Indian Economy and Economic Reforms: Economy-Wide Studies in Inter-Industry Frameworks

V.V.N. Somayajulu

Himalaya Publishing House
ISO 9001:2008 CERTIFIED

INDIAN ECONOMY AND ECONOMIC REFORMS:

ECONOMY-WIDE STUDIES IN INTER-INDUSTRY FRAMEWORKS

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First Edition: 2014

Published by : Mrs. Meena Pandey for **Himalaya Publishing House Pvt. Ltd.,** "Ramdoot", Dr. Bhalerao Marg, Girgaon, **Mumbai - 400 004.**
Phone: 022-23860170/23863863, Fax: 022-23877178
E-mail: himpub@vsnl.com; Website: www.himpub.com

Branch Offices :

New Delhi : "Pooja Apartments", 4-B, Murari Lal Street, Ansari Road, Darya Ganj, New Delhi - 110 002. Phone: 011-23270392, 23278631; Fax: 011-23256286

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Guwahati : House No. 15, Behind Pragjyotish College, Near Sharma Printing Press, P.O. Bharalumukh, Guwahati - 781009, (Assam). Mobile: 09883055590, 08486355289, 7439040301

DTP by : Asmita Tandle.

Printed at : M/s. Aditya Offset Process (I) Pvt. Ltd., Hyderabad. On behalf of HPH.

Dedicated to

Honour Prof. Ambika Ghosh and Prof. R. Bharadwaj for their outstanding academic contributions to Inter-Industry Economics Research

In memory of

W.W. Leontief, P.N. Mathur, S. Chakraborty
N.S. Iyengar, K.N. Prasad, K. Uma Shankar Patnaik,
Jani Gokulnathan and V. Susila for their souls
to rest in PEACE

Foreword

The publication of this four volume collection of papers on Input-Output Analysis (I-O) and its applications to the Indian economy is a rare event. I-O Analysis used to be an active field of research in India for a full three decades from the early sixties upto the early nineties. After the initiation of economy reforms in 1992, the interest in I-O analysis in India quickly receded because it was widely felt that I-O analysis is valid only in an environment of planned economic development. That this reasoning is completely baseless may be seen from the fact that I-O analysis has found its most fertile and richly varied applications chiefly in the context of developed market economies of the world. Be that as it may, the consequence was that I-O profession in India shrunk and the membership of the Input-Output Research Association of India (IORA) has now begun to exhibit a skewed age-distribution. In contrast, the International Input-Output Association (IIOA) is teeming with young scholars who have greatly enlarged the scope and range of I-O techniques and applications as can be witnessed from the agendas of the IIOA conferences and journals.

Nevertheless, thanks to the determination of the small surviving community of I-O researchers and continuing support from the Planning Commission of India, IORAI conferences have been held with a fair regularity. The work discussed in these conferences has now achieved a critical mass. So it was thought necessary to compile and publish selected papers for the benefit of the wider community of economists.

Thus, the volumes now being offered contain a varied range of I-O applications. These include the measurement of structural change in the post-reforms period, identification of key sectors, estimation of backward and forward linkages, structural decomposition analysis, impact analysis of government expenditures, factor content of India's foreign trade, linkages between organized and unorganized sectors, pollution and environment-related issues. The interlinkages of the emerging telecom and I.T. sectors, identification of innovation clusters and the diagnosis of financial crises.

It is hoped that the wide range of subjects in these volumes will re-establish the bridge between I-O researchers and the economics and policymaking professions and revive interest in the rapidly growing subject of I-O economics.

Prof. Rajas Parchure

RBI Chair Professor & Officiating Director,
Gokhale Institute of Politics and Economics,
Pune - 411 004.

Preface

This preface is intended to facilitate students and research scholars in economics, mathmatical linear and non-linear economics and econometrics particularly to grasp the common uniform premise and analytical details of components of inter-industry economics frameworks. Basically, on account of uniform and common premises for frameworks of both input-output (I-O) analysis of W.W. Leontief and of Sraffa: Production of commodities by means of commodities (PCMC) framework; and Non-paramatric Linear Programming (LP) Production Frontier Framework; all three together are grouped and termed, Inter-Industry Economics Frameworks. Distinct features from other schools of Economic Analysis; from within three of them and their economic significance are necessarily relevant to be grasped.

The titles of the papers are self-explanatory indicating to contain uniformity in respect of theme(s) of research papers of each book and relevance to Inter-Industry Economic frameworks of them. All address to Indian Economy issues of reform periods; and uniform frameworks of both Input-Output (I-O) analysis of W.W. Leontief and of Sraffa: Production of Commodities by Means of Commodities (PCMC) framework; and Non-parametric Linear Programming (LP) Production Frontier Framework; together termed, Inter-Industry Economics Framework. Sraffian PCMC, Leontief I-O models and Non-parametric L-P models have deterministic modelling, i.e., for specifications; and premise for equilibrium conditions; and non-stochastic content and/or methods of estimation of those models of inter-industry framework. For instance, I-O analysis and PCMC analysis both follow the Supply-Demand identity for an instantaneous equilibrium of unique, discrete, optimum point for each activity or process or sector, with a finite number of sectors of the economy; but without substitution between sectors' outputs and/or inputs. However, Linear Programming Framework undergoes and starts with disequilibrium of, Supply-Demand, in either of the sectors, but allows for process substitution as to bring for an equilibrium in a finite number of processes' substitution being efficient. Given price structures and budget constraints, optimum is unique one of a finite number of efficient points in L-P solution; but both efficient and optimum points are the same unique solution in I-O analysis and PCMC analysis. In other words, PCMC, I-O and L-P are analytical approaches, distinguished for facilitating inter-industry

economics framework that have common premise, such as, finite and discrete processes, linearity or constant returns to scale of them, deduced from fixed input coefficients production function of W.W. Leontief, a pioneer for its new contribution. Hence, those authors of PCMC, I-O and L-P and their economics, are critiques of Neo-Classicals' premise and their economics. Sraffian PCMC is alone known for revivor of Classicals' propositions but not necessarily so, in use of I-O analysis and L-P models, though the latter two distinct frameworks, their results, and findings are also different from that of Neo-Classicals.

However, the distinction between I-O and L-P is clear in terms of (i) no substitution between those finite and discrete processes, between inputs and outputs and between each of inputs and of outputs in I-O analysis, hence remain finite and discrete unique processes; only one process for each sector in I-O analysis; (ii) but, process substitution in a finite number of ways is possible in L-P analysis; that results from scarcities of factors, inputs, outputs, etc., in relation to markets' supplies vs demands for them; prices vs costs in case of dual form of LP Analysis; and in both cases, bottlenecks and/or shortages persist due to such a number of constraints or inequalities in L-P framework; thus the inequalities are more than a distinct number to provide a solution of positive levels of activities; thus, L-P analysis provides the number of solutions but to limit to the number of equalities of demand and supply of factors, inputs, commodities outputs, etc., i.e., to turn out a basic feasible solution, as also needed in I-O framework.

Hence, the basic feasible solution is a unique optimal solution in I-O framework; while in L-P framework, optimal basic feasible solution for an objective function of activities (processes) is deduced to be one of efficient finite number of solutions; which depends on the number of linearly independent constraints/vectors and the optimizing objective function, for a given budget line. Thus, both I-O and L-P models in inter-industry framework are non-stochastic and deterministic models; based on non-parametric frontier production function, applicable to inter-industry framework, i.e., a uniform framework, of Sraffa-Leontief. The current themes and issues are related to Economic Reforms' periods of Indian economy and are intended to resolve those problems and arriving at the solutions due to either of economic reforms, or by merely market forces or by both interactions of them, in the newly emerging applied economics; i.e., environment, information technology, infrastructure, services, tertiary and major physical, financial, fiscal and trade sectors of Indian economy.

Primal forms of I-O, PCMC and LP models provide output solutions sectors/processes; while dual forms of primal of I-O, PCMC and LP models provide relative price structure solution irespective of those distinct sectors of those finite processes. Then, subsitution between those finite and discrete processes, between Inputs and Outputs and between each of Inputs and of Outputs is applicable to both primal and dual L-P models; whereas finite and discrete unique processes or only one process for each is applicable to both primal and dual forms of I-O Analysis; and in both cases, it is due to basic feasible solution. Process subsitution in L-P model results from scarcity of factors, inputs, outputs, etc., in relation to market supplies versus demands for them; in turn prices versus costs per unit, as of both primal and dual forms of L-P models; and in both cases, bottlenecks and/or shortages persists reflected in number of constraints or inequalities of L-P frameworks; thus L-P model provides multiple, feasible, basic solutions of efficient points; only one of them requires to become corner kinked optimum point solution.

Summing up, given the uniform premise and distinctions between three forms for inter-industry frameworks, the basic feasible solution is a unique optimal solution in I-0 framework; while in L-P framework optimal basic feasible solution for an objective function of activities (processes) is deduced to be one of efficient finite number of solutions; that depends on number of linearly independent constraints based vectors for attaining solutions of the optimising objective function, for a given set of prices and budget line.

However, both I-O and L-P models and Sraffian models are non-parametric frontier production function based on inter-industry economics frameworks.

The themes and issues in four books cover current economic reforms period of Indian Economy, to resolve the economic issues of Indian Economy, for arriving at solutions that were attributable to economic reforms, or to merely market forces or to both or not.

The Papers in the first book (A) dealt with frontier developments in economics: Theoretical, analytical, methodological and empirically verified explorations in inter-industry frameworks, with new specifications and in estimation of them; thus provided advanced knowledge in inter-industry frameworks by professors of eminence and in research papers, out of Ph.D., dissertations of young research scholars, spread all over the country and abroad; whose contributions are pioneering, awakening and provoking new researches.

Book B: Economy-wide studies of structural changes, balanced economic growth, technology and development, factor contents of foreign trade debates, etc., during the reforms period, whether due to innovations in indigenous technology or due to imports of foreign technology during reforms period are the major issues dealt by professors of eminence and research scholars in their Ph.D., dissertations: all these contributions are pioneering, awakening and provoking new researches.

The third book C deals with newly emerging sectors' impact on Indian Economy; that is, environment, all forms of pollutions, Information Technology, all forms of services and infrastructure, technical progress, scale efficiency, etc., of major sectors, inter-regional and inter-country trade and tertiary sectors, financial, fiscal, Govt., etc., sectors of Indian Economy particularly with uniform premise of Inter-Industry Frameworks — an exception in the professional Book world, where contributions are of professions of academic excellence and similarly of research scholar's Ph.D., dissertations – all these contributions are pioneering, awakening and provoking new researches.

Book D: brings out role of foreign trade and interventions in foreign exchange payments in India versus other countries, exchange determinants, role of foreign direct investments, macro models for development of India versus other countries, etc., in transitional economies of India versus China; structural changes in Jute Cultivation of North East Agriculture due to new technology experiments and structural changes in Iran Economy. In this fourth book stochastic econometric estimation methods are also used in contrast to and combining with inter-industry economy frameworks; and compares and contrasts relevance of either of them or both of them, as suggested by L.R.Klein.[1] All these studies contribute new knowledge in emerging areas combining econometrics and inter-industry frameworks. They add to new knowledge of eminent professors and research scholars in their Ph.D., dissertations; which are pioneering, provoking and awakening new researches.

Hence, the four books are an essential MUST for all readers/seekers of knowledge on current issues of Indian economy; a Text and Reference to all Postgraduates, Ph.D Scholars and Faculty in Economics; to Development Executives, Planners and Policymakers for their economic practice in the current globalisation decades of Indian Economy.

– V.V.N. Somayajulu

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[1] L.R. Klein for Macroeconomy wide studies in India versus other countries, *The Indian Economic Journal issue*.

Acknowledgements

All chapters are contributed by eminent Professors of Economics and by the most scholarly works of Ph.D., dissertations of the best accorded first rate Universities/Research Institutes of excellence in India, as in advanced economies. Accordingly, the editor of the book is highly grateful to the following:

1. The Director (Professor Rajas Parchure) of Gokhale Institute of Politics and Economics, Pune and to all Faculty, Research Fellows and staff in Administration/Accounts/Technical/Library. Four Research Assistants (i) Chandrakant Kolekar and (ii) Vijay Prakash Misra (iii) Bhupesh Chintamani and (iv) Anil Aralikar; who undertook all the tasks of Research/Secretarial assistance to help me to function as Editor of the two Books, hence, special thanks to them.
2. The Vice-Chancellors, University of Hyderabad (UH), Deans, Schools of Social Sciences and of Economics, Heads of Dept. of Economics, All Faculty and Ph.D/M.Phil Research Scholars and students of M. A. Economics. Many thanks to Non-teaching Staff in the Dept. of Economics, Library and Technical Staff, and to all officers in Administration, Accounts and Secretarial Staff in the University of Hyderabad.
3. Dr. B. Nagarjuna, Associate Professor, in Economics deserves special thanks for co-editing the fourth Book with a similar title dealing with Foreign/International Issues of Inter-country Studies in Inter-Industry Frameworks.
4. Then Director, Birla Institute of Technology and Sciences (BITS), Pilani, and Faculty in Economics & Management Groups.
5. Then Director, Centre for Economic and Social Studies, Hyderabad.
6. Director, Institute of Public Enterprises, Hyderabad.
7. All Authors and Co-authors of all papers of these four books for their cooperation, consent, etc. All precautions are taken by them and me regarding publication of the papers in four books.

8. Professor R. Bharadwaj, President, Input-Output Research Association (IORA), Professor Rajas Parchure, Director, GIPE, encouraged me to undertake publication. Professors P. Venkatramaiah, R.K. Koti did refereeing of the papers of the four books; and recommended for publication. All Governing Council members (GC), General Body (GB) members, of IORA, India and sponsoring bodies (all funding organisations), invited speakers and all delegates are the most encouraging to get published by the reputed publishers.

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Contents

Structural Analysis of the Indian Economy during Pre-reform and Reform Periods (1983-84 to 2006-07)

1

Paramita Dasgupta, Debesh Chakraborty and Partha Pratim Ghosh

ABSTRACT

This paper uses Input-Output Tables of India (1983-84, 1993-94, 1998-99, 2003-04 and 2006-07) and devises a three-fold classification of sectors based on input-usage pattern, to study the structural changes in the Indian economy during the period 1983-84 to 2006-07 in the extended Leontief and Ghosh type of Input-Output framework. The study reveals a fluctuating but declining importance of the resource-intensive of Ricardo Sectors and an increasing importance of the High-Technology-intensive sectors. The primary factor-intensive Heckscher-Ohlin sectors have gained importance in terms of the Leontief Forward linkages. Overall, there have been some changes in the economic structure, though not very sharp ones.

INTRODUCTION

At the time of Independence, Indian economy was predominantly rural and agricultural. At the beginning of the First Five Year Plan in 1951, the contribution of the primary sector to GDP at factor cost was the largest followed by tertiary and secondary sectors respectively. A major drive towards diversification and modernization of the Indian economy in the following plans resulted in increased shares of the secondary and tertiary sectors and declined shares of the primary sector in the national product. The share of the primary sector in GDP at factor cost declined from 55% in 1950-51 to 22% in 2003-04, while share of

the secondary sector was 16% in 1950-51 and increased to 27% in 2003-04. The share of the tertiary sector increased from 29% to 51% during the same period.

It is argued that reform measures have resulted in a major structural shift for the Indian economy since the nineties, as economic growth has become more responsive to the performance of the industrial and service sectors and less to the performance of the agricultural sector as compared to the previous decades. In this paper, an attempt has been made to explore the structural changes that have taken place during pre-reform and reform periods and to study whether the reform measures in the nineties have truly brought about any major change in the production structure of the Indian economy as compared to pre-reform period.

While exploring and analyzing the structural changes during pre-reform and reform periods a new scheme of classification of sectors has been adopted, which differs from Colin Clark's (1940) famous categorization of an economy into primary, secondary and tertiary sectors. Here, the commodities are classified into three categories corresponding to the importance and nature of specific factors of production used in the production process. This classification is based on the notable work of Nambiar, Mungekar and Tadas, (1999) where goods are classified into three categories, namely Ricardo sectors, High-Technology sectors and Heckscher-Ohlin sectors. The Ricardo sectors are characterized by the importance of natural resources in their production. In other words, the sectors chosen for this category have high natural resource content. For example, agricultural crops and other allied activities, minerals like Coal and lignite, Crude petroleum and natural gas, Iron ore, agro-based sectors, etc., are included in this group of sectors. The goods produced with advanced technology are included in the category of High-Technology sectors, while the commodities belonging to the category of Heckscher-Ohlin sectors are characterized by the factor contents (labour and capital) importance of standard technologies in their production. As the sectors included in each of the groups may reflect high dispersion in their behaviour, each group is again divided into several subgroups. While the Ricardo sectors are divided into four subgroups, the High-technology intensive sectors and

the Heckscher-Ohlin sectors are divided into three and two subgroups respectively. The detailed scheme of classification of sectors is given in Appendix I.

The structural analysis over pre-reform and reform periods using this scheme of classification of the sectors is expected to reflect the changing importance of the resource-intensive, advanced technology-intensive, and labour and capital-intensive sectors in the production structure of the Indian economy over the study period.

The current structural analysis is based on the Input-Output methodology. The study of sectoral linkages and key sectors using Input-Output Tables is useful to grasp the nature and degree of interdependence among the sectors and explore the structure of an economy.

There are several studies on the linkage analysis and structural interdependence of the Indian economy. The pioneers in this field are Baradwaj (1966), Hashim (1971) and Hazari (1970). The other studies related to the sectoral linkages in India are done by Mehta (1977), Venkatramaiah and Argade (1979), Saxena and Bhatnagar (1987), Bhowmik and Chakraborty (1995), Dhawan and Saxena (1992) have studied the intersectoral linkages of the Indian economy and identified the key sectors for the years 1973-74, 1978-79 and 1983-84, using the supply side and demand side models. A more recent study on sectoral linkages of the Indian economy is conducted by Sastry, Singh, Bhattacharya and Unnikrishnan (2003). They have examined the linkage of growth among the agriculture, industry and service sectors of the economy using both input-output and simultaneous equations framework. The above-mentioned papers have studied the structural changes of the Indian economy within the input-output framework during pre-1991 era. In the current paper, an attempt has been made to study the structural changes focusing on the post-1991 period. The paper has also compared the changes during reform period with those of the pre-reform period in order to find out whether the reform measures in the nineties have brought about any major structural shift of the Indian economy. This paper also differs from the earlier studies with respect to using the input-based scheme of classification of the sectors. In this respect, the paper

makes a modest contribution to the earlier studies conducted on the Indian economy.

This paper is organized in four sections. Section 2 discusses the methodological framework used in this study. Section 3 contains the database. The results obtained from the analysis and discussions on the same are presented in Section 4. Section 5 presents the conclusions of the paper.

METHODOLOGY

We first discuss the Leontief (1951) Model and the measure of backward and forward linkages based on the model, followed by a brief discussion of the Ghosh (1958) model, and the measure of forward linkage in this model. It should be noted, that our measures of linkages are not the traditional measures but weighted linkage measures in line with Cuello, Mansouri and Hewings (1992).

The Leontief Static Open Input-Output Model is represented as

$$\mathbf{x} = \mathbf{X}\,\mathbf{e} + \mathbf{f} \qquad \ldots. (1)$$

where $\mathbf{X}$ = (n × n) Transactions Matrix,

$\mathbf{e}$ = (n × 1) Unit vector,

$\mathbf{f}$ = (n × 1) Final demand vector,

$\mathbf{x}$ = (n × 1) Gross output vector

In this demand-led model, each sector is assumed to require the intermediate inputs in fixed proportion to its own output, i.e.,

$$X_{ij} = a_{ij}\, x_j \qquad \ldots. (2)$$

where, a_{ij} is the technical coefficient which shows the direct requirement of input i per unit of output of sector j.

The solution to the model is given by the equation

$$\mathbf{x} = (\mathbf{I} - \mathbf{A})^{-1}\,\mathbf{f} \qquad \ldots. (3)$$

where $\mathbf{A}$ is the Input-Output Technical coefficient matrix of order (n × n), and $(\mathbf{I} - \mathbf{A})^{-1}$ is the Leontief Inverse. While the Technical coefficient matrix shows the direct input requirements per unit of gross output, the Leontief Inverse matrix gives the total direct and indirect

input requirement per unit of final demand. Rasmussen (1957) relied on the Leontief Inverse to calculate the backward and forward linkages, which are simple column-sum and row-sum of the Leontief Inverse respectively. Cuello, Mansouri and Hewings (1992) have reformulated this traditional approach of measuring sector-level linkages. They introduced two weighting schemes where either the importance of the total sector-level output, *i.e.*, gross output, or the sector-level final demand share can be used as weights for each sector. In this study, we have used the share of gross output as the weight for each sector, defined as

$$\alpha_i = x_i / \sum_i x_i, \text{ so that } \sum_i \alpha_i = 1.$$

Therefore, the weighted backward linkages used in this study, is defined as

$$I_1 = c/L \qquad \ldots. (4)$$

Where I = weighted backward linkage index in the Leontief Model,

c = $\sum i \ \alpha_i \ p_i \ j/n$, the weighted column-average,

L = $\sum i \sum_i j \ \alpha_i \ pi \ j/n^2$, the weighted total average,

n = number of sectors,

$p_i \ j$ = element of the Leontief Inverse.

Hence, I_1 is an index measuring the extent of expansion in the system of industries for an expansion in the j^{th} industry. The sectors having values of I_1 greater than one are considered as sectors with strong backward linkages.

In a similar manner, we construct the index for measuring the relative forsward linkage as

$$I_2 = r/ L' \qquad \ldots. (5)$$

where I_2 = weighted forward linkage index in the Leontief Model,

$r = \sum_j \alpha_j \ p_{i\,j}/n$, the weighted row-average,

$L' = \sum ij \ \alpha j \ p_{ij}/n^2$, the weighted total average,

n = Number of sectors,

p_{ij} = Element of the Leontief Inverse.

We now develop the weighted Ghosh forward linkage. The Ghosh model is given as

$$\mathbf{x}' = \mathbf{e}' X + \mathbf{v}' \quad \text{…. (6)}$$

where $\mathbf{X}$ = (n × n) Transactions Matrix,

$\mathbf{e}'$ = transpose of the Unit vector,

$\mathbf{v}'$ = transpose of the Value addition vector,

$\mathbf{x}'$ = transpose of the Gross output vector

The solution to the Ghosh model is given by

$$\mathbf{x}' = \mathbf{v}' (\mathbf{I} - \mathbf{B})^{-1} \quad \text{…. (7)}$$

where, **B** is the fixed allocation coefficients matrix. The elements of this matrix are

$$b_{ij} = X_{ij} / x_i \quad \text{…. (8)}$$

i.e., the fixed fraction of i^{th} output flowing into sector j. The matrix $(\mathbf{I} - \mathbf{B})^{-1}$ is the Ghosh Inverse. The same weighting scheme has been used to develop the index for the Ghosh forward linkage. Thus, the weighted Ghosh forward linkage index is constructed as

$$I_3 = h/G \quad \text{…. (9)}$$

where I_3 = weighted Ghosh forward linkage index,

h = $\sum_j \alpha_j q_{ij}/n$, the weighted row-average,

$G = \sum_{ij} \alpha_j q_{ij}/n^2$, the weighted total average,

n = Number of sectors,

$q_i j$ = element of the Ghosh Inverse.

DATA BASE

This study used India's Input-Output Tables of 1983-84, 1993-94, 1998-99, 2003-04 and 2006-07 prepared by the Central Statistical Organization, Ministry of Statistics and Programme Implementation, Government of India. While the tables of 1983-84, 1993-94 and 1998-99 are each based on 115 sectors, the tables of 2003-04 and 2006-07 contain 130 sectors each. The original tables have been made comparable by using the concordance table published by the Central

Statistical Organization. Further, each table has been converted into constant prices of 1993-94 aggregated into 70 sectors for comparability.

RESULTS AND DISCUSSION

The discussions run in terms of the proposed input-based classification, with reference to three measures of interconnectedness, namely the indexes developed for Backward Linkages, Forward Linkages and Ghosh Forward Linkages. We begin with the Ricardo Sectors and move on to the High-Tech and Heckscher-Ohlin Sectors. Identification of the Key Sectors of the Indian Economy in terms of our input-based classification follows next. The detailed results of Linkage Analysis are given in Appendix 2. These results throw light on the pattern of structural change in the Indian economy during the period 1983-84 to 2006-07. The discussion begins with the Ricardo Sectors and moves on to the High-Technology Sector and the Heckscher-Ohlin Sectors.

(a) Ricardo Sectors

The broad pattern of evolution of the Ricardo Sectors in terms of Backward Linkages, Forward Linkages and Ghosh Forward Linkages are shown in Figure 1. It emerges that there has been an overall decline in the number of Ricardo Sectors that have strong interconnectedness with the rest of the economy over the time period 1983-84 to 2006-07. Table 1 presents a detailed identification of the Ricardo Sectors that have strong linkages. The same Table also shows the linkage details of the various subgroups of the Ricardo Sectors.

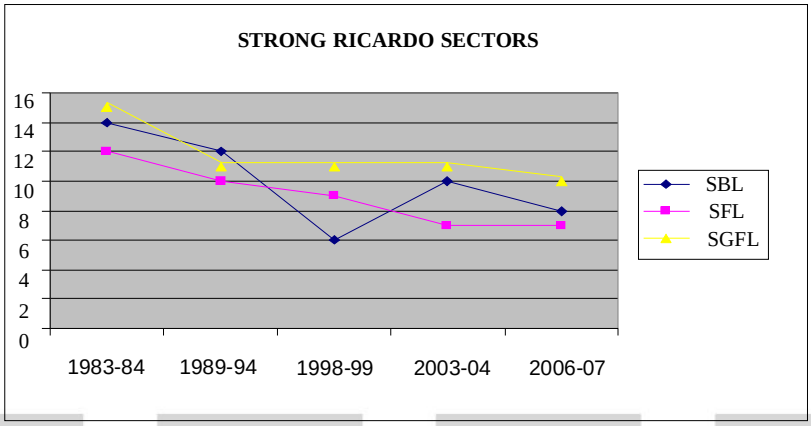

Fig. 1: Strong Ricardo Sectors

Note: *SBL, SFL and SGFL indicate Strong Backward Linkages, Strong Forward Linkages and Strong Ghosh Forward Linkages respectively.*

Source: *Results from the study.*

Table 1: Identification of Ricardo Sectors with Strong Linkages

Backward Linkages					
Subgroup	1983-84	1993-94	1998-99	2003-04	2006-07
Agriculture & Forestry	1 – 7	1, 3, 6	3, 6	1, 2, 4, 6	1, 2, 4
Minerals	–	–	–	–	–
Agro-based Industries	16, 17, 19-21, 25	16, 17, 19-21, 23, 25	17, 19, 21	16, 17, 19-21	16, 17, 19, 21
Mineral Products	28	28, 38	28	27	27
Forward Linkages					
Subgroup	1983-84	1993-94	1998-99	2003-04	2006-07
Agriculture & Forestry	1-6	1, 3-5	1, 3-5	1, 4	1, 4
Minerals	10, 11	10, 11	10, 11	10, 11	10, 11
Agro-based Industries	17, 19, 21	17, 19, 21	17, 21	17, 21	17, 21
Mineral Products	27	27	27	27	27

Ghosh Forward Linkages					
Subgroup	1983-84	1993-94	1998-99	2003-04	2006-07
Agriculture & Forestry	1, 3, 4, 6	3, 6	3, 6	4	–
Minerals	10, 11, 13, 14	10, 11, 13, 14	10, 14	10, 11, 13, 14	10, 11, 13, 14
Agro-based Industries	20, 22, 23	22, 23	23	22, 23	22, 23
Mineral Products	27, 28, 38, 39	27, 28, 38	27, 28, 38	27, 28, 38, 39	27, 28, 38, 39

Source: *Results from the study.*

OBSERVATIONS ON THE RICARDO SECTORS

Backward Linkages

We begin with the Backward Linkages. The number of Ricardo Sectors with strong Backward Linkages has declined from fourteen in 1983-94 to twelve in 1993-94. It declined further to six in 1998-99 but increased to ten in 2003-04 before decreasing to eight in 2006-07. Thus, overall, the importance of the Ricardo sectors has declined in the period of study.

Let us now look at the effects on the various subgroups included in the Ricardo Sectors. Ricardo Sectors are divided into four subgroups, namely Agriculture & Forestry, Minerals, Agro-based Industries and Mineral Products.

Between 1983-84 and 1998-99, the importance of Agriculture and Forestry type of Ricardo Sectors has decreased steadily. Their position improved marginally in 2003-04 but came down again in 2006-07. In 1983-84, seven sectors from the Agriculture & Forestry subgroup that qualified for the category of sectors with strong backward linkages. These are Paddy (sector 1), Wheat (sector 2), Other Crops (sector 3), Commercial Crops (sector 4), Milk & Milk Products (sector 5), Animal Services (agricultural) (sector 6) and Other Livestock Products (sector 7). Of these, only Paddy (sector 1), Other Crops (sector 3) and Animal Services (agricultural) (sector 6) retained their importance in 1993-94. Further, Paddy (sector 1) dropped out in 1998-99. However, there were four sectors from this subgroup that qualified for the category of sectors

with strong Backward Linkages in 2003-04, namely. These are Paddy (sector 1), Wheat (sector 2), Commercial Crops (sector 4) and Animal Services (agricultural) (sector 6). But the number again decreased to three in 2006-07, with only Paddy (sector 1), Wheat (sector 2) and Commercial Crops (sector 4) qualifying for this category. The Ricardo Mineral subgroup does not show any strong backward linkages during the entire period of study.

In 1983-84, six sectors from the Agro-based industries subgroup showed integration with the rest of the economy in the form of strong backward linkages. These were Sugar, Khandsari and Boora (sector 16), Other Food Products and Beverages (sector 17), Cotton Textiles (sector 19), Jute, Hemp, Mesta Textiles (sector 20), Other Textiles (sector 21) and Leather and Leather Products (sector 25). The number of sectors in the Agro-based industries subgroup increased marginally from 1983-84 to 1993-94 as Paper, Paper Products and Newsprints (sector 23) joined this category, but the number declined drastically in 1998-99, with only three sectors, namely Other Food Products and Beverages (sector 17), Cotton Textiles (sector 19) and Other Textiles (sector 21). The position of this subgroup improved considerably again in 2003-04, almost reaching the level of 1983-84, but it came down again in 2006-07, back to the same status as in 1998-99. The number of sectors in the Mineral Products subgroup with strong backward linkages has been two in 1993-94 and only one in all the other years.

Thus, the decline of the Ricardo Sectors in terms of backward linkages has been mainly due to the decline of the Agriculture and Forestry sectors, and to a limited extent due to the decline of the sectors of the Agro-based Industries.

Forward Linkages

Coming to the Forward Linkages of the Ricardo Sectors, we find that the number of such sectors with strong forward linkages has decreased steadily over successive years, from twelve in 1983-84 to ten in 1993-94, nine in 1998-99, seven in 2003-04 and also in 2006-07. Among the subgroups, the decrease has been mostly in Agriculture and Forestry. The number of sectors from this subgroup that have shown strong forward linkages has been reduced from six in 1983-84 to four in

1993-94 and further to two in 2003-04 and 2006-07. Only two specific sectors from the Minerals subgroup have shown strong forward linkages from 1983-84 to 2006-07. These are Coal & Lignite (sector 10) and Crude Petroleum & Natural Gas (sector 11). No sector from this subgroup showed strong forward linkage in 2006-07.

Other Food Products & Beverages (sector 17) and Other Textiles (sector 21) are sectors from the Agro-based Industries subgroup of the Ricardo Sectors that show strong forward linkages in all the years. During the first two years, i.e., in 1983-84 and 1993-94, Cotton Textiles (sector 19) also showed strong forward linkage. Thus, the importance of the Agro-based Industries subgroup in the Ricardo Sectors has declined initially and then remained steady. In the case of Mineral Products subgroup, we find Petroleum Products (sector 27) showing strong forward linkage in all the years. It is the only sector from this subgroup showing strong forward linkages.

Thus, the decline in the importance of the Ricardo Sectors in terms of forward linkages has also occurred chiefly in the Agriculture and Forestry subgroup.

Ghosh Forward Linkages

In the case of Ghosh forward linkages, the number of strong Ricardo Sectors has decreased from fifteen in 1983-84 to eleven in 1993-94 and further to ten in 2006-07. The number of strong sectors from Agriculture and Forestry subgroup of the Ricardo Sectors decreased from four in 1983-84 to two in 1993-94, one in 2003-04 and none in 2006-07. The Minerals subgroup has experienced a marginal increase in 1998-99 and a marginal decrease in 2003-04. There has been a decline in the case of the Agro-based industries in 1993-98 and 1998-99 and a rise in 2003-04 up to the level of 1993-94.

The pattern in the Mineral Products subgroup has been similar to that of the Minerals subgroup. Thus, overall the importance of the Ricardo Sectors has decreased from 1983-84 to 2006-04.

Now we move on to the High-Technology Sectors of the Indian economy.

(b) High-Technology Sectors

The broad results regarding the evolution of the High-Tech sectors with respect to sector-level interdependence are shown in Figure 2 while Table 2 presents the details of the various subgroups in this respect.

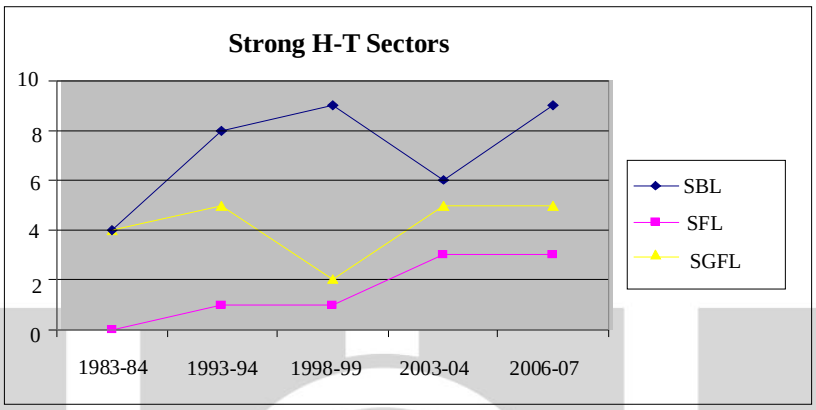

Fig. 2: Strong H-T Sectors

Note: *SBL, SFL and SGFL indicate Strong Backward Linkages, Strong Forward Linkages and Strong Ghosh Forward Linkages.*

Source: *Results from the study.*

Table 2: Identification of High-Tech Sectors with Strong Linkages

Backward Linkages					
Subgroup	**1983-84**	**1993-94**	**1998-99**	**2003-04**	**2006-07**
Chemical Products	36	33, 36	33, 36	29, 36	29, 36
Machinery & Electronic Equipment	45, 46	43-46	43-46	46, 50	44, 46, 47, 50, 52
Transport & Communication	55	53, 55	53-55	55, 63	55, 63
Forward Linkages					
Subgroup	**1983-84**	**1993-94**	**1998-99**	**2003-04**	**2006-07**
Chemical Products	–	29	29	29	29
Machinery & Electronic Equipment	–	–	–	–	50
Transport & Communication	–	–	–	55, 63	63
Ghosh Forward Linkages					
Subgroup	**1983-84**	**1993-94**	**1998-99**	**2003-04**	**2006-07**
Chemical Products	29, 31	29, 31, 36	29, 36	29, 36	29, 36

Machinery & Electronic Equipment	48	–	–	–	–
Transport & Communication	54	54, 63	–	53, 54, 63	53, 54, 63

Source: *Results from the study.*

Observations on the High-Technology Sectors

Backward Linkages

The number of High-Technology Sectors with strong backward linkages has shown oscillations over the period of study. In 1983-84, there were four High-Tech sectors with strong backward linkages. This number increased to eight and nine in 1993-94 and 1998-99 respectively. However, the number came down sharply to six in 2003-04. It increased once again to nine in 2006-07. So overall, the number of High Technology Sectors with strong backward linkages has increased.

Among the High-Tech sectors, there are three subgroups, namely Chemical Products, Machinery and Electronics and Transport and Communication Equipment. In 1983-84 only one sector, namely Other Chemicals (sector 36), from the Chemical Products subgroup showed strong backward linkages. In 1993-94, another sector, namely Drugs and. Medicines (sector 33) joined this category. The picture remained unchanged in 1998-99 and in 2003-04 the Paints, Drugs and Medicines (sector 33) was replaced by Heavy Chemicals (sector 29) in this category. The picture for sectors of this subgroup showing strong backward linkages remained unchanged in 2006-07.

The Machinery and Electronics subgroup show two sectors, namely Machine Tools (sector 45) and other Non-electrical Machinery (sector 46), with strong backward linkages in 1983-84. Two more sectors joined this category in 1993-94. These sectors are Tractors and Agricultural Implements (sector 43) and Industrial Machinery (sector 44). The number of sectors with strong backward linkages from this subgroup declined to two in 2003-04. These sectors are Non-electrical Machinery (sector 46) and Communication Equipment (sector 50). In 2006-07, the number of sectors from this subgroup showing strong backward linkages shot up to five, comprising Industrial Machinery (Sector 44), Other Non-electrical Machinery (sector 46), Electrical Industrial Machinery (sector

47), Communication Equipment (sector 50) and Electronic Equipment including TV (sector 52).

Coming to the Transport and Communications subgroup, we find Motor Vehicles (sector 55) to be the only sector with strong backward linkages in 1983-84. This sector also showed strong backward linkages in all the subsequent years. In addition, during 1993-94 and 1998-99, Ships and Boats (sector 53) also qualified in this category while Rail Equipment (sector 54) also joined the category in 1998-99. So the number of sectors with strong backward linkages from the Transport and Communications subgroup increased steadily from 1983-84 to 1998-99. However, in the next two years, i.e., 2003-04 and 2006-07, only two sectors from this subgroup qualified in this category. These are Motor Vehicles (sector 55) and Communication (sector 63).

Thus, the oscillation in the number of High-Tech sectors with strong backward linkages has been due to the initial rise in the sectors form all the three subgroups between 1983-84 and 1998-99. Among the three subgroups, the Chemical Products and Machinery showed a marked increase in this respect. The decline from 1998-99 to 2003-04 occurred due to the decline in the number of sectors with strong backward linkages from the Machinery and Electronics subgroup and the Transport and Communication Equipment subgroup. The rise in the importance of the High-Tech sectors with respect to strong backward linkages during 2006-07, was due to the substantial rise in the number of sectors from the Machinery and Electronics subgroup that joined this category in that year.

Forward Linkages

During the period of study, the number of High-Tech sectors with strong forward linkages has increased. However, the pattern of change is not uniform among the various subgroups. The sectors in the Chemical products subgroup of the High-Tech sectors do not show very strong integration with the rest of the economy with respect to forward linkages in the Leontief System. From this subgroup, only one sector, namely Heavy Chemicals (sector 29), qualifies for strong forward linkages and it recurs in 1993-94 through 2006-07. No sector qualifies from the Machinery and Electronics subgroup from 1983-94 up to 2003-04. In

2006-07 however, we find Communication Equipment (sector 50) from the Machinery and Electronics subgroup to qualify for strong forward linkages.

The Transport and Communications subgroup follows the same pattern as the Machinery and Electronics subgroup from 1983-94 up to 1998-99. In 2003-04, however, Motor Vehicles (sector 55) and Communication (sector 63) from this subgroup qualified in this category. In 2006-07, only Communication (sector 63) qualified for high forward linkages from this category. So we find that due to the rising importance of the Machinery and Electronics subgroup in 2006-07 and that of the Transport and Communications subgroup from 2003-04 onwards, the number of High-Tech sectors with strong forward linkages has increased overall, from 1983-94 to 2006-07.

Ghosh Forward Linkages

With respect to Ghosh forward linkages, we find that the number of sectors with strong linkages was four in 1983-84, five in 1993-94, decreased to two in 1998-99 and increased to five in 2003-04 onwards. Overall, there has been a small increase in the number of sectors with strong Ghosh forward linkages from 1983-84 to 2006-07. The sectors from the Chemicals Products subgroup that qualified for strong Ghosh forward linkages were Heavy Chemicals (sector 29) for all the years, Pesticides (sector 31) in 1983-84 and 1993-94 and Other Chemicals (sector 36) from 1993-94 onwards.

From the Machinery and Electronics subgroup, there was only one qualifying sector, namely Electrical Wires, Cables and Appliances (sector 48), and that too for a single year, 1983-84. The Transport and Communications subgroup show an increasing importance initially from 1983-84 to 1993-94 and a decrease in 1998-99, after which a rise has been witnessed again in 2003-04. In 1983-84, Rail Equipment (sector 54) from this subgroup was the only qualifying sector in this category. It was joined by Communication (sector 63) from the same subgroup in 1993-94. No sector from this subgroup qualified in 1998-99, while in 2003-04 both Rail Equipment (sector 54) and Communication (sector 63) together with Ships and Boats (sector 53) from this subgroup were found in the category of sectors with strong Ghosh forward linkages.

(c) Heckscher-Ohlin Sectors

We present the broad results regarding the evolution of the H-O (High-Tech) sectors with respect to sector-level interdependence in Figure 3 and the details of the various subgroups in this respect in Table 3

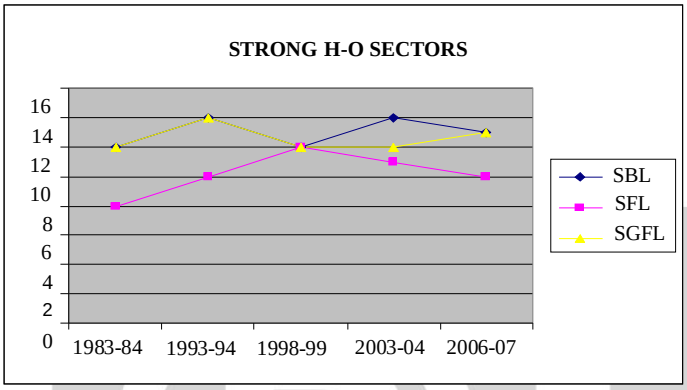

Fig. 3: Strong H-O Sectors

Note: *SBL, SFL and SGFL indicate Strong Backward Linkage, Strong Forward Linkage and Strong Ghosh Forward Linkages respectively.*

Source: *Results from the study.*

Table 3: Identification of Heckscher-Ohlin Sectors with Strong Linkages

Backward Linkages					
Subgroup	**1983-84**	**1993-94**	**1998-99**	**2003-04**	**2006-07**
Capital Intensive Sectors	15, 26, 30, 34, 40, 59-61	15, 26, 30, 34, 40-42, 58-60	26, 40, 42, 58-60	15, 26, 30, 40-42, 58-60	15, 26, 40, 41, 42, 58-60
Labor Intensive Sectors	62, 64, 65, 69	62, 64, 65, 69	62, 64-66, 68, 69	62, 64-66, 69	62, 64-66, 69
Forward Linkages					
Subgroup	**1983-84**	**1993-94**	**1998-99**	**2003-04**	**2006-07**
Capital Intensive Sectors	40, 42, 59, 60	40, 41, 58-60	30, 40-42, 58-60	40-42, 58-60	40, 41, 42, 58-60

Labor Intensive Sectors	62, 64, 66, 69	62, 64, 66, 69, 70	62, 64, 66, 69, 70	62, 64-66, 69	62, 64, 66, 69
Ghosh Forward Linkages					
Subgroup	**1983-84**	**1993-94**	**1998-99**	**2003-04**	**2006-07**
Capital Intensive Sectors	30, 32, 37, 40-42, 59, 60	26, 30, 32, 35, 37, 40, 41, 58-60	30, 32, 35, 37, 40, 41, 59, 60	32, 35, 37, 40, 41, 58-60	32, 35, 37, 40-42,58-60
Labor Intensive Sectors	62, 64, 66,69	62, 64, 66,69	62, 64, 66, 69	62, 64, 66,69	62, 64, 66,69

Source: *Results from the study.*

Observations on the Heckscher-Ohlin Sectors

Backward Linkages

The number of Heckscher-Ohlin sectors with strong backward linkages varies between twelve and fourteen over the years 1983-84 to 2003-04 and it reaches thirteen in 2006-07, indicating a small rise in their importance. Among the Capital Intensive sectors, the ones with strong backward linkages in 1983-84 were Tea and Coffee Processing (sector 15), Rubber and Plastic Products (sector 26), Fertilizers (sector 30), Soaps, Cosmetics and Glycerine (sector 34), Iron and Steel (sector 40), Construction (sector 59), Electricity (sector 60) and Water Supply (sector 61). In 1993-94, three more sectors joined this category and one sector was left out. Those joining were Non-Ferrous Basic Metals (sector 41), Hand Tools and Other Metal Products (sector 42) and Miscellaneous Manufacturing (sector 58) while the sector that was left out was Water Supply (sector 61). Four more sectors were left out of this category in 1998-99. These were Tea and Coffee Processing (sector 15), Fertilizers (sector 30), Soaps, Cosmetics & Glycerine (sector 34) and Non-Ferrous Basic Metals (sector 41). Three out of these four sectors (all except Soaps, Cosmetics and Glycerine) rejoined the category of sectors with strong backward linkages in 2003-04. However, in 2006-07, the picture again became very similar to that of 1998-99. Thus, the Capital Intensive subgroup itself shows an oscillating pattern of the number of sectors with strong backward linkages. Starting from eight, the number rises to ten, falls to six, then rises to nine and finally falls to eight during the years 1983-84, 1993-94, 1998-99, 2003-04 and 2006-07

respectively. With regard to the Labor Intensive Heckscher-Ohlin sectors with strong backward linkages, we find that all the years of analysis contain four common sectors, namely Transport Services (sector 62), Trade (sector 64), Hotels and Restaurants (sector 65) and Other Services (sector 69). Banking and Insurance (sector 66) also joins this league from 1998-99 onwards.

Forward Linkages

The number of Heckscher-Ohlin sectors with strong forward linkages increases from eight to ten and further to twelve for the years 1983-84, 1993-94 and 1998-99 respectively. Thereafter, for 2003-04, it came down to eleven and further to ten in 2006-07. Among the Capital Intensive sectors, those that are common for all the years are Iron and Steel (sector 40), Construction (sector 59) and Electricity (sector 60). Hand tools and Other Metal Products (sector 42) qualifies for this category in all the years except 1993-94. Non-ferrous Basic Metals (sector 41) is included in this category for the years 1993-94, 1998-99, 2003-04 and 2006-07. Miscellaneous Manufacturing (sector 58) also joins this category from 1993-94 onwards. The variation across the Labor Intensive sectors is also minimal. From this subgroup, Transport (sector 62), Trade (sector 64), Banking and Insurance (sector 66) and Other Services feature (sector 69) show strong forward linkages for all the years of study. In addition Public Administration (sector 70) also qualifies in 1993-94 and 1998-99 while Hotels and Restaurants (sector 65) qualifies for the year 2003-04.

Ghosh Forward Linkages

The number of Heckscher-Ohlin sectors with strong Ghosh forward linkages increases goes up twelve to fourteen during the years 1983-84 and 1993-94 respectively. The number comes down to twelve in 1998-99 and remains at that level for 2003-04, before increasing marginally to thirteen in 2006-07. In a manner similar to the pattern of minimal variation among the subgroups in case of backward and forward linkages, the variation among the subgroups with respect to Ghosh forward linkages is also quite low in case of the Heckscher-Ohlin Sectors.

Having completed the detailed exercise on identification of strong inter-sector linkages on the basis of our proposed input-based classification, we now move on to the evolution of the Key Sectors of the Indian Economy. It is possible to work out two sets of Key Sectors, one based on backward and forward linkages and the other based on backward and Ghosh forward linkages.

(d) Evolution of the Key Sectors of the Indian Economy

An important aspect of the linkage analysis is the identification of the key sectors of the economy. We define a key sector as one which shows both strong backward and strong forward (Leontief or Ghosh, as the case may be) linkages. Apart from key sectors, another set of sectors which consists of the sectors having strong backward linkage and weak forward linkage, may play a pivotal role in accelerating the pace of growth. The backward linkage is found to be more powerful in transmitting the effects of growth to the other sectors as compared to the forward linkage, particularly in the case of the developing economy. The Key Sectors are presented in Table 3.

From Table 3 it is clear that the importance of the Ricardo Key Sectors has diminished while that of the High-Tech Key Sectors and the Heckscher-Ohlin Key Sectors has increased over the period 1983-84 to 2006-07. A striking result of the analysis is that none of the High-Tech Sectors feature as Key Sector until the year 2003-04. In addition, the absolute number of High-Tech Key Sectors of the Indian Economy is not very high. In 2006-07, the High-Tech Key Sectors were Heavy Chemicals (sector 29), Communication Equipment (sector 50) and Communication (sector 63). The Heckscher-Ohlin Key Sectors in 2006-07 were Iron and Steel (sector 40), Non-Ferrous Basic Metals (sector 41), Hand Tools and Other Metal Products (sector 42), Miscellaneous Manufacturing (sector 58), Construction (sector 59), Electricity (sector 60), Transport Services (sector 62), Trade (sector 64), Hotels and Restaurants (sector 65), Banking & Insurance (sector 66) and Other Services (sector 69). While the Heckscher-Ohlin Key Sectors for 1983-94 included only Iron & Steel (sector 40), Construction (sector 59), Electricity (sector 60), Transport Services (sector 62) and Trade (sector 64), the difference between the set of Heckscher-Ohlin Key Sectors for

2006-07 and those obtained in the years 1993-94, 1998-99 and 2003-04 is not very substantial.

Table 4: Key Sectors

Input-based Classification	1983-84	1993-94	1998-99	2003-04	2006-07
Ricardo Sectors	1-6, 17, 19, 21	1, 3, 17, 19, 21	3, 17, 21	1, 4, 17, 21, 27	1, 4, 17, 21, 27
High Techn-ology Sectors	-	-	-	29, 55, 63	29, 50, 63
Heckscher-Ohlin Sectors	40, 59, 60, 62, 64, 69	40, 41, 58-60, 64, 66, 69	40, 42, 58-60, 62, 64, 66, 69	40-42, 58-60, 62, 64-66, 69	40, 41, 42, 58-60, 62, 64, 66, 69
Input-based Classification	1983-84	1993-94	1998-99	2003-04	2006-07
Ricardo Sectors	1-6, 17, 19, 21	1, 3, 17, 19, 21	3, 17, 21	1, 4, 17, 21, 27	1, 4, 17, 21, 27
High Techn-ology Sectors	-	-	-	29, 55, 63	29, 50, 63
Heckscher-Ohlin Sectors	40, 59, 60, 62, 64, 69	40, 41, 58-60, 64, 66, 69	40, 42, 58-60, 62, 64, 66, 69	40-42, 58-60, 62, 64-66, 69	40, 41, 42, 58-60, 62, 64, 66, 69

Source: *Results from the study.*

CONCLUSIONS

The current paper explores the structure of the Indian economy during pre-reform and reform periods with a classification of sectors which is based on the inputs used intensively in the production process. For this purpose input-output methodology has been used as it offers important insights into the structure of an economy. The relative strength of linkages of the three broad categories of sectors, *i.e.*, Ricardo sectors, High-Technology sectors and Heckscher-Ohlin sectors have been studied and the Key sectors of the Indian economy identified. The following conclusions can be broadly made from our structural analysis about the Indian economy.

The Ricardo Sectors are natural resource intensive. The number of Ricardo Sectors with strong backward linkages declined from 1983-84 to 1998-99. The number increased in 2003-04 but decreased again in 2006-07, causing an overall decrease from 1983-84 to 2006-07. Those

with strong Leontief and Ghosh forward linkages also fell steadily. This declining importance of the Ricardo Sectors over the entire period of study is chiefly attributable to the decline in the importance of the sectors in the Agriculture and Forestry subgroup and the Agro-based Industries subgroup.

In the case of the High-Technology Sectors, the number of sectors with strong backward linkages has gone up in case of the Chemical Products category, the Machinery and Electronic Equipment category as also the Transport and Communication category. The number of sectors with strong Leontief Forward Linkages has increased from zero to three only over the entire period of study. However, the number of High-Technology Sectors with strong Ghosh Forward Linkages has not changed very much. Overall, the number of High Technology Sectors with strong Backward Linkages has shown a rise. It is observed that the High-Technology-intensive sectors gained prominence during the early years of the reform period. Although there appears to be a decline in their importance in the middle years of the reform period, they pick up again during the later years of the reform period. Overall, the importance of the High-Technology-intensive sectors has increased modestly over the years.

Coming to the Heckscher-Ohlin Sectors, we find that although the importance of these sectors has increased, there is considerable stability in the pattern of sectors with strong Backward, Leontief Forward or Ghosh Forward Linkages, even at the level of the two subgroups, namely the Capital Intensive and the Labor Intensive sectors (or Service sectors).

The Key sectors identified with the help of Backward and Forward Linkages indicate a dip in the importance of the Ricardo Sectors coupled with a slow rise in the importance of the High- Technology and Heckscher-Ohlin Sectors. In case of the Key sectors declining importance has been witnessed for the Ricardo and Heckscher-Ohlin Categories while the High-Tech category has shown fluctuations with little overall change.

From these summary observations, we may conclude that the structural changes in the Indian Economy in post-reform in terms of the

Backward, Forward and Ghosh Forward Linkage Indices have been low to moderate. The current pace of reform might not have ushered in the structural shift towards technology-intensive and capital-intensive sectors as expected when the reform was initiated. The reason behind such an outcome may be the existence of some bottlenecks in the program of economic reforms, which have hindered the major structural shift during reform period. It seems that any significant structural change would become difficult to realize in the future until and unless further and more accelerated reform measures and sector specific policies are not undertaken.

APPENDIX — I

CLASSIFICATION OF SECTORS ON THE BASIS OF INPUT USAGE

Se. No.	A. RICARDO SECTORS (27)	Se. No.	B. HIGH-TECHNOLOGY SECTORS (20)	Sector No.	C. HECKSCHER-OHLIN SECTORS (23)
Subgroup AI: Agriculture and Forestry		**Subgroup BI: Chemical Products**		**Subgroup CI: Capital Intensive sectors**	
1	Paddy	29	Heavy chemicals	15	Tea and coffee processing
2	Wheat	31	Pesticides	24	Printing and publishing
3	Other crops	33	Drugs and medicines	26	Rubber and plastic products
4	Commercial crops	36	Other chemicals	30	Fertilizers
5	Milk and milk products	**Subgroup BII: Machinery and Electronic Equipment**		32	Paints, varnishes and lacquers
6	Animal services (agricultural)	43	Tractors and agri. Implements	34	Soaps, cosmetics and glycerin
7	Other livestock products	44	Industrial machinery	35	Synthetic fibers, resin
8	Forestry and logging	45	Machine tools	37	Structural clay products
9	Fishing	46	Other non-electrical machinery	40	Iron and steel
Subgroup AII : Minerals		47	Electrical industrial Machinery	41	Non-ferrous basic metals
10	Coal and Lignite	48	Electrical wires, cables and appliances	42	Hand tools and other metal products
11	Crude petroleum, Natural Gas	49	Batteries	58	Miscellaneous manufacturing
12	Iron ore	50	Communication equipment	59	Construction
13	Other Metallic Products	51	Other electrical Machinery	60	Electricity
14	Other Non-metallic Prodts	52	Electronic equipment	61	Water supply

Subgroup AIII: Agro based Industries		57	Watches and clocks		
16	Sugar and khandsariboora			**Subgroup C II: Service sectors**	
17	Other food prods & bevrgs	**Subgroup B III: Transport and Communication**		62	Transport services
18	Tobacco products	53	Ships and boats	64	Trade
19	Cotton textiles	54	Rail equipment	65	Hotels and restaurants
20	Jute, hemp, mesta textiles Other textiles	55	Motor vehicles	66	Banking and insurance
21 22 23	Wood & Wood products Paper, Paper Products etc.	56	Other transport equipment	67	Education and research
25	Leather products	63	Communication	68	Medical and health
Subgroup AIV: Mineral products				69	Other services
27	Petroleum products			70	Public Administration
28	Coal tar products				
38	Cement				
39	Other non-metallic mineral prods.				