STRUCTURAL PATTERNS OF GROWTH WITH SPECIAL REFERENCE TO SERVICES SECTOR : CO-INTEGRATION AND CAUSALITY

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DECLARATION

This is to certify that the dissertation entitled "STRUCTURAL PATTERNS OF GROWTH WITH SPECIAL REFERENCE TO SERVICES SECTOR: CO-INTEGRATION AND CAUSALITY", submitted by GANTAKOLLA SRIVASTAVA, in partial fulfilment of the requirement for the award of the degree of **Master of Philosophy (M.Phil.)** of this University, has not been previously submitted for any degree of this or any other University. This is his own work.

We recommend this dissertation to be placed before the examiners for evaluation.

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TO

MY PARENTS

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The views expressed in this study are those of the author alone. Responsibility for errors and omissions remain those of the author alone.

Gantakolla Srivastava.

CONTENTS

CHAPTER I

Introduction

The theoretical growth models[1] that assume the production function to be linearly homogenous imply that economic growth is limited to scale and further implies that all the sectors of the economy expand proportionately during the process of economic growth. On the contrary, empirical evidence does not conform to this phenomenon. In fact growth is accompanied by structural change of a non-random and a systematic character coupled with an increase in output of a changing composition. Therefore, the process of structural transformation is a consequence of economic growth. Structural change is defined as a change in the relative weight of significant components of the aggregate indicators of the economy. Economic development is seen as an interrelated set of long-run processes of structural transformation which had been described by Kuznets (1966) as modern economic growth. This was basically propounded on the basis of historical evolution of the advanced economies and from intercountry experience of structural change and growth identified over the long run.

The process of economic growth can be formally described as the result of expansion in productive resources and increase in the efficiency of their use. Structural change stems from technical progress, change in demand pattern and economies of scale. Economies of scale lead to specialisation, and hence, result in increase in productivity. Therefore an inter sectoral shift takes place. The ubiquitous reason for the shift is differences in relative pace of advance of factor productivity within these sectors. This shift causes further growth due to increase in the productivity of efficient sectors as resources for growth shift from low

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[1] basically neo classical models.

productivity sector(s) to high productivity sector(s), generally from Primary to Secondary and to tertiary sectors. Secondly, increase in productivity leads to increase in income generated and thus leads to wage rise in advanced sectors (secondary and tertiary). The wage differentials cause a shift of labour from primary activities to secondary activities. The shift of labour force is often not completely absorbed by the secondary sector. Hence the shift of labour force is partly absorbed in tertiary sector (organised and unorganised)[2].

The changing composition of output accompanying growth in favour of industry from agriculture is primarily due to technical progress. Consequently, the relative profitability of investment is high in favour of the industrial sector. It leads to bias in the share of investment towards industrial sector. Since the rate of technical progress is itself a function of the volume of investment with dynamic interaction between them, profitability in the industry comes about through the operation of increasing returns due to division of labour. Division of labour is directly linked to the size of the market. The size of the market depends on the income elasticities of demand for manufactured or industrial goods which are generally high when compared to agricultural products. Given this framework, increase in productivity promotes further investment. Therefore, the predominance of agriculture in the early stages of development transforms to the predominance of industry in the middle stages and further to Services at the advanced stages of development, leading to high rates of growth [Clark, 1951].

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[2] In most of the developing countries, labour force engaged in primary activities are unskilled and marginally skilled. Therefore some of them land up in the informal sector or the unorganised sector (labour displacement) mostly concentrated in urban areas leading to congestion and other related problems of the urban population.

The patterns of structural transformation are transition from a low income agrarian rural economy to an industrial urban economy with substantially higher per capita income [Syrquin, 1988]. These are generally known as ***Stylized facts*** of development[3]. Another generally expected stylized fact is that the share of services in output increases with economic growth. It is also expected that on an average, the share of services will be higher in high income countries as compared to the low income countries.

1.1. Splintering of Goods and Services

As economies grow, there occurs a structural change arising from technical progress and economies of scale. This brings about splintering of goods and services. Splintering is not a one way process, goods may splinter from services and vice-versa. According to Bhagwathi (1984), "the splintering of services from goods is simply a consequence of the way industry-of-origin services are identified".

> For illustration, intra-firm transactions even when they partake of the nature of services otherwise so defined are automatically classified as part of that firm's output. Within a firm producing goods, it would all go into goods production, whereas when purchased from outside the value added from these activities would get classified as services.

As economies of scale lead to specialisation, services are produced separately from goods. Consequently, Services are taken out of the firm and become part of inter-firm transactions. This splintering causes a shift in the relative proportion of goods and services in the industry in favour of services.

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[3] A phrase initially used by Kaldor.

In the process of economic transformation, services have come to play a major role. Such trends were mainly witnessed by the advanced countries which had transformed from industrial societies to service societies. This process is noteworthy in major developed economies, where they had evolved from primary activities, passed on to industrial societies and further to services societies. Examples are the U.S, where services account for seventy percent of its total output, and most of the west European countries, where services account for more than fifty five percent of the total national output [Quibria, 1988].

As far as developing countries are concerned, the role of services sector has been becoming more important as "their role in economic development is far from unilinear"[Quibria, 1988]. The development of services form the preconditions for growth and development of any economy[4] and not vice-versa.

1.2. Growth and Change in India

Growth and change in India have been presented in Table 1.1 (page-6) and table 1.3 (page-7) respectively. A glimpse at table 1.1 shows that agriculture grew at 2.32 per cent[5] per annum from 1950-51 to 1992-93. The industry grew at 5.05 per cent per annum and services at 4.85 per cent per annum during the same period. During this period, industry had grown at a higher rate followed by services. Agricultural growth had declined during the sixties (1960-61 to 1969-70) to 1.43 per cent per annum and increased to 3.09 per cent per

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[4] A well developed service infrastructure in terms of Transport, communication, financial sector and public administration when operated efficiently, provides one of the important preconditions for growth and development.

[5] Exponential growth rates.

annum during the eighties(1980-81 to 1989-90). Industry and services had increased steadily, clearly depicting the dominance of these sectors in the growth of total income(NDP).

The total income growth was 3.72 per cent per annum per annum from 1950-51 to 1992-93. In the fifties(1950-51 to 1959-60) it was 3.54 per cent per annum and it came down to 3.02 per cent per annum in the sixties(1960-61 to 1969-70) as agricultural and industrial growth had declined. But the noteworthy feature has been the steady services growth and in fact it had registered a marginal increase from 4.22 per cent per annum to 4.37 per cent per annum during this period.

On the whole it is quite evident that the growth in NDP was highly influenced by the growth in industry and services, depicting the process of income transformation. The interesting noteworthy feature has been the steady growth of services sector. This has been captured in Graph 1.1 (page-8).

Now looking at the structure of income, the share of agriculture in total income was the highest unto 1980-81 to 1984-85 (see table 1.2). The decline in the share of agriculture started from the mid fifties (1955-56 to 1959-60) with a steady and sustained increase in the share of industry and services. But the share of services grew faster than that of industry during the period 1986-90 and 1990-93. During this period the share of services was the highest at 38.9 per cent and 40.4 per cent followed by agriculture at 35.7 per cent and 33.8 per cent and industry at 25.4 per cent and 25.8 per cent. Though the share of industry was increasing, the share of services was increasing at a faster rate than that of industry. The shares of agriculture, industry and services are presented in Graph 1.2 (page-8). A detailed

Table 1.1

Income Growth -- India					(Percent)
Income Structure	1951-60	1961-70	1971-80	1981-93	1951-1993
Agriculture	2.62	1.43	1.62	3.09	2.32
Industry	5.63	4.97	4.53	6.20	5.05
Services	4.22	4.37	4.63	6.60	4.85
Net Domestic Product	3.54	3.02	3.28	5.19	3.72

Table 1.2

Services Income Growth -- India					(Percent)
Services Decomposition	1951-60	1961-70	1971-80	1981-93	1951-1993
Trade	5.11	4.43	4.85	5.50	4.87
Transport	5.85	4.03	7.20	7.57	5.91
Banking & Insurance	7.69	5.00	7.80	12.68	7.64
Real Estate	2.66	2.93	3.20	3.93	3.16
Public Administration	4.95	7.59	4.79	7.05	6.41
Other Services	2.83	3.88	2.81	5.82	3.72

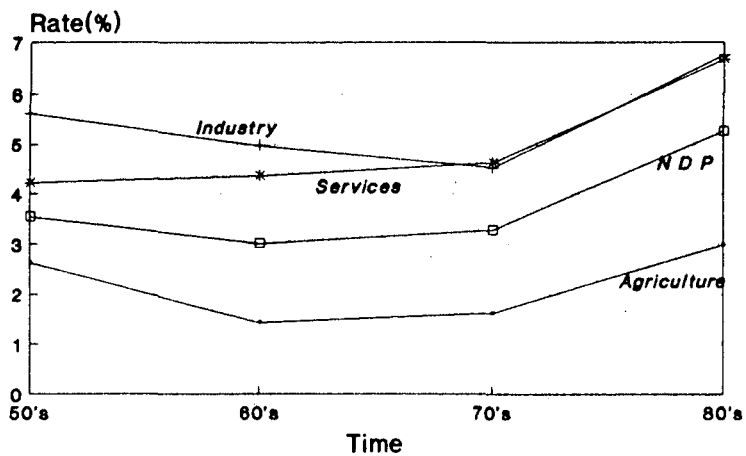
Data source : CSO, National Accounts Statistics, various issues.

Table 1.3

Structural Change of Income - India.									(Percent)
Income Structure	Quinquennial Years								
at (1980-81 prices)	1951-55	1956-60	1961-65	1966-70	1971-75	1976-80	1981-85	1986-90	1990-93
Agriculture	58.2	55.2	51.2	46.9	45.7	42.8	40.4	35.7	33.8
(Shift)		-3.0	-4.0	-4.3	-1.2	-2.9	-2.4	-4.7	-1.9
Industry	15.2	17.2	19.7	21.7	21.8	22.9	23.7	25.4	25.8
(Shift)		1.9	2.5	2.0	0.1	1.1	0.8	1.7	0.3
Services	26.5	27.6	29.1	31.4	32.5	34.3	35.9	38.9	40.4
(Shift)		1.1	1.5	2.3	1.1	1.8	1.6	2.9	1.6
Trade	8.9	9.7	10.8	11.6	11.7	12.6	13.1	13.6	13.5
(Shift)		0.8	1.1	0.8	0.1	0.9	0.5	0.5	-0.0
Transport	1.8	2.1	2.2	2.4	2.6	3.1	3.4	3.9	4.1
(Shift)		0.2	0.2	0.1	0.2	0.5	0.3	0.5	0.3
Banking & insurance	1.3	1.6	1.8	2.0	2.3	2.9	3.4	4.8	6.1
(Shift)		0.3	0.2	0.2	0.4	0.6	0.4	1.5	1.3
Real estate	6.1	5.8	5.5	5.5	5.4	5.3	5.2	4.9	4.7
(Shift)		-0.2	-0.4	0.1	-0.1	-0.1	-0.1	-0.3	-0.2
Public administration	2.2	2.4	2.9	3.6	4.1	4.3	4.8	5.6	5.5
(Shift)		0.2	0.5	0.7	0.6	0.2	0.5	0.7	-0.1
Other Services	6.3	6.1	6.0	6.3	6.3	6.0	6.1	6.1	6.4
(Shift)		-0.2	-0.1	0.4	-0.0	-0.3	0.0	0.1	0.3

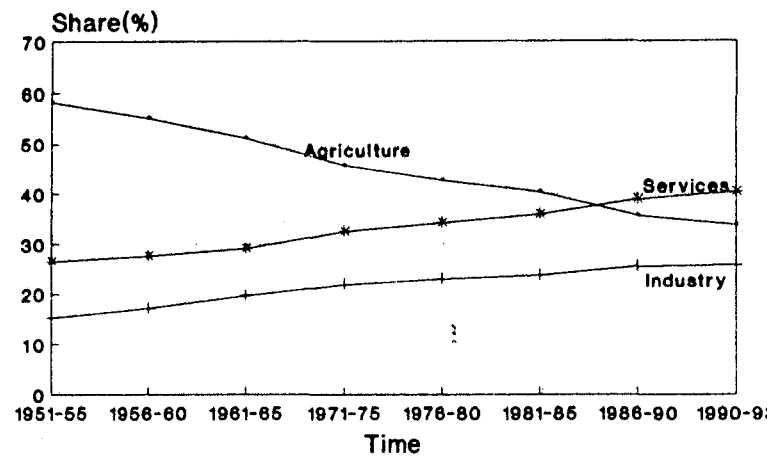
Data Source: CSO, National Accounts Statistics, variuos issues.

Income Growth
India



Graph 1.1

Structural Change of Income
India



Graph 1.2

discussion of income growth and structural change of income in the states of India is presented in subsequent chapters.

1.3. Services growth in India

We have witnessed that the growth of services in India has been consistent from the fifties (1950-51 to 1959-60) through the eighties (1980-81 to 1992-93) (table 2, page-6). The services growth during this period was 4.85 per cent per annum which is well above the growth of agriculture at 2.32 per cent per annum but below industrial growth at 5.05 per cent per annum. There had been a gradual increase in services growth during the fifties (1950-51 to 1959-60), sixties (1960-61 to 1969-70) and the seventies (1970-71 to 1979-80) from 4.22 per cent per annum to 4.37 per cent per annum and further to 4.63 per cent per annum. But during the eighties (1980-81 to 1992-93), there was a big sprut in growth to 6.60 per cent per annum. This has been due to tremendous increase in growth of income in the banking & insurance sector (12.68 per cent per annum), public administration (7.05 per cent per annum) and transport (7.57 per cent per annum) during this period.

1.3.1. Decomposition of services growth in India

Services can broadly be classified into

1. Trade, Hotels & restaurants
2. Transport, Storage & Communication
3. Banking & Insurance
4. Real estate, ownership of dwellings and business services
5. Public administration & defence
6. Other services

The growth of service activities is presented in table 1.2 (page-6). The growth in

banking and insurance was 7.64 per cent per annum per annum from 1950-51 to 1992-93. The growth in banking & insurance has consistently increased except during 1961 to 1970.

The growth in public administration and defence was at 6.41 per cent per annum from 1950-51 to 1992-93. There was a consistent increase in the growth of public administration except in the seventies(1970-71 to 1979-80). The third note worthy growth in service activity was transport and communication at 5.91 per cent per annum during the entire period of the study.

From table 1.2 it is evident that there has been an encouraging growth in the banking & insurance, public administration and transport & communication. As these service activities form the infrastructure of the economy, the growth in these sectors is encouraging for further expansion and development of the economy. Moreover, growth in real estate & trade has been low. This is desirable in the case of real estate by reason of the fact that real estate activities act as mere intermediaries.

A glimpse at table 1.4 (page 11) captures the share of individual service activities in total service income. Trade and real estate put together constitute the major share of the services. But the declining share of trade and real estate and increasing share of banking, transport and public administration is noteworthy. While the share of trade and real estate put together declined from 56.2 per cent during the quinquennial period 1951-55 to 45.1 per cent during the quinquennial year 1992-93, the share of transport, banking & insurance and public administration increased from 20.1 per cent to around 38.9 per cent during the same period. The shift in favour of trade, real estate, transport, banking & insurance and public

Table 1.4

Structural Change of Services Income - India.									(Percent)
Services Decomposition	Quinquennial Years								
at (1980-81 prices)	1951-55	1956-60	1961-65	1966-70	1971-75	1976-80	1981-85	1986-90	1990-93
Trade	33.4	35.1	37.1	37.0	36.1	36.8	36.4	34.9	33.5
(Shift)		1.7	2.0	-0.1	-0.9	0.7	-0.4	-1.5	-1.5
Transport	6.9	7.5	7.7	7.5	7.9	8.9	9.4	10.0	10.2
(Shift)		0.6	0.2	-0.1	0.3	1.1	0.5	0.5	0.2
Banking & insurance	4.8	5.7	6.1	6.2	7.2	8.5	9.4	12.4	15.1
(Shift)		0.9	0.5	0.1	0.9	1.3	0.8	3.1	2.7
Real estate	22.8	21.0	18.7	17.6	16.8	15.5	14.5	12.6	11.6
(Shift)		-1.8	-2.3	-1.1	-0.9	-1.3	-1.0	-1.9	-1.0
Public administration	8.4	8.7	9.9	11.4	12.7	12.7	13.4	14.3	13.6
(Shift)		0.3	1.2	1.5	1.3	-0.1	0.8	0.9	-0.7
Other Services	23.7	22.0	20.5	20.2	19.4	17.6	16.9	15.7	15.9
(Shift)		-1.7	-1.6	-0.3	-0.8	-1.8	-0.7	-1.1	0.2

Data Source: CSO, National Accounts Statistics, variuos issues.

administration is desirable as these service activities form the basic infrastructure of the economy which have repercussions on the growth and development of rest of the economy over the long run. Therefore, a higher growth rate of transport & communication, banking & insurance and public administration with increasing share in the total output and services output is encouraging as these are the major components of infrastructure which provide the impetus for growth & development of both agriculture and industry and not the least for the growth of services itself.

1.4. Rationale of the study

Conventional development theory propounds that the process of development constitutes -

i. High growth rates due to rise in total factor productivity through development of physical & human capital and technical progress.

ii. The growth and distribution of income in the initial periods of development are characterised by rapid growth in the non-primary sector with greater inequality within it.

iii. In the subsequent periods, inequality declines due to various institutional changes and narrowing down of inequalities of factor productivity.

The conventional growth and development theories had captured the relative growth of agriculture and industry but failed to capture the interesting phenomenon of services growth in a modern economy. Basically, these theories[6] were based on observed phenomena of the growth process which every contemporary developed nation had passed through.

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[6] Neo classical growth theories, dual economy models etc.

Though the services had begun to grow after the depression of 1930's[7] it was neglected in economic theorising about inevitability of such growth.

It is a commonly known fact that services provide linkages to the production process. Service activities like trade, banking & insurance, transport & communication and public administration are essential inputs for growth of output, investment and thus employment in the industrial sector which has been considered as the "***Engine of growth***". Though there have been arguments (discussed subsequently) against such growth pattern of services, the role of services in economic growth & development cannot be neglected. It is in fact industrialisation at the outset which gives rise to demand for a variety of services.

The growth of the services sector with the fall in the growth of agricultural sector plays an important role as the potential source of demand, which is vital for economic growth[8]. The falling share of agricultural income and a meagre rise in the share of industrial income to the total income has been compensated by the rapidly rising share of services income[9]. This rise sustains demand in the economy thus avoiding market glut.

It has been opined by Ahluwalia [1987] that services sector growth need cause no alarm and in fact government should take explicit measures to enhance its role, in view of

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[7] it was visualised even before 1930's by Sir William Petty as far back as 1691.

[8] Economic growth does not take place not only through the process of capital accumulation, but also through consumption demand which is hitherto equally important.

[9] see table 1.2, page-7.

the need for the economy to create a strong infrastructural base. On the other side Katousian [1970] argued that rapid growth of public administration in most LDCs' is not always dictated by concern for economic progress[10]. Further there has been apprehension about the tremendous growth of services sector and hence it has been declared undesirable. Therefore, net material product, it is argued, should be considered as more meaningful than net domestic product as an index of economic progress of an LDC [Datta, 1989]. But as far as the Indian economy is concerned, it was found that there has been no significant difference between the rates of growth of NMP and NDP [Datta, 1989].

Further it has to be noted that services growth could lead to greater inequality as a few people earn majority of the share of total income[11]. A detailed discussion regarding implications of services growth in the context of growth and development is presented in chapter three.

Taking the above scenario into consideration, this study proposes to look into the pattern of growth in India since 1950-51 and for the States since 1960-61 ***with special reference to the services growth.*** Secondly, the study tests the direction of Causality (Granger & Sims tests) for services growth vis-a-vis the agricultural growth and the industrial growth which forms the Hypothesis of the study. Lastly, the impact of decomposed services growth on the other sectors of the economy is examined.

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[10] i.e., a part of the output of the tertiary sector may be considered as having no contribution to the growth potential of the economy.

[11] 39 percent of the total income share goes to 20 percent of the work force (usual principal status).

1.5. Objectives of the study

The following objectives were framed for the study.

1. To study the patterns of income growth and structural transformation of income for the states and the union.
2. To decompose the patterns of services growth into various service activities
3. To examine the direction of causality between services growth and the total income growth, Services growth and Agricultural growth and services growth and industrial growth through the application of the Granger and Sims causality tests after testing for co-integration.
4. To asses the impact of individual services activities on NDP growth, Agricultural growth and Industrial growth through the application of auto-regressive models.

1.6. Methodology & Hypothesis of the study

Investigation of the above objectives was carried out with the help of the following analytical methodology-

1.6.1. Growth rates

For objectives 1 and 2 the Exponential growth rates were calculated using the following equation.

$$Y_t = ae^{(bT)}$$

where Y_t is income (agricultural, industrial, services and total income).

Taking Log on both sides, we get a semi-log equation.

$$Log(Y_t) = Log(a) + bT + U_t$$

Basically we regress income on time and the resultant coefficient is then further put

through the following formula to get the compounded growth rate in percentage terms.

$$\text{Growth } (g) = \{\text{Antilog}(b\hat{})-1\}100$$

1.6.2. Test of co-integration

The theory of co-integration determines whether two or more time series have a stationary relationship over the long run. The two variables are said to have a stationary relationship over the long run or said to have long run equilibrium relationship when the residuals of the regression of one variable on the other is stationary or I(0) (i.e., integrated of order zero). A detailed methodology is presented in chapter four, section 4.1.2.

1.6.3. Causality Tests[12]

Causality according to Granger's sense is that a variable Y can be better predicted from the past values of X and Y than from past values of Y alone [Ahsan, 1989]. Thi is based on the presumption that the past and the present may cause the future but the future cannot cause the present or past (Granger, 1969).

Causality from a variable X to a Variable Y is determined by examining whether Y can be better predicted by using lagged values of X in addition to its own past history [Linda & Joyce, 1993].

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[12] Granger & Sims : A detailed note is presented in the subsequent chapter.

The Model

For a two variable model[13], the following equations are estimated using the simultaneous[14] estimation technique.

$$X_t + b_0 Y_t = \Sigma\, a_j X_{t-j} + \Sigma\, b_j Y_{t-j} + \varepsilon_t' \quad \text{.....(for j = 1 to m)}$$

$$Y_t + c_0 X_t = \Sigma\, c_j X_{t-j} + \Sigma\, d_j Y_{t-j} + \varepsilon_t'' \quad \text{.....(for j = 1 to m)}$$

Where ε_t' and ε_t'' are mutually uncorrelated white noise series.

The estimation of the above model leads to the testing of the following Hypothesis;

Null Hypothesis:

$a_j = d_j = 0$ for all j

if $a_j = 0$ and $d_j = 0$, then no causality exists between Y and X.

if $a_j \neq 0$ and $d_j = 0$, then X causes Y.

if $a_j = 0$ and $d_j \neq 0$, then Y causes X.

Alternative Hypotheses:

$a_j \neq d_j \neq 0$ for all j

if $a_j \neq 0$ and $d_j \neq 0$, then a bidirectional causality or feed back exists between Y and X.

The above model will be applied to the following variables.

1. Services growth & NDP/NSDP growth.
2. Services growth & Agricultural growth.
3. Services growth & Industrial growth.

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[13] The study uses the two variable model.

[14] as the number of variables (two) are equal to the number of equations (two) the problem of identification is solved.

1.6.4. Hypotheses of the Study

The Hypotheses of the present study are based on the above model and are as follows;

Hypothesis 1

Causality between Services growth[15] and NDP growth.

$$Y_t + b_0S_t = \Sigma\, a_jY_{t-j} + \Sigma\, b_jS_{t-j} + \varepsilon_t' \quad \text{.....(for j = 1 to m)}$$

$$S_t + c_0Y_t = \Sigma\, c_jY_{t-j} + \Sigma\, d_jS_{t-j} + \varepsilon_t'' \quad \text{.....(for j = 1 to m)}$$

Where,

ε_t' and ε_t'' are mutually uncorrelated white noise series

Y_t refers to NDP growth

and S_t refers to Services growth.

Null Hypothesis:

$a_j = d_j = 0$ for all j

if $a_j = 0$[16] and $d_j = 0$, then no causality exists between Services growth and NDP growth.

if $a_j \neq 0$ and $d_j = 0$, then NDP growth causes Services growth.

if $a_j = 0$ and $d_j \neq 0$, then Services growth causes NDP growth.

Alternative Hypothesis:

$a_j \neq d_j \neq 0$ for all j

if $a_j \neq 0$ and $d_j \neq 0$, then a bidirectional causality or feed back exists between Services growth and NDP growth.

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[15] Average annual growth.

[16] with appropriate level of significance.

Hypothesis 2

Causality between Services growth and Agricultural growth.

$$A_t + b_0 S_t = \Sigma\, a_j A_{t-j} + \Sigma\, b_j S_{t-j} + \varepsilon_t' \quad \text{.....(for j = 1 to m)}$$

$$S_t + c_0 A_t = \Sigma\, c_j A_{t-j} + \Sigma\, d_j S_{t-j} + \varepsilon_t'' \quad \text{.....(for j = 1 to m)}$$

Where,

ε_t' and ε_t'' are mutually uncorrelated white noise series

A_t refers to Agricultural growth

and S_t refers to Services growth.

Null Hypothesis:

$a_j = d_j = 0$ for all j

if $a_j = 0$ and $d_j = 0$, then no causality exists between Services growth and Agricultural growth.

if $a_j \neq 0$ and $d_j = 0$, then Agricultural growth causes Services growth.

if $a_j = 0$ and $d_j \neq 0$, then Services growth causes Agricultural growth.

Alternative Hypothesis:

$a_j \neq d_j \neq 0$ for all j

if $a_j \neq 0$ and $d_j \neq 0$, then a bidirectional causality or feed back exists between Services growth and Agricultural growth.

Hypothesis 3

Causality between Services growth and Industrial growth.

$$I_t + b_0 S_t = \Sigma\, a_j I_{t-j} + \Sigma\, b_j S_{t-j} + \varepsilon_t' \quad \text{.....(for j = 1 to m)}$$

$$S_t + c_0 I_t = \Sigma\, c_j I_{t-j} + \Sigma\, d_j S_{t-j} + \varepsilon_t'' \quad \text{.....(for j = 1 to m)}$$

Where,

ε_t' and ε_t'' are mutually uncorrelated white noise series

I_t refers to Industrial growth

and S_t refers to Services growth.

Null Hypothesis:

$a_j = d_j = 0$ for all j

if $a_j = 0$ and $d_j = 0$, then no causality exists between Services growth and Industrial growth.

if $a_j \neq 0$ and $d_j = 0$, then Industrial growth causes Services growth.

if $a_j = 0$ and $d_j \neq 0$, then Services growth causes Industrial growth.

Alternative Hypothesis:

$a_j \neq d_j \neq 0$ for all j

if $a_j \neq 0$ and $d_j \neq 0$, then there is a bidirectional causality between Services growth and Industrial growth.

1.6.5. Auto-regressive models

Lastly, the study examines,

(a) The impact of growth of individual service activities on the NDP growth, Agricultural growth and the Industrial growth.

a.1. The functional form for the impact of services growth on the NDP/NSDP growth is outlined below:

$NDP(Y_t) = f$ [Trade(Tr_t), Transport(Tn_t), Banking(B_t), Public Administration(P_t), Other services(O_t) and $NDP(Y_{t-j})$]

The model for the above functional form would be

$$Y_t = \alpha + \beta_1 Tr_t + \beta_2 Tn_t + \beta_3 B_t + \beta_4 P_t + \beta_5 O_t + \beta_6 Y_{t-i} + \varepsilon_t$$

a.2. The functional form for the impact of services growth on the Agricultural growth is outlined below:

Agriculture(A_t) = f [Trade(Tr_t), Transport(Tn_t), Banking(B_t), Public Administration(P_t), Other services(O_t) and Agriculture(A_{t-i})]

The model for the above functional form would be

$$A_t = \alpha + \beta_1 Tr_t + \beta_2 Tn_t + \beta_3 B_t + \beta_4 P_t + \beta_5 O_t + \beta_6 A_{t-i} + \varepsilon_t$$

a.3. The functional form for the impact of services growth on the Industrial growth is outlined below:

Industry(I_t) = f [Trade(Tr_t), Transport(Tn_t), Banking(B_t), Public Administration(P_t), Other services(O_t) and Industry(I_{t-i})]

The model for the above functional form would be

$$I_t = \alpha + \beta_1 Tr_t + \beta_2 Tn_t + \beta_3 B_t + \beta_4 P_t + \beta_5 O_t + \beta_6 I_{t-i} + \varepsilon_t$$

(b) The determinants of the services growth.

The functional form for the determinants of the services growth model is:

Services(S_t) = f [Agriculture(A_t), Industry(I_t), NDP/NSDP(Y_t) and Services(S_{t-i})]

The model for the above functional form would be

$$S_t = \alpha + \beta_1 A_t + \beta_2 I_t + \beta_3 Y_t + \beta_4 S_{t-i} + \varepsilon_t$$

The co-efficients of the above autoregressive equations would be put to appropriate significance tests and other related tests of time series.

1.7. Data Base

The data for the study are secondary in source. The Net State Domestic Product (NSDP) according to industry of origin and Net Domestic Product (NDP) by industry of origin (New Series) for India as a whole has been used. The data are published by the Central Statistical Organisation (CSO) in the National Accounts Statistics and the Estimate of State Domestic Product of India. The data for NDP is from 1950-51 to 1992-93 and for SDP[17], it is from 1960-61 to 1989-90. The data has been converted to constant prices using the implicit deflators for the SDP. The used is not the comparable series prepared by the CSO for the Finance Commission and the Planning Commission as these data is published only unto 1979-80. Hence the data used for the study is the series published by the CSO as reported by the respective State Statistical Bureaus. However the study is primarily based on time series analysis and the incomparable estimates in no way affects the results of the study.

Further, the Industry of origin data was grouped in the Agricultural sector, Industrial

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[17] SDP data for the following states is available from 1970-71 to 1989-90 only;
1. Assam
2. Haryana
3. Punjab
4. Madhya Pradesh

sector and the Services sector as presented below.

Agricultural sector

1. Agriculture
2. Forestry & logging
3. Fishing
4. Mining & quarrying

Industrial sector

1. Registered manufacturing
2. Unregistered manufacturing
3. Electricity, gas & water supply
4. Construction

Services sector

1. Trade
2. Hotels & restaurants
3. Transport by railways
4. Transport by other means
5. Storage
6. Communication
7. Banking & Insurance
8. Real estate, ownership of dwellings and business services
9. Public administration & defence
10. Other services

1.8. Plan of the Study

This study comprises of five chapters. Chapter two briefly reviews the relavent literature and highlights the issue, "is services growth desirable ?". Chapter three looks into the patterns of growth and structural change in the Indian economy including the states. Chapter four tests for co-integration and causality between services growth and other sectors of the economy. Further, impact of individual service activities on the other sectors of the economy are also examined. Chapter five provides a brief summary of the study, findings of the study and conclusions of the study along with limitations and scope for further research.

CHAPTER II

Is Services growth desirable ? - A Review.

This chapter presents a brief review of the available literature on services growth in advanced countries, LDCs and services growth in India with the support of the theory of stages of growth and the Growth Pole theory. The arguments in favour and against services growth are analysed.

2.1. Stages of Economic Growth

The origin and basis of the division of the economic activities into primary, secondary and tertiary sectors was first attempted by Fisher in 1935. He considered that primary sector comprises of agriculture, mining, forestry and fishing. Secondary sector comprises manufacturing only and the remaining activities fall under the tertiary sector. Fisher emphasised the relationship between the distribution of employment among these sectors and the level of development of the economy. The per capita national income experienced an increase as the economy moved from the agriculture dominated stage through the manufacturing industry stage and to the services stage which form the bulk of the economic activities. Fisher was basically concerned with economic growth. In this analysis of economic growth, Fisher alluded that economies that move from the primary stage through the secondary stage to the tertiary stage are based on two observations. On the one hand there is a constant increase in yields from the production side and on the other hand there are growing preferences for secondary and the tertiary products as income increases.

The dynamism of production is ensured through innovations and technical progress.

Thus the surplus created in the economy is "channelled by the structure of demand mainly into the secondary and then into the tertiary sectors in accordance with the observations made by Engel who pointed out that, beyond a certain level of income, proportionately less of any increase in income was spent on staple food" [Petit, 1986]. The dynamism of the supply side (which created an increasing surplus) and the law of demand contributed to a process of rapid development in which service activities and the consumption of services had an increasing share. "This was therefore the explanation given for the process by which societies would develop to the stage in which the tertiary sector would provide most jobs and in which household income would be spent mainly on the purchase of services" [Petit, 1986]. Petit points out three major limitations in the Fisher's model:

(i) analysis of the value of final demand (in terms of income shares) is used to draw conclusions about developments in the volume of demand.

(ii) there is no mention of demand from firms for intermediate services for their production requirements.

(iii) there is no explicit mention of a growth mechanism which would explain the change from one stage of growth to another.

Though Fisher provided the basis for classification of economic activities into primary, secondary & tertiary activities, he failed to provide an objective explanation for the growth of services through his model. Petit rightly pointed out that Fisher's model lacked any real dynamics of growth as the problem of transition from one stage to another is central to the stages of growth. But one of the major reasons for transition is that, "the demand for services and manufactures being more elastic than that of agricultural products, the process of development is said to have witnessed a shift, away from agriculture towards manufacturing

and services" [Clark,1940].

During the 1950's and 1960's after the post war reconstruction, the developed economies experienced rapid growth. The stages of growth theory were further developed by Rostow, Kuznets and Chenery who were precisely concerned with development of models and stages of growth which would provide a better understanding of the dynamics of the growth process. Rostow (1960) provided the greatest contributions in reviving and popularizing the stages of economic growth. He basically propounded five stages, namely,

1. traditional society
2. the preconditions for take off
3. take off
4. phase of maturity and
5. the age of high mass consumption.

These stages describe the process of industrialisation in all stages. Rostow's analysis of the growth process is itself based on, to a large extent on the characteristics inherent in each society that explain its propensity to innovate, to carry out basic and applied research, to seek material well being, to consume and to increase its population. The growth of each economy also depends on certain basic facts such as size of country and natural resources. The propensities are assumed to evolve slowly and they help to strengthen the impetus of the expanding economy as growth sustains and the economies develop.

This cumulative process led Rostow to believe that after the take-off stage is completed, growth becomes self-sustaining. The problem of transition from one stage to

another are limited to the initial take-off in his analysis. We shall not discuss the stages of growth in detail but the final stage has got something to convey: According to Rostow, in the last stage of growth, the consumer durables and the services sector act as the leading sectors in the growth process. This state is an age of abundance in which the major problems are concerned with establishment of priorities in the competition for resources between military expenditures, welfare state and the expansion of private consumption. The major criticism of Rostow's stages of growth is that of self-sustaining growth and his final stage has been considered as vague by Petit (1986).

Studies by Chenery(1960) and Chenery & Taylor(1968) attempted to clarify the paths taken towards economic growth, taking into account certain specific characteristics of individual countries such as size and natural resources. They had analysed changes in the distribution of national income among the primary, secondary and tertiary sectors as a function of the growth of per capita income. Their analysis was for fifty four countries for the period 1950 to 1963 (Chenery & Taylor, 1968). They highlighted the development of the industrial sector. The share of the industrial sector grows more faster than the per capita national income which signifies the rapid phase of industrialisation. This share continues to grow but at a slower rate until it reaches a certain level[1] of per capita national income. Beyond this level of per capita income, the industrial sector falls, as the per capita income increases. The size of the industrial sector is directly related to the size of the country. Chenery & Taylor carried out detailed analysis within the industrial sector and found a relationship between different stages of industrialisation as per capita income grows.

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[1] $1200 at 1960 prices [petit, 1986].

They envisaged the following stages of industrialisation;

(i) the initial period is characterised by industries producing low quality consumer goods

(ii) the intermediate period is characterised by the production of certain consumer goods and intermediate products

(iii) the final period characterised by the production of capital goods and consumer durables.

Although Chenery and Chenery & Taylor give a good account of the patterns of industrialisation, they failed to analyse the role of the other two sectors of the economy.

There are countries with higher growth in services in their initial stages of development and some countries have large services sector with low per capita income. On the contrary there are some countries with high levels of per capita income with a relatively low share of services sector. All the above mentioned theories simply identify the existence of a modern sector. Though the theory of stages of growth envisages the emergence of a modern tertiary sector at the mass consumption stage, still there seemed to be sceptical thoughts about emergence of such a stage. It has been established that reduced growth in the manufacturing sectors may be accompanied by different patterns of growth with the tertiary or the services sector casting a key role.

The above theories had been able to explain the role of industrialisation in the transformation from traditional to modern sector, but fail to give an explanation for the growth of services sector and, its impact on the other sectors in a modern economy. In the

following sections a modest search is made through the growth pole theory as to analyse the crux of the problem, Is services desirable.

2.2. Definition of services

The concept of services is itself very complex in nature. As Jagdish Bhagwati (1984) points out, "services are a nebulous concept and are frequently embracing activities which have differential and opposed characteristics" [Quibria, 1988].

Services are, in general, non-tangible while goods are tangible. Goods take the form of physical entity while services are qualitative improvement of some goods, eg., Car is a good and its repair a service. In general, it is believed that services have to be produced and consumed simultaneously. As Hill[2] points out;

> *"One essential feature of goods produced is that output which are produced are capable of being subsequently traded; that is, the output consists of objects where ownership may subsequently be exchanged with other units. Thus, in the case of goods production, there is a clear distinction between the process of production as such and the ultimate destination or use of the output produced by that process. Production may take place in one period of time, which the subsequent disposal of the output has been acquired by another economic unit, perhaps situated in quite a different location. In fact, most goods producers, whether farmers or manufacturers, have no idea at the time production actually takes place when economic units will eventually acquire the various outputs they produce".*

Kravis[3] noted that services are in general non storable while goods are storable. He further adds that "the ability to stock it is a logical impossibility because a stock of changes is a contradiction in terms".

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[2] in Quibria, 1988.

[3] in Quibria, 1988.

2.3. Classification of services

Services have been classified into different categories based on the nature of the studies undertaken. We shall basically stick on to Allen's and Katouzian's classification, where both the classifications differ from each other. Allen[4] follows service classification according to the end use of the services. Allen does the classification into three categories, namely, Producer related services, consumer related services and circulation services which are both producer related and consumer related. As Allen notes;

> *"services like advertising, marketing and research and development are readily identifiable as producer related services and, similarly, recreational, education, health, welfare and personal services fall neatly under the category of consumer services, the commercial and financial services which mediate and abbreviate the exchange process within an economy are neither producer nor consumer services. They are circulation services, services produced within the process of circulation and for circulation, and not intermediate services produced primarily for other branches of industry or final services produced for consumers".*

On the other hand, Katouzian [1970] had classified services into three categories namely, old services, new services and complementary services. Old services are those which flourished before industrialisation and had continuously declined since then in advanced countries. They consist of mainly domestic and personal services. Katouzian suggested that demand for these services in the past was supported by income inequality and buyer's monopoly and their supply was assured due to lack of alternative employment. Such activities are relevant today in the LDC's especially those with surplus labour. New services replace old services and some of them have "experienced a great shift in demand with the advent of high mass consumption and there after" [Katouzian, 1970]. Katouzian attributed their growing popularity to rising per capita income. He includes education, medical and clinical services and entertainment industry (including tourism) under this category. The bulk

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[4] in Daniels, 1993.

of the new service category are a consequence of replacement for traditional services categories which have more of a local role than in the world economy. The third category includes activities that are considered as necessary links to the process of capitalistic production. The demand for them stems from the industrial growth, unification of domestic and international markets, bureaucratization and urbanisation. Katouzian noted that old services were on the decline, the complementary services were increasing at a decreasing rate and the new services were increasing at an increasing rate. As Katouzian points out, old services have declined certainly but only in advanced nations. However, the third world nations are experiencing a growing employment opportunities in such activities. This has been basically due to migration from rural to urban areas as a consequence of displacement from agricultural sector due to lack of employment in the agricultural sector. We might not concentrate on the growth differentials among these services but look into the implications of the growth of the modernised service activities in the world economy.

The types of services discussed seem to be playing the role of integration in the international economy. They ensure linkages in the channels of production and distribution. These services especially new services and complementary services discussed above are hardly the home for surplus labour or excess expansion of the economy. In fact, they are "strong components of a robust world economy" [McKee, 1988]. Advanced economies like the U.S appearing to be losing manufacturing jobs may be attributed to the advent of sophisticated service groups as the leading sectors replacing traditionally dominant manufacturing activities. Realising this fact, economic policies can be adjusted to enforce the growth of more robust service categories in the world economy.

2.4. Slow growth and the service economy

The slow down in economic growth and the rise in unemployment were experienced by the industrialized economies during the 1970's. The main area of concern was employment. Petit (1986) tries to analyse the relationship between economic growth and the development of tertiary activities. Petit alludes that large productivity gains originating in the industrial sector and the potential for large markets have been the driving force behind economic growth. During the sixties and seventies a major part of that driving force was directed towards the extension of markets on a world scale. But this externalisation needs to be supported by continuous growth of demand. On the contrary, disequilibria were increasingly able to reappear and the national policies of demand management which Keynes had advocated, had become less applicable in the absence of coordination between trading partners. This vulnerability of trade was caused firstly by the collapse of the international monetary system (Bretton woods) and the 1973 oil shock. Petit attributes the development of the service economy to this framework of industrial crisis. The number of jobs in manufacturing industry were declining but at the same time jobs were created in the services sector. He summarises the development of services sector as,

(i) the historic expansion of employment in services and

(ii) the relative increase in the production of services in the volume of the domestic product.

Conventional explanation for the growth of services are of Engles law type as propounded by Gershuny and miles [Price & Blair, 1989]. This is appropriate for consumer services by the reason of the fact that elasticity of demand for services is such that richer people tend to consume more services than the poor. Since incomes have generally risen in

advanced economies, the overall demand for services is increasing and hence the deduction follows that when the economy as a whole is growing, the services sector increases in size relative to the rest of the economy. A similar principle applies to producer services, as a result of division of labour force across industrial branches in an expanding economy. This leads to the conclusion that the services sector's prices must rise relative to the rest of the economy.

Price & Blair (1989) allude that "there is a persistent, but misplaced, belief that manufacturing is productive in the sense that tangible goods are produced and the same cannot be said of services which are somehow inferior or even parasitic". At best services are dependent on manufacturing and there is a widely held view that services were led by and grew naturally following an expansion of manufacturing.

The important fact to note while analysing the growth of services is that, services differ with respect to resource needs and their growth is the result of differing causes. This leads to differential expansion of different service activities. Since services are heterogenous in character their rate of demand differs within themselves. Those services which have a higher demand are characterized by higher rates of expansion.

2.5. Services and Growth poles in advanced economies.

McKee (1988) examines the role of services as potential for growth and prosperity in the modern economy through the growth pole theory, a widely accepted explanation for growth under capitalism. Pole theory according to Francois Perroux is that " growth does not appear everywhere at the same time, it becomes manifest at points or poles of growth, with

variable intensity, it spreads through different channels, with variable terminal effects on the whole of the economy". This suggests that the imbalances are a natural concomitant of the free enterprise system and these imbalances are not necessarily spatial. Perroux was considering economic space and not geographical space. He recognises three categories namely,

(i) economic space as defined by a plan which refers to "the set of relations which exist between the firm and the supplier of input on the one hand and on the other hand, the buyer of output".

(ii) economic space as centres or poles of forces "from which centrifugal forces emanate and to which centripetal forces are attracted" and

(iii) economic space as a homogenous aggregate. McKee considers this as Perroux's most difficult spatial notion but apparently Perroux meant the ***firm*** as having a private integrity of existence. Space in that sense means an abstract territorial imperative (probably a market) enjoyed by individual firms.

McKee (1988) notes that Paelinck recognised a direct cause-and-effect relationship between growth poles and tertiary or service activities through polarization or technical linkages. Free enterprise system has been characterised by an ebb and flow of industrial activity. Activities that form the leading sectors of the economy are replaced over time by new activities following new and relatively efficient lines of production. The reason why Perroux observed that growth does not appear as a homogenous phenomenon through out the economy is due to the natural ebb and flow that contained the imbalances under free enterprise system. Most pole theorists have accepted the notion of growth centres and had recognised urban environment as the best climate suited for industrial activity. An urban area

is considered as a growth centre when it becomes the spatial location of a leading industrial activity. But the leading sectors of an economy shift over time and hence according to the natural ebb and flow of free enterprise system they are no longer growth centres but centres of stagnation. Now, if tertiary activities have resulted from the action of the growth pole, then the declining activities of the pole should be automatically transmitted to those tertiary activities or services. If growth poles have been the engine behind economic growth and around forty percent of the total national income is contributed by services, then there stems an implication that services are directly involved in growth poles.

Growth poles are composed of dynamic propulsive firms or leading propulsive industries capable of asserting considerable influence on the environment through inter industry linkages. Hermansen [1972] visualises the importance of interindustry linkages or industrial interdependence in the development of growth pole theory. According to Hermansen, an industry exerts a backward linkage effect if it has a high percentage of intermediary inputs from elsewhere in its total output. If service inputs contribute substantially to the output of an manufacturing activity, then the backward linkages are in operation. Due to the non-tangible nature of services, such linkages contributing to the growth poles has never been explicitly stated [McKee, 1988]. "The completion of the manufacturing process renders the service input undetectable in the final output. Services are not independent growth poles or leading sectors by themselves, but by interacting with manufacturing activities, they strengthen the influence of those activities on the economy".

Services provide forward linkages too. Those activities which form the basis of distribution of the industrial products to their final destination (final consumers) provide

forward linkages. Transport & communication, trade and product promotion services fall into this category. Therefore, the impact of industrial growth poles is enhanced and prolonged by service inputs. They have an important contribution to the determination of the multifaced economic space [McKee, 1988].

It should also be noted that growth poles can be regional, national or even international in scope. Therefore, services as facilitators have entered the world economy from local through national economies to the world economy.

Concluding the discussion, the following are clearly inferable;

(i) services facilitate and strengthen the key industrial operations which has a dynamic capacity for innovation.

(ii) services establish linkages that enhance the potential of the industrial operations which act as leading sector or a growth pole.

(iii) besides the necessary condition, "dynamic capacity for innovation", the sufficient condition, "high income elastic demand curve" is also required for an industry to be the leading sector or a growth pole. Here the service activities once again play a vital role through distribution of the industrial products to the markets.

(iv) Services play a key role in the extension of markets for the industrial goods from local markets to national markets and from national markets to the international markets.

2.6. Services growth as an urban phenomenon: *application of economic base theory*

Past studies had recognised a close relationship between proliferation of services and extensive urbanisation [McKee, 1988]. Tertiary activities are considered to play a subordinate role in the urban expansion despite the fact that urban areas are the milieu of service expansion. The prime role in the urban expansion has been attributed to manufacturing. This proposition is supported by economic base theory which suggests that the base of a local economy is its export base and industries that supply such exports are known as the economic base of the economy. In this economic base, services activities have been thought of as an overlay and service activities remain viable only as long as the manufacturing sector does. But McKee argues that though proliferation of services has been an urban phenomenon, their role in the national economy must be better understood. In advanced countries , the forces of demand and supply in the services sector respond to the needs of the national markets. Advances in communications especially information technology and economic integration at the national level have developed national markets for various services both producer related as well as consumer related services. These services though initially concentrated in urban areas, have diversified spatially from a demonstration effect through improved communications with their markets spread. In pursuit of meeting the demand, the supply side of service markets have expanded in a pattern unrelated to economic base theory. Therefore, it can be inferred that services are not limited to urban location though they originate in the urban environment.

2.7. Services growth in the Less Developed Countries (LDCs).

In the light of the discussion in the previous section on services in advanced

economies, there arises a question whether services assume a causative role in the development process of the LDCs. The growth pole theory applicable to the advanced economies is also applicable for developing economies. McKee (1988) while trying to look at the role of services in LDCs, gave greater emphasis on the creation of employment opportunities which happens to be one of the most severe problems facing the LDCs. Under these circumstances, the broadening of employment opportunities will depend on the structure of the modern sector and the direction of expansion that would take place in this sector.

LDCs are characterised by surplus labour which remains unabsorbed in the agricultural sector in the rural areas. This leads to migration into metropolitan areas where the modern sector activities are expanding and the rate of expansion must facilitate absorbtion of surplus labour if economic progress is to be achieved. The modern sectors of the economy are entrusted with the responsibility of achieving this economic progress through surplus labour absorbtion. The modern sectors according to the neoclassical[5] surplus labour models are manufacturing and a loosely associated group of activities generally characterised as the services sector. The labour absorbtion was considered to be an automatic process controlled by market forces. These market forces, by equating real wages in rural and urban areas, would cut off the flow of migration until the expansion of the modern sector is profitable. These market forces determining the labour absorbtion follow flexible wage rates but at the same time a subsistence wage rate is also fixed.

Empirically, this simple model does not work well. A critical factor of the urban labour markets in the third world is that, the labour absorbtion has not been kept up due to

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[5] Dual economy models.

downward inflexibility of wages. The migrated labour to the urban labour markets generally lack skills required for the modern sector. Therefore many new arrivals work out options for survival through menial urban occupations which has come to be known as the ***informal sector***. It has been suggested by Portes & Benton (1984) that the informal sector provides a pool of labour that is sometimes tapped by employers in ways that deny workers the advantages of a formal wage contract.

It is possible to apply neo classical labour absorbtion models to the informal sector, i.e., growing opportunities in that sector have a part to play in encouraging rural-to-urban occupations that may actually be providing an urban subsistence wage to new arrivals. Therefore, the reason for the continuous glutting of urban labour markets in the LDCs might be the survival opportunity which seems to be absent in the rural areas. This seems to confirm the rationale of subsistence wages in the neo classical models. One noteworthy feature of the informal sector is that, it is more service oriented.

If services can be relied upon to enhance the process of development, it is important to infer their potential emergence as a function of rising incomes or economic growth. The environment under which services have grown in advanced countries are different from those of the LDCs. In the developed nations of the western world there is no doubt that services have risen as largely urban phenomena.

However, services play a positive role in advanced countries at the national level. What is more important is that services had been recognised as facilitators of the growth poles which are the leading sectors in determining the expansion at the national level. Their role

have contributed to the income and employment multipliers too. Now in the LDCs, the ability of services to perform similar functions as that of advanced countries in the development process depends on the existence of the growth poles.

Service activities play an important role in manufacturing sectors as noted earlier. It is also entirely possible that they strengthen and prolong the impact of the leading manufacturing sectors, while smoothening the transition as new manufacturing sectors take up leading roles in the economy. As shifts in strength and leadership occur among manufacturing activities in advanced economies, their repercussions are often characterised by the shift in location of production facilities to LDCs where it is more profitable with lower labour costs and lower environmental constraints. In cases where LDCs have permitted multinational firms to place production units in LDCs, have been facilitated by the ascendency of a sophisticated array of services [McKee, 1988]. This need not be the case always , it can also happen that services that provide linkages are being provided by service firms which are multinationals themselves. But, here the discussion is about the role of services as facilitators to the leading sectors. It is always true that domestic services of LDCs happen to facilitate linkages to domestic leading sector activities and the multinational leading sector activities. Services also provide backward and forward linkages in LDCs as in advanced countries. Services are known to be instrumental in the distribution of manufacturing output of LDCs in the national and the international economy.

Summarising the entire discussion, it can be inferred that services have a significant role to play in the economy as facilitators of linkages for the leading manufacturing sectors. This is true for both advanced economies and the LDCs though the context or environment

in which services have grown differs between them. In advanced countries, the already prevailing services have grown due to falling industrial activities (deindustrialization) and more globalisation (international trade in services) of services. On the other hand services have grown in LDCs as facilitators of linkages to manufacturing sector which is known to be the modern sector of the economy. Another characteristic growth is due to the growth of the informal sector due to the excess flow of labour into the modern sector.

Therefore, services in developing economies are of increasing importance and their role cannot be neglected in the growth and development process. The causal[6] role played by services in both agriculture and industry has a positive impact on the growth and development of the LDCs.

2.8. Services growth in India - Issues.

It is accepted that industrialisation at the outset gives rise to demand for a wide variety of services pertaining to the tertiary sector activities. It is also held that, in India and many other countries, agricultural growth and development depends on a positive price policy and other infrastructure development provided by the State. Moreover, Banking and Financial services, transportation and communication, public administration and other essential services are required both by the agricultural and industrial sector. Further, it is opined by Ahluwalia(1989) that services sector growth need cause no alarm and in fact government should take explicit measures to enhance its role, in view of the need of the economy to create a strong infrastructural base (like transport, communication and banking) which has also provided employment.

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[6] The Indian case is examined in Chapter IV.

There is another opinion that, with the declining share of agriculture in total product and rapidly rising share of services sector, the role of the tertiary sector as a source of demand becomes vital and this potential source of demand that may originate in the tertiary sector needs to be examined. Therefore, there has been a strong debate in India as to the consideration of growth in the tertiary sector as an indicator of economic development.

Mohanty and Raghavan (1990) are optimistic that the tertiary sector has played a significant role in the development process and would continue to do so. Bhattacharya and Mitra (1989) found that the employment elasticity of output in general is lower in the tertiary sector than in agriculture and manufacturing. But the growth in volume of employment in tertiary sector is higher compared to manufacturing in all states.

The tertiary sector does not produce material goods but helps in production of goods through services. So the value added in this sector is estimated from the income receipts. This is used as an yard stick for argument against the tertiary sector. But it must be realised that activities like trade, transport as well as banking and finance are crucial for the production process. Economic growth is not dependent on capital formation only, the process of capital formation must also be coupled with consumer's demand as it sustains the impetus to growth of the economy. Moreover, this sector requires less capital for its operation. therefore a rapid growth of the tertiary sector not only sustains demand but also partakes in the process of capital formation compared to the other sectors.

Mohanty and Raghavan (1990) in their study had that, the sectoral composition of GDP reveal that the share of primary sector has shown a continuous decline which has been

offset by a rise in the share of secondary and tertiary sectors with the share of the tertiary sector growing at a faster pace. The reason being that the tertiary sector has grown continuously irrespective of the fluctuations in the growth rates in primary and secondary sectors. They further concluded that, all the tertiary activities cannot be undesirable as a part of the tertiary activity is directly involved in the production of commodities. Moreover, higher growth of the commodity producing sector has to be sustained on the basis of demand impulses generated by the tertiary sector in the absence of adequate demand response from agriculture.

The rapidly growing share of the services in national income has given rise to certain issues. Some economists have refused to accept it as an indicator of economic development in the context of developing countries. A brief discussion is presented below.

2.8.1. Excess growth of the tertiary sector

Bhattacharya and Mitra[1990] tried to investigate the patterns of growth of the tertiary sector and its implications on growth and distribution in India in the post independence period. They used NDP at 80-81 prices(new series) disaggregated at sectoral level. They had estimated the consumption function with respect to income to bring out the marginal propensity to consume. Their study found that the marginal propensity to consume was high and nearly eighty percent of consumer expenditure is still dependent on consumer goods. Therefore, growth in services sector income would increase only the demand for commodities without any supply.

Further, if there is a wide disparity between growth of income in services and

commodity sector then the gap between demand and supply of consumer goods in the economy as a whole would further widen. This would result in either inflation and/or higher import demand for consumer goods.

The study concludes that there is a strong evidence of the services sector growing much faster than the commodity sector. The pattern of services income growth in India is different from the general pattern observed elsewhere in two aspects:

(i) the services sector has become the predominant sector even before the economy could become a highly industrialised one.

(ii) the share of services in national income is much larger than its corresponding share in employment.

On the whole it was also observed through the behaviour of growth of services income that the growth rate of services cannot be explained in terms of the commodity sector.

Nagaraj (1991) questions the excess growth of tertiary sector as found by Bhattacharya and Mitra (1990). His study clearly suggests that it is the secondary sector which has grown at a faster rate than the tertiary sector during the period 1950-51 to 1987-88.

However, he acknowledges that the growth rate of the secondary sector witnessed drastic slow down with considerable fluctuations during the period 1965-66 to 1979-80. But the tertiary sector displayed a much sturdy growth since 1950-51. Further looking at his analysis through changes in shares as percent to the initial values, agriculture had -41.7 percent, industry had 74.2 percent and tertiary had 49.2. These values very well support his

arguments against that of Bhattacharya and Mitra. An examination of the above issue at the state and union level has been dealt in chapter three.

2.8.2. Tertiary sector and the Net Material Product (NMP).

Datta, M. (1989) tried to see the rate of growth of NMP and NDP to explain economic progress. He notes that value added in the tertiary sector doesn't constitute the difference between NDP and NMP. He bases his argument on the views of some economists that, "rapid growth of tertiary sector in India is rather undesirable, and they have suggested that NMP should be considered as more meaningful than NDP as an index of economic progress of an LDC".

He considers NMP as the induplicated aggregate value of material goods produced in the economy. A large part of the value added in the tertiary sector is incorporated into the value of material goods. It is further noted that with economic growth on one hand, the tax base expands and on the other hand the demand for administrative services also expands, hence the importance of public administration.

The role of defence has been neglected in the context of certainty as the economic units will act rationally only when adequate security is ensured. Since protection of the frontiers of the economy is directly related to political stability which in turn influences stability on the economic scene. Since the advent of Keynes and his followers there has been a strong belief in the role of the government in protection, intervention, regulation, reconciliation and harmonisation. Hence the role of tertiary sector and its growth cannot be isolated or undesired in the growth of the economy. It can also be argued that tertiary sector

operationalises the linkages in the production process. Further, the elasticities of consumption of services with respect to total consumption are higher than unity even in the countries with very low per capita consumption. So the rapid growth in income originating from the tertiary sector has been further rationalised in terms of the support drawn from a strong demand base [Sabolo, 1975].

On the whole, reviewing the arguments presented, the following is propounded by this study. Major part of the tertiary sector activities which are in the form of infrastructure and complementary to the material goods produced and hence they are included in NMP. The most important fact is that the tertiary sector generates income, employment and demand which is essential and healthy sign for the economy as a whole in terms of economic growth. Hence the importance of tertiary sector.

Concluding the discussion "Is services growth desirable " the following is worth noting. The General Agreement on Tariffs and Trade, 1989 notes that "services such as insurance, banking, telecommunications and transport reach to the heart of the national economies and provide essential inputs to manufacturing". It has been argued in the previous section that services growth cannot be neglected, as they facilitate the production process through necessary linkages. It is infact industrialisation at the outset, which gives rise to demand for various services activities that facilitate production and distribution of the final and intermediate output. Hence services growth is necessary for the growth and development of the economy. However, the extent and limits to such growth still remains an issue in the literature.

CHAPTER III

Structural patterns of growth with special reference to services sector

Patterns of income growth and structural change in India with special reference to the services income growth and change within the components of the services sector are examined in this chapter. This has been briefly highlighted in chapter one. However, a detailed discussion on the broad trends that prevail are examined in this chapter before testing whether services income growth causes in the Granger sense the agricultural income growth, industrial income growth and the total income growth. This chapter basically presents the scenario prevailing in the Indian economy and its major states.

3.1. Methodology

The data[1] used for the study are the following. National income data or net domestic product (NDP) from national accounts statistics (new series) from 1950-51 to 1992-93 has been used. For state level analysis, state income or net state domestic product (SDP) from Estimates of state domestic product for the period 1960-61 to 1989-90 has been used. Data was available in real terms[2] for NDP and for SDP, it was converted to real terms using implicit deflators.

Using the above data the following analysis was attempted. NDP and SDP were

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[1] Published by C.S.O., data pertaining to the computerised database maintained by C.S.O.

[2] at 1980-81 prices.

grouped into agricultural income, industrial income and services income[3] to look into the structural patterns of growth. Further, the analysis was extended to decomposed service activities.

3.1.1. Exponential growth rates

Exponential growth rates for NDP were calculated for the following periods,

(i) 1950-51 to 1959-60 (at 1950-51 prices) referred as fifties.
(ii) 1960-61 to 1969-70 (at 1960-61 prices) referred as sixties.
(iii) 1970-71 to 1979-80 (at 1970-71 prices) referred as seventies.
(iv) 1980-81 to 1992-93 (at 1980-81 prices) referred as eighties.

and finally, growth rates for the entire period 1950-51 to 1992-93 (at 1980-81 prices) were also calculated.

Exponential growth rates for SDP were calculated for the following periods,

(i) 1960-61 to 1969-70 (at 1960-61 prices) referred as sixties,
(ii) 1970-71 to 1979-80 (at 1970-71 prices) referred as seventies,
(iii) 1980-81 to 1989-90 (at 1980-81 prices[4]) referred as eighties,

and finally, growth rates for the entire period, 1960-61 to 1989-90 were also calculated.

3.1.2. Structural change

Structural change of NDP was calculated for the following quinquennial periods.

(i) 1950-51 to 1954-55
(ii) 1955-56 to 1959-60
(iii) 1960-61 to 1964-65
(iv) 1965-66 to 1969-70

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[3] refer Chapter one, page: , for details of classification of Income.

[4] for Madhya pradesh data was available only at 1970-71 prices for the period 1980-81 to 1989-90.

(v) 1970-71 to 1974-75
(vi) 1975-76 to 1979-80
(vii) 1980-81 to 1984-85
(viii) 1985-86 to 1992-93

Structural change for the SDP was calculated for the following quinquennial periods.

(i) 1960-61 to 1964-65
(ii) 1965-66 to 1969-70
(iii) 1970-71 to 1974-75
(iv) 1975-76 to 1979-80
(v) 1980-81 to 1984-85
(vi) 1985-86 to 1992-93

Structural change for NDP and SDP comprises of the individual sectors' share in total income. Structural change of income is calculated as;

$$\text{Structural change of income} = \frac{Y_i}{\Sigma Y}$$

where,

Y_i = income of the ith sector ; i = agricultural income, industrial income and services income

ΣY = NDP/SDP

and in the case of structural change of services income, i = Trade, transport, banking & insurance, public administration, real estate and other services.

$$\text{Structural change of services income} = \frac{Y_j}{\Sigma Y_s}$$

where,

Y_j = income of the jth service activity

where j = Trade, Transport, Banking, Real estate, Public Administration

and Other services.

ΣY_S = Services income

Further, shifts were calculated over the previous period to get percentage change over the earlier period.

For the state level analysis, the states have been categorised[5] into three broad categories viz, high income states, middle income states and low income states. The states have been grouped as follows:

High Income States	Low Income states	Middle income states
1. Gujarat	1. Assam	1. Andhra Pradesh
2. Haryana	2. Bihar	2. Karnataka
3. Maharashtra	3. Himachal Pradesh	3. Kerala
4. Punjab	4. Jammu & Kashmir	4. Tamil Nadu
	5. Madhya Pradesh	5. West Bengal
	6. Orissa	
	7. Rajasthan	
	8. Uttar Pradesh	

3.2. Patterns of Growth and Structural Change in India

Net domestic product growth in India was marginally above the `Hindu rate of growth[6] at 3.72 per cent per annum during the period 1950-51 to 1992-93. The last decade witnessed growth of 5.19 per cent per annum, a rate envisaged since the inception of planning in India. Table 3.1 (page-52) gives the rates of growth during the fifties, sixties, seventies, and the eighties. The NDP growth had a sharp acceleration during eighties after a gradual decline from fifties to seventies which was hanging around the Hindu rate of growth. The eighties

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[5] Based on the study

[6] Refers to 3.5% Per annum as envisaged by Prof. Raj Krishna.

Table 3.1

Income Growth -- India					(Percent)
Income Structure	1951-60	1961-70	1971-80	1981-93	1951-1993
Agriculture	2.62	1.43	1.62	3.09	2.32
Industry	5.63	4.97	4.53	6.20	5.05
Services	4.22	4.37	4.63	6.60	4.85
Net Domestic Product	3.54	3.02	3.28	5.19	3.72

Table 3.2

Services Income Growth -- India					(Percent)
Services Decomposition	1951-60	1961-70	1971-80	1981-93	1951-1993
Trade	5.11	4.43	4.85	5.50	4.87
Transport	5.85	4.03	7.20	7.57	5.91
Banking & Insurance	7.69	5.00	7.80	12.68	7.64
Real Estate	2.66	2.93	3.20	3.93	3.16
Public Administration	4.95	7.59	4.79	7.05	6.41
Other Services	2.83	3.88	2.81	5.82	3.72

Data source : CSO, National Accounts Statistics, various issues.

seemed to be comparatively prosperous period. All the sectors of the economy had a sharp increase in trend with services at the highest rate of 6.6 per cent per annum followed by industry at 6.2 per cent per annum and agriculture at 3.09 per cent per annum. A noteworthy observation is that services growth had over taken industrial growth since the seventies.

Even though services had outgrown industry since the seventies, it is the industrial growth which was high compared to the other sectors during the entire period 1950-51 to 1992-93. Agriculture had gradually declined except for the eighties with an overall growth of 2.32 per cent per annum. graph 3.1 (page-54) gives a picturesque representation of the structural trends of income growth where services sector displays a consistent growth since the fifties. On the whole NDP growth has been characterised by declining agricultural growth along with increasing industrial and services growth thus fitting into the stylized facts of development as discussed in chapter one.

3.2.1. Structural change of Income

Structural change of income further confirms stylized facts of development with falling share of agricultural income and rising share of industrial and services income. The share[7] of agriculture in NDP declined continuously from 58.2 per cent in 1951-55 to 33.8 per cent in 1990-93 On the other hand share of industry and service in NDP depicted a continuous increase with the share of industry in NDP at 25.8 per cent in 1990-93 from 15.2 per cent in 1951-55. and share of services in NDP at 40.4 per cent in 1990-93 from 26.5 per cent in 1951-55. The increase in the share of industry and services are supported by positive shifts.

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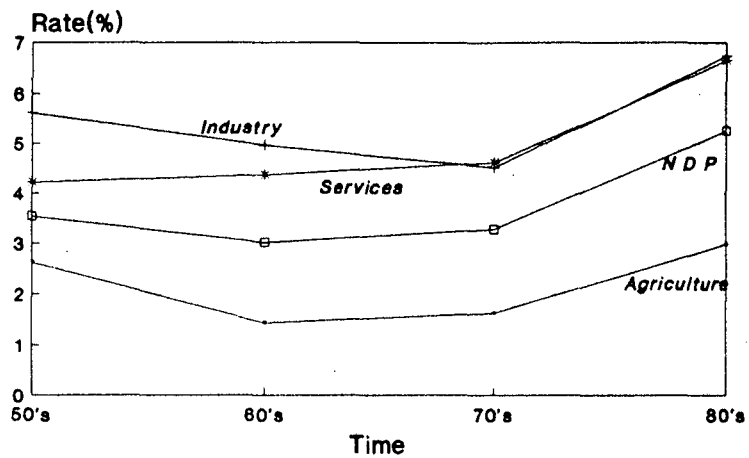
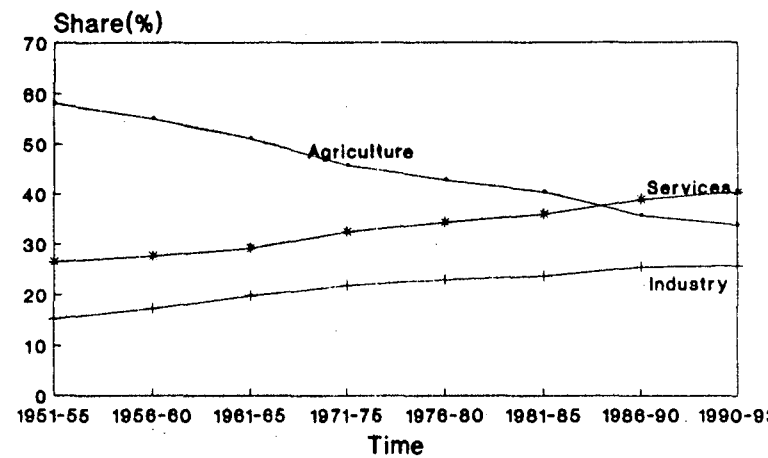
[7] please refer table 3.2, page-52.

Income Growth
India



Graph 3.1

Structural Change of Income
India



Graph 3.2

Table 3.3

Structural Change of Income - India.									(Percent)
Income Structure	Quinquennial Years								
at (1980-81 prices)	1951-55	1956-60	1961-65	1966-70	1971-75	1976-80	1981-85	1986-90	1990-93
Agriculture	58.2	55.2	51.2	46.9	45.7	42.8	40.4	35.7	33.8
(Shift)		-3.0	-4.0	-4.3	-1.2	-2.9	-2.4	-4.7	-1.9
Industry	15.2	17.2	19.7	21.7	21.8	22.9	23.7	25.4	25.8
(Shift)		1.9	2.5	2.0	0.1	1.1	0.8	1.7	0.3
Services	26.5	27.6	29.1	31.4	32.5	34.3	35.9	38.9	40.4
(Shift)		1.1	1.5	2.3	1.1	1.8	1.6	2.9	1.6
Trade	8.9	9.7	10.8	11.6	11.7	12.6	13.1	13.6	13.5
(Shift)		0.8	1.1	0.8	0.1	0.9	0.5	0.5	-0.0
Transport	1.8	2.1	2.2	2.4	2.6	3.1	3.4	3.9	4.1
(Shift)		0.2	0.2	0.1	0.2	0.5	0.3	0.5	0.3
Banking & insurance	1.3	1.6	1.8	2.0	2.3	2.9	3.4	4.8	6.1
(Shift)		0.3	0.2	0.2	0.4	0.6	0.4	1.5	1.3
Real estate	6.1	5.8	5.5	5.5	5.4	5.3	5.2	4.9	4.7
(Shift)		-0.2	-0.4	0.1	-0.1	-0.1	-0.1	-0.3	-0.2
Public administration	2.2	2.4	2.9	3.6	4.1	4.3	4.8	5.6	5.5
(Shift)		0.2	0.5	0.7	0.6	0.2	0.5	0.7	-0.1
Other Services	6.3	6.1	6.0	6.3	6.3	6.0	6.1	6.1	6.4
(Shift)		-0.2	-0.1	0.4	-0.0	-0.3	0.0	0.1	0.3

Data Source: CSO, National Accounts Statistics, variuos issues.

The continuous decline in the share of agriculture along with consistent increase in the share of services and industry are captured in graph 3.2[8]. It's evident from the graph 3.2 (page-54) that services had the largest share from the quinquennial period 1986-90. An interested fact to be noted is that the share of services have been higher than that of industry through out the period. This reflects the popular belief that services share rise at the saturation of industrialisation. The important observation evident from table 3.2 is that though industrial share seems to be increasing, it is the services share increase that is compensating the falling share of agriculture. This is true for the quinquennial period 1966-70. Until then, it was the increase in industrial share that was observing the majority of the decline in agricultural share.

On the whole, it is quite evident that it is the services sector which has been expanding at a faster rate with a large share and a higher rate of growth compared to industry and agriculture.

3.2.2. Decomposed services growth in India

Table 3.3 (page-55) gives the decomposed services growth in India. A glimpse of the table clearly establishes that service activities that are essential for the growth and development of the economy, had grown at a faster pace. For instance, Banking & Insurance, public administration and transport had growth rates above 5 per cent per annum with banking & Insurance at 7.64 per cent per annum followed by public administration at 6.41 per cent per annum and transport at 5.91 per cent percent per annum during the entire period of the study. Moreover all the service activities seem to depict a consistent increase in their growth

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[8] Observations for the quinquennial period 1966 to 1970 were suppressed to accommodate the last period.

with fluctuations during 60's and 80's. Banking and Insurance had a steady growth since fifties through the eighties. It had also registered the highest rate of growth. Real estate had registered the lowest rate of growth during all the periods with a mild increase from 50's through 80's.

Summarising the discussion, all the service activities had shown an upward trend and activities that are essentially infrastructure in their role had especially shown higher growth rates, It is quite evident from the table that services in the form of infrastructure like trade & transport (which form the distribution function in an economy), Banking & Insurance and public administration have shown an upward trend. These service activities are essential inputs for the expansion of other sectors and the economy as a whole.

3.2.3. Structural change of decomposed service activity

Looking at the share of service activities to total service activities, trade has the maximum share. Table 3.4 (page-58) shows the individual service activities' share with shifts over the quniquenial periods. Share of trade had initially picked up but could not sustain after the quinquennial period 1956-60 and there upon it had gradually declined and at the end of 1990-93 it was 33.5 per cent, same as in the initial quinquennial period.

Transport contributed an increasing share from 6.9 per cent during the quinquennial period 1951-50 to 10.2 per cent during the quinquennial period 1990-93. This is also supported with higher growth rate in this activity. Banking & Insurance share displayed a tremendous increase from 4.8 per cent during the quinquennial period 1951-50 to 15.1 per cent during the period 1990-93. This increasing share is also supported by higher rates of

Table 3.4

Structural Change of Services Income - India.									(Percent)
Services Decomposition	Quinquennial Years								
at (1980-81 prices)	1951-55	1956-60	1961-65	1966-70	1971-75	1976-80	1981-85	1986-90	1990-93
Trade	33.4	35.1	37.1	37.0	36.1	36.8	36.4	34.9	33.5
(Shift)		1.7	2.0	-0.1	-0.9	0.7	-0.4	-1.5	-1.5
Transport	6.9	7.5	7.7	7.5	7.9	8.9	9.4	10.0	10.2
(Shift)		0.6	0.2	-0.1	0.3	1.1	0.5	0.5	0.2
Banking & insurance	4.8	5.7	6.1	6.2	7.2	8.5	9.4	12.4	15.1
(Shift)		0.9	0.5	0.1	0.9	1.3	0.8	3.1	2.7
Real estate	22.8	21.0	18.7	17.6	16.8	15.5	14.5	12.6	11.6
(Shift)		-1.8	-2.3	-1.1	-0.9	-1.3	-1.0	-1.9	-1.0
Public administration	8.4	8.7	9.9	11.4	12.7	12.7	13.4	14.3	13.6
(Shift)		0.3	1.2	1.5	1.3	-0.1	0.8	0.9	-0.7
Other Services	23.7	22.0	20.5	20.2	19.4	17.6	16.9	15.7	15.9
(Shift)		-1.7	-1.6	-0.3	-0.8	-1.8	-0.7	-1.1	0.2

Data Source: CSO, National Accounts Statistics, variuos issues.

growth in this activity. Real estate which constitutes real estate and business services had a major share during the quinquennial period 1951-55 at 22.8 per cent. The share of real estate in the total services income declined gradually and was around 11.6 per cent during the period 1990-93. Public administration showed a substantial increase in its share to the total services. Though its share was quite low to start with hut it had expanded over the period of analysis from 8.4 per cent in 1951-55 to 13.6 per cent in 1990-93.

3.3. Patterns of growth and structural change in Indian states

Following the discussion of the previous section, we now look into the patterns of growth and structural change in a regionalised (state-wise) setting. In this section we look into the broad trends of the macro sectors along with their respective shares over time laying emphasis on the services sector. In order to make the analysis more explicit in terms of the levels of income, the states are categorised into high income states, middle income states and low income states as listed in section 3.1. Though the analysis is done on the above categorization, individual states scenario will be looked into rather than aggregating all the states that fall into these respective categories.

3.3.1. Patterns of growth and structural change in high income states

The states that fall under this category are Gujarat, Maharastra, Punjab and Haryana.

Gujarat

Gujarat experienced a growth rate (Table 3.H.1, page-60) of 4.13 per cent per annum from 1961 to 1990. The disaggregated growth rates according to the major sectors show that services grew at 5.18 per cent per annum alongwith industry at 5.04 and agriculture at 1.89

Table 3.H.1

Income Growth - Gujarat				(Percent)
Income Structure	1961-70	1971-80	1981-90	1961 to 1990
Agriculture	1.47	3.32	-3.50	1.89
Industry	3.95	6.10	7.82	5.04
Services	3.33	5.86	7.53	5.18
State Income	2.73	4.69	4.23	4.13

Services Income Growth - Gujarat				(Percent)
Income Structure	1961-70	1971-80	1981-90	1961 to 1990
Trade	3.16	6.17	7.04	5.54
Transport	4.58	7.63	14.49	8.29
Banking & Insurance	6.77	8.84	9.09	7.87
Real Estate	2.84	3.39	3.35	3.22
Public Administration	6.08	6.74	8.22	6.60
Other Services	1.51	3.09	5.82	3.04

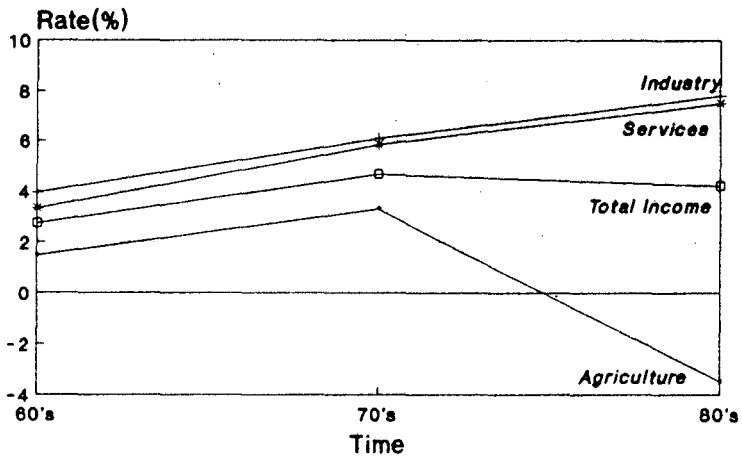
Data source: CSO, Estimates of State Domestic Product, various issues.

Table 3.H.2

Structural change of Income - Gujarat						(Percent)
Income Structure	1961-65	1966-70	1971-75	1976-80	1981-85	1986-90
Agriculture	45.8	41.9	41.5	41.3	38.8	24.8
(Shift)		-3.9	-0.4	-0.1	-2.5	-14.0
Industry	25.9	28.2	27.8	27.4	28.5	35.4
(Shift)		2.3	-0.4	-0.3	1.0	6.9
Services	28.3	30.0	30.8	31.2	32.7	39.8
(Shift)		1.6	0.8	0.5	1.5	7.1
Trade	8.8	9.2	9.3	10.1	11.1	13.1
(Shift)		0.4	0.1	0.8	1.1	1.9
Transport & Communication	2.1	2.4	2.7	2.9	4.0	6.4
(Shift)		0.3	0.3	0.3	1.1	2.4
Banking & Insurance	2.0	2.4	3.2	3.9	3.9	5.1
(Shift)		0.5	0.8	0.7	-0.0	1.3
Real Estate	6.9	7.2	7.1	6.4	6.0	6.0
(Shift)		0.3	-0.1	-0.7	-0.4	0.0
Public Administration	1.6	2.0	2.1	2.3	2.6	3.2
(Shift)		0.3	0.1	0.2	0.3	0.7
Other Services	6.9	6.7	6.4	5.7	5.2	5.9
(Shift)		-0.1	-0.4	-0.7	-0.5	0.7

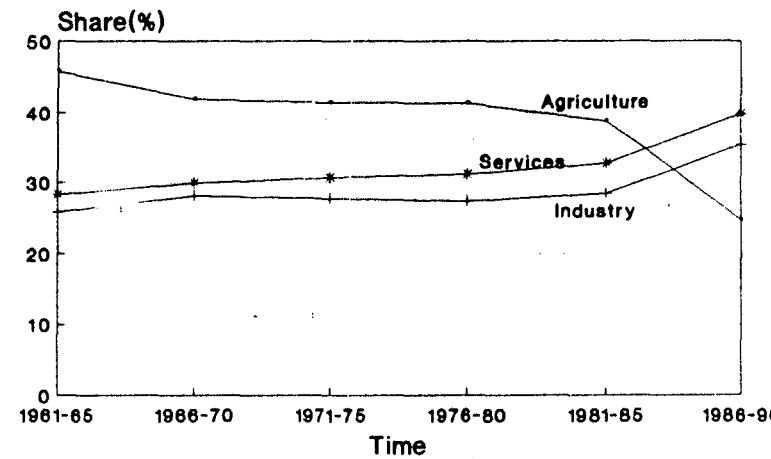
Data source : CSO, Estimates of State Domestic Products, various issues.

Income Growth
Gujarat



Graph 3.H1

Structural Change of Income
Gujarat



Graph 3.H2

per cent per annum respectively. As far as their respective shares (table 3.H.2, page-61) are concerned, services had the largest share of 39.8 per cent followed by industry at 35.4 per cent and agriculture at 24.8 per cent. The growth and structural change are captured in graph 3.H.1 (page-62) and 3.H.2 (page-62) respectively. The graphs clearly show that the share of agriculture along with its respective growth rate is falling and that of industry and services are rising consistently. Services constitute the major share in the SDP. Among the services, trade, transport, banking and public administration grew at a tremendous rate with rising share. All these components form the infrastructure of the economy and growth of these service activities is desirable.

Maharastra

Though Maharastra is considered to be a highly industrialised state, services were more dominant in terms of growth and share. Tables 3.H.5 (page-64) and 3.H.6 (page-65) show the scenario of growth and structural change for the macro sectors of the Maharastrian economy. Services had grown at 4.45 per cent per annum and agriculture at 1.86 per cent per annum along with their respective shares being 42.6 per cent for services, 35.3 per cent for industry and 22.1 per cent for agriculture. Graph 3.H.5 (page-66) gives a picturesque representation of the growth experienced by the macro sectors. It is evident that, services growth has been consistently rising followed by industry. Further graph 3.H.6 (page-66) also shows that services share has been growing consistently followed by industry. Among the service activities, it was trade, transport, banking and Public administration that had higher rates of growth and share. Moreover, these form the infrastructure of the economy and such growth is essential.

Table 3.H.5

Income Growth - Maharastra				(Percent)
Income Structure	1961-70	1971-80	1981-90	1961 to 1990
Agriculture	-0.75	6.45	1.69	1.86
Industry	5.09	5.76	5.65	4.45
Services	4.74	5.31	6.70	4.94
State Income	2.90	5.76	5.07	4.16

Services Income Growth - Maharastra				(Percent)
Income Structure	1961-70	1971-80	1981-90	1961 to 1990
Trade	2.30	6.49	5.15	4.10
Transport	7.62	4.84	7.39	6.04
Banking & Insurance	1.53	5.92	11.01	7.46
Real Estate	4.95	3.28	3.28	3.71
Public Administration	9.06	8.59	7.66	8.64
Other Services	4.72	2.11	6.50	3.76

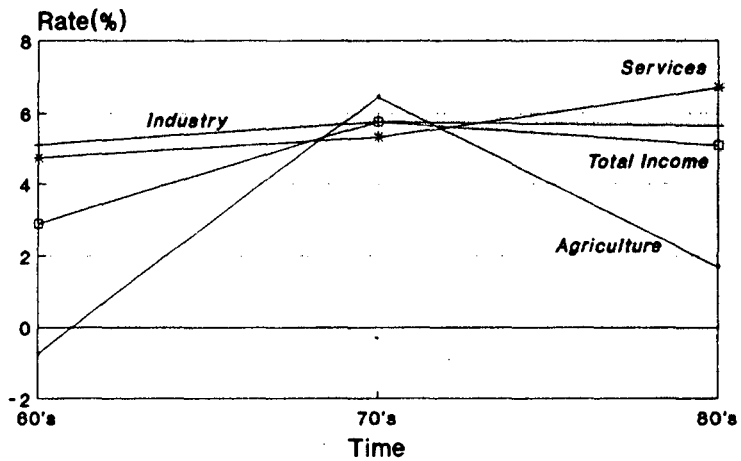
Data source: CSO, Estimates of State Domestic Product, various issues.

Table 3.H.6

Structural change of Income - Maharastra						(Percent)
Income Structure	1961-65	1966-70	1971-75	1976-80	1981-85	1986-90
Agriculture	39.1	32.9	30.0	30.8	27.1	22.1
(Shift)		-6.2	-2.9	0.8	-3.8	-4.9
Industry	29.2	32.6	33.4	33.3	33.5	35.3
(Shift)		3.4	0.8	-0.1	0.2	1.8
Services	31.7	34.5	36.6	35.9	39.4	42.6
(Shift)		2.8	2.0	-0.7	3.5	3.2
Trade	11.8	11.8	11.3	12.0	12.3	12.5
(Shift)		-0.0	-0.5	0.7	0.3	0.2
Transport & Communication	3.1	4.0	4.2	4.1	5.1	5.6
(Shift)		0.9	0.2	-0.1	0.9	0.5
Banking & Insurance	3.7	3.5	5.1	5.4	6.6	8.6
(Shift)		-0.2	1.5	0.3	1.3	1.9
Real Estate	4.4	5.0	5.2	4.7	4.8	4.4
(Shift)		0.7	0.2	-0.5	0.1	-0.4
Public Administration	1.1	1.5	2.0	2.3	2.9	3.3
(Shift)		0.4	0.5	0.3	0.6	0.4
Other Services	7.7	8.7	8.8	7.4	7.7	8.3
(Shift)		1.0	0.1	-1.4	0.3	0.6

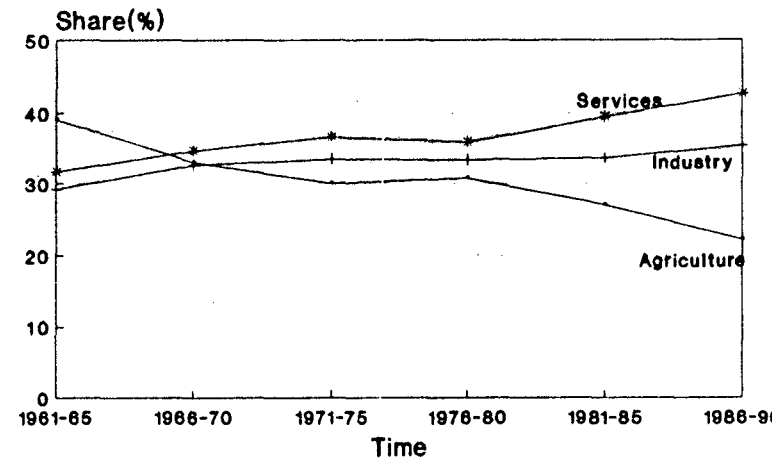
Data source : CSO, Estimates of State Domestic Products, various issues.

Income Growth
Maharastra



Graph 3.H5

Structural Change of Income
Maharastra



Graph 3.H6

Haryana

The growth and structural change for Haryana is summarised in tables 3.H.3 (page 68) and 3.H.4 (page,69) respectively. Among the macro sectors of the economy, services had the highest rate at 7.98 per cent per annum followed by industry at 7.24 per cent per annum and agriculture at 3.33 per cent per annum during the period 1971 to 1990. During the period, 1986-90, their respective shares were 47 per cent for agriculture followed by services at 31.1 per cent and industry at 21.9 per cent. Though agricultural share was higher compared to other sectors, its share was declining continuously with the decline being offset by services and industry. It was services that absorbed the major part of the declining share of agriculture. This is captured by graph 3.H.4 (page-70). As far as growth was concerned, the services growth declined during the decennial period 1981-90. This is captured by graph 3.H.3 (page-70).

Further, the share of services was also increasing at a slow pace. Even among the individual service activities, trade, transport, banking and public administration experienced a slow pace of growth and structural change.

Punjab

Punjab which is known for its mechanised agriculture, exhibited a different scenario (table 3.H.7, page-71). Industry exhibited a higher growth during eighties and during the period 1971 to 1990. Table 3.H.7 (page-71) gives the growth of the major macro sectors. Services grew at 5.77 per cent per annum followed by agriculture at 4.27 per cent per annum. Graph 3.H.7 (page-73) captures the growth of the major sectors. Services seem to have declined from seventies to eighties, with all other sectors growing. As far as shares (table 3.H.8, page-72) were concerned, agriculture had the highest share at 49.2 per cent during the period 1986-90 followed by industry at 21.5 per cent and services at 29.4 per cent. Graph

Table 3.H.3

Income Growth - Haryana			(Percent)
Income Structure	1971-80	1981-90	1971 to 1990
Agriculture	2.58	3.88	3.33
Industry	6.62	8.20	7.24
Services	8.78	7.68	7.98
State Income	4.83	5.90	5.33

Services Income Growth - Haryana			(Percent)
Income Structure	1971-80	1981-90	1971 to 1990
Trade	11.97	8.12	9.38
Transport	8.04	7.27	7.63
Banking & Insurance	11.20	11.65	11.54
Real Estate	3.99	4.09	5.41
Public Administration	8.62	9.94	7.82
Other Services	3.27	5.00	4.73

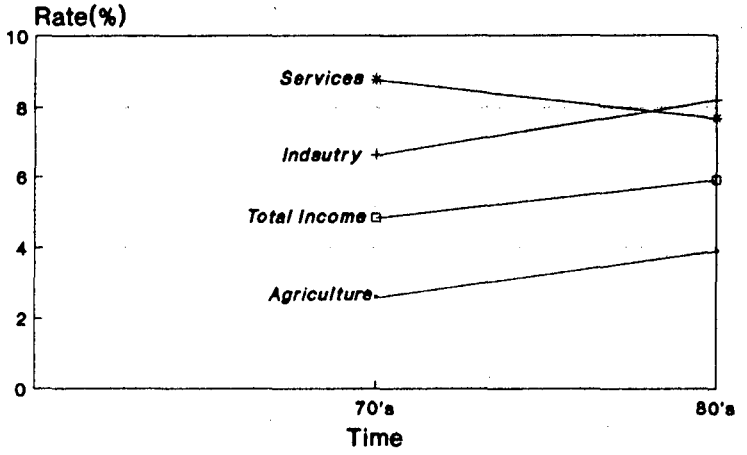
Data source: CSO, Estimates of State Domestic Product, various issues.

Table 3.H.4

Structural change of Income - Haryana				(Percent)
Income Structure	1971-75	1976-80	1981-85	1986-90
Agriculture	61.6	56.9	51.7	47.0
(Shift)		-4.7	-5.2	-4.8
Industry	17.0	17.7	19.6	21.9
(Shift)		0.7	1.9	2.4
Services	21.4	25.4	28.7	31.1
(Shift)		4.0	3.3	2.4
Trade	8.6	12.2	13.9	15.5
(Shift)		3.7	1.6	1.7
Transport & Communication	2.5	2.8	3.2	3.3
(Shift)		0.3	0.4	0.2
Banking & Insurance	1.2	1.6	2.2	2.8
(Shift)		0.4	0.6	0.6
Real Estate	2.5	2.3	2.7	2.4
(Shift)		-0.2	0.3	-0.2
Public Administration	2.0	2.3	2.4	2.8
(Shift)		0.3	0.1	0.4
Other Services	4.7	4.2	4.4	4.2
(Shift)		-0.5	0.2	-0.2

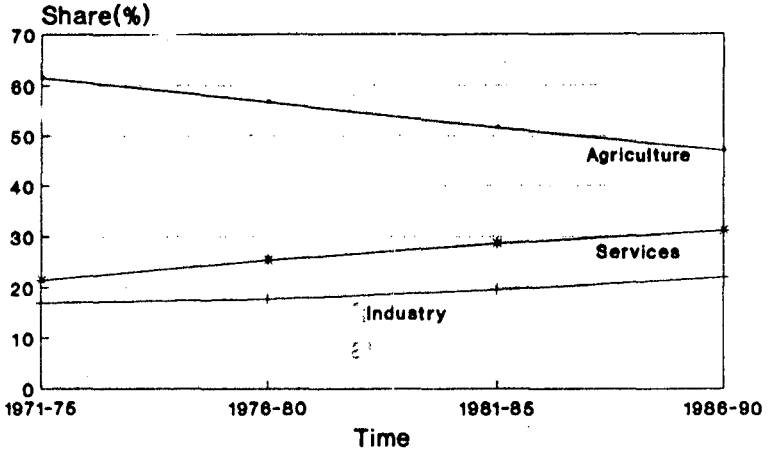
Data source : CSO, Estimates of State Domestic Products, various issues.

Income Growth
Haryana



Graph 3.H3

Structural Change of Income
Haryana



Graph 3.H4

Table 3.H.7

Income Growth - Punjab			(Percent)
Income Structure	1971-80	1981-90	1971 to 1990
Agriculture	4.04	5.19	4.27
Industry	6.90	7.55	6.01
Services	7.17	4.50	5.77
State Income	5.39	5.46	5.13

Services Income Growth - Punjab			(Percent)
Income Structure	1971-80	1981-90	1971 to 1990
Trade	8.35	3.35	5.78
Transport	7.01	7.24	6.95
Banking & Insurance	10.00	10.76	10.22
Real Estate	1.14	2.97	3.75
Public Administration	5.43	6.46	8.42
Other Services	5.28	2.55	3.61

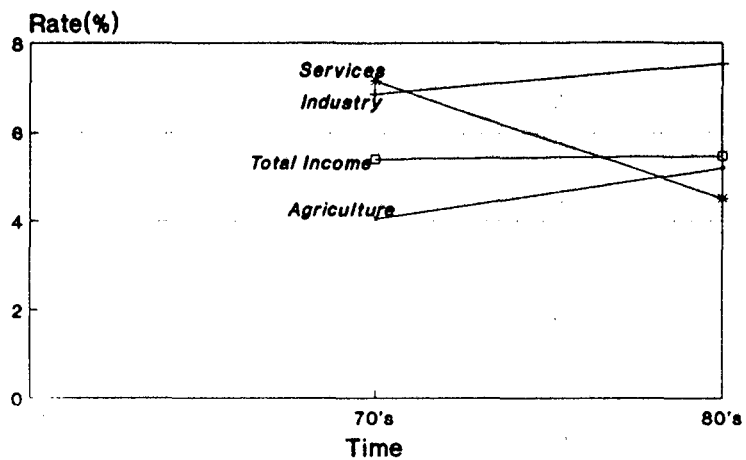
Data source: CSO, Estimates of State Domestic Product, various issues.

Table 3.H.8

Structural change of Income - Punjab				(Percent)
Income Structure	1971-75	1976-80	1981-85	1986-90
Agriculture	55.0	51.7	49.8	49.2
(Shift)		-3.2	-1.9	-0.6
Industry	18.2	19.7	19.3	21.5
(Shift)		1.5	-0.4	2.2
Services	26.8	28.5	30.9	29.4
(Shift)		1.7	2.4	-1.5
Trade	11.4	13.3	14.0	12.6
(Shift)		1.9	0.7	-1.4
Transport & Communication	1.8	1.9	2.1	2.3
(Shift)		0.1	0.2	0.2
Banking & Insurance	1.8	2.3	2.9	3.7
(Shift)		0.5	0.6	0.8
Real Estate	4.3	3.5	3.9	3.4
(Shift)		-0.8	0.4	-0.5
Public Administration	1.7	1.7	2.5	2.7
(Shift)		-0.0	0.8	0.1
Other Services	5.8	5.8	5.4	4.7
(Shift)		-0.0	-0.4	-0.7

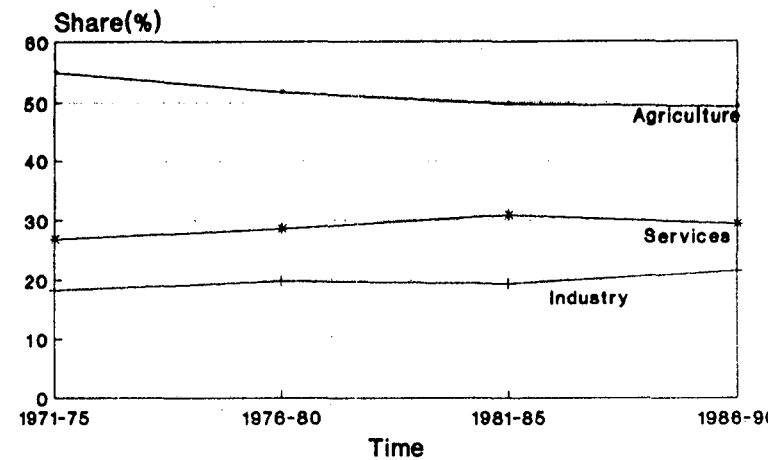
Data source : CSO, Estimates of State Domestic Products, various issues.

Income Growth
Punjab



Graph 3.H7

Structural Change of Income
Punjab



Graph 3.H8

3.H.8 (page-72) captures the share of the three macro sectors. Agriculture has been slowly declining alongwith the share of services and industry increasing at a slow pace. As far as the individual service activities' share are concerned, transport, trade, banking and public administration had high rates of growth and increasing share (please refer table 3.H.7 and 3.H.8).

Summarising the discussion, it was found that Gujarat and Maharastra had higher growth and share of services closely followed by industry. Thus these two states fit into the stylised facts of development discussed in chapter one. Whereas Haryana and Punjab were the opposite. Though services depicted a higher growth it was the agricultural share that was dominant. It is a well known fact that Haryana and Punjab are the home for the success of the 'Green Revolution'. Nevertheless, in all these four states, trade, transport, banking and public administration were doing well with increasing rates of growth and rising shares. Such growth is desirable as these economic activities form the basic infrastructure of the economy.

3.3.2. Patterns of growth and structural change in middle income states

The following states are covered under this category, namely, Andhra Pradesh, Karnataka, Kerala, Tamil Nadu and West Bengal.

Andhra Pradesh

Table 3.M.1 (page-75) and 3.M.2 (page-76) represents the growth and structural change of the macro sectors in the Andhra economy. The growth of industry was the highest at 4.76 per cent per annum followed by services at 4.62 per cent per annum and agriculture at 1.86 per cent per annum alongwith SDP growth at 3.32 per cent per annum during the period 1961

Table 3.M.1

Income Growth -- Andhra Pradesh				(Percent)
Income Structure	1961-70	1971-80	1981-89	1961 to 1989
Agriculture	0.04	1.65	0.67	1.86
Industry	4.78	5.52	3.61	4.76
Services	3.15	4.88	5.38	4.62
State Income	1.49	3.22	2.96	3.32

Services Income Growth -- Andhra Pradesh				(Percent)
Income Structure	1961-70	1971-80	1981-89	1961 to 1989
Trade	3.07	3.41	5.80	4.30
Transport	4.42	5.37	4.80	5.50
Banking & Insurance	7.78	11.51	11.54	8.90
Real Estate	-2.40	4.29	5.09	3.67
Public Administration	4.99	9.97	5.49	7.58
Other Services	4.26	2.40	1.91	3.06

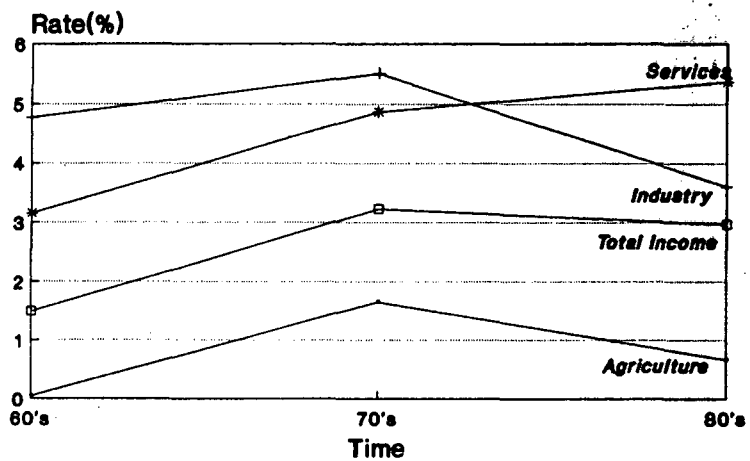
Data source: CSO, Estimates of State Domestic Product, various issues.

Table 3.M.2

Structural change of Income - Andhra Pradesh						(Percent)
Income Structure	1961-65	1966-70	1971-75	1976-80	1981-85	1986-89
Agriculture	35.3	32.5	34.2	33.5	32.9	35.6
(Shift)		-2.7	1.7	-0.8	-0.6	2.7
Industry	33.4	35.6	32.6	32.1	30.3	28.9
(Shift)		2.2	-3.0	-0.5	-1.8	-1.5
Services	31.4	31.9	33.2	34.4	36.7	35.6
(Shift)		0.5	1.3	1.3	2.3	-1.2
Trade	11.3	11.1	10.8	10.4	10.4	9.8
(Shift)		-0.2	-0.3	-0.4	-0.0	-0.7
Transport & Communication	4.5	4.8	4.7	5.0	4.8	4.5
(Shift)		0.4	-0.2	0.3	-0.2	-0.3
Banking & Insurance	2.9	2.9	3.7	4.1	4.6	4.4
(Shift)		0.1	0.7	0.4	0.6	-0.2
Real Estate	6.2	6.2	6.6	7.0	7.5	6.7
(Shift)		0.0	0.4	0.4	0.5	-0.8
Public Administration	2.5	2.8	3.0	3.0	3.9	5.3
(Shift)		0.3	0.2	0.0	0.9	1.3
Other Services	4.0	4.0	4.4	4.9	5.4	4.9
(Shift)		-0.0	0.4	0.5	0.5	-0.5

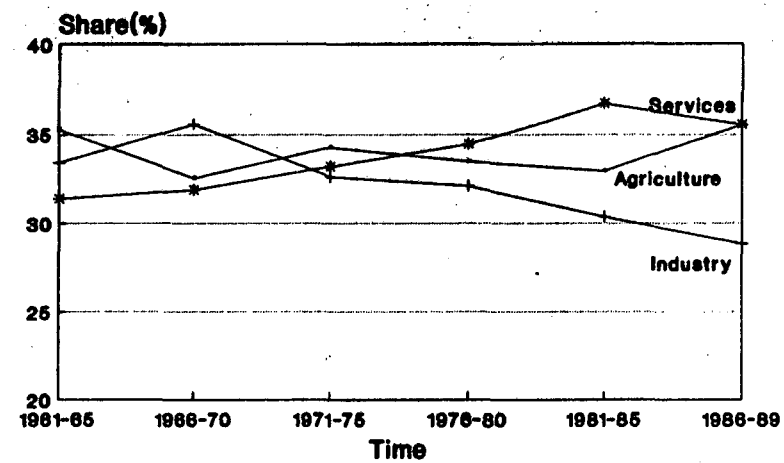
Data source : CSO, Estimates of State Domestic Products, various issues.

Income Growth
Andhra Pradesh



Graph 3.M1

Structural Change of Income
Andhra Pradesh



Graph 3.M2

to 1989. The growth from sixties to eighties showed that services was growing rapidly with falling growth rates of agriculture as well as industry. This is captured in graph 3.M.1 (page-75).

As far as their respective shares are concerned, during the period 1986-89, services and agriculture constituted 35.6 per cent each and industry at 28.9 per cent. The share of services was increasing at a rapid pace along with highly fluctuating agricultural sector and falling industrial share. This is captured in graph 3.M.2 (page-76). As far as service activities are concerned, banking, public administration, transport and trade exhibited continuous increase in growth and constituted the major share of services when put together. But trade and transport share had declined (please refer table 3.M.1 and 3.M.2).

Karnataka

Table 3.M.3 (page-79) and 3.M.4 (page-80) explain the growth and structural change of the three macro sectors of the economy. Industrial growth was the highest at 5.28 per cent per annum followed by services at 4.74 per cent per annum and agriculture at 2.44 per cent per annum during the period 1961 to 1990. Graph 3.M.3 (page-81) captures the growth in these three macro sectors during sixties, seventies and the eighties. It was found that services were growing at a rapid rate from 3.93 per cent per annum in the sixties to 6.90 in the eighties. Industrial growth initially increased and experienced a mild fall during the eighties. Agricultural income had also experienced a mild increase. Glancing at their shares (table 3.M.4, page-80), agricultural income constituted the largest share at 37.9 per cent followed by services at 35.6 per cent and industry at 26.5 per cent during the period 1986-90. The share of services and industry were continuously rising along with declining share of agriculture. This is captured in graph 3.M.4 (page-80). Among the individual service activities, it was found that banking, transport, trade and public administration had high rates of growth and

Table 3.M.3

Income Growth - Karnataka				(Percent)
Income Structure	1961-70	1971-80	1981-90	1961 to 1990
Agriculture	2.37	2.51	2.80	2.44
Industry	6.13	6.78	6.58	5.28
Services	3.93	5.22	6.90	4.74
State Income	3.37	4.25	5.15	3.97

Services Income Growth - Karnataka				(Percent)
Income Structure	1961-70	1971-80	1981-90	1961 to 1990
Trade	2.75	4.95	7.34	4.43
Transport	7.24	6.06	5.92	6.21
Banking & Insurance	6.61	8.98	10.51	8.15
Real Estate	2.53	3.86	3.09	3.12
Public Administration	6.13	8.97	6.62	8.30
Other Services	3.26	1.66	7.49	3.28

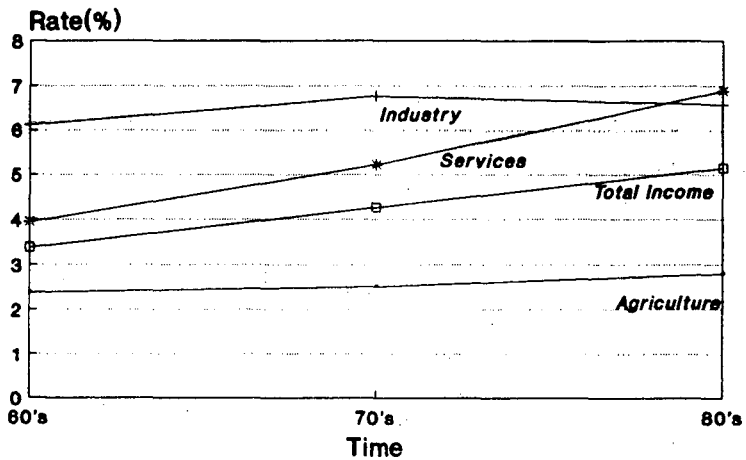
Data source: CSO, Estimates of State Domestic Product, various issues.

Table 3.M.4

Structural change of Income - Karnataka						(Percent)
Income Structure	1961-65	1966-70	1971-75	1976-80	1981-85	1986-90
Agriculture	53.8	50.9	51.0	46.7	42.8	37.9
(Shift)		-2.9	0.1	-4.2	-3.9	-4.9
Industry	18.5	20.2	20.4	23.4	24.7	26.5
(Shift)		1.7	0.2	3.0	1.3	1.7
Services	27.7	28.9	28.6	29.8	32.4	35.6
(Shift)		1.2	-0.3	1.2	2.6	3.2
Trade	11.6	11.7	11.2	11.7	12.5	13.9
(Shift)		0.1	-0.5	0.5	0.8	1.4
Transport & Communication	2.0	2.5	2.7	2.9	3.4	3.6
(Shift)		0.5	0.2	0.3	0.5	0.1
Banking & Insurance	1.6	1.9	2.3	2.9	3.4	4.5
(Shift)		0.3	0.4	0.7	0.5	1.1
Real Estate	5.3	5.3	5.0	4.9	4.8	4.5
(Shift)		-0.0	-0.3	-0.0	-0.1	-0.4
Public Administration	1.2	1.5	1.9	2.4	3.1	3.3
(Shift)		0.2	0.4	0.5	0.8	0.2
Other Services	6.0	6.2	5.6	5.0	5.1	5.9
(Shift)		0.2	-0.5	-0.6	0.1	0.7

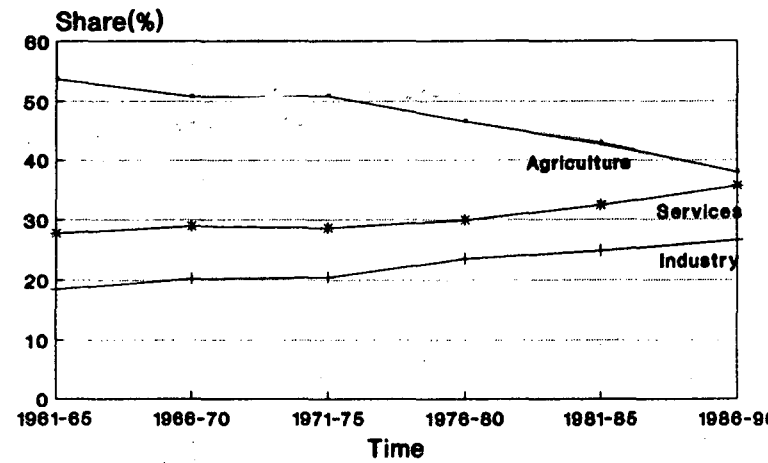
Data source : CSO, Estimates of State Domestic Products, various issues.

Income Growth
Karnataka



Graph 3.M3

Structural Change of Income
Karnataka



Graph 3.M4

this rate was increasing along with increasing shares(please refer 3.M.3 and 3.M.4).

Kerala

Tables 3.M.5 (page-83) and 3.M.6 (page-84) represent the growth and structural change in the Kerala economy. The growth in industrial income for the period 1961 to 1990 was 4.26 per cent per annum followed by 3.97 per cent per annum growth in services and 0.82 per cent per annum growth in agriculture. Graph 3.M.5 (page-85) captures growth of the three macro sectors during sixties, seventies and the eighties. It was found that all the sectors along with the state income had experienced a general decline during seventies and a upward swing during the eighties. But industry did not revive and declined further. These fluctuations had least impact on the services as the fluctuations were mild, compared to other sectors (please see graph 3.M.5, page-83). The structural change of the economy suggests that the share of agriculture had continuously declined along with steady increase in the share of services and a mild increase in the share industry (please refer table 3.M.5 and 3.M.6). Trade showed a decline in growth and share but had the highest share among other service activities.

Tamil Nadu

Tables 3.M.9 (page-90) and 3.M.10 (page-91) present the growth and structural change in the Tamil Nadu economy. Industrial growth was at 7.03 per cent per annum followed by services growth at 3.34 per cent per annum and agriculture at 0.51 per cent per annum during the period 1961 to 1990. Though industry experienced a high rate of growth, it had declined in the eighties and services had infact risen during the eighties along with a mild increase in agricultural growth. Graph 3.M.9 (page-92) gives a picturesque representation where the fall in industrial growth is offset by services growth. The share of agriculture (please refer table

Table 3.M.5

Income Growth - Kerala				(Percent)
Income Structure	1961-70	1971-80	1981-90	1961 to 1990
Agriculture	2.63	0.00	1.55	0.82
Industry	5.39	3.42	0.89	4.26
Services	4.82	3.11	3.30	3.97
State Income	3.76	1.73	2.06	2.65

Services Income Growth - Kerala				(Percent)
Income Structure	1961-70	1971-80	1981-90	1961 to 1990
Trade	5.10	0.47	0.72	2.92
Transport	6.59	5.28	8.14	6.46
Banking & Insurance	5.18	9.26	10.60	8.50
Real Estate	2.87	2.99	-10.50	-0.13
Public Administration	8.90	6.05	8.31	8.91
Other Services	2.71	3.03	1.92	2.77

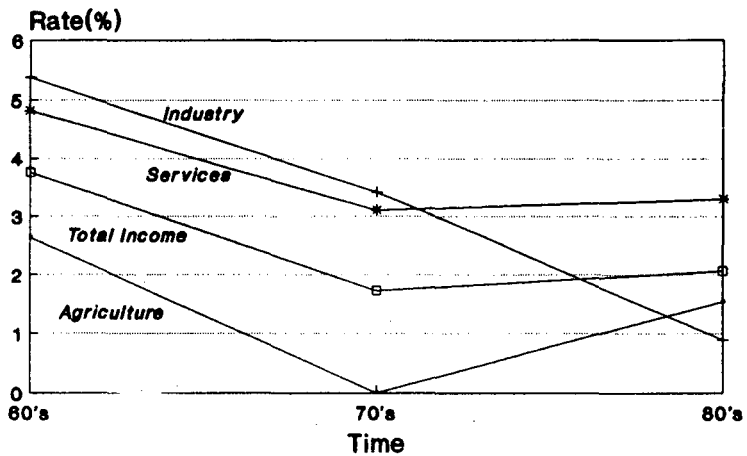
Data source: CSO, Estimates of State Domestic Product, various issues.

Table 3.M.6

Structural change of Income - Kerala						(Percent)
Income Structure	1961-65	1966-70	1971-75	1976-80	1981-85	1986-90
Agriculture	54.5	53.2	47.3	43.9	37.8	37.0
(Shift)		-1.3	-5.9	-3.4	-6.1	-0.8
Industry	16.5	16.7	20.0	21.5	24.4	22.9
(Shift)		0.2	3.3	1.5	2.9	-1.5
Services	29.0	30.1	32.7	34.6	37.8	40.2
(Shift)		1.1	2.6	1.9	3.2	2.4
Trade	12.4	13.2	15.2	14.4	14.2	13.4
(Shift)		0.8	2.0	-0.8	-0.1	-0.8
Transport & Communication	2.1	2.4	2.6	3.2	4.1	5.6
(Shift)		0.3	0.2	0.6	0.9	1.5
Banking & Insurance	1.4	1.5	1.9	2.8	3.6	5.5
(Shift)		0.1	0.5	0.8	0.9	1.9
Real Estate	3.8	3.6	3.0	3.3	3.2	1.6
(Shift)		-0.1	-0.6	0.2	-0.0	-1.6
Public Administration	1.3	1.7	2.2	2.6	4.5	6.0
(Shift)		0.4	0.4	0.4	1.9	1.6
Other Services	7.9	7.7	7.8	8.4	8.2	8.1
(Shift)		-0.3	0.1	0.7	-0.3	-0.1

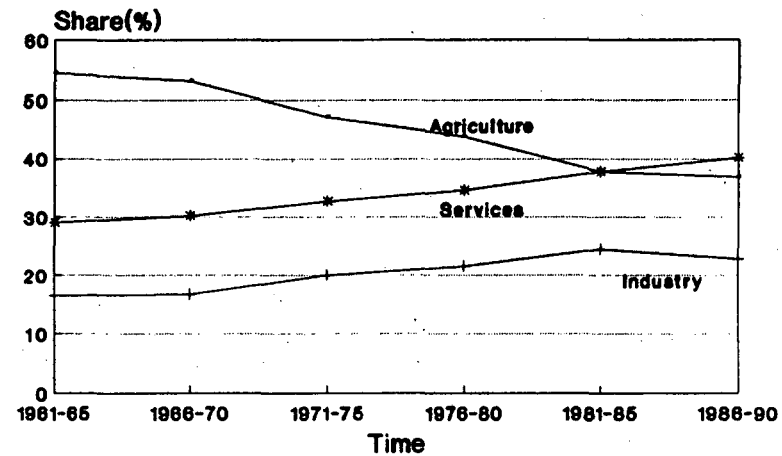
Data source : CSO, Estimates of State Domestic Products, various issues.

Income Growth
Kerala



Graph 3.M5

Structural Change of Income
Kerala



Graph 3.M6

Table 3.M.7

Income Growth - Tamil Nadu				(Percent)
Income Structure	1961-70	1971-80	1981-90	1961 to 1990
Agriculture	-0.63	0.94	1.53	0.51
Industry	5.84	6.00	3.17	7.03
Services	3.69	3.98	6.48	3.34
State Income	2.12	3.44	4.19	2.81

Services Income Growth - Tamil Nadu				(Percent)
Income Structure	1961-70	1971-80	1981-90	1961 to 1990
Trade	1.81	2.89	5.43	2.88
Transport	7.97	4.49	9.22	5.96
Banking & Insurance	4.58	7.18	9.09	6.60
Real Estate	2.74	3.86	5.20	3.62
Public Administration	8.96	8.36	10.21	8.11
Other Services	2.27	1.75	3.36	0.10

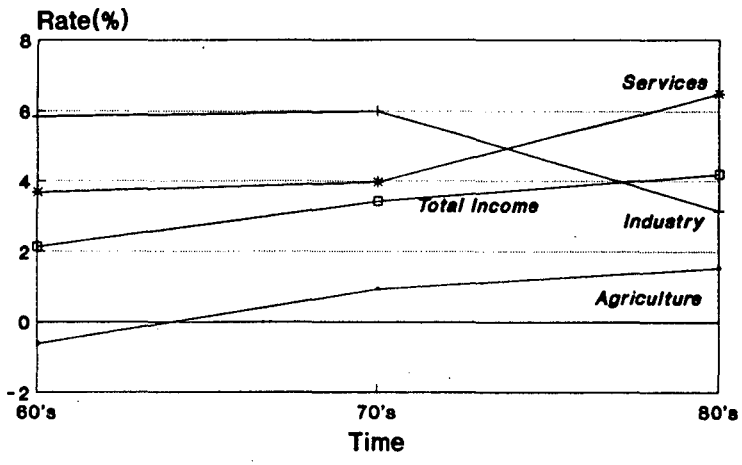
Data source: CSO, Estimates of State Domestic Product, various issues.

Table 3.M.8

Structural change of Income - Tamil Nadu						(Percent)
Income Structure	1961-65	1966-70	1971-75	1976-80	1981-85	1986-90
Agriculture	41.0	35.3	34.2	31.0	27.1	23.6
(Shift)		-5.6	-1.1	-3.2	-3.9	-3.5
Industry	21.8	25.9	26.5	29.9	32.7	30.7
(Shift)		4.1	0.6	3.5	2.8	-2.0
Services	37.2	38.8	39.3	39.1	40.2	45.7
(Shift)		1.6	0.5	-0.3	1.2	5.5
Trade	16.7	16.4	16.2	15.8	16.6	18.0
(Shift)		-0.3	-0.2	-0.5	0.8	1.4
Transport & Communication	3.3	4.3	5.1	5.2	5.9	8.0
(Shift)		1.0	0.8	0.2	0.7	2.0
Banking & Insurance	1.8	2.0	2.3	2.8	3.6	4.6
(Shift)		0.2	0.3	0.5	0.8	1.0
Real Estate	4.1	4.2	4.2	4.3	4.9	5.1
(Shift)		0.1	0.0	0.1	0.6	0.3
Public Administration	1.1	1.5	1.8	2.3	3.1	4.2
(Shift)		0.4	0.3	0.5	0.8	1.1
Other Services	10.3	10.4	9.7	8.7	6.1	5.8
(Shift)		0.1	-0.7	-1.0	-2.6	-0.3

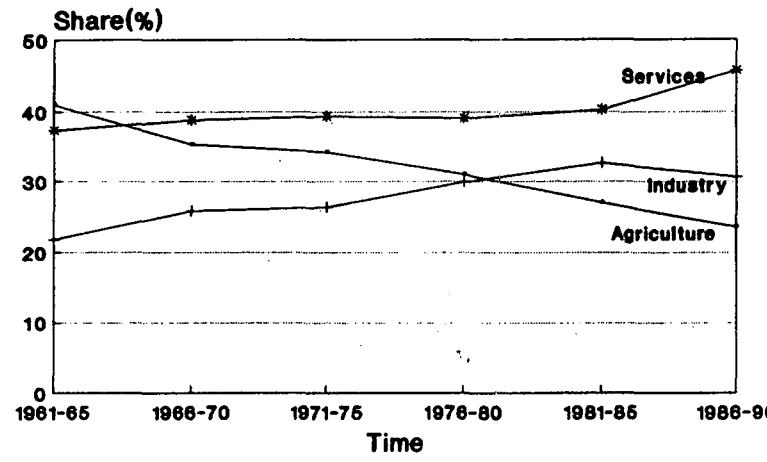
Data source : CSO, Estimates of State Domestic Products, various issues.

Income Growth
Tamil Nadu



Graph 3.M7

Structural Change of Income
Tamil Nadu



Graph 3.M8

3.M.10) had declined continuously from 41 per cent in 1961-65 to 23.6 per cent in 1986-90. On the other hand services and industrial share had experienced a continuous rise as depicted in graph 3.M.10 (page-91). Services constituted the highest share at 45.7 per cent followed by industry at 30.7 per cent during the period 1986-90. As far as the individual service activities are concerned, banking, transport and public administration showed a continuous increase in growth during the period of analysis and a consistently rising share to the SDP. Though trade had the largest share at 39.4 per cent, its growth and share was declining over the period of the study (please see 3.M.10).

West Bengal

Table 3.M. 9 (page-90) and 3.M.10 (page-91) represent growth and structural change. It can be inferred from the tables that services had the highest rate of growth at 3.45 per cent per annum followed by agriculture at 2.76 per cent per annum and industry at 2.08 per cent per annum. It is evident from graph 3.M.9 (page-92) that industrial growth had declined along with services, although decline in services growth was less. Agriculture showed a sudden increase during the eighties. On the other hand share(please refer table 3.M.10) of agriculture and services were increasing consistently except during the period 1986-90, where there was a fall in its share. Industrial share registered a continuous fall during the entire period of the study. This is captured in graph 3.M.10 (page-92). As far as individual service activities are concerned, banking, public administration and other services had high rates of growth along with increase in their shares during the period of analysis. Their shares were rising at a slower pace (please refer table 3.M.9 and 3.M.10). On the whole services were not doing well in West Bengal as compared to other states in this category.

Table 3.M.9

Income Growth - West Bengal				(Percent)
Income Structure	1961-70	1971-80	1981-89	1961 to 1989
Agriculture	1.11	2.54	6.14	2.76
Industry	3.89	2.76	2.87	2.08
Services	2.94	3.83	3.72	3.45
State Income	2.45	3.02	4.27	2.84

Services Income Growth - West Bengal				(Percent)
Income Structure	1961-70	1971-80	1981-89	1961 to 1989
Trade	2.42	2.24	2.92	2.22
Transport	4.10	4.12	2.95	2.89
Banking & Insurance	3.44	5.17	3.69	5.01
Real Estate	2.48	4.63	1.74	3.46
Public Administration	4.55	3.49	11.21	5.45
Other Services	2.32	5.59	2.31	4.04

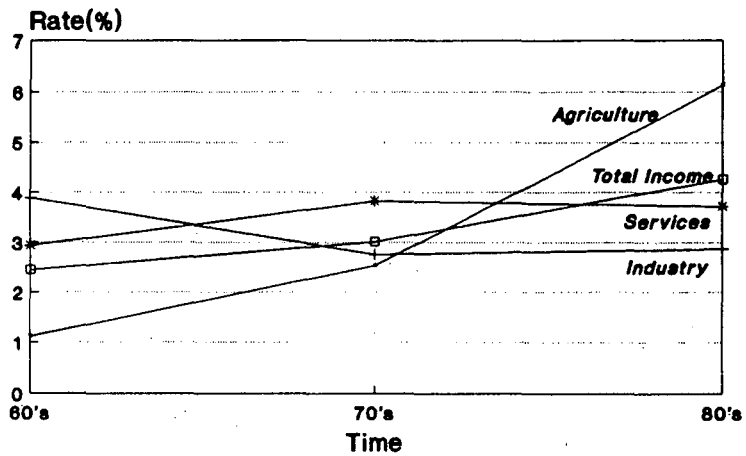
Data source: CSO, Estimates of State Domestic Product, various issues.

Table 3.M.10

Structural change of Income - West Bengal						(Percent)
Income Structure	1961-65	1966-70	1971-75	1976-80	1981-85	1986-90
Agriculture	35.3	32.5	34.2	33.5	32.9	35.6
(Shift)		-2.7	1.7	-0.8	-0.6	2.7
Industry	33.4	35.6	32.6	32.1	30.3	28.9
(Shift)		2.2	-3.0	-0.5	-1.8	-1.5
Services	31.4	31.9	33.2	34.4	36.7	35.6
(Shift)		0.5	1.3	1.3	2.3	-1.2
Trade	11.3	11.1	10.8	10.4	10.4	9.8
(Shift)		-0.2	-0.3	-0.4	-0.0	-0.7
Transport & Communication	4.5	4.8	4.7	5.0	4.8	4.5
(Shift)		0.4	-0.2	0.3	-0.2	-0.3
Banking & Insurance	2.9	2.9	3.7	4.1	4.6	4.4
(Shift)		0.1	0.7	0.4	0.6	-0.2
Real Estate	6.2	6.2	6.6	7.0	7.5	6.7
(Shift)		0.0	0.4	0.4	0.5	-0.8
Public Administration	2.5	2.8	3.0	3.0	3.9	5.3
(Shift)		0.3	0.2	0.0	0.9	1.3
Other Services	4.0	4.0	4.4	4.9	5.4	4.9
(Shift)		-0.0	0.4	0.5	0.5	-0.5

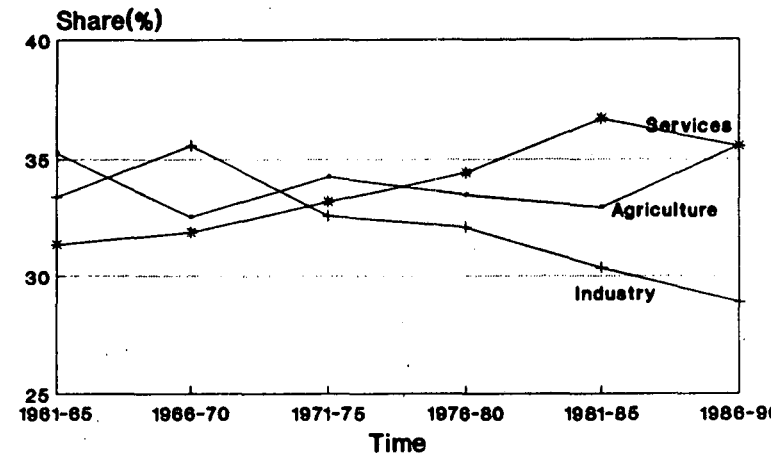
Data source : CSO, Estimates of State Domestic Products, various issues.

Income Growth
West Bengal



Graph 3.M9

Structural Change of Income
West Bengal



Graph 3.M10

Summarising the discussion, it was found that in the middle income states, there was no clear picture emerging as to the dominance of the services sector. In West Bengal, it was more of agriculture and in other states it was services which experienced increasing rates of growth along with rising shares and closely followed by industry.

Among the service activities, the most common activities that showed a tremendous increase in growth and rising share during the period of analysis were, banking, public administration and transport. Though trade had an active role, it was limited to a very few states like Tamil Nadu, karnataka and Andhra pradesh. It can be inferred that at middle levels of income, it is industry which has a more important role along with services as shown in the tables. The service activities that are basic infrastructure to the economy like transport, banking, public administration and trade are doing well and are essential for the growth and development of the economy.

3.3.3. Patterns of growth and structural change in low income states

The states categorised under this category are Assam, Bihar, Himachal Pradesh, Jammu & Kashmir, Madhya Pradesh, Orissa, Rajasthan and Uttar Pradesh. The patterns of growth and structural change in these states are discussed in this section.

Assam

Tables 3.L.1 (page-94) and 3.L.2 (page-95) represent the patterns of growth and structural change in Assam. Services grew at 6 per cent per annum followed by industry at 5.83 per cent per annum and agriculture at 3.91 per cent per annum along with the total income growth at 4.75 per cent per annum. Services had a continuous increase in their share

Table 3.L.1

Income Growth - Assam				(Percent)
Income Structure		1971-80	1981-90	1971 to 1990
Agriculture		2.27	2.82	3.91
Industry		-0.07	10.73	5.83
Services		5.01	5.65	6.00
State Income		2.65	5.25	4.75

Services Income Growth - Assam				(Percent)
Income Structure		1971-80	1981-90	1971 to 1990
Trade		2.80	3.41	5.07
Transport		5.20	9.78	6.80
Banking & Insurance		8.47	14.51	10.87
Real Estate		7.41	3.10	5.93
Public Administration		12.57	9.74	10.63
Other Services		3.21	5.25	4.06

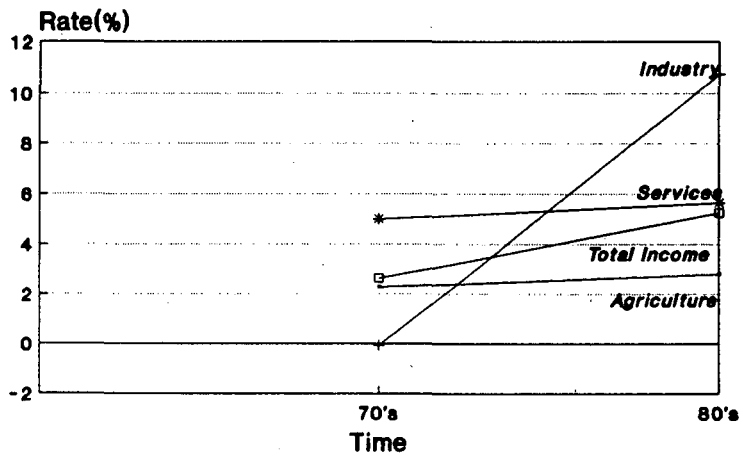
Data source: CSO, Estimates of State Domestic Product, various issues.

Table 3.L.2

Structural change of Income - Assam				(Percent)
Income Structure	1971-75	1976-80	1981-85	1986-90
Agriculture	54.5	52.1	52.5	46.7
(Shift)		-2.3	0.4	-5.8
Industry	15.3	14.7	14.2	17.6
(Shift)		-0.6	-0.5	3.4
Services	30.3	33.1	33.3	35.7
(Shift)		2.9	0.1	2.4
Trade	11.4	11.2	11.1	11.8
(Shift)		-0.2	-0.1	0.7
Transport & Communication	2.3	2.6	2.5	3.2
(Shift)		0.3	-0.1	0.7
Banking & Insurance	1.0	1.3	1.5	2.4
(Shift)		0.3	0.2	0.8
Real Estate	7.2	8.8	9.1	8.3
(Shift)		1.6	0.3	-0.8
Public Administration	2.1	2.9	3.5	4.4
(Shift)		0.8	0.6	0.9
Other Services	6.3	6.3	5.6	5.6
(Shift)		-0.0	-0.7	0.1

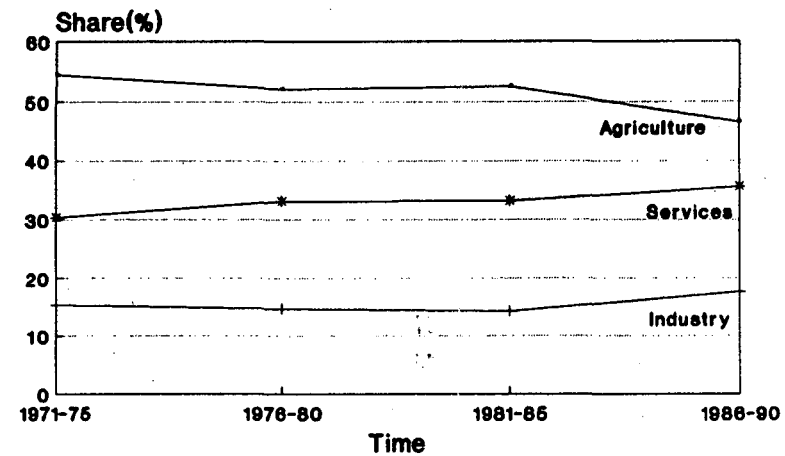
Data source : CSO, Estimates of State Domestic Products, various issues.

Income Growth
Assam



Graph 3.L1

Structural Change of Income
Assam



Graph 3.L2

from the seventies to the eighties. Industry started off with negative growth and grew at a tremendous rate of 10.73 per cent per annum during the eighties. Agriculture had also grown consistently. This is captured in graph 3.L.1 (page-96). The structural change was from agriculture to services rather than to industry. This is evident from table 3.L.2 that the share of agriculture and industry registered a fall along with rising services share. Graph 3.L.2 gives a picturesque representation of the structural change between the three macro sectors of the economy. Though industrial share was falling, it registered a rise during 1986-90. As far as the individual service activities are concerned, banking, public administration, transport and real estate had high rates of growth. Among these transport, banking and public administration registered a continuous increase in their shares (please refer table 3.L.1 and table 3.L.2).

Bihar

Patterns of growth and structural change in Bihar is presented in Table 3.L.3 and 3.L.4 respectively. Industry had grown at 4.25 per cent per annum during the period 1961 to 1990. During the same period, services had grown at 3.09 per cent per annum followed by agriculture at 1.8 per cent per annum. Services experienced a decline in growth during the eighties along with continuous increase in agriculture and industry from sixties to eighties. Graph 3.L.3 (p-100) captures the patterns of growth. On the other hand, share of agriculture was the highest at 50.3 per cent followed by services at 30.6 per cent and industry at 19.1 per cent during the period 1986-90. Graph 3.L.4 (p-100) captures the structural change from the period 1961 to 1990. It is clear from the graph that the share of agriculture registered a continuous fall from 1971-75 along with rise in the share of services and industry. among the individual service activities it was trade and banking which had high rates of growth and a continuous rise in their shares. Though the shares of public administration was 4.2 per cent,

Table 3.L.3

Income Growth - Bihar				(Percent)
Income Structure	1961-70	1971-80	1981-90	1961 to 1990
Agriculture	-0.68	0.78	1.98	1.80
Industry	5.66	5.83	7.50	4.25
Services	0.87	6.12	5.52	3.09
State Income	0.68	2.99	4.02	3.25

Services Income Growth - Bihar				(Percent)
Income Structure	1961-70	1971-80	1981-90	1961 to 1990
Trade	-0.51	11.62	4.31	7.79
Transport	3.68	3.81	5.70	3.43
Banking & Insurance	4.66	7.94	12.30	9.40
Real Estate	-9.15	0.00	1.94	-1.19
Public Administration	1.90	1.05	6.79	3.93
Other Services	2.24	4.58	7.37	4.71

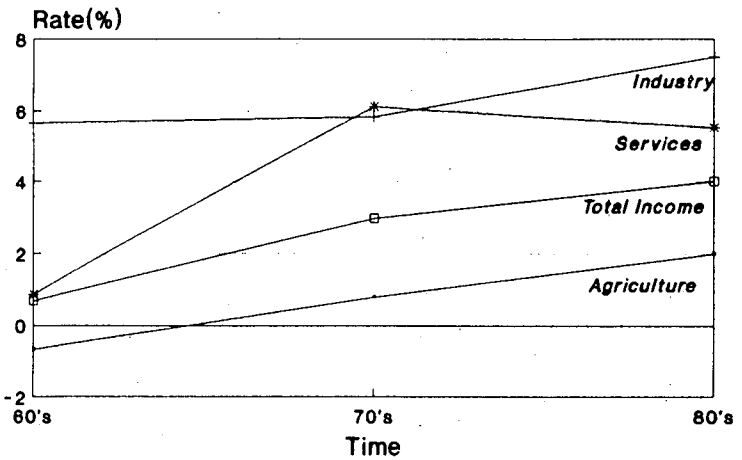
Data source: CSO, Estimates of State Domestic Product, various issues.

Table 3.L.4

Structural change of Income - Bihar						(Percent)
Income Structure	1961-65	1966-70	1971-75	1976-80	1981-85	1986-90
Agriculture	60.7	58.4	63.4	59.3	54.6	50.3
(Shift)		-2.3	5.0	-4.2	-4.7	-4.3
Industry	11.5	16.5	12.7	15.1	16.9	19.1
(Shift)		5.0	-3.9	2.4	1.8	2.2
Services	27.8	25.1	23.9	25.7	28.5	30.6
(Shift)		-2.7	-1.2	1.8	2.9	2.1
Trade	2.8	2.9	3.4	5.4	8.1	8.2
(Shift)		0.1	0.5	1.9	2.7	0.1
Transport & Communication	2.0	2.4	2.2	2.4	2.4	2.6
(Shift)		0.4	-0.2	0.2	0.0	0.2
Banking & Insurance	0.5	0.7	1.4	1.8	1.9	2.8
(Shift)		0.1	0.7	0.4	0.1	0.9
Real Estate	15.7	11.4	7.8	6.9	6.6	5.9
(Shift)		-4.3	-3.6	-0.9	-0.3	-0.7
Public Administration	2.8	3.1	3.9	3.6	3.6	4.2
(Shift)		0.3	0.8	-0.3	0.0	0.6
Other Services	4.0	4.6	5.2	5.7	6.0	7.0
(Shift)		0.6	0.6	0.5	0.4	1.0

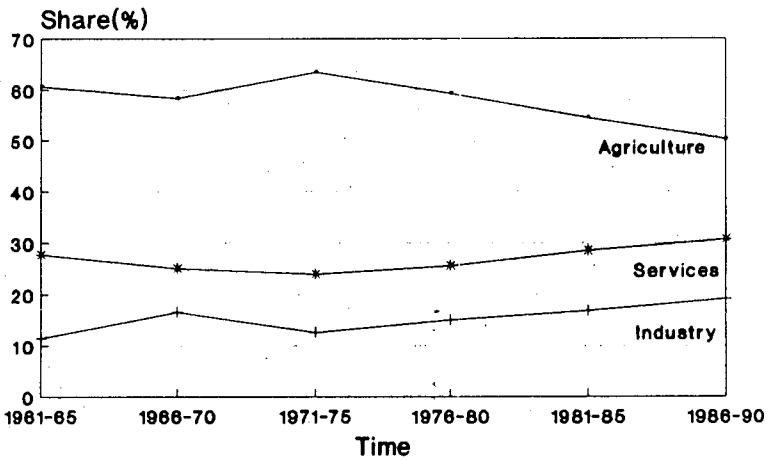
Data source : CSO, Estimates of State Domestic Products, various issues.

Income Growth
Bihar



Graph 3.L3

Structural Change of Income
Bihar



Graph 3.L4

it was stagnant throughout the period of the study. Table 3.L.4 represents the services share. Therefore, in Bihar, among the infrastructural services activities, it was trade and banking which had significant growth and share.

Himachal Pradesh

Table 3.L.5 (p-102) represents patterns of growth and table 3.L.6 (p - 103) represents structural change in Himachal Pradesh. Services had the highest rate of growth at 5.48 per cent per annum followed by industry at 3.77 per cent per annum and agriculture at 1.18 per cent per annum during the period 1971 to 1990. Services and industrial growth experienced an increase in their growth rates from seventies to eighties along with declining agricultural growth. The patterns of growth is captured in graph 3.L.5 (p-104). Among the shares, agriculture had the largest share at 42.2 per cent followed by services at 36.9 per cent and industry at 20.9 per cent during the period 1986-90. However, the share of agriculture was continuously falling with the rising share of services and industry with services rising at a faster pace as is evident from graph 3.L.6 (p - 104). As far as individual services activities are concerned, banking, trade, transport and public administration experienced high rates of growth and share (please refer table 3.L.5 and 3.L.6).

Jammu & Kashmir

Patterns of growth and structural change in Jammu & Kashmir is presented in tables 3.L.7 (p - 105) and 3.L.8 (p-106). The growth of industrial income at 6.90 per cent per annum followed by services at 4.28 per cent per annum and agriculture at 2.46 per cent per annum during the period 1961 to 1989. Jammu & Kashmir experienced stagnation in all sectors from seventies to eighties as evident from graph 3.L.7 (p-107). As far as shares are

Table 3.L.5

Services Income Growth - Himachal Pradesh			(Percent)
Income Structure	1971-80	1981-90	1971 to 1990
Trade	11.77	4.46	7.79
Transport	4.36	7.11	4.16
Banking & Insurance	13.25	15.58	14.70
Real Estate	2.83	2.51	2.54
Public Administration	4.60	8.56	5.63
Other Services	2.42	6.43	4.70

Income Growth - Himachal Pradesh			(Percent)
Income Structure	1971-80	1981-90	1971 to 1990
Agriculture	1.42	1.17	1.18
Industry	3.89	5.24	3.77
Services	5.84	6.60	5.48
State Income	3.10	3.84	3.19

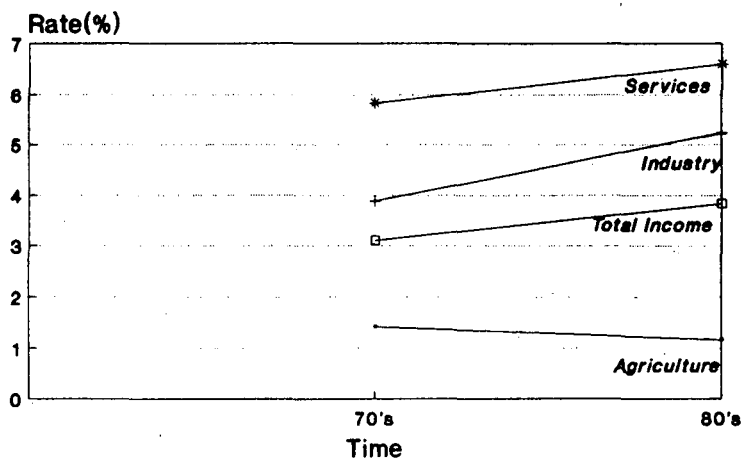
Data source: CSO, Estimates of State Domestic Product, various issues.

Tabel 3.L.6

Structural change of Income - Himachal Pradesh				(Percent)
Income Structure	1971-75	1976-80	1981-85	1986-90
Agriculture	54.4	51.9	48.3	42.2
(Shift)		-2.4	-3.6	42.2
Industry	19.8	19.8	19.1	20.9
(Shift)		0.0	-0.7	20.9
Services	25.8	28.3	32.6	36.9
(Shift)		2.4	4.3	36.9
Trade	3.2	5.0	6.3	6.4
(Shift)		1.9	1.2	6.4
Transport & Communication	1.9	2.0	2.0	2.3
(Shift)		0.1	-0.0	2.3
Banking & Insurance	0.8	1.3	2.4	4.1
(Shift)		0.5	1.1	4.1
Real Estate	6.5	6.5	6.6	6.0
(Shift)		-0.1	0.1	6.0
Public Administration	5.4	5.8	6.4	8.0
(Shift)		0.4	0.6	8.0
Other Services	8.0	7.7	9.0	10.1
(Shift)		-0.3	1.3	10.1

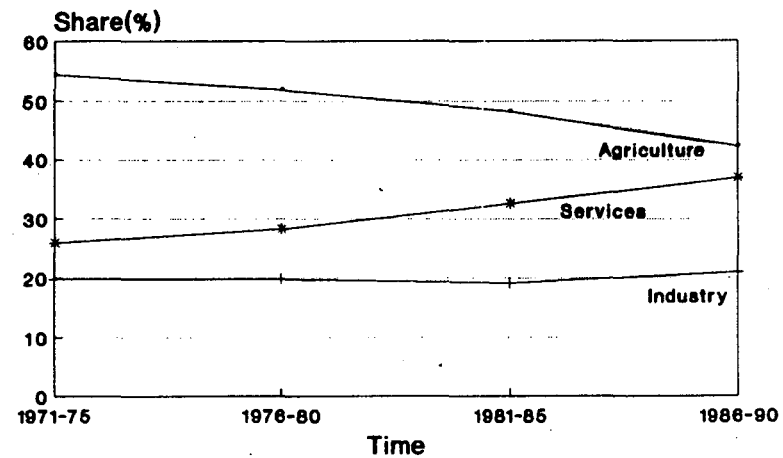
Data source : CSO, Estimates of State Domestic Products, various issues.

Income Growth
Himachal Pradesh



Graph 3.L5

Structural Change of Income
Himachal Pradesh



Graph 3.L6

Table 3.L.7

Income Growth - Jammu & Kashmir				(Percent)
Income Structure	1961-70	1971-80	1981-89	1971 to 1989
Agriculture	1.07	3.43	3.43	2.46
Industry	7.75	5.70	5.70	6.90
Services	5.95	5.35	5.35	4.28
State Income	3.08	4.36	4.36	4.05

Services Income Growth - Jammu & Kashmir				(Percent)
Income Structure	1961-70	1971-80	1981-89	1971 to 1989
Trade	1.29	5.21	5.21	3.68
Transport	11.65	7.16	7.16	7.71
Banking & Insurance	14.23	14.07	14.07	13.13
Real Estate	2.99	2.42	2.42	2.58
Public Administration	8.03	5.58	5.58	5.85
Other Services	4.72	3.14	3.14	3.99

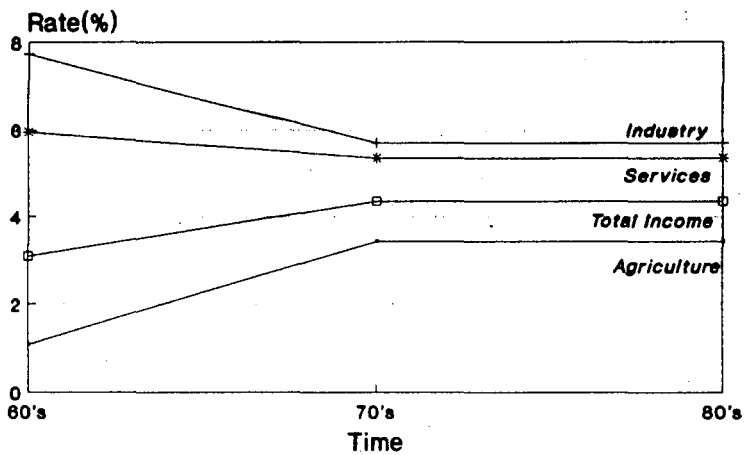
Data source: CSO, Estimates of State Domestic Product, various issues.

Table 3.L.8

Structural change of Income - Jammu & Kashmir				(Percent)
Income Structure	1971-75	1976-80	1981-85	1986-90
Agriculture	52.6	51.8	49.3	43.2
(Shift)		-0.8	-2.5	-6.0
Industry	12.4	12.9	15.2	19.3
(Shift)		0.5	2.3	4.1
Services	34.9	35.3	35.6	37.5
(Shift)		0.4	0.3	1.9
Trade	16.3	17.0	16.0	16.3
(Shift)		0.6	-0.9	0.3
Transport & Communication	0.6	0.7	0.9	1.0
(Shift)		0.1	0.2	0.2
Banking & Insurance	1.0	1.5	2.3	3.3
(Shift)		0.5	0.7	1.1
Real Estate	11.5	10.4	10.2	9.6
(Shift)		-1.1	-0.2	-0.6
Public Administration	4.8	5.1	5.6	6.6
(Shift)		0.3	0.4	1.0
Other Services	0.6	0.6	0.6	0.6
(Shift)		-0.0	0.1	-0.0

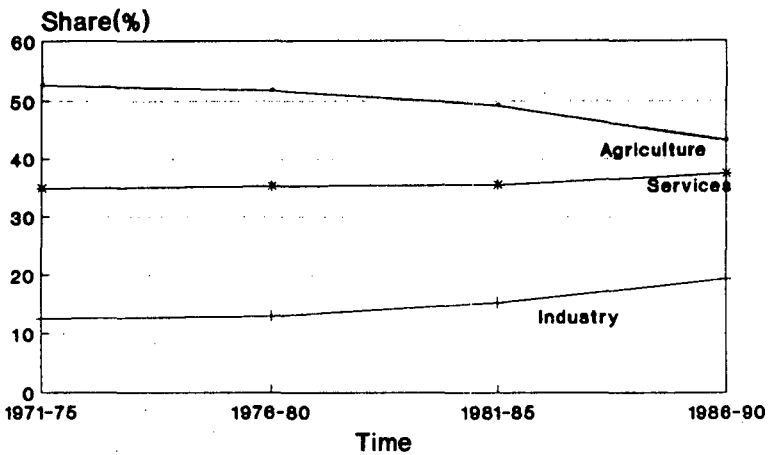
Data source : CSO, Estimates of State Domestic Products, various issues.

Income Growth
Jammu & Kashmir



Graph 3.L7

Structural Change of Income
Jammu & Kashmir



Graph 3.L8

concerned, agriculture had the largest at 43.2 per cent followed by services at 37.5 per cent and industry at 19.3 per cent during the period 1986-89. The share of agriculture was continuously falling with rising share of services and industry where, services were rising at a faster pace. This is evident from graph 3.L.8 (p-107). Among the individual service activities, banking, transport and public administration had high rates of growth. But as far as their shares were concerned, it was trade and real estate which had large shares (please refer table 3.L.8, p-106). The stagnation in Jammu and Kashmir can be attributed to the political disturbances in the state.

Madhya Pradesh

Patterns of growth and structural change in Madhya Pradesh is presented in table 3.L.9 (p-109) and 3.L.10 (p-110) respectively. Services registered 7.21 per cent per annum growth followed by industry at 5.64 per cent per annum and agriculture at 2.03 per cent per annum. There was a tremendous increase in services growth from seventies to eighties followed by increase in growth of other sectors. This has been captured in graph 3.L.9. The share of services was 37.4 per cent followed by industry at 19.4 per cent. Agricultural share was the largest at 43.2 per cent during the period 1986-90. However, share of agriculture was falling with tremendous rise in the share of services followed by mild increase in industrial share. As far as individual service activities are concerned, it was public administration with the largest share and highest rate of growth among the service activities. Transport, banking and other services experienced high rates of growth. However, share of transport was falling along with other services (please refer table 3.L.10).

Table 3.L.9

Income Growth - Madhya Pradesh			(Percent)
Income Structure	1971-80	1981-90	1971 to 1990
Agriculture	-1.25	2.10	2.03
Industry	4.88	5.84	5.64
Services	4.35	9.77	7.21
State Income	1.32	5.38	4.23

Services Income Growth - Madhya Pradesh			(Percent)
Income Structure	1971-80	1981-90	1971 to 1990
Trade	-0.23	2.88	2.37
Transport	6.49	5.47	5.45
Banking & Insurance	9.41	12.87	10.48
Real Estate	2.71	3.50	3.81
Public Administration	7.51	19.57	16.00
Other Services	5.88	9.09	6.82

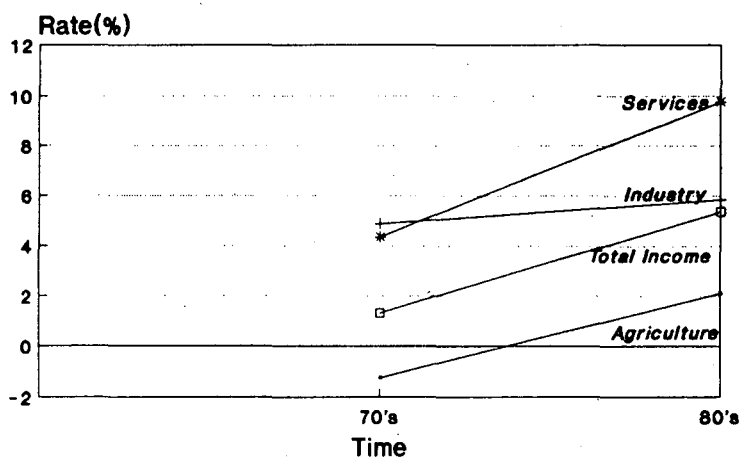
Data source: CSO, Estimates of State Domestic Product, various issues.

Table 3.L.10

Structural change of Income - Madhya Pradesh				(Percent)
Income Structure	1971-75	1976-80	1981-85	1986-90
Agriculture	59.7	54.0	50.5	43.2
(Shift)		-5.8	-3.4	-7.3
Industry	16.1	18.5	19.3	19.4
(Shift)		2.4	0.8	0.1
Services	24.1	27.5	30.2	37.4
(Shift)		3.4	2.7	7.2
Trade	8.0	7.5	6.9	6.1
(Shift)		-0.5	-0.6	-0.8
Transport & Communication	4.8	6.1	5.7	5.9
(Shift)		1.3	-0.4	0.2
Banking & Insurance	1.4	2.1	2.4	3.5
(Shift)		0.7	0.3	1.1
Real Estate	2.1	2.2	2.2	2.0
(Shift)		0.1	-0.1	-0.2
Public Administration	2.5	3.2	6.6	12.2
(Shift)		0.7	3.3	5.6
Other Services	5.2	6.3	6.4	7.7
(Shift)		1.1	0.1	1.3

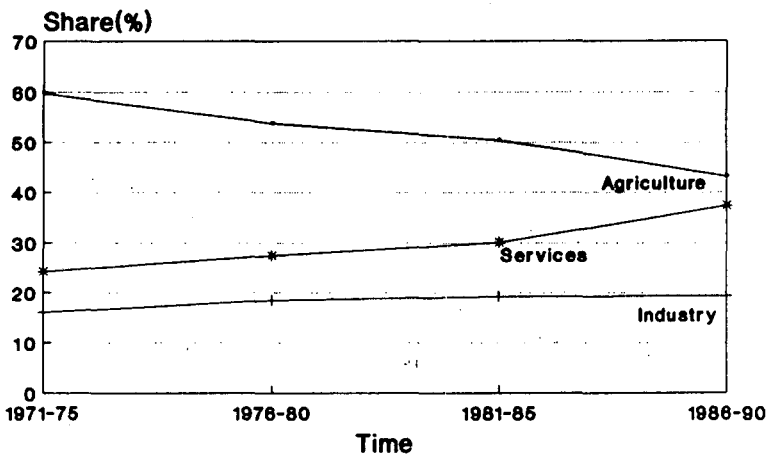
Data source : CSO, Estimates of State Domestic Products, various issues.

Income Growth
Madhya Pradesh



Graph 3.L9

Structural Change of Income
Madhya Pradesh



Graph 3.L10

Orissa

The patterns of growth and structural change in Orissa is presented in tables 3.L.11 (p- 113) and 3.L.12 (p - 114) respectively. The growth of services was at 4.19 per cent per annum followed by industry at 3.30 percent per annum and agriculture at 2.30 per cent per annum during the period 1971-90. There was a continuous increase in the growth of services and industry. This has been captured in graph 3.L.11. The share of services has been gradually increasing and was 31.8 per cent during the period 1986-90 followed by industry at 15.5 per cent and agriculture at 52.7 per cent. The share of agriculture was the largest in Orissa. This is captured in graph 3.L.12. As far as individual service activities are concerned, it was banking, public administration and transport which had high rates of growth and rising shares.

Rajasthan

The patterns of growth and structural change in Rajasthan is presented in table 3.L.13 and 3.L.14 respectively. The growth of services was the highest at 4.06 per cent per annum during the period 1961 to 1989 followed by industry at 2.83 per cent per annum and agriculture at 2.81 per cent per annum. All the states of the economy experienced a steady increase with services as the leading sector. This is captured in graph 3.L.13. The share of agriculture was the largest at 49.1 per cent followed by services at 31.6 per cent and industry at 19.3 per cent. The share of agriculture has been continuously falling along with rising share of services. This is captured in graph 3.L.14 (p-117). As far as individual service activities are concerned, banking, public administration and transport experienced high rates of growth and rising shares (please refer table 3.L.13 and 3.L.14).

Table 3.L.11

Income Growth - Orissa			(Percent)
Income Structure	1971-80	1981-90	1971 to 1990
Agriculture	1.20	3.07	2.30
Industry	6.67	7.27	3.30
Services	3.39	6.03	4.19
State Income	2.41	4.58	3.04

Services Income Growth - Orissa			(Percent)
Income Structure	1971-80	1981-90	1971 to 1990
Trade	1.22	3.87	2.49
Transport	4.75	10.48	5.53
Banking & Insurance	9.79	14.26	12.23
Real Estate	3.87	2.78	3.27
Public Administration	3.91	8.69	6.34
Other Services	4.00	7.06	5.03

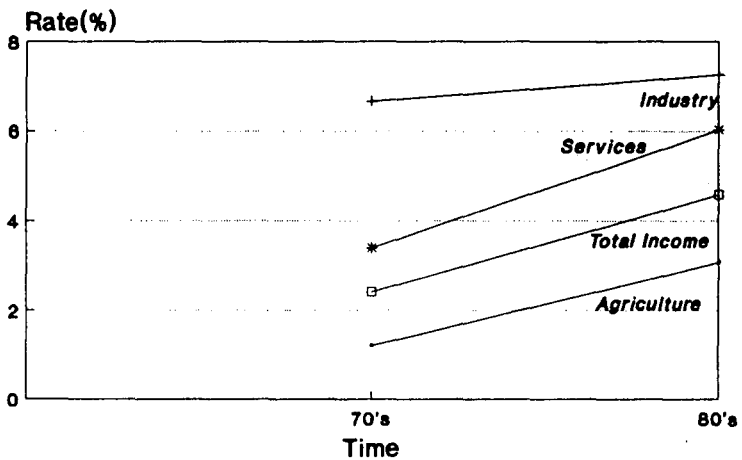
Data source: CSO, Estimates of State Domestic Product, various issues.

Table 3.L.12

Structural change of Income - Orissa				(Percent)
Income Structure	1971-75	1976-80	1981-85	1986-90
Agriculture	59.0	56.2	57.2	52.7
(Shift)		-2.8	1.1	-4.5
Industry	14.2	16.5	13.1	15.5
(Shift)		2.3	-3.4	2.4
Services	26.8	27.3	29.6	31.8
(Shift)		0.5	2.3	2.2
Trade	13.4	12.6	12.8	12.3
(Shift)		-0.7	0.1	-0.5
Transport & Communication	1.3	1.4	1.4	2.0
(Shift)		0.2	-0.1	0.6
Banking & Insurance	0.7	1.0	1.7	2.7
(Shift)		0.3	0.6	1.0
Real Estate	4.2	4.5	4.8	4.3
(Shift)		0.3	0.3	-0.5
Public Administration	3.1	3.4	4.2	5.1
(Shift)		0.3	0.8	0.9
Other Services	4.1	4.2	4.8	5.4
(Shift)		0.2	0.5	0.6

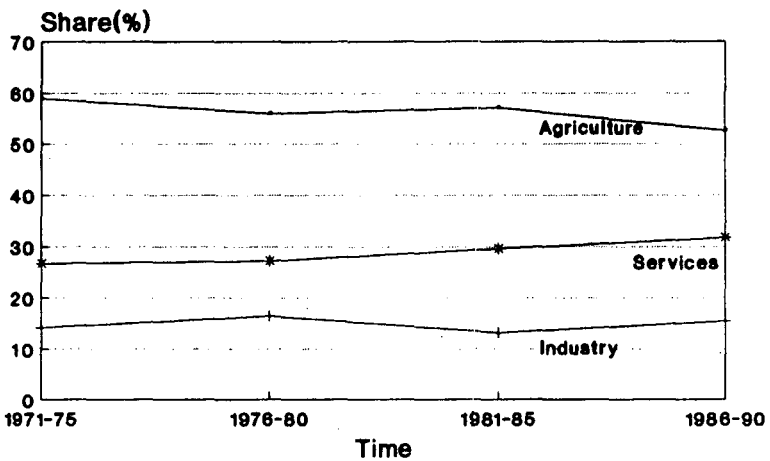
Data source : CSO, Estimates of State Domestic Products, various issues.

Income Growth
Orissa



Graph 3.L11

Structural Change of Income
Orissa



Graph 3.L12

Table 3.L.13

Income Growth - Rajasthan				(Percent)
Income Structure	1961-70	1971-80	1981-89	1961 to 1989
Agriculture	-0.12	1.75	2.86	2.81
Industry	1.79	4.15	5.86	2.83
Services	3.74	4.96	5.89	4.06
State Income	1.32	3.04	4.40	3.54

Services Income Growth - Rajasthan				(Percent)
Income Structure	1961-70	1971-80	1981-89	1961 to 1989
Trade	2.06	3.37	4.36	3.37
Transport	4.85	5.15	6.33	4.20
Banking & Insurance	5.10	11.95	11.84	9.18
Real Estate	1.63	4.39	3.81	4.11
Public Administration	6.31	8.82	9.71	6.89
Other Services	4.29	4.21	4.93	2.43

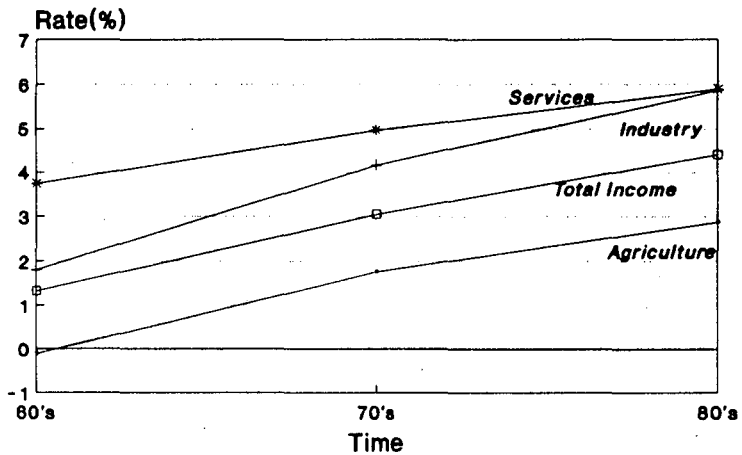
Data source: CSO, Estimates of State Domestic Product, various issues.

Table 3.L.14

Structural change of Income - Rajasthan						(Percent)
Income Structure	1961-65	1966-70	1971-75	1976-80	1981-85	1986-90
Agriculture	56.0	52.5	56.2	54.2	54.3	49.1
(Shift)		-3.4	3.7	-2.1	0.1	-5.1
Industry	19.5	20.4	19.0	18.8	17.3	19.3
(Shift)		0.9	-1.3	-0.3	-1.5	2.0
Services	24.5	27.1	24.7	27.1	28.4	31.6
(Shift)		2.6	-2.4	2.3	1.4	3.1
Trade	10.9	11.4	10.9	11.7	11.2	11.7
(Shift)		0.5	-0.5	0.8	-0.4	0.5
Transport & Communication	1.9	2.4	2.2	2.3	2.3	2.7
(Shift)		0.4	-0.2	0.1	0.0	0.4
Banking & Insurance	0.9	1.1	1.3	2.0	2.6	3.6
(Shift)		0.2	0.2	0.7	0.6	1.1
Real Estate	3.6	3.7	3.9	3.9	4.3	4.4
(Shift)		0.1	0.2	0.1	0.4	0.1
Public Administration	1.6	2.1	2.1	2.7	3.3	4.1
(Shift)		0.5	-0.1	0.6	0.6	0.8
Other Services	5.5	6.5	4.5	4.5	4.8	5.1
(Shift)		0.9	-2.0	0.0	0.3	0.4

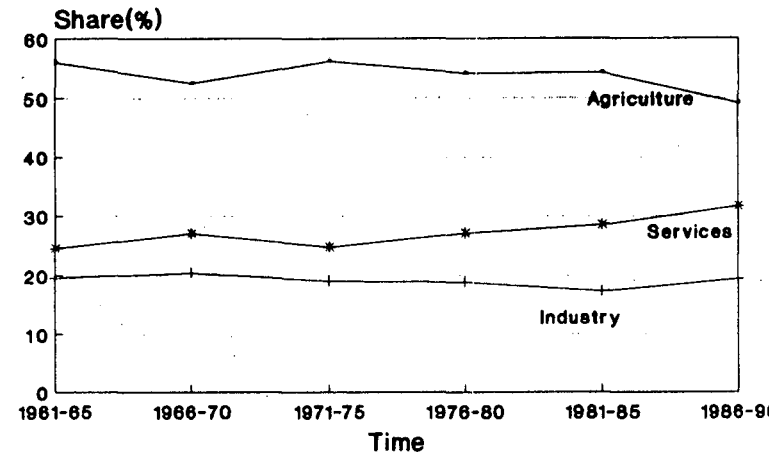
Data source : CSO, Estimates of State Domestic Products, various issues.

Income Growth
Rajasthan



Graph 3.L13

Structural Change of Income
Rajasthan



Graph 3.L14

Uttar Pradesh

The patterns of growth and change in Uttar Pradesh are presented in tables 3.L.15 (p-120) and 3.L.16 (p-121) respectively. Industrial growth was the highest at 5.52 per cent per annum followed by services at 3.85 per cent per annum and agriculture at 2.31 per cent per annum during the period 1961 to 1990. The rates of growth in all these sectors experienced a general increase. This is captured in graph 3.L.15 (p-121a). But looking at shares it can be inferred that services and industry were rising slowly with a mild fall in the share of agriculture from the sixties to eighties. This has been captured in graph 3.L.16 (p-121a). As far as individual service activities are concerned, it was banking, public administration and transport which had high rates of growth and rising share only in transport and banking.

Summarising the discussion, among the low income states, industry and agriculture were the leading sectors followed by services. But the note worthy fact is that, the share and growth of services had been rising. And within services, banking, transport and public administration were growing at a faster pace. As these activities are basic infrastructure for the economy therefore, such growth is desirable.

Table 3.L.15

Income Growth - Uttar Pradesh				(Percent)
Income Structure	1961-70	1971-80	1981-90	1961 to 1990
Agriculture	0.79	1.24	2.39	2.31
Industry	3.86	5.45	6.49	5.52
Services	2.52	3.59	6.09	3.85
State Income	1.60	2.62	4.36	3.37

Services Income Growth - Uttar Pradesh				(Percent)
Income Structure	1961-70	1971-80	1981-90	1961 to 1990
Trade	1.54	3.08	3.81	3.20
Transport	3.85	4.90	6.27	5.30
Banking & Insurance	5.77	9.20	14.72	9.13
Real Estate	1.51	3.85	3.84	3.52
Public Administration	1.89	2.26	8.75	3.71
Other Services	3.81	2.20	7.68	3.60

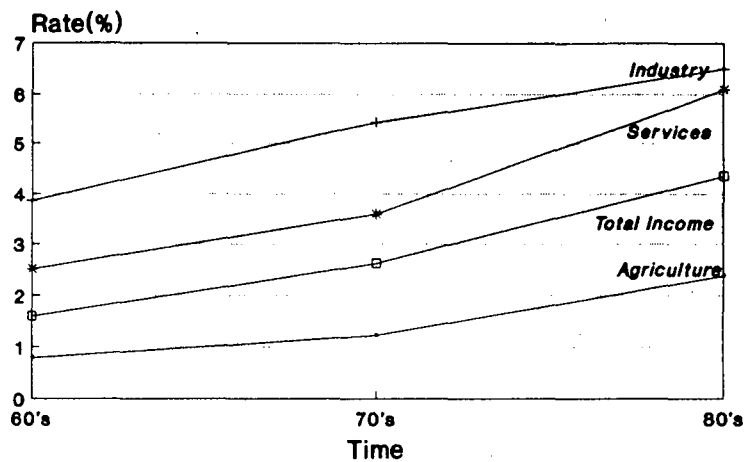
Data source: CSO, Estimates of State Domestic Product, various issues.

Table 3.L.16

Structural change of Income - Uttar Pradesh						(Percent)
Income Structure	1961-65	1966-70	1971-75	1976-80	1981-85	1986-90
Agriculture	58.8	56.5	54.9	52.4	50.5	45.7
(Shift)		-2.3	-1.6	-2.5	-1.9	-4.8
Industry	11.3	12.4	13.5	15.2	17.1	19.0
(Shift)		1.1	1.1	1.7	2.0	1.9
Services	29.9	31.1	31.6	32.4	32.4	35.2
(Shift)		1.2	0.5	0.8	-0.0	2.9
Trade	14.1	14.1	14.2	14.7	14.1	13.7
(Shift)		-0.0	0.0	0.5	-0.6	-0.4
Transport & Communication	1.7	1.9	2.1	2.3	2.6	2.8
(Shift)		0.2	0.1	0.2	0.3	0.3
Banking & Insurance	0.9	1.1	1.3	1.8	2.3	3.6
(Shift)		0.2	0.3	0.5	0.4	1.4
Real Estate	4.6	4.6	4.3	4.4	4.8	4.8
(Shift)		0.0	-0.3	0.1	0.4	-0.1
Public Administration	3.0	3.1	3.2	3.0	2.9	3.6
(Shift)		0.0	0.1	-0.2	-0.0	0.7
Other Services	5.6	6.3	6.5	6.2	5.7	6.7
(Shift)		0.7	0.2	-0.3	-0.6	1.0

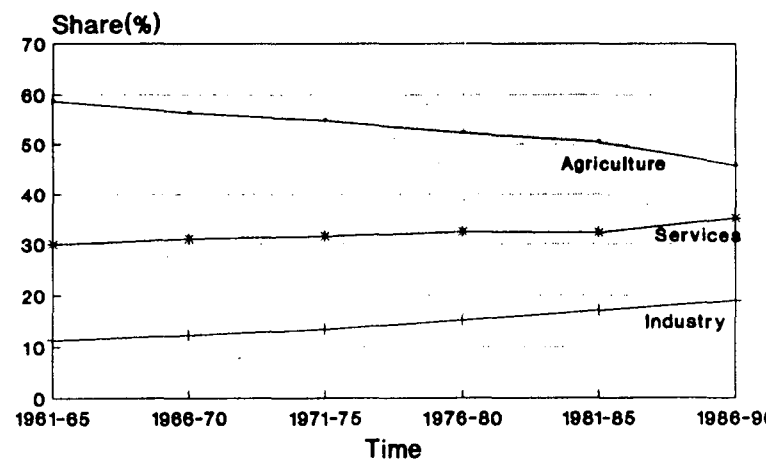
Data source : CSO, Estimates of State Domestic Products, various issues.

Income Growth
Uttar Pradesh



Graph 3.L15

Structural Change of Income
Uttar Pradesh



Graph 3.L16

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CHAPTER IV

Services Growth - Tests of Co-integration and Causality

Following the brief discussion on the growth and change in the Indian economy, an attempt is made to explain the agricultural growth, industrial growth and NDP growth due to growth in services. One direct method to examine whether growth in one sector explains the growth in the other sector is through the application of Granger casualty[1]. This study uses this method to test the direction of casualty in both Granger's (1969) sense and Sims's (1972) sense. Granger's and Sims's notion of causality is distinguished in the subsequent sections. Before testing for causality it becomes necessary to establish what Granger had assumed in lieu of the data characteristics. Granger's definition of causality between two time series was assumed to be covariance stationary. Therefore, stationarity of the time series is tested and appropriate transformation is done to solve the problem of non-stationarity. Furthermore, transformation of the data through first differencing to convert a series to achieve stationarity might loose information in the process. Henceforth co-integration tests are carried out to examine whether there exists a long-run equilibrium relationship between the given two time series.

4.1. Methodology

Geweke's cannonical causality formulation is used to test causality in the Granger's and Sims's sense for the following series;

1) Agricultural growth & Services growth

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[1] Kalirajan (1994)

2) Industrial growth & Services growth

3) NDP growth & Services growth

after testing for stationarity and co-integration of the above series.

4.1.1. Non-stationarity of Time Series

It is generally accepted that most of the time series are non-stationary[2]. Non stationarity of time series may lead to the problem of spurious regression and there upon it can significantly affect the tests of hypothesis concerning the causal relationships between the macro-economic sectors[3]. Therefore testing for non stationarity or unit roots are essential. Before discussing the appropriate tests for unit roots it is essential to distinguish between the two types of stationary process namely, trend stationary process (TSP) and difference stationary process (DSP).

Consider the model,

$$Y_t = \alpha + \beta Y_t + \Gamma T + \varepsilon_t \qquad ...(4.1)$$

where

Y_t is the series to be tested for stationarity

T is the time trend

ε_t is a white noise stationary series with mean zero and constant variance

i.e., $\varepsilon_t \approx N(0, \sigma^2_\varepsilon)$.

For the above model, we obtain TSP if $|\beta| < 1$ and $\Gamma \neq 0$ and a DSP if $\beta = 1$ and $\Gamma = 0$. The remedy for a TSP is to remove the deterministic linear trend by prior regression

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[2] Upadhyay (1992), Kalirajan (1994), Sarma & Rao (1992)

[3] Engle & Granger, 1987)

on a time trend and working with the residuals or incorporating a time trend in the model. However, a trend may be stochastic rather than deterministic, and the stochastic trend can be removed by first differencing (Perman, 1991). In the case of DSP too, first differencing of the series will attain stationarity. A DSP is also called 'random walk with a drift'.

Dickey and Fuller had formulated the following test

$$Y_t = C_1 + C_2 T + \Gamma Y_{t-1} + \Sigma \beta i \, \Delta Y_{t-i} + \varepsilon_t \quad ; i = 1 \text{ to } m \quad ...(4.2)$$

Where,

Y_t is the series to be tested for stationarity

T is the time trend

ε_t is the white noise residual

The null to be tested is $|\Gamma| = 1$; non stationary

The widely used test for unit roots is the Augmented Dickey Fuller test (ADF).

The ADF regression may be written as

$$\Delta Y_t = C_1 + C_2 T + \Gamma Y_{t-1} + \Sigma \beta i \, \Delta Y_{t-i} + \varepsilon_t \quad ; i = 1 \text{ to } m \quad ...(4.3)$$

if $\Gamma = 0$ following Dickey and Fuller (1979) then DSP hypothesis is valid. The process of testing the hypothesis $\Gamma = 1$ in equation (4.2) or $\Gamma = 0$ in equation (4.3) is called testing for unit root i.e., non stationarity or I(1), integrated of order one. The first differencing produces a stationary series which would be I(0).

To test the hypothesis $|\Gamma| = 0$, Dickey and Fuller have suggested the statistics which are calculated as 't' Statistics, but since under the null hypothesis concerned, the observations are not independent, the distribution of these statistics do not follow the usual 't' distribution.

Dickey and Fuller (1979) had derived the limiting distribution and had calculated the lower percentage points at different levels of significance using Monte-carlo Simulation technique (Upadhyay, 1992).

An important aspect to be noted is that, lagged first difference terms are included in equations (4.2 & 4.3) to generate white noise[4], it is preferred to used regressions augmented with lags that are necessary to eliminate serial correlation in the residuals. Therefore, lags are incorporated to generate non auto-correlated error term or white noise residuals. The lag that generates a white noise is applied to the model.

In this study the following series, Agricultural income, industrial income, services income and the NDP are tested for stationarity with lags that generate white noise. The results of these tests are discussed in Section 4.2.

4.1.2. Tests of Co-integration

Referring back to the discussion that most of the time series are non stationary and that first differencing would lead to I(0) (i.e., would attain stationarity), will ultimately result in loss of information. Thus the estimation of Granger and Sims causality tests will be based on limited information and the results may not give the true relationship between the two series and sometimes may result in spurious relationships. Further more, co-integration between two series will explain a long run equilibrium relationship as to whether the two series move together and attain an equilibrium relationship in the long run though they may not do so in the short run. Henceforth, it becomes necessary to test for co-integration before

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[4] Serially uncorrelated ε in eq. (4.2)

testing for causality as this would investigate for `suitability and appropriateness'[5] of the two series to be used for testing causality.

The Co-integration Model

Consider the model,

$Y_t = \alpha + \beta X_t + U_t$ ...(4.4)

The series Y_t and X_t are said to be cointegrated if the linear residual relationship of equation (4.4) has the coefficient different from 1.

Now suppose Y_t is I(1) and X_t is I (1). Then it is true that $aX_t + bY_t$ is I(1) i.e., regression of Y on X or X on Y cannot generate white noise residuals of I(0). This is commonly known to be spurious regression. However, if there is no non-zero ß such that $Y_t - \beta X_t$ is I(0) or U_t is I(0), then Y_t and X_t are said to be co-integrated [Mukhopadhyay, 1993]. U_t is also known to be 'equilibrium error' in the regression $Y_t = \beta X_t + U_t$, were U_t is I(0), this basically refers to equilibrium error being stationary. Henceforth, Y_t and X_t will not drift apart but will move together [Mukhopadhyay, 1993].

Following equation 4.4

$U_t = \phi U_{t-1} + \varepsilon_t$ ...(4.5)

where

ε_t is white noise with mean zero and constant variance. The null hypothesis tests here is $\phi = 1$, i.e., the given series Y_t and X_t are non cointegrated (H_o: $\phi = 1$; non co-integration).

---

[5] Kalirajan & Shand, 1992

In the equation (4.5), if $\phi = 1$ then $U_t - U_{t-1} = \varepsilon_t$ which is I(0). Precisely, co-integration refers to the residuals of the co-integrating regression being I(0).

Co-integration literature provides several techniques for testing the hypothesis that Y_t and X_t are non-integrated. Following Mukhopadhyay (1993) and Perman (1991). We shall essentially discuss and use the Augmented Dickey Fuller tests (ADF) to test the null hypothesis that Y_t and X_t are non cointegrated.

ADF Regression

$$\Delta U_t = -\phi U_{t-1} + \Sigma\delta_i \Delta U_{t-i} + \varepsilon_t \quad ; i = 1 \text{ to } m \quad ...(4.6)$$

Where ε_t is white noise, with mean zero and constant variance.

In equation (4.6), U_t are the residuals of the co-integrating regression (4.4). Here, the null hypothesis is, H_o: $\phi = 0$; non co-integration. This is equivalent to testing for $\phi = 1$ in equation 4.5. The t-statistic on ϕ is used to test the null hypothesis of non co-integration. Critical values for this t-statistic are given in Engle & Granger (1987).

This study uses the ADF regression to test Engle-Granger co-integration for the following series

1) Agricultural income and Services income

The co-integrating regression for agricultural income and services income is;

$$\ln A_t = \alpha + \beta \ln S_t + U_t \quad ...(4.7)$$

following (4.7)

$$\Delta U_t = -\phi U_{t-1} + \Sigma\beta i \Delta U_{t-i} + \varepsilon_t \quad ...(4.8)$$

H_0: $\phi = 0$; agricultural income and services income are non co-integrated.

Where, $\ln A_t$ = log(agricultural income)

$\ln S_t$ = log(services income)

U_t = residuals of the co-integrating equation (4.7)

ε_t = white noise $\approx N(0,\sigma^2\varepsilon)$

2) Industrial income and Services income

$$\ln I_t = \alpha + \beta \ln S_t + U_t \qquad ...(4.9)$$

following (4.9)

$$\triangle U_t = - \phi U_{t-1} + \Sigma\beta i \triangle U_{t-i} + \varepsilon_t \qquad ...(4.10)$$

H_0: $\phi = 0$; industrial income and services income are non co-integrated.

Where, $\ln I_t$ = log(industrial income)

$\ln S_t$ = log(services income)

U_t = residuals of the co-integrating equation (4.10)

ε_t = white noise $\approx N(0,\sigma^2\varepsilon)$

3) NDP income and Services income

$$\ln N_t = \alpha + \beta \ln S_t + U_t \qquad ...(4.11)$$

following (4.11)

$$\triangle U_t = - \phi U_{t-1} + \Sigma\beta i \triangle U_{t-i} + \varepsilon_t \qquad ...(4.12)$$

H_0: $\phi = 0$; NDP and services income are non cointegrated.

Where, $\ln N_t$ = log(NDP)

$\ln S_t$ = log(services income)

U_t = residuals of the co-integrating equation (4.11)

εt = white noise $\approx N(0,\sigma^2\varepsilon)$

The Summary results are discussed in Section 4.3

4.1.3. Geweke's Cannonical formulation for testing causality[6]

The general model of Granger causality tests are discussed in chapter one. The hypothesis are also defined for the three macro sectors of the economy. Before explaining Geweke's Cannonical frame work testing for Granger causality, it becomes necessary to distinguish between Granger and Sims causality[7].

Granger Causality

Granger's definition of causality for a given two time series X_t and Y_t which are assumed to be covariance stationary can be functionally denoted as:

$Y_t = f\ \{Y_{(t-i)}, X_{(t-i)}\}$

H0 : the co-efficients are jointly different from zero.

Basically, in Granger's test, test for Causality is done by regressing Y on the past values of X and itself.

Sims' Causality

Sims' model test Granger's hypothesis by regressing Y on the past, current and future values of X. Functionally,

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[6] This section heavily borrows from Geweke (1984) and Sarma & Rao, (1992)

[7] Kalirajan & Shand, 1992.

$Y_t = f \{X_{(t-i)}, X_{(t)}, X_{(t+1)}\}$

H_o : the coefficients of $X_{(t+1)}$ are jointly different from 0.

Granger's notion of causality asserts that X causes Y if the past lagged values of X can be used to predict Y more accurately than by just using the past lagged values of Y. Whereas under the Sims's method, the dependent variable is regressed on past, current and future values of the independent variable and the tests are done whether future values of the independent variable as a group can improve the prediction of the dependent variable. If causality runs from the independent variable to the dependent, then the co-efficients of the future values of the independent variables should be insignificant as a group.

The causality testing methods adopted in this study are based on the cannonical formulation provided by Geweke (1984). This method uses vector auto regression (VAR) framework. This method enables quantification of the strength of causality. This method provides Wald, likelihood-ratio and Lagrange multiplier measures of the causality tests. This is the main advantage of this over the others which are basically based on F tests. Further more, this method allows for multivariate causality testing other than bivariate causality testing using VAR framework.

The method of testing for causality using VAR is discussed briefly below;

$[I-A(L)]\ Z_t = e_t$ ...(4.12)

where Z_t is a `K' dimensional vector of variables involved in testing for causality (2 in our case). `A' is a Matrix polynomial of order P in the lag/lead operator L where each co-efficient matrix is of the dimension (k.k) and I is an identity matrix. The error

term of the vector `e' are serially uncorrelated.

Let Z be partitioned into two sub vectors X and Y of dimensions l and g respectively. This facilitates testing for Granger causality between the two groups. The partitioned VAR system will be of the following form.

$$\begin{bmatrix} X \\ Y \end{bmatrix} = \begin{bmatrix} Axx(L) & Axy(L) \\ Ayx(L) & Ayy(L) \end{bmatrix} \bullet \begin{bmatrix} X \\ Y \end{bmatrix} + \begin{bmatrix} U \\ V \end{bmatrix} \qquad ...(4.14)$$

where A_{ij} (L) such that (i,j = x,y) denote the partitioned matrix polynomials. The linear dependence between the two sub-vectors is tested by putting four alternative sets of restrictions on the matrix polynomials.

System: 1

The first set of restrictions implies a system where the sub-vectors x and y are mutually independent and each is a auto regressive function with lags specified. The errors are denoted as u_1 and v_1 and their respective variances as Σ_1 and T_1. The restrictions on the polynomials imply that the errors are contemporaneously independent.

System: 2

The second system implies that the matrix polynomials A_{ij} are non-zero for $i \neq j$ with the two sub-vectors of errors as contemporaneously independent. The variances of the two errors are denoted by Σ_2 and T_2 respectively.

System: 3

The third system implies that the error variance-covariance matrix may not be a diagonal matrix but rather contain non-zero off-diagonal elements. Subsequently, this model

should be estimated by pre-multiplying the system with a factor matrix such that the transformed errors are uncorrelated with the independent variables in the respective equations and therefore ordinary least squares can be applied for estimation. By virtue of this transformation, the system might contain zero-lagged (current) independent variables [Sarma & Rao, 1992]. The variances of the two errors are denoted by Σ_3 and T_3 respectively.

System: 4

In this set, the order of the matrix polynomials are relaxed to accommodate non-zero matrix co-efficients for lag L = -p to p. The variances of the two errors are denoted by Σ_4 and T_4 respectively.

Following these four systems, the following types of measures of causality or `linear feedbacks' are computed.

(i) Feed back from X to Y; $F_{x \dashrightarrow y} = \ln (|T_1|/|T_2|)$.

(ii) Feed back from Y to X; $F_{y \dashrightarrow x} = \ln (|\Sigma_1|/|\Sigma_2|)$.

iii) Instantaneous feed back between X and Y;

$F_{x <\dashrightarrow> y} = \ln (|\Sigma_2|/|\Sigma_3|)$.

(iv) Total mutual linear dependence

$F_{x,y} = \ln (|T_1|/|T_4|)$.

Based on the above measures, the Granger causality tests are examined by calculating the likelihood ratio (LR) test statistics. For testing the direction of causality from X to Y, the LR statistic is computed as n. $\ln (|\Sigma_1|/|\Sigma_2|)$ for Granger's test and LR for Sims test as n . $\ln (|T_3|/|T_4|)$. While testing the null hypothesis that no causality exists between X to Y, the LR statistic is compared with the chi-square distribution with p degrees of freedom.

Similarly, the LR test is also used for testing causality from Y to X, instantaneous causality and total mutual linear dependence.

Geweke also provides for computation of the Wald and Lagrange multiplier (LM) test statistics, where Wald test is calculated as n. (tr $(\Sigma_1 \Sigma_2^{-1})$-k) and LM test as n.(k-tr $(\Sigma_2 \Sigma_1^{-1})$) for Granger causality. For Sims causality Wald test is calculated as n.(tr$(T_3T_4^{-1})$-l) and LM test as n.(l-tr$(T_4T_3^{-1})$).

For the present study, the two vector time series X and Y are one dimensional vectors and refer to

(i) Agricultural growth and services growth

(ii) Industrial Growth and services growth

iii) NDP growth and services growth.

Following the above methodology stationarity tests, co-integration tests and Grange & Sims causality tests were examined for the macro sectors of the Indian economy.

4.2. Empirical tests for Stationarity

The Augmented Dickey fuller test for testing stationarity is used on log values of agricultural income, industrial income and services income for the period 1950-51 to 1992-93.

4.2.1. Stationary test for agricultural income

Table 4.2.1 gives the summary results of the stationarity tests carried out an log values of agricultural income for lag 2 (since lag 2 generates a white noise residual). It was found

that the series, agricultural income was non stationary ($|\Gamma| = 0$) by comparing the Dickey fuller (D-F) statistic with the Dickey fuller (D-F) tables[8]. Therefore this series requires first differencing to transform the series to a stationary process.

4.2.2. Stationary test for industrial income

Table 4.2.2 gives the summary results of the stationarity tests for unit roots in the log values of industrial income for lag 1 (since lag 1 generates a white noise residual). The calculated Dickey fuller statistic was insignificant i.e., $|\Gamma| = 0$. Therefore, the series industrial income was non-stationary, I(1). Henceforth, first differencing is necessary for transformation of the series into a stationary process.

4.2.3. Stationary test for services income

Table 4.2.3 gives the summary results of the stationarity tests for unit roots in the log values of services income for lag 1 (since lag 1 generates a white noise residual). The Dickey fuller test statistic calculated was found insignificant thus accepting the null hypothesis $|\Gamma| = 0$, implying that the series, services income is non stationary, I(1). Therefore, first differencing of the series would transform the series to a stationary process.

4.2.4. Stationary test for NDP

Table 4.2.4 gives the summary results of the stationarity tests for unit roots carried out on the log values of NDP for lag 1 (since lag 1 generates a white noise residuals). The Dickey fuller test statistic calculated was insignificant when compared to the table value, thus

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[8] Dickey Fuller tables are given in Appendix I.

Table 4.2.1

Augmented Dickey Fuller Tests for Unit Roots				
Series: Log(Agricultural Income)				
Lag	| Γ |	D-F statistic	LM test#	Result
2	0.727	2.741	no SC	Non stationary, I(1)
Notes - ** 1 percent level of significance.				
* 5 percent level of significance.				
# LM test for serial correlation (SC).				

Table 4.2.2

Augmented Dickey Fuller Tests for Unit Roots				
Series: Log(Industrial Income)				
Lag	| Γ |	D-F statistic	LM test#	Result
1	0.241	2.601	no SC	Non stationary, I(1)
Notes - ** 1 percent level of significance.				
* 5 percent level of significance.				
# LM test for serial correlation (SC).				

Table 4.2.3

Augmented Dickey Fuller Tests for Unit Roots				
Series: Log(Services Income)				
Lag	| Γ |	D-F statistic	LM test#	Result
1	0.034	0.625	no SC	Non stationary, I(1)
Notes - ** 1 percent level of significance.				
* 5 percent level of significance.				
# LM test for serial correlation (SC).				

Table 4.2.4

Augmented Dickey Fuller Tests for Unit Roots				
Series: Log(NDP)				
Lag	| Γ |	D-F statistic	LM test#	Result
1	0.198	1.511	no SC	Non stationary, I(1)
Notes - ** 1 percent level of significance.				
* 5 percent level of significance.				
# LM test for serial correlation (SC).				

accepting the null hypothesis $|\Gamma| = 0$. Therefore it was found that the series, NDP is non stationary for the lag 1. Henceforth, the common remedy is to perform first differencing to transform the series to a stationary process.

On the whole it was found that all the series used in this study i.e., Agricultural income, industrial income, services income and the NDP were non stationary, i.e., I(1). As mentioned in the previous sections, first differencing would convert the respective series to a stationary process.

4.3. Empirical tests of co-integration

The co-integration tests using the Augmented Dickey Fuller regression are examined for the period 1950-51 to 1992-93 for the series mentioned in section 4.1.2.

4.3.1. Co-integration between agricultural income and services income

Table 4.3.1 gives the summary results of Engle-Granger co-integration tests between agricultural income and services income. The null hypothesis that agricultural income and services income are non cointegrated (i.e., $\phi = 0$) is rejected if the calculated 't' value is greater than the critical D-F table[9] value. Thus confirming co-integration. In the present relationship (equation 4.7 and 4.8) the null hypothesis is rejected for lag 1, at 1 per cent level of significance (since lag 1 generates a white noise residual in the equation 4.8). Thus implying that the two series agricultural income and services income are cointegrated. Therefore it can be inferred that the two series agricultural income and services income move

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[9] Dickey Fuller table for co-integration is presented in Appendix II.

together over time and attain a long run equilibrium relationship.

The necessary condition for co-integration between the two series, is that agricultural income and the services income must have unit roots, I(1)[10]. If the residuals of the co-integrating regression of agricultural income on services income has I(0) then the two series are said to be cointegrated. In the co-integrating equation(4.7), the residuals ≈ I(0) along with agricultural income and services income as I(1). As a result there exists co-integration between them.

4.3.2. Co-integration between industrial income and services income

Table 4.3.2 gives the summary results of Engle-Granger co-integration test between the two series industrial income and services income. The null hypothesis that industrial income and services income are non cointegrated (i.e., $\phi = 0$) stands accepted for lag 1 (since lag 1 generates white noise residuals in equation (4.10)) following the D-F statistic comparison between calculated values and the critical table values implying nonexistence of co-integration between industrial income and services income. Therefore it can be inferred that industrial income and services income do not move together. In other words there is no long run equilibrium relationship between the series industrial income and services income.

The necessary condition for co-integration is that the series must have unit roots i.e., I(1). If the resulting residuals for the co-integrating regression (4.9) ≈ I(0) then the two series are said to be cointegrated. For the present relationship the tests confirm that U_t does not ≈ I(0), as I_t and S_t ≈ I(1).

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[10] non stationary.

4.3.3. Co-integration between NDP and services income

The summary results of the Engle-Granger co-integration test between NDP and services income are presented in table 4.3.3. The test is carried out under the null hypothesis that the two series NDP and services income are non cointegrated (i.e., $\phi = 0$). The results show that the null hypothesis is rejected at 1 per cent level of significance for lag 1 (since lag 1 generates white noise residual in the error terms) signifying that co-integration exists between NDP and services income as the D-F statistic is higher than the critical table value. Therefore, NDP and services move together and there exists a long run equilibrium relationship between them.

The necessary condition for co-integration that NDP and services income have unit roots was established. The residuals of the co-integrating regression 4.11. were I(0) and hence there exists co-integration between NDP and services income.

4.4. Empirical tests for causality

In this section we discuss causality tests carried out using Geweke's cannonical formulation under the VAR frame work. It is more appropriate to test for causality between those series which are also cointegrated. This would further confirm that causality results are more reliable as the two series which are tested for causality also move together implying existence of a long run equilibrium relationship. Before testing for causality, it is necessary that the series are transformed to be stationary[11] in case they are integrated of order one (i.e., I(1), implying non stationarity). Following the results[12] of stationarity in section 4.2, all the

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[11] following Granger(1969).

[12] Table 4.2.1, 4.2.2, 4.2.3

Table 4.3.1

Engle-Granger Cointegration Tests				
between Agricultural growth and Services growth				
Lag	$\lvert \phi \rvert$	D-F Statistic	LM test#	Result
1	1.018	4.756 **	no SC	Cointegrated
Notes - ** 1 percent level of significance.				
* 5 percent level of significance.				
# LM test for serial correlation (SC).				

Table 4.3.2

Engle-Granger Cointegration Tests				
between Industrial growth and Services growth				
Lag	$\lvert \phi \rvert$	D-F statistic	LM test#	Result
1	0.231	2.362	no SC	Non cointegrated
Notes - ** 1 percent level of significance.				
* 5 percent level of significance.				
# LM test for serial correlation (SC).				

Table 4.3.3

Engle-Granger Cointegration Tests				
between NDP growth and Services growth				
Lag	$\lvert \phi \rvert$	D-F statistic	LM test#	Result
1	1.071	5.011 **	no SC	Cointegrated
Notes - ** 1 percent level of significance.				
* 5 percent level of significance.				
# LM test for serial correlation (SC).				

series are first log differenced[13]. The causality tests are then examined between services income and agricultural income, industrial income & the NDP. The results of causality will be inferred as growth in agricultural income or agricultural growth, industrial growth and NDP growth due to services growth. The reason for the above naming convention is that causality basically explains growth in a variable due to growth in the other variable....

4.4.1. Causality testing between services growth and agricultural growth

The summary results of the Granger and Sims causality tests are presented in table 4.4.1 (page, 143 & 144). Following the tests of co-integration between agricultural income and services income, causality tests were carried out for lag structure 1 through 5. For lag 1, Granger and Sims type of tests confirm no causality. The Granger type tests for lag 2 show that causality runs from services growth to agricultural growth. This implies that services growth causes or determines or influences agricultural growth. The Sims type of tests confirms that there is a bidirectional causality between services growth and agricultural growth. The LR (likelihood ratio) statistic confirms causality, but under Sims test, the Wald test shows that causality from agricultural growth to services growth was stronger. Granger's test for lag 3 did not show any significant causality from either side. But the instantaneous[14] causality was significant. Thus it cannot be said that agricultural growth and services growth are exogenous to each other. On the other hand, Sims test establishes that there is a bidirectional causality between services growth and agricultural growth by the LR statistic at 1 per cent level of significance following Chi square distribution. But causality from services

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[13] first differencing after taking log.

[14] The current value of X_t is better predicted if the present value of Y_t is included in the prediction than if it is not.

growth to agricultural growth was stronger

by the Wald test which was significant at 1 per cent level. The significant LM tests show the absence of serial correlation for lag 2 and 3.

For lag 4, the Granger type of tests confirmed causality from services growth to agricultural growth, but due to the presence of auto correlation (since the LM statistic was not significant), this test was dropped. However Sims type of tests establishes causality from services growth to agricultural growth at 1 per cent level of significance following chi square distribution. For lag 5, Granger type of tests did not confirm causality since LM tests for causality from services growth to agricultural growth had serial correlation. However, instantaneous causality was significant. On the other hand, the Sims type of tests confirm that causality runs from agricultural growth to services growth and was significant at 1 per cent level of significance. Therefore, for lag 2, 3 and 4, direction of causality was from services growth to agricultural growth and for lag 5 direction of causality was from agricultural growth to services growth.

4.4.2. Causality testing between services growth and industrial growth

Following the co-integration tests between industrial income and services income, both the series were found to be non cointegrated. Therefore causality testing was not possible between industrial growth and services growth since they were non co-integrated or the two series were not moving together. Moreover it is better not to test for causality without co-integration as this could lead to 'spurious regression'.

Table 4.4.1

CAUSALITY TESTS BETWEEN SERVICES GROWTH AND AGRICULTURAL GROWTH.

Lag = 1	WALD TEST	LR TEST	LM TEST
GRANGER TYPE TESTS:			
CAUSALITY FROM SER TO AGR	-.52 ..	-.52 ..	-.53 ..
CAUSALITY FROM AGR TO SER	1.73 ..	1.70 ..	1.67 ..
INSTANT CAUSALITY.....	2.15 ..	2.10 ..	2.05 ..
LINEAR DEPENDENCE.....	.66 ..	.65 ..	.65 ..
SIMS TYPE TESTS:			
CAUSALITY FROM SER TO AGR	1.91 ..	1.87 ..	1.83 ..
CAUSALITY FROM AGR TO SER	-.91 ..	-.92 ..	-.93 ..
INSTANT CAUSALITY.....	2.15 ..	2.10 ..	2.05 ..
LINEAR DEPENDENCE.....	6.05 ..	5.66 ..	5.31 ..

Lag = 2	WALD TEST	LR TEST	LM TEST
GRANGER TYPE TESTS:			
CAUSALITY FROM AGR TO SER	1.47 ..	1.45 ..	1.43 ..
CAUSALITY FROM SER TO AGR	11.40 **	10.11 **	9.01 *.
INSTANT CAUSALITY.....	4.78 *.	4.53 *.	4.30 *.
LINEAR DEPENDENCE.....	20.91 **	17.04 **	14.07 *.
SIMS TYPE TESTS:			
CAUSALITY FROM AGR TO SER	14.98 **	12.85 **	11.11 **
CAUSALITY FROM SER TO AGR	12.61 **	11.06 **	9.75 **
INSTANT CAUSALITY.....	4.78 *.	4.53 *.	4.30 *.
LINEAR DEPENDENCE.....	38.50 **	27.49 **	20.31 **

Lag = 3	WALD TEST	LR TEST	LM TEST
GRANGER TYPE TESTS:			
CAUSALITY FROM AGR TO SER	-1.21 ..	-1.23 ..	-1.25 ..
CAUSALITY FROM SER TO AGR	6.49 ..	6.04 ..	5.64 ..
INSTANT CAUSALITY.....	7.82 **	7.18 **	6.62 *.
LINEAR DEPENDENCE.....	40.91 **	28.75 **	20.96 **
SIMS TYPE TESTS:			
CAUSALITY FROM AGR TO SER	19.56 **	16.12 **	13.45 **
CAUSALITY FROM SER TO AGR	30.06 **	22.79 **	17.69 **
INSTANT CAUSALITY.....	7.82 **	7.18 **	6.62 *.
LINEAR DEPENDENCE.....	42.09 **	29.35 **	21.27 **

Table 4.4.1 contd ...

CAUSALITY TESTS BETWEEN SERVICES GROWTH AND AGRICULTURAL GROWTH.

Lag = 4	WALD TEST	LR TEST	LM TEST
GRANGER TYPE TESTS:			
CAUSALITY FROM AGR TO SER	.36 ..	.35 ..	.35 ..
CAUSALITY FROM SER TO AGR	11.53 *.	10.21 *.	9.09 ..
INSTANT CAUSALITY.....	11.47 **	10.16 **	9.05 **
LINEAR DEPENDENCE.....	33.02 **	24.50 **	18.68 *.
SIMS TYPE TESTS:			
CAUSALITY FROM AGR TO SER	9.69 *.	8.74 ..	7.91 ..
CAUSALITY FROM SER TO AGR	16.52 **	13.98 **	11.94 *.
INSTANT CAUSALITY.....	11.47 **	10.16 **	9.05 **
LINEAR DEPENDENCE.....	41.63 **	29.12 **	21.15 *.

Lag = 5	WALD TEST	LR TEST	LM TEST
GRANGER TYPE TESTS:			
CAUSALITY FROM AGR TO SER	-1.42 ..	-1.44 ..	-1.47 ..
CAUSALITY FROM SER TO AGR	13.70 *.	11.89 *.	10.39 ..
INSTANT CAUSALITY.....	15.93 **	13.55 **	11.62 **
LINEAR DEPENDENCE.....	30.34 **	22.96 *.	17.79 ..
SIMS TYPE TESTS:			
CAUSALITY FROM AGR TO SER	29.88 **	22.69 **	17.63 **
CAUSALITY FROM SER TO AGR	12.34 *.	10.85 ..	9.59 ..
INSTANT CAUSALITY.....	15.93 **	13.55 **	11.62 **
LINEAR DEPENDENCE.....	88.68 **	48.13 **	28.96 **

Notes: ** test statistic is significant at 1% level.
*. test statistic is significant at 5% level.

4.4.3 Causality testing between services growth and NDP growth

The summary results of causality are presented in table 4.4.2. Following the tests for co-integration (please refer table 4.3.3, page 146 & 147), causality tests between NDP growth and services growth income were attempted. The Granger test for lags 1 through 5 confirm unidirectional causality from services growth to NDP growth at 1 per cent level of significance following Chi square distribution for the LR statistic. On the other hand, Sims test for lags 1 through 5 confirms bidirectional causality between NDP growth and services growth by the LR statistic at 1 per cent level of significance following Chi square distribution. But the causality from services growth to NDP growth was stronger by virtue of the Wald test. The influence of services growth on NDP growth was much stronger than for the reverse mechanism. Further the LM tests show the absence of serial correlation i.e., the residuals are white noise series.

4.5. Impact of Service activities on Agricultural growth, Industrial growth and NDP growth

This study attempted to examine the impact of the individual service activities on agricultural growth, industrial growth and NDP growth by applying autoregressive models.

However, the study encountered a serious problem of multicollinearity in the explanatory variables (i.e., the individual service activities). The partial correlations between the explanatory variables were very high and furthermore the individual coefficients of the regression of service activities on agricultural growth, industrial growth and NDP growth were found to be insignificant along with a high value of R^2, adjusted R^2 and a significant 'F' test.

Table 4.4.2

Causality testing between services(SER) growth and NDP growth.

Lag = 1	WALD TEST	LR TEST	LM TEST
GRANGER TYPE TESTS:			
CAUSALITY FROM NDP TO SER	-1.05 ..	-1.06 ..	-1.08 ..
CAUSALITY FROM SER TO NDP	30.89 **	23.28 **	17.98 **
INSTANT CAUSALITY.....	2.21 ..	2.15 ..	2.10 ..
LINEAR DEPENDENCE.....	44.30 **	30.45 **	21.82 **
SIMS TYPE TESTS:			
CAUSALITY FROM NDP TO SER	30.57 **	23.09 **	17.87 **
CAUSALITY FROM SER TO NDP	42.12 **	29.37 **	21.28 **
INSTANT CAUSALITY.....	2.21 ..	2.15 ..	2.10 ..
LINEAR DEPENDENCE.....	89.90 **	48.52 **	29.09 **

Lag = 2	WALD TEST	LR TEST	LM TEST
GRANGER TYPE TESTS:			
CAUSALITY FROM NDP TO SER	1.27 ..	1.25 ..	1.23 ..
CAUSALITY FROM SER TO NDP	24.11 **	19.14 **	15.45 **
INSTANT CAUSALITY.....	4.78 *.	4.53 *.	4.30 *.
LINEAR DEPENDENCE.....	56.00 **	35.86 **	24.32 **
SIMS TYPE TESTS:			
CAUSALITY FROM NDP TO SER	35.30 **	25.77 **	19.39 **
CAUSALITY FROM SER TO NDP	43.55 **	30.08 **	21.64 **
INSTANT CAUSALITY.....	4.78 *.	4.53 *.	4.30 *.
LINEAR DEPENDENCE.....	92.79 **	49.45 **	29.38 **

Lag = 3	WALD TEST	LR TEST	LM TEST
GRANGER TYPE TESTS:			
CAUSALITY FROM NDP TO SER	-.71 ..	-.72 ..	-.72 ..
CAUSALITY FROM SER TO NDP	11.70 **	10.35 *.	9.20 *.
INSTANT CAUSALITY.....	7.82 **	7.18 **	6.62 *.
LINEAR DEPENDENCE.....	112.26 **	55.21 **	31.09 **
SIMS TYPE TESTS:			
CAUSALITY FROM NDP TO SER	45.62 **	31.10 **	22.14 **
CAUSALITY FROM SER TO NDP	90.59 **	48.74 **	29.16 **
INSTANT CAUSALITY.....	7.82 **	7.18 **	6.62 *.
LINEAR DEPENDENCE.....	90.23 **	48.63 **	29.12 **

Notes: ** test statistic is significant at 1% level.
*. test statistic is significant at 5% level.

Table 4.4.2 contd...

Causality testing between services(SER) growth and NDP growth.

Lag = 4	WALD TEST	LR TEST	LM TEST
GRANGER TYPE TESTS:			
CAUSALITY FROM NDP TO SER	1.62 ..	1.59 ..	1.56 ..
CAUSALITY FROM SER TO NDP	22.90 **	18.36 **	14.94 **
INSTANT CAUSALITY.....	11.47 **	10.16 **	9.05 **
LINEAR DEPENDENCE.....	96.58 **	50.63 **	29.75 **
SIMS TYPE TESTS:			
CAUSALITY FROM NDP TO SER	33.78 **	24.93 **	18.92 **
CAUSALITY FROM SER TO NDP	63.19 **	38.87 **	25.59 **
INSTANT CAUSALITY.....	11.47 **	10.16 **	9.05 **
LINEAR DEPENDENCE.....	106.05 **	53.45 **	30.59 **

Lag = 5	WALD TEST	LR TEST	LM TEST
GRANGER TYPE TESTS:			
CAUSALITY FROM NDP TO SER	-.32 ..	-.32 ..	-.32 ..
CAUSALITY FROM SER TO NDP	19.88 **	16.34 **	13.59 *.
INSTANT CAUSALITY.....	15.93 **	13.55 **	11.62 **
LINEAR DEPENDENCE.....	101.46 **	52.11 **	30.20 **
SIMS TYPE TESTS:			
CAUSALITY FROM NDP TO SER	49.41 **	32.89 **	22.99 **
CAUSALITY FROM SER TO NDP	63.20 **	38.88 **	25.59 **
INSTANT CAUSALITY.....	15.93 **	13.55 **	11.62 **
LINEAR DEPENDENCE.....	142.17 **	62.78 **	33.01 **

Notes: ** test statistic is significant at 1% level.
. *. test statistic is significant at 5% level.

The following trial and error method was attempted to solve the problem.

(i) dropping those service activities which are considered to have less impact.

(ii) appropriate grouping of variables using extraneous information.

But the above anomalies did not improve and some of the co-efficients had negative values which was undesirable. Therefore, these models were dropped from this study. However, principal components regression and Ridge regression techniques might have solved this problem, but due to time constraints it was not attempted.

CHAPTER V

SUMMARY AND CONCLUSIONS

This study was aimed at studying

i. the patterns of income growth and structural transformation or change of income in the Indian economy and its states.

ii. Patterns of income growth according to the individual services activities.

iii. Testing of co-integration and to examine the direction of causality between services growth and the agricultural growth, industrial growth and the NDP growth, through the application of Granger and Sims causality tests.

iv. to assess the impact of decomposed services growth on agricultural growth, industrial growth and NDP growth using auto-regressive models.

Based on the above objectives, the study was divided into the following chapters.

Chapter one looks into the theoretical aspects of growth and change. The Indian scenario is presented and the rationale for the study on the growth of services influencing other sectors of the economy were established. A general methodology for co-integration and causality tests along with the Hypothesis of the study are defined. A brief note on Data used is presented at the end of this chapter.

Chapter two highlights the discussion, "Is services growth desirable", where in services are defined and classified. A theoretical support for services growth using the stages of growth theory and the growth pole theory are discussed. Past studies in general and specific to the Indian case are critically analysed and arguments are placed in favour of services

growth in India.

Chapter three examines the patterns of growth and structural change in India with special reference to the services sector for the period 1950-51 to 1992-93. Further the analysis was extended to the state level, wherein the states were categorised into high income states, middle income states and the low income states. A detailed methodology was presented at the beginning of this chapter on exponential growth rates and structural change.

Chapter four carries out the main part of the analysis of the study. The Hypothesis are tested using Granger and Sims causality tests. Before testing for causality, stationarity tests were carried out and the non-stationary series were first differenced to attain stationarity. Before first differing, co-integration tests were carried out between those series to be tested for causality, to examine whether a long run equilibrium relationship exists between. The lags selected for causality tests between services growth and the growth of the other sectors were arbitrarily based from 1 through 5.

Conclusions of the study

This study while testing the Hypothesis of the study namely,

1) Services growth does not cause agricultural growth, Hypothesis - 1.

2) Services growth does not cause industrial growth, Hypothesis - 2.

3) Services growth does not cause NDP growth, Hypothesis - 3.

had to test for co-integration before testing for causality, for reasons specified in Section 4.1.2.

The results of the causality test between agricultural growth and services growth confirm that there was no causality for lag 1, thus accepting the null hypothesis. However, for lags 2 and 3 there exists a bidirectional causality implying that services growth influences agricultural growth and agricultural growth causes services growth with a lag of 2 years and 3 years, thus accepting the alternative hypothesis. However, for lag 4 and 5, there was unidirectional causality from services growth to agricultural growth for lag 4 and the reverse for lag 5.

While trying to test Hypothesis-2 as specified in chapter one, the co-integration tests confirmed non co-integration. Hence forth this hypothesis could not be tested as causality tests could not be carried out due to reasons specified in Chapter IV, Section 4.3. Though testing for causality with non co-integrated time series is not methodologically sound, this study carried out test of causality between services and industrial growth and found that therexists bidirectional causality[1] according to Sims test for lag 1,2,3 & 5 and unidirectional causality for lag 4 from services to industry. Though there was a bidirectional causality it was more stronger from services to industry. On the other hand, Granger tests suggests that there was a unidirectional causality from services growth to industrial growth for lags 1,2,3, & 4. The fifth lag was dropped since the LM test is insignificant and implies presence of Auto correlation. There seems to be a strong causality between services growth and industrial growth. However, the causality tests ideally without co-integration is not methodologically correct. Hence, this hypothesis stands dropped.

While testing the null Hypothesis-3 as specified in chapter one, that services growth

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[1] Please refer table 5.1, Page-154 & 155

does not causes NDP growth stands rejected. The alternative hypothesis accepted that there exists a bidirectional causality between services growth and NDP growth for lags 1 through 5, for which co-integration was confirmed. Moreover, it was stronger from services to NDP. This implies that services growth causes NDP growth with time lag from 1 to 5.

On the whole, this study concludes that there is a strong long run relationship between services growth and agricultural growth, services growth and NDP growth for which there exists a long run equilibrium relationship though they may not be so in the short-run.

Furthermore, it can also be concluded that there is a dynamic interaction between services growth, industrial growth, agricultural growth and NDP growth as is evident from bidirectional causality according to the Sims tests. Moreover, the direction of causality from services to the other sectors and the NDP growth is stronger than the reverse. Thus services growth has facilitated growth of the economy alongwith facilitating growth in agriculture and industry. Moreover, services growth has not been autonomous, the agricultural growth and industrial growth were influencing or causing the services growth, though not so strong as the reverse mechanism. However, the impact of the individual service activities on agricultural growth, industrial growth and services growth could not be ascertained due to reasons specified in chapter IV, section 4.4.

Therefore, services growth in India is desirable as it facilitates growth and development of the economy. Moreover, services growth is characterised by tremendous growth in infrastructure activities like Banking & Insurance, Transport & communication, Trade and Public Administration which form the `key' infrastructure of the economy and act

as catalytic agents in the growth and development of the economy. Hence it can be said that services growth need cause no alarm but the Government has to take explicit measures to promote its growth and development in order to create a strong infrastructural base.

Limitations of the Study

The study was solely based on income data. However, data on employment and capital stock could have been collected and the respective factor productivities could have been computed and then causality tests examined. Furthermore, employment growth in the service sector seems to be higher compared to growth in output. Income elasticities of employment could have been computed to analyse this problem.

Further, state wise disparities in the growth of services sector influencing the levels of income could have been looked into. However, due to unavoidable constraints (the major constraint being time), these could not be carried out.

Scope for Further Research

This topic and area seems to be dynamic and interesting. The causality tests carried at the national level can be carried out at the State level and examine the direction of causality among the High income states, middle income states and low income states. Further, the limitations expressed above can be looked into and a complete analysis can be attempted to assess the growth and the role of services played in the national and state economies.

Table 5.1

Causality testing between services growth and NDP growth.

Lag = 1	WALD TEST	LR TEST	LM TEST
GRANGER TYPE TESTS:			
CAUSALITY FROM NDP TO SER	-1.05 ..	-1.06 ..	-1.08 ..
CAUSALITY FROM SER TO NDP	30.89 **	23.28 **	17.98 **
INSTANT CAUSALITY.....	2.21 ..	2.15 ..	2.10 ..
LINEAR DEPENDENCE.....	44.30 **	30.45 **	21.82 **
SIMS TYPE TESTS:			
CAUSALITY FROM NDP TO SER	30.57 **	23.09 **	17.87 **
CAUSALITY FROM SER TO NDP	42.12 **	29.37 **	21.28 **
INSTANT CAUSALITY.....	2.21 ..	2.15 ..	2.10 ..
LINEAR DEPENDENCE.....	89.90 **	48.52 **	29.09 **

Lag = 2	WALD TEST	LR TEST	LM TEST
GRANGER TYPE TESTS:			
CAUSALITY FROM NDP TO SER	1.27 ..	1.25 ..	1.23 ..
CAUSALITY FROM SER TO NDP	24.11 **	19.14 **	15.45 **
INSTANT CAUSALITY.....	4.78 *.	4.53 *.	4.30 *.
LINEAR DEPENDENCE.....	56.00 **	35.86 **	24.32 **
SIMS TYPE TESTS:			
CAUSALITY FROM NDP TO SER	35.30 **	25.77 **	19.39 **
CAUSALITY FROM SER TO NDP	43.55 **	30.08 **	21.64 **
INSTANT CAUSALITY.....	4.78 *.	4.53 *.	4.30 *.
LINEAR DEPENDENCE.....	92.79 **	49.45 **	29.38 **

Lag = 3	WALD TEST	LR TEST	LM TEST
GRANGER TYPE TESTS:			
CAUSALITY FROM NDP TO SER	-.71 ..	-.72 ..	-.72 ..
CAUSALITY FROM SER TO NDP	11.70 **	10.35 *.	9.20 *.
INSTANT CAUSALITY.....	7.82 **	7.18 **	6.62 *.
LINEAR DEPENDENCE.....	112.26 **	55.21 **	31.09 **
SIMS TYPE TESTS:			
CAUSALITY FROM NDP TO SER	45.62 **	31.10 **	22.14 **
CAUSALITY FROM SER TO NDP	90.59 **	48.74 **	29.16 **
INSTANT CAUSALITY.....	7.82 **	7.18 **	6.62 *.
LINEAR DEPENDENCE.....	90.23 **	48.63 **	29.12 **

Notes: ** test statistic is significant at 1% level.
. *. test statistic is significant at 5% level.

Table 5.1 contd...

Causality testing between services growth and NDP growth.

Lag = 4	WALD TEST	LR TEST	LM TEST
GRANGER TYPE TESTS:			
CAUSALITY FROM NDP TO SER	1.62 ..	1.59 ..	1.56 ..
CAUSALITY FROM SER TO NDP	22.90 **	18.36 **	14.94 **
INSTANT CAUSALITY.....	11.47 **	10.16 **	9.05 **
LINEAR DEPENDENCE.....	96.58 **	50.63 **	29.75 **
SIMS TYPE TESTS:			
CAUSALITY FROM NDP TO SER	33.78 **	24.93 **	18.92 **
CAUSALITY FROM SER TO NDP	63.19 **	38.87 **	25.59 **
INSTANT CAUSALITY.....	11.47 **	10.16 **	9.05 **
LINEAR DEPENDENCE.....	106.05 **	53.45 **	30.59 **

Lag = 5	WALD TEST	LR TEST	LM TEST
GRANGER TYPE TESTS:			
CAUSALITY FROM NDP TO SER	-.32 ..	-.32 ..	-.32 ..
CAUSALITY FROM SER TO NDP	19.88 **	16.34 **	13.59 *.
INSTANT CAUSALITY.....	15.93 **	13.55 **	11.62 **
LINEAR DEPENDENCE.....	101.46 **	52.11 **	30.20 **
SIMS TYPE TESTS:			
CAUSALITY FROM NDP TO SER	49.41 **	32.89 **	22.99 **
CAUSALITY FROM SER TO NDP	63.20 **	38.88 **	25.59 **
INSTANT CAUSALITY.....	15.93 **	13.55 **	11.62 **
LINEAR DEPENDENCE.....	142.17 **	62.78 **	33.01 **

Notes: ** test statistic is significant at 1% level.
. *. test statistic is significant at 5% level.

APPENDIX - I

Empirical cumulative distribution of $\hat{\tau}$ for $\rho = 1$

Sample Size	Probability of a Smaller Value							
n	0.01	0.025	0.05	0.10	0.90	0.95	0.975	0.99
				$\hat{\tau}$ (no intercept, no time trend)				
25	−2.66	−2.26	−1.95	−1.60	0.92	1.33	1.70	2.16
50	−2.62	−2.25	−1.95	−1.61	0.91	1.31	1.66	2.08
100	−2.60	−2.24	−1.95	−1.61	0.90	1.29	1.64	2.03
250	−2.58	−2.23	−1.95	−1.62	0.89	1.29	1.63	2.01
500	−2.58	−2.23	−1.95	−1.62	0.89	1.28	1.62	2.00
∞	−2.58	−2.23	−1.95	−1.62	0.89	1.28	1.62	2.00
				$\hat{\tau}_\mu$ (intercept, no time trend)				
25	−3.75	−3.33	−3.00	−2.63	−0.37	0.00	0.34	0.72
50	−3.58	−3.22	−2.93	−2.60	−0.40	−0.03	0.29	0.66
100	−3.51	−3.17	−2.89	−2.58	−0.42	−0.05	0.26	0.63
250	−3.46	−3.14	−2.88	−2.57	−0.42	−0.06	0.24	0.62
500	−3.44	−3.13	−2.87	−2.57	−0.43	−0.07	0.24	0.61
∞	−3.43	−3.12	−2.86	−2.57	−0.44	−0.07	0.23	0.60
				$\hat{\tau}_\tau$ (intercept and time trend)				
25	−4.38	−3.95	−3.60	−3.24	−1.14	−0.80	−0.50	−0.15
50	−4.15	−3.80	−3.50	−3.18	−1.19	−0.87	−0.58	−0.24
100	−4.04	−3.73	−3.45	−3.15	−1.22	−0.90	−0.62	−0.28
250	−3.99	−3.69	−3.43	−3.13	−1.23	−0.92	−0.64	−0.31
500	−3.98	−3.68	−3.42	−3.13	−1.24	−0.93	−0.65	−0.32
∞	−3.96	−3.66	−3.41	−3.12	−1.25	−0.94	−0.66	−0.33

This table was constructed by David A. Dickey using the Monte Carlo method. Details are given in Dickey (1975). Standard errors of the estimates vary, but most are less than 0.02.

To extend the results for the first order process with $\rho = 1$ to the pth order autoregressive process, we consider the time series

$$Y_t = \sum_{j=1}^{t} Z_j, \qquad t = 1, 2, \ldots,$$

where $\{Z_t: t \in (0, \pm 1, \pm 2, \ldots)\}$ is a $(p-1)$ order autoregressive time series with the representation

$$Z_t + \sum_{i=2}^{p} a_i Z_{t-i+1} = e_t.$$

APPENDIX - II

Critical values for the co-integration test.

Number of var's N	Sample size T	Significance level		
		1%	5%	10%
1[a]	50	2.62	1.95	1.61
	100	2.60	1.95	1.61
	250	2.58	1.95	1.62
	500	2.58	1.95	1.62
	∞	2.58	1.95	1.62
1[b]	50	3.58	2.93	2.60
	100	3.51	2.89	2.58
	250	3.46	2.88	2.57
	500	3.44	2.87	2.57
	∞	3.43	2.86	2.57
2	50	4.32	3.67	3.28
	100	4.07	3.37	3.03
	200	4.00	3.37	3.02
3	50	4.84	4.11	3.73
	100	4.45	3.93	3.59
	200	4.35	3.78	3.47
4	50	4.94	4.35	4.02
	100	4.75	4.22	3.89
	200	4.70	4.18	3.89
5	50	5.41	4.76	4.42
	100	5.18	4.58	4.26
	200	5.02	4.48	4.18

[a] Critical values of $\hat{\tau}$.

[b] Critical values of $\hat{\tau}_{\mu}$. Both cited from Fuller 1976, p. 373.

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