30 per cent), the fact that non-major countries started sharing more of India's exports, is itself an indication of country-diversification of India's exports.

20. The correlation coefficient between exports to major countries and exports to non-major countries – a measure of the effect of country-diversification – was significantly positive during Period I and Period II. However, during Period III, the correlation coefficient took a negative value, but turned out to be insignificant. In other words, country-diversification did little in improving the stability in total export earnings.

21. The instability of exports to major countries (I12) had throughout displayed a declining tendency-from 0.1022 during Period I to 0.0566 during Period II and further to 0.0277 during Period III. Its relative contribution towards total instability (R12) had

also decreased from one-to-one relationship with its exports share to 0.75 times of its exports share during Period II and 0.70 times of its exports share during Period III. On the contrary, the instability of exports to non-major countries (I13) increased from 0.0695 during Period I to 0.0771 during Period II, but declined to 0.0345 during Period III. However, its relative contribution increased from 1.00 to 1.26 and finally, to 1.30 times its exports share during the three successive periods. From the foregoing analysis, it appears that geographical diversification in India's exports had little, if any, impact on total export instability.

22. Among the group of major countries, India's exports to the U.S.A. (W14), the U.K. (W15), Australia (W16) had declined and increased in case of the U.S.S.R (W17), Japan (W18), F.R.G. (W19) and Canada (W20) during Period III. The instability in exports to U.S.A. (I14) decreased during Period II but increased during Period III and so also its relative contribution (R14). On the other hand, the instability of exports to the U.K.(I15) continuously declined and its relative contribution (R15) increased only during Period III. In the case of exports to Australia, the instability (I16) decreased during Period III and its relative contribution (R16) was also very low. Though the instability in exports to the U.S.S.R (I17) increased during Period III, its relative contribution (R17) remained positive all along. The instability in exports to Japan (I18) fell in Period III and its relative contribution was 1.75 times of its share during the same period. While the instability in exports to F.R.G. declined during Period III and that of to Canada increased, their relative contributions were towards reducing total instability.

Commodity – Country Analysis

23. In order to study the behaviour of instability of exports of specific commodities to individual countries, the paper selected three important traditional export commodities, viz., tea. jute and tobacco. The relevant values are given in Table 3. In the case of exports of tea, the share of the U.S.S.R. (W21) increased and so also its instability (I21) but the relative contribution (R21) was almost in proportion to its export share. The share of the U.K. in tea exports (W22) remained same, but its instability (I22) fell

continuously. As in case of the U.S.S.R., its relative contribution was almost in proportion to its export share. The instabilities in exports of jute to the U.S.A. and the U.S.S.R. had increased. But while the relative contribution increased in case of the U.S.A., it decreased for the U.S.S.R. Though the instabilities in exports of tobacco to the U.K. and the U.S.S.R. fell, the relative contribution fell for the U.K., but remained almost same for the U.S.S.R.

Conclusion

24. The instability of India's total export earnings declined over the entire period under study, with sharp fall observed during the third period, viz., 1975-85. The sharp fall in total instability was mainly due to two important factors : first, the introduction of an exchange rate system based on a basket of currencies and second, the commodity diversification.

25. The geographical diversification, on the other hand, had not contributed much to reducing total instability. Rather, geographical diversification was not found advisable because the instabilities and relative proportionate contributions of exports to non-major countries were higher than those of exports to major countries. The study argues for more exports to major countries.

26. Among the group of selected agricultural commodities the instabilities of exports of tea and jute increased and so also their relative proportionate contribution during 1975-85. In case of exports of jute, cashew kernel, tobacco and coffee, while the instabilities of the first two commodities declined, that of the rest increased, but the relative proportionate contributions were towards reducing total instability. Among the group of non-agricultural commodities, the instabilities of exports of leather, iron ore, and machinery and transport equipments declined in the recent period and their relative proportionate contributions except for iron ore moved towards maintaining stability in total export earnings.

27 Among the group of major countries, while the instabilities of exports to the U.K., Australia, Japan and F.R.G. decreased in the recent period, the instabilities of exports to the

U.S.A., the U.S.S.R. and Canada increased. Further, the proportionate contribution of individual instabilities towards total instability as compared to export share was more than unity in the case of exports to the U.S.A., the U.K. and Japan and less than unity in the case of exports to Austrialia, the U.S.S.R., F.R.G. and Canada.

Notes

1. Coppock was concerned with the question of instability during the years 1946-58 and he calculated Gini-Hirschman Coefficient for the year 1957 (Coppock, 1962). Massel has taken the year 1959 for the period of 1948-59 and for his later study for the period 1950-66, Massel has estimated coefficient for the year 1960 (Massel, 1970). MacBean took coefficient for the year 1954 (MacBean, 1966).

2. Since countries tend to plan in terms of growth rates, not in terms of absolute increments, it is relevant to explain deviations from an exponential growth path. The exponential trend as fitted here is of the form Log E = Log a + t Log b. The fit has been found to be good.

3. The other measure available is based on the geometric mean which takes the functional form

$$I(E) = \sqrt{1/n \sum_{t=1}^{n} \left[\log (E_t / pE_t) \right]^2}$$

While perhaps less frequently employed than arithmetic measure, well-known geometric measures include log-variance as used by Coppock (1962) and the standard error from the exponential trend as used by Massel (1970). There is, however, no basic difference between these two measures; when the 'fit' of the predicted time series pE is good, a geometric measure can, in fact, be interpreted as essentially equivalent to a normalized arithmetic measure based on the same prediction operator. This follows from the Taylor's series expansion of log (X) about the point X = 1 i.e., when $(E_t - pE_t)$ is small.

$$\text{Log } (E_t/pE_t) \backsim (E_t - pE_t) / \bar{E}$$

A third measure of instability is the arithmetic measure based on first order deviation as

$$I(E) = \quad 1/n \sum_{t=1}^{n} \Big/ E_t - pE_t / \Big/ \bar{E}$$

One important demerit of this measure, as argued by Brodsky (1980) is that it cannot admit meaningful decomposition analogous to equations (2) and (2a) given in the text.

4. If m is an integer, the decomposition property (i.e., equation (2a)) implies that I (mE) = mI (E), which (for m #1) contradicts the definition of a normalised measure.

5. Agricultural and allied commodities include tea, jute, tobacco, cashew kernel, coffee, spices and fish. The rest is categorised as non-agricultural commodities.

6. Major countries include the U.S.A., Japan, Federal Republic of Germany (F.R.G.), Canada, Australia, the U.K. and the U.S.S.R. The rest is categorised as non-major countries.

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Table 1: Instability and Contribution of Agricultural and Non-agricultural Commodities

Periods	Total Exports Instability (TI)	Correlation co-efficient (γ) between Agricultural & Non-Agricultural Exports	't' Value of correlation co-efficient (γ) between Agricultural & Non-Agricultural Exports	Exports of Agricultural Commodities			Exports of Non-Agricultural Commodities		
				I1	W1	R1	I2	W2	R2
Period I (1956-57 to 1965-66)	0.1661	0.85	4.564 +	0.0651	0.37	1.00	0.1071	0.63	1.00
Period II (1966-67 to 1974-75)	0.1293	0.92	6.211 +	0.0582	0.32	1.35	0.0738	0.68	0.94
Period III (1975-76 to 1984-85)	0.0377	-0.66	2.485 *	0.0203	0.26	-0.62	0.0478	0.74	1.57

(Contd.....)

\+ Significant at 1% level
* Significant at 5% level
I = Instability Index
W = Weight or Share
R = Relative Proportionate contribution statistic.

Table 1 : (Concluded)

ods	Exports of Major Agricultural & Allied Commodities														
	Tea			Jute			Spices			Tobacco			Cashew Kernal		
	I3	W3	R3	I4	W4	R4	I5	W5	R5	I6	W6	R6	I7	W7	R7
;riod I (956-57 to 965-66)	0.0254	0.1803	2.9006	0.0334	0.2022	2.2162	0.0054	0.0205	33.6915	0 0052	0.0250	30.9790	0.0064	0.0284	23.6085
Period II (1966-67 to 1974-75)	0.0142	0.0884	1.3098	0.0145	0.1323	1.1445	0.0037	0.0208	9.5949	0.0032	0.0250	8.7432	0.0063	0.0361	5.2065
Period III (1975-76 to 1984-85)	0.0150	0.0555	1.4329	0.0084	0.0349	0.5561	0.0042	0.0163	1.4336	0.0041	0.0188	1.6994	0.0031	0.0187	0.1027

Periods	Exports of Non Agricultural Commodities											
	Coffee			Leather			Iron Ore			Machinery & Transport Equipment		
	I8	W8	R8	I9	W9	R9	I10	W10	R10	I11	W11	R11
Period I (1956-57 to 1965-66)	0.0025	0.0110	64.1187	0.0134	0.0323	20.6232	0.0074	0.0299	21.4367	0.4274	0.0178	39.2935
Period II (1966-67 to 1974-75)	0.0021	0.0155	14.4663	0.0126	0.0572	4.5836	0.0271	0.0690	5.3939	0.2075	0.0448	3.6271
	0 0045	0.0227	0.7146	0.0085	0.0469	0.2714	0.0020	0.0430	0.4805	0.1434	0.0633	2.3804

Table 2 : Instability and Contribution of Major Countries and Non-Major Countries

Periods	Correlation co-efficient (γ) between Export to Major Countries & Non-Major Countries	't' Value of correlation co-efficient (γ) between Export to Major Countries & Non-Major Countiries	Exports to Major Countries			Exports to Non-Major Countries			Exports to U.S.A.		
			I12	W12	R12	I13	W13	R13	I14	W14	R14
Period I (1956-57 to 1965-66)	0.87	4.99+	0.1022	0.60	1.00	0.0695	0.40	1.00	0.0278	0.1615	-2.8768
Period II (1966-67 to 1974-75)	0.87	4.67+	0.0566	0.56	0.75	0.0771	0.44	1.26	0.0129	0.1467	-8.7021
Period III (1975-76 to 1984-85)	-0.34	1.02x	0.0277	0.50	0.70	0.0345	0.50	1.30	0.0194	0.1263	2.4951

+ Significant at 1 per cent level
x Not Significant

(Contd.....)

Table 2 : (Concluded)

Periods	EXPORTS TO U.K.			EXPORTS TO Australia			EXPORTS TO U.S.S.R.		
	I15	W15	R15	I16	W16	R16	I17	W17	R17
Period I (1956-56 to 1965-66)	0.0346	0.2395	-1.7985	0.0823	0.0314	22.5548	0.0183	0.0615	-9.3510
Period II (1966-67 to 1974-75)	0.0230	0.1167	-0.1827	0.2751	0.0188	10.1803	0.0128	0.1272	-1.3462
Period III (1975-76 to 1984-85)	0.1416	0.0700	3.4747	0.1376	0.0131	0.4522	0.0358	0.1397	-2.4343

Periods	EXPORTS TO Japan			EXPORTS TO F.R.G.			EXPORTS TO Canada		
	I18	W18	R18	I19	W19	R19	I20	W20	R20
Period I (1956-56 to 1965-66)	0.0954	0.0642	10.4988	0.1186	0.0274	26.3700	0.0743	0.0267	-27.0485
Period II (1966-67 to 1974-75)	0.1597	0.1127	-2.0568	0.1901	0.0264	-6.9721	0.1443	0.0177	-12.6270
Period III (1975-76 to 1984-85)	0.0779	0.0933	1.7433	0.1652	0.0441	-1.0281	0.2105	0.0920	0.2497

Table 3 : Instability and Contribution of Commodity - Country Exports

Period	Exports of Tea to						Exports of Jute to					
	U.S.S.R.			U.K.			U.S.A.			U.S.S.R.		
	I21	W21	R21	I22	W22	R22	I23	W23	R23	I24	W24	R24
Period I (1956-57 to 1965-66)	0.0155	0.0760	1.2111	1.2156	0.0924	0.7813	0.0510	0.3460	0.8454	0.0232	0.0597	2.3430
Period II (1966-67 to 1974-75)	0.0333	0.1850	1.0936	0.3851	0.0712	1.0985	0.0650	0.4172	0.4990	0.0329	0.1426	1.0866
Period III (1975-76 to 1984-85)	0.1016	0.3029	0.8322	0.3049	0.0924	1.0735	0.0779	0.2003	1.1112	0.1377	0.3470	1.0223

Periods	Exports of Tobacco to					
	U.K.			U.S.S.R.		
	I25	W25	R25	I26	W26	R26
Period I (1956-56 to 1965-66)				-	-	-
Period II (1966-67 to 1974-75)	0.1482	0.4682	1.0613	0.1284	0.2697	0.8325
Period III (1975-76 to 1984-85)	0.0663	0.2710	0.6670	0.1148	0.3756	1.1065

Statement I

(Rs. Crore)

Year	Total Exports	Agriculture Exports	Non-Agriculture Exports	Exports to Major Countries	Exports to Non-Major Countries
1956-57	620	263	357	353	267
1957-58	635	226	409	357	278
1958-59	573	220	353	363	210
1959-60	640	223	417	395	245
1960-61	642	235	407	399	243
1961-62	661	236	425	405	256
1962-63	380	147	233	224	156
1963-64	793	310	483	464	329
1964-65	816	309	507	508	308
1965-66	806	280	526	501	305
1966-67	1094	376	718	692	402
1967-68	1199	421	778	773	426
1968-69	1358	426	932	328	530
1969-70	1413	402	1011	838	575
1970-71	1535	469	1066	877	658
1971-72	1608	507	1101	927	681
1972-73	1971	644	1327	1087	884
1973-74	2523	819	1704	1424	1099
1974-75	3332	1153	2179	1616	1716
1975-76	4041	1434	2607	1993	2048
1976-77	5151	1494	3657	2436	2715
1977-78	5405	1698	3707	2741	2664
1978-79	5727	1600	4127	2716	3011
1979-80	6458	1934	4524	3136	3322
1980-81	6711	2038	4673	3502	3209
1981-82	7806	2217	5589	4220	3586
1982-83	8903	1821	7082	4263	4640
1983-84	9866	2045	7821	4642	5224
1984-85	11398	2118	9280	5873	5525

Note For commodity groups see note 5 and for country groups see note 6

Source Various issues of Report on Currency and Finance Vol II

Reserve Bank of India Occasional Papers
Vol. 11, No. 1, March 1990

BOOK REVIEWS

Foreign Trade Barriers and Export Growth

Economic Office, Asian Development Bank, Manila, 1988 ; pp 348

THERE have been many discussions and debates all over the world on how the world economy has fallen into the grip of protectionism followed by developed countries and its crippling effect on the growth of exports of developing countries. After a fairly healthy growth in the trade between developed and developing countries in 1960s and early 1970s which to a large measure was due to the liberal import policies adopted by the former group of countries, a new era of rising protectionism has come to the fore since mid 1970s as economic growth of high-income advanced industrial countries slowed down perceptibly. An interesting feature that marks the new protectionist era is that while successive multilateral trade negotiations held under the auspices of General Agreement on Tariff and Trade (GATT) have been successful in bringing down the average tariff levels on imports in the developed countries, rising non-tariff barriers (NTBs) to international trade have more than offset the benefits accruing from trade negotiations. Another feature of the New Protectionism is that the policy instruments used in recent years have become less transparent because of greater reliance placed on non-traditional and new forms of non-tariff barriers. As they are less transparent and more innovative, their incidence and economic effects are as yet little known

Co-existing with non-tariff barriers imposed by the

developed economies, mainly to protect their domestic industries which have lost international competitiveness, are protectionist measures also followed by the developing economies to restrict their foreign exchange outflow and/or pursue their chosen strategy of economic growth. Apart from lesser resource complementarity, restrictive import policies followed by most of the developing countries hinder the expansion of South-South trade. But the extent to which barriers to South-South trade are recognised and perceived as important by exporters in developing countries is seldom explored or analysed in a meaningful manner.

In this background, a study was undertaken during 1985-86 under a technical assistance grant provided by the Asian Development Bank to investigate the nature and impact of foreign barriers facing exporters in five selected developing member countries viz., India, Pakistan, Philippines, Republic of Korea and Thailand. The study was commissioned by the Asian Development Bank in collaboration with selected Economic Institutes in each of the above countries. Among the principal objects of the study were the assessment of the relative importance of new forms of foreign protectionist measures for developing Asian Countries and identification of other major barriers to expanding South-South as well as North-South trade relations. The findings of the study form part of the book under review.

The study relied heavily on information gathered through formal surveys and local interviews of Government officials, businessmen and export associations in the respective countries. Based on the comprehensive analysis, the study prescribed some policy reforms to be initiated in order to achieve greater regional and interregional trade by developing countries of Asia. The results of the study find their generality from the fact that the countries covered in the study represent a good mix in terms of geographical area as well as their income levels.

Some important limitations of the study results, as stated therein, are noteworthy. A basic problem was the limited extent of information about trade barriers in many countries, especially in less developing countries. Another limitation was that where trade restrictions were prohibitive, surveys of exporters' experiences in

different foreign markets yielded no significant information. Finally, assessing the economic cost of foreign trade barriers in the selected countries was considered beyond the scope of the study as it was felt difficult to accomplish this assessment with technical or quantitative precision. However, interesting evidence of the effects of trade restrictions on investment planning, production and trade has been demonstrated in the survey of the affected exporters.

In India and Pakistan where size of the export sector is small, domestic supply conditions act as equally important constraints as do international demand conditions to the growth of exports. As majority of the items exported by these two countries are covered under Generalised System of Preferences (GSP) Scheme tariffs do not impose restrictions on exports from either of the countries to the developed economy markets. However, non-tariff barriers, the study observed, affected the rate of expansion of exports of a few items from these two countries to the developed economy markets. Indian exports of metal manufactures faced NTBs in the U.S. market and being a signatory to Multi-Fibre Arrangements (MFA), its exports of garments to U.S. and EEC are determined by the quotas available for different categories. Protectionist measures in the major industrial markets were found to reduce the growth rates of some important exports of Pakistan like textiles and associated products, footwear and sports goods. Negative impact of MFA quotas on garment exports from India were found to be twofold – the forced diversification to markets not governed by such quota system and the emergence of high rental incomes (from allotted quotas) and speculation in the industry. Survey of Pakistani exporters undertaken as part of the study indicated that trade barriers restricted capacity utilisation and fresh investment level in the textile sector. The study argued that apart from actual imposition of NTBs the threat of trade barrier is sufficient to choke off exports and prevent building up of export capabilities. The study has, therefore, recommended that removal of this threat which distorts international trade environment should be accorded the highest priority by countries like India in the coming round of multilateral negotiations. Barriers against Pakistan's exports are unlikely to be lowered in the face of similar barriers raised by them to control their imports and hence the study

advocated steps like rationalisation of Pakistan's import policies and exchange rates as also negotiation with major trade partners for easing of NTBs in order to stimulate growth of Pakistan's exports.

While developed economy markets are major destinations for exports from both India and Pakistan, the shares of developing countries are not insignificant. Exports to majority of such countries are characterised by high levels of tariffs, intended in some countries to protect the domestic industries and in others to restrict foreign exchange outflows. These countries frequently enforce conventional NTBs in the form of quota restrictions, import licencing requirements, etc. But more sophisticated NTBs covered under the New Protectionist measures were found to be generally absent in these developing economy markets. It is difficult to argue for removal of these barriers by the developing countries because most of them were imposed to encounter their own balance of payments problems. Four products viz., Tea, Jute products, Machinery including Transport equipments and Metal manufactures among India's exportables were, however, identified as suited for tariff preference negotiations among the developing countries in future.

Two other countries selected for the study viz., Philippines and Thailand belonging to the Association of South-East Asian Nations (ASEAN) have relatively abundant natural and human resources and thus have comparative advantages in resource based and labour intensive exports over the industrial countries. It was, however, observed that non-tariff barriers of various forms were imposed on exports of all major commodities from these countries in the developed country markets to limit their growth. In the case of Philippines, the study found supporting evidence of the view that non-tariff barriers in developed countries particularly impinge on the trade of agricultural goods and agro based manufactures. The NTB coverage of labour intensive manufactures, in which Philippines is becoming internationally competitive, appeared to be low in the Philippine experience although there were instances when NTBs tended to be reinforced by higher than average tariffs, as in the case of footwear textiles and apparel. Government sources as well as individual exporters, however, admitted that introduction of MFA benefitted the country as they were assured of non-competitive market shares

The study on Thailand sought to dispel the impression that barriers were imposed by only the developed economies against developing countries. Examining the trade restrictions enforced within ASEAN countries the study concluded that intra-ASEAN trade did not progress satisfactorily despite adoption of Preferential Trading Arrangement (PTA) by the members in 1977, as large number of items were kept outside the purview of PTA and were subjected to high tariffs.

Country studies on both Philippines and Thailand saw vast potential in the growth of intra-ASEAN trade to realise which initiation of trade liberalisation policies among the member countries was advocated. The findings of the study had a number of policy implications for the Philippine economy, principal among which was that Philippine plans for future trade liberalisation might be used more profitably to bargain for reciprocity. In the case of Thailand, the study was critical of its overemphasis on bilateral agreements to expand exports as it promoted discrimination whereas multilateral negotiations would serve the interests of Thailand as well as other countries. The study also felt that Thailand itself must be prepared to discuss restrictive trade measures imposed by it in the past, often without any justification, in its bid to strive for greater access to foreign markets.

Korea's experiences with foreign trade barriers were typical of problems of Newly Industrialised Countries (NICs) with Protectionism. As the international competitiveness of Korea's exports moved up from simple-process, labour-intensive commodities such as textiles, clothings and footwear to more sophisticated capital and technology intensive commodities such as iron and steel and consumer electronics, restrictions against Korea's exports followed suit. It was demonstrated in the study that the share of restricted exports in Korea's total exports at the overall level as well as at the individual industrialised countries' level increased since late seventies. Although Korean exports were also subjected to traditional tariff measures, Korea's primary concern was the widening of non-tariff measures against its exports. According to the study, in the face of mounting protectionism abroad, Korea responded with many policy changes which included reforms in the export policy, liberalisation of imports by accommodating the requests of

important trading partners and intensified economic diplomacy. In most cases, restrictions against Korea's exports were imposed as it disrupted previous market supply conditions. The study, in its general conclusion, therefore, warned that Korea's experiences with foreign protectionism are likely to be repeated by other aspiring, outward-oriented developing countries.

To sum up, the Asian Development Bank's technical study demonstrated effectively that exports of developing Asian countries were appreciably affected by trade barriers, including the increasing recourse of many countries to New Protectionist measures. It was observed therein that New Protectionist measures and threats of greater application of administered protection were targetted *primarily at exports of labour-intensive manufactures to industrial* countries. Of the countries studied, while Korea was most seriously affected by the New Protectionist measures the experiences of low and middle-income countries were more limited. The study observed that recent developments raised uncertainty and hence lowered the profitability of exporting Other adverse effects of New Protectionism in the Asian region as noted in the study were scaling down of investment to expand production capacity and correspondingly generation of employment. As reported by the country studies, protectionism has often led to upgradation of export products and the technologies employed in producing them. These effects can also impose economic costs in less developed economies, especially where inappropriate infrastructure or shortages of trained manpower and capital exist. Finally, the costs of lobbying against restrictive trade practices in industrial countries and the larger costs of administration and rent-seeking surrounding export control systems mandated by restrictive trade arrangements like MFA were found to be burdensome in terms of resources diverted from more productive activities.

The findings of the study hold important implications for the developing Asian countries as they have to formulate policy options for strengthening the growth of their international trade relations in the face of rising protectionism. Greater unilateral steps towards trade liberalisation may be undertaken by some countries following the example of Korea. However, the study concluded that the most feasible option would be participation in negotiations in which

concessions involved in reducing trade barriers could be exchanged on a reciprocal basis with other countries. The study thus recommended participation of Asian countries actively with major industrial countries and other less developed countries in the new GATT round of multilateral trade negotiations.

Country specific studies such as the book under review are most welcome and need to be repeated at periodic intervals to study the changes over a time period. The study is very timely and opportune for India. The country is planning a high profile export strategy to overcome its adverse balance of payments position, but it has to face a number of exogenous problems such as the possible action under the US Super 301, integration of EEC market in 1992, etc.

The book is well presented and immensely readable. It will be extremely useful for Government Organisations, research workers and academic institutions in all developing countries and may possibly result in commissioning of such highly useful studies in their countries as well at periodic intervals.

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Robust Regression and Outlier Detection

Peter J. Rousseeuw and Annick M. Leroy. (New York : John Wiley & Sons, Inc., 1987. pp. xiv + 329 $39.95)

MANY data sets frequently encountered in real practice often are contaminated by exceptional observations which are commonly referred to as outliers. These outliers are observations which are far away from the bulk of data and often escape attention particularly in cases where primary data are not scrutinised carefully. The presence of these outliers vitiate many statistical procedures and pose dangers in analysis of data. The outliers may be a result of typing errors, misplaced decimal points, recording or transmission errors or exceptional phenomena such as earthquakes or strikes. Outliers occur frequently in real data, and they often go unnoticed bacause data are mostly processed by computers without examining or screening it carefully. Sometimes the response variable as well as the explanatory variables may turn out to be outliers which are not often detected by the normal statistical procedures. In order to deal with the problem of outliers in regression analysis, new statistical techniques, that are not so easily affected by outliers, have been developed in this book. These are robust methods, the results of which remain trustworthy even if a certain amount of data is contaminated. The book is mainly concerned with treatment of outliers met in regression analysis, that is, cases for which the data set (X_{i1}, . . . , X_{ip} ; Y_i) deviated from the linear relation followed by the majority of the data taking into account both the explanatory variables and the response variables simultaneously.

Basically there are two types of approaches to this problem. The first approach is to construct the so called outlier diagnostics, and the other approach is of robust (or 'reliable') regression. These two approaches really have the same goals, but they proceed in opposite order. In diagnostic procedure, one first tries to identify

and isolate the outliers and then fit the 'good' data by ordinary least squares method, whereas in robust regression procedure, first a robust regression is fitted to the majority of data and then outliers are detected as points which possess large residuals from that robust equation. Though, many books dealing with topics in robustness and outlier detection have come out in the last few years, there is a novelty in the approach developed by Rousseeuw and Leroy. While most of the books in this area emphasise on either of the two topics, this book gives emphasis on both robustness and outlier detection.

In Chapter 1, which is introductory in nature, the authors introduce the concept of outliers, breakdown points and robust estimators. The notations used in the book are also described in this chapter. It has been shown through examples that the least squares (LS) approach is very sensitive to outliers. Section 2 of this chapter is devoted to the discussions of breakdown point and robust estimation. The estimators least median of squares (LMS) and least trimmed squares (LTS) are introduced which form the core of this book. The authors have also mentioned briefly about the generalisations of LMS and LTS by Rousseeuw and Yohai (Lecture notes in Statistics No. 26 (1984) pp.256-272). The relative merits of different estimators like the M-estimators, bounded influence estimators and the generalised M-estimators are also dealt with.

Chapter 2 deals with the application of robust methods to simple regression. The technique of LMS is discussed at length in this chapter and its usefulness is shown by applying it to several real data examples. The use of the program PROGRESS, to perform a robust regression analysis on the least median of squares method is explained. The values of least squares, least median of squares and reweighted least squares together with related materials are generated through this program, with the aid of several examples. The output of PROGRESS, designed to run on an IBM-PC or a compatible micro-computer, gives a fit by the three techniques (i) LS, (ii) LMS, and (iii) Reweighted least squares (RLS). The program runs in an interactive manner which makes it easy for use. Interpretation of results is given at the end of the sample session of PROGRESS. The readers are warned about a

common misunderstanding - 'when the LS and the RLS are substantially different, the right thing to do is to identify the outliers (by means of RLS residuals) and to study them. Instead, some people choose between the LS and the RLS output, and typically they will prefer the estimates with most significant t-values or F-values often assuming that the highest R^2 corresponds to the best regression, RLS discards the outliers that were responsible for a high R^2 and helps in coming to the right conclusions. Some more examples using PROGRESS are given which further establish the purpose of robustness and identification of outliers. The chapter concludes with a brief description of some other robust techniques for simple regression.

In chapter 3, Rousseeuw and Leroy present an extension of LMS approach from simple linear regression to the case of multiple regression. This chapter also contains the theoretical robustness results. Two other robust estimators, viz., the LTS and S-estimators which have high breakdown points are discussed. In section 4 of this chapter, the properties of the LMS, the LTS and S-estimators are explained. The asymptotic efficiency of the S-estimators is also discussed. It is established through several theorems that the LMS and LTS estimators are regression, scale and affine equivariant. The proofs used for the theoretical results on existence, uniqueness and breakdown points are quite simple and easy to follow. Though the authors have recommended treatments for the missing values and heteroscedasticity, the problem of multi-collinearity is still open. The technique of LMS, LTS and S-estimators is related with projection pursuit which is essentially a procedure to discover structure in multivariate data set by projecting such data in a lower dimension space. In the end, several approaches to robust multiple regression are also given.

Chapter 4 deals with special case of one dimensional location. The authors describe location as special case of regression. The properties of equivariance, described in chapter 3, also hold good for location and scale estimators in particular. The LMS and LTS estimators are described for this one dimensional location case and their asymptotic properties are established. The difference between the concept of breakdown points and influence functions is also dealt with in this chapter. It is stressed that all

estimators possess a breakdown point but not all of them have an influence function. The local robustness properties of LMS are explained by resorting to stylized sensitivity curve. It is indicated that if the estimator (T_n) is really asymptotically normal, then the sensitivity curve should converge to the influence function as n - oo, and V_n to the asymptotic variance.

Chapter 5 gives the algorithms that are used in PROGRESS and also some special algorithms for simple regression. A small simulation study is also included in this chapter.

Rousseeuw and Leroý describe the outlier diagnostics in chapter 6. Outlier diagnostics are statistics that focus attention on observations having a large influence on the LS estimator, which is known to be non-robust. Technique of single case diagnostics is first discussed and then generalized to multiple case diagnostics. The field of diagnostics consists of a combination of numerical and graphical tools. The need for diagnostics that are able to cope with multiple outliers without suffering from masking effect is also discussed in this chapter.

In chapter 7, discussions are focussed on the extensions of LMS. LTS and S-estimators to related areas such as multivariate location and estimation. time series and orthogonal regression. Discussion in Section 2 of this chapter is about robust time series analysis while Section 3 briefly discusses the merits of robustification in other situations.

The book, welcome as it is, is not without flaws, though they are very minor. The LMS technique and its computations using PROGRESS (chapter 2) is described even before the readers familiarize themselves with the underlying principles which are given in chapter 4. The term translational equivariance which is defined on page 203 is actually used earlier on page 116 in connection with regression equivariance. But these flaws are minor and are outweighed by the quality of descriptions and illustrations.

The best part of this book is the real life examples which make the reading very interesting The data sets cover a wide range of disciplines, e.g., the number of international phone calls

from Belgium, brain and weight data for 28 animals, lactic acid concentration in blood, pension funds of Dutch firms, air quality in New York, US educational expenditure, etc. These data sets are small enough to illustrate computations, yet large enough to be meaningful. Though the authors are biased towards LMS & LTS, yet they do not exclude other robust techniques.

For professional statisticians who are new to this field, this book offers good descriptions, theory as well as application and interpretations of results from real data examples. The book gives an extensive bibliography in robust regression, outlier diagnostics and related topics. The aim of the book, as the authors say, is to make robust regression available for everyday statistical use. And this objective has amply been achieved by the authors. The book is well written and contains several examples to illustrate the techniques. As the book is addressed to real data sets which often contain outliers which go unnoticed, the book will be of great interest to all the users of regression analysis.

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