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***Terms of Trade in a Multi-Sectoral Framework:  
Analysis for All-India and States***

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***Terms of Trade in a Multi-Sectoral Framework: Analysis for All-India and States***

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**Abstract**

Conventionally, the analytical treatment of domestic terms of trade is accomplished within a dual economy framework, wherein its empirical estimation is worked out by calculating the barter terms of trade between an "agriculture" and "industry" sector. However, since contemporary economies have undergone rapid structural transformation, which has seen the emergence of a third "services" sector, it has become vital to analyse shifts in sectoral terms of trade by exploiting a multi-sectoral framework.

In this paper, we employ a multi-sectoral accounting framework to examine the pattern of terms of trade movements in India. The estimates of "terms of trade effect" are generated for the three broad domestic sectors, viz. agriculture and allied, industry and services, and further for a detailed nine-sector classification. We also construct comparable estimates of terms of trade effect for three broad sectors encompassing fifteen major states in India. The time period of analysis is 1951-97 at the all-India level and 1971-96 at the level of individual states.

A natural consequence of the two-sector analysis of domestic terms of trade has been that adverse movements in agriculture are believed to emerge due to supportive industrial terms of trade. Our multi-sectoral analysis indicates that terms of trade gains in the Indian economy, if any, have accrued in the agriculture and services sectors, and not in the manufacturing (or aggregate industry) sector.

**JEL Classification:** Q11, C82, E31, O17, and O18.

**Keywords:** terms of trade measure, national accounts, service sector, regional variation.

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## 1. Introduction

It has been the standard practice to accomplish the analysis of sectoral terms of trade (hereafter TOT) within a dual economy framework, where the economy is notionally bifurcated into agriculture and industry sectors. However, contemporary sectoral profiles of various countries indicate that developing economies can no longer be represented in the terms of a prototype dual economy. The growth experience has led to a structural transformation of many low and middle-income economies – where an increasing percentage share of the GDP seems to originate from service and tertiary activities.<sup>1</sup> Given such structural change, the impact of a shift in sectoral TOT on many developing economy problems needs to be studied using a multi-sectoral accounting framework. Take the instance of the belief that the beneficiary of an adverse agricultural TOT is the industry sector. This belief is informed by the standard two-sector analysis of TOT, which either excludes the service sector or implicitly includes it as a component of "non-agriculture". Thus, the two-sector framework has led to a conclusion in certain quarters that the industry sector is "protected". It is pertinent here to ask whether a TOT loss for agriculture implies that such a loss is necessarily being accrued as a gain to the industry. To come up with a suitably nuanced reply to this question, a multi-sectoral framework that can separately evaluate the TOT impacts on industry and services would be clearly useful.

The main objective of this paper is to provide a multi-sectoral formulation of domestic TOT as against conceiving TOT in a two-sector framework, and later apply this accounting framework to examine the pattern of TOT movements in India. It may be noted that a wide range of discussion on domestic TOT, both in terms of estimation and analytical issues, can be found with regard to the developing experience of the Indian economy.<sup>2</sup> Further, it is pertinent to point out that the previous studies on Indian sectoral TOT have been undertaken on the basis of interpreting the bilateral trade between agricultural and industry (or non-agriculture) sectors, viz. Thamarajakshi [1969, 1977, 1994], Kahlon and Tyagi [1980], Tyagi [1987], Mungekar [1992] and Palanivel [1999]. Their approach of estimating the agricultural net barter TOT (NBTOT) took into account only the commodity segment

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<sup>1</sup> For example, see *World Development Report* data on the sectoral distribution of GDP in high, medium and low-income economies.

<sup>2</sup> See Deb [2002 a] for details.

of goods that are exchanged in inter-sectoral trade.<sup>3</sup> The factor and non-factor service inputs were mostly left out in the list of traded commodities.<sup>4</sup> Now, it is important that the basic framework of TOT analysis includes the service sector, since it is the largest and fastest growing segment in India and many developing economies.<sup>5</sup> In such a situation, the practice of estimating TOT within the two-sector approach may not be sufficient to address the issue of sectoral TOT for the macro economy.

It may be crucially noted that the proposed multi-sectoral framework allows us to transcend the conventional two-sectoral analysis and instead pursue an examination of the economy viewed as being comprised of multiple sectors. The methodology uses the accounting framework, which takes into account the entire economy and not just two notional sectors. In addition to this there are other advantages in using the multi-sectoral approach in TOT measurement. For one, it provides TOT estimates for all the constituent sectors of the economy by avoiding some of the sticky estimation problems associated with aggregate NBTOT calculations, such as the aggregation error and aggregation problems.<sup>6</sup> Two, the same methodology can be used to generate consistent and comparable set of TOT estimates across different states in India on which there exists very little work today. Three, apart from examining the pattern of regional variation, the state level estimates of TOT can be used for modeling sectoral TOT in a cross-sectional framework, which is particularly important to test certain policy hypotheses that are best modeled using a cross-sectional framework. For instance, the implications of TOT change can be examined in relation to the rural-to-urban migration process, changes in the work force composition and incidence of rural (or urban) poverty, all

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<sup>3</sup> The NBTOT for the agricultural sector are developed by considering the ratio of composite indices of prices received to prices paid by the sector.

<sup>4</sup> If the share of service inputs is considerable in the total purchase by a sector, the exclusion of such inputs could make a big difference to the analysis of TOT. To bring in a related concern, Sheng [1992] has argued that service items should not be excluded in the estimation of resource flow out of agriculture. By reworking on the estimates of Lee [1971], he has shown that the inter-sectoral exchanges of services were quite significant in Taiwan's domestic trade. He maintained, "In the case of Taiwan, we find that the inclusion of services makes a large difference. It turns the position of agriculture from import excess to export excess." (Sheng 1992, page 12)

<sup>5</sup> According to data published by the ADB [2000], the primary sector's share in the Indian GDP fell from 44.5% to 25.5% over the period 1970 to 1999. The sectoral share of industry and service sectors rose from 23.9% to 27.3% and from 31.6% to 47.2%, respectively during this period.

<sup>6</sup> This aspect is discussed in Deb [2002 a].

of these being concerns that can be studied using a data set which is available only for select points of time.

The plan of this paper is as follows. In section 2, we provide the methodological framework and then derive various measures of TOT effect, by using the national income accounting (NIA) principles. In section 3, we compare the alternate indicators of TOT (viz. TOT effect) with the standard net barter TOT measure. The details on the sectoral classifications and database are described in section 4. Section 5 discusses the suitability and quality of the database. The estimates of TOT effects on each of the major sectors in the Indian economy, as well as in 15 major states are worked out in sections 6 and 7, respectively. We discuss the reliability of our results in section 8. Finally, section 9 summarizes the results and implications of our findings.

## 2. Multi-Sectoral TOT Measures

The multi-sectoral formulation of domestic TOT evolved in the works of Rasmussen [1957] and Olgaard [1966]. Subsequently, Bjerke [1968, 1972], Olgaard [1981] and Derksen [1980] have used this framework in the context of examining TOT for the Danish and Dutch economies. These studies, by employing the inter-industry transactions data within the NIA framework, have attempted to provide measures of income gains (or losses) accruing to different domestic sectors as a result of changes in the economy's relative price structure.<sup>7</sup> These effects can be considered as the "*sectoral TOT effects*" on various domestic sectors in the economy. There are two alternate concepts of TOT effect, one that defines the TOT gain from a *production point of view* focusing on aspects of intermediate purchase, while the other focuses on TOT gain from an *income point of view* emphasizing final demand expenditures of a given sector. These two measures are developed below.

Consider an open economy with  $n$  domestic sectors and the external (foreign) sector. The value added by an individual sector (say  $j$ -th) at current year's prices is defined as:

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<sup>7</sup> Studies which have used the same NIA framework to examine the TOT effect occurring due to changes in the economy's international TOT include Stuvell [1956, 1958, 1959], Nicholson [1960], Geary [1961], United Nations [1968], Courbis [1969, 1972], Kurabayashi [1971], Godley and Cripps [1974], Scott [1979], Gutmann [1981], Hamada and Iwata [1984], Silver and Mahdavy [1989], etc.

$$\begin{aligned}
X_{va.j} &= P_j \cdot X_j - \sum_i P_i \cdot x_{ij}, \quad i=1, \dots, n \\
&= P_j \cdot X_j - \sum_i P_i \cdot a_{ij} \cdot X_j \\
&= \left( P_j - \sum_i P_i \cdot a_{ij} \right) X_j
\end{aligned} \tag{1}$$

where,  $X_{va.j}$  = gross value added in sector j

$X_j$  = gross output in sector j

$x_{ij}$  = intermediate demand of the sector j from the i-th sector

$a_{ij}$  = i-th primary factor input-output coefficient for sector j

$P_j$  = price of gross output in sector j, and

$P_i$  = price of intermediate input i.

This measure of value-added is based on the assumptions that price of sectoral output is same for final or intermediary use. Correspondingly, the GDP for the economy at current prices is the sum of value added in all domestic sectors, i.e.

$$X_{va} = \sum_j X_{va.j} \tag{2}$$

Now, equation (1) or (2) referring to any particular year (say  $t$ ) can also be expressed at the constant (base year) prices. We consider two time periods denoted by subscript  $0$  and  $1$ . In the NIA procedures, the real value added output of sector  $j$  in period  $1$  is converted to prices at period  $0$  by means of deflating each of the values in equation (1) with appropriate price indices, viz. the *double deflation method*. These deflated GDP values (value added at constant prices) are denoted by using a prime symbol, viz.  $X'_{va.j,t}$  and  $X'_{va,t}$ . The implicit price deflator for sector  $j$ 's value added output ( $P_{va.j}$ ), as well as the same for the economy ( $P_{va}$ ) can be defined as:

$$P_{va.j} = \frac{X_{va.j,1}}{X'_{va.j,1}}, \text{ and } P_{va} = \frac{\sum_j X_{va,j,1}}{\sum_j X'_{va,j,1}}$$

This deflation<sup>8</sup> has been undertaken from the production point of view, i.e. the implicit price development in the value added between year  $0$  and  $1$  can be written as:

$$P_{va.j} = \frac{P_{j,1} \cdot X_{j,1} - \sum_i P_{i,1} \cdot x_{ij,1}}{P_{j,0} \cdot X_{j,1} - \sum_i P_{i,0} \cdot x_{ij,1}} \tag{3}$$

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<sup>8</sup> The index of real value added output is a Laspeyzer's quantity index whereas the implicit price deflators are indices of the Paasche's type.

$$P_{va} = \frac{\sum_j P_{va,j,1} \cdot X_{va,j,1}}{\sum_j P_{va,j,0} \cdot X_{va,j,1}} \quad (4)$$

Assuming that each domestic sector trades with other sectors in the economy, the inter-sectoral TOT gain (loss) accruing to the  $j$ -th sector that results due to changes in the economy's relative price structure between year 0 and year 1 is defined as:<sup>9</sup>

$$\begin{aligned} \text{Gain (Production)}_j &= P_{va,j} X'_{va,j} - P_{va} X'_{va,j} \\ &= X'_{va,j} (P_{va,j} - P_{va}) \end{aligned} \quad (5)$$

The expression of TOT effect as per equation (5), fundamentally reflects the disproportionate change in implicit price of value added for the  $j$ -th sector vis-a-vis that of the economy. Further, the price difference between sector  $j$  and the economy is assumed to be in some proportion of the  $j$ -th sector's real value added in the TOT gain (loss) measure. This assumption implicates that sector  $j$  purchases commodities in correspondence with its value added output. Finally, to express the sectoral gains as the purchasing power of total GDP basket, a deflation by such price index is necessary. Thus, the final expression for sectoral TOT effect on sector  $j$  yields,<sup>10</sup>

$$\begin{aligned} \text{Gain (Production)}_j &= \frac{1}{P_{va}} [X'_{va,j} (P_{va,j} - P_{va})] \\ &= \frac{X_{va,j}}{P_{va}} - X'_{va,j} \end{aligned} \quad \text{Measure I}$$

Defined in this way, sectoral TOT effect reflects the difference between the sector's purchasing power of primary factor incomes evaluated in terms of the price of overall GDP basket and the same evaluated in terms of the sector specific output-input price.

Correspondingly, to capture the sector specific TOT gain from its purchasing power of the final demand basket, the real income of sector  $j$  has to be defined. For this, we make use of the production account identity, whereby the nominal value added output in the economy is expressed as:

$$X_{va,t} = \sum_j X_{va,j,t} = P_{C,t} \cdot X_{C,t} + P_{I,t} \cdot X_{I,t} + P_{G,t} \cdot X_{G,t} + P_{E,t} \cdot X_{E,t} - P_{M,t} \cdot X_{M,t}, \text{ for } t = 0,1 \quad (6)$$

<sup>9</sup> Compare equation 6.9, page 91 in Rasmussen [1957] and equation 14.4, page 262 in Olgaard [1966].

<sup>10</sup> Compare the formula provided in footnote 3, page 341 by Bjerke [1972].

Where,  $X_C$ ,  $X_I$ ,  $X_G$ ,  $X_E$  and  $X_M$  indicate the consumption expenditure, investment expenditure, government expenditure, exports and imports in the economy, respectively, and  $P_C$ ,  $P_I$ ,  $P_G$ ,  $P_E$  and  $P_M$  represent the corresponding prices.

The value added output as per equation (6) for period 1 when expressed in terms of the prices of period 0, will be:

$$X'_{va.1} = P_{C.0} \cdot X_{C.1} + P_{I.0} \cdot X_{I.1} + P_{G.0} \cdot X_{G.1} + P_{E.0} \cdot X_{E.1} - P_{M.0} \cdot X_{M.1}, \text{ for } t = 0,1 \quad (7)$$

Following Olgaard [1966], Bjerke [1972] and Derksen [1980], we can define a price index for the overall economy's final demand ( $P_D$ ), which can be used to convert the sectoral value added output into sectoral real incomes as:

$$\frac{X_{va.j}}{P_D} = \frac{X'_{va.j} \cdot P_{va.j}}{P_D}, \quad (8)$$

Similarly, the total real income of the economy can be defined as:

$$\frac{X'_{va} \cdot P_{va}}{P_D} = \frac{X_{va}}{P_D} = \frac{X_D}{P_D} = \frac{(X_M \cdot P_M - X_E \cdot P_E)}{P_D} = X'_D - \frac{(X_M \cdot P_M - X_E \cdot P_E)}{P_D}, \quad (9)$$

where,  $X_D = P_C X_C + P_I X_I + P_G X_G$  is the total domestic final demand, and  $P_D$  can be computed as a composite price index of consumption and investment expenditure.

To define sector specific TOT gains from the income point of view, the overall economy's price index of final demand items ( $P_D$ ) is applied to all the sectors. This obviously involves an assumption that the commodity composition of the final demand basket of all the domestic sectors is the same equivalent. With this assumption, the formula for TOT gains (income) accruing to sector  $j$  is defined as:<sup>11</sup>

$$\begin{aligned} \text{Gain (Income)}_j &= \frac{1}{P_D} [X'_{va.j} (P_{va.j} - P_D)] \\ &= \frac{X_{va.j}}{P_D} - X'_{va.j} \end{aligned} \quad \textbf{Measure II}$$

A basic feature of the above TOT gain (income) measure is that it assumes an identical purchasing pattern of final demand for all the domestic sectors.<sup>12</sup> However, if the composition of final demand basket is unequal among sectors, the impact of prices on purchasing patterns is presumably going to be different across sectors. Therefore, the use of a sector-specific price index of final demand may be more

<sup>11</sup> Compare equation 14.40, page 272 in Olgaard [1966], the expression provided by Bjerke [1972] in page 341 and equation 2, page 347 in Derksen [1980].

<sup>12</sup> Bjerke [1972] and Derksen [1980] carried out estimation of TOT effect by employing a common price index of final demand for all the domestic sectors in the Danish economy.



appropriate to define a TOT gain (income) measure for different sectors. In this study, we incorporate the possibility of separate final demand patterns for two crucial economic sub-sectors, viz. agriculture and manufacturing, i.e. a different TOT gain (income) measure referred to as the TOT gains (income\*) has been defined as follows:

$$\begin{aligned} \text{Gain (Income*)}_j &= \frac{1}{P_{Dj}} [X'_{va.j} (P_{va.j} - P_{Dj})] \\ &= \frac{X_{va.j}}{P_{Dj}} - X'_{va.j} \end{aligned} \quad \textbf{Measure III}$$

where,  $P_{Dj}$  = sector specific price index of final demand for sector  $j$ .

It can be inferred from the above that the sectoral TOT effect accruing to sector  $j$  is essentially an expression of income gain (or loss), that arise due to the non-uniform changes between sector  $j$ 's implicit price deflator (IPD) and a general price level in the economy. The IPD for sector  $j$  reflects the unequal changes in its gross output price relative to changes in prices paid for purchased intermediate inputs. The general price level on the other hand evaluates the average price in the economy, viz. the GDP deflator in measure I and the economy's domestic final demand deflator in measure II. Thus, two different concepts of TOT effect are distinguished, viz. one that defines TOT gains from a *production point of view* and the other differentiates TOT gain from an *income point of view*. While the *production gain* evaluates a sector's purchasing power over the GDP basket, the income gain is drawn from the purchasing power of final consumption goods. Both the concepts consider the traded as well as non-traded segment of the goods produced by a given sector in measuring the TOT effects. It may further be noted that the sum of TOT gains (production), i.e. Measure I, across sectors would be equal to zero in a closed economy situation.<sup>13</sup> On the other hand, the sum of gains (income) i.e. Measure II, accruing to various domestic sectors will be equal to the nation's gain from international TOT change in foreign trade.<sup>14</sup>

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<sup>13</sup> The derivation is as follows: Sum of Gains (production) =  $\sum_j \frac{1}{P_{va}} X'_{va.j} (P_{va.j} - P_{va})$   
 $= \frac{1}{P_{va}} \sum_j X'_{va.j} (P_{va.j} - P_{va}) = \frac{X_{va}}{P_{va}} - X'_{va} = 0$

<sup>14</sup> In this case, the sum of gains becomes:

### 3. Comparison with NBTOT Measure

The NBTOT measure has been extensively used for the analysis of TOT between agriculture and industry sectors in India, viz. Thamarajakshi [1977, 1994], Kahlon and Tyagi [1980], Tyagi [1987], Mungekar [1992], Palanivel [1999]; and also by the agencies of Commission of Agricultural Costs and Prices (CACP) and Directorate of Economics and Statistics (DES) in the Ministry of Agriculture, (Government of India). The multi-sectoral TOT measure within the NIA methodology is characteristically different from the standard NBTOT concept in many ways. First, the NBTOT and its other variants, viz. income TOT and factorial TOT are based on the prices of inter-sectoral sale and purchase by a sector. The NBTOT is approximated by the ratio between index of prices received to prices paid for commodities exported by a given sector. A constructed NBTOT index measures the deviation in relative sectoral prices from the base year's level, which is fixed at 100. On the other hand, the measure of TOT effect attempts to quantify the inter-sectoral transfer of income due to changes in the economy's relative price structure. The transfer of income in a given year is perceived with reference to the base year, which in this case is set at zero, implying no transfer of income (or TOT gains) has occurred during the base period.

Second, there are differences in perception as to how the price variables have been incorporated in these measures. We can distinguish the notion of *price of production* in the NIA approach and the *price of exchange* in the NBTOT measure. The barter TOT measure views prices as one of the prices received (and prices paid) by a sector, for which the market price (unit value) of individual commodities that have supposedly entered in the inter-sectoral trade are considered. In this approach, a particular emphasis is laid so as to include only those commodities that are actually traded between the sectors. In contrast, prices in the NIA method of TOT measurement, particularly the one which is supposed to represent "prices

$$\sum_j [(1/P_D)X'_{va,j} (P_{va,j} - P_D)] = (1/P_D) \cdot \sum_j X'_{va,j} (P_{va,j} - P_D) = (1/P_D)X'_{va} - X'_{va}$$

The production account of the national income accounting at constant prices yields:

$$X'_{va} = X'_c + X'_I + X'_G + X'_E - X'_M = X'_D - (X'_M - X'_E)$$

where,  $X'_D = X'_c + X'_I + X'_G$  = total domestic final demand.

Replacing this into the above equation results in:

$$(1/P_D)[X'_D - (X'_M - X'_E)] - [X'_D - (X'_M - X'_E)] = 1/P_D (X'_E - X'_M) - (X'_E - X'_M).$$

It may be noted that the above expression as a measure of gains from changes in international TOT comprises the purchasing capacity of final consumption goods at domestic prices. For other types of

received by a sector" is based on the *price of value added* or *price of production*. These price indices which are implicitly derived by dividing the value added at current prices by that at constant prices, signify the price development for the entire sector. The implicit price deflator (IPD) for the *j*-th sector is defined in a way such that the following sectoral account of national income holds, which is,

$$P_{va,j} \cdot X_{va,j} = X_j \cdot P_j - \sum_i p_i \cdot X_{ij}$$

$$\text{that provides: } P_{va,j} = [X_j / X_{va,j}] \cdot P_j - [\sum_i X_{ij} / X_{va,j}] \cdot P_i, \quad (10)$$

This defines the IPD for sector *j* as the difference between output price index of the sector and that of its composite price index of intermediary inputs (or the returns to non-produced primary factors of production). The weights are defined by the ratio of output (or intermediate inputs) to the total value added output of sector *j*<sup>15</sup>. If we interpret equation (10) as the price effect faced by sector *j* due to differential changes in gross output price received by the sector (relative to changes in price paid for purchased intermediate inputs), then  $P_{va,j}$  may be considered as an analog of a standard NBTOT index.

Third, the "TOT effects" are essentially an income TOT type of measure since it includes the quantum of goods produced (traded) by the sector. However, there are differences between the two frameworks as to how the quantum or value of tradable is incorporated for the purpose of developing the income TOT type of measure. In the standard income TOT measure, the ratio of price received to prices paid by a sector (viz. the NBTOT) is applied to a sector's actual volume of exports, which is generally approximated by the sector's *marketable surplus*. Such an ITOT measure represents the net income earned from exports in terms of the prices paid for the commodities purchased. The NIA approach on the other hand includes the total real output of the sector, on the assumption that the sectoral purchase of goods and services are in proportion to its value added. The TOT effect as per measure I can be interpreted as income gain (loss) of primary factors of production employed in sector *j* that results from a difference in the movements between the IPD of sector *j* to that of the economy. Thus, the TOT effect for sector *j* will reveal a *gain* if the value of sector specific IPD exceeds an average IPD for the aggregate economy during corresponding years. Since, the system of relative price movements is

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TOT gains measures due to international trade, refer to Gutmann [1981] and Silver and Mahdavy [1989].

measured with reference to a given base year; the TOT effects will indicate no gain (or loss) during that particular year. Further, since the entire value added output is included in this measure, the TOT effect would represent the maximum gains that a given sector can acquire due to changes in relative prices.

Fourth, it can be observed that the net gain accruing to a given sector due to its TOT effect is composed of two different effects. One originates from non-uniform changes in gross output price relative to the changes in prices for purchased intermediate inputs. The other is due to the disproportionate changes in implicit price of sectoral value added vis-a-vis some general price level in the economy. To illustrate this point, the basic expression of TOT effect as per measure I can be broken down into two parts as follows:

$$\begin{aligned}
 \text{Gain (Production)}_j &= \frac{1}{P_{va}} [X'_{va,j} (P_{va,j} - P_{va})] && \text{Measure I} \\
 &= \frac{1}{P_{va}} \left[ X_{va,j} \left( 1 - \frac{P_{va}}{P_{va,j}} \right) \right] \\
 &= \frac{1}{P_{va}} \left[ \left( P_j - \sum_i p_i \cdot a_{ij} \right) X_j \right] \left[ \left( 1 - \frac{P_{va}}{P_{va,j}} \right) \right]
 \end{aligned}$$

According to this, the TOT effect for sector  $j$  would depend on the variability of its primary input prices as well as the economy's average output price in relation to its output price movements. The output or final demand deflator of the economy can alternatively represent the general price level in various measures of TOT effect. Further, absolute amount of TOT gain (loss) valued in monetary terms, can also be expressed as percentages of the sectoral real value added output, i.e. the percentage of output gained or lost by sector  $j$  due to inter-sectoral TOT change as per measure I can be written as,

$$\text{Gain (Production)}_j = \left( \frac{P_{va,j} - P_{va}}{P_{va}} \right) \times 100 \quad (11)$$

Expressed in this way, sectoral TOT effect indicates the rate of growth of sectoral IPD in relation to the overall economy's IPD.

Fifth, despite all these differences, we can identify a similarity between the measure of TOT effect and the measure of real net inter-sectoral resource flow

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<sup>15</sup> The derivation of this result can be found in Mohan Rao [1996].

(NIRF). The real NIRF measure as provided by Ishikawa [1967 a], can be decomposed in two parts, one is the visible NIRF and the other being invisible NIRF caused by changes in inter-sectoral TOT. We observe that the expression of TOT effect is equivalent to the invisible part of the NIRF measure.<sup>16</sup> The distinction if any, is only with regard to how the price variables as well as volume of tradable are incorporated in the analysis.

Finally and most importantly, while the barter TOT outline is based on a two-sector framework, the NIA approach is founded in the multi-sectoral setting of the overall economy. A NBTOT index considers only the bilateral trade between two competing sectors and excludes any intra-sectoral trade within the two. Therefore, TOT improvement for one sector necessarily implies deterioration in the other. In contrast, the NIA framework evaluates TOT position for a sector from its own level in the base year. The TOT effect as per Measure I, can be conceived as hypothetically denoting the TOT situation of a sector vis-à-vis the economy. The TOT effect derived in this fashion can therefore indicate a simultaneous deterioration (or improvement) in both agriculture and industry sectors, if the sectoral TOT has actually moved favouring (against) other component sectors of the economy.

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<sup>16</sup> The real NIRF in the case of an import excess balance is given as:

$$\text{Real NIRF} = \frac{1}{P_M} R + \frac{1}{P_E} E \left( \frac{P_E}{P_M} - 1 \right).$$

The first part of the expression represents the visible part and the other implies the invisible part, which is due to changes in inter-sectoral TOT (compare equations (I) and (I') in Ishikawa 1967a, pp 297). On the other hand, the formula for TOT gains as per the NIA framework (Measure I) can also be derived as follows:

$$\begin{aligned} \text{Sectoral TOT Gains} &= \frac{1}{P_{va}} [X'_{va,j} (P_{va,j} - P_{va})] \\ &= X'_{va,j} \left( \frac{P_{va,j}}{P_{va}} - 1 \right) \\ &= \frac{X_{va,j}}{P_{va,j}} \left( \frac{P_{va,j}}{P_{va}} - 1 \right), \end{aligned}$$

It can be observed that the measure of sectoral TOT effect and invisible NIRF have similar expressions. That is, while,  $P_{va,j}$  and  $P_{va}$  are analogous to  $P_E$  and  $P_M$ , representing the prices received (or price of exports) and prices paid (or price of imports), the export proceeds (or marketable surplus) of a sector is equivalent to the value added in the sector.

## 4. Sectoral Classification and Data Source

### 4.1 Sectoral Classification

The two different concepts of TOT effect, one defined from a *production point of view* and the other defined from the *income point of view* are formulated using alternate sectoral classifications of the Indian economy. Two types of classifications are used, one is a detailed 9-sector classification in which the economy is disaggregated into: 1) agriculture, forestry, logging and fishing, 2) mining and quarrying, 3) manufacturing, 4) electricity, gas and water supply, 5) construction, 6) trade, hotels and restaurants, 7) transport, storage and communications, 8) finance, insurance, real estate and business services, and 9) community, social and personal services. The other is a broader 3-sector classification of the economy consisting of: i) agriculture and allied activities, ii) industry, and iii) services. To construct this, alternate definitions based on the World Bank and the United Nations definitions are used, as shown in the box below.

3-Sector Classification	World Bank Definition	United Nations Definition
Agriculture and Allied Activities	1) Agriculture, forestry & logging and fishing	1) Agriculture, forestry & logging and fishing
Industry	2) mining & quarrying 3) manufacturing 4) electricity, gas & water supply 5) construction	2) mining & quarrying 3) manufacturing
Services	6) trade, hotel & restaurants 7) transport, storage & com 8) finance, insurance, real estate & business services 9) community, social and personal services	4) <i>electricity, gas &amp; water supply</i> 5) <i>construction</i> 6) trade, hotel & restaurant 7) transport, storage & com. 8) finance, insurance, real estate and business services 9) community, social and personal services

As seen above, according to United Nations classification system, construction and electricity, gas and water supply are considered part of the services sector and not of industry. The three measures of TOT effect and the corresponding data counterpart of the variables used in these measures are given below.

$$\text{Gain (Production)}_j = \frac{1}{P_{va}} [X'_{va,j} (P_{va,j} - P_{va})] \quad \text{Measure I}$$

$$\text{Gain (Income)}_j = \frac{1}{P_D} [X'_{va,j} (P_{va,j} - P_D)] \quad \text{Measure II}$$

$$\text{Gain (Income}^*)_j = \frac{1}{P_{Dj}} [X'_{va,j} (P_{va,j} - P_{Dj})] \quad \text{Measure III}$$

where:

$X'_{va,j}$  = sectoral gdp of the  $j$ -th sector at constant prices

$P_{va,j}$  = implicit price deflator for the  $j$ -th sector, i.e.  $P_{va,j} = X_{va,j} / X'_{va,j}$

$P_{va}$  = implicit price deflator for the economy, i.e.  $P_{va} = \sum_j X_{va,j} / \sum_j X'_{va,j}$

$P_D$  = price index of final demand (consumption plus investment)

$P_{Dj}$  = sector specific price index of final demand for the  $j$ -th sector,

$j$  runs from 1 to 3 in the 3-sector classification ( $j$  = agriculture and allied, industry, services) that is used in Measure I and II.

$j$  runs from 1 to 9 in the 9-sector classification ( $j$  = agriculture & allied; mining & quarrying; manufacturing; electricity, gas & water supply; construction; trade, hotels & restaurants; transport, storage & communications; finance, insurance, real estate & business services; and community, social and personal services) that is used in Measure I and II.

and,  $j$  = agriculture or manufacturing, that is used in Measure III.

## 4.2 Data Source (All-India)

### 4.2.1 Data for Measure I

Information concerning the sectoral contributions to the total GDP, at current and constant (1980/81) prices are provided in various issues of National Accounts Statistics (NAS) brought out by Central Statistical Organization (CSO). The implicit price deflator (IPD) for sector  $j$  ( $P_{va,j}$ ) is calculated as ratio of sectoral GDP at current to that of constant prices, both at factor cost. Similarly, the GDP price deflator ( $P_{va}$ ) is worked out as the ratio of economy's GDP at current to that at constant prices, again at factor cost. Now, the factor cost evaluation of GDP does not include indirect taxes and producer subsidies. It is more appropriate to use the estimate of GDP at market

price, since actual sales and purchases of goods and services take place at market prices. Therefore, our subsequent calculation of gain (production) and gain (income) estimates of TOT are undertaken by considering IPDs based on domestic product at market price. However, since the estimates of sectoral value added are available at factor cost only, the total amount of indirect taxes and subsidies due for all sectors are dealt as a separate sector. That is, the difference between market price GDP and factor cost GDP is considered to represent a separate sector consisting of indirect taxes and subsidies due to all sectors in the economy. The GDP price deflator in that case is worked out as the ratio of GDP at current to constant prices, both evaluated at market prices.

#### *4.2.2 Data for Measure II*

Our price index for the overall final demand ( $P_D$ ) is a weighted index of price of private final consumption expenditure (PFCE) and price of total gross domestic capital formation (GDCF). For this, IPDs for PFCE and GDCF are worked out by using the CSO data. The weight used for GDCF ( $w_{GDCF}$ ) is its share in the GDP at market prices at constant prices, and  $(1 - w_{GDCF})$  is the weight for PFCE.

#### *4.2.3 Data for Measure III*

The estimation of sector specific price indices of final demand by agriculture and manufacturing ( $P_{DA}$  and  $P_{DM}$ ) is separately carried out as weighted average of price index for sectoral consumption and capital formation. For this, the two consumer price indices, viz. the *all-India financial year average consumer price index number (general index) for agricultural laborers* (CPIAL) and the same for industrial workers (CPIIW), as prepared by the Labor Bureau (Ministry of Labor), are used to represent the price of consumption items paid by agriculture and manufacturing, respectively. The two different sector-specific series on implicit price changes for items of capital formation in agriculture and manufacturing are calculated using the disaggregated CSO data. The weights used in preparing the sector specific  $P_{Dj}$  are computed by following a procedure analogous to Measure II above. The  $P_{DA}$  for agriculture could not be calculated for years prior to 1960/61 due to the non-availability of data on CPIAL. The  $P_{DM}$  could not be estimated prior to 1965/66 because of similar reasons.



### **4.3 State Level Data**

The state-level data on a comparable basis are available for the period 1970/71 and 1995/96. Further, since the GDCF data are not available for all the states on a comparable basis, our state level examination of TOT is based on analyzing the TOT gain (production) estimates only. The required data for this purpose are compiled from the official estimates of *State Domestic Product* (SDP) as prepared by the respective state statistical bureau or directorates of the various state governments. The SDP estimates for the period 1970/71 to 1980/81 (base: 1970/71) have been assembled from the CSO publication "Estimates of State Domestic Product" (GOI 1985). The estimates of SDP for the period 1980/81 to 1995/96 (base: 1980/81) are collected from the office of the CSO in the electronic format as furnished to the CSO by the state statistical agencies.

The sector specific IPD in different states are worked out as in the all-India analysis. However, since the SDP estimates are evaluated in terms of factor cost only, the extent of taxes and subsidies are not included in the state level TOT calculations. Further, since it is not possible to chain the two series with different base years, our estimates of TOT effect refer to two different base periods. That is, TOT estimates from 1970/71 to 1980/81 refer to 1970/71 base, whereas estimates from 1980/81 to 1995/96 have 1980/81 as the base year.

## **5. Suitability and Quality of the Database**

We have indicated earlier that the multi-sectoral framework of TOT is based on the national income accounting (NIA) principles, which requires the application of sectoral value-added and implicit price deflator (IPD) estimates. Thus, the question of suitability and quality of the database underlying value added aggregates and IPDs requires a detailed comment.

There have been some significant definitional improvements, methodological refinements and expansion in the scope of the Central Statistical Organization's (CSO) value added estimates from time to time. However, despite the best efforts made by the CSO, there are still some deficiencies in the 1980/81 series estimates of GDP, which have been used in this study. For instance, it has been argued that the agricultural value added in India is underestimated due to the incomplete coverage of certain agricultural crops and allied products, and omission of emerging

crops and plants (Kulshreshtha et al 1997, Minhas and Roy Choudhury 1998). Similarly, Pradhan and Saluja [1998] and Nagraj [1999] indicate that the manufacturing value added estimates in India have certain limitations, due to 1) incomplete coverage of factories, 2) under-reporting of both worker and value added figures in the registered segment, and 3) under-estimation of value added in the unregistered segment. In addition, it is believed that the inaccuracies in the services GDP estimates are considerable as compared to the agriculture and industry sectors (GOI 1989, Sivasubramonian 2000). It is argued that the underestimation of the GDP originating from services is due to the downward bias of the census-based workforce estimates and the understatement of income originating in certain service producing sectors (Kansal 1992, Kulshreshtha and Singh 1999).

In view of the above considerations, it becomes essential to keep in mind the possible shortcomings of IPDs as indicators of price signals in the economy. In addition, there are other methodological and practical problems, which crop up in the process of computing the sectoral IPDs. First, the aggregate GDP deflator is an implicit price index derived in a roundabout manner by dividing the current value GDP by constant value GDP. Since the IPD is not obtained by direct price measurement, its value depends upon all those price indexes (wholesale price, consumer price as well as several other indexes and deflators), that have been previously used to adjust various components and sub-components of GDP for price change. Now, since the resulting IPD is a mixture of the effects of wholesale or consumer price changes, its direct interpretation has some definite limitations. Further, as the composition of GDP changes, the importance of the individual indexes that are used to deflate components of GDP also changes. The components of GDP are in effect weights for determining the IPD, which in essence is a *Paasche* type index.

Second, a sectoral IPD truly reflects the price development of sectoral value added provided a *double deflation method* is used to calculate the real value added of the sector. However, it has not been possible to apply the double deflation method consistently for all the economic sectors in India. This is due to the non-availability or limitations in required data base that constrained the separation and subsequent identification of price and quantity data for all items of inputs and output in certain sectors, particularly in the service segment (GOI 1980, 1989). As a result, a single deflation method - by means of deflating only the output values - has

sometimes been adopted for specific service sectors. In a few cases only the base period cost ratios have been applied to the deflated values of output. In this context, RoyChoudhury and Mukherjee [1984] claim that IPDs for the primary and secondary sectors are reasonably representative and realistic as compared to the IPD for the service sector.

Third, in services group of sectors where the value of output is generally estimated by a *factor income* approach, estimates of real value added in certain cases are prepared only on the basis of some indicators relating to the growth of sectoral price and quantity levels. These factors make the value added estimates in services sector prior to the 1970/71 base year revision of NAS data suspect due to the use of inappropriate methods of calculation (GOI 1980). Therefore, the quality and suitability of the IPD for services sector prior to 1970/71 may not be as satisfactory as for the other sectors. However, the revised methodology of NAS used for the post 1970/71 period seems to have resulted in more satisfactory price deflators for the different service sectors.

However, the inherent weakness in the IPD for various service sectors persist due to the fact that output in these sectors is typically not well defined in India. That is, while estimating the real value added in these hard-to-measure service sectors, it is generally assumed that output increases proportionately with inputs, thus ruling out productivity growth in these sectors by assumption. This may have led to an upward bias in the IPDs of the service producing sectors.

Fourth, the methodology employed for estimating different value added aggregates has been revised several times since the inception of the series in 1955 till the publication of the latest series with 1993/94 base. There have been several definitional and methodological changes thanks to availability of fresh data and (or) inclusion of new products. While the revised estimates for previous years are generally provided along with each revision of the NAS data, the extent of such revisions is considerable, particularly at the sectoral level (GOI 1989). Consequently, the possibility of aberrant fluctuations can not be ruled out in the output series of certain sectors during the overall period spanning five decades. It has been claimed in this context that the changes in concepts, database and methodology in NAS do not pose a serious problem for long-term analysis over the period 1950/51 to 1996/97 with 1980/81 as base (Sivasubramonian 2000).

It is apparent that similar caveats also apply to the sectoral IPDs at the state-level, which are worked out from the CSO's state domestic product data. However, in spite of these limitations, IPD series have been used by Ahluwalia [1979,1985 b], Roy Choudhury and Mukherjee [1984] to analyze the behavior of relative prices, and more recently by Misra and Hazell [1996], Misra [1998], Acharya [2001] to examine the agricultural TOT. It may be mentioned that Pandit [2000] has recently argued that the IPD series, due to its wider coverage, may perform better (as compared to any other series based on wholesale or consumer prices) in capturing the total economic activity of a particular sector.

It may be surmised from this above discussion that IPDs are no doubt very important price indices since they are used to compute the real GDP - one of the fundamental economic aggregates - but these are basically "production" price indices.<sup>17</sup> Thus, if the IPDs are used in the calculations, the derived TOT index will capture the relative sectoral price variability from a producer perspective, unlike the wholesale or consumer prices which reflect the perspective of consumer income and welfare.

## **6. Empirical Analysis of TOT Effects: all-India**

### **6.1 Three sector Analysis**

#### *6.1.1 Patterns in TOT Effects*

Table 1 provides the estimates of sectoral TOT effect for the three broad economic sectors, viz. agriculture and allied, industry and services.<sup>18</sup> It appears that the service sector in India has by and large experienced favourable TOT effects (i.e. TOT gains) over the entire study period. The extent of the favourable TOT effect for services is more pronounced when we define the sector according to the UN classification system. Concomitantly, the adversity of industrial TOT is greater when electricity, gas and water supply and construction sub-sectors are excluded to define the aggregate industry sector. Domestic TOT at the beginning of 50's remained favourable to agriculture as well as services sector, and unfavourable to the industry sector. A distinct change occurred during mid-50's whereby TOT effect became

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<sup>17</sup> See Fisher and Shell [1972, 1998] for an analysis on this line.

<sup>18</sup> The TOT effects in this table have been calculated by using the value added estimates at factor cost, thus the estimates exclude the extent of taxes and subsidies in the economy. In the subsequent analysis, we have included the total taxes and subsidies in the economy as a separate sector.

negative for agriculture along with a coexisting improvement for the industry sector. This pattern continued till the mid-60, whereby some considerable TOT gain was

Table - 1: Terms of Trade Effects, gain (production) and gain (income) in Major sectors, base 1980/81.

Sector ->	I. AGRICULTURE & ALLIED				II. INDUSTRY (WB definition)				III. SERVICES (WB definition)			
	Production Gains		Income Gains		Production Gains		Income Gains		Production Gains		Income Gains	
	(Rs.Crore)	as % of sectoral real gdp	(Rs.Crore)	as % of sectoral real gdp	(Rs.Crore)	as % of sectoral real gdp	(Rs.Crore)	as % of sectoral real gdp	(Rs.Crore)	as % of sectoral real gdp	(Rs.Crore)	as % of sectoral real gdp
1950/51	174.9	0.7	-	-	-391.9	-5.7	-	-	217.0	1.8	-	-
1955/56	-3203.4	-11.7	-	-	160.1	1.7	-	-	3043.4	20.8	-	-
1960/61	-3169.8	-9.9	-4067.2	-12.7	430.7	3.4	25.5	0.2	2739.1	15.0	2083.5	11.4
1965/66	562.5	1.8	960.7	3.1	-1730.7	-9.9	-1532.8	-8.7	1168.2	5.0	1476.1	6.3
1970/71	633.5	1.6	-50.7	-0.1	-1560.9	-7.3	-1892.8	-8.9	927.4	3.2	429.0	1.5
1975/76	-2150.1	-4.8	-4571.3	-10.2	-112.1	-0.4	-1530.8	-6.1	2262.3	6.4	124.4	0.4
1980/81	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1985/86	-2504.1	-4.6	-1476.4	-2.7	848.0	2.0	1723.9	4.0	1656.1	2.8	2863.9	4.8
1990/91	91.5	0.1	2035.8	3.1	-1498.5	-2.4	340.9	0.5	1407.0	1.7	3900.2	4.7
1991/92	2763.7	4.3	5118.0	8.0	-3223.1	-5.1	-1123.6	-1.8	459.5	0.5	3538.0	4.1
1992/93	873.1	1.3	3255.8	4.8	-1824.2	-2.8	377.2	0.6	951.0	1.0	4145.1	4.5
1993/94	2160.1	3.1	5331.0	7.6	-2787.7	-4.1	79.7	0.1	627.5	0.6	4929.3	5.1
1994/95	4460.7	6.1	9401.5	12.8	-3717.6	-5.0	719.6	1.0	-743.1	-0.7	5748.4	5.6
1995/96	4063.1	5.7	8456.9	11.8	-2877.1	-3.3	1969.0	2.3	-1186.1	-1.0	5544.4	4.7
1996/97	2540.7	3.3	6931.4	8.9	-3238.0	-3.5	1640.4	1.8	697.4	0.5	7699.0	6.1

Sectors -	II. INDUSTRY (UN definition)				III. SERVICES (UN definition)			
	Production Gains		Income Gains		Production Gains		Income Gains	
	(Rs.Crore)	as % of sectoral real gdp	(Rs.Crore)	as % of sectoral real gdp	(Rs.Crore)	as % of sectoral real gdp	(Rs.Crore)	as % of sectoral real gdp
1950/51	-126.2	-2.4	-	-	-48.7	-0.4	-	-
1955/56	170.9	2.4	-	-	3032.6	18.0	-	-
1960/61	447.6	4.7	135.8	1.4	2722.2	12.8	1973.1	9.2
1965/66	-1236.1	-9.4	-1086.6	-8.3	673.6	2.4	1029.9	3.7
1970/71	-1367.5	-8.7	-1608.7	-10.2	734.1	2.1	144.9	0.4
1975/76	71.4	0.4	-998.3	-5.3	2078.7	5.0	-408.1	-1.0
1980/81	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1985/86	-817.4	-2.5	-178.9	-0.5	3321.5	4.8	4766.8	6.9
1990/91	-4228.5	-8.6	-2902.5	-5.9	4137.0	4.2	7143.6	7.3
1991/92	-5325.0	-11.2	-3838.2	-8.1	2561.3	2.5	6252.6	6.1
1992/93	-4582.9	-9.3	-3032.8	-6.1	3709.8	3.5	7555.1	7.0
1993/94	-5682.6	-11.0	-3674.5	-7.1	3522.4	3.1	8683.6	7.6
1994/95	-6757.3	-12.1	-3647.9	-6.5	2296.5	1.9	10115.8	8.3
1995/96	-7267.0	-10.8	-3792.8	-5.6	3203.8	2.3	11306.1	8.3
1996/97	-9120.9	-12.7	-5678.6	-7.9	6580.2	4.5	15017.9	10.2

Notes:

The data source is National Accounts Statistics (CSO). b) TOT gain during the base year assumes a situation of no loss-no gain. c) TOT gain (production) and (income) have been calculated according to Measure I and II, respectively. d) In the VB definition, industry sector comprises of mining, manufacturing; construction; and electricity, gas and water supply, and the service sector includes wholesale and retail trade, restaurants and hotels; transport, storage and communications; finance, insurance, real estate & business services; and community, social and personal services. In the UN definition, construction and electricity, gas and water supply are included in services instead of industry. e) The indirect taxes and subsidised have not been considered in this table.

also noticed for the services sector in this period. The second major turnaround in the pattern of Indian domestic TOT effect occurred during the mid-60's, which was marked by a distinct improvement for agriculture along with a deterioration for industry and a decline in the extent of TOT gains in services. The agricultural sector continued to experience positive TOT effects till about mid-70's, after which there was a slump in agricultural TOT effect which carried on till the beginning of 90's. During the 90's, sectoral TOT effects again turned favorable to agriculture and distinctively negative to industry. The TOT effects on services remained positive, though it fell considerably in the 90's. A graphical plot of TOT gain (production), as per measure I, is provided in figure 1.

### 6.1.2 Patterns in Trend of TOT Effects

We analyze the statistical trend of TOT effects in these three broad sectors during two sub-periods.<sup>19</sup> It may be noted that the earlier studies have detected a pattern for the agricultural NBTOT during the period between early or mid-60's and mid-70's. Similarly, the recent NBTOT estimates of the government agencies (Commission for Agricultural Costs and Prices and Directorate of Economics and Statistics) and Thamarajakshi [2000] have revealed an improvement of agricultural NBTOT between early-80's and mid-90's. We therefore examine the trend of TOT effects referring to the sub-periods 1960/61 to 1975/76 and 1981/82 to 1996/97. Table 2 provides this information.

**Table 2: Time Trend in TOT Effects (3-sector classification), (1961-76 and 1982-97).**

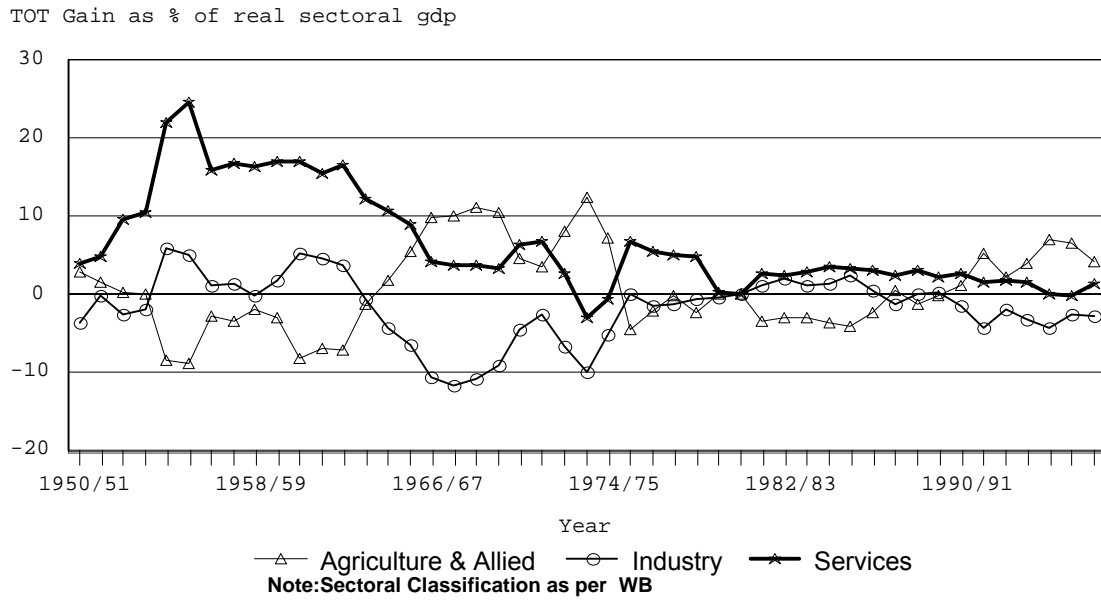
Sectors	TOT Gain (Production)		TOT Gain (Income)	
	1961-76	1982-97	1961-76	1982-97
Agriculture & Allied	0.81 (2.43)*	0.73 (8.41)*	0.75 (2.08)*	1.12 (9.37)*
Industry (WB)	-0.56 (-2.04)*	-0.40 (-6.61)*	-0.56 (-2.29)*	-0.04 (-0.51)
Services (WB)	-1.03 (-5.63)*	-0.18 (-4.65)*	-1.02 (-6.11)*	0.21 (6.07)*
Industry (UN)	-0.68 (-2.19)*	-0.88 (-11.76)*	-0.68 (-2.45)*	-0.55 (-5.52)*
Services (UN)	-0.92 (-4.77)*	0.02 (0.33)	-0.91 (-5.19)*	0.41 (8.44)*

Notes:

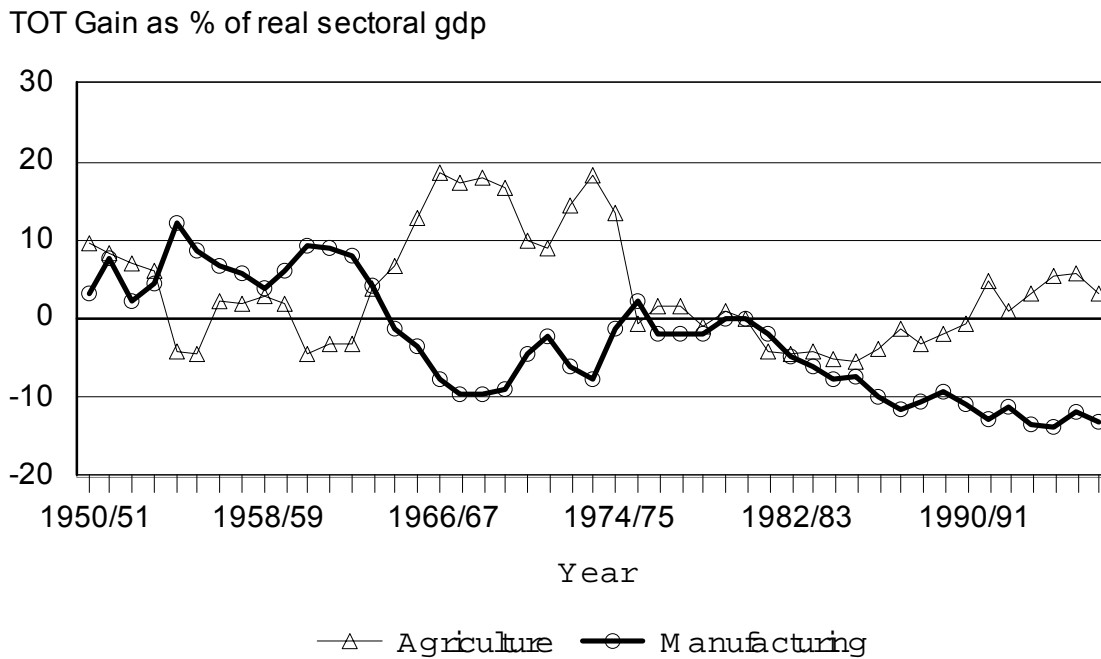
- 1) The coefficient of time trend (t) is given in the table.
- 2) The time trends are obtained by regressing the TOT effects (TOT gains as percentage of real output) on time in linear form.
- 3) \* indicates significant t values at 10% level of significance.

<sup>19</sup> The TOT effects revealed absence of any statistically significant trend during the overall study period. This is consistent with the earlier assertions made by Thamarajakshi [1994] and Palanivel [1999] that NBTOT in India did not bear any distinct trend in the long run. See Deb [2002 a] for details.

**Figure 1: TOT Effects in Agriculture & Allied , Industry and Services:  
1950/51 to 1996/97, base:1980/81**



**Fig 2 :TOT Effects in Agriculture and Manufacturing :  
1950/51 to 1996/97 ,base :1980/81**



We notice a positive trend in the TOT effects for agriculture and allied sector during both the sub-periods, i.e. the TOT gain (production) and TOT gain (income) measure indicated statistically significant upward movements in this sector. On the contrary, the trend in both the measures of TOT effects for the aggregate industry sector is downward movements in each of the two sub-periods. This result is robust to alternate sectoral definitions. The TOT effect towards services reflected a positive trend during the 80's after having moved downward between 1960/61 to 1975/76. In particular, the TOT gain (income) measure indicates the presence of statistically significant positive trend for both the WB and UN definition.

## **6.2 Nine-Sector Analysis**

### *6.2.1 Patterns in TOT Effects*

The detailed estimates of TOT effect at 9-nine-sector classification level of the Indian economy are provided in appendix table A-1. The table shows that sectoral TOT effect turned positive for sectors like, mining and quarrying; construction; and trade, hotels and restaurants (THR) during the 80's and 90's decade. The TOT gain in construction sector is significantly high during recent years. The finance, insurance, real estate and business services (FIRE) sector reflects an opposite trend with a positive TOT effect during the period preceding 1980/81 followed by considerably negative TOT effects. As regards the infrastructure segment, viz. electricity, gas and water supply (EGW); and transport, storage and communications (TSC) sectors, while EGW can be found to have experienced positive TOT effect only since the 90's, TSC had positive TOT effect in each of its constituents sub-sectors during the entire study period.

### *6.2.2 Patterns in Trend of TOT Effects*

In table 3, we provide information on the sustained trend of TOT effects in these disaggregated sectors during similar sub-periods, viz. 1960/61 to 1975/76 and 1981/82 to 1996/97. We notice that both the TOT gain (production) and TOT gain (income) measure have registered a sustained upward movement in agriculture and a downward one in manufacturing during both the sub-periods. The downward trend in manufacturing holds for both the registered and unregistered segments within manufacturing sector. The TOT effects for construction sector indicated an upward trend during the second sub-period. On the other hand, the FIRE sector displayed a



significant declining trend in both sub-periods. Finally, while the TOT gain (income) measure indicated an upward movement, the TOT gain (production) measure revealed a significant TOT downturn in the THR sector since the 80's decade.

**Table 3: Time Trend in TOT Effects (9-sector classification): 1961-76 and 1982-97**

Sectors	TOT Gain (Production)		TOT Gain (Income)	
	1961-76	1982-97	1961-76	1982-97
Agriculture	0.88 (2.16)*	0.76 (7.65)*	0.82 (1.90)*	1.15 (8.68)*
Manufacturing (Registered + Unregistered)	-0.76 (-2.46)*	-0.64 (-7.59)*	-0.76 (-2.72)*	-0.31 (-2.86)
Manufacturing (Registered)	-0.81 (-2.73)*	-0.77 (-11.08)*	-0.80 (-3.11)*	-0.44 (-4.99)*
Manufacturing (Unregistered)	-0.69 (-1.99)*	-0.44 (-3.68)*	-0.69 (-2.13)*	-0.11 (-0.72)
Electricity, Gas & Water Supply	-0.87 (-3.28)*	0.47 (1.78)*	-0.85 (-3.60)*	0.87 (3.07)*
Construction	0.04 (0.17)	1.75 (4.87)*	0.02 (0.09)	2.24 (6.86)*
Trade, Hotels & Restaurants	0.85 (4.27)*	-0.22 (-2.44)*	0.78 (5.12)*	0.16 (1.91)*
Transport, Storage & Communication	-2.67 (-7.84)*	2.08 (9.62)*	-2.58 (-7.81)*	2.59 (13.44)*
Finance, Insurance & Real Estate	-2.51 (-9.46)*	-1.59 (-10.57)*	-2.42 (-8.48)*	-1.29 (-7.47)*
Community, Social & Personal Services	-1.21 (-5.12)*	0.31 (3.36)*	-1.19 (-5.63)*	0.70 (9.56)*

Notes:

- 1) The coefficient of time trend (t) is given in the table.
- 2) The time trends are obtained by regressing the TOT effects (TOT gains as percentage of real output) on time in linear form.
- 3) \* indicates significant t values at 10% level of significance.

Finally, in view of the general interest on the agriculture-manufacturing TOT relations, we separately examine the TOT effects for these two sub-sectors in table 4. These results are based on measure III, which incorporates the possibility of separate final demand patterns in agriculture and manufacturing. It can be seen that while the pattern for agricultural TOT effect broadly followed that of the agriculture and allied activities, the same was not true for the manufacturing sub-sector in relation to aggregate industry sector. The results indicate that while the agricultural TOT effect turned positive during the 90's, there has not been any indication of

positive TOT effect on manufacturing since the mid-60s. Additionally, TOT effects on manufacturing appear to have become particularly adverse since the late-80. A graphical plot of the TOT gain (production) measure (measure I) on agriculture and manufacturing sub-sectors during the entire study period has been provided in figure2.

Since the nature of TOT gain (production) and TOT gain (income) measure is different, a noticeable difference between the two can indicate a possible impact of TOT change on sectoral real income positions. It can be observed from table 4 that the extent of TOT gain (production) was much greater than corresponding TOT gain (income) during the period between mid-60's to mid-70, and vice versa in the latter period. Now, studies by Tyagi [1987], Mungekar [1992], Palanivel [1992] and Thamarajakshi [1994] have indicated this phase as a period of favorable agricultural TOT in India. The difference in production and income measures of TOT effect may indicate that the favorable agricultural TOT in this period was more pronounced with regard to the production front of buying intermediary inputs, as compared to the expenditure side of buying final consumption goods. The relatively lower purchasing capacity of final consumption goods by agriculture might indicate a demand constraint for manufactured final goods as a result of reduced rural demand. The TOT adversity on manufacturing sector was also felt more with regard to its final consumption front in comparison with the purchasing power of intermediary inputs during the period of adverse TOT (mid-60's to mid-70's). The combined pressure of adversity in final consumption front as experienced by both agriculture and manufacturing could have resulted in an overall "demand constraint" for the manufactured consumption goods during this period. This would indicate that the Indian manufacturing sector, besides experiencing a possible wage goods constraints in the input front due to adverse NBTOT, was also constrained with regard to demand for manufactured final consumption items during mid-60's to mid-70's.

## **7 State Level Analysis**

### **7.1 Patterns in TOT Effects**

The results on sectoral TOT effect for fifteen state economies of India during specific years in 70's, 80's and 90's, have been provided in the appendix at table A-.2. The TOT effect on agriculture has been negative during the 70's, which seems to have

Table - 4: Terms of trade effects, gain (production) and gain (income) in Agriculture and Manufacturing, base 1980/81.

Sector ->	I.1 AGRICULTURE						II.1. MANUFACTURING (REGD+UNREGD)					
	Production Gain		Income Gain		Income Gain *		Production Gain		Income Gain		Income Gain *	
	(Rs.Crore)	as % of sectoral real gdp	(Rs.Crore)	as % of sectoral real gdp	(Rs.Crore)	as % of sectoral real gdp	(Rs.Crore)	as % of sectoral real gdp	(Rs.Crore)	as % of sectoral real gdp	(Rs.Crore)	as % of sectoral real gdp
1950/51	2043.68	9.80	-	-	-	-	157.90	3.24	-	-	-	-
1955/56	-1061.78	-4.36	-	-	-	-	562.25	8.69	-	-	-	-
1960/61	-1277.19	-4.43	-2627.22	-9.11	-	-	828.65	9.45	358.48	4.09	-	-
1965/66	3540.29	12.94	2796.65	10.22	-993.07	-3.63	-433.02	-3.59	-712.91	-5.91	-444.63	-3.69
1970/71	3571.66	9.94	1734.46	4.83	-1119.76	-3.12	-634.69	-4.35	-1284.11	-8.80	-1073.07	-7.35
1975/76	-259.73	-0.65	-2687.28	-6.76	-8305.23	-20.90	369.73	2.15	-710.29	-4.13	-1303.40	-7.58
1980/81	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
1985/86	-2726.95	-5.47	-2071.76	-4.16	-8.75	-0.02	-2180.18	-7.19	-1788.97	-5.90	-4043.85	-13.34
1990/91	-357.97	-0.59	825.80	1.35	4308.39	7.06	-4866.25	-10.85	-4085.37	-9.11	-6398.36	-14.26
1991/92	2910.27	4.90	4439.23	7.47	4804.41	8.09	-5531.22	-12.80	-4606.88	-10.66	-7086.02	-16.40
1992/93	727.97	1.15	2349.93	3.71	1269.95	2.01	-5018.33	-11.15	-4006.35	-8.91	-6819.64	-15.16
1993/94	2024.31	3.09	4349.69	6.64	6124.65	9.35	-6257.97	-13.33	-4857.07	-10.35	-7326.76	-15.61
1994/95	3865.68	5.61	7746.98	11.25	7922.03	11.51	-7102.53	-13.89	-4751.57	-9.29	-7373.46	-14.42
1995/96	3933.57	5.88	7335.72	10.97	-	-	-7270.99	-11.69	-4631.02	-7.44	-	-
1996/97	2446.19	3.38	5864.01	8.10	-	-	-8763.92	-13.12	-6113.06	-9.15	-	-

Note :- The TOT production gain, income gain and income gain\* are calculated according to Measure I, II, and III, respectively.

continued till about mid-80's in most of the states. The exceptions are Haryana, Rajasthan and to some extent Madhya Pradesh and Maharashtra, where some positive agricultural TOT effect is noticed during the 70's decade. Beginning 1990/91, a favorable shift in agricultural TOT effect is seen in some of the states. The states of Bihar, Gujarat, Maharashtra, Rajasthan and West Bengal have a distinctively positive agricultural TOT effect since early-90's, which may mark the beginning of policy reforms in agriculture. Some improvements in agricultural TOT effect during the post-reform phase is also seen in the states of Haryana, Himachal Pradesh, Karnataka, Kerala and Orrisa. Conversely, a negative TOT effect on agriculture is noticed in the states of Andhra Pradesh, Madhya Pradesh, Punjab, Tamil Nadu and Uttar Pradesh. The TOT situation of the aggregate agricultural and allied activities sector in these states is more or less similar, excepting Himachal Pradesh and Orrisa, where the allied activities (viz. forestry and logging, fishing) had positive TOT effects during the 90's, despite a negative agricultural TOT effect.

A generally negative TOT effect towards manufacturing is observed during the 80's, which persisted till mid-90's in most states, with the exceptions of Kerala, Tamil Nadu and particularly Andhra Pradesh. The TOT effects of the aggregate industrial sector in different states mostly represent a pattern similar to the one depicted by their respective manufacturing sectors. During the mid-90's too a generally negative industrial TOT effect is seen in most states, barring Andhra Pradesh, Kerala, Tamil Nadu, Orrisa and Uttar Pradesh. The sectoral TOT effect of the aggregate service sector was positive in as many as many as nine states during the 70's decade. This pattern continued in the states of Madhya Pradesh, Punjab, Rajasthan, Tamil Nadu and West Bengal during the 90's but in other states negative service TOT effect is noticed.

## **7.2 Patterns in Trend of TOT Effects**

In table 5, we provide the statistical trend of sectoral TOT effects in each state during the 70's and 80's decade. We have mentioned earlier that construction of a single TOT series for the whole study period was not possible at state level. Therefore, the trends have been calculated separately using the decadal TOT series between 1971/72 and 1980/81 and between 1981/82 to 1990/91. Further, the states have been ranked in descending order by the growth rates of TOT effect. The table shows that sectoral TOT effects during the 70's has registered a sustained

**Table 5: Trend of Sectoral TOT Effects in Major States in India, 1971-81 and 1981-91.**

AGRICULTURE AND ALLIED				INDUSTRY				SERVICES			
(1971/72 to 1980/81)		(1981/82 to 1990/91)		(1971/72 to 1980/81)		(1981/82 to 1990/91)		(1971/72 to 1980/81)		(1981/82 to 1990/91)	
States											
Kerala	0.44	Gujarat	1.92	Orissa	3.69	Orissa	2.16	Uttar Pradesh	3.49	Punjab	0.73
Maharashtra	0.02	Bihar	1.38	Rajasthan	2.98	Himachal	1.38	Bihar	2.09	Haryana	0.48
Madhya Pradesh	-0.02	Maharashtra	0.97	Madhya Pradesh	2.74	Andhra Pradesh	1.17	Karnataka	1.41	West Bengal	0.24
Himachal	-0.09	Karnataka	0.69	West Bengal	2.12	Kerala	0.97	Andhra Pradesh	1.25	Himachal	0.22
Rajasthan	-0.49	Uttar Pradesh	0.31	Punjab	1.76	Tamil Nadu	0.46	Tamil Nadu	1.24	Kerala	0.20
Haryana	-0.54	Rajasthan	0.30	Haryana	1.39	West Bengal	0.21	Orissa	1.08	Maharashtra	0.07
Punjab	-1.24	Madhya Pradesh	0.28	Andhra Pradesh	1.32	Uttar Pradesh	0.16	Punjab	1.03	Tamil Nadu	-0.22
Orissa	-1.26	Andhra Pradesh	-0.13	Gujarat	1.21	Punjab	-0.05	West Bengal	0.91	Rajasthan	-0.45
Bihar	-1.26	Haryana	-0.16	Karnataka	0.97	Rajasthan	-0.09	Haryana	0.54	Orissa	-0.46
Andhra Pradesh	-1.28	Tamil Nadu	-0.39	Bihar	0.88	Madhya Pradesh	-0.15	Gujarat	0.52	Karnataka	-0.55
Karnataka	-1.32	Punjab	-0.41	Uttar Pradesh	0.84	Karnataka	-0.43	Maharashtra	0.48	Andhra Pradesh	-0.61
Gujarat	-1.56	Orissa	-0.48	Kerala	0.52	Haryana	-0.63	Himachal	0.20	Bihar	-0.74
Tamil Nadu	-1.67	West Bengal	-0.58	Tamil Nadu	0.04	Maharashtra	-0.79	Rajasthan	-0.69	Uttar Pradesh	-0.76
West Bengal	-1.84	Himachal	-0.92	Himachal	0.03	Gujarat	-0.84	Kerala	-0.79	Gujarat	-0.77
Uttar Pradesh	-1.94	Kerala	-0.92	Maharashtra	-0.49	Bihar	-1.27	Madhya Pradesh	-1.62	Madhya Pradesh	-0.82

Notes: 1). Trends are derived by regressing TOT gain (production) as % of respective real sectoral output on time in linear form.

2). States are arranged by ranking the magnitude of trends in a descending order.

3). Industry and service sectors are been defined as per the World Bank definition.

downward movement for agriculture and allied sector and upward movement for both industry and service sectors in most of the states. A noticeable turnaround in the trend direction of TOT movements occurred at the state-level during the 80's, whereby sectoral TOT begun to move with a positive trend in agriculture along with a coexisting declining trend in both industry and service sectors.

We further examine the statistical trend by including the estimates of sectoral TOT effects for the post-reform years, i.e. by calculating the trend in state-level sectoral TOT series during the period between 1981/82 and 1995/96. The results are provided in Appendix table A-3. We noticed a statistically significant positive trend in agricultural TOT effect for nine states. On the other hand, a significant downward movement for the TOT effects on manufacturing was seen for eleven out of fifteen states in our sample. The only exceptions are Andhra Pradesh and Kerala. There is evidence of a significantly declining TOT effect for the aggregate industry sector in eight states, and similarly, a significant downtrend in the TOT effect of services sector was observed for seven states. A sustained improvement for service TOT effect is seen only in the states of Punjab and West Bengal. When the aggregate industry sector is defined according to UN classification (by excluding EGW and construction sectors), more states see a statistically significant downturn in industrial TOT effect. Concomitantly, there are fewer states that reflect a statistically significant declining trend in service TOT effect. The information on the statistically significant time trend in sectoral TOT effects of different state economies is classified in table 6.

## **8. Reliability of TOT Results for the Service Sector**

The weakness of data source and possible biases in the value added estimates for service sectors have been pointed out earlier in section 5. It is therefore important to scrutinize whether the limitations in the value added estimates for service sectors are likely to lead to a bias in our TOT series, i.e. whether the inclusion of service sector has produced any tendency to under- (or over-) estimate the domestic TOT movements in India. It appears that such a bias may not be large, due to the fact that the methodological framework that has been used in this study refers to the entire economy and not services sector in isolation. That is, the estimates of

**Table 6: Pattern of Sectoral TOT Effects across Indian States.**

Sectors	Statistically Significant Trend of TOT Effect	
	Upward Trend (favorable TOT)	Downward Trend (Unfavorable TOT)
Agriculture	<i>Bihar, Gujarat, Haryana, Himachal Pradesh, Karnataka, Maharashtra, Punjab, Rajasthan, U.ttar Pradesh &amp; <b>all India</b></i>	None
Agriculture & Allied	<i>Andhra Pradesh, Bihar, Gujarat, Haryana, Karnataka, Kerala, Maharashtra, Orrisa, Punjab, Rajasthan, Uttar Pradesh, West Bengal &amp; <b>all India</b></i>	None
Manufacturing	<i>Andhra Pradesh, Kerala.</i>	<i>Bihar, Gujarat, Haryana, Himachal Pradesh, Karnataka, Maharashtra, Madhya Pradesh, Punjab, Rajasthan, Uttar Pradesh, West Bengal &amp; <b>all India.</b></i>
Industry (WB definition)	<i>Andhra Pradesh, Uttar Pradesh</i>	<i>Bihar, Gujarat, Haryana, Karnataka, Maharashtra, Punjab, Rajasthan, West Bengal &amp; <b>all India</b></i>
Services (WB definition)	<i>Punjab, West Bengal</i>	<i>Bihar, Gujarat, Karnataka, Kerala, Madhya Pradesh, Orrisa, Uttar Pradesh and <b>all-India</b></i>
Industry (UN definition)	<i>Andhra Pradesh, Kerala</i>	<i>Bihar, Gujarat, Haryana, Himachal Pradesh, Karnataka, Madhya Pradesh, Maharashtra, Punjab, Rajasthan, Uttar Pradesh, West Bengal &amp; <b>all India</b></i>
Services (UN definition)	<i>Himachal Pradesh, Maharashtra, Punjab &amp; <b>all India</b></i>	<i>Andhra Pradesh, Bihar, Gujarat, Karnataka, Kerala, Rajasthan, Tamil Nadu &amp; Uttar Pradesh</i>

Source: derived from tables 2, 3 and appendix table A-3.

Note: based on statistically significant trends during 1981/82 to 1995/96

sectoral TOT in our methodology are simultaneously developed for all the domestic sectors that constitute the Indian economy, and not service sector alone. Now, there is no evidence to presume that the value-added estimates on commodity producing sectors or the total GDP estimates in India are erroneous. Thus, if our results on the

TOT effect for agriculture and industry sectors compare well with the previous NBTOT series including the government series in India, then the possibility that the present estimates of services TOT are biased is relatively less. Because, our methodological framework ensures that sectoral TOT effects in constituent sectors get neutralised at the level of aggregate economy.

### **8.1 Comparison with Other Series**

Since the present formulation of sectoral TOT has been based on a multi-sectoral framework, a straightforward comparison of our results with those of the bilateral indices on agricultural NBTOT as estimated by Thamarajakshi [1994], Tyagi [1987], Mungekar [1992] and Palanivel [1999] is not possible. At the best, we can compare our results with theirs across estimates for the agricultural sector. Further, it should be kept in mind that the *TOT effects* are estimates of inter-sectoral resources transfer resulting from changes in the relative price structure, rather than being a measure of changes in relative price itself.

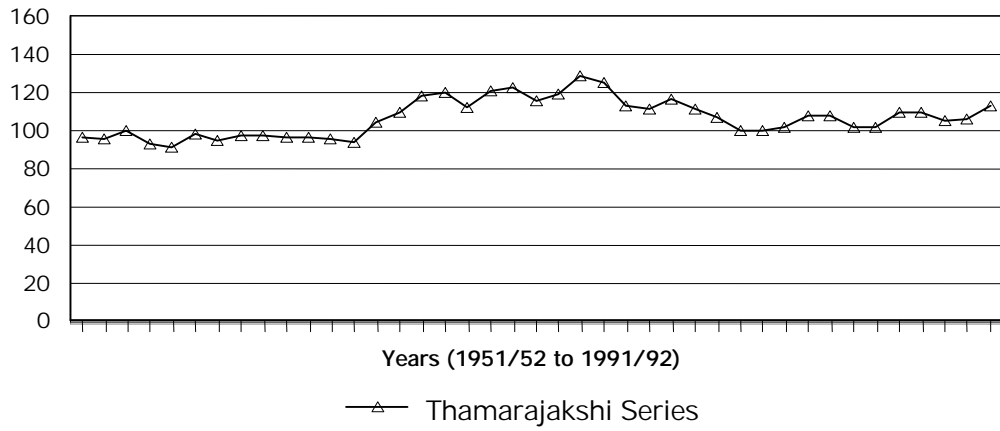
The various agricultural NBTOT series in India, after connecting them with a common base (1980/81), have been reported in Deb [2002 a]. We observe that the decade between mid-60 to mid-70 has been marked with a favorable TOT shift for agriculture in all the NBTOT estimates. This is true for the present estimates of TOT effect on agriculture as well. A subsequent turnaround of TOT against agriculture has likewise been noticed in most of the NBTOT estimates and in the present estimates of agricultural TOT effect. Finally, the results also reflect a favorable turnaround in agricultural TOT during the post-reforms period in India, similar to the series provided by Thamarajakshi [2000] and two government agencies, viz. Commission for Agricultural Costs and Prices (CACP) and Directorate of Economics and Statistics (DES).

To provide a comparison in the overall pattern of movements, we attempt a graphical plot of our series on agricultural TOT effect along with the series constructed by Thamarajakshi [1994], the CACP and the DES in figure 3. It can be observed that the swings in our agricultural TOT series during the 60's and 70's are similar to those in the Thamarajakshi series. Similarly, the upward movement in our agricultural TOT series observed during the early 90's is analogous to that in the CACP series.

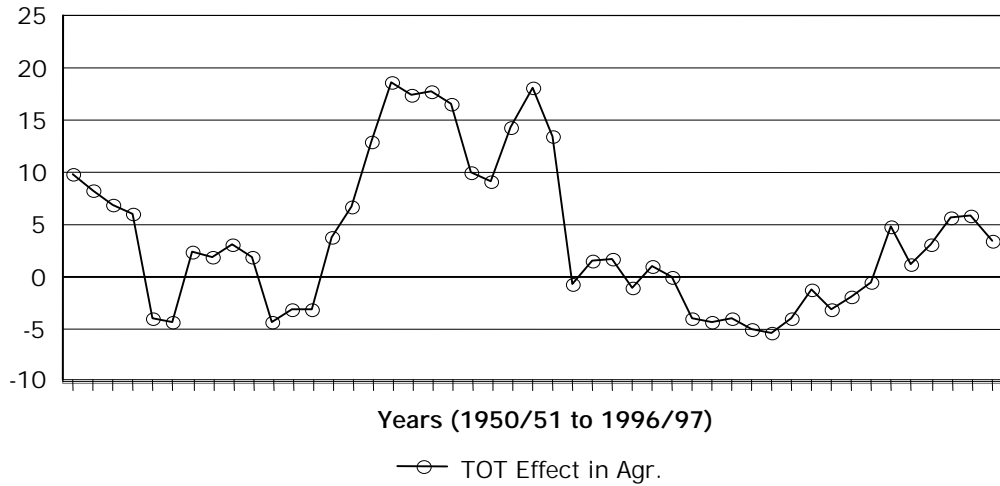


**Figure 3: Comparison of TOT Effect and NBTOT in Agriculture**

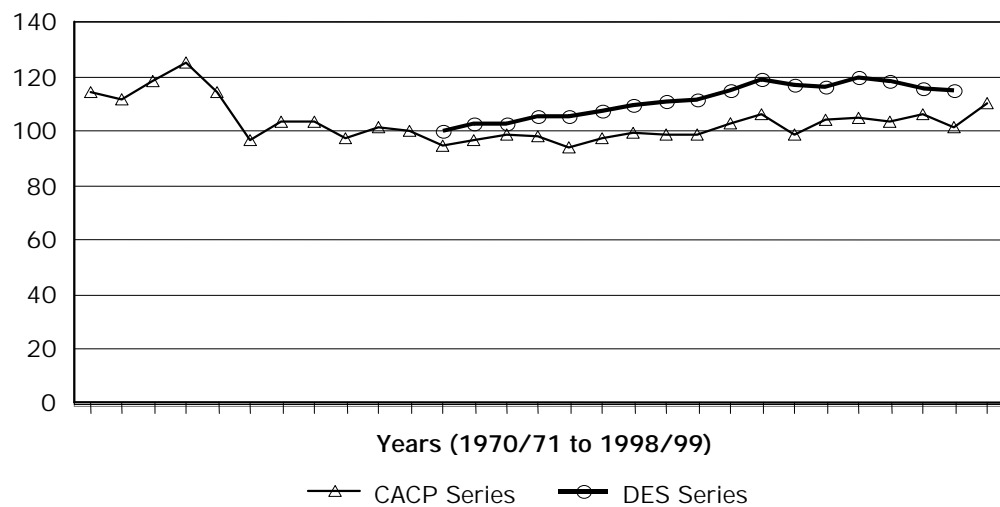
NBTOT Index for all uses



TOT Gain as % of real sectoral gdp



NBTOT Index for all uses



Further, in table 7, we tabulate the correlation coefficients between the present estimates of agricultural TOT effect vis-a-vis alternate agricultural NBTOT series in India. Since the time periods covered in various NBTOT series are different, the correlation coefficient has been computed on the basis of common observations only. We notice a high degree of correlation between the present series on agricultural TOT effect and every agricultural NBTOT series, except the Thamarajakshi series for which the correlation is moderate (0.64).

**Table 7: Coefficient of Correlation between Agricultural TOT Effect and Various Agricultural NBTOT Series.**

Coefficient of Correlation with:					
Thamarajakshi	Tyagi	Mungekar	Palanivel	CACP	DES
0.64	0.89	0.71	0.88	0.96	0.91

*Note: The series on TOT gain (production) as % of real agricultural output has been used in the calculations.*

We also compare our estimates of industrial TOT effect with the inverse of agriculture-industry NBTOT series so as to interpret it as an industry-agriculture NBTOT series. The correlation coefficients between industrial TOT effect and alternate industry-agriculture NBTOT series are given in table 8.

**Table 8: Coefficient of Correlation between Industrial TOT Effect and Inverse of Agricultural NBTOT Series.**

Coefficient of Correlation with the inverse series by:					
Thamarajakshi	Tyagi	Mungekar	Palanivel	CACP	DES
0.87	0.84	0.67	0.87	0.96	0.93

*Note: The TOT gain (production) as % of real industrial output (WB definition) has been used in the calculations.*

We again notice a high degree of correlation between the present series on industrial TOT effect and the inverse of every alternate NBTOT series except for the Mungekar series, which correlates only moderately with the industrial TOT effects.

As far as the issue of agricultural TOT at the state-level is concerned, only a few studies are available on a comparable basis across Indian states. Further, the TOT analysis does not relate to the total agriculture of the state economies, rather involves examining the parity between output and input prices (Rath 1985), or calculating the net income for principal crops (Swamy and Gulati 1986). Recently, Acharya [2001] provided homogeneous estimates of the overall agricultural TOT

encompassing 17 major states, by using the IPD of agriculture and non-agriculture from the SDP (CSO) data. Similar to our results, his analysis also reveals that the compound growth rate of agricultural TOT recorded a positive growth in almost all the states during the period 1980/81 to 1997/98.

## **9. Summary and Implications**

Earlier analyses of sectoral TOT in India have been undertaken on the basis of interpreting the bilateral trade between agriculture and industry (non-agriculture) sector (Thamarajakshi 1994, Tyagi 1987, Mungekar 1992 and Palanivel 1999). The present methodological framework is different from the standard barter TOT concept associated with the two-sector model, because, the TOT effects are derived based on the multi-sectoral trade among all the constituent sectors in the Indian economy. We calculate estimates of sectoral TOT effects at the all-India and also at the level of fifteen major states in India.

The all-India estimates are calculated using a three-sector classification (viz. agriculture and allied, industry and services), and also a detailed 9-sector classification of the Indian economy. Our results indicate that domestic TOT effect in recent years has been positive for agriculture and services sector and negative for the industry sector. The TOT effects for the manufacturing sub-sector and aggregate industry sector have not been positive since the mid-60. Our results also suggest that the infrastructure sectors (electricity, gas and water supply and transport, storage and communication) and service activities (construction and community, social and personal services) have experienced positive TOT movements in India.

We have also constructed estimates of sectoral TOT effect encompassing fifteen state economies of India during 1970/71 to 1995/96. These estimates have been uniformly compiled at the level of 3 broad sectors, and also for agriculture and manufacturing sub-sectors. We notice considerable regional variations in the pattern of sectoral TOT movements across states. A statistically significant improvement in agricultural TOT during 1980/81 to 1995/96 has been observed for nine out of fifteen states. Concomitantly, a significant deterioration in the manufacturing's TOT effect was seen for eleven states during the same period except in the states of Andhra Pradesh and Kerala. We found evidence of a declining TOT effect on aggregate

industry sector in eight states. Similarly, a significant decline in services TOT was observed for seven states.

Beginning with 1991, sectoral TOT effects seem to have increasingly improved for agriculture and deteriorated for manufacturing at the all-India level and also in major state economies. It has been found in many occasions that both output support prices and input subsidies in Indian agriculture have risen substantially during the 90's decade (GOI 1998, 2000a and 2000b). Thus as indicated by Balakrishnan [2000], the favorable shifts in Indian agricultural TOT during the 90's may have been brought about by rising agricultural support prices. On the other hand, the trade liberalization and industrial policy reforms intended to reduce industrial protection in India may have caused the further deterioration in TOT faced by the manufacturing sector.

One major reason why a multi-sectoral approach to TOT analysis is quite relevant for the purpose of analyzing Indian TOT movements is because the service producing segment is now the largest and fastest growing sector in Indian economy, and a two-sector TOT analysis remains insufficient for addressing such. In this context, these results provide a more comprehensive outlook of sectoral TOT because it takes into account all the economic sectors. These multi-sectoral TOT measures are not based only on the traded segment of sectoral outputs but rather, these measures of income gain (loss) due to intersectoral TOT change are hypothetical and therefore refers to both the traded and non-traded segment of each sector. However, this does not imply that the multi-sectoral TOT estimates are unrealistic or inaccurate. In fact, we have found a high degree of correlation between the multi-sectoral TOT series vis-a-vis the previous NBTOT series in India.

These results have some important implications. *First*, the previous agriculture-industry TOT results have led us believe that the beneficiary of an adverse agricultural TOT is inevitably the industry sector. Such an understanding also led to the conclusion that the industry sector is "protected" in the sense that the government intends to provide TOT incentives to the sector. An important aspect of the multi-sectoral TOT analysis is the realization that an unfavorable agriculture TOT does not necessarily imply that sectoral TOT is favorable to the industry sector. In fact, our results suggest that TOT gains since 1965/66 have accrued in the agriculture or services sector, and not in the manufacturing (or aggregate industry) sector in India. Thus, it appears that if we want to know about what is going on in

the domestic TOT front in India, it is time that we start taking the service sector seriously.

Second, a number of the domestic sectors have significant public presence. In addition to services rendered by several administrative departments of the government, i.e, community, social and personal services (CSPS), almost the total output of the electricity, gas and water supply (EGW) sector and the railways and communications sub-sector within the transport, storage and communication (TSC) originate in the public sector. The sectoral TOT effect since the 80's has been positive for EGW, TSC and CSPS sectors after being negative in earlier years. It therefore appears that the role of government - particularly the administered price policy and (or) the public expenditure policy - has an important bearing on the inter-sectoral TOT mechanism in India.

Appendix Table A-1: Terms of Trade Effects, gain (production) and gain (income) in sectors of India, base 1980/81.

Years	Sectors - I. Agriculture, Forestry & Fishing				1.1 Agriculture				1.2 Forestry and Logging			
	Production Gain		Income Gain		Production Gain		Income Gain		Production Gain		Income Gain	
	Rs.Crore	as % of sectoral real gdp	Rs.Crore	as % of sectoral real gdp	Rs.Crore	as % of sectoral real gdp	Rs.Crore	as % of sectoral real gdp	Rs.Crore	as % of sectoral real gdp	Rs.Crore	as % of sectoral real gdp
1950/51	720.5	3.0	-	-	2043.7	9.8	-	-	-1227.5	-47.4	-	-
1955/56	-2426.3	-8.9	-	-	-1061.8	-4.4	-	-	-1265.7	-49.6	-	-
1960/61	-2628.9	-8.2	-4067.2	-12.7	-1277.2	-4.4	-2627.2	-9.1	-1201.2	-45.2	-1272.6	-47.9
1965/66	1754.0	5.6	960.7	3.1	3540.3	12.9	2796.6	10.2	-1609.6	-49.3	-1649.5	-50.5
1970/71	1908.4	4.7	-50.7	-0.1	3571.7	9.9	1734.5	4.8	-1538.6	-42.9	-1633.7	-45.6
1975/76	-1944.5	-4.4	-4571.3	-10.2	-259.7	-0.7	-2687.3	-6.8	-1625.7	-40.4	-1773.3	-44.0
1980/81	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1985/86	-2199.6	-4.1	-1476.4	-2.7	-2727.0	-5.5	-2071.8	-4.2	379.7	11.9	429.2	13.5
1990/91	739.5	1.1	2035.8	3.1	-358.0	-0.6	825.8	1.4	609.8	19.6	682.3	22.0
1991/92	3459.7	5.4	5118.0	8.0	2910.3	4.9	4439.2	7.5	198.7	6.4	279.2	9.1
1992/93	1495.9	2.2	3255.8	4.8	728.0	1.1	2349.9	3.7	238.2	8.1	318.9	10.8
1993/94	2815.2	4.0	5331.0	7.6	2024.3	3.1	4349.7	6.6	160.1	5.5	265.0	9.2
1994/95	5191.3	7.0	9401.5	12.8	3865.7	5.6	7747.0	11.3	8.6	0.3	163.9	5.6
1995/96	4772.1	6.6	8456.9	11.8	3933.6	5.9	7335.7	11.0	195.6	6.7	345.6	11.8
1996/97	3239.6	4.2	6931.4	8.9	2446.2	3.4	5864.0	8.1	12.2	0.4	146.7	5.0

Sectors	1.3 Fishing				2. MINING AND QUARRYING				3. MANUFACTURING			
	Production Gain		Income Gain		Production Gain		Income Gain		Production Gain		Income Gain	
	Rs.Crore	as % of sectoral real gdp	Rs.Crore	as % of sectoral real gdp	Rs.Crore	as % of sectoral real gdp	Rs.Crore	as % of sectoral real gdp	Rs.Crore	as % of sectoral real gdp	Rs.Crore	as % of sectoral real gdp
Years												
1950/51	-95.7	-32.9	-	-	-165.1	-35.7	-	-	157.9	3.2	-	-
1955/56	-98.9	-25.6	-	-	-158.9	-27.8	-	-	562.2	8.7	-	-
1960/61	-150.5	-30.4	-167.4	-33.8	-193.0	-24.2	-222.7	-27.9	828.7	9.4	358.5	4.1
1965/66	-176.7	-30.4	-186.5	-32.1	-355.7	-32.3	-373.7	-33.9	-433.0	-3.6	-712.9	-5.9
1970/71	-124.7	-17.8	-151.4	-21.6	-283.3	-24.2	-324.6	-27.7	-634.7	-4.3	-1284.1	-8.8
1975/76	-59.1	-6.6	-110.7	-12.3	-207.5	-13.7	-288.0	-19.0	369.7	2.2	-710.3	-4.1
1980/81	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1985/86	147.7	12.5	166.2	14.1	1552.0	59.2	1610.0	61.4	-2180.2	-7.2	-1789.0	-5.9
1990/91	487.7	31.3	527.6	33.9	1079.7	25.7	1182.9	28.1	-4866.2	-10.8	-4085.4	-9.1
1991/92	350.8	21.4	399.6	24.4	645.8	14.8	768.7	17.6	-5531.2	-12.8	-4606.9	-10.7
1992/93	529.7	30.6	587.0	33.9	840.6	19.1	973.6	22.1	-5018.3	-11.2	-4006.3	-8.9
1993/94	630.8	34.1	716.3	38.7	990.2	21.6	1182.5	25.7	-6258.0	-13.3	-4857.1	-10.3
1994/95	1317.0	68.1	1490.6	77.0	805.0	16.8	1103.7	23.0	-7102.5	-13.9	-4751.6	-9.3
1995/96	642.9	30.3	775.6	36.6	541.8	10.5	815.4	15.8	-7271.0	-11.7	-4631.0	-7.4
1996/97	781.2	34.4	920.7	40.5	214.4	4.2	459.0	8.9	-8763.9	-13.1	-6113.1	-9.2

cont (1) -

Note :- a) The data source is National Accounts Statistics [CSO]. b) TOT gain during the base period assumes a situation of no loss and no gain. c) Terms of trade gain (production) and (income) are calculated according to Measure I and II, respectively. d) The total indirect tax and subsidy in the economy has been treated as a separate sector.

Appendix Table A-1: Terms of Trade Effects, gain (production) and gain (income) in sectors of India, base 1980/81.

Sectors -	3.1 Manufacturing [Regd]				3.2 Manufacturing [Unregd]				4. ELCTRICITY, GAS & WATER SPLY.			
	Production Gain		Income Gain		Production Gain		Income Gain		Production Gain		Income Gain	
Years	Rs.Crore	as % of sectoral real gdp	Rs.Crore	as % of sectoral real gdp	Rs.Crore	as % of sectoral real gdp	Rs.Crore	as % of sectoral real gdp	Rs.Crore	as % of sectoral real gdp	Rs.Crore	as % of sectoral real gdp
1950/51	66.3	2.9	-	-	91.6	3.6	-	-	-32.6	-23.3	-	-
1955/56	265.4	8.5	-	-	296.9	8.8	-	-	-5.4	-2.6	-	-
1960/61	395.2	8.6	150.5	3.3	433.5	10.4	208.0	5.0	-7.5	-2.0	-25.4	-6.8
1965/66	-279.2	-4.1	-437.4	-6.4	-153.9	-3.0	-275.5	-5.3	-111.9	-16.4	-125.6	-18.4
1970/71	-517.5	-6.1	-889.5	-10.4	-117.2	-1.9	-394.6	-6.5	-70.3	-6.5	-116.9	-10.9
1975/76	269.7	2.8	-335.7	-3.5	100.0	1.3	-374.6	-4.9	-218.9	-14.7	-296.9	-20.0
1980/81	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1985/86	-1070.0	-5.8	-828.3	-4.5	-1110.2	-9.4	-960.7	-8.1	197.6	6.4	243.5	7.9
1990/91	-2736.2	-9.9	-2249.6	-8.1	-2130.1	-12.4	-1835.7	-10.7	-102.9	-2.1	-11.3	-0.2
1991/92	-3225.8	-11.9	-2641.9	-9.8	-2305.4	-14.3	-1965.0	-12.1	-282.7	-5.4	-160.6	-3.1
1992/93	-3062.7	-11.0	-2435.4	-8.7	-1955.6	-11.4	-1571.0	-9.2	102.8	1.8	249.6	4.4
1993/94	-3848.9	-13.2	-2980.9	-10.3	-2409.1	-13.5	-1876.2	-10.5	111.6	1.8	325.9	5.3
1994/95	-4634.2	-14.8	-3205.1	-10.2	-2468.3	-12.5	-1546.5	-7.8	77.1	1.2	433.4	6.6
1995/96	-4962.8	-12.4	-3284.6	-8.2	-2308.2	-10.3	-1346.4	-6.0	647.9	9.1	1020.9	14.4
1996/97	-5757.3	-13.3	-4048.6	-9.4	-3006.6	-12.7	-2064.4	-8.7	1094.2	14.7	1485.3	19.9



Sectors ->	5. CONSTRUCTION				6. TRADE, HOTELS AND RSTRNT.				6.1 Trade			
	Production Gain		Income Gain		Production Gain		Income Gain		Production Gain		Income Gain	
	Rs.Crore	as % of sectoral real gdp	Rs.Crore	as % of sectoral real gdp	Rs.Crore	as % of sectoral real gdp	Rs.Crore	as % of sectoral real gdp	Rs.Crore	as % of sectoral real gdp	Rs.Crore	as % of sectoral real gdp
Years												
1950/51	-203.4	-14.2	-	-	-781.5	-21.4	-	-	-720.8	-21.0	-	-
1955/56	64.2	3.3	-	-	-774.1	-16.8	-	-	-708.7	-16.3	-	-
1960/61	46.9	1.8	-85.0	-3.2	-1033.6	-17.0	-1281.5	-21.0	-948.9	-16.5	-1183.2	-20.6
1965/66	-237.9	-6.5	-320.6	-8.7	-1455.3	-18.4	-1610.8	-20.4	-1361.5	-18.3	-1507.9	-20.2
1970/71	46.0	1.0	-167.2	-3.7	-1493.3	-15.3	-1876.4	-19.3	-1413.5	-15.4	-1773.6	-19.4
1975/76	65.0	1.3	-235.6	-4.9	-34.2	-0.3	-761.7	-6.4	-30.9	-0.3	-715.6	-6.4
1980/81	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1985/86	1538.2	21.4	1659.4	23.1	1266.4	6.4	1557.2	7.9	1246.0	6.7	1520.5	8.2
1990/91	3004.0	30.6	3254.6	33.1	1180.4	4.4	1722.4	6.5	1201.3	4.8	1711.5	6.9
1991/92	2565.7	25.5	2875.2	28.6	868.5	3.2	1548.1	5.8	911.2	3.6	1550.6	6.2
1992/93	2826.1	27.2	3160.4	30.5	1158.5	4.0	1913.2	6.7	1190.2	4.4	1900.6	7.1
1993/94	2960.8	27.9	3428.4	32.3	983.1	3.2	2085.6	6.7	1044.6	3.6	2081.1	7.2
1994/95	3158.9	27.8	3934.1	34.6	513.3	1.5	2327.8	7.0	624.1	2.0	2328.1	7.4
1995/96	3963.4	32.4	4740.9	38.8	-414.8	-1.0	1486.0	3.7	-204.8	-0.6	1572.5	4.2
1996/97	5017.3	39.0	5833.7	45.4	354.9	0.8	2350.0	5.4	507.9	1.3	2371.7	5.9

cont (2) -

Note :- a) The data source is National Accounts Statistics [CSO]. b) TOT gain during the base period assumes a situation of no loss and no gain. c) Terms of trade gain (production) and (income) are calculated according to Measure I and II, respectively. d) The total indirect tax and subsidy in the economy has been treated as a separate sector.

Appendix Table A-1: Terms of Trade Effects, gain (production) and gain (income) in sectors of India, base 1980/81.

Sectors	6.2 Hotels and Resturants				7.TRNSPRT,STORAGE & COMN.				7.1 Railways			
	Production Gain		Income Gain		Production Gain		Income Gain		Production Gain		Income Gain	
Years	Rs.Crore	as % of sectoral real gdp	Rs.Crore	as % of sectoral real gdp	Rs.Crore	as % of sectoral real gdp	Rs.Crore	as % of sectoral real gdp	Rs.Crore	as % of sectoral real gdp	Rs.Crore	as % of sectoral real gdp
1950/51	-60.7	-28.0	-	-	468.4	44.0	-	-	400.3	117.0	-	-
1955/56	-65.4	-24.1	-	-	882.6	66.9	-	-	720.8	180.7	-	-
1960/61	-84.7	-23.4	-98.3	-27.2	856.5	46.3	724.0	39.2	725.5	134.6	663.6	123.1
1965/66	-93.8	-20.1	-102.8	-22.0	721.8	28.8	644.1	25.7	735.8	104.5	701.1	99.6
1970/71	-79.8	-13.9	-102.8	-17.9	914.7	29.0	725.4	23.0	589.0	72.4	523.8	64.4
1975/76	-3.3	-0.5	-46.2	-6.6	477.2	11.0	181.9	4.2	368.7	38.2	286.7	29.7
1980/81	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1985/86	20.4	1.8	36.7	3.2	1545.5	19.4	1677.5	21.1	708.4	50.5	737.8	52.5
1990/91	-20.8	-1.3	10.9	0.7	4049.2	36.3	4346.2	38.9	1208.8	72.1	1265.2	75.4
1991/92	-42.7	-2.5	-2.5	-0.1	4253.3	36.1	4646.9	39.4	1093.8	61.5	1164.2	65.5
1992/93	-31.7	-1.8	12.7	0.7	5250.8	42.2	5698.5	45.8	1283.3	73.0	1360.3	77.4
1993/94	-61.4	-3.1	4.5	0.2	5416.9	41.2	6055.9	46.1	1432.2	82.0	1541.6	88.3
1994/95	-110.8	-5.1	-0.3	0.0	5205.1	36.6	6242.5	43.9	1429.6	80.8	1600.3	90.5
1995/96	-210.0	-7.6	-86.5	-3.1	5609.7	36.8	6612.8	43.3	1578.3	82.8	1745.7	91.6
1996/97	-153.0	-5.1	-21.7	-0.7	6420.8	38.5	7475.5	44.9	1471.4	74.9	1628.4	82.9

Sectors - Years	7.2 Transport by other Means				7.3 Storage				7.4 Communications			
	Production Gain		Income Gain		Production Gain		Income Gain		Production Gain		Income Gain	
	Rs.Crore	as % of sectoral real gdp	Rs.Crore	as % of sectoral real gdp	Rs.Crore	as % of sectoral real gdp	Rs.Crore	as % of sectoral real gdp	Rs.Crore	as % of sectoral real gdp	Rs.Crore	as % of sectoral real gdp
1950/51	7.0	1.2	-	-	-0.7	-2.3	-	-	61.8	54.2	-	-
1955/56	59.2	8.1	-	-	-0.4	-1.2	-	-	102.9	65.1	-	-
1960/61	71.1	6.7	15.8	1.5	-1.2	-3.1	-3.0	-7.8	61.1	28.8	47.7	22.5
1965/66	-54.4	-3.8	-87.6	-6.1	-0.5	-1.1	-1.5	-3.4	40.9	12.6	32.1	9.8
1970/71	179.1	9.6	84.0	4.5	14.8	28.9	11.7	22.9	131.9	30.9	105.9	24.8
1975/76	70.6	2.6	-100.4	-3.7	1.0	1.3	-3.9	-5.0	36.9	6.5	-0.4	-0.1
1980/81	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1985/86	820.8	15.5	906.0	17.1	12.1	7.4	14.6	8.9	4.1	0.4	19.1	1.8
1990/91	2155.6	27.4	2351.0	29.9	22.6	12.8	26.5	15.0	662.2	45.4	703.5	48.3
1991/92	2490.0	30.1	2754.1	33.3	11.6	6.6	16.2	9.2	658.0	42.3	712.4	45.8
1992/93	3133.9	35.7	3435.3	39.2	7.7	4.4	12.4	7.0	825.9	47.9	890.4	51.6
1993/94	2989.8	32.2	3412.9	36.7	5.8	3.1	12.3	6.7	989.1	51.7	1089.1	56.9
1994/95	2787.9	27.7	3473.7	34.5	9.9	5.2	20.4	10.9	977.7	44.1	1148.1	51.8
1995/96	2910.8	27.6	3556.6	33.8	26.7	13.4	37.6	18.9	1093.9	41.6	1272.9	48.4
1996/97	3920.3	34.4	4620.6	40.5	33.6	16.5	44.4	21.9	995.5	32.2	1182.1	38.3

cont (3) -

Note :- a) The data source is National Accounts Statistics [CSO]. b) TOT gain during the base period assumes a situation of no loss and no gain. c) Terms of trade gain (production) and (income) are calculated according to Measure I and II, respectively. d) The total indirect tax and subsidy in the economy has been treated as a separate sector.

Appendix Table A-1: Terms of Trade Effects, gain (production) and gain (income) in sectors of India, base 1980/81.

Years	8. FINANCE, INSURANCE, REAL ESTATE AND BSN. SERVICES.				8.1 Banking and Insurance				8.2 Real Estate, Ownership of Dwelling & Business Services.			
	Production Gain		Income Gain		Production Gain		Income Gain		Production Gain		Income Gain	
	Rs.Crore	as % of	Rs.Crore	as % of	Rs.Crore	as % of	Rs.Crore	as % of	Rs.Crore	as % of	Rs.Crore	as % of
	sectoral		sectoral		sectoral		sectoral		sectoral		sectoral	
	real gdp		real gdp		real gdp		real gdp		real gdp		real gdp	
1950/51	500.7	12.9	-	-	-144.3	-29.4	-	-	645.0	19.1	-	-
1955/56	2349.3	52.1	-	-	-237.9	-32.2	-	-	2587.2	68.6	-	-
1960/61	2452.7	47.3	2078.6	40.1	-287.2	-29.5	-320.8	-33.0	2739.9	65.0	2399.4	57.0
1965/66	2324.0	38.1	2121.2	34.8	-232.4	-17.5	-258.8	-19.5	2556.4	53.6	2380.0	49.9
1970/71	2092.8	28.8	1658.0	22.8	-277.5	-15.3	-349.1	-19.2	2370.3	43.6	2007.1	36.9
1975/76	1404.6	16.2	786.3	9.1	315.4	13.6	153.6	6.6	1089.2	17.2	632.8	10.0
1980/81	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1985/86	-1315.4	-8.9	-1129.2	-7.7	-260.7	-4.5	-183.3	-3.1	-1054.7	-11.9	-945.9	-10.7
1990/91	-4248.7	-19.6	-3908.0	-18.0	-1705.4	-15.3	-1520.7	-13.6	-2543.3	-24.2	-2387.4	-22.7
1991/92	-4784.2	-20.0	-4313.4	-18.0	-1562.5	-11.9	-1279.2	-9.8	-3221.7	-29.7	-3034.2	-27.9
1992/93	-5998.6	-24.3	-5525.4	-22.4	-2484.0	-18.4	-2205.9	-16.4	-3514.6	-31.3	-3319.5	-29.6
1993/94	-5899.8	-22.0	-5180.5	-19.3	-2037.4	-13.4	-1584.6	-10.4	-3862.4	-33.3	-3595.9	-31.0
1994/95	-6296.6	-22.5	-5141.6	-18.4	-2010.1	-12.7	-1269.3	-8.0	-4286.6	-35.6	-3872.3	-32.1
1995/96	-6985.5	-21.1	-5728.0	-17.3	-2544.1	-12.3	-1674.8	-8.1	-4441.3	-35.5	-4053.2	-32.4
1996/97	-7905.3	-21.9	-6619.7	-18.4	-3312.4	-14.4	-2409.2	-10.4	-4592.9	-35.4	-4210.4	-32.5

9.COMNTY,SOC. & PERSNAL SRV. 9.1 Public Administration & Defence

9.2 Other Services

Years	Production Gain		Income Gain		Production Gain		Income Gain		Production Gain		Income Gain	
	Rs.Crore	as % of sectoral real gdp	Rs.Crore	as % of sectoral real gdp	Rs.Crore	as % of sectoral real gdp	Rs.Crore	as % of sectoral real gdp	Rs.Crore	as % of sectoral real gdp	Rs.Crore	as % of sectoral real gdp
1950/51	313.0	8.6	-	-	322.0	33.0	-	-	-9.0	-0.3	-	-
1955/56	1155.5	27.5	-	-	783.7	67.7	-	-	371.8	12.2	-	-
1960/61	858.7	16.5	562.4	10.8	759.5	47.2	643.4	40.0	99.2	2.8	-81.0	-2.3
1965/66	498.9	7.3	321.5	4.7	770.1	31.2	692.2	28.1	-271.2	-6.2	-370.7	-8.4
1970/71	342.1	3.9	-78.1	-0.9	643.4	18.8	453.9	13.2	-301.3	-5.7	-532.0	-10.1
1975/76	596.3	5.7	-82.1	-0.8	809.1	18.6	491.6	11.3	-212.8	-3.5	-573.7	-9.4
1980/81	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1985/86	517.5	3.1	758.5	4.5	411.5	5.1	528.6	6.6	106.0	1.2	229.9	2.6
1990/91	1257.1	5.4	1739.6	7.4	833.0	7.4	1070.4	9.4	424.1	3.5	669.2	5.5
1991/92	1032.0	4.2	1656.4	6.8	727.8	6.3	1029.6	8.9	304.2	2.4	626.8	4.9
1992/93	1375.3	5.4	2058.9	8.0	883.1	7.3	1213.6	10.0	492.1	3.7	845.2	6.3
1993/94	1016.0	3.8	1968.3	7.4	679.2	5.4	1133.1	9.1	336.8	2.4	835.2	5.9
1994/95	794.9	2.9	2319.6	8.4	565.2	4.4	1282.6	10.0	229.7	1.5	1037.0	7.0
1995/96	1713.2	5.9	3196.6	11.0	1002.8	7.5	1695.9	12.6	710.5	4.5	1500.6	9.5
1996/97	2918.1	9.4	4468.7	14.4	1489.0	10.4	2210.9	15.4	1429.2	8.6	2257.8	13.5

concluded.

Note :- a) The data source is National Accounts Statistics [CSO]. b) TOT gain during the base period assumes a situation of no loss and no gain. c) Terms of trade gain (production) and (income) are calculated according to Measure I and II, respectively. d) The total indirect tax and subsidy in the economy has been treated as a separate sector.

Appndix Table A-2: Terms of Trade Effect, gain (production) in Major States of India, base:1970/71 & 1980/81.

ANDHRA PRADESH	I.1. Agriculture		I.AGR. & ALLIED.		II.1 Manufacturing		II. INDUSTRY		III. SERVICES		
	Gain in Lakh of Rupees.	Gain as % of sectoral real gdp.	Gain in Lakh of Rupees.	Gain as % of sectoral real gdp.	Gain in Lakh of Rupees.	Gain as % of sectoral real gdp.	Gain in Lakh of Rupees.	Gain as % of sectoral real gdp.	Gain in Lakh of Rupees.	Gain as % of sectoral real gdp.	
1970/71	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	
1975/76	-17729.4	-11.3	-16050.3	-10.0	6315.0	21.9	8669.3	19.4	7381.0	8.0	
1980/81	-12714.4	-8.0	-10998.3	-6.8	3436.5	9.4	4368.7	7.5	6629.6	5.4	
1980/81	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	
1985/86	-47413.1	-13.0	-35538.6	-9.4	494.8	0.4	24118.6	14.4	11419.9	3.2	
1990/91	-27606.8	-6.3	-17308.6	-3.8	24315.2	17.9	29222.8	12.8	-11914.2	-2.5	
1995/96	-29216.8	-5.8	-16983.0	-3.2	28674.2	19.4	27667.5	10.8	-10684.4	-1.8	
<b>BIHAR.</b>											
1970/71	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	
1975/76	-6680.8	-5.0	-5775.8	-4.2	7619.9	29.5	7440.1	12.2	-1664.2	-3.0	
1980/81	-165.1	-0.1	378.9	0.3	-3363.9	-9.8	-4656.6	-6.3	4277.7	5.8	
1980/81	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	
1985/86	-8882.7	-2.4	-8018.2	-2.1	-2206.8	-1.7	6572.0	3.1	1446.2	0.6	
1990/91	34310.6	8.7	30847.3	7.2	-14000.5	-8.4	-17760.2	-6.1	-13087.1	-4.2	
1995/96	61938.6	15.8	55495.9	12.9	-27514.5	-17.2	-45254.7	-14.9	-10241.3	-2.8	
<b>GUJARAT.</b>											
1970/71	0.0	0.0	0.0	0.0	10.0	0.0	0.0	0.0	0.0	0.0	
1975/76	-9077.8	-8.9	-8283.0	-7.9	3636.6	8.5	4696.3	8.0	3586.7	4.4	
1980/81	-9251.2	-8.3	-7770.1	-6.8	6291.4	10.8	5387.6	6.7	2382.5	2.2	
1980/81	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	
1985/86	-16544.0	-7.3	-10424.6	-4.2	-23069.2	-10.4	5122.0	1.8	5302.6	1.8	
1990/91	22689.6	8.4	29500.2	10.0	-51149.5	-16.4	-9334.4	-2.4	-20165.8	-4.9	
1995/96	58568.7	22.3	64665.6	22.2	-93142.7	-19.4	-57733.4	-10.0	-6932.2	-1.3	

cont (1)-

Notes: 1) TOT gain in the base year assumes a situation of no loss or gain. 2) TOT gains are calculated as per Measure 1. 3) Estimates prior (subsequent) to 1981 refer to 1971 (1981) as base. 4) The industry sector comprises of mining, manufacturing, electricity, gas and water supply and construction. The service sector includes transport, storage and communication; trade, hotels and restaurants; banking and insurance; real estate, ownership of dwelling and business services; public administration and other services.

Appndix Table A-2: Terms of Trade Effect, gain (production) in Major States of India, base:1970/71 & 1980/81.

HARYANA	I.1. Agriculture		I.AGRICULTURE & ALLIED.		II.1 Manufacturing		II. INDUSTRY		III. SERVICES	
	Gain in Lakh of Rupees.	Gain as % of sectoral real gdp.	Gain in Lakh of Rupees.	Gain as % of sectoral real gdp.	Gain in Lakh of Rupees.	Gain as % of sectoral real gdp.	Gain in Lakh of Rupees.	Gain as % of sectoral real gdp.	Gain in Lakh of Rupees.	Gain as % of sectoral real gdp.
1970/71	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1975/76	1335.5	2.2	1388.1	2.2	-143.6	-1.2	-1169.3	-6.4	-218.8	-0.8
1980/81	1094.7	1.6	1449.1	2.1	1223.1	6.6	-292.9	-1.1	-1156.2	-3.0
1980/81	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1985/86	-13232.0	-6.5	-12869.9	-6.3	-52.0	-0.1	5444.9	5.7	7424.9	6.2
1990/91	-5940.0	-2.3	-6527.8	-2.5	-4299.3	-3.8	3505.0	2.6	3022.8	1.7
1995/96	-14856.2	-5.4	-15874.4	-5.7	3907.5	2.8	19216.1	11.6	-3341.6	-1.5
<b>HIMACHAL PRADESH.</b>										
1970/71	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1975/76	-931.7	-6.5	-461.5	-2.9	253.1	19.0	361.2	7.7	100.3	1.3
1980/81	-1590.5	-12.0	-551.2	-3.7	81.8	6.4	-70.0	-1.4	621.2	7.2
1980/81	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1985/86	-2567.5	-8.3	-412.0	-1.1	-563.7	-9.5	519.7	2.8	-107.8	-0.4
1990/91	-5284.9	-13.9	-3905.8	-8.5	-1154.5	-9.9	2917.6	10.7	988.1	2.4
1995/96	2365.4	5.9	2803.9	5.5	-6095.6	-35.4	-4149.9	-10.5	1346.0	2.6
<b>KARNATAKA</b>										
1970/71	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1975/76	-9116.7	-8.4	-8849.3	-7.9	1727.5	4.9	988.8	1.8	7860.5	15.8
1980/81	-7085.1	-6.5	-5643.4	-5.0	-1101.0	-2.1	1334.8	1.8	4308.6	6.7
1980/81	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1985/86	-28428.3	-11.0	-12133.3	-4.5	2872.2	2.8	15508.1	10.5	-3374.8	-1.3
1990/91	-542.8	-0.2	16593.1	5.3	-20451.9	-12.5	-2579.4	-1.2	-14013.7	-3.7
1995/96	7698.4	2.0	27153.8	6.7	-35097.0	-17.8	-6656.5	-2.6	-20497.3	-4.1

cont (2)-

Notes: 1) TOT gain in the base year assumes a situation of no loss or gain. 2) TOT gains are calculated as per Measure 1. 3) Estimates prior (subsequent) to 1981 refer to 1971 (1981) as base. 4) The industry sector comprises of mining, manufacturing, electricity, gas and water supply and construction. The service sector includes transport, storage and communication; trade, hotels and restaurants; banking and insurance; real estate, ownership of dwelling and business services; public administration and other services.

Appndix Table A-2: Terms of Trade Effect, gain (production) in Major States of India, base:1970/71 & 1980/81.

KERALA	I.1. Agriculture		I.AGRICULTURE & ALLIED.		II.1 Manufacturing		II. INDUSTRY		III. SERVICES	
	Gain in Lakh of Rupees.	Gain as % of sectoral real gdp.	Gain in Lakh of Rupees.	Gain as % of sectoral real gdp.	Gain in Lakh of Rupees.	Gain as % of sectoral real gdp.	Gain in Lakh of Rupees.	Gain as % of sectoral real gdp.	Gain in Lakh of Rupees.	Gain as % of sectoral real gdp.
1970/71	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1975/76	-4413.1	-7.0	-2387.4	-3.6	580.7	3.2	352.3	1.4	2035.1	4.0
1980/81	-1226.2	-2.0	2317.7	3.7	1483.2	5.9	1897.6	5.5	-4215.2	-6.5
1980/81	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1985/86	-10034.0	-7.3	-8516.6	-5.7	-4232.2	-7.2	8740.9	9.1	-224.3	-0.1
1990/91	-24040.8	-13.6	-16283.3	-8.7	2862.8	3.6	12863.5	10.1	3419.8	1.6
1995/96	6182.0	3.1	25514.2	11.8	343.2	0.3	4382.7	2.3	-29896.8	-9.2
<b>MADHYA PRADESH.</b>										
1970/71	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1975/76	-236.6	-0.2	-111.4	-0.1	1917.0	8.9	2823.4	6.5	-2712.0	-4.6
1980/81	3141.6	2.6	5208.2	4.0	1498.6	5.6	6315.6	11.8	-11523.7	-15.2
1980/81	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1985/86	-53096.9	-13.7	-48565.4	-11.4	502.3	0.6	39686.2	25.7	8879.2	3.7
1990/91	-54552.8	-11.4	-31375.6	-6.2	-20885.0	-11.8	21183.9	7.9	10191.7	3.0
1995/96	-48351.7	-9.3	-36216.6	-6.7	-22726.7	-11.1	30619.0	9.0	5597.5	1.3
<b>MAHARASHTRA.</b>										
1970/71	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1975/76	-690.7	-0.5	1292.1	0.9	-4404.0	-3.5	-2284.5	-1.4	992.4	0.6
1980/81	167.3	0.1	3391.3	2.0	-8629.4	-4.9	-5091.1	-2.4	1699.9	0.8
1980/81	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1985/86	7037.6	1.9	15461.0	3.7	-32092.8	-6.3	6542.5	1.0	-22003.5	-2.8
1990/91	1757.8	0.3	20860.7	3.4	-91908.3	-12.0	-37456.2	-3.9	16595.5	1.4
1995/96	87016.9	13.5	100969.5	14.4	-149956.8	-13.2	-26188.9	-1.9	-74780.6	-4.2

cont (3)-

Notes: 1) TOT gain in the base year assumes a situation of no loss or gain. 2) TOT gains are calculated as per Measure 1. 3) Estimates prior (subsequent) to 1981 refer to 1971 (1981) as base. 4) The industry sector comprises of mining, manufacturing, electricity, gas and water supply and construction. The service sector includes transport, storage and communication; trade, hotels and restaurants; banking and insurance; real estate, ownership of dwelling and business services; public administration and other services.



Appndix Table A-2: Terms of Trade Effect, gain (production) in Major States of India, base:1970/71 & 1980/81.

ORISSA	I.1. Agriculture		I.AGRICULTURE & ALLIED.		II.1 Manufacturing		II. INDUSTRY		III. SERVICES	
	Gain in Lakh of Rupees.	Gain as % of sectoral real gdp.	Gain in Lakh of Rupees.	Gain as % of sectoral real gdp.	Gain in Lakh of Rupees.	Gain as % of sectoral real gdp.	Gain in Lakh of Rupees.	Gain as % of sectoral real gdp.	Gain in Lakh of Rupees.	Gain as % of sectoral real gdp.
1970/71	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1975/76	-2451.5	-3.5	-2314.9	-3.2	1208.8	16.0	2544.3	18.6	-229.5	-0.9
1980/81	-7605.2	-9.0	-5872.5	-6.7	3096.5	23.6	6000.5	32.2	-128.0	-0.4
1980/81	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1985/86	-1791.3	-0.9	1507.4	0.7	-2361.3	-6.1	3402.9	5.1	-4910.3	-3.8
1990/91	-6742.3	-4.5	3752.9	2.2	-1447.9	-3.0	9465.5	9.4	-13218.4	-8.1
1995/96	17848.0	10.2	23578.1	11.7	-7343.5	-11.0	-6932.0	-5.1	-16646.1	-7.5
<b>PUNJAB.</b>										
1970/71	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1975/76	-6072.5	-6.3	-6042.6	-6.2	2454.7	13.9	4641.4	15.9	1401.3	2.8
1980/81	-11095.2	-9.9	-11263.9	-10.0	4063.6	15.5	7913.5	19.6	3350.5	4.4
1980/81	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1985/86	-32434.4	-10.9	-32102.5	-10.6	-4331.2	-5.2	2202.5	1.9	29899.9	17.5
1990/91	-25969.7	-7.3	-27747.7	-7.7	-11236.9	-9.2	-1127.2	-0.7	28875.0	13.2
1995/96	-7932.4	-1.9	-10198.5	-2.4	-45765.4	-24.6	-42579.6	-17.4	52778.0	20.5
<b>RAJASTHAN.</b>										
1970/71	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1975/76	734.3	0.8	930.5	1.0	508.1	3.5	414.3	1.5	-1344.8	-2.7
1980/81	19.4	0.0	379.2	0.4	2011.9	12.6	4366.5	13.5	-4745.7	-8.0
1980/81	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1985/86	-9859.3	-4.0	-9153.4	-3.7	-2977.0	-4.7	2949.9	2.7	6203.5	3.9
1990/91	-3566.9	-0.9	-2810.5	-0.7	72.4	0.1	1686.3	1.0	1124.3	0.4
1995/96	21166.8	5.4	20037.0	4.9	-17407.2	-15.2	-25795.1	-11.2	5758.1	1.6

cont (4)-

Notes: 1) TOT gain in the base year assumes a situation of no loss or gain. 2) TOT gains are calculated as per Measure 1. 3) Estimates prior (subsequent) to 1981 refer to 1971 (1981) as base. 4) The industry sector comprises of mining, manufacturing, electricity, gas and water supply and construction. The service sector includes transport, storage and communication; trade, hotels and restaurants; banking and insurance; real estate, ownership of dwelling and business services; public administration and other services.

Appndix Table A-2: Terms of Trade Effect, gain (production) in Major States of India, base:1970/71 & 1980/81.

TAMIL NADU	I.1. Agriculture		I.AGRICULTURE & ALLIED.		II.1 Manufacturing		II. INDUSTRY		III. SERVICES	
	Gain in Lakh of Rupees.	Gain as % of sectoral real gdp.	Gain in Lakh of Rupees.	Gain as % of sectoral real gdp.	Gain in Lakh of Rupees.	Gain as % of sectoral real gdp.	Gain in Lakh of Rupees.	Gain as % of sectoral real gdp.	Gain in Lakh of Rupees.	Gain as % of sectoral real gdp.
1970/71	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1975/76	-11485.9	-11.6	-12082.2	-11.8	6542.6	12.5	9330.2	13.0	2752.0	2.9
1980/81	-16219.6	-21.2	-16426.5	-20.7	2476.0	3.3	2619.3	2.8	13807.3	12.1
1980/81	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1985/86	-11110.0	-4.9	-10496.5	-4.5	-6139.4	-2.5	7312.6	2.4	3183.9	0.8
1990/91	-37792.9	-13.9	-38542.7	-13.6	36823.7	12.3	24549.5	5.9	13993.2	2.5
1995/96	3591.0	1.0	15518.6	4.3	-19355.4	-6.2	-13491.1	-3.0	-2027.4	-0.3
<b>UTTAR PRADESH.</b>										
1970/71	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1975/76	-21335.7	-8.1	-21344.8	-7.9	2215.5	5.2	4646.1	6.5	16698.7	13.9
1980/81	-24385.2	-8.0	-23706.9	-7.7	5538.7	8.9	-1031.1	-0.9	24738.0	16.5
1980/81	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1985/86	-46042.4	-5.8	-46530.5	-5.8	-18630.8	-8.5	11779.6	3.8	34750.9	6.0
1990/91	-13337.0	-1.4	-13906.7	-1.4	-23830.6	-7.0	20967.7	4.5	-7061.0	-0.8
1995/96	-22035.6	-2.1	-24374.5	-2.3	-40247.1	-10.6	28816.1	5.7	-4441.5	-0.5
<b>WEST BENGAL.</b>										
1970/71	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1975/76	-17379.1	-11.1	-16824.8	-10.2	13175.6	22.8	16386.8	19.8	438.0	0.4
1980/81	-30781.3	-17.7	-28922.3	-15.9	14331.9	21.4	20966.9	22.4	7955.4	5.9
1980/81	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1985/86	149.7	0.0	11457.7	3.0	-20115.0	-9.3	3458.2	1.1	-14915.9	-3.2
1990/91	17229.8	4.4	26562.7	5.9	-1352.3	-0.5	-13753.1	-3.4	-12809.5	-2.1
1995/96	39014.6	7.3	66756.4	11.1	-41828.1	-12.8	-76376.4	-14.7	9620.0	1.1

concluded

Notes: 1) TOT gain in the base year assumes a situation of no loss or gain. 2) TOT gains are calculated as per Measure 1. 3) Estimates prior (subsequent) to 1981 refer to 1971 (1981) as base. 4) The industry sector comprises of mining, manufacturing, electricity, gas and water supply and construction. The service sector includes transport, storage and communication; trade, hotels and restaurants; banking and insurance; real estate, ownership of dwelling and business services; public administration and other services.

**Appendix Table A-3: Time trend of Sectoral TOT Effects, gain (production) in Major States of India (1980/81-1995/96).**

Sectors ->	I.1 Agriculture	I. AGRICULTURE AND ALLIED.	II.1 Manufacturing	II. INDUSTRY (WB definition)	III. SERVICES (WB definition)	II. INDUSTRY (UN definition)	III. SERVICES (UN definition)
States							
Andhra Pradesh	0.10 (ns)	0.20 ****	1.67 *	0.43 ***	-0.53 (ns)	1.49 *	-0.66 *
Bihar	2.17 *	1.81 *	-1.66 *	-1.61 *	-0.69 *	-1.70 *	-0.85 *
Gujarat	2.15 *	2.08 *	-0.87 *	-1.07 *	-0.36 **	-1.17 *	-0.40 *
Haryana	0.39 ***	0.29 ****	-0.94 **	-0.62 ****	-0.14 (ns)	-0.93 **	-0.06 (ns)
Himachal Pradesh	0.67 ***	0.30 (ns)	-1.78 *	-0.40 (ns)	0.06 (ns)	-1.47 *	0.21 ****
Karnataka	0.83 *	0.87 *	-1.43 *	-0.53 **	-0.58 *	-1.29 *	-0.29 *
Kerala	0.11 (ns)	0.75 **	0.71 *	0.06 (ns)	-0.56 **	0.73 *	-0.66 **
Madhya Pradesh	0.11 (ns)	0.19 (ns)	-1.47 *	-0.54 (ns)	-0.39 **	-1.30 *	0.02 (ns)
Maharashtra	0.11 *	1.08 *	-1.09 *	-0.58 *	-0.04 (ns)	-1.06 *	0.16 ***
Orrisa	-0.02 (ns)	0.31 ****	-0.04 (ns)	0.41 (ns)	-0.36 *	-0.38 (ns)	0.03 (ns)
Punjab	0.37 **	0.27 ****	-1.33 *	-1.29 *	0.79 *	-1.31 *	0.49 **
Rajasthan	0.59 *	0.54 *	-0.79 **	-1.03 *	-0.11 (ns)	-0.94 **	-0.37 ***
Tamial Nadu	0.22 (ns)	0.41 (ns)	0.18 (ns)	-0.14 (ns)	-0.14 (ns)	0.30 (ns)	-0.39 *
Uttar Pradesh	0.45 *	0.40 *	-0.45 **	0.20 **	-0.73 *	-0.47 **	-0.34 **
West Bengal	0.35 (ns)	0.56 ***	-0.62 ***	-1.25 *	0.41 *	-0.55 ****	-0.17 (ns)

Notes: 1) The time trends are obtained by regressing sectoral TOT gains (production) as % of respective real value added on time in linear form.

2) \*, \*\*, \*\*\* and \*\*\*\* indicate significant t values at 1%, 5%, 10% and 20% respectively; (ns) represents insignificant trend.

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