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# INTERSECTORAL TERMS OF TRADE IN INPUT – OUTPUT FRAMEWORK : AN EXPLORATORY STUDY

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## ABSTRACT

The literature on Economics reveals that the concept of terms of trade has been developed as an analytical tool in the comparative cost theory of International trade. Over a period of time, several writers have evolved and used different concepts like gross, net, barter, commodity, single and double, factorial, real cost, utility and income terms of trade and etc. However, during the last several years the concept of multi-sectoral terms of trade, specially between agriculture and non-agriculture, have been increasingly used and analyzed in the sphere of inter-sectoral trade. Such analysis has, generally, been done in terms of barter and / or income terms of trade, especially in India.

From the beginning of the post-independence period, i.e. from 1952-53 to 1990-91 i.e. just prior to the introduction of structural reforms in the economy, barter terms of trade have been varying, though, largely in favour of agriculture. However, income terms of trade have been invariably in favour of agriculture, particularly during the period from 1975-76 to 1990-91. The effect of such favourable terms of trade for agriculture on inter-sectoral distribution of income too has been analyzed in a number of studies in India.

However, as there is no such study with respect to terms of trade in input-output framework, specially in India, we intend to make and attempt to estimate barter and income terms of trade in accordance with the methodology, enunciated by Rasmuseen. As, some works have been done with regard to distribution of income between agriculture and non-agricultural sectors in Input-Output framework by various authors and specially by Ambica Ghosh for India, we therefore, intend to analyze the sensitivity of inter-sectoral distribution of income (i.e. between agriculture and non-agriculture) due to movements in barter and income terms of trade specially during 1973-74 to 1988-89 in this paper. We shall be making use of the available input-output tables for the 1973-74, 1979-80, 1983-84 with suitable adjustments. We shall try to extend the study to assess the effects of structural reforms on distribution of income on the basis of barter and income terms of trade, with the help of the more recent input-output table if available or on the basis of the above mentioned ones for illustrative purposes.

## 1. INTRODUCTION

The literature on Economics reveals that the concept of terms of trade has been developed as an analytical tool in the comparative cost theory of International trade. Over a period of time, several writers have evolved and used different concepts like gross, net, barter, commodity, single and double, factorial, real cost, utility and income terms of trade and etc. However, during the last several years the concept of multi-sectoral terms of trade, specially between agriculture and non-agriculture, have been increasingly used and analyzed in the sphere of inter-sectoral trade. Such analysis has, generally, been done in terms of barter and / or income terms of trade, especially in India.

From the beginning of the post-independence period, i.e. from 1952-53 to 1990-91 i.e. just prior to the introduction of structural reforms in the economy, barter terms of trade have been varying, though, largely in favour of agriculture. However, income terms of trade have been invariably in favour of agriculture, particularly during the period from 1975-76 to 1990-91. The effect of such favourable terms of trade for agriculture on inter-sectoral distribution of income too has been analyzed in a number of studies in India. (1)

One of the recent studies (2) has succinctly reviewed the debate, specially of Concept and Method of Inter Sectoral Terms of Trade :-

1) The use of wholesale prices of Agricultural and Industrial products as terms of trade.
2) The pattern of Trade
3) Wholesale vs. Farm harvest prices as price indicators
4) The rationale of income terms of trade and
5) The method of estimating agricultural marketed surplus.

After comprehensive discussion, the study has come to the following conclusions: -

1) The ratio of wholesale prices of agricultural and non- agricultural products cannot yield the realistic estimates of agriculture's terms of trade.
2) To incorporate the pattern of trade comprehensively as many products as possible amongst those actually exchanged should be covered.
3) In the estimation of terms of trade, the relative rates of change in prices received and paid by agriculture are as important as the direction of their movements.
4) Since the bulk of the marketable surplus of agricultural produce is sold by the farmers during the harvesting period, analytically from the point of view of these farmers, farm harvest prices are better indicators for them. However, farm harvest prices will be underestimation for those producers, who sell their produce afterwards and the extent of underestimation for them will

depend upon the level of non-market prices and the quantity of marketed surplus sold by them during the rest of the period. This necessitates suitable adjustment of the prices, received by these producers and the corresponding quantities of marketable surplus sold by them later on during the year after the harvesting period.

5) The superiority of Income Terms of Trade as compared to Net Barter Trade is justifiable on the ground that as income terms of trade are obtained by correcting the net barter terms of trade with the volume of exports reflect the total capacity of import (due to export income alone) and are therefore more superior to net barter terms of trade. Thus an improvement in the income terms of trade of the agricultural sector would initiate an increase in its total purchasing power. This may happen despite less favourable or even unfavourable net barter terms of trade in agriculture.

Likewise, though there are various studies (3) pertaining to the effects of terms of trade on inter-sectoral distribution of income, as mentioned above, they too are beset with controversies. For example, whereas one important study in political economy framework has concluded that agricultural price policy in India has been biased in favour of Agriculture, (Tyagi 1977) another study has not only emphatically controverted this conclusion but also tried to prove that if there was a class bias it was against agriculture (Mitra 1977).

However, none of the above-mentioned studies make any use of Input-Output Approach, though there are a few studies with respect to Agriculture-Industry inter-relations in India. For example, whereas the study by Patil, Sardana, and Chawla (4) make use of 1973-74 table prepared by RBI, the other one by Kishan Rao (5) makes use of 1968-69, 1973-74 and 1978-79 input-output tables prepared by C.S.O with suitable aggregation. They have tried to find out backward and forward linkages. Whereas both the studies reveal greater forward linkages of agriculture with respect to industry as compared to its backward linkages showing that the dependence of manufacturing on agriculture is much more than that of agriculture on manufacturing. In another study, Ahluwalia (6) has tried to quantify the industrial dependence on agriculture for current inputs over time by tracing relevant direct input-output coefficients in the Input-Output tables at 1968-69 prices for 1959-60, 1968-69, and 1973-74. Her studies shows a reduced dependence of industry on agriculture and increased dependence of agriculture on industry, contrary to the above-mentioned studies.

Rasmaussen (7) also, whose study enunciated the methodology for measuring barter and income terms of trade in input-output framework, and is based on only direct input-output table for Denmark, talks of gains and losses from international trade on account of terms of trade. However, he also significantly concludes that " an improvement in the terms of trade is not

necessarily tantamount to a net transfer of real income from other countries and vice-versa". Thus his study also reveals the superiority of Income Terms of Trade over the Net Barter Terms of Trade.

## 2. Approach of the Present Study

However, as there is no such study with respect to terms of trade in total (i.e. direct and indirect) input-output framework based on Leontief Inverse Matrix, an attempt is made here to make use of it with suitable adjustment to construct composite input-output tables based on the available input-output tables for 1973-74, 1979-80 and 1983-84 with 1979-80 base. (see section 3 on Data base of the present study). These tables are generally at factor cost. Thus, for agricultural producers, selling their product at harvesting time it should be equivalent to farm harvest prices, which is in conformity with the overall observation of the earlier studies that farm harvest price are better price indicators as compared to wholesale prices (since the bulk of the marketable surplus of agricultural produce is sold by the farmers during the harvesting period)

However, as these tables are available at current prices different sectors of 1973-74 and 1983-84 tables have been repriced at 1979-80 prices by using Sectoral Price Deflators determined from current and constant prices of industry gross outputs. Hence NAS price deflators by using double deflation method has been used for re-pricing 1973-74 and 1979-80 tables at 1979-80 prices. As the objective of the present exploratory study is to assess "net barter" and "income" terms of trade for agricultural and non-agricultural sectors as a whole, net barter terms of trade have been assessed on the basis of agricultural/non-agricultural weighted price indices for 1973-74/79-80, 1973-74/83-84 and 1979-80/83-84 and changes in them over time have been assessed by comparing these ratios of agricultural/non-agricultural price-indices. Weights have been derived on the basis of index of current years agricultural composite (intermediate + capital use) use for non-agricultural sectors divided by price index of current years price of non-agriculture produce to base years price for intermediate demand at the first instance. When such income terms of trade have been derived for total agricultural use for non-agricultural purposes, respectively the current years as well as base years agricultural use for nom-agricultural purposes is enhanced by agricultural product use for non-agricultural sectors final demand purposes. As to derive agricultural product use for final demand for non-agricultural purposes, it is based on a bold assumption that the proportion of agricultural products for its own final demand purposes is similar to the proportion of agricultural products for its own composite intermediate use as compared to non-agricultural composite intermediate use. Similar procedure has been followed when income terms of trade have been derived with respect to non-agricultural sector. Such crude assumption has been made here at this stage because the

methodological debate about price-deflators, weights, wholesale vs. farm harvest prices, prices received and paid by farmers as well as the method of estimating marketed surplus are still beset with controversies as mentioned earlier.

Likewise, though it was intended to make use of Ghosh's method to analyse income distribution in Input-Output Framework, in terms of Composite inverse coefficients when the final demand, i.e. household sectors are endogenised, in the absence of such endogenisation of household sectors in the inverse table, another compromise at this stage has been made with respect to derivation of income distribution between agricultural and non-agricultural sectors for the respective years for 1973-74, 1979-80, and 1983-84 with 1979-80 as the base year. Here the percentage of gross value-added components of agricultural to non-agricultural sectors (derived on the basis of gross value-added i.e. Gross output minus Total Intermediate use and indirect taxes) as given in the respective input-output tables with suitable price adjustments to present them in constant prices has been taken as the income for the agricultural vs. non-agricultural sectors for the respective years.

Because of these unavoidable simplifications at the present stage, the study has not been extended for nineties to compare the effects of Structural Reforms on gains and /or losses to respective sectors at more disaggregative level, both with respective "terms of trade" as well as "income distribution" which has been the basic objective of the present study. It is intended to make such refinements at a future date, keeping in view the ongoing methodological debate in the country as well as the feedback from the scholars here in this conference.

Even inspite of such limitations, the present study is undertaken, it is only to highlight the dominant role of input and technology (reflected by input coefficients in terms of constant prices) incorporating their total (not only direct and indirect in terms of inverse elements) effects with respect to composite intermediate (i.e. flows and capital use) but also final uses of agricultural sectors produce for non-agricultural purposes and vice-versa for the decade between 1973-74 to 1983-84 together with price factors (i.e. terms of trade) as at least income terms of trade on the whole have invariably been found to be favourable to agriculture. The objective of the study is not only to examine whether the findings of the present study in Input-Output Framework corroborate or contradict the above-mentioned findings, but also to derive limited policy implications and direction of future research to incorporate the effects of structural reforms. As the role of the institutions apart from non-price factors like inputs and technology is being highlighted in recent literature (Vaidyanathan, EPW, May 13,2000 p. 38), the variations in income distribution even in the present form of analysis should be indirectly representing their favourable or infavourable effects for agricultural sectors as a whole as compared to non-agricultural areas.

## 3. Methodology for the Present Study

The way the given Input-Output tables have been adjusted to derive composite Leontief Inverse tables i.e. $[I - (A + B)]^{-1}$ has been briefly described in the next section on database. Likewise, the sources of data and other adjustments made to derive weighted price-indices, gross output, gross value added and final demand and construct rudimentary capital coefficient table (which has been added to input coefficient table) to derive composite coefficient table too have been discussed there. Besides, details of sectors used for this study, together with their requisite aggregation to have two composite i.e. agricultural and non-agricultural sectors have been detailed in that section.

Here, we are roughly presenting the mathematical basis for the methodology used for this study

i) Net Barter Terms of Trade:-

$$\frac{PAi/PAo}{PNAi/PNAo}$$

Where PAi = Weighted constant prices for Agricultural products used for non-agricultural purposes for the years 1973-74 and 1983-84 and for the base year 1979-80,

NAi = Weighted constant prices for Non-agricultural products used for agricultural purposes for the years 1973-74 and 1983-84 and for the base year 1979-80

NAo = for the base year 1979-80.

ii) Income Terms of Trade for Composite (Flows and Capital) intermediate use with respect to Agricultural products for Non-agricultural purposes.

$$\frac{PAi \,.\, QAi}{PAo \,.\, QAo} \Big/ \frac{PNAi}{PNAo}$$

Where PAi . QAi denote total use of intermediate agricultural products for non-agricultural purposes in value terms for the years 1973-74 and 1983-84 respectively and likewise PAo . QAo for the base year 1979-80.

iii) PNAi and PNAo as defined above.

Likewise taking the opposite form of this expression i.e.

$$\frac{PNAi \,.\, QNAi}{PNAo \,.\, QNAo} \Big/ \frac{PAi}{PAo}$$

Income Terms of Trade for Composite Intermediate use for non-agricultural purposes have been derived.

iv) Income Terms of Trade for Total [i.e. Composite (flows and capital) intermediate use + final demand] use with respect to Agricultural products for non-agricultural purposes i.e.

$$\frac{PA(I+F)i \,.\, QA(I+F)i}{PA(I+F)o \,.\, QA(I+F)o} \qquad \frac{PNAi}{PNAo}$$

Where $PA(I+F)i \,.\, QA(I+F)i$ represent total use of Agricultural products for non-agricultural purposes in value terms for 1973-74 and 1983-84 respectively and $PA(I+F)o \,.\, QA(I+F)o$ represent similar price figures for the base year 1979-80.

PNAi / PNAo denote the similar ratios of weighted price-indices of non-agricultural products for agricultural purposes. This figure has been used presently because we have not been able to estimate the prices paid by agriculture for final demand use of non-agricultural products.

v) Income Terms of Trade for Total [i.e. Composite (flows and capital) intermediate + final demand] use with respect to non-agricultural products for agricultural purposes. This expression has been derived by taking the opposite form of the above-mentioned expression i.e.

$$\frac{PNA(I+F)i \,.\, QNA(I+F)i}{PNA(I+F)o \,.\, QNA(I+F)o} \Big/ \frac{PAi}{PAo}$$

Where $PNA(I+F)i \,.\, QNA(I+F)i$ represent total use of non-agricultural products for agricultural purposes in value terms for 1973-74 and 1983-84 respectively and $PNA(I+F)o \,.\, QNA(I+F)o$ represent similar price figures for the base year 1979-80.

PAi / PAo denote the similar ratios of weighted price-indices of agricultural products for non-agricultural purposes. Again, this figure has been used presently because we have not been able to estimate the prices paid by non-agricultural (i.e. received by agriculture) for final demand use of agricultural products.

vi) Income Distribution :- As it is based on Gross Value added components, the following formulas have been used i.e.

a) VAi/VNAi b) VAo/VNAo and their reciprocals i.e. c) VNAi/VAi and d) VNAo/VAo

where VA and VNA represent gross value components with respect to agriculture and non-agriculture, i and o likewise represent non-base years i.e. 1973-74 and 1983-84 and base year i.e. 1979-80 respectively. Their respective ratios have also been estimated i.e.

$$\frac{VAi / VNAi}{VAo / VNAo} \quad \text{and} \quad \frac{VNAi / VAi}{VNAo / VAo}$$

to estimate the relative change in income distribution in 1973-79 and 1983-84 with respect to base year i.e. 1979-80.

## 4. Data Base for Present Study

The study is based on 14 sector commodity by commodity tables for 1973-74 and 1983-84 by suitably adjusting the 60 x 60 sector tables constructed by Central Statistical Organization (CSO) under industry technology assumption and 1979-80 table as derived by Parkar (1985) by suitable combination of 14 x 14 sectors absorption and make matrices given in the Technical Note on the Sixth Plan, 1980-85 (Planning Commission, 1981) at factor cost in 1979-80 prices. Such aggregation has been done because Technical Note of the Sixth Plan also gives corresponding gross output figures, commodity x industry, investment by destination comprising net fixed replacement and inventory figures besides percentage distribution of these investment figures in terms of construction, machinery and inventory based on capital coefficient matrix, prepared by CSO (see Technical Note) for 14 x14 sectors only. As we could not get CSO's capital coefficient table and there is no other recent capital coefficient table for India (the earlier ones are prepared by Mathur and Hashim, 1963), we have tentatively prepared one based on investment by destination table and capital coeficient table (giving percentage distribution only) of the Technical note by suitably distributing net fixed capital and replacement (given in investment by destination table) to construction and machinery equipment in accordance with their percentage share given in the above mentioned capital coefficient table and putting them in construction and industries rows (as there is no separate machinery sector) in the Indian Input Output table for capital coefficient table. Inventories have been distributed in accordance with their input proportions in the Input Output table (as was done by Mathur and Hashim). Following this, here no adjustment has been made, say, either with respect to life profile, obsolescence, introduction of new machines and so on.

All these tables are given at factor cost at current prices. We have decided to aggregate 60 sector 1973-74 and 1983-84 tables to 14 sectors to make them comparable with sectoral classification of 1979-80 table. Besides auxiliary data on capital required for this study is available only for 14 sectors in National Accounts Statistics (NAS) published by C.S.O. (1998) Besides, the 1973-74 and 1983-84 tables are consistent with NAS sectoral classification. This fact has been instrumental in our decision to aggregate these tables to 14 sectors.

Secondly, in order to make our three-point tables comparable we have to eliminate the dissimilarity and changing character of prices embodied in these I-O tables. For this purpose, we have decided to re-price different sectors of 1973-74 and 1983-84 tables at 1979-80 prices by using sectoral price deflators obtained from current and constant prices series on gross domestic outputs given in NAS, C.S.O. white papers. As mentioned above NAS price-deflators for re-pricing 1973-74 and 1983-84 at 1979-80 prices have been used by using double deflation method. The procedure of deflation is row-wise and is carried out after aggregating 1973-74 and 1983-84 tables of 60 sectors to

14 sectors. The different sectors of these two tables (given in current prices) at 1979-80 prices, in accordance with Parkar's methodology to derive 1979-80 at factor cost in current (i.e. 1979-80) prices.

The 14 sectors used in this study are as follows: -

1) Agriculture
2) Forestry
3) Fishing
4) Mining
5) Manufacturing
6) Construction
7) Electricity, Gas and Water supply
8) Railways
9) Other Transport
10) Communication
11) Trade and Storage
12) Banking and Insurance
13) Real Estate and
14) Public Administration

Whereas the first three of these 14 sectors have been considered as Agricultural Sector, the remaining 11 have been considered as Non-Agricultural Sector for this study. However, all these 14 sectors have been considered for deriving price-deflators, weights and price-indices, respective shares of Composite (flows and capital) and final uses as well as value-added of agricultural and non-agricultural sectors.

## 5. Empirical Results and Analysis

Empirical results are presented in the appended table. The first four sections of the first column of the table presents the final figures of Net Barter Terms of Trade with respect to agriculture and non-agriculture and Income Terms of Trade of Agriculture for Intermediate use by Non-agriculture and vice-versa as well as ratio of these two income terms of trade with respect to respective years i.e. 1973-74/1979-80, 1973-74/1983-84 and 1979-80/1983-84. Likewise, sections 5 to 7 of column 2 show such Income Terms of Trade of Agriculture for Total use by Non-agriculture and vice-versa and their ratios for the respective years. Likewise, sections 8 to 10 of column 3 presents Income Distribution of Agriculture and Non-agriculture and vice-versa in terms of their respective value-added for each of these years i.e. 1973-74, 1979-80, and 1983-84 as well as their respective ratios in

sections 8 and 9 respectively. As there are 3 sectors which are agricultural and 11 which are non-agricultural, the totals of the respective value-added have been normalised i.e. by dividing total value-added of agriculture by 3 and that of non-agriculture by 11. Thereafter, the ratios of these two ratios respectively, i.e. ratios of income distribution of agriculture / non-agriculture and vice-versa for respective years, i.e. 73-74/79-80, 73-74/83-84 and 79-80/83-84 are presented in section 10 of column three of this table. The detailed figures pertaining to $[I - (A + B)]^{-1}$ , $[I - (A + B)]^{-1} Y$ , where "Y" represents Sectoral Final Demand, Gross value-added, Final Demand. Price-deflators and respective weights used to derive price-indices have not been included here*.

5.1 Net Barter Terms of Trade

If we consider Section 1 of the appended table, i.e. Net Barter Terms of Trade, it has been most favourable to agriculture for the period 79/83 as compared to the other two periods, i.e. 73/79 and 73/83. It is so, because weighted price indices for agriculture for 79/83 is much larger i.e. 1.7369 as compared to non-agriculture which is only 1.3558. For the earlier two periods, its Net Barter Terms of Trade is considerably unfavourable, being only 0.4824 for 73/79 and 0.6180 for 73/83. Thus, it does not support the findings of the earlier studies that the net barter terms of trade has been fluctuating over the years, though this study pertains only to the decade of 1973-1983.

5.2 Income Terms of Trade for Intermediate Use

The same pattern is discernible with respect to composite intermediate use of agriculture for non-agriculture and vice –versa. It is so, because whereas income terms of trade with respect to composite intermediate use of agriculture for non-agriculture for 79/83 is 1.7157, the corresponding figure with respect to non-agriculture is only 1.0448. Therefore, their ratios (i.e. for 79-83) as shown in section 4 is considerably lower for agriculture, it being 1.6422. That, such situation is highly

*They have not been included to avoid increasing bulk of the size of the paper. They can be supplied to the interested scholars on request.

unfavourable to agriculture can be seen from the other two ratios in section 4, which are only 0.1814 and 0.2979 respectively for 1973/79 and 1973/83.

5.3 Income Terms of Trade for Total Use

In a way, similar situation is discernible with respect to income terms of trade for total use of Agriculture by non-agriculture and vice-versa over these periods. It is so, because though these income terms of trade both for agriculture and non-agriculture respectively appear to be favourable, each one being more than 1 in 73/79 and 73/83. However, these income terms of trade are relatively

so high for non-agriculture as compared to agriculture, that their ratios as shown in section 7 are only 0.6590 and 0.7686, showing relative unfavourable situation for agriculture as compared to non-agriculture. However, similar to the case of net barter terms of trade and income terms of trade for intermediate use, here also agriculture has an edge over non-agriculture during 79/83 only. It is so because not only income terms of trade of agriculture with respect to total use of its products by non-agriculture is distinctly favourable, being more than 1, whereas similar terms of trade for non-agriculture is less than 1. Thus their ratio only for 1979/83 becomes more than 1, i.e. 1.1683 as compared to earlier periods as is the case with respect to net and income terms of trade for composite use as discussed above.

5.4 Income Distribution in Terms of Value-Added

As there are only three agricultural sectors as compared to 11 non-agricultural sectors, when they are considered for respective years, i.e. 1973-74. 1979-80, and 1983-84, they have been suitably normalised by divided gross value added of the respective sectors by the total number of disaggregated sectors, i.e. 3 and 11 respectively in the respective cases. However, this aspect is automatically taken care when such income distribution, like barter and income terms of trade are taken over respective periods, i.e. 73/79, 73/83, and 79/83. Though, for the respective year, income distribution for agriculture as compared to non-agriculture appears to be almost identical in 1973 being 99.5571 and 100.4448, they are considerably higher for agriculture in 1979 and 1983 being 198.2863 and 239.9421 respectively as compared to only 50.4321 and 41.6767 respectively for non-agriculture. However if we take such income distribution over a period the situation of agriculture becomes totally reversed. The highest figure for agriculture is for the period 79-83 when it is 0.8264 as compared to 1.2101 for non-agriculture. Thus, in the overall sense, such analysis of income distribution also like earlier cases reveals a relatively better position for agriculture over the period 79/83 as compared to 1973-79 and 1973-83. Thus, over the whole period, income distribution also does not seem to be favourable to agriculture.

## 6. Conclusion

Though in earlier studies it was hypothesized that favourable income terms of trade, especially based on total uses is likely to favour agricultural producers but not so consumers, because of administered prices, which by themselves may not boost agricultural production. It is so because it depends upon apart from Prices, Technology, Inputs, Irrigation, Electricity and other infrastructural facilities such as extension services, availability of Agricultural credit and marketing of agricultural products.

However, the present study in its simplistic form being exploratory in nature neither reveals favourable barter, income terms of trade for intermediate as well as total use nor income distribution for agriculture. Thus, it reveals contradictory results as compared to earlier studies. However, no final judgement can be passed at this stage. It requires more refined and detailed analysis. It is so, because, without going into Political Economy aspect of Class-relations, similar to one of the earlier studies, i.e. Mitra (1977), it shows that the overall situation in this decade has not been favourable to agriculture However in the overall sense the uniqueness of this study lies in a way in its pioneering attempt to make use of Total Interdependence of Agriculture and Non-agriculture, especially with respect to technology and Inputs for deriving Terms of Trade and Income Distribution on the basis of Leontief Composite Inverse rather than only on Direct Coefficients.

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References

1). a) Thamarajakshi (1977) – Role of Price Incentives in stimulating Agricultural Production in a Developing Economy in Food Enough or Starvation for Millions –Douglas Ensminger (ed.) Mcgraw-Hill Publishing Co. Ltd., New Delhi.

b) Tyagi, D.S. (1979) - Farm Prices and Class Bias in India- Economic and Political Weekly, vol. 14, No.39, September 29. (1988) – Inter-Sectoral Terms of Trade : Misconceptions and fairy Tales-Economic and Political Weekly, vol.23, No. 17, April,23.

c) Mitra, Ashok (1977), Terms of Trade and Class Relations : An Essay in Political Economy, Frank Cass, London.

d) Kahlon, A.S. and D.S. Tyagi (1983) – Agricultural Price Policy in India, Allied Publishers Pvt. Ltd., New Delhi.

e) Vittal, Nalini (1986) – “Inter-Sectoral Terms of Trade in India : A study of Concept and Method, “Economic and Political Weekly, vol.21, No. 52, Review of Agriculture December 29.

Ibid (1988),” Inter-Sectoral Terms of Trade in India : Reality and Hype, Economic and Political Weekly, vol.23, No.39, Review of Agriculture, September 24.

(f) Mungekar, B.L. (1992) – The Political Economy of Terms of Trade

2) Ibid (1993) - Inter-Sectoral Terms of Trade : Issues of Concept and Method, Economic and Political Weekly, 28 (39), September

3) – See 1.(a) to (f)

4) Patel, R.K., P.K.Sardana and S.D. Chamola- Resource flows between Agriculture and the Manufacturing Sectors in India –(1985)- The Indian Economic Association, Conference volume-Part II : Agriculture – Industry Interrelations in India, Dec. 28-30, Ahmedabad.

5) Kishan Rao, S. (1985)- Sectoral Articulation of Agriculture & Industry in India (1968-80) - Ibid

6) Ahluwalia,I.J. – Inter-relationships between Agriculture and Industry- Rapporteur's Report - Ibid

7) Rasmussen,P.N.- (1957) –Studies in Inter Sectoral Relations- Amsterdam, North Holland

8) Prasad, K.N., Swaminathan,A.M., and Mohan Kumar – Science and Technology Policy, Planning, Present Scenario and Prospects for Scientific and Technological Development in India (1998) – Paper presented to Twelfth International Conference On Input-Output Techniques, International Input-Output Association, May 18-22.

9) Prasad, K.N and Pillai,P.M. – Mapping the Sources of Innovation and Application of Innovative Activities in Developing Countries like India (1995) Paper presented to the Eleventh International Conference on Input-Output Techniques, International Input-Output Association, Nov. 27 – Dec. 01.

10) Ghosh, A. and Sengupta, A.K. (1984) – Income Distribution and the structure of Production – South Asian Publishers Pvt. Ltd., New Delhi.

11) Vaidyanathan, A. – India's Agricultural Development Policy – Economic and Political Weekly, vol.XXXV No.20, May 13-19, 2000

12) Yotopoulous, Pan.A and Jefferey B. Nugent (1976) – Economics of Development – Part V 18 – Export Instability and Terms of Trade

13) (i) Central Statistical Organisation, Govt. of India (1981) – Input –Output Transactions Tables for the Indian Economy – 1973-74.

(ii) Ibid (1989) – Input-Output Transactions Tables 1983-84

(iii) Ibid (1998) National Accounts Statistics – February

14) Parkar, R.G. (1989) – Productivity Analysis for India – Paper presented to the Ninth International Conference on Input-Output Techniques, Hungary

15) Planning Commission, Govt. of India (1981) – A Technical Note on the Sixth Plan of India.

16) Mathur, P.N. and Hashim, S.R. (1963) – A Capital Coefficient Matrix (65 x 65) for India.

**TABLE**

**INTER-SECTORAL TERMS OF TRADE AND INCOME DISTRIBUTION IN I-O FRAMEWORK**

| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| **1** | **Net Barter Terms of Trade** | | | | | | | |
| | Weighted Price Index Agri. 73/79 | 0.4736 | | | | | | |
| | Weighted Price Index Non-agri. 73/79 | 0.9816 | | | | | | |
| | **Ratio** | **0.4824** | | | | | | |
| | Weighted Price Index Agri. 73/83 | 0.8225 | | | | | | |
| | Weighted Price Index Non-agri. 73/83 | 1.3309 | | | | | | |
| | **Ratio** | **0.6180** | | | | | | |
| | Weighted Price Index Agri. 79/83 | 1.7369 | | | | | | |
| | Weighted Price Index Non-agri. 79/83 | 1.3558 | | | | | | |
| | **Ratio** | **1.2811** | | | | | | |
| **2** | **Income Terms of Trade of Agriculture for Intermediate use by Non-agriculture** | | **5** | **Income Terms of Trade of Agriculture for Total use by Non-agriculture** | | **8** | **Income Distribution of Agriculture and Non-agriculture in Terms of Value Added** | |
| | **Income Terms of Trade 73/79** | 0.5117 | | **Income Terms of Trade 73/79** | 1.1670 | | Income Distrbution agri./non-agri 73 | 99.5571 |
| | intermediate agri. for non-agri. 73/79 | | | total agri. for non-agri. 73/79 | | | Income Distrbution agri./non-agri 79 | 198.2863 |
| | price index of non-agri. 73/79 | | | price index of non-agri. 73/79 | | | Income Distrbution agri./non-agri 83 | 239.9421 |
| | **Income Terms of Trade 73/83** | 0.8779 | | **Income Terms of Trade 73/83** | 1.3034 | | **Income Distrbution agri./non-agri 73/79** | 0.5021 |
| | intermediate agri. for non-agri. 73/83 | | | total agri. for non-agri. 73/83 | | | **Income Distrbution agri./non-agri 73/83** | 0.4149 |
| | price index of non-agri. 73/83 | | | price index of non-agri. 73/83 | | | **Income Distrbution agri./non-agri 79/83** | 0.8264 |
| | **Income Terms of Trade 79/83** | 1.7157 | | **Income Terms of Trade 79/83** | 1.1169 | | | |
| | intermediate agri. for non-agri. 79/83 | | | total agri. for non-agri. 79/83 | | | | |
| | price index of non-agri. 79/83 | | | price index of non-agri. 79/83 | | | | |
| **3** | **Income Terms of Trade of Non-Agriculture for Intermediate use by Agriculture** | | **6** | **Income Terms of Trade of Non-Agriculture for Total use by Agriculture** | | **9** | **Income Distribution of Agriculture and Non-agriculture in Terms of Value Added** | |
| | **Income Terms of Trade 73/79** | 2.8202 | | **Income Terms of Trade 73/79** | 1.7709 | | Income Distrbution non-agri./agri. 73 | 100.4448 |
| | intermediate non-agri. for agri. 73/79 | | | total non-agri. for agri. 73/79 | | | Income Distrbution non-agri./agri. 79 | 50.4321 |
| | price index of agri. 73/79 | | | price index of agri. 73/79 | | | Income Distrbution non-agri./agri. 83 | 41.6767 |
| | **Income Terms of Trade 73/83** | 2.9466 | | **Income Terms of Trade 73/83** | 1.6959 | | **Income Distrbution non-agri./agri. 73/79** | 1.9917 |
| | intermediate non-agri. for agri. 73/83 | | | total non-agri. for agri. 73/83 | | | **Income Distrbution non-agri./agri. 73/83** | 2.4101 |
| | price index of agri. 73/83 | | | price index of agri. 73/83 | | | **Income Distrbution non-agri./agri. 79/83** | 1.2101 |
| | **Income Terms of Trade 79/83** | 1.0448 | | **Income Terms of Trade 79/83** | 0.9576 | | | |
| | intermediate non-agri. for agri. 79/83 | | | total non-agri. for agri. 79/83 | | | | |
| | price index of agri. 79/83 | | | price index of agri. 79/83 | | | | |
| **4** | **Ratio of 2/3 for respective years** | | **7** | **Ratio of 5/6 for respective years** | | **10** | **Ratio of 8/9 for respective years** | |
| | 73/79 | 0.1814 | | 73/79 | 0.6590 | | 73/79 | 0.2521 |
| | 73/83 | 0.2979 | | 73/83 | 0.7686 | | 73/83 | 0.1722 |
| | 79/83 | 1.6422 | | 79/83 | 1.1663 | | 79/83 | 0.6829 |