CHAPTER II

THE TREND OF SECTORAL DISTRIBUTION IN STATE DOMESTIC PRODUCT OF NORTHEASTERN STATES

2.1 Introduction

In chapter I we have given much attention on the fundamental theories on the stages of development of any economy. All these stages were the expected behaviors of any economy throughout its development process. It is mentioned earlier that the history of development process must be influenced by the given status of economy, be it ecological, socio-economic or anything else. Due to the heavy influences of these ecological or socio-economic factors any economy may not follow the usual or expected chronological order of the developmental stages as prescribed by the fundamental theories. This chapter examines whether the sectoral dynamics and the trend of other related parameters follow our common expectations or not.

2.2 Overall Trend of NSDP and Per-capita NSDP

The reference period of the present research work is 1980-2003/4 and the entire period starting from 1980 may be clearly divided between two phases - pre and post-reform. To analyse the effectiveness of developmental policy, post-reform period is more significant. Per capita income (PCI) in 1970-71 of Arunachal Pradesh was Rs.2808 and that in 1980-81 was Rs 4001 and Rs 6902(1990-91) against Net State Domestic Product Rs 13140 Lakh, 24889 Lakh and 58876 Lakh. So, corresponding growth rates of PCI are 42.48% and 72.5% against NSDP growth rates 89.41% and 136.55%. Growth rates of PCI are rising as decadal growth rate of population is almost stagnant during 1971-1981(35.15%) and 1981-91 (36.83%) and at the same time growth rate of NSDP is drastically

rising. For Assam per capita NSDP was Rs 1284 (1980-81), and 1544 (1990-91) against total NSDP of Rs 2298 crore and Rs. 3426 crore. Thus growth rate of NSDP (49.08%) was higher than the growth rate of per capita NSDP (20.24%). Over the same period decadal growth rate of population is 24.24%. Manipur too has experienced higher growth rate of NSDP (58.45% during 1981-91) compared to the growth rate of per capita NSDP (22.55% during 1981-91). It is to be noted that between 1981-91 population growth rate of Manipur was 29.29%. Although population growth rate has increased from 50.05 %(1971-81) to 56.08 %(1981-91) in Nagaland, per capita NSDP growth has increased from 191.61% to 295.37%. It has become possible due to massive growth (i.e. 333.5% and 512.8% at current market price) of NSDP over the period. In the decade of 1980's Mizoram, and Tripura registered growth of per capita NSDP of 220.8% and 157.84% respectively, at current market price against the population growth of 39.7% and 34.3%. Over that time span State Domestic Product, per capita SDP and population grew at the rates 181.4%, 120.7% and 28.47% respectively in Sikkim. Thus in every case per capita SDP growth is dominated by growth of total SDP. Population trend takes a crucial role in this regard. Elasticity of per capita SDP with respect to population rise is 1.97 for Arunachal Pradesh, 0.82 for Assam, 0.77 for Manipur, 5.27 for Nagaland and 4.23 for Sikkim during 1981-91.

2.3 Trend of NSDP and Per-capita NSDP in the Post- Reform Period

Table 2.1 represents NSDP and per capita NSDP in the post-reform period, at the 1993-94 price level. We have received the information from different issues of NEDFi journal and to some extent inconsistencies have been observed in the sources.

Table-2.1 NSDP (Rs. Crore) and Per Capita NSDP During 1993-2004

NSDP	1993-4	94-5	95-6	96-7	97-8	98-9	99-00	00-01	2001-2	2002-3	2003-4	2004-5
A.Pradesh	812		911	857 (-5.92)	884 (3.15)	910 (-2.94)	948 (4.17)	993 (4.74)	1036 (4.33)	1092 (5.4)	1162 (6.41)	1179 (1.47)
Assam	13477			14467 (2.42)	14704 (1.63)	14574 (-0.89)	15078 (3.46)	15671 (3.93)	16441 (4.91)	17114 (4.09)	18004 (5.2)	19041 (5.76)
Manipur	1141			1329	1374 (9.4)	1396 (1.60)	1581 (13.25)	1559 (-1.39)	1730 (10.96)	1766 (2.09)	1823 (3.22)	1979 (8.56)
Meghalaya	1309	1353 (3.36)	1509 (11.52)	1562 (3.57)	1662 (6.46)	1842 (10.83)	1999 (8.52)	2162 (8.15)	2317 (7.16)	2428 (4.8)	2589 (6.63)	2740 (5.83)
Nagaland	1251	1348 (7.76)	1445 (7.19)	1547 (7.05)	1684 (8.86)	1605 (-4.7)	1614 (0.57)	2230 (38.16)	2385 (6.9)	2641 (10.73)		
Sikkim	364		366	409 (11.48)	461 (14.96)	494 (7.47)	508 (2.8)	538 (5.9)	575 (6.88)	631 (9.73)	677 (7.3)	720 (6.36)
Tripura	1619			1923	2132 (10.87)	2333 (9.42)	2532 (8.52)	2999 (18.44)	3091 (3.06)	3343 (8.16)	3680 (10.08)	
PC-NSDP												
A.Pradesh	8733		9424	8635 (-8.38)	8634 (0.68)	8712 (0.9)	8890 (2.04)	9153 (2.95)	9399 (2.68)	9760 (3.84)	10253 (5.05)	10266 (0.12)
Assam	5715			5793	5796 (.05)	5664 (-2.28)	5785 (2.13)	5943 (2.78)	6122 (3.01)	6254 (2.16)	6466 (3.38)	6721 (3.94)
Manipur	5846			6331	6434 (6.93)	6401 (-0.51)	7097 (10.87)	6851 (-3.46)	7445 (8.67)	7446 (0.01)	7532 (1.16)	8015 (6.41)
Meghalaya	6893	6705	7221	7225	7881	8507	8996	9476	9905	10262	10795	11278
Nagaland	9126	9410 (3.07)	9646 (2.5)	9880 (2.42)	10287 (4.11)	9118 (-11.4)	8726 (-4.3)	11473 (31.48)	11674 (1.75)	12292 (5.3)		
Sikkim	8402		7633	8236 (7.9)	9539 (10.8)	9914 (3.93)	9874 (-0.40)	10119 (2.48)	10415 (2.92)	11367 (9.14)	12026 (5.8)	12637 (5.09)
Tripura	5534			5724	6828 (6.83)	7396 (8.31)	7967 (7.72)	9397 (17.94)	9664 (2.84)	10261 (6.18)	11136 (8.52)	
India	7690				9243	9647	10071	10313	10774	10964	11799	12416

Source: NEDFi Journal, October 2004 &January 2006

The percentage figures given within brackets represent the growth rates of NSDP/ per capita NSDP in any year over the previous year. For many states NSDP or per capita NSDP have shown a negative growth in the post-reform period. For example, -5.92% and -2.945 NSDP growth in Arunachal Pradesh (1995-96-97, 1997-98-99) -0.89% NSDP growth in Assam (1997-98-99), -1.39% NSDP growth in Manipur (1999-00-01), -4.7% NSDP growth in Nagaland (1997-98-99), -0.56% NSDP growth in Sikkim(1999-00-01). Among the negative growth figures of per capita NSDP it is -8.38% for Arunachal Pradesh during 1995-96-97, for Assam -2.28% (1997-98-99) for Nagaland -11.36% and -4.3% (in 1997-

98-99 and 1998-99-2000 respectively), for Sikkim -0.40%(1998-99-2000) and for Manipur -0.51%(1997-98-99), -3.36%(1999-2000-01).

Trend of NSDP or per capita NSDP are highly fluctuating in all northeastern states. Moreover, some growth figures are unbelievably high, though obtained through calculation from available data. High value of standard deviation is supposed to reflect a high degree of fluctuation of any variable. The standard deviations of NSDP and the per capita NSDP are high for all northeastern states. These values for NSDP are 3.63 for Arunachal Pradesh, 2.07 for Assam, 5.24 for Manipur, 2.65 for Meghalaya, 5.06 for Nagaland, 3.52 for Sikkim, and 4.57 for Tripura. Calculation of standard deviation of Nagaland did not include growth figure of 1999-2000-01 (38.16%). Standard Deviation values for per capita NSDP are 3.88 for Arunachal Pradesh, 2.04 for Assam, 5.11 for Manipur, 3.53 for Sikkim and 4.65 for Tripura.

The post-reform period has witnessed a rising trend of per capita income (although lower than national average in most cases) in all northeastern states. We have calculated the corresponding growth rates of NSDP and per capita NSDP, of any year over the previous year, given within the brackets and accordingly have formed simple linear trend equations of growth rates of NSDP and per capita NSDP.

The trend equations for which value of R^2 is too low have not been mentioned. However a much lower value of (0.10-0.20) of R^2 is acceptable in social science (Gaur and Gaur, 2006). This is why the purpose of regression analysis is not to get a high value of R^2, but to establish a reliable regression coefficient in support of our logics and intuitions (Christopher H Achen, 1982). Besides, according to Judge, Griffths and Lee (1982), maximizing R^2 may go against some properties of classical linear regression model, which is considered as pretest bias. In the trend equations of NSDP growth only Assam has shown a significant relationship at 5% level of significance. So the growth rate of NSDP is not significantly rising

for almost all northeastern states. Similarly growth rate of per capita NSDP has shown significant relationship only in Arunachal Pradesh (at 10% level of significance) and Assam (at 5% level of significance). Other states have been unable to produce rising growth rate of per capita NSDP. The results are given below:

Table 2.2: Trend Equations of Growth Rate of NSDP= a+bt

Arunachal Pradesh-	-.736+.740t, (SE= .416)	t=1.781,	R^2=.312,	p value=.118
Assam	.433+.591t, (SE= .178)	t=3.315	R^2=.611	p value=.013
Manipur	6.975-.225t (SE=.869)	t=-.259	R^2=.011	p value=.804
Nagaland	3.757+1.082t (SE=1.585)	t=.683	R^2=.062	p value=.517
Sikkim	11.003-.581t (SE= .435)	t=-1.337	R^2=.203	p value=.223
Tripura	11.271-.370t (SE=.933)	t=-.396	R^2=.030	p value=.708

Source: Estimated from Table 2.1

Table 2.3: Trend Equations of Growth Rate of Per capita NSDP= a+bt

Arunachal Pradesh	-3.371+.665t (SE=.418)	t=2.144	R^2=.396	p value=.069
Assam	-1.105+ .665t (SE= .206)	t= 3.231	R^2= .635	p value=.018
Meghalaya	2.883 +.23t (SE=.256)	t= .9	R^2= .083	p value= .391
Nagaland	-.813+ .94t (SE=1.558)	t= .603	R^2= .049	p value= .565
Sikkim	6.337-.208t (SE= .482)	t= -.433	R^2= .026	p value= .678

Source: Estimated from Table 2.1

Although, trends of NSDP and Per Capita NSDP growth rates have not shown significant relationships over time, trends of NSDP and Per Capita NSDP have shown that. Results are given below:

Table 2.4: Results on Trend Equations [NSDP=a +bt]

	Arunachal Pradesh	Assam	Manipur	Meghalaya	Nagaland	Sikkim	Tripura
R^2	.907	.926	.965	.990	.855	.987	.988
t value	8.8	9.3	13.8	31.1	6.8	24.6	21.8

Source: Estimated from Table 3.1. [All t values are significant at 1% level of significance]

Table 2.5: Results on Trend Equations [Per Capita NSDP=a +bt]

	Arunachal Pradesh	Assam	Manipur	Meghalaya	Nagaland	Sikkim	Tripura
R^2	.625	.848	.914	.980	..528	..947	..985
t value	3.6	6.2	8.6	21.9	2.9 (*)	11.9	19.96

All are significant at 1% levels of significance. (*) indicates significant at 5% level of significance. [Source: Estimated from Table 2.1]

Economic and Political Weekly Research Foundation (2003) has presented a continuous series of Per capita GSDP data at 1980-81 price level. Based on that data we have computed annual compound growth rate of same during 1980-81 to 1990-91 and 1990-91 to 1997-98 using the formula $Y=A(1+r)^t$, where r= compound annual growth rate of Per Capita GSDP. We may observe Arunachal Pradesh, Manipur and Tripura have experienced remarkable rise of the compound growth rate of per capita GSDP in the decade of 1990's over the decade of 1980's.

Table 2.6: Annual Compound Growth Rate of Per Capita GSDP at 1980-81 Price Level

	1980-81 to 1990-91	1990-91 to 1997-98
Arunachal Pradesh	5%	5.27%
Assam	1.38%	1.37%
Manipur	2.39%	2.6%
Meghalaya	2.55%	2.57%
Tripura	2.69%	3.75%

Source: Calculated from EPWRF; SDP Estimation 1960/61-2000/01 (2003)

2.4 Overall Trend of Sectoral Shares in Pre-Reform Period

The path of economic development is characterised by a change in the composition of aggregate output, with a decline in the share of agriculture and the rise of industry to begin with, and then a boost in the share of services at the cost of industry, further on. During 1971-91 all the northeastern states have shown a declining trend of the share of primary sector total NSDP. Besides, shares of tertiary sector have been characterized with a significant rising trend. But the shares of secondary sector are enhanced by highly insignificant magnitudes. Changes in the percentage points of the shares of primary,

secondary and tertiary sectors out of total NSDP are -13, +1.22 and+11.78 respectively for Arunachal Pradesh, -13.68, +1.15 and +12.53 respectively for Assam, -9.97, -6.62 and +16.59 respectively for Manipur, -31.53, +9.95 and +21.58 respectively for Meghalaya, -19.14, +1.6 and +17.54 respectively for Nagaland, -32.01, +1.19 and +30.82 respectively for Tripura.

It becomes difficult to examine properly the sectoral dynamics looking at the shares of the sectors of two different periods with long gap. In between 1970-71 to 1980-81 the changes in the percentage points of the shares of the primary, secondary and tertiary sector are -11.91, +1.87 and +10.04 respectively for Arunachal Pradesh. The same from 1980/81 to 1990/91 are, -1.09, -0.05 and +1.74. So in the decade of 70's declining contribution of primary sector has not been proved helpful for the growth of secondary sector. The decade of 1980's has not seen much variations of the sectoral contribution compared to the decade of 1970's. During 1975-81 in Manipur contributions of both primary sector and secondary sector has fallen from 58.21% to 49.10% and from 8.62% to 7.65% respectively. After that during 1981-86, contribution of secondary sector has marginally increased to 9.04%.

The decreasing nature of the primary sector, i.e. from 48.09% in 1970/71 to 42.68% in 1980/81 and further 29.07% in 1990/91 has not also provided a positive impact on secondary sector that is having a growth trend of 10.54% in 1970/71 to 14.86% in 1980/81 and further 12.14% in 1990/91 for Nagaland. In between 1981-91 there is a sudden jump of tertiary sector's share from 42.26% to 58.77%.

A high or moderate share of secondary or tertiary sectors can not properly present the true status of industrial or service sector of any economy. Manufacturing sector is the backbone of secondary sector. So, to judge the performance of industrial sector the performance of manufacturing sector must be judged. Secondly what manufacturing we are talking about? We must not forget that the manufacturing sector in the northeast India is mainly dominated by

the unorganised cottage industries or small scale industries. A properly flourished manufacturing sector can induce to develop service sector through the increasing importance of intermediate services (Gershuny, 1987). Development experience of Brazil has supported this view (Flores and Santos, 1995). Besides, the interventions of industries with growth enhancing prospect will have three criteria- "a) they should have inter-industry linkage to the rest of the economy b) they should be leading sectors in a casual sense, so that they can supply input to produce output to other industries and c) variations in output should have strong industry specific component, other wise variations in output are simply due to macroeconomic shocks and there is little scope for industry specific stimulus" (Noland, 2004). Thirdly, the economy of northeast India is well known for having strong influence of construction and government job sectors. In this region roads are in continuous need of repair, due to frequent land slide and erosion. Income is generated several times on a same road within a short period. The cycle of construction and deconstruction is supported by abundant supply of village poor workers and a labour intensive production process. For example Sikkim allots 2 workers per km. of road to maintain against national standard of 0.3 workers per km (Lahiri, Chottopadhaya and Vasin, 2001). On the other hand due to typical geographical nature, construction of roads and buildings can not take place in a timeless manner. Altogether there is a problem of stagnancy with less impact of growth through its forward and backward linkage effects. Regarding public sector, Himalayan regions are identified by a great demand for government service. With a cultural and traditional background, these communities have no saving-investment based money market. As a result public expenditure has a natural tendency to flow into salaries and current income (Rao, 1994).

In Meghalaya during 1980-81, 1985-86, 1990-91 the contributions of manufacturing sector are meagre in total NSDP, i.e. 3.22%, 3.33% and 4.15% respectively. On the other hand the same for construction sector were 11.67%,

9.55% and 8.46% respectively. Agriculture sector continued to fall by its share from 37.7% to 26.9% over 1980-90.

Tripura also has experienced a stagnant shares of manufacturing sector having 2.73% in 1970/71, 3.8% in 1980/81 and 3.82% in 1987/88 even if agriculture and allied activities have provided a falling trend of contributions, namely, 70.02%, 60.22% and 52.22% respectively corresponding to same time references. Over the period domestic product through public administration has been steadily rising from 4.07 %(1970-71) to 9.41% (1987-88).

In Sikkim agriculture, manufacturing and construction all three sectors have shown a declining performance throughout 1980-93. Besides, entire service sector and public administration sub-sector have been identified with significant rise by their shares in total SDP. The figures for agriculture sector in 1980/81, 1986/87 and 1993/94 are 47%, 45%, and 33% respectively. Subject to same time references, the shares of other sub-sectors are 6.07%, 5.13% and 4.8 % for manufacturing, 15.08%, 15% and 11 % for construction, 9.2%, 9.2% and 12.9 % for public administration, 32.6%, 33.1% and 45.6 % for tertiary sector.

2.5 Identity of Agriculture Sector

Apparently from the experience of north-eastern states mentioned above in the pre-reform period, it will not be wise to conclude that secondary sector has been much influenced by the primary sector with its usual trend of falling importance in total domestic product. Besides, as from the very beginning of our reference period (70's or 80's) tertiary sector has occupied a lion share of domestic product, it may be considered as the tertiarisation without being dependent on secondary sector or it may be called tertiarisation bypassing the secondary sector. The dynamics of the shares can not be the only clue to the causes underlying economic progress. It must be accompanied with quantam rises in the aggregate value of GDP for economic development to take a firm hold. As per

report of the world development indicators 2004 the share of agriculture sector of Japan, UK, USA are only 1%, 1%, and 2% respectively. Keeping in mind the issue of self sufficiency in food supply, development can take place, even if there is low and declining share of primary sector.

Let us have a look on the production status of food grain in the northeastern states. Table 2.7 suggests that except Manipur and Meghalaya in all other states growth rate of production of foodgrain over 1985-2000 is lower than the growth rate of productivity. Moreover in the decade of 1990's growth of foodgrain production in Assam (17.6%), Manipur (31.46%), Meghalaya(35.29%) and Mizoram(49.36%) have maintained a balance with the population growth in between 1991-2001. On the other hand, Tripura and Arunachal Pradesh have experienced negative growth of foodgrain production. Besides, Nagaland having highest growth rate of population during 1991-2001(64.46%), had foodgrain production growth of only 45.49%. Thus per capita foodgrain availability has decreased for Tripura, Arunachal Pradesh and Nagaland in the decade of 1990's.

Table 2.8 exhibits production of fruits and vegetables subject to three reference periods. Figures given within the brackets are the growth rates with respect to previous reference periods. It is to be noticed that during 2001-05, four states, viz, Arunachal Pradesh, Assam, Mizoram and Nagaland have registered negative growth in the fruit and vegetable output. Moreover, during 1991-2002 fruit and vegetable output growth was 23.63%. Where as, growth of productivity (MT/ha) of the same was 10.03%. The entire northeast region has been identified with crop diversification or shifting in the agricultural pattern from food grain production towards fruit and vegetable production. Food grain output by its share in total agricultural output has decreased from 71.8% (1990-91) to 64.41% (2003-04). The same for fruits and vegetables has increased from 9.88% to 12.92%

Table 2.7 : Production ('000tonnes) & Productivity (kg/ha) of Foodgrain During 1985-2000

	1985-86	1990-91	1999-2000	Growth(85-00)
A.Pradesh	173-Production	220	205	18.5%
	1071-Prodctivity	1173	1126	5.13%
Assam	3031-Prodction	3442	4048	33.55%
	1112-Prodctivty	1249	1406	26.43%
Manipur	347-Production	286	376	8.36%
	2038-Productivty	1673	2238	9.81%
Meghalaya	160-Production	153	207	29.37%
	1152-Productivty	1147	1556	35.06%
Mizoram	51-Production	77	115	125.5&
	926-Productivty	1296	1474	59.17%
Nagaland	111-Production	211	307	176.58%
	677-Productivty	1166	1420	109.74%
Tripura	395-Producton	515	513	29.87%
	1371-Productivty	1783	2138	55.94%

Source: NEDFi Quarterly Journal; April 2004

Table 2.8: Production of Fruits and Vegetable ('000 MT) in NE States

	1991-92	2001-02	2005-06
Arunahal Pradesh	127.2	208.8(64.15%)	182.03(-12.82%)
Assam	3018.7	4270 (41.48&)	3201.5(-25.02%)
Manipur	93 3	200.1(114.46%)	426.96(113.37%)
Meghalaya	437.3	452.8(3.54%)	471.42(4.11%)
Mizoram	66.6	107 5(61 41%)	66.50(-38.13%)
Nagaland	76 1	588(672.66%)	132.42(-77.47%)
Sikkim	64.9	70.3(8.32%)	94.46(34.36%)
Tripura	625.9	805.3(28.66%)	855.42(6.22%)

Source: NEDFi Quarterly Journal; January 2006.

We have mentioned earlier that development process has to compromise with many given factors of any economy, which go against this process. Agricultural practices in northeast India have not become feasible in a full-fledged

manner for many reasons. Soil erosion, deforestation, landslide and other natural calamities are common characteristics of these hill states. Irrigation in the hills is difficult. Besides, horizontal capillary movements of soil moisture of the hills also play a negative role against smooth agricultural practice.

The diversities in the agro-climatic condition have influenced the crop pattern in the hills. Subba and Upadhaya(1995) have identified mainly two types of climates in northeastern states, i.e., per humid to humid and humid to per humid. In the per humid to humid climate soil types, viz., brown hills, red sandy laterite acid soil, alluvial red heavy tarai soil are available. Under these types of soils farmers prefer to cultivate Rice, Maize, Ragi, Potato, Rapeseed, Wheat, Jute etc. On the other hand, in humid to per humid climate with an alluvial red heavy type of soil, farmers prefer to cultivate rice, Jute, Rapeseed and Wheat.

Another reflection of declining share of agriculture is the falling share of outlay on this sector in total planned outlay in all northeastern states over the successive planning periods (Table 2.9). Mechanisation in the hills is almost impossible. So the scopes of agricultural reform are limited and are mainly dependent on the steps such as bringing additional area for cultivation, various state sponsored schemes, giving training to the agricultural workers to have more skill, generation of additional employment, application of fertilizers etc.

Table 2.9 Outlay on Agriculture During Different Plan Periods

	6th Plan	7th Plan	8th Plan	9th Plan
A. Pradesh	37.04%	29.51%	22.89%	21.00%
Assam	15.90%	19.0%	11.04%	11.09%
Meghalaya	13.21%	18.27%	15.10%	15.66%
Nagaland	36.00%	34.98%	31.21%(1996-97)	
Tripura	24.89%	16.35%	18.00%	6.53%

Source: Government Reports of the respective States

2.6 Resource- Industry Linkage and Credit-Deposit Ratio

It is commonly said that an economy is poor because it is poor. In case of north-eastern economy it is not true. In every corner of north-east region we can observe the abundance of natural resources which may be utilised for economic development. We noted before the low profile of secondary or manufacturing sector in State Domestic Product which is a prove of the fact that the north-eastern economy is unable to exploit properly resource potential of this region and thereby establish a resource based industrial base. Broadly resource-industry linkage is identified on the following industries: agro-based industries, forest horticulture and plantation based industries, hydroelectricity, mineral based industries and tourism industry. We have provided below a brief account of natural resource and resource based economic output of northeastern states.

In the Appendix I, land availability for the agricultural purpose for each state has been mentioned. As per latest available record (2000-01) of Arunachal Pradesh, 61.55% of the total geographical area comes under the forest area with per capita availability of 6.3 hectares, higher than national average of 0.12 hectares. In the decade of 1990's forest revenue has steadily declined from Rs. 2175.95 lakh to Rs. 1299.72 lakh. Different districts in Arunachal Pradesh are sources of different minerals. Such as coal (Kameng, Subansari, Tirap districts), copper ore, gold, pyrites (Subansiri, Kameng, Sianj, Lohit districts), dolomite (Kameng district), Graphite (Lohit, Sabansiri distrit) Flux grade ironstone (Lohit district) and Oil (Ningru and DumDuma and other places). Mineral resources provided Rs. 11 crores in 1994-95 and 16 crores in 1993-94. Total reserves for coal, dolomite, limestone are 84.23, 154.13, 409.35 million tones respectively. During 1999-2000, out of total installed capacity of electricity of 65.27 MW, 30.57 MW is generated through hydel power project. The hydropower electricity capacity achieved by Arunachal Pradesh is a meagre fraction compared to the full potential of this state, lying in between 26747-30000 MW as per reports of

Tenth Five Year plan, Economic Review 1999 and Tata Consultancy Service. Some natural factors like hilly surface or high seismical sensitivity are also responsible for this. Besides, 18 resource based industries are established which are not operating efficiently. Among those there are 15 medium scale factories based on forest resources such as saw mills, veneering mills and plywood industry. Also there is one mini cement, one horticulture processing unit and one tea manufacturing unit. Although tourism is considered as an industry, it has not provided many forward and backward linkages within the state economy.

34.14% of total geographical area is occupied by forest area in Assam, at the end of the March 2001. Main forest products are wood, fuel wood, bamboo, stone etc produced in 421 registered factories. Following the supreme court ban in 1996 against wood based industries revenue earned through forest activities has declined from 17.53 crore (1991-92) to 11.37 crore(2000-01). Assam is well known for being a storehouse of the minerals like coal (371 MT), Limestone (463 MT), Sillimanite(50MT), White clay (20MT), Quartzite(17 MT), Petroleum (156.2 MT) and Natural gas (151.7 billion cubic meters). There are at present 405 mineral based factories in the state. The potential of water resource is not fully utlised as, out of total installed capacity of power of 572.4 MW (2001-02) only 2 MW is generated by hydel power project. Assam is considered as the most developed among all the northeastern states, although industrial performance will be proved disappointing in comparison with any other developed general category state. For instance as per CSO report (2000) total amount of productive capital in Assam was Rs 5829 crore, far below than that of Maharastra (Rs 110352 crore).

In Meghalaya, 42.3% of the total geographical area is covered by forest area which is the source of many forest based products like wood, fuelwood, resin, tannin, gum, fiber, latex, fruits, honey and medicinal plants. Meghalaya too, is identified with huge amount of excess capacity of water resource unutilised for economic benefits. The amount of hydroelectricity generated (186.71 MW) was

only 15% of the total hydroelectricity potential of the state in 1998-99. Limestone, Coal, Kaolin, Sand are the main minerals of Meghalaya. As per report of NEDFi(2002) journal, estimated resources of those minerals are 4147MT, 563.50 MT, 4.44 MT, 80.97 MT and 2.54 MT respectively. Fear about the exhaustion of coal reserve and underutilization of limestone are present among the planners or researchers of the state economy. An estimate over the time gap 1978-83 revealed that 15% and 10.5% registered factories are dependent on forest and water resources respectively. Among the SSI units in 1998-99, 17.8% units and 8.2% units are dependent on forest and mineral resources respectively. Main mineral based industries are cement, stone crushers, sand stone chips and lime. 45.6% and 10.15% of khadi and village industries collect raw material from forest resources and mineral resources respectively.

Mizoram has not experienced affluence in natural resources. Even though, out of 450 MW potential of hydropower only 6MW has been used and this state has occupied 3rd position in terms of forest area (36.20% of total geographical area) after Andaman and Nicobar Islands and Nagaland.

Principal items produced from forest resources in Nagaland are plywood paper and pulp, bamboo and cane, handicraft, resin, flowers, medicinal plants. Some established mineral based industries are mini cement plant, stone unit, brick plant. Nagaland has water resources based potential of power generation of about 104 MW, out of which only 3.2 MW has come under practical use. During 1999-2000 total fish production was 4500 MT (worth Rs 94 Lakh). This figure is much lower than the local demand of 21874 tones.

Forest area in Sikkim (44.9% of total area) has become source of wood, medicinal plants and herbs which are used into various economic projects. Wood in turn through forward linkage has created industries of tea, wooden boxes, match boxes, pencil, sophisticated furniture, activated carbon etc. Sikkim may not be declared as the rich state in resources. Though some minerals like copper, coal, limestone and graphite are available under the soil of this state.

Tourism is the most successful industry in Sikkim. Over the period 1981-2000 number of tourist arrival has increased from 21854 to 154680 (The Glory of New Sikkim, IPR Department 2003). Simultaneously non-tax revenue generated from this industry has increased from 38 Lakhs to 54 Lakhs during 1997-2003 (Sikkim Statistical Profile, 2002). Live stock sector and its product have a significant influence of Sikkim economy through income & employment generation. Cattle, yaks, sheep, are available in the tropically humid zone, moderate humid upper zone and dry high zone. Main livestock products are milk (37000 tonnes under 9th five year plan), Egg (16.30 millions- 9th five year plan) and wool (0.15 lakh kgs). However mountain slope, limited markets and genetically poor quality of livestocks are the constraints to develop this sector.

Value addition by the forest related products (timber, plumbwood, matchwood, roundwood and firewood) has decreased from Rs 473.13 Lakh (1990-91) to 137.65 Lakh (2000-01) in Tripura. Minerals like plastic clay, silica sand, limestone and hardrock are obtained from the womb of the soil of this state. Plastic clay is used to prepare seer pipe, tiles, terracotta items and ceramic goods. Silica is used to prepare glassware and sheetglass. Hardrock is the main input in road construction. Of the total power generation only 23% is generated by hydel power project. It can be seen that power deficit over the period 1994-2001 has risen from 22.01 MW to 69.62 MW.

From the paragraphs given above we get a brief account of the resources based industries of the north-eastern states. Now some facts may come out automatically. Firstly resources base in this region has failed to establish a belt of heavy (or modern) industries. A rich nation generally has a strong industrial base and most sophisticated forms of services are likely to be concentrated around industrial centres.

Be it resource base or general industrial scenario, three indicators are sufficient to realise the low profile of manufacturing or industrial sector. These are declining share of secondary as well as manufacturing sector in SDP, pattern of industrial

outlay and trend of credit-deposit ratio. Overall trend of secondary sector in the pre-reform period has been mentioned before. On the other hand, industrial outlays in different planning periods were insufficient for the upliftment of industrial structure in northeastern economy. During 6th, 7th, 8th, and 9th plan periods percentage of planned outlays on industries in Arunachal pradesh were 4.84%, 2.38%, 2.12% and 1.29% respectively. The same for Assam were (4.5%, 4.9%, 6.91% and 4.6%) for Meghalaya (4.04%, 4.57% and 4.08%), Tripura (4.12%, 4.635, 5.72% and 3.08%), for Nagaland (6.6%, 7.05% and 3.15 in 1996-97) and for Sikkim (4.2%, 3.38%, 3.48% and 2.98%). The trend is either falling or stagnant over the period.

Credit-deposit ratio is also one important indicator of industrial sphere of any economy. Lower the value of this ratio, lower will be the participation rate in economic growth through investment. Subject to three reference periods 1982,1992 and 2002 credit-deposit ratios for all India were 67.1, 57.7 and 58.4 respectively, where as, these ratios were 19. 22.3 and 15.8 for Arunachal Pradesh, 42.3, 50.3 and 31.7 for Assam, 42.1, 67.4 and 26.4 for Manipur, 22.6, 21.2 and 18.2 for Meghalaya, 21.8, 25.3 and 26.4 for Mizoram, 43.6, 43.4 and 12.8 for Nagaland , 66.3, 65.3 and 21.5 for Tripura, 16.2, 23.9 and 16.0 for Sikkim. For the entire northeast region these figures were 41.5, 46.7, and 27.2 respectively. We have also collected a continuous series of C-D ratio values for the post- reform period which (Table 2.10-a) clearly shows large discrepancies between credit and deposit in the post- reform period.

Table 2.10(a): Trend of Credit and Deposit (1994-2005) [Rs.Crore]

States	1994	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005
A. Pradesh	30 226	37 360	42 394	54 413	68 484	84 538	105 611	119 754	144 849	170 980	264 1082
Assam	1311 3066	1726 4393	1789 5084	1978 6022	2214 7035	2701 8444	3193 9864	3627 11552	3695 12921	4607 14970	6219 18080
Manipur	91 126	124 231	152 264	167 283	169 406	172 459	165 423	156 611	179 639	238 820	398 972
Meghalaya	84 535	105 730	127 892	155 1019	191 1147	229 1403	276 1647	359 1990	623 2164	987 2676	1316 2906
Mizoram	24 118	34 209	40 285	50 214	63 305	75 321	100 390	129 498	176 668	259 675	368 722
Nagaland	98 235	104 377	118 490	100 545	116 739	118 770	124 890	132 1052	161 1231	206 1223	294 128
Sikkim	35 122	42 186	43 240	50 281	69 342	71 511	96 616	129 808	177 1033	257 1103	365 126
Tripura	197 357	245 581	262 694	283 832	309 1051	327 1274	355 1542	417 1867	537 2101	591 321	786 265

Source: January 2006, Vol.5 Issue, Quarterly NEDFi.

(Note: For any state, 1st figure corresponds to the credit and 2nd figure corresponds to the deposit)

Table 2.10(b): Credit-Deposit Ratio of India and North-Eastern States

	A. Pradesh	Assam	Manipur	Meghalaya	Mizoram	Nagaland	Sikkim	Tripura	India
1982	19.0	42.3	42.1	22.6	21.8	43.6	16.2	66.3	67
1992	22.3	50.3	67.4	21.2	25.3	43.4	23.9	65.5	57
2002	15.8	31.7	26.4	18.2	26.4	12.8	16.0	21.5	58

Source: India Development Report, 2004-05

We tried to find out the relationship between credit and deposit through formation of regression equation for each state considering credit as dependent variable and deposit as independent variable. The strength of the loanable fund and the policies regarding this fund are highly dependent on the strength of deposit flow. Therefore deposit is one of the indicators of credit flow (Cicila, 2003). Depending on the t values all the relationships are statistically significant. The values of deposit coefficients are too low implying insensitivity of credit towards deposit.

Table 2.11: Results of the Regression Equation Credit = a + b(Deposit)

Arunachal Pradesh	credit	=-49.963+.25deposit (SE= .025)	t=9.91	R^2=.916
Assam	credit	=190.40+.305 deposit (SE=.017)	t=18.028	R^2=.973
Manipur	credit	=57.42+.264 deposit (SE=.052)	t=5.092	R^2=.742
Meghalaya	credit	=-335.215+.476 deposit (SE=.063)	t=7.606	R^2=.865
Mizoram	credit	=-70.302 + .475 deposit (SE=.068)	t=6.951	R^2 =.843

Source: Estimated from 2.10 (a).

Based on the given data of Table 2.10(b), we have tried to find out the relative status across the states in comparison with all India average of credit-deposit ratio values subject to three different periods 1982, 1992, 2002 with the help of one sample T Test. One sample T test may be applied to find out whether the differences between sample values and the population value are statistically significant or not. In this case the null hypothesis is: states have no difference with all India credit-deposit ratio values at any particular reference period. Here test values and all India values are synonymous. From the column of p value we notice at 5% level of significance for all three reference

periods null hypothesis is rejected implying the presence of gap between the credit – deposit ratio trend of north-eastern states and the same of all India. In 1992, at 1% level of significance the null hypothesis is accepted. On this period credit deposit ratio of some states like Manipur and Tripura were much higher than all India figures.

Table 2.12: Results of One Sample T- Test

Year	t	p value	Test Value
1982	-5.379	.001	67.1
1992	-2.581	.036	57.7
2002	-16.113	.000	58.4

Source: Estimated from 2.10(b).

Apart from some ecological factors, researchers have found many other factors which are not helpful to create a resource based industry friendly atmosphere in the north-east region (Das, 2004). These are: a) lack of infrastructural facility like transport, communication, power, banking facility, schooling, health and medical care etc, b) lack of investment, c) absence of appropriate technology which is ecologically sustainable and cost effective for small industries, d) insufficient demand and improper market structure, e) restriction of outsiders in property right and land use, f) lack of local interest in entrepreneurship and g) socio- political status.

As per endogenous growth literature conditional convergence implies poorer economy will have faster growth rate than the rich economy. Efficient government policies and activities have a role of positive catalyst on this matter (Barro and Martin 1995). Many such factors mentioned above may be handled and negative impacts of them may be minimised by effective government policies. As such planned sectoral outlays on infrastructural development have not shown a rising trend (Table 2.13). This expenditure includes transportation and communication, irrigation and energy. Although expenditure flow only can not ensure the efficiencies of the government

policies as empirical study of Barro and Salai Martin (1995) suggests, many factors like the ratio of government consumption to GDP, corruption, lack of enforcement of contracts are responsible for not having faster growth rate of the poor economy. Lack of entrepreneurship is directly reflected from the low profile of C-D ratio in the pre and post-reform periods of all northeastern states. This ratio should have a positive relationship with infrastructural status. In Appendix I the values of social and economic infrastructure index of all states have been mentioned. All the values were highly insignificant compared to other developed states of India. Any strong positive correlationships between this index and C-D ratio may or may not be experienced across the states for any particular reference period. This is why entrepreneurship is an attitude, which is partially formed through historical evolutions of any society. So lack of entrepreneurship totally can not be explained by C-D ratio only.

Table 2.13 Planed Outlay on Infrastructural Development

	6th Plan	7th Plan	8th Plan	9th Plan
A Pradesh		41.81%	42.94%	39.13%
Assam	58%	46.8%	39.86%	28.6%
Meghalaya	43.83%	37.07%	39.8%	36.12%
Nagaland	23.6%	24.70%	25.70% (1990-9	20.3% (1995-6
Tripura		31.08%	26.65%	28.62%

Source: Reports of Respective State Governments

Similarly in the absence of proper marketing facility money economy can not flourish in the rural area through selling marketable surplus. Actually money economy and the expansion of peasant export product can be interlinked in two ways (Myint, 1973): a)"bringing an increasing number of peasant family into export production and b) there may be specialisation in export sector through devotion of whole resources and thus setting up a cash demand for goods and services produced locally or in outside". Existence of rich natural resources can not ensure a resource based growth prospect. In spite of having endowed with

rich natural and human resources Turkey never reached its potential. After reform EU and Turkey found the mutual comparative advantages in trade. This country had a comparative advantage in labour intensive production process of plant products like fruits and vegetables. Implementation of proper government policy brought a good marketing infrastructure and export sector for which agrarian economy experienced sufficient cash flow (Cakmak, 2004).

2.7 Sectoral Dynamics in the Post-Reform Period

The main tools under globalization are to abolish the restrictions against flowing goods and services, capital and knowledge (Stiglitz, 2002). All these tools can bring national and international economy more closer than before (Bhagwati, 2004). Apart from well established marketing infrastructure, reform policies should bring a well established manufacturing and multidimensional service sector. As argued before, in a developed society both are dependent on each other. In this context Thomas (2003) has observed "the western states in India, which began with initial advantages over the eastern states, further built on their advantages by realisation of scale economies and faster induced technical progress". So the success of any reform policy regarding industrial sector is dependent on the industrial scenario already existing in any economy. The general trend of manufacturing sector in northeastern states, discussed before in the pre-reform period have not shown ray of hope on this matter. Besides Rao (1981) has noticed some states, which are advanced in agricultural sector, have no tendency to be advanced in industrial field in India. This can raise the question about the strength of agriculture-industry linkages. However these are all the experiences of the states, which are developed in either agricultural or industrial field. What are the implications of the experiences in which both the fields are underdeveloped, what we observed in all northeastern states in the pre-reform period? This is a 'no-way' situation in which somehow service sector

Table 2.14 Sectoral Distribution in the Post-Reform Period

SIKKIM	93-94	95-96	96-97	97-98	98-99	99-00	2000-01	01-02	02-03	03-04	04-05	05-6
Agriculture	36.26	34.33	33.9	30.8	29.48	21.9	21.82	21	22.51	22.36	21.58	21.47
Primary	38.36	36.46	35.8	32.4	31.13	23.9	23.85	22.88	24.19	23.96	23.13	22.97
Manufacturing	5.61	5.14	4.74	4.09	3.86	4.3	4.08	3.8	3.48	3.24	3.06	2.88
Construction	11.63	14.1	14.1	17.9	15.44	14.9	14.1	16.74	16.62	18.16	20.03	21.06
Secondary	17.56	19.82	19.6	22.6	19.95	20.5	23.83	26.19	24.71	25.27	26.65	27.26
Public Administration	12.11	11.19	10.4	12.1	14.49	18.8	17.52	17.21	17.94	18.17	18.3	18.26
Tertiary	44.07	43.72	44.7	45	48.92	55.6	52.32	50.93	51.1	50.77	50.22	49.77
A.PRADESH												
Agriculture	35.51	28.55	30.7	31.2	30.56	29.2	31.09	27.66	26.45	26.06	24.58	
Primary	49.7	41.88	44.8	36.6	37.05	35.3	37.37	34.06	33.98	32.43	31.56	
Manufacturing	3.16	3.37	4.5	3.1	3.3	3.11	2.64	2.8	2.48	2.31	2.28	
Construction	20.81	26.03	18.4	17.5	16.92	16.7	16.2	18.83	19.9	22.29	21.82	
Secondary	21.37	29	22.3	22.6	22.66	21.9	18.34	21.29	22.85	25.06	24.75	
Public Administration	9.65	9.24	10.8	13.8	12.7	11.2	16.63	16.84	15.42	14.62	15.12	
Tertiary	28.93	29.11	33	40.8	40.29	42.8	44.28	44.64	43.17	42.51	43.88	
ASSAM												
Agriculture	37.26		35.4	37.3	35.65	34.4	32.46	34.74	33.17	30.88	30	27.95
Primary	48		45	48	46	44.9	42.43	44.49	41.96	39.22	36.91	35.6
Manufacturing	8.42		8.27	9.02	7.97	8.54	7.98	7.2	7.3	7.56	7.8	8.36
Construction	4.95		5.57	5.27	5.92	3.99	5.79	4.61	4.6	4.73	5.61	5.58
Secondary	13		14	14	13	12	13.13	10.89	11.75	12.28	13.58	14.46
Public Administration	5.51		5.31	6.52	6.58	7.5	7.44	7.48	6.7	6.59	6.48	6.06
Tertiary	39		41	38	40	43	44.45	46.28	46.3	48.5	49.5	49.94
MANIPUR												
Agriculture	31.19		27.6	26.3	26.3	22.3	27.7	25.75	24.41	24.38	23.13	
Primary	38		33	33	34	29	33.38	31	29.57	29.38	27.95	
Manufacturing	7.39		6.97	6.5	9.62	9.94	7.5	8.1	8.48	8.82	8.87	
Construction	7.31		13.3	15.2	14.58	11.3	9.6	11.2	14.22	14.53	15.71	
Secondary	16		19	20	24	22	16.83	19.52	22.81	23.42	24.64	
Public Administration	13.64		14.2	13.7	11.99	17.4	15.59	16.18	14.6	14.3	14.2	
Tertiary	46		49	47	42	49	49.79	49.49	47.62	47.2	4742 %	
MEGHALAYA												
Agriculture	26.05	26.56	27.5	26.2	24.8	26.5	25.47	24.83	24.21	23.12	22.3	
Primary	32	34	35	33	34	35	34.01	34.33	32.83	32.38	32.84	
Manufacturing	2.57	2.81	2.92	2.33	1.9	2.08	2.09	1.82	2.73	2.69	2.66	
Construction	7.55	7.43	8.11	9.62	9.85	9.37	10.91	11.08	11.27	11.57	11.27	
Secondary	12	11	11	13	12	12	13.53	13.35	14.47	14.72	14.4	
Public Administration	13.6	12.22	12.1	13.4	13.12	12.9	12.64	11.68	11.48	11.8	11.55	

Tertiary	56	55	54	55	54	54	52.45	52.32	52.7	52.9	52.76
NAGALAND											
Agriculture	20.87	18.39	19.2	22.5	24.9	28.2	30.31	33.32	34.32		
Primary	25.85	23.09	24.3	26.2	29.09	32.7	33.69	36.68	37.39		
Manufacturing	3	5.59	6.34	5.93	2.15	0.78	0.66	0.8	0.64		
Construction	8.1	10.7	10.8	12.7	10.99	10.3	14.48	10.15	10.78		
Secondary	12.24	18.02	18.7	20	14.57	11.1	14.14	10.24	10.74		
Public Administration	18.17	16.15	15.4	14.6	15.34	15.2	12.11	12.16	11.97		
Tertiary	61.19	58.89	57	53.8	56.33	56.2	52.16	53.07	51.85		
TRIPURA											
Agriculture	31.43		28.7	26.5	26.43	25.2	20.79	22.27	20.63	19.35	
Primary	38.01		34.8	32.3	32.24	30.4	24.97	26.32	23.18	21.46	
Manufacturing	3.26		2.66	2.42	1.07	1.92	3.66	2.6	1.66	1.57	
Construction	6.72		9.52	10.8	12.53	12.6	22.74	17.88	18.76	20.33	
Secondary	8.19		10.3	11.5	12.56	14.7	25.57	20.8	21.91	23.78	
Public Administration	12.88		14.8	16.3	15.33	14.4	13.35	14.92	14.52	14.23	
Tertiary	53.79		54.9	56.2	55.19	54.9	49.45	52.87	54.9	54.74	
MIZORAM											
Agriculture	27.72		27.4	27.5	27.25	21.6	27.28	24.54	22.52		
Manufacturing	2.74		3.14	1.59	1.23	1.22	1.05	0.96	0.86		
Construction	7.09		11.4	10.6	10.5	11.5	8.29	10.86	11.82		
Secondary	9.45		14	11.1	11.5	13.5	7.58	11.02	13.9		
Public Administration	15.22		15.2	15.9	15.07	17.8	18.11	18.66	19.84		
Tertiary	57.13		55.8	59	59.1	62.8	63.49	62.45	61.81		

Source: Calculated from October 2004 & January 2006 Databank Quarterly Journal NEDFI

has to be given importance to maintain an unproductive balance. We must examine whether there is any tendency of the situation to be changed or not.

The data have been collected over the period 1993-2005. In terms of changes in percentage share of sectoral contribution Sikkim, Arunachal Pradesh, Assam, Tripura and Mizoram have experienced a negative trend regarding manufacturing sector estimated as -2.73, -0.88, -0.06, -1.69 and -1.88 respectively. On the other hand agricultural sector in these states have shown negative trends as -14.49, -10.93, -9.31, -12.08 and -5.2 respectively. In Manipur and Meghalaya the contribution of manufacturing sector has increased marginally along with the falling share of agricultural sector.

One thing is to be noticed here. Even if the manufacturing sector almost in all states are having negative trend, the secondary sector as a whole has a positive trend. The explanation of this fact is the positive contribution of construction sub-sector with its major share in total NSDP from the very beginning of our reference period. It is desirable that the tertiary sector would occupy largest share in total NSDP in course of time. But in some states share of this sector is either falling or rising by meagre percentage. For instance changes in the percentage shares of tertiary sector are +1.42 in Manipur, -3.24 in Meghalaya, -9.34 in Nagaland and +0.95 in Tripura. Public sector too, being a major contributor in NSDP pool, follows the trend of service sector in these states.

If the agriculture, manufacturing and the tertiary sectors are providing declining performances, the roles of the sectors like construction, transport and communication, trade, hotel and restaurant become important. A similar experience may be noticed all over India during 1950-2000. Over that period growth pattern was biased in favour of market and demand driven horticulture, fishery and livestock products, transport and communication and financial services (Bathla, 2001). Forward linkages from primary sector and secondary sector to service sector are created through storage, transport, trade and communication service. Empirical results reveal "a subsiding two way linkage between primary sector and secondary sector and little role being played by economic reforms in reviving agriculture-industry relationship". In the study of Bathla it is argued that even if there is absence of strong interdependence within the sectors, long run equilibrium is achieved through linkages between trade-hotel-restaurant and transport-storage-communication.

Table 2.15 : Results on the Simple Linear Trend of Agriculture (A), Manufacturing (M), Secondary (S) and Tertiary (T) Sectors.

Sikkim	t statistic	R^2	p value
A Sector	-5.088*	.742	.001
M sector	-8.794*	.896	.000
S Sector	6.467*	.823	.000
T Sector	2.151***	.340	.060
Arunachal Pradesh			
A Sector	-3.428*	.595	.009
M sector	-4.355*	.703	.002
S Sector	-.477	.028	.646
T Sector	3.684*	.629	.006
Assam			
M sector	-1.472	.213	.179
S Sector	-.244	.007	.814
T Sector	9.19*	.913	.000
Manipur			
A Sector	-1.877	.335	.103
M sector	1.193	.169	.272
S Sector	1.46	.233	.188
T Sector	.311	.014	.765
Meghalaya			
A Sector	-5.832*	.810	.000
M sector	-.152	.003	.883
S Sector	6.487*	.840	.000
T Sector	-4.207*	.689	.003
Nagaland			
A Sector	22.761*	.989	.000
M sector	-4.71*	.787	.003
S Sector	-4.204*	.747	.006
T Sector	-3.855*	.712	.008
Tripura			
A Sector	-7.928*	.913	.000
M sector	-.457	.034	.663
S Sector	4.529*	.774	.004
T Sector	-.706	.007	.507
Mizoram			
A Sector	-1.779	.388	.135
M sector	-3.098**	.658	.027
S Sector	-.340	.023	.747
T Sector	3.185**	.670	.024

Note: (*) indicates significant at 1% level of significance; (**) indicates significant at 5% level of significance; (***) indicates significant at 10% level of significance

Table 2.16: Annual Growth Rate of Sectoral Income Shares

	Sikkim	Arunachal Pradesh	Assam	Manipur	Meghalaya	Nagaland	Tripura	Mizoram
A sector	-2.17%	-0.89%	-1.09%	-0.59%	-0.79%	4.28%	-2.37%	-1.19%
M sector	-2.17%	-2.56%	-0.39%	1.005%	-0.09%	-15.71%	-1.09%	-7.5%
S sector	1.51%	-0.19%	-0.09%	0.9%	1.4%	-4.01%	5.86%	-0.69%
T sector	0.5%	1.61%	1.20%	0.1%	-0.19%	-0.59%	-0.09%	0.70%

Source: Calculated from Table 2.14.

Table 2.16 suggests growth rate of agriculture sector's income share is negative in all states except Nagaland. On the other hand, among all the states Manipur only has experienced positive growth of manufacturing sector's income share. Because of the rising share of the construction sector, in Sikkim, Meghalaya and Tripura, the growth rate of secondary sector's income share is positive where as the same for manufacturing sector's income share is negative. By the same logic in Arunachal Pradesh, Assam, Nagaland and Mizoram the income share of secondary sector is reduced at a lower rate compared to the rate by which income share of manufacturing sector is reduced. Thus, in Manipur only we notice positive growth of manufacturing sector during post-liberalisation period though, to be remembered that the rising trend of manufacturing sector in this state is not statistically significant (Table 2.15). Almost in all states tertiary sector has witnessed rising trend barring Meghalaya, Nagaland and Tripura and the positive trend of this sector is statistically significant in Sikkim, Arunachal Pradesh, Assam and Mizoram.

2.8 Inter-Sectoral Relationships

Inter-sectoral relationships and their strengths may be examined by regression analysis between the percentage contributions in state domestic product of two different sectors. Agarwal (2004) has shown by this way that many food surplus states like Haryana, Madhya Pradesh, Punjab, Rajasthan and Uttar Pradesh have not been much influenced by the liberalization policies taken in the decade of 1990's.

Table 2.17: Results on the Regression Analysis within the Sectors (A-agriculture, S- secondary, M- manufacturing, T-tertiary)

	TREND EQUATIONS	SE	t	R Square	p VALUE
SIKKIM	A = 3.14 + 5.78S	1.716	3.36*	0.558	0.008
	T = 38.67 + .46S	0.377	1.217	0.141	0.255
ARUNACHAL PRADESH	21.68+ 2.31M	0.952	2.43**	0.425	0.041
	67.08 - 1.15S	0.522	2.12***	0.379	0.058
ASSAM	24.95 + 2.18M		0.908**	0.093	0.39
	51.58 - .53S	1.25	-0.43	0.022	0.682
MANIPUR	34.86 - 1.14M	0.438	-2.62**	0.496	0.034
	59.53 - .56S		-2.13***	0.394	0.071
MEGHALAYA	A =25.28 - 5.63E-02M	1.41	-0.04	0	0.969
	60.34 - .527S	0.178	-2.96**	0.523	0.018
NAGALAND	A = 32.49 – 2.13M	0.395	-5.4*	0.83	0.002
	T = 50.34 +.31S	0.238	1.31**	0.221	0.24
TRIPURA	A = 24.21 - .22M	1.718	-0.13	0.003	0.903
	T = 58.29 - .23S	0.105	-2.24***	0.456	0.066
MIZORAM	A = 23.31 + 1.48M	1.28	1.15	0.21	0.301
	T = 66.84 - .527S	0.49	-1.07	0.187	0.332

Note: (*) indicates significant at 1% level of significance. (**) indicates significant at 5% level of significance. (***) indicates significant at 10% level of significance [Source: Table 3.14]

For the northeastern states we have done simple linear type of regression analysis between the shares of agriculture and manufacturing sectors as well as between the shares of tertiary and secondary sectors. The results are given in the Table 2.17.

The significant relationships between agriculture and manufacturing sector are obtained in Sikkim (1% level of significance), Arunachal Pradesh (5% level of

significance), Manipur (5% level of significance) and Nagaland (1% level of significance). Among these in Sikkim and Aunachal Pradesh the sign of regressor coefficients are positive. In reality both sectors have shown declining performances regarding contributions in total NSDP. On the other hand, in Nagaland even if we get significant relationship with negative coefficient, the experience is somewhat different compared to other northeastern states as mentioned before. In this case the contribution of manufacturing sector is continuously falling, whereas the same of agricultural sector is continuously increasing since 1997-98. So only in Manipur we can see a substantial rise of the manufacturing sector's share accompanied with decreasing share of agricultural sector, which, at least is an indication of the success of reform policies.

Statistical tests confirm that manufacturing sector in northeast states have not been much influenced by primary or tertiary sector. Earlier we have seen that industrial world in the northeastern states is heavily dominated by small scale industries or cottage industries. A group of people from the very first day was engaged to produce traditional goods in search of their livelihood. Their economic activities were not influenced by the activities associated with any other sector. Thus a part of industrial world is not an outcome of any structural change. In the next chapter it will be clearer that like sectoral distribution, sectoral employment pattern also did not follow strictly structural progression. So, a large number of workers (and hence large number of population) has been always dependent on primary sector of which contribution in total GSDP is continuously falling. These workers have not been able to strengthen the demand side of manufacturing sector. As per Eswaran and Kotal (1994) industrial sector must get sufficient inspiration from agricultural sector through its demand side. If we assume that agricultural productivity (and hence agricultural wage) is fixed, the only increase in the industrial productivity will not increase the demand for agricultural product. This is why industry related workers normally consume more industrial goods than agriculture related workers. So after reallocation of labour from agriculture to industry there is a scope of enhancement of agricultural productivity which in turn will

augment agricultural wage and demand for industrial product. In the absence of this reallocation, industrial process becomes insensitive to the agricultural process. Through this reallocation of labour, demand for agricultural goods too, will be increased. Because agricultural workers actually can not satisfy their basic needs. So as a consequence of their wage rise demand for and price of agricultural goods will simply rise.

2.9 Causality Test within the Sectors

2.9.1 General Methodology

Here we present our analysis on the relationship between primary, secondary and tertiary sectors into different steps with the help of continuous data of the income shares of three sectors since 1980. We have taken help at first of unit root test to find out order of integration of the variables.

Let us assume

$$Y_t = \rho Y_{t-1} + u_t \qquad -1 \leq \rho \leq 1$$

u_t is a white noise error term

So, $\Delta Y_t = \delta Y_{t-1} + u_t$

Where $\Delta Y_t = Y_t - Y_{t-1}$; $\delta = \rho - 1$

Thus in case of unit root test null hypothesis becomes $\delta=0$. If it is zero or if the null hypothesis is not rejected we conclude that Y_t is nonstationary.

Cointegration test can be applied if the variables are of same order of integration. Dicky-Fuller (DF) and Augmented Dicky Fuller (ADF) are two popular tests which are useful to examine the unit roots and stationary property of the variables. The rule of thumb is, to run standard Granger causality test in a bivariate framework the linear combination of two series has to be non-stationary. If it is stationary then simple regression analysis is acceptable.

Let us consider in a bivariate framework we are trying to forecast for any particular variable. Under Granger test if that forecast is improved after taking lagged values of another variable then second variable has a Granger cause to the first variable. More generally " if variable X (Granger) cause variable Y then changes in X should precede changes in Y. Therefore, in a regression of Y on other variables (including its own past values) if we include past or lagged values of X and it significantly improves the prediction of Y, then we can say that X (Granger) cause Y" (Gujarati & Sangeetha, 2007).

Relationship and causality between two variables are not the same things. There may be relationship between two variables. It does not necessarily mean causation. Let us consider that we are trying to have prediction on the time series data of a variable Y. If the error of current Y is reduced after taking into consideration the past values of another variable X along with the past values of Y, then time series X is said to be Granger cause to another time series Y. When the linear combination of two non-stationary variables is non-stationary the Granger's causality test can take place. The following equations represent standard Granger's test for the bilateral causality (Bhandari and Paul, 2007).

$$\Delta X_t = \alpha_1 + \sum_{i=1}^{n_1} \beta_{1i} \Delta X_{t-i} + \varepsilon_{1t} \quad (1)$$

$$\Delta X_t = \alpha_2 + \sum_{i=1}^{n_1} \beta_{1i} \Delta X_{t-i} + \sum_{j=1}^{n_2} \beta_{2j} \Delta Y_{t-j} + \varepsilon_{2t} \quad (2)$$

$$\Delta Y_t = \alpha_3 + \sum_{i=1}^{n_3} \beta_{3i} \Delta Y_{t-i} + \varepsilon_{3t} \quad (3)$$

$$\Delta Y_t = \alpha_4 + \sum_{i=1}^{n_3} \beta_{3i} \Delta Y_{t-i} + \sum_{j=1}^{n_4} \beta_{4j} \Delta X_{t-j} + \varepsilon_{4t} \quad (4)$$

Equations (1) and (2) are useful to examine whether the coefficients of past lags of Y are zero or not. Similarly equations (3) and (4) are useful to examine

whether the coefficients of past lags of X are zero or not. If in equation (2) the above-said co-efficient is not zero (i.e. computed F statistic is significant) then Y Granger causes X. By the same way, in equation (4) if the coefficient of past lagged values of X is not zero (i.e. computed F statistic is significant at chosen level of significance), then X Granger causes Y

There is a possibility that two non-stationary series are co-integrated. In that case Engle and Granger (1987) suggested another technique for testing causality. The technique is named as error correction mechanism. Error correction mechanism was first implemented by Sargan (1984).

While the cointegration may bring long term or equilibrium relationship between two, there may be disequilibrium in the short run. As per Granger representation theorem "if two variables are cointegrated then the relationship between the two can be expressed as ECM". Under ECM the one period lagged value of the error from the cointegrating regression is considered. This error correction term becomes representative of long run causality. A statistically significant coefficient of this error term implies that there is a disequilibrium in the long run relationship in which case the error term provides an additional channel to capture causality (Ansari 1996). Following Bhandari and Paul (2007) error correction equations are given below:

$$\Delta X_t = \lambda_1 + \sum_{i=1}^{k_1} \alpha_i \Delta X_{t-i} + \sum_{i=1}^{k_2} \alpha_i \Delta Y_{t-i} + \eta_1 \varepsilon_{t-1} + \mu_t \qquad (5)$$

$$\Delta Y_t = \lambda_2 + \sum_{i=1}^{k_1} \alpha_i \Delta Y_{t-i} + \sum_{i=1}^{k_2} \alpha_i \Delta X_{t-i} + \eta_1 \varepsilon_{t-1} + \mu_t \qquad (6)$$

To get optimal lag length of independent variable we have followed Akike's final prediction error (FPE) criterion as suggested by Hsiao (1981).

Following this approach any optimum lag length will minimise the Final Prediction Error (FPE). Let us consider that 'm' and 'n' are the optimum

$$FPE(m, 0) = \frac{R+m+1}{R-m-1} \cdot \frac{RSS(m,0)}{R} \quad \ldots\ldots (7)$$

$$FPE(m, n) = \frac{R+m+n+1}{R-m-n-1} \cdot \frac{RSS(m, n)}{R} \quad \ldots\ldots (8)$$

Lag Lengths of the independent variables estimated from the equations 1 and 2. In the equation (7) FPE (m,0) will be obtained from equation (1) and in the equation (8) above FPE (m, n) will be obtained from equation (2) where, RSS (m,0) is the residual sum of square and R denotes the number of observation.

If the FPE value in equation (8) is smaller than the FPE value in equation (7) then we can conclude Y Granger cause X. The same process can be followed for the equations (3) and (4).

2.9.2 Results on Unit Root and Cointegration Tests

Dicky-Fuller (DF) and Augmented Dicky-Fuller (ADF) tests are applied to examine the stationarity of the variables representing income shares of primary, secondary and tertiary sectors of Arunachal Pradesh, Assam, Tripura, Manipur and Sikkim. The tests have considered both with and without time trends. DF and ADF test statistics confirm that in most cases the variables are non-stationary with integrated of order one, i.e., I (1) in all states. Similarly DF and ADF test statistics for cointegration test suggest that the variables are not cointegrated as the non-stationarity of the residual is not rejected.

Accordingly the state wise results of the standard Granger test are given below-

2.9.3 Results of Causality Test in Manipur

Table 2.18: Share of Primary, Secondary and Tertiary Sectors in Total State Domestic Product

YEAR	PRIMARY	SECONDARY	TERTIARY
1980-81	49.1	7.65	43.25
81-82	47.7	8.34	43.96
82-83	45.86	8.42	45.72
83-84	45.79	8.45	45.76
84-85	44.96	8.8	46.24
85-86	43.78	9.04	47.18
86-87	41.85	8.8	49.35
87-88	40.85	8.72	50.43
88-89	38.79	9.76	51.45
89-90	38.26	9.48	52.26
90-91	38.02	10.2	51.78
91-92	37.84	9.98	52.18
92-93	35.64	10.28	54.08
93-94	37.87	15.73	46.4
94-95	36.92	15.43	47.65
95-96	35.68	16.56	47.76
96-97	32.76	18.66	48.58
97-98	33.45	19.96	46.59
98-99	32.36	24.99	42.65
99-00	32.1	26.29	41.61

Source: EPWRF (2003) Estimations of SDP 1960/61-2000/01

Table 2.19: Unit Root Tests without Trend

Variable	Level		First Difference	
	DF	ADF(1)	DF	ADF(1)
Primary	-1.879	-1.860	-4.775	-3.632
Secondary	1.546	2.039	-4.543	-2.709
Tertiary	-2.108	-2.143	-4.156	-3.005

2.20: Unit Root Test with Time Trend

Variable	Level		First Difference	
	DF	ADF(1)	DF	ADF(1)
Primary	-1.920	-1.856	-5.765	-4.844
Secondary	-0.765	-0.115	-6.113	-4.633
Tertiary	-1.163	-1.012	-5.846	-5.147

2.21: Cointegration Tests

Regression Equation:	DF	ADF
(a) Regress P on S	-2.094	-2.075
(b) Regress S on P	-0.413	-0.601
(c) Regress S on T	1.250	0.789
(d) Regress T on S	-2.123	-2.164

Note: No DF and ADF values are significant subject to Critical values at 5% level of significance. P and S denote primary and secondary sector respectively.

2.22: Granger Causality test between Primary and Secondary Sector

Regression	FPE†	F-Value
(a) Primary as a dependent variable		
i. Regress P on P (m=2)	0.00658	2.480*
ii. Regress P on P (m=2) and S(n=2)	0.00569	
(b) Secondary as a dependent variable		
i. Regress S on S (m=2)	0.01489	1.264
ii. Regress S on S (m=2) and P(n=1)	0.01504	

Note: † FPE represents Akaike's final prediction error
* Significant at 5% level

2.23: Granger Causality Test between Secondary and Tertiary Sector

Regression	FPE†	F-Value
(a) Secondary as a dependent variable		
i. Regress S on S (m=1)	0.01208	2.745*
ii. Regress S on S (m=2) and T (n=2)	0.01145	
(b) Tertiary as a dependent variable		
i. Regress T on T (m=1)	0.00534	1.458
ii. Regress T on T (m=1) and S (n=2)	0.00567	

Note: † FPE represents Akaike's final prediction error. * Significant at 5% level

2.9.4 Results of Causality Test for Sikkim

Table 2.24: Share of Primary, Secondary and Tertiary Sectors in Total State Domestic Product

YEAR	Primary	Secondary	Tertiary
1980-81	48.91%		30.40%
81-82	50.81%	19.91%	29.29%
82-83	51.90%	19.67%	28.43%
83-84	50.15%	20.91%	28.93%
84-85	50.28%	19.39%	30.32%
85-86	45.10%	21.32%	33.58%
86-87	39.18%	27.17%	33.65%
87-88	48.20%	21.84%	29.96%
88-89	45.37%	20.74%	33.89%
89-90	44.44%	22.84%	32.72%
90-91	42.09%	18.51%	39.40%
91-92	40.10%	18.22%	41.68%
92-93	35.71%	19.82%	44.47%
93-94	35.07%	19.00%	45.93%
94-95	34.02%	18.60%	47.37%
95-96	33.17%	21.19%	45.63%
96-97	32.80%	20.85%	46.35%
97-98	29.98%	23.62%	46.40%
98-99	28.73%	20.99%	50.28%
99-00	27.52%	22.73%	49.74%

Source: EPWRF (2003) Estimations of SDP 1960/61-2000/01

Table 2.25: Unit Root Tests without Trend

Variable	Level		First Difference	
	DF	ADF(1)	DF	ADF(1)
Primary	0.764	0.215	-5.395	-3.992
Secondary	-2.953	-2.259	-5.661	-4.828
Tertiary	-0.656	-0.395	-5.327	-4.851

Table 2.26: Unit Root Tests with Time Trend

Variable	Level		First Difference	
	DF	ADF(1)	DF	ADF(1)
Primary	-1.534	-3.150	-5.286	-4.000
Secondary	-2.859	-2.180	-5.467	-4.672
Tertiary	-2.574	-2.245	-5.125	-4.692

Table 2.27: Cointegration Tests

Regression Equation:	DF	ADF
(a) Regress P on S	-0.101	-0.230
(b) Regress S on P	-2.678	-2.049
(c) Regress S on T	-2.879	-2.200
(d) Regress T on S	-0.603	-0.579

Note: No DF and ADF values are significant subject to Critical values at 5% level of significance. P and S denote primary and secondary sector respectively.

Table 2.28: Granger Causality Test between Primary and Secondary Sector

Regression	FPE†	F-Value
(a) Primary as a dependent variable		
i. Regress P on P (m=2)	0.00758	2.419*
ii. Regress P on P (m=2) and S(n=2)	0.00509	
(b) Secondary as a dependent variable		
i. Regress S on S (m=2)	0.01489	1.569
ii. Regress S on S (m=2) and P(n=1)	0.01596	

Note: † FPE represents Akaike's final prediction error
* Significant at 5% level

Table 2.29: Granger Causality Test between Secondary and Tertiary Sector

Regression	FPE†	F-Value
(a) Secondary as a dependent variable	0.01258	2.745*
i. Regress S on S (m=1)	0.01146	
ii. Regress S on S (m=2) and T (n=2)		
(b) Tertiary as a dependent variable	0.00578	1.650
i. Regress T on T (m=1)	0.00597	
ii. Regress T on T (m=1) and S (n=2)		

Note: † FPE represents Akaike's final prediction error
* Significant at 5% level

2.9.5 Results of Causality Test for Arunachal Pradesh

Table 2.30: Share of Primary, Secondary and Tertiary sectors in total State Domestic product

	AGRICULTURE	INDUSTRY	SERVICE
1980-81	47.22	22.27	30.51
81-82	50.83	20.04	29.13
82-83	46.63	22.94	30.42
83-84	52.46	18.45	29.09
84-85	47.82	23.69	28.49
85-86	50.25	22.58	27.17
86-87	50.87	19.51	29.62
87-88	49.3	20.18	30.52
88-89	53.03	17.95	29.03
89-90	48.06	22.46	29.49
90-91	45.39	22.35	32.25
91-92	46.91	20.59	32.5
92-93	47.73	19.83	32.44
93-94	45.39	23.94	30.67
94-95	42.81	25.64	31.55
95-96	38.93	33.09	27.98
96-97	33.58	35.98	30.44
97-98	36.48	33.75	30.77

Source: EPWRF (2003) Estimations of SDP 1960/61-2000/01

Table 2.31: Unit Root Tests without Trend

Variable	Level		First Difference	
	DF	ADF(1)	DF	ADF(1)
Agriculture	-0.189	0.258	-5.564	-3.478
Industry	-2.056	-2.458	-5.458	-3.858
Service	-1.568	-0.425	-5.742	-3.587

Table 2.32: Unit root Test with Time Trend

Variable	Level		First Difference	
	DF	ADF(1)	DF	ADF(1)
Agriculture	-3.258	-2.597	-5.415	-4.617
Industry	-2.456	-2.748	-5.748	-4.784
Service	-4.470	-2.695	-5.025	-2.546

Table 2.33: Cointegration Tests

Regression Equation:	DF	ADF
(a) Regress A on I	-1.257	-0.479
(b) Regress I on A	-2.879	-2.408
(c) Regress I on S	-3.241	-2.679
(d) Regress S on I	-1.387	-1.356

Note: No DF and ADF values are significant subject to Critical values at 5% level of significance.

Table 2.34: Granger Causality test between Agriculture and Industry

Regression	FPE†	F-Value
(a) Agriculture as a dependent variable		
i. Regress A on A (m=1)	0.00489	2.460*
ii. Regress A on A (m=1) and I (n=2)	0.00450	
(b) Industry as a dependent variable		
i. Regress I on I (m=2)	0.01471	1.754
ii. Regress I on I (m=2) and A (n=1)	0.01569	

Note: † FPE represents Akaike's final prediction error. * Significant at 5% level

Table 2.35: Granger Causality Test between Industry and Service sector

Regression	FPE†	F-Value
(a) Industry as a dependent variable		
i. Regress I on I (m=1)	0.01495	2.650*
ii. Regress I on I (m=1) and S (n=1)	0.01407	
(b) Service as a dependent variable		
i. Regress S on S (m=1)	0.00468	1.287
ii. Regress S on S (m=1) and I (n=1)	0.00530	

Note: † FPE represents Akaike's final prediction error.
* Significant at 5% level

2.9.6 Results of Causality Test for Assam

Table 2.36: Share of Primary, Secondary and Tertiary sectors in total State Domestic product

	AGRICULTURE	INDUSTRY	SERVICE
1980-81	48.43	11.18	40.39
81-82	43.42	16.77	39.81
82-83	44.51	15.81	39.68
83-84	44.95	15.78	39.27
84-85	42.49	17.05	40.46
85-86	42.75	15.9	41.35
86-87	42.13	15.45	42.42
87-88	42.9	15.36	41.75
88-89	42.04	15.71	42.25
89-90	42.34	15.23	42.43
90-91	40.98	14.66	44.36
91-92	40.36	13.96	45.68
92-93	40.21	13.42	46.37
93-94	39.4	13.47	47.13
94-95	39.34	15.29	45.36
95-96	38.65	15.1	46.24
96-97	38.38	14.91	46.71
97-98	37.77	14.46	47.77

Source: EPWRF (2003) Estimations of SDP 1960/61-2000/01

Table 2.37: Unit root Tests without Trend

Variable	Level		First Difference	
	DF	ADF(1)	DF	ADF(1)
Agriculture	-1.258	0.146	-5.250	-3.458
Industry	-2.458	-2.253	-5.364	-4.546
Service	-1.580	-0.387	-5.543	-2.256

Table 2.38:Unit Root Test with Time Trend

Variable	Level		First Difference	
	DF	ADF(1)	DF	ADF(1)
Agriculture	-3.458	-2.678	-5.560	-4.568
Industry	-2.860	-2.656	-5.448	-4.745
Service	-5.345	-2.897	-5.890	-4.878

Table 2.39: Cointegration Tests

Regression Equation:	DF	ADF
(a) Regress A on I	-0.856	-1.214
(b) Regress I on A	-2.958	-2.785
(c) Regress I on S	-3.472	-2.478
(d) Regress S on I	-0.978	-0.668

Note: No DF and ADF values are significant subject to Critical values at 5% level of significance.

Table 2.40: Granger Causality test between Agriculture and Industry Sector

Regression	FPE†	F-Value
(a) Agriculture as a dependent variable		
i. Regress A on A (m=1)	0.00506	1.547
ii. Regress A on A (m=1) and I (n=2)	0.00512	
(b) Industry as a dependent variable		
i. Regress I on I (m=2)	0.01586	2.568*
ii. Regress I on I (m=2) and A (n=1)	0.01514	

Note: † FPE represents Akaike's final prediction error

- Significant at 5% level

Table 2.41: Granger Causality Test between Industry and Service Sector

Regression	FPE†	F-Value
(a) Industry as a dependent variable		
i. Regress I on I (m=1)	0.01487	2.568*
ii. Regress I on I (m=1) and S (n=1)	0.01401	
(b) Service as a dependent variable		
i. Regress S on S (m=1)	0.00568	1.558
ii. Regress S on S (m=1) and I (n=1)	0.00525	

Note: † FPE represents Akaike's final prediction error

* Significant at 5% level

2.9.7 Results of Causality Test for Tripura

Table 2.42: Share of Primary, Secondary and Tertiary sectors in total State Domestic Product

	AGRICULTURE	INDUSTRY	SERVICE
1980-81	55.91	7.57	36.51
81-82	53.56	7.53	38.9
82-83	55.27	6.74	37.99
83-84	50.8	7.13	42.07
84-85	50.77	5.29	43.93
85-86	50.87	4.48	44.65
86-87	48.72	4.79	46.49
87-88	48.95	6.13	44.93
88-89	45.33	3.89	50.78
89-90	44.26	4.01	51.73
90-91	43.26	6.08	50.67
91-92	40.39	5.88	53.73
92-93	37.75	5.79	56.46
93-94	36.42	4.9	58.69
94-95	30.46	6.86	62.68
95-96	29.32	7.65	63.01
96-97	29.5	7.96	62.55
97-98	29.65	8.33	62.02
98-99	29.76	8.82	61.42

Source: EPWRF (2003) Estimations of SDP 1960/61-2000/01

Table 2.43: Unit Root Tests without Trend

Variable	Level		First Difference	
	DF	ADF(1)	DF	ADF(1)
Agriculture	-1.457	-2.474	-4.457	-4.470
Industry	-2.653	-2.203	-4.586	-4.696
Service	-0.747	-2.712	-4.985	-4.250

Table 2.44: Unit Root Test with Time Trend

Variable	Level		First Difference	
	DF	ADF(1)	DF	ADF(1)
Agriculture	-3.478	-2.478	-5.540	-4.658
Industry	-3.528	-2.586	-5.745	-4.567
Service	-5.146	-2.470	-5.656	-4.693

Table 2.45: Cointegration Tests

Regression Equation:	DF	ADF
(a) Regress A on I	-0.458	-1.586
(b) Regress I on A	-2.586	-2.856
(c) Regress I on S	-3.784	-2.879
(d) Regress S on I	-0.588	-0.445

Note: No DF and ADF values are significant subject to Critical values at 5% level of significance.

Table 2.46: Granger Causality test between Agriculture and Industry Sectors

Regression	FPE†	F-Value
(a) Agriculture as a dependent variable		
i. Regress A on A (m=1)	0.00523	1.547
ii. Regress A on A (m=1) and I (n=2)	0.00856	
(b) Industry as a dependent variable		
i. Regress I on I (m=2)	0.01584	2.547*
ii. Regress I on I (m=2) and A (n=1)	0.01501	

Note: † FPE represents Akaike's final prediction error
* Significant at 5% level

Table 2.47: Granger Causality Test between Industry and Service sector

Regression	FPE†	F-Value
(a) Industry as a dependent variable		
i. Regress I on I (m=1)	0.01587	2.655*
ii. Regress I on I (m=1) and S (n=1)	0.01443	
(b) Service as a dependent variable		
i. Regress S on S (m=1)	0.00534	1.345
ii. Regress S on S (m=1) and I (n=1)	0.00530	

Note: † FPE represents Akaike's final prediction error

- Significant at 5% level

2.9.8 Interpretation of the Results

If we consider secondary sector's contribution as dependent variable and primary sector's contribution as independent variable, then we get significant F value for Granger test in Assam and Tripura. In the opposite case we get significant F value in Arunachal Pradesh, Manipur and Sikkim. Thus, unidirectional causality from primary to secondary sector exists in Assam and Tripura and the same from secondary to primary sector exists in other states. In other words, growth of agricultural sector has influenced growth of industries in Assam and Tripura. The opposite is true for other states. Similarly, service sector is causing secondary sector in Assam, Tripura, Manipur and Sikkim and industrial sector is causing tertiary sector only in Arunachal Pradesh. The directions of causality are given below.

Table 2.48: Directions of Causality

States	Direction
Arunachal Pradesh	Industry → Agriculture Industry → Service
Assam	Agriculture → Industry Service → Industry
Tripura	Agriculture → Industry Service → Industry
Manipur	Secondary→Primary Tertiary →Secondary
Sikkim	Secondary→Primary Tertiary →Secondary

2.10 Summary

on the basis of our analysis above, we have not seen significant growth in per capita income and manufacturing sector during post-liberalisation period. Service sector is continuously growing and falling productivity of food grain, fruits and

vegetables is noticed. Income share of secondary sector has got a rising trend because of heavy growth of construction sector.

Poor profile of industrial world in northeast India is well reflected by low figures on credit-deposit ratio at different time periods. Statistically the credit-deposit ratio of northeastern states have shown significant differences with all India credit-deposit ratio figures subject to three reference periods 1982, 1992 and 2002. The identified factors taking role against the growth of industrial sector are- a) paucity of investment, b) inappropriate technology, c) insufficient demand and market structure, d) restrictions on property rights, e) unwillingness in entrepreneurship, f) socio-political status and g) ecological constraints.

Granger causality tests have confirmed that, in Assam and Tripura primary sector has become helpful for the growth of secondary sector and in Arunachal Pradesh only secondary sector has shown Granger cause to tertiary sector.
