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ANALYSIS OF INDIA'S REFORMS

A CGE MODELLING EXERCISE

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FOREWORD

The process of major economic reforms undertaken in the Indian economy has completed nearly five years of implementation. The economy has entered into a new phase of development directed towards becoming globally competitive through the opening of trade, foreign investment, and technology inflows. The unilateral reform measures in the industrial and the trade policies of India along with reforms in the tax-regime represent a significant departure from the policy framework of the past four decades and are important to the future course of the Indian economy.

The basic objective of this Working Paper is to evaluate the comparative static effects of selected trade and domestic policy reforms on trade, output, domestic prices, economic welfare and intersectoral allocation of resources. The major reforms analysed in this study relate to reduction in tariff and non-tariff barriers to trade along with rationalization of the tax-regime. A Computable General Equilibrium (CGE) Model of the Indian Economy has been constructed for the purpose of analysis.

The results indicate that the import liberalization enhances the welfare of the economy but the effect gets further enlarged if exports are also liberalized simultaneously. This is particularly true of the agricultural sectors. The freeing of prices in the sectors which were under some form of administered price controls in the base year (1989-90) greatly intensifies the welfare effect. The economy becomes more efficient through better allocation of land, labour and capital across different producing sectors with distinct increase in the returns to each of these factors of production. The output as well as exports are expected to register big increase in five sectors, *viz.* clothing, leather products, footwear, non-metallic mineral products and glass products. These sectors are the major gainers from the improving scale economies. The major losing sectors in terms of output as well as the reasources-usage are expected to be non-ferrous metals, non-electrical machinery, and mining and quarrying. However,

the mining and quarrying sector may not lose if prices in the administered sectors are not freed. In the case of agricultural sector, the resources are expected to move from cereals to other crops. The rationalization of the existing structure of indirect taxes (mainly excise) and subsidies is expected to further benefit the factors of production and enhance the overall welfare.

The active collaboration between NCEAR, New Delhi and the University of Michigan, Ann Arbor has been immensely helpful in making the timely completion of this study possible. We would like to put on record our sincere thanks to Professors Robert M. Stern and Alan V. Deardorff of the University of Michigan and Prof. Drusilla K. Brown of the Tufts University for their academic support.

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The analysis of the India CGE Model developed in the present study has been made possible through the use of General Equilibrium Modelling Package (GEMPACK) Software developed at Monash University, Melbourne, Australia by Professors Jill Harrison and Ken Pearson. We are extremely thankful to Prof. Ken Pearson for his prompt and active support in marking this software package operative on NCAER's UNIX computer.

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Rakesh Mohan
Director General

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ANALYSIS OF INDIA'S REFORMS

A CGE MODELLING EXERCISE

1. Introduction

THE process of major economic reforms undertaken in the Indian economy has completed nearly five years of implementation. The economy has entered into a new phase of development directed towards becoming globally competitive through opening it up to trade, foreign investment, and technology inflows. The unilateral reform measures in the trade and domestic policies of India along with reforms of the tax-regime represent a significant departure from the policy framework of the past four decades and are important to the future course of the Indian economy. Such policy changes are likely to have medium to longer term impact on micro or industry level variables within the domestic economies of the concerned countries along with re-alignment of production across countries of the world. There is an ongoing debate on the likely impact of such reforms on the economy's output, employment and other variables signifying changes in the economic conditions of the country's population. It thus becomes important to evaluate the comparative static effects of such policy reforms on factor prices, output, and trade, along with intersectoral movement of resources, *viz.* land, labour and capital. In this paper, we do the same by using a 34-sector Computable General Equilibrium Model for India that has been

developed for this purpose. The research evaluations should help to provide an assessment of the impact so that the policy debate can be based on empirical findings rather than merely theoretical conjectures.

The paper proceeds as follows. The policy relevance of the present work is outlined in Section 2. In Section 3, we elaborate briefly the essential features of the India model. The various policy scenarios are discussed in Section 4. The results of the policy simulations are analyzed in Section 5. In Section 6, we illustrate the stability of the model results by analysing their sensitivity to changes in some of the major parameters used in the model. Our findings are summarised in Section 7.

2. Policy Relevance

India entered into an era of ambitious industrialization during the mid-1950s with the Mahalanobis strategy of development as its basis. The basic emphasis was on import-substitution, heavy industries and a central role for the public sector. Export pessimism was widely prevalent. The trade policy regime was highly protectionist and regulated through quantitative controls on imports. The tariff rates were exceptionally high. Domestic industry, heavily insulated from international competition, was under strict regulation.

India commenced its major thrust towards globalization in July 1991, although a slow process of economic liberalization had been under way since the late seventies. The five years of economic reforms beginning with 1991 appear to have set the stage for an accelerated growth in the future.

A programme of macroeconomic stabilization was initiated by the government in July 1991 through reducing the

fiscal deficit, controlling the money supply and correcting the overvalued exchange rate by a major devaluation of domestic currency. The rupee was made partially convertible in 1992-93, fully convertible on trade account in 1993-94, and fully convertible on current account in 1994-95.

Though the policy changes of July 1991 were triggered by the pressure of crisis in India's foreign exchange sector and fiscal deficit, the reforms gathered a momentum of their own and many far reaching changes were introduced. The much overdue microeconomic/sectoral reforms with a medium term perspective were launched. Major structural reforms have been introduced in the industrial and trade policy regimes and in the financial sector with a view to improve the efficiency, productivity and international competitiveness of India's manufacturing sector. It has now become a well accepted fact that in order to achieve the desired results, India has to transform itself into an internationally competitive economy open to trade and foreign investment. While the significant changes in the industrial policy regime have led to industrial delicensing and a larger role for the private sector, the changes in trade policy relate to abolishing of import licensing (except for import of consumer goods) along with major reduction in import duties. Reforms have also been initiated towards streamlining the structure of indirect taxes in India.

With these trade and industrial policy reforms, India has stepped into an era of competitive industrial environment in which entrepreneurs are expected to respond more to the signals of the market than trying to skirt around bureaucratic controls.

The unilateral trade and industry policy reforms since July 1991 should be viewed in the context of the unilateral

measures undertaken by many other developing countries in the past few years. Moreover, major trading partners of India in the Asian region as well as elsewhere have witnessed changes in recent years with regard to the rise of regionalism within a broader GATT/WTO framework. The present paper makes an attempt in this direction to analyze the impact of unilateral reform measures on India's economy.

This provides an empirical basis for discussions on the impact of policy changes, especially the policies relating to trade. The issues which we intend to analyze have immense policy relevance for India. For example, the policy makers need to know the likely direction of inter-sectoral changes that would result when India undertakes unilateral trade and industry policy reforms. The industrial structure is expected to become aligned to the one that is internationally competitive. Thus, there may be a re-allocation of resources across sectors as a result of unilateral changes in trade policy.

The analysis also indicates relative strengths of the sectors in making investment decisions with regard to future investments. The implications for expanding and contracting sectors in terms of employment policies are also clearly brought out by the analysis.

The present paper, therefore, provides an important basis for discussions on policy reforms which aim at freer trade and a more liberalized market regime for the economy. Such analysis can be facilitated easily through the use of the Computable General Equilibrium (CGE) approach. We have also done the same by constructing a multisectoral CGE model for India with built-in selected features of the Indian economy, the details of which are outlined in the next section.

3. The Distinguishing Features of the India CGE Model

The CGE model that has been developed in the present paper is distinctly different from the existing models of the Indian economy. The India Model is a single country multi-sectoral computable general equilibrium model. The major source of inspiration in developing this model has been the multi-country structure used in the Michigan Brown-Deardorff-Stern (BDS) CGE Model (Brown *et al.*, 1995) and various other research papers by the same authors (*see References*).

The India CGE Model has various departures from the assumptions of the Heckscher-Ohlin (H-O) Model of international trade. This model incorporates several of the assumptions of the New Trade Theory such as particular forms of increasing returns to scale, product differentiation and imperfect competition, none of which is permitted in the H-O Model (*see Brown et al.*, May 1993).

India is modelled to produce, consume and trade 33 tradable goods. In addition, there is one non-traded sector, *i.e.* rail transport. The sectoral breakdown, as shown in *Table A*, has been concorded from ISIC Rev. 2. *Table B*, provides a key to the sectoral classification into different sets and subsets.

The market structure in 29 out of 34 sectors is either perfectly competitive or monopolistically competitive, depending on the degree of scale economies in production. The remaining 5 sectors are assumed to be state monopolies (SMS), including rail transport, which is the only non-traded sector. The other four state monopoly sectors are petroleum products, iron & steel, mining & quarrying, and electricity, gas &

Table A
Sectoral Breakdown of India CGE Model

S.No	Sector	ISIC Code
1.	Paddy	1A
2.	Wheat	1B
3.	Other cereals	1C
4.	Other agriculture	1D
5.	Food, beverages, tobacco	310
6.	Textiles	321
7.	Clothing	322
8.	Leather products	323
9.	Footwear	324
10.	Wood products	331
11.	Furniture and fixtures	332
12.	Paper and paper products	341
13.	Printing and publishing	342
14.	Fertilizer	35A
15.	Other chemicals	35B
16.	Petroleum and related products	35C
17.	Rubber products	355
18.	Non-metallic mineral products	36A
19.	Glass and glass products	362
20.	Iron and steel	371
21.	Non-ferrous metals	372
22.	Metal products	381
23.	Non-electrical machinery	382
24.	Electrical machinery	383
25.	Transport equipment	384
26.	Miscellaneous manufactures	38A
27.	Mining & quarrying	2
28.	Electricity, gas & water supply	4
29.	Construction	5
30.	Wholesale trade	6
31.	Rail transport	7A
32.	Other transport, storage and communication	7B
33.	Financial services	8
34.	Personal services	9

Note : ISIC codes are as per Rev. 2.

Table 2
Sectoral Sets Specification

ALS	=	TRS + NTS
TRS	=	TICS + TSMS + TPCS
TPCS	=	TAGS + TNAGS
TAGS	=	TAGSAP + TAGSNA
TICS	=	TMCS + TICSAP
NTS	=	NSMS
SMS	=	TSMS + NSMS
APS	=	TAGSAP + SMS + TICSAP
TAPS	=	APS - NSMS

where,

ALS	:	all sectors (1..34)
TRS	:	tradable sectors (1..34 except rail transport, i.e. 31)
NTS	:	non-traded sectors (31)
TPCS	:	tradable perfect competition sectors (1..4, 29..34 except 31)
TAGS	:	tradable agricultural sectors (1..4)
TNAGS	:	tradable non-agricultural perfect competition sectors (29..34 except 31)
TAGSAP	:	TAGS under administered price (1, 2)
TAGSNA	:	TAGS under free price (3, 4)
TSMS	:	tradable state monopoly sectors (16, 20, 27, 28)
TICS	:	tradable imperfect competition sectors (5..27 except TSMS)
TICSAP	:	TICS under administered price (12, 14, 21)
TMCS	:	TICS under monopolistic competition (TICS except TICSAP)
NSMS	:	non-traded state monopoly sectors (31)
SMS	:	state monopoly sectors (TSMS and NSMS)
APS	:	sectors under administered prices (TAGSAP, TSMS, TAPS, NSMS)

water supply. Out of 33 tradable sectors, 9 are assumed to be under perfect competition (TPCS) and 4 under state monopolies (TMCS). The remaining 20 sectors are assumed to be under monopolistic competition (TICS). These include three sectors in which prices are administered (TICSAP). Thus, 17 out of 20 sectors are really under monopolistic competition (TMCS).

The final consumer demand equations for various sectors are obtained assuming a representative consumer who maximizes utility subject to a budget constraint. The revenue from tariffs and indirect taxes along with profits of the state monopoly sectors are assumed to be redistributed to consumers and spent. Intermediate demands are derived from the profit maximizing decisions of the representative firms in each sector.

Products in all the tradable sectors are assumed to be characterized by some degree of product differentiation. In nine of the sectors where markets are taken to be perfectly competitive, as well as in the cases of four state monopoly sectors and three administered price manufacturing sectors, products are differentiated by country of origin, *i.e.* whether from India or rest-of-world (ROW). In the monopolistically competitive industries products are differentiated by firm.

Consumers and producers are assumed to use a two-stage procedure to allocate expenditure across differentiated products. At the first stage, expenditure is allocated across goods without regard for the country of origin (whether India or ROW) or the producing firm. At this stage, the utility function is taken to be Cobb-Douglas. The production function at this stage requires inputs in fixed proportion. In the second stage, expenditure on monopolistically competitive goods is allocated across competing firms in India and ROW. However, in the case of perfectly competitive goods, individual

firm supply is indeterminate. Therefore, expenditure on each good must be allocated over the industry as a whole. The aggregation function in the second stage is the Constant Elasticity of Substitution (CES) function.

In the case of factor markets, the variable input requirements are taken to be the same for the three market structures. Primary and intermediate input aggregates are required in fixed proportion to output. Expenditures on primary inputs are allocated between capital and labour, assuming that a CES function is used to form the primary inputs aggregate. In the case of four agricultural sectors, land (along with capital and labour) is also assumed to be one of the primary factors of production. The primary inputs aggregate in these cases is a CES function of labour and a composite of land and capital. The composite of land and capital is a CES function of land and capital. In the monopolistically competitive sectors as well as in the state monopoly sectors, additional fixed inputs of capital and labour are required. It is assumed that fixed capital and fixed labour are used in the same proportion as variable capital and variable labour so that production functions are homothetic. Capital and labour are assumed to be perfectly mobile across sectors except that all capital is assumed to be immobile into and out of the state monopoly sectors. However, we keep the option of specifying sector specific capital for some purposes - especially for short-term analysis. Land usage in agriculture is assumed to be substitutable across four agricultural sectors. Returns to land, capital (in sectors across which it is mobile) and labour are determined to equate factor demand to an exogenous supply of each factor. The aggregate supplies of labour, capital and agricultural land are assumed to remain fixed. This assumption is made so as to abstract from macroeconomic forces and focus on intersectoral allocation of resources.

Perfectly competitive firms set price equal to marginal cost, while monopolistically competitive firms maximize profits by setting price as an optimal markup over marginal cost. The numbers of firms in sectors under monopolistic competition are determined by the condition that there are zero profits. The numbers of firms in the state monopoly sectors as well as in the three administered price sectors under imperfect competition are assumed to remain fixed.¹

International trade in goods by India is assumed to be subject to tariff and non-tariff barriers (NTBs). NTBs are incorporated by endogenously solving for the ad valorem tariff-equivalent rate that would hold imports within each product category covered by NTBs at a pre-determined level. An ad valorem tariff variable in each product category is then an average of this NTB tariff-equivalent rate and the nominal tariff rate, using the NTB coverage ratio to weigh the NTB tariff equivalent. Tariff rates are aggregated according to the sectors specified in this model.

In the non-tradable rail transport sector, total demand must equal national output. The prices in this sector are assumed to be set by the government and hence exogenous. For two of the four agricultural sectors, *viz.* other cereals and rest of agriculture (which are under perfect competition), total demand (inclusive of exports) for the sector's product must equal its output. In the case of the remaining two agricultural sectors, paddy and wheat, as well as in four tradable state monopoly sectors, the prices are assumed to be administered by the government. In three of the sectors under imperfect competition, *viz.* paper products, fertilizers and non-ferrous metals, the prices have been assumed to be administered.

¹ The profits are assumed to be redistributed to be spent on consumption.

The proportionately differentiated version of the model is presented in the *Appendix 1* at the end of the paper. It also includes variable and parameter definitions.² The circumflex indicates per cent change.

The reference year of our model is 1989-90. The trade policy inputs into the model are the tariff and non-tariff barriers (NTBs) that were applicable to India's trade in 1989-90. In order to investigate sectoral employment effects of the unilateral trade liberalization, it has been assumed that the existing bilateral tariffs will be removed and NTBs will be relaxed in two stages, the first stage to be completed by the mid-1990s and the second towards the end of 1990s.

The domestic policy inputs include reduction in 'other net indirect taxes' (indirect taxes net of custom duty and subsidies) and changes in administered prices in the regulated sectors.

When policy changes are introduced into the model, the method of solution yields percentage changes in sectoral employment and certain other variables of interest for India. Multiplying the percentage changes by actual (1989-90) levels given in the data base yields the absolute changes, positive or negative, that might result of one-time unilateral trade and domestic policy reforms in India.

In addition to the sectoral effects which are the primary focus of our analysis, the model also yields results for changes in total exports, total imports, the terms of trade, the overall level of welfare in the economy, and the economy-wide changes in real wages and returns to capital. Because both labour

² Since we have a long list of parameters, we do not provide here the estimates of the parameters values used in the model. The interested reader may get in touch with the authors for the estimates.

and capital are assumed to be homogeneous and intersectorally mobile in these scenarios³, we cannot distinguish effects on factor prices by sector. Nor can we distinguish effects on different skill groups or other categories of labour. In particular we are unable to address the important question of how trade liberalization might affect the differential between the wages of skilled and unskilled workers.

4. The Scenarios

The India CGE model that has been discussed in the earlier section is mainly suited to analyze the impact of changes in tariff and non-tariff barriers (NTBs) on the economy. We have analyzed such impact on the economy through simulations under three different scenarios, *viz.* (a) with retaining the product market imperfections (state monopolies and administered prices) as these existed in 1989-90; (b) assuming that the economy was free from such distortions; and (c) assuming that the economy was free from such distortions and an attempt is made to rationalize the indirect-tax regime. Keeping this in view, experiments have been performed with trade liberalization under the three different scenarios. We have analyzed in this paper the following aspects of reforms:

- i) **Import Reforms** : These refer to reduction in tariff and non-tariff barriers on imports;
- ii) **Import and Export Reforms** : These refer to the above mentioned import reforms *plus* reduction in NTBs on exports.

The first set of simulations refers to trade liberalization while retaining the product market imperfections. The state

³ The capital stock is assumed to remain fixed in the state monopoly sectors.

monopolies and the price administered sectors continue to operate in the same way. The domestic policy reforms are thus assumed to maintain status quo. We refer to this version of the model as 'administered version'. The results of such analysis are thus based on the assumption that the domestic policy with respect to the product market imperfections is not reformed.

The second set of simulations refers to trade liberalization under the assumption that the domestic reforms have already taken place. We refer to this version of the model as 'market version'. It is assumed that before we introduce trade reforms, as indicated above, the economy has already removed the product market imperfections. Thus all the sectors that were under state monopoly in 1989-90 are assumed to have been opened up to private competition such that petroleum products and iron & steel now operate under monopolistic competition while mining & quarrying, electricity, gas & water, and rail transport now operate under perfect competition. Thus, the prices are no more "administered" in these sectors. We also assume that the sectors which were under some kind of administered price regime in 1989-90 now determine their own prices. This amounts to doing away with administered prices in two agricultural sectors, *viz.* paddy and wheat, and in three manufacturing sectors, *viz.* paper products, fertilizer and non-ferrous metals. Paddy and wheat sectors are now assumed to determine their respective prices under perfect competition while the three manufacturing sectors are now assumed to determine their respective prices under monopolistic competition. Domestic capital is now mobile across all sectors.

The third set of simulations refers to trade liberalization under 'market version' along with reducing subsidies (through increasing net indirect taxes) in agricultural sectors, fertilizer, and electricity, gas & water supply, along with reducing excise duties (through reducing net indirect taxes) on remaining sectors of the Indian economy. In fact, the changes in indirect taxes are superimposed on the experiments with import and export liberalization under the domestically liberalised economy (market version) as discussed above in the second set of simulations.

Of course, the policy inputs to the various simulations are guided by our assumptions regarding the extent of the trade policy reforms. So, below we discuss briefly on our assumptions about reforms.

4.1 Import Reforms

These include reduction in tariff and NTBs on imports.

4.1(a) Reduction in Import Duties

As per the Tariff Reforms Committee (Chelliah Committee) *Interim Report* (Table 8.2 and para 8.47) and *Final Report-II* (para 2.11), the import weighted average declared duty is to be reduced from 87% in 1989-90 to 45% in 1995-96 and to 25% in 1998-99. The reduction to 25% may even be achieved by 1997-98.

The collection rate was 50.4% in 1989-90. It has already come down to 29% in 1994-95. It may go down further to 25% by 1998-99. We would refer to the period 1989-90 to 1995-96 as *Stage I* and the longer period 1989-90 to 1998-99 as *Stage II*.

and capital are assumed to be homogeneous and intersectorally mobile in these scenarios³, we cannot distinguish effects on factor prices by sector. Nor can we distinguish effects on different skill groups or other categories of labour. In particular we are unable to address the important question of how trade liberalization might affect the differential between the wages of skilled and unskilled workers.

4. The Scenarios

The India CGE model that has been discussed in the earlier section is mainly suited to analyze the impact of changes in tariff and non-tariff barriers (NTBs) on the economy. We have analyzed such impact on the economy through simulations under three different scenarios, *viz.* (a) with retaining the product market imperfections (state monopolies and administered prices) as these existed in 1989-90; (b) assuming that the economy was free from such distortions; and (c) assuming that the economy was free from such distortions and an attempt is made to rationalize the indirect-tax regime. Keeping this in view, experiments have been performed with trade liberalization under the three different scenarios. We have analyzed in this paper the following aspects of reforms:

- i) **Import Reforms** : These refer to reduction in tariff and non-tariff barriers on imports;
- ii) **Import and Export Reforms** : These refer to the above mentioned import reforms *plus* reduction in NTBs on exports.

The first set of simulations refers to trade liberalization while retaining the product market imperfections. The state

³ The capital stock is assumed to remain fixed in the state monopoly sectors.

Proposed Tariff Rates

Sectors	Import Weight	Import Weighted Average		
		1989-90	1995-96	1998-99
Agricultural products	0.03	46	20	15
Coal, crude oil, natural gas	0.16	54	34	25
Other mineral products	0.03	20	15	10
Manufactured products	0.78	98	49	25
Consumer goods	0.07	89	60	50
Intermediate goods	0.47	103	45	30
Capital goods	0.24	91	55	30
Import Weighted Average	1.00	87	45	25

Source : Adapted from Tariff Reforms Committee (Chelliah Committee) *Interim Report* (Table 8.2 and para 8.47) and *Final Report-II* (para 2.11).

4.1(b) *Reduction in NTBs on Imports*

The existing NTBs (1989-90) on imports are assumed to be partially relaxed so as to permit a "fixed" per cent increase in the imports that had been constrained. This is implemented in the model by increasing the level of imports that were under some kind of quantitative restriction for the sectors subject to import NTBs. Handling NTBs in such a manner is by no means satisfactory, but our rationale here is that the existing NTBs are not expected to be completely eliminated at the end of Stage II. We have attempted to analyze the effect of the following two Scenarios of the relaxation of NTBs on imports:

**Per Cent Increase (Over 1989-90) in
the Level of Imports Under NTBs**

Sectors	1995-96	1996-99
Agricultural goods	10	25
Consumer goods	25	50
Intermediate goods	75	85
Capital goods	75	85
Services	75	85

Source : Authors' estimates.

These estimates are not based on any actual declared numbers. However, we have tried to incorporate the implicit intentions in various policy announcements whereby the import of agricultural and consumer goods are likely to remain more restricted than that of intermediate and capital goods as well as of services. Thus, these numbers are indicative of the government's intentions towards the degree of expansion of imports that were under some type of quantitative restriction in 1989-90.

4.2 Export Reforms

These refer to reduction only in non-tariff barriers to exports since tariff barriers on exports were negligible as of 1989-90. The existing NTBs (1989-90) on exports are assumed to be partially relaxed so as to permit a "fixed" per cent increase in the exports that had been constrained. This is implemented in the model by increasing the level of exports that were under some kind of quantitative restriction for the sectors subject to export NTBs. Again, we have assumed here that the NTBs on exports are not expected to be completely

removed as of Stage II. We have attempted to analyze the effect of the following proposed relaxation of NTBs:

Per Cent Increase in Constrained Exports

Sectors	1995-96	1998-99
Agricultural sectors	25	50
Other sectors	50	75

Source : Authors' estimates.

Similar to the logic explained earlier, these numbers are based on government's intention to open up exports of agricultural goods at a slower rate compared to other sectors.

4.3 Rationalization of Indirect Taxes

In this paper, we do not intend to go into a detailed analysis of the sectoral impact of changes in excise duty structure as envisaged in *The Tax Reforms Committee* (TRC), chaired by Raja J. Chelliah. Instead we have performed a naive experiment on indirect tax rationalization which may be improved upon later. It is assumed that the subsidies (net indirect taxes) are reduced in each of the four agricultural sectors, in the fertilizer sector and in electricity, gas & water supply. In all the remaining 28 sectors, the indirect taxes are assumed to be reduced through reduction of excise duties.

Per Cent Change (Over 1989-90) in Tax/Subsidy Rates

Sectors	1995-96	1998-99
Reduction of subsidies to four agricultural sectors, fertilizer, and electricity, gas & water supply	5	10
Reduction of indirect taxes in 28 other sectors	5	10

Source : Authors' estimates.

5. Results

It is expected that trade liberalization will stimulate production of labour-intensive sectors in India. Productive resources will then be allocated more efficiently as compared to the pre-liberalization position, as India specializes in the production of tradable goods in which it has comparative advantage. There may of course be transitional costs due to intersectoral movement of factors of production. Beyond such conventional welfare gains, trade liberalization is also expected to have a 'pro-competitive' effect on domestic firms, resulting in additional gains from the realization of economies of large scale production. When firms are protected by tariff and NTBs from foreign competition, they may take advantage of their market power by raising their prices and reducing their domestic sales. The result is that the protected firms may produce at levels much below their minimum-cost plant size. Trade liberalization should then bring about competitive pressures on formerly protected firms and induce them to raise production and productivity, and to achieve more efficient plant size and lower per unit costs. Thus the gains in economy's welfare are expected to come from improved allocation of resources, lower prices to consumers and business firms, and availability of more varieties to the consumers. The realization of economies of scale in the manufacturing also reinforces the welfare enhancing effect.

The gains from the liberalization scenarios under study should, however, be read with caution. We have abstracted from the effects of the macroeconomic forces and policies and are not able to capture the effects of dynamic changes in efficiency and economic growth. We have also not analyzed the effects of likely inflow of foreign direct investment during the period under analysis. Thus the reported gains are the

result of reduction only in tariff and non-tariff barriers on trade along with rationalization of structure of net indirect taxes and subsidies. Further, we have also not been able to model the benefits to the Indian economy as a result of the reduction in tariff and non-tariff barriers by the countries of ROW and measures expected to be taken by those countries in meeting the Uruguay Round obligations.

The reduction in import tariff and non-tariff barriers leads to a fall in the sectoral tariff equivalents (tariff *plus* tariff equivalent of import NTBs), which are endogenously determined in this model. The exchange rate depreciates in order to keep the base year balance of trade at the same level. Consequently, the sectoral export tax equivalents (export tax *plus* export tax equivalent of export NTBs) tend to increase. The world prices are assumed to be exogenous. Therefore, the changes in import prices depend on two opposing forces, *viz.* (a) the declining import tariff equivalents which tend to make imports cheaper, and (b) the depreciating exchange rate which tends to make imports costlier. However, the exchange rate depreciation gets an opposing push from the increased demand for Indian goods by ROW, many of which are now cheaper than before.

The changes in world prices of India's goods also depend on two opposing forces, *viz.* (a) the increasing export tax equivalents which tend to make exports costlier, and (b) depreciating exchange rate which tends to make exports cheaper. Consequently, both the import prices as well as the domestic prices in most of the sectors decline resulting in increases in exports as well as imports. If the export NTBs are also reduced, the export tax equivalent moves downwards thus giving a further push to sectoral exports.

The domestic price of a representative firm declines in almost all the cases except for four agricultural sectors (sectors 1 to 4) and the two services sectors (sectors 34 and 35). These are the sectors which have a very high value added content. Since all the primary factors of production now have become dearer, the overall domestic price rises in these sectors. This increase in domestic prices of agricultural goods leads to improvement in terms of trade between agriculture and manufacturing in favour of agriculture. The domestic prices of wood products and of furniture & fixtures also increase since these depend on now costlier raw material (wood) from agriculture.

5.1 Increase in GDP

It may be observed from *Tables 1* and *2* that the economy gains in GDP (a proxy for welfare) when trade policy reforms, as discussed in Section 1, are undertaken. It is important to note that all the three factors of production, *viz.* land, labour and capital, gain as a result of unilateral liberalization. The terms of trade between agriculture and manufacturing sectors shift in favour of agriculture.

The gain in GDP distinctly increases as India proceeds forward from reduction in import restrictions to concurrent reduction in export restrictions (*Table 1*) during Stage I under 'administered version'. The gain shows a significant increase when the economy undertakes such reforms under 'market version'. The expected GDP growth increases from 1.1 per cent when the economy reduces import tariff and NTBs under 'administered version' to 3.1 per cent when the economy undertakes trade reforms** (both import and export) under 'market version'. The GDP growth gains further if we rationalize the indirect tax regime under 'market version'.

Table 1
Overall Changes from Unilateral Liberalization - Stage I

(Per cent)

	Trade Reforms (Administered)		Trade and Domestic Policy Reforms (Market)		Trade & Domestic Pol- icy Reforms and IT Rationali- zation
	Imports Reforms	Imports & Exports Reforms	Imports Reforms	Imports & Exports Reforms	Overall
GDP	1.07	1.35	2.32	3.13	3.23
RETURNS					
Land	1.00	1.55	2.32	3.19	3.23
Labour	1.62	1.88	2.80	3.40	3.63
Capital	1.47	1.66	2.87	3.34	3.77
Exchange Rate (Depreciation)	27.82	22.09	29.59	22.39	22.21
Terms of Trade (Agr vs Mfg)	2.20	2.40	4.60	4.90	5.74

A similar picture emerges from the analysis of *Table 2* (Stage II). Thus, India's real GDP has the potential to be pushed up by about 5 per cent as a result of sectoral re-adjustment that is expected to occur if we undertake the above mentioned trade and domestic policy reforms. The gains in GDP are presented in *Figure 1*.

5.2 Gains in Returns to Factors of Production

An important gain to the economy comes from higher real returns to all the three factors of production. It may be

Table 2
Overall Changes from Unilateral Liberalization - Stage II

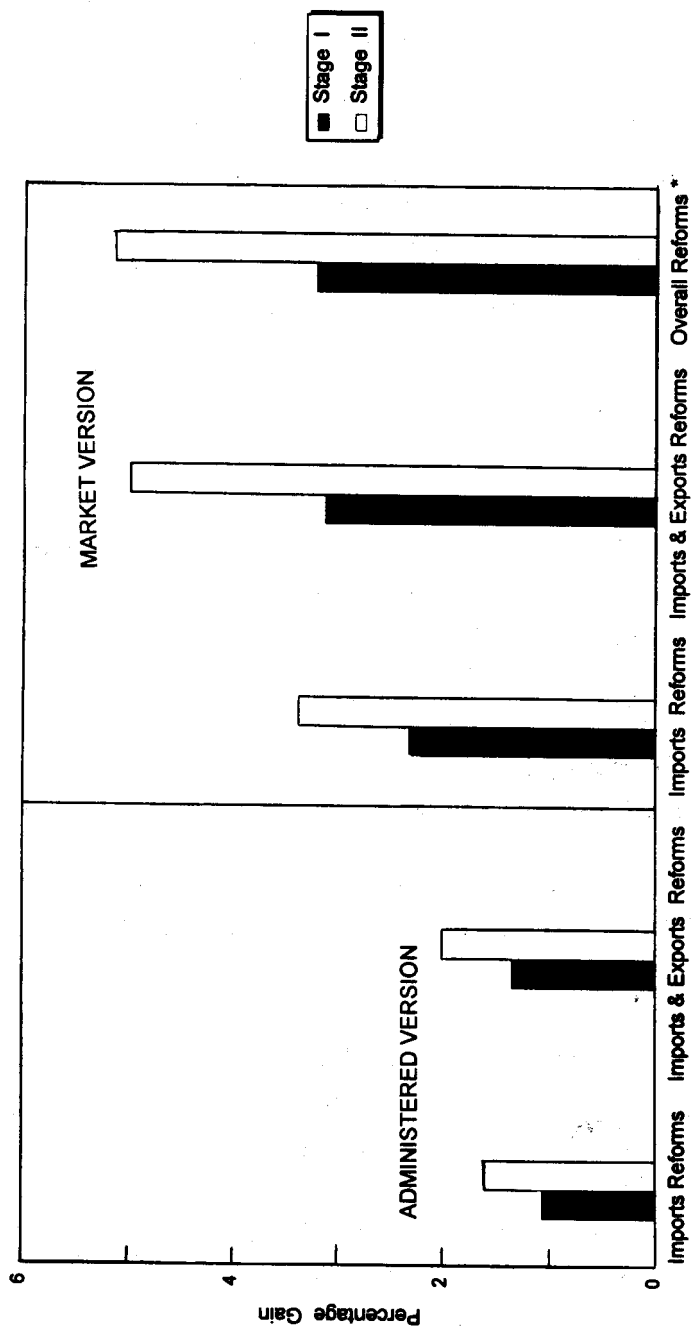
(Per cent)

	Trade Reforms (Administered)		Trade and Domestic Policy Reforms (Market)		Trade & Domestic Pol- icy Reforms and IT Rationali- zation
	Imports Reforms	Imports & Exports Reforms	Imports Reforms	Imports & Exports Reforms	Overall
GDP	1.60	2.01	3.38	5.00	5.15
RETURNS					
Land	1.26	2.24	2.89	4.57	4.64
Labour	2.19	2.58	3.62	4.70	5.16
Capital	2.11	2.36	3.85	4.64	5.53
Exchange Rate (Depreciation)	38.29	29.57	38.21	26.63	26.33
Terms of Trade (Agr vs Mfg)	2.80	3.20	5.60	6.10	7.10

observed from *Tables 1* and *2* that the factors, *viz.* land, labour and capital, gain in real terms nearly by the same proportion as the gain to GDP. Thus, contrary to the Stolper-Samuelson hypothesis, even the scarce factors of production, *viz.* land and capital, gain when tariffs against imports are lowered.

The returns to the factors of production distinctly increase as India proceeds forward from reduction in import restrictions to concurrent reduction in export restrictions (*Table 1*) during Stage I under 'administered version'. There

Figure 1
Overall Percentage Change in GDP from Unilateral Liberalization
 (For both Stage I and II of Administered and Market Versions)



* Overall Reforms represents Trade Reforms & Domestic Policy Reforms and Rationalization of Indirect Tax

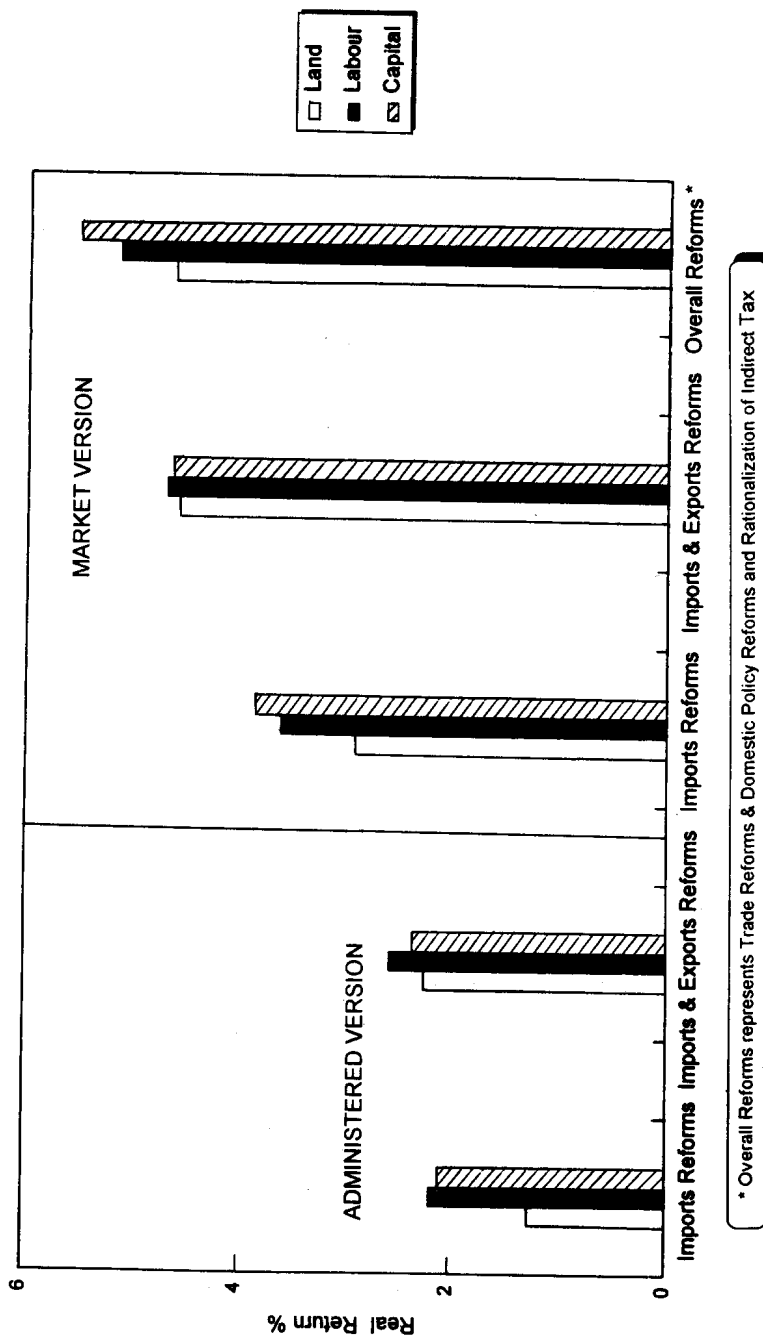
is a significant increase in factor returns when the economy undertakes such reforms under 'market version'. The expected gains in factor returns increase from a range of 1.0 to 1.5 per cent when the economy reduces import tariff and NTBs under 'administered version' to a range of 3.2 to 3.4 per cent when the economy undertakes trade reforms (both import and export) under 'market version'. The factor returns gain further if we rationalize the indirect tax regime under 'market version'.

A similar picture emerges from the analysis of *Table 2* (Stage II). Thus, the real returns to the factors of production have the potential to be pushed up by more than 4.5 per cent as a result of sectoral re-adjustment that is expected to occur if we undertake the above mentioned trade and domestic policy reforms. The gains in real returns to the factors of production are presented in *Figure 2*.

5.3 Terms of Trade Between Agriculture and Manufacturing

One of the implications of the reforms process refers to the domestic terms of trade between agriculture and industry. The tariff reductions and deregulation in the industrial sector is expected to change terms of trade between agriculture and industry in favour of agriculture (Gulati and Chadha, 1995). It may be observed from *Tables 1 and 2* that the terms of trade move in favour of the agricultural sector vis-a-vis the manufacturing sector with the effect becoming larger with the widening of reforms. The increase in the shift of terms of trade in favour of agriculture varies from 2.2 per cent when the economy undertakes import reforms under the 'administered version' (*Table 1*) to 6.1 per cent when the economy

Figure 2
Overall Changes in Returns to Factors of Production
 (From Unilateral Liberalization - Stage II)



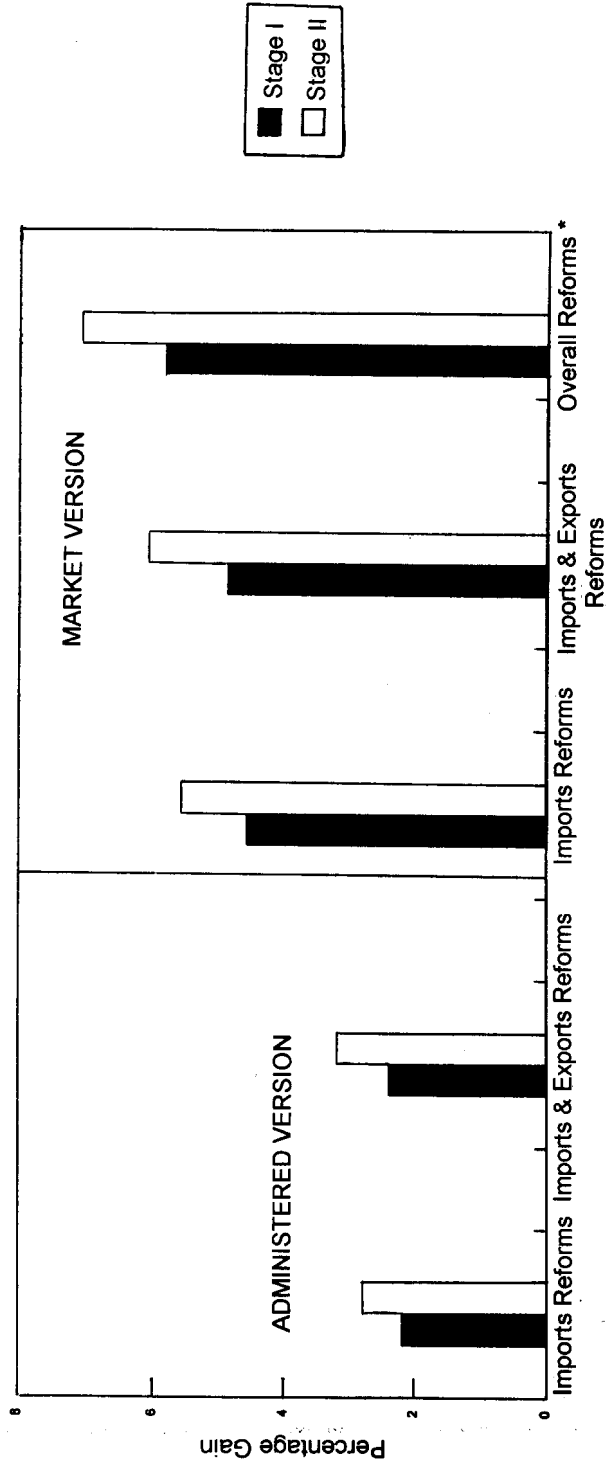
undertakes imports and export reforms under the 'market version'. The gains in terms of trade in favour of agriculture *vis-a-vis* manufacturing are depicted in *Figure 3*.

5.4 Output, Number of Firms and the Scale Effect

The changes in sectoral output, number of firms and 'scale effect' (output per firm) are given in *Table 3*. We have reported such changes only for Stage II. The highest increase in output occurs in clothing followed closely by leather products. The next highest output gaining sectors are leather products, non-metallic mineral products and glass products. This is true of all the scenarios under the market version. The major output losing sectors include non-ferrous metals, non-electrical machinery and mining & quarrying followed by moderate output losing sectors which include paper products, fertilizer, iron and steel. The low output losing sectors include metal products, electrical machinery, transport equipment and other transport, storage and communications. The output of cereals declines while that of the rest of agriculture increases. The overall agricultural output, however, registers a positive growth.

The change in the number of firms has only been analyzed for the 22 manufacturing sectors. The change in the direction of number of firms is consistent with the change in the direction of output of different sectors. The scale effect, which indicates the per cent change in the output per firm, turns out to be positive in all the manufacturing sectors. The highest scale effect is observed in the footwear sector in which the output per firm gains by about 9 per cent under imports and exports reforms of Stage II. This is followed by petroleum products and glass products where the scale effect is close

Figure 3
Overall Changes in Domestic Terms of Trade from Unilateral Liberalization
 (Agriculture vs Manufacturing)



* Overall Reforms represents Trade Reforms & Domestic Policy Reforms and Rationalization of Indirect Tax

Table 3
Changes in Output, Number of Firms, and the Scale Effect - Stage II

(Per cent)

Sl. No.	Sectors	ISIC Code	Trade and Domestic Policy Reforms Market Version			Imports & Exports Reforms			Trade & Domestic Policy Reforms and IT Rationalization		
			Output	No. of Firms	Scale Effect	Output	No. of Firms	Scale Effect	Output	No. of Firms	Scale Effect
1.	Paddy	1A	-1.3	—	—	-1.1	—	—	-1.5	—	—
2.	Wheat	1B	-1.1	—	—	-1.4	—	—	-2.0	—	—
3.	Other Cereals	1C	-1.4	—	—	-1.7	—	—	-1.9	—	—
4.	Rest of Agriculture	1D	1.3	—	—	1.7	—	—	1.6	—	—
5.	Food, Bev. & Tobbaco	310	1.5	0.9	0.6	1.5	0.9	0.6	1.5	0.3	1.2
6.	Textiles	321	16.5	13.7	2.8	17.3	14.3	3.0	17.3	13.5	3.8
7.	Clothing	322	122.6	118.2	4.4	130.4	125.8	4.6	127.2	122.1	5.1
8.	Leather Products	323	93.6	89.4	4.2	103.5	98.9	4.6	102.3	97.0	5.3
9.	Footwear	324	64.6	56.5	8.1	69.4	60.4	9.0	68.8	59.1	9.7
10.	Wood Products	331	2.2	2.1	0.2	2.2	2.1	0.1	2.8	2.3	0.5
11.	Furniture Fixtures	332	-0.8	-1.7	0.9	-1.1	-2.0	0.9	-0.9	-2.4	1.5
12.	Paper Products	341	-10.7	-12.6	1.9	-11.2	-13.3	2.1	-10.6	-13.8	3.2
13.	Printing & Publishing	342	-1.3	-2.5	1.2	-1.6	-2.9	1.3	-1.2	-3.7	2.4
14.	Fertilizer	35A	-10.7	-14.5	3.9	-10.8	-15.0	4.3	-11.0	-16.2	5.1
15.	Other Chemicals	35B	-0.8	-3.5	2.7	-1.0	-3.9	3.0	0.0	-4.7	4.8

(Continued)

Table 3 (Continued)

(Per cent)

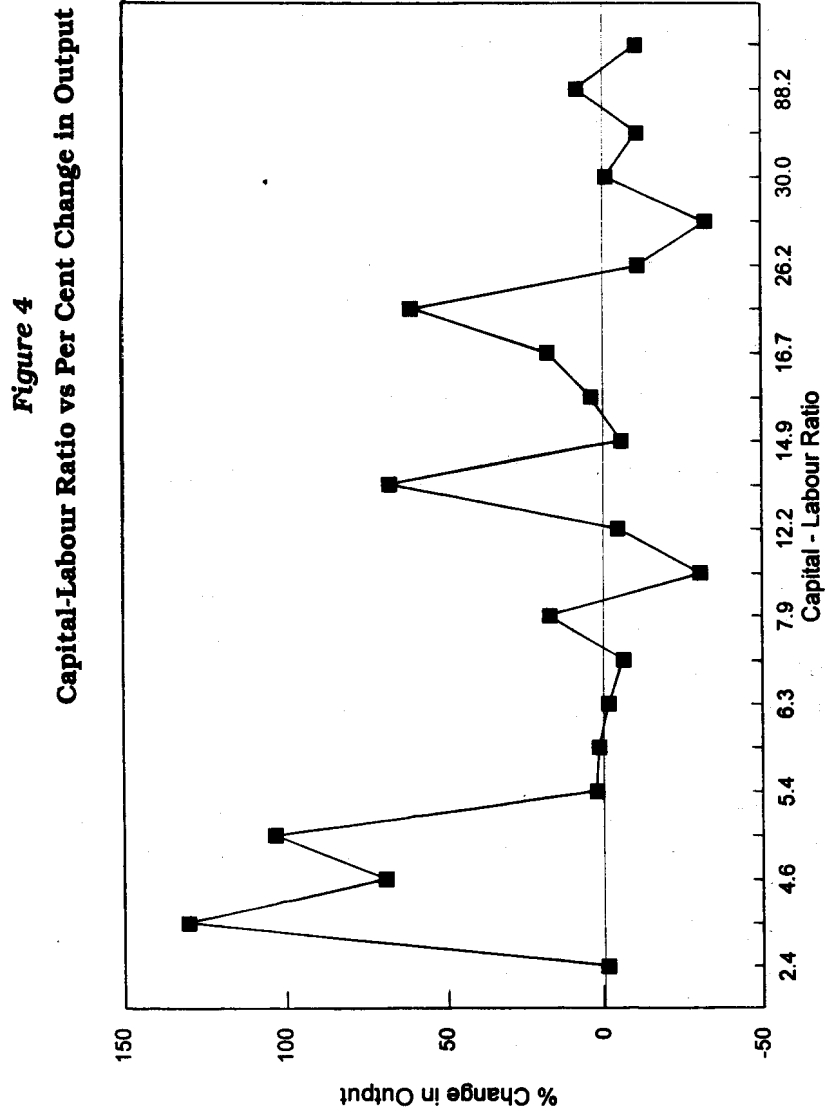
Sl. No.	Sectors	ISIC Code	Trade and Domestic Policy Reforms						Trade & Domestic Policy Reforms and IT Rationalization		
			Market Version			Imports & Exports Reforms			Imports & Exports Reforms		
			Output	No. of Firms	Scale Effect	Output	No. of Firms	Scale Effect	Output	No. of Firms	Scale Effect
16.	Petroleum Products	35C	6.8	1.3	5.5	8.3	2.5	5.8	9.9	0.7	9.3
17.	Rubber Products	355	16.3	13.5	2.7	17.9	15.0	3.0	19.0	14.3	4.7
18.	Non-Metallic Min. Prod.	36A	54.3	50.2	4.0	61.2	56.9	4.3	61.2	55.9	5.3
19.	Glass Products	362	60.0	54.5	5.4	67.9	61.9	6.0	68.6	61.1	7.5
20.	Iron & Steel	371	-8.3	-9.5	1.3	-11.0	-12.1	1.2	-9.2	-12.3	3.1
21.	Non-Ferrous Metal	372	-27.2	-29.7	2.5	-32.5	-35.1	2.6	-29.2	-33.8	4.6
22.	Metal products	381	-4.5	-4.9	0.4	-6.4	-6.7	0.3	-5.0	-7.0	2.0
23.	Non-Electrical Machinery	382	-25.4	-26.2	0.9	-30.6	-31.4	0.8	-27.6	-30.2	2.6
24.	Electrical Machinery	383	-4.8	-5.9	1.1	-5.8	-6.9	1.1	-3.9	-7.1	3.2
25.	Transport Equipments	384	-4.3	-5.5	1.2	-4.7	-5.9	1.2	-3.3	-6.3	3.0
26.	Misc. Manufacturing	38A	3.8	2.3	1.6	3.9	2.2	1.6	5.2	1.5	3.8
27.	Mining & Quarrying	2	-27.5	—	—	-25.9	—	—	-24.5	—	—
28.	Electricity, Gas & Water	4	2.3	—	—	2.3	—	—	2.7	—	—
29.	Construction	5	0.8	—	—	0.7	—	—	1.4	—	—
30.	Wholesale & Retail Trade	6	2.6	—	—	2.4	—	—	2.5	—	—
31.	Rail Transport	7A	0.5	—	—	0.4	—	—	1.1	—	—
32.	Other Trans., Storage & Com.	7B	-2.7	—	—	-3.2	—	—	-2.5	—	—
33.	Finance, Ins. & Real Est.	8	-0.7	—	—	-0.9	—	—	-0.9	—	—
34.	Comm., Social & Pers. Serv.	9	-0.2	—	—	-0.4	—	—	-0.2	—	—

to 6 per cent. The scale effect between 4 to 5 per cent is observed in sectors including clothing, leather products, fertilizer and non-metallic mineral products. The scale effect between 2 to 3 per cent is observed in sectors including textiles, paper products, other chemicals, rubber products and non-ferrous metals. While the scale effect turns out to be

Table 4
Capital Labour Ratio vs Output Gain and Scale Effect

Manufacturing Sectors	ISIC Code	K/L Ratio	Output Gain	Scale Effect
Furniture & Fixtures	332	2.4	-1.1	0.9
Clothing	322	3.2	130.4	4.6
Footwear	324	4.6	69.4	9.0
Leather Products	323	5.0	103.5	4.6
Wood Products	331	5.4	2.2	0.1
Food, Bev. & Tobacco	310	5.9	1.5	0.6
Printing & Publishing	342	6.3	-1.6	1.3
Metal Products	381	7.4	-6.4	0.3
Textiles	321	7.9	17.3	3.0
Non-Electrical Machinery	382	11.8	-30.6	0.8
Transport Equipments	384	12.2	-4.7	1.2
Glass Products	362	12.5	67.9	6.0
Electrical Machinery	383	14.9	-5.8	1.1
Misc. Manufacturing	38A	15.1	3.9	1.6
Rubber Products	355	16.7	17.9	3.0
Non-Metallic Min. Products	36A	22.4	61.2	4.3
Paper Products	341	26.2	-11.2	2.1
Non-Ferrous Metal	372	28.2	-32.5	2.6
Other Chemicals	35B	30.0	-1.0	3.0
Iron & Steel	371	43.9	-11.0	1.2
Petroleum Products	35C	88.2	8.3	5.8
Fertilizer	35A	100.0	-10.8	4.3

Note : Capital-Labour ratio has been normalized with respect to the ratio in the fertilizer sector taken as 100.



high for a few sectors that are relatively labour intensive, the capital intensive sectors do not benefit equally. Iron and steel, non-electrical machinery, electrical machinery and transport equipment experience only 1 per cent increase in scale effect.

The relationship between the capital-labour ratio of 22 manufacturing sectors with changes in output and the 'scale effect' (market version under Stage II) is shown in *Table 4*. It may be observed from *Figure 4* that the sectors with low capital-labour ratio, *i.e.* the labour intensive sectors, experience higher per cent gains in output as compared to the capital intensive sectors. This has important implications for employment in the country. *Figure 5* depicts the relationship between capital-labour ratio and change in output per firm (scale effect). It may be observed that the scale effect is higher for more capital intensive sectors than in less capital intensive sectors. Thus the scarce factor of production (capital) is expected to get more effectively utilised.

5.5 Intersectoral Movement of Labour and Capital

The intersectoral movement of labour and capital matches well with the changes in output (*Table 5*). Labour and capital move into the sectors that now produce more and vice versa. In agriculture, land, labour and capital move out of cereals to other agriculture. It appears that the realization of economies of scale in India's manufacturing sector tends to raise the average product of both labour and capital in these sectors. Thus, the assumptions of the New Trade Theory have served to alter the effects of tariffs on the real return to the scarce factor, *i.e.* capital, in ways that are counter to the Stolper-Samuelson Theorem.

Figure 5
Capital-Labour Ratio vs Scale Effect

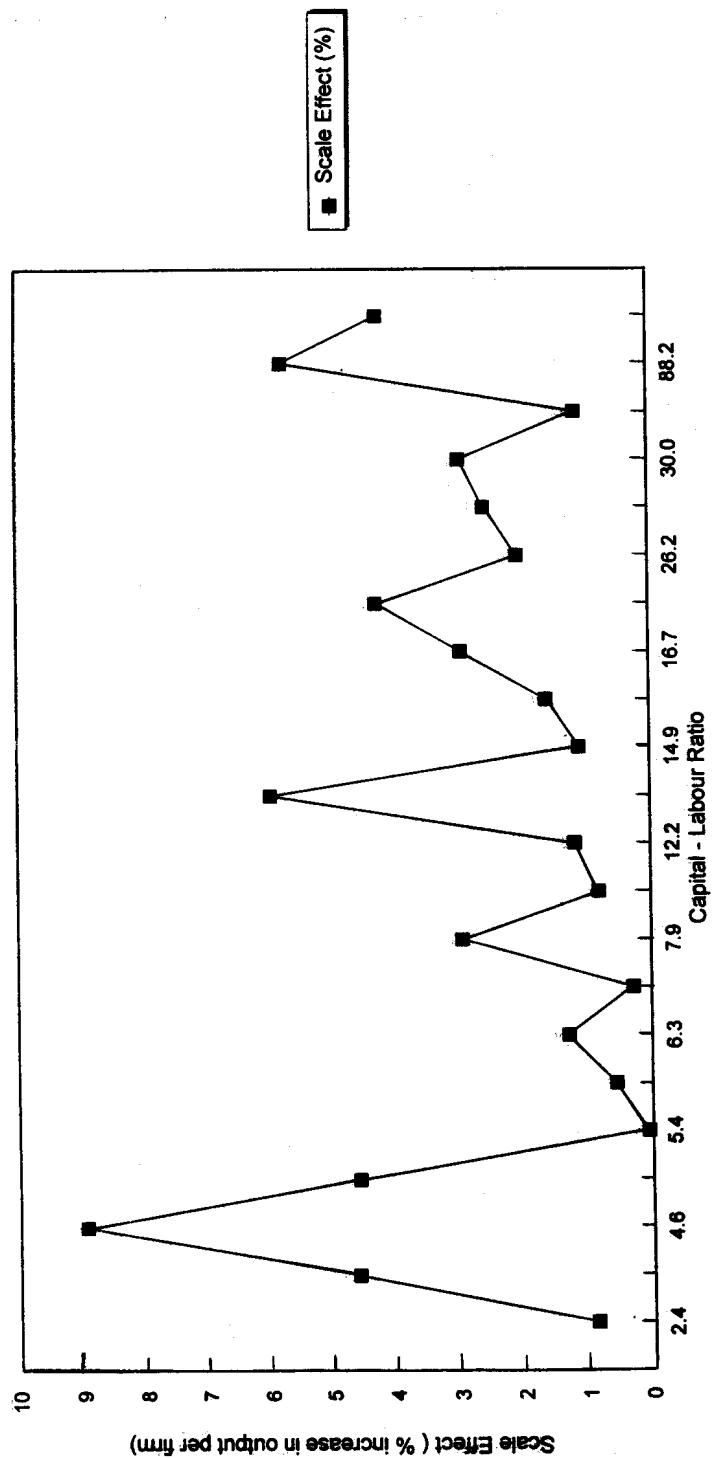


Table 5
Intersectoral Movement of Factors of Production - Stage II

(Per cent)

Sl. No.	Sectors	ISIC Code	Trade Reforms						Trade and Domestic Policy Reforms						Trade & Domestic Policy Reforms and IT Rationalization			
			Administered Version			Market Version			Imports Reforms			Exports Reforms			Overall			
			Imports Reforms	Labour Capital	Reforms	Imports Reforms	Labour Capital	Reforms	Imports Reforms	Labour Capital	Reforms	Imports Reforms	Labour Capital	Reforms	Imports Reforms	Labour Capital	Reforms	Imports Reforms
1.	Paddy	1A	-0.6	-0.5	-0.3	0.1	-1.3	-0.6	-1.0	-0.2	-1.5	-0.9	-0.6	-0.2	-1.5	-0.9	-1.5	-0.9
2.	Wheat	1B	-0.7	-0.6	-0.8	-0.5	-1.2	-0.5	-1.4	-0.6	-2.0	-1.5	-0.5	-0.6	-2.0	-1.5	-2.0	-1.5
3.	Other Cereals	1C	-1.1	-1.1	-1.2	-1.2	-1.5	-0.8	-1.7	-0.9	-1.9	-1.4	-1.2	-0.9	-1.9	-1.4	-1.9	-1.4
4.	Rest of Agriculture	1D	1.0	0.9	1.5	1.6	1.3	2.0	1.8	2.6	1.6	2.2	1.0	1.6	1.6	2.2	1.6	2.2
5.	Food, Bev. & Tobacco	310	1.3	1.2	1.3	1.3	1.0	1.6	1.0	1.6	1.0	1.4	1.0	1.6	1.0	1.4	1.0	1.4
6.	Textiles	321	9.8	9.7	10.1	10.1	15.7	16.4	16.5	17.3	16.4	17.0	15.7	16.4	16.5	17.3	16.4	17.0
7.	Clothing	322	48.6	48.5	51.1	51.2	119.6	120.7	127.1	128.4	124.1	124.9	119.6	120.7	127.1	128.4	124.1	124.9
8.	Leather Products	323	56.7	56.6	62.3	62.4	92.4	93.3	102.1	103.3	101.0	101.8	92.4	93.3	102.1	103.3	101.0	101.8
9.	Footwear	324	35.9	35.9	38.2	38.2	63.2	63.7	67.8	68.3	67.2	67.6	63.2	63.7	67.8	68.3	67.2	67.6
10.	Wood Products	331	1.0	1.0	0.9	1.0	1.9	2.5	1.8	2.5	2.5	3.0	1.9	2.5	1.8	2.5	2.5	3.0
11.	Furniture & Fixtures	332	-0.9	-1.0	-1.2	-1.2	-1.4	-0.4	-1.7	-0.6	-1.7	-0.9	-1.2	-0.4	-1.7	-0.6	-1.7	-0.9
12.	Paper Products	341	0.8	0.7	0.5	0.6	-11.6	-10.7	-12.3	-11.2	-11.6	-10.8	-11.6	-10.7	-12.3	-11.2	-11.6	-10.8
13.	Printing & Publishing	342	-1.6	-1.7	-2.0	-1.9	-2.2	-1.3	-2.6	-1.6	-2.6	-1.9	-2.2	-1.3	-2.6	-1.6	-2.6	-1.9
14.	Fertilizer	35A	0.1	0.0	0.2	0.3	-11.7	-11.1	-12.0	-11.2	-11.7	-11.7	-11.7	-11.1	-12.0	-11.2	-12.2	-11.7
15.	Other Chemicals	35B	-2.7	-2.8	-3.2	-3.2	-1.6	-1.0	-2.0	-1.2	-1.1	-0.6	-1.6	-1.0	-2.0	-1.2	-1.1	-0.6
16.	Petroleum Products	35C	4.6	0.0	22.8	0.0	4.5	6.2	5.7	7.6	7.4	8.7	4.5	6.2	5.7	7.6	7.4	8.7
17.	Rubber Products	355	11.8	11.7	12.8	12.9	15.2	16.2	16.7	17.9	17.8	18.6	15.2	16.2	16.7	17.9	17.8	18.6
18.	Non-Metallic Min. Prod.	36A	29.8	29.7	33.4	33.4	53.0	53.9	59.8	60.9	59.9	60.7	53.0	53.9	59.8	60.9	59.9	60.7

(Continued)

Table 5 (Continued)

(Per cent)

Sl. No.	Sectors	ISIC Code	Trade Reforms Administered Version		Trade and Domestic Policy Reforms Market Version		Trade & Domestic Policy Reforms Imports & Exports Reforms		Trade & Domestic Policy Reforms Imports & Exports Reforms		Overall			
			Imports	Reforms	Imports	Reforms	Imports	Reforms	Imports	Reforms	Labour	Capital	Labour	Capital
			Reforms	Capital	Reforms	Capital	Reforms	Capital	Reforms	Capital	Reforms	Capital	Reforms	Capital
19.	Glass Products	362	32.2	32.1	36.1	36.1	58.1	59.0	65.8	66.8	66.3	67.0		
20.	Iron & Steel	371	-36.6	0.0	-49.0	0.0	-9.0	-8.4	-11.8	-11.1	-10.1	-9.7		
21.	Non-Ferrous Metal	372	-2.2	-2.3	-2.1	-2.1	-28.2	-27.3	-33.6	-32.6	-30.3	-29.7		
22.	Metal Products	381	-4.6	-4.7	-6.3	-6.2	-5.2	-4.3	-7.1	-6.0	-6.0	-5.3		
23.	Non-Electrical Machinery	382	-22.7	-22.8	-28.1	-28.0	-26.1	-25.3	-31.4	-30.4	-28.8	-28.2		
24.	Electrical Machinery	383	-5.3	-5.4	-6.4	-6.3	-5.4	-4.7	-6.5	-5.7	-4.7	-4.2		
25.	Transport Equipments	384	-4.4	-4.4	-4.7	-4.7	-4.6	-4.2	-5.1	-4.5	-3.9	-3.5		
26.	Misc. Manufacturing	38A	1.7	1.6	1.5	1.5	3.1	3.8	3.1	3.9	4.3	4.8		
27.	Mining & Quarrying	2	7.5	0.0	15.1	0.0	-28.3	-26.9	-26.8	-25.2	-25.2	-24.1		
28.	Electricity, Gas & Water	4	4.8	0.0	5.0	0.0	1.1	3.2	1.0	3.4	1.8	3.4		
29.	Construction	5	0.1	-0.0	-0.1	-0.0	0.6	1.6	0.4	1.5	1.2	2.0		
30.	Wholesale & Retail Trade	6	1.5	1.4	1.1	1.3	1.4	3.5	1.1	3.5	1.6	3.2		
31.	Rail Transport	7A	0.3	0.0	0.2	0.0	0.4	1.7	0.3	1.9	1.1	2.1		
32.	Other Transport, Storage & Com.	7B	-3.6	-3.7	-4.3	-4.2	-3.4	-2.1	-4.1	-2.6	-3.1	-2.1		
33.	Finance, Ins. & Real Est.	8	-0.6	-0.8	-1.0	-0.8	-1.6	-0.1	-1.9	-0.2	-1.6	-0.5		
34.	Comm., Social & Pers. Serv.	9	-0.3	-0.4	-0.5	-0.4	-0.3	0.7	-0.5	0.7	-0.2	0.5		

5.6 Exports

The details of gains in exports and imports in 33 traded sectors of the Indian economy are provided in *Table 6*. The very high export gaining sectors as a result of only trade policy liberalization include textiles, clothing, footwear, iron & steel, electrical machinery, transport equipment, and misc. manufacturing. The growth of exports in these sectors is followed by the high export growth sectors, *viz.* food, beverages & tobacco, leather products, furniture, paper products, printing & publishing, fertilizer, petroleum products, rubber products, non-metallic mineral products, glass products, non-ferrous metal and mining & quarrying.

However, if domestic policy reforms are also undertaken along with trade policy reforms, some of the very high export gaining sectors lose their position. The gains in exports are much higher than before. The very high export gaining sectors include clothing and footwear followed by the high export gaining sectors, *viz.* textiles, leather products, non-metallic mineral products and glass products. The moderate export gaining sectors include rubber products, iron & steel, non-ferrous metal, electrical machinery, transport equipment and misc. manufacturing. Note that the gains of the moderate export gaining sectors under this scenario are nearly as high as the very high export growth gains under the scenario in which domestic policy was not liberalized.

It may be noted that the exports of the agricultural sectors, fertilizer, petroleum products, and mining & quarrying show impressive gains in export growth when export NTBs are also reduced along with import liberalization. This is true under administered as well as market version of the model.

Table 6
 Gains in Exports and Imports - Stage II

(Per Cent)

Sl. No.	Sectors	ISIC Code	Trade Reforms Administered Version				Trade and Domestic Policy Reforms Market Version				Trade & Domestic Policy Reforms and IT Rationalization	
			Imports Reforms		Exports Reforms		Imports Reforms		Exports Reforms		Imports	Exports
			Imports	Exports	Imports	Exports	Imports	Exports	Imports	Exports		
1.	Paddy	1A	12.9	-0.9	51.1	-1.0	12.4	5.2	50.8	7.1	50.3	7.6
2.	Wheat	1B	12.9	-0.8	51.1	-1.0	12.5	5.2	50.9	7.1	50.2	7.7
3.	Other Cereals	1C	12.6	5.7	50.9	7.8	12.4	6.0	50.8	7.9	50.3	8.3
4.	Rest of Agriculture	1D	25.3	-0.1	51.7	5.1	24.8	0.9	51.4	5.8	50.6	6.9
5.	Food, Bev. & Tobacco	310	64.7	32.1	71.0	34.1	65.5	32.2	72.5	34.0	71.0	34.4
6.	Textiles	321	83.6	9.0	88.2	15.0	97.0	8.1	103.1	13.6	102.0	14.2
7.	Clothing	322	85.5	-24.8	90.3	-20.7	210.1	-51.2	223.8	-49.3	218.4	-47.1
8.	Leather Products	323	67.4	22.0	74.7	24.7	108.4	20.1	120.7	22.2	119.2	22.7
9.	Footwear	324	94.5	25.3	100.6	26.8	165.9	20.9	177.9	21.8	176.0	22.2
10.	Wood Products	331	37.8	-12.2	70.1	-4.7	37.6	-11.2	70.3	-4.1	69.6	-2.8
11.	Furniture & Fixtures	332	61.2	39.7	68.0	43.0	59.8	40.1	66.9	43.2	66.1	43.6
12.	Paper Products	341	61.1	0.5	68.0	0.4	62.0	53.2	69.6	55.5	69.5	55.6
13.	Printing & Publishing	342	61.3	21.5	68.2	24.8	60.9	21.5	68.3	24.5	68.6	24.5
14.	Fertilizer	35A	10.0	0.0	68.6	0.3	10.6	52.7	69.5	54.4	69.3	54.7
15.	other Chemicals	35B	41.1	38.8	51.1	45.4	44.6	37.0	55.4	43.0	56.1	42.6
16.	Petroleum Products	35C	10.0	0.2	68.6	0.3	11.7	-47.3	70.8	-38.0	71.5	-44.4
17.	Rubber Products	355	62.6	35.3	70.2	42.5	73.9	33.4	83.2	39.8	84.5	39.3

(Continued)

Table 6 (Continued)

(Per Cent)

Sl. No.	Sectors	ISIC Code	Trade Reforms Administered Version				Trade and Domestic Policy Reforms Market Version				Trade & Domestic Policy Reforms and IT Rationalizations	
			Imports Reforms		Exports Reforms		Imports Reforms		Exports Reforms		Imports	Exports
			Imports	Exports	Imports	Exports	Imports	Exports	Imports	Exports		
18.	Non-Metallic Min. Prod.	36A	59.0	18.6	66.5	23.2	106.5	-2.3	120.3	-0.8	119.6	0.5
19.	Glass Products	362	61.9	1.7	69.9	6.0	111.5	-17.5	126.6	-16.3	127.1	-16.2
20.	Iron & Steel	371	79.9	-4.0	84.2	-5.1	76.8	23.1	80.4	30.0	82.5	29.6
21.	Non-Ferrous Metal	372	40.0	-3.3	79.6	-4.1	40.1	42.8	80.2	52.1	81.7	50.2
22.	Metal Products	381	39.7	24.6	49.5	31.8	39.2	25.2	48.9	32.3	49.7	31.9
23.	Non-Electrical Machinery	382	55.6	35.1	63.5	42.5	57.2	35.8	65.7	42.9	67.1	41.9
24.	Electrical Machinery	383	78.3	48.0	83.3	52.7	82.1	48.2	87.6	52.6	90.2	52.0
25.	Transport Equipments	384	81.3	55.6	85.9	57.9	82.9	55.8	87.8	58.1	90.0	57.8
26.	Misc. Manufacturing	38A	81.8	26.8	86.5	28.7	88.1	26.7	93.7	28.5	96.2	28.3
27.	Mining & Quarrying	2	12.9	2.7	71.1	3.6	16.7	53.3	75.3	56.0	75.1	56.7
28.	Electricity, Gas & Water	4	14.0	2.2	12.1	2.3	14.6	42.4	12.9	45.4	12.4	46.3
29.	Construction	5	28.8	42.2	25.2	45.4	29.6	41.7	26.3	44.6	26.6	44.5
30.	Wholesale & Retail Trade	6	13.9	52.7	12.1	54.7	13.9	53.1	12.2	55.0	11.8	55.5
31.	Rail Transport	7A	-	-	-	-	-	-	-	-	-	-
32.	Other Transport, Storage & Com.	7B	14.0	48.5	12.2	50.8	15.2	48.5	13.6	50.6	13.8	50.5
33.	Finance, Ins. & Real Est.	8	13.8	53.0	12.0	55.0	13.7	53.2	12.0	55.0	11.5	55.5
34.	Commercial, Social & Personal Services	9	14.0	-25.1	12.2	-21.8	13.8	-24.8	12.1	-21.7	11.8	-21.2

5.7 Imports

While the economy undertakes reforms in trade policy alone (administered version), the growth of sectoral imports is high in electrical machinery, transport equipment, wholesale & retail trade, other transport, storage & communications, and finance, insurance & real estate. The sectors which experience rapid decline in import growth include clothing and commercial, social & personal services. The sectors which experience moderate decline in imports include wood products, iron & steel, and non-ferrous metals. The imports of rice and wheat show a very small decline.

If the economy also undertakes domestic policy reforms along with trade policy reforms (market version), the high import gaining sectors under the 'administered version' remain so under the 'market version'. However, some of the sectors which experienced very small or even negative imports growth under the administered version become high import growth sectors under the market version. These include paper products, fertilizer, iron & steel and non-ferrous metals. The clothing sector, which was a high import decline sector under the administered version exhibits very high import decline under the market version. The other such sector is petroleum products. The other import decline sectors include other chemicals, glass products, and commercial, social & personal services.

6. Sensitivity Analysis

The results of the model have been tested for their stability through analysing their sensitivity to changes in some of the major parameters used in the model. We have done this exercise for five such parameters, *viz.*

- i) demand elasticity of India's exports to ROW;
- ii) elasticity of substitution between imported and varieties of good j produced by representative firms/industry in India;

- iii) elasticity of substitution between capital and labour in the non-agricultural sectors in India;
- iv) elasticity of substitution between land and capital in India's agricultural sectors; and
- v) elasticity of substitution between labour and composite of land and capital in India's agricultural sectors.⁴

It may be observed from *Table 7* that a 10 per cent increase in export demand elasticity values for each of the tradable sectors leads to less than 5 per cent changes in GDP, total imports, total exports, real returns to the three factors of production, and the exchange rate depreciation. The major variables change by less than 4 per cent when the values of elasticity of substitution between imported and domestic varieties are increased by 10 per cent each.

Table 7
Sensitivity Analysis : Per Cent Change in Base Run Values of Important Endogenous Variables Due to Changes in Major Parameters

Variable	10% Increase in ϵ_{ij}	10% decrease in Σ_{ij}	10% Increase in $\Sigma_{bar1(j)}$	10% Increase in $\Sigma_{2(j)}/\Sigma_{3(j)}$
Per Cent Change in :				
GDP	-2.9	-0.9	-0.0	0.0
Import	3.6	-0.1	0.0	0.0
Export	1.6	-0.1	0.0	0.0
Real Returns to :				
Land	-1.1	-2.2	0.0	0.2
Labour	1.7	-3.7	0.0	0.0
Capital	0.2	-2.8	0.0	0.0
Exchange Rate Depreciation	-4.7	0.3	0.0	0.0

ϵ_{ij} : Demand elasticity of India's export of good j (unit : elasticity)

Σ_{ij} : Elasticity of substitution between different varieties of good j (unit : elasticity)

$\Sigma_{bar1(j)}$: Elasticity of substitution between capital and labour (unit : elasticity)

$\Sigma_{2(j)}/\Sigma_{3(j)}$: Elasticity of substitution between factors of production (unit : elasticity)

⁴ The details about the use of these parameters in the model as well as their estimates are available from the authors on request.

The model results are observed to remain even more stable with 10 per cent increases in the elasticities of substitution between the primary factors of production. There is nearly no change in any of the major variables when the elasticity of substitution between capital and labour in the non-agricultural sectors is increased by 10 per cent. However, there is minor change (0.2 per cent) in the real return to land when each of the two measures of the elasticity of substitution between factors in India's agricultural sectors (*given in iv and v above*) is increased by 10 per cent.

It thus appears that the model results are not sensitive to the values of the major parameters used in this paper.

7. Conclusion

India's economy has undertaken unilateral trade reforms since 1991-92. Under the import policy reforms, the economy has reduced both tariff as well as non-tariff barriers. The economy has also further opened up on the export front by reducing export incentives as well as non-tariff barriers. The exchange rate has been made flexible subject to market forces. The domestic policy reforms attempt at eliminating/reducing various product market imperfections, such as state monopolies, administered prices, etc. in certain sectors of the economy. Further, the structure of indirect taxes on production along with subsidies is undergoing major reforms.

The present study has shown that the economy's resources get re-allocated more efficiently as a result of the unilateral trade reforms. The resultant efficiency gains are higher if the product market imperfections in the economy are absent. The GDP (a proxy for welfare) increases along with gains in real returns to all three factors of production, *viz.* land, labour and capital. The domestic terms of trade between agriculture and manufacturing shift in favour of agriculture.

Appendix 1 Equations of the India CGE Model

COUNTRY EQUATIONS

A. Final Demand:

$$(1) \quad \hat{C}_j = \hat{E} - \hat{P}_j \quad j \in ALS$$

B. Intermediate Demand:

$$(2) \quad \hat{Z}_{jk} = \hat{S}_k \quad j/k \in ALS$$

C. Total Demand:

$$(3) \quad \hat{D}_j = v_{j0} \hat{C}_j + \sum_{k \in ALS} v_{djk} \hat{Z}_{jk} \quad j \in ALS$$

D. Product Demand:

$$(4) \quad \hat{D}_j^m = \hat{D}_j + \sigma_j \theta_j^I (\hat{P}_j^I - \hat{P}_j^M) - \frac{\sigma_j \theta_j^I}{\sigma_j - 1} \hat{n}_j \quad j \in TRS$$

$$(5) \quad \hat{D}_j^I = \hat{D}_j + \sigma_j \theta_j^M (\hat{P}_j^M - \hat{P}_j^I) - \frac{\sigma_j \theta_j^I}{\sigma_j - 1} \hat{n}_j \quad j \in TRS$$

E. Prices

- $$(6) \quad \hat{p}_j = \theta_j^I \hat{p}_j^I + \theta_j^M \hat{p}_j^M - \frac{\theta_j^I \hat{n}_j}{\sigma_j - 1}, \quad j \in TRS$$
- $$(7) \quad \begin{aligned} \hat{p}_j &= \hat{p}_j^o & j \in NTS \\ \hat{p}_j^I &= \hat{p}_j^o & j \in TAPS \\ \hat{p}_j^M &= \hat{p}_j^o & j \in TAPS \end{aligned}$$
- $$(8) \quad \hat{p}_j^M = \hat{p}_{wj}^W + \hat{R} + \hat{t}_j^{Meq} \quad j \in TRS$$
- $$(9) \quad \hat{p}_{wj}^I = \hat{p}_j^I - \hat{R} + \hat{t}_j^{XeQ} \quad j \in TRS$$
- $$(10) \quad \hat{p}_j^I = \hat{MC}_j \quad j \in TPCS$$
- $$(11) \quad \hat{p}_j^I = \hat{MC}_j \quad j \in TSMS$$
- $$(12) \quad \hat{p}_j^I = \hat{MC}_j + \hat{PR}_j \quad j \in NSMS$$
- $$(13) \quad \begin{aligned} \hat{p}_j^I &= \theta_j^{MC} \hat{MC}_j + \theta_j^{FC} (P_j^V + \hat{n}_j - \hat{S}_j) & j \in TICS \\ \hat{n}_j &= 0 & j \in TICSAP \end{aligned}$$
- $$(14) \quad \hat{p}_j^I = \hat{MC}_j + \frac{\hat{n}_j}{\eta_j + 1} \quad j \in TMCS$$

$$(15) \quad \hat{P}_j^V = \theta_{j1}^L \hat{w} + \theta_{j1}^K \hat{r}_j \quad j \in (TAGS)^c$$

$$(16) \quad \hat{P}_j^V = \theta_{j2}^{KF} \hat{P}_j^{KF} + \theta_{j2}^L \hat{w} \quad j \in TAGS$$

$$(17) \quad \begin{aligned} \hat{P}_j^{KF} &= \theta_{j3}^k \hat{r}_j + \theta_{j3}^F \hat{f} & j \in TAGS \\ \hat{r}_j &= \hat{r} & j \in (SMS)^c \end{aligned}$$

F. Marginal Cost and Average Cost:

$$(18) \quad \hat{MC}_j = b_{j0} \frac{\theta_j^{VK}}{\theta_j^{MC}} \hat{P}_j^V + \sum_{k \in ALS} \frac{b_{kj}}{\theta_j^{MC}} \hat{P}_k + bt_j \hat{N}T_j \quad j \in ALS$$

$$\theta_j^{VK} = \theta_j^{MC=1} \quad \text{for } j \in TPCS \cup TSMS \cup NTS$$

G. Demand for Primary Inputs:

$$(19) \quad \hat{V}_j = \hat{S}_j - \hat{n}_j \quad j \in TMCS$$

$$(20) \quad \hat{V}_j = \hat{S}_j \quad j \in (TMCS)^c$$

$$(21) \quad \begin{aligned} \hat{L}_j &= \theta_j^{VK} \hat{V}_j - \bar{\sigma}_{j1} \theta_{j1}^k (\hat{w} - \hat{r}_j) + \hat{n}_j & j \in (TAGS)^c \\ \hat{n}_j &= 0 & j \in (SMS) \cup (TNAGS) \cup (TICSAP) \\ \theta_j^{VK} &= 1 & j \in TNAGS \cup NSMS \\ \hat{r}_j &= \hat{r} & j \in (TMCS) \cup (TICSAP) \cup (TNAGS) \end{aligned}$$

$$(22) \quad \hat{K}_j = \theta_j^{VK} \hat{V}_j + \bar{\sigma}_{j1} \theta_{j1}^L (\hat{w} - \hat{r}_j) + \hat{n}_j \quad j \in (TAGS)^c$$

$$\hat{n}_j = 0 \quad j \in (SMS) \cup (TNAGS) \cup (TICSAP)$$

$$\theta_j^{VK} = 1 \quad j \in TNAGS \cup NSMS$$

$$\hat{r}_j = \hat{r} \quad j \in (TMCS) \cup (TICSAP) \cup (TNAGS)$$

$$(23) \quad \hat{K}_j = 0 \quad j \in SMS$$

$$(24) \quad \hat{KF}_j = \hat{V}_j - \bar{\sigma}_{j2} \theta_{j2}^L (\hat{P}_j^{KF} - \hat{w})$$

$$(25) \quad \hat{L}_j = \hat{V}_j + \bar{\sigma}_{j2} \theta_{j2}^{KF} (\hat{P}_j^{KF} - \hat{w})$$

$$(26) \quad \hat{K}_j = \hat{KF}_j - \bar{\sigma}_{j3} \theta_{j3}^F (\hat{r}_j - \hat{r})$$

$$(27) \quad \hat{F}_j = \hat{KF}_j + \bar{\sigma}_{j3} \theta_{j3}^K (\hat{r}_j - \hat{r})$$

$$\hat{r}_j = \hat{r}$$

$$j \in TAGS$$

H. Non-Tradable Goods Market Equilibrium:

$$(28) \quad \hat{S}_j = \hat{D}_j \quad j \in NTS$$

I. Demand Elasticity:

$$(29) \quad \hat{n}_j = \frac{(\sigma_j - 1)}{\eta_j n_j} \theta_j^I (\hat{D}_j^I + \hat{P}_j^I - \hat{P}_j - \hat{D}_j) \quad j \in TMCS$$

J. Primary Factors Market Equilibrium:

$$(30) \quad \sum_{j \in ALS} h_j^K \hat{K}_j = \hat{K}^o$$

$$(31) \quad \sum_{j \in ALS} h_j^L \hat{L}_j = \hat{L}^o$$

$$(32) \quad \sum_{j \in TAGS} h_j^F \hat{F}_j = \hat{F}^o$$

K. Non-Tariff Barriers:

$$(33) \quad \hat{t}_j^{Meq} = \hat{t}_j + (\hat{D}_j^M - \hat{Q}_j^M) \frac{\theta_j^{MO}}{\sigma_j(1 - \theta_j^{MO})}$$

$j \in TMCS \cup TNAGS \cup TAGSNA$

$$(34) \quad \hat{t}_j^{XeQ} = \hat{t}_j^x + (\hat{D}_{jR} - \hat{Q}_j^x) \frac{\theta_j^{XO}}{\eta_j^R(1 - \theta_j^{XO})}$$

$j \in TRS$

$$\hat{n}_j = 0 \quad j \in TPCS \cup TSMS \cup TICSAP$$

$$(35) \quad \hat{p}_5^I = 0$$

L. Demand for India's Exports to ROW:

$$(36) \quad \hat{D}_{jR}^I = \eta_j^R \hat{p}_{Wj}^I \quad j \in TRS$$

M. Trade Balance:

$$(37) \quad \delta B^T = \sum_{j \in TRS} D_{jR}^I P_{Wj}^I (\hat{D}_{jR}^I + \hat{P}_{Wj}^I) - \sum_{j \in TRS} D_j^M P_{Wj}^W (\hat{D}_j^M + \hat{P}_{Wj}^W)$$

N. Tradable Goods Market Equilibrium:

$$(38) \quad \begin{aligned} S_j \hat{S}_j &= D_{jR}^I \hat{D}_{jR}^I + D_j^I n_j (\hat{D}_j^I + \hat{n}_j) & j \in TRS \\ \hat{n}_j &= 0 & j \in TPCS \cup TSMS \cup TICSAP \\ n_j &= 1 & j \in TPCS \cup TSMS \end{aligned}$$

O. Exchange Rate Determination:

$$(39) \quad \hat{R} = \hat{R}^0$$

$$(40) \quad \delta B^T + \delta B^{ko} = 0$$

List of Exogenous Variables of the Model

B^{K^0}	:	Exogenous level of capital inflow in India	
F^0	:	Supply of agricultural land in India	
K^0	:	Capital stock in India	
K_j	:	Fixed capital stock in sector j	(j ∈ SMS)
L^0	:	Labour supply in India	
NT_j	:	Net production tax on good j	(j ∈ ALS)
P_{wj}^w	:	World price of good j	(j ∈ TRS)
Q_j^M	:	Quota restriction on imports of good j by India	(j ∈ TRS)
Q_j^X	:	Restriction on exports of good j by India	(j ∈ TRS)
t_j	:	One plus tariff imposed by India on imports of good	(j ∈ TRS)
t_j^X	:	One plus tariff imposed by India on exports of good	(j ∈ TRS)
n_j	:	Number of firms in industry j in India	(j ∈ TSMS ∪ TICSAP ∪ TPCS)

List of Endogenous Variables of the Model

B^T	:	India's trade balance	
C_j	:	Final demand for good j in India	(j ∈ ALS)
n_j	:	Number of firms in industry j in India	(j ∈ TMCS)
D_j	:	Total demand for good j in India	(j ∈ ALS)
D_{jR}^I	:	Demand for good produced in India by ROW	(j ∈ TRS)

- D_j^I : Demand in country i of the good produced by a representative firm in industry j in India (j \in TRS)
- D_j^M : Total demand for imports of good j in India (j \in TRS)
- E : Aggregate nominal expenditure
- η_j : Perceived elasticity of demand by a representative firm in industry j in India (j \in TMCS)
- F_j : Demand for land in sector j in India (j \in TAGS)
- f : Return to land in India
- K_j : Demand for capital in industry j in India (j \in SMS_C)
- KF_j : Demand for aggregate of land and capital in sector j (j \in TAGS)
- L_j : Demand for labour in industry j in India (j \in ALS)
- MC_j : Marginal cost in India of industry j or of a representative firm in industry j (j \in ALS)
- P_j^M : Price index of imported good j in India (j \in TRS)
- P_j^I : Price of domestic good produced by a representative firm in industry j in India (j \in TRS)
- P_j : Price index of good j in India (j \in ALS)
- P_j° : Administered price of tradable good j (j \in APS)
- $P_{w_j}^I$: World price of good j produced in India (j \in TRS)

- P_{w5}^I : World price of numeraire good (food) produced in India
- P_j^V : Price Index of primary input aggregate (i.e. labour and capital or labour and composite of land and capital) in industry j in India (j \in ALS)
- P_j^{KF} : Price index of 1st stage primary input aggregate (i.e. labor and composite of capital & land) in sector j in India (j \in TAGS)
- PR_j : Premium over price in industry j (j \in NSMS)
- r : Return to capital in India in equilibrium
- r_j : Return to capital in India in industry j (j \in ALS)
- R : Exchange rate of Rupee vis-a-vis Dollar
- S_k : Production of good k in India (k \in ALS)
- t_j^{Meq} : One plus tariff equivalent in industry j imposed by India on imports from ROW (j \in TRS)
- t_j^{Xeq} : One plus export tax equivalent imposed in industry j by India (j \in TRS)
- V_j : Primary input aggregate demanded by a representative firm in industry j in India (j \in ALS)
- w : Wage paid to labour
- Z_{jk} : Aggregate of sectoral inputs from industry j into industry k (aggregation of industries and/or firms) (j/k \in ALS)

List of Parameters of the Model

b_{jo}	:	Primary input share of total cost in industry j in India	$(j \in \text{ALS})$
b_{jk}	:	Intermediate input k 's share of total cost of production in industry j in India	$(j/k \in \text{ALS})$
bt_j	:	Tax share of total cost in industry j in India	$(j \in \text{ALS})$
h_j^K	:	Fraction of capital in India employed in industry j	$(j \in \text{ALS})$
h_j^L	:	Fraction of labour in India employed in industry j	$(j \in \text{ALS})$
h_j^F	:	Fraction of land in India allocated to sector j	$(j \in \text{TAGS})$
v_{jo}	:	Final consumption share of total purchases of good j in India	$(j \in \text{ALS})$
vd_{jk}	:	Intermediate demand for good j by industry k share of purchases of good j in India	$(j/k \in \text{ALS})$
θ_j^M	:	Fraction of expenditure on good j in India devoted to imports	$(j \in \text{TRS})$
θ_j^I	:	Fraction of expenditure on good j in India devoted to goods produced in India	$(j \in \text{TRS})$
$\theta_j^{M\theta}$:	Fraction of imports of goods j by India that are subject to quantitative restriction	$(j \in \text{TRS})$

- θ_j^{XQ} : Fraction of exports in industry j that are subject to quantitative restriction (j \in TRS)
- θ_j^{MC} : Variable input share of total cost in industry j in India (j \in ALS)
- θ_j^{FC} : Fixed cost share of total cost in industry j in India (j \in TICS)
- θ_{j1}^L : Labour's share of expenditure on primary inputs in industry j in India (j \in TAGS^c)
- θ_{j2}^L : Labour's share of expenditure on 1st stage aggregate of primary inputs in sector j in India (j \in TAGS)
- θ_{j2}^{KF} : Composite of land and capital's share of expenditure on 1st stage aggregate of primary inputs in sector j in India (j \in TAGS)
- θ_{j1}^K : Capital's share of expenditure on primary inputs in industry j in India (j \in TAGS^c)
- θ_{j3}^K : Capital's share of expenditure on second stage aggregate primary inputs in sector j in India (j \in TAGS)
- θ_{j3}^F : Land's share of expenditure on second stage aggregate of primary inputs in sector j in India (j \in TAGS)
- θ_j^{vK} : Variable capital's share of total cost in industry j in India (j \in ALS)

- σ_j : Elasticity of substitution between imported and varieties of good j produced by representative firms/ industry in India (j \in TRS)
- $\bar{\sigma}_{j1}$: Elasticity of substitution between capital and labour in industry j in India (j \in TAGS^c)
- $\bar{\sigma}_{j2}$: Elasticity of substitution between labour and composite of capital and land in sector j in India (j \in TAGS)
- $\bar{\sigma}_{j3}$: Elasticity of substitution between capital and land in sector j in India (j \in TAGS)
- η_j^R : Demand elasticity of India's export of good j (j \in TRS)

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