# DOHA ROUND IMPACTS ON INDIA: A STUDY IN A SEQUENTIAL DYNAMIC CGE FRAMEWORK

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# CONTENTS

## ABBREVIATIONS

| | |
|---|---|
| AoA | Agreement on Agriculture |
| BaU | Business-as-Usual |
| CES | Constant Elasticity of Substitution |
| CET | Constant Elasticity of Transformation |
| CGE | Computable General Equilibrium |
| CIF | Cost, Insurance and Freight |
| CIS | Commonwealth of Independent States |
| CPI | Consumer Price Index |
| EU | European Union |
| FDI | Foreign Direct Investment |
| FGT | Foster-Greer-Thorbecke |
| FoB | Free-on-Board |
| GATS | General Agreement on Trade in Services |
| GDP | Gross Domestic Product |
| GTAP | Global Trade Analysis Project |
| HES | Household Expenditure Survey |
| LES | Linear Expenditure System |
| MFN | Most-favoured Nation |
| NAMA | non-agricultural market access |
| NGMA | Negotiating Group on Market Access |
| NTBs | Non-tariff Barriers |
| QR | Quantitative Restrictions |
| SAM | Social Accounting Matrix |
| WTO | World Trade Organisation |

# PREFACE

Trade negotiators, especially from developing countries, often have incomplete or inexact knowledge of the possible implications of alternative negotiation outcomes for development and poverty in their own country. This is a drawback as mere instinct or the informal application of experience comes into play in choosing between alternative scenarios at the negotiation table instead of concrete and robust evaluation of welfare associated with these.

This study tries to provide such evaluation from the perspective of the Indian economy in regard to the Doha Round of WTO negotiations. Various scenarios are envisaged in the study: multilateral liberalisation of agriculture with developing and developed countries reducing their tariffs to different extents; similar liberalisation of manufacturing; the simultaneous liberalisation of both sectors in the manner mentioned; as well as the liberalisation of service sector trade.

It has to be pointed out that global trade models which look at the impact of alternative liberalisation scenarios on both developed and developing countries exist. However, many of these produce results which can crucially influence the perceptions of developing country researchers, policy makers and negotiators regarding liberalisation outcomes and through these the direction of negotiations and the trajectory of liberalisation.

For instance, the study entitled *Winners and Losers: Impact of the Doha Round on Developing Countries* commissioned by Carnegie Endowment for International Peace and authored by Sandra Polanski defies conventional wisdom in pointing to losses for developing countries from agricultural trade liberalisation. Such findings need to be verified through detailed attention to socio-economic realities in developing countries as otherwise these could have a crucial and unwarranted impact on the direction of liberalisation. The present study verifies these findings from the Indian economy's perspective and uses data which has been updated to 2006. The study also includes an analysis of service sector liberalisation which has not been attempted in previous empirical studies on the implications of multilateral liberalisation.

The results of the scenario analysis are meant to illustrate the net benefits of various kinds of liberalisation to negotiators. Such evaluations by informing the negotiating strategies of Indian negotiators can help them influence the multilateral negotiation process to their own advantage, though final outcomes would also be dependant on the negotiation strategies employed by other countries.

Thus, the study is an important input into the negotiation process from the Indian perspective but does not attempt to predict the actual outcomes of negotiations. The value of this input is not critically time dependent as the constructed scenarios are hypothetical and can be easily abstracted from by negotiators.

This study was supported by the William and Flora Hewlett Foundation and undertaken by CUTS International. The research and drafting of the preliminary report was undertaken by two eminent economists from Bangladesh: Selim Raihan and Bazlul Haque Khondker, who are affiliated to the South Asian Network for Economic Modelling based in Dhaka.

Comments from external reviewers such as Alan Winters (Department for International Development, UK), Bernard Hoekman and Richard Newfarmer (The World Bank), Sanjib Pohit (National Council for Applied Economic Research, New Delhi), Rajan S Ratna (Centre for WTO Studies, New Delhi) and Amit Shovan Roy (Indian Council for Research on International Economic Relations, New Delhi) were then sought through correspondence and an advocacy meeting in Geneva in December, 2009. These were then suitably incorporated through a round of revisions by the mentioned authors and content editing at CUTS International carried out by the team of Joseph George, Madhuri Vasnani and Siddhartha Mitra.

The study is thus the outcome of wide ranging collaboration involving experts from both developed and developing countries. It also puts to use highly developed computational techniques such as dynamic general equilibrium modelling, which not only recognises the interconnectedness of the world economy but also associated dynamism brought about by processes of capital accumulation etc. It is one of the first of its kind for developing countries and will hopefully contribute to the popularisation of a scientific approach to negotiating on multilateral trade issues among developing countries.

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# EXECUTIVE SUMMARY

The Doha Round of World Trade Organisation (WTO) negotiations will have profound and far reaching impact on developing countries such as India characterised by large agricultural sectors and rapidly developing manufacturing.

Agriculture has been at the centre stage of multilateral trade negotiations in the past 20 years. Several studies predict that envisaged elimination of export and production subsidies is likely to result in increases in agricultural prices which would be welfare enhancing (welfare diminishing) for net exporting (importing) countries. Given that India is a net exporter of many agricultural commodities and is ranked in the top 15 exporters of agricultural products (with a growing share in world agricultural trade) it would be affected significantly by the outcomes of negotiations.

On the other hand, WTO negotiations in regard to non-agricultural commodities centre around enhancement of market access through elimination or reduction of bound tariff rates, new bounds on presently unbound tariff rates and identification and removal of non-tariff barriers (NTBs). Such liberalisation would again have important implications for India for reasons similar to those associated with agriculture.

In light of the above, this study examines the effects of the Doha agreement on the Indian economy. A sequential dynamic computable general equilibrium framework (the first such application in the Indian context), which takes into account the interrelatedness of various sectors and the cumulative effect of various phenomena resulting from liberalisation associated with the successful conclusion of the Doha Round, has been used. This facilitates effective long run poverty analysis, especially as the tracking of adjustment to liberalisation is facilitated.

The results of various alternative scenarios regarding liberalisation emerging out of the Doha negotiations are reduced from the simulations conducted through this study. These are discussed below:

**Impacts of Agricultural Trade Liberalisation on India under Doha**

A moderate Doha scenario for agricultural liberalisation is simulated which involves:

- Developed (developing) countries cutting agricultural tariffs by 36 (24) percent; and
- All countries reducing domestic agricultural subsidies by 33 percent and completely eliminating agricultural export subsidies.

The results reveal a rise in international prices which is more prominent for paddy and wheat. The general equilibrium nature of the framework transmits these price shocks to the manufacturing and services sectors. Thus, except mineral and miscellaneous chemicals, all sub-sectors in manufacturing and services experience some rise in export prices and face a rise in import prices. The impacts on gross domestic product (GDP) and welfare are positive both in the short and long run but small. Similarly, the impact on head count index of poverty is also small. Skilled and unskilled wage rates rise, although less so in the long run when capital is

reallocated toward expanding sectors. The rise in unskilled wage rates is somewhat larger, given the expansion of unskilled labour intensive agricultural sectors.

**Impact of NAMA Trade Liberalisation on India under Doha**

It is assumed that developed (developing) countries cut their industrial tariffs by 36 (24) percent. All industrial commodities experience a fall in world export prices with the highest fall occurring in the machinery sub-sector. Moreover, because of sectoral inter-linkages the export prices facing agricultural and services sub-sectors also decline. On the other hand, import prices of all manufacturing commodities decline whereas those of agricultural ones increase.

The simulation results for India suggest a rise in real GDP and fall in aggregate welfare in both short and long runs as factor returns fall more than consumer price indices. All household categories experience a rise in headcount index of poverty in both short and long runs, though long run effects are smaller.

Sectors with high initial tariff rates register large import growth in the short run as consumers substitute toward goods registering more dramatic declines in prices. In the long run, import volumes grow significantly in all manufacturing sectors leading to real devaluation and increase in exports.

**Impact of Services Trade Liberalisation on India under Doha**

The model analyses the impact of services trade liberalisation based on two assumptions:

- Five major services sectors (where there are imports of services) have a tariff equivalent protection equal to the average tariff rate on the manufacturing and agricultural sectors which is fully removed through the Doha negotiations.
- There would be a 10 percent rise in foreign direct investment (FDI) into these services sectors.

The results show that the liberalisation in the services sectors would lead to a rise in real GDP and aggregate welfare both in the short and long run, the long run impacts larger. The scenario would entail two opposite effects. Firstly, because of trade liberalisation domestic services sectors would tend to contract. On the other hand, increased flow of FDI into these sectors would expand. The net impact would depend on the relative strength of these two effects. It is revealed that the services sectors under consideration expand both in the short and long run, which suggests much stronger impact of the later effects.

Services trade liberalisation, along with increased flow of foreign investment into the services sectors, would also result in drop in poverty indices and the long run poverty reducing effects are stronger than the short run effects. In sum, the scenario would lead to some positive outcomes for the Indian economy.

**Impact of Full Doha Scenario on India**

This assumes a combination of the two types of liberalisation mentioned above and assumes:

- Developed (developing) countries cutting their agricultural and industrial tariffs by 36 (24) percent; and

- All countries carrying out a one-third reduction in domestic agricultural subsidies and a complete elimination of agricultural export subsidies.

All agricultural product prices rise in the world market under this scenario. Because of the combined effects of agriculture and non-agricultural market access (NAMA) liberalisation, the changes in export prices of manufacturing products are less prominent than those under the NAMA scenario whereas import price changes are more prominent. Real GDP rises in the short as well as long run. In the short run, aggregate welfare declines. However, in the long run the negative effect on welfare appears to be very minimal. Headcount index of poverty rises but in the long run this effect is minimal.

In general, the agricultural, services and a few manufacturing sectors such as textiles are beneficiaries. In contrast, production contracts in most manufacturing sectors. Increased demand from expanding sub-sectors in agriculture and manufacturing leads to expansion in some services sectors.

A fall in nominal income as well as real consumption is observed for all households in the short run. However, in the long run, some household categories such as rural agricultural labour and urban self employed experience a rise in real consumption.

In conclusion, the agricultural liberalisation scenario is superior to the other two as it is the only scenario in which there is a rise in GDP and welfare accompanied by a fall in headcount index of poverty in both long and short runs.

# CHAPTER 1: INTRODUCTION

## 1.1 Background

International trade is a strong instrument for development. This is equally true of the ongoing WTO Doha Development Round. The Doha Round of negotiations by the WTO Members will have profound and far-reaching impact on developing countries such as India with at least three very important components from the Indian perspective: agricultural trade liberalisation, liberalisation of the manufacturing sector, and liberalisation of the services sector.

In regard to the negotiations on global agricultural trade liberalisation, a number of studies have predicted that, with the elimination of export and production subsidies, prices of agricultural commodities are likely to increase in the international market. This will be beneficial to a number of developing countries that have clear comparative advantage in this sector. Liberalisation will also imply further market access opportunities for these countries as a result of reduced tariff barriers in developed country markets. India, being a net exporter of agricultural commodities, is likely to gain from such liberalisation.

WTO negotiations with respect to NAMA are proceeding towards the elimination or the reduction of bound tariff rates, bringing unbound tariff rates under binding commitments subject to formula cuts, and identifying and removing NTBs. The important considerations under the NAMA negotiations are the extent and modalities of tariff cut for industrial goods in order to reduce and ultimately eliminate high bound tariffs rates, tariff peaks and tariff escalation. The NAMA liberalisation is likely to have important implications for India in terms of both market access to developed country markets and domestic trade liberalisation in manufacturing sectors.

Finally, negotiations on services trade liberalisation under General Agreement on Trade in Services (GATS) also have important implications for India as India has important offensive and defensive interests in a number of service sectors.

To address these important issues, this study examines the poverty effects on India of the Doha agreement in a sequential dynamic computable general equilibrium framework, which takes into account accumulation effects and long-run poverty analysis. In addition, the model tracks the adjustment path of the Indian economy, which may include substantial effects on poverty. All these effects are analysed by comparing the business-as-usual scenario with different policy scenarios.

There have been a lot of misconceptions about the impacts of trade reforms on poverty in India. For India to decide what its position on trade should be, good analysis of trade impacts on poverty is imperative. This will enable India to determine whether it should move forward with liberalisation as well as the extent, related modalities, and the process of affecting a smooth transition. This analysis intends to fill in that gap with the aim of taking the results to the policy makers and relevant stakeholders.

### 1.2 Objective of the Research

The general objective of this research is to examine the impact of Doha Round negotiations on the economy of India. The specific objectives are to:

- examine the impacts of envisaged agricultural trade liberalisation on India under the Doha negotiations;
- examine the impacts of envisaged NAMA liberalisation on India under Doha negotiations; assess the combined effects of agricultural and NAMA negotiations; and
- examine the impacts of liberalisation of domestic service sectors on the Indian economy.

### 1.3 Methodology

Like any other useful work, the research has reviewed the relevant literature, analysed data, and drawn on discussions with concerned stakeholders. In addition, a strong analytical framework has been incorporated to provide credible results and thereby promote informed policy analysis. The methodology involves use of simulation exercises based on general equilibrium models.

Effective policy negotiations partly depend on the policymakers' (negotiators') apriori assessment about the implications arising from different negotiation outcomes. Therefore, it is very important to provide the policymakers with *ex-ante* analysis of alternative scenarios. For example, for a net-agriculture exporting developing country such as India, it is crucial for its negotiators to have a clear idea about the potential implications of agriculture trade liberalisation (or, for that matter any other liberalisation scheme) under the WTO-led multilateral trade negotiations.

This study undertakes precisely such *ex-ante* analyses. The liberalisation scenarios assumed are only illustrative and might not be the ones that actually result from negotiations. However, they do provide negotiators with an idea of post liberalisation outcomes in advance of such liberalisation and are therefore an important input into the process of negotiations. A global general equilibrium model and a country-specific computable general equilibrium (CGE) model for India have been used to simulate the effects arising from alternative negotiating outcomes for India. The Social Accounting Matrix has also been updated for the year 2006.

### 1.4 Outline of the Report

The study has ten chapters. Chapter I provides introduction. Chapter 2 discusses the Doha Round issues for India and tries to provide an assessment of the possible impact of such negotiations on the Indian economy. Chapter 3 provides an overview of the economy by highlighting the major features of the economy as well as trends in some major macroeconomic variables. Chapter 4 presents a brief description of the data. Chapter 5 provides a brief description of the model. Chapter 6, 7 and 8 present the impact of agricultural liberalisation, NAMA negotiations and full Doha negotiations on the Indian economy respectively. Chapter 9 explores the impact of service trade liberalisation. Finally Chapter 10 provides the conclusion.

# CHAPTER 2: THE DOHA ROUND ISSUES FOR INDIA

## 2.1 Introduction

The Doha Round of negotiations involves developed-country reforms that have at least three very important components from India's perspective: agricultural trade liberalisation, liberalisation of the manufacturing sector, and service trade liberalisation. Furthermore, the implementation of the Doha Round agreement will require domestic reforms in India, notably in the area of trade liberalisation. Thus, the objective of this study will be to analyse poverty and other economic impacts of these issues. The rough envisaged impacts are discussed below. The model and analytical exercise facilitated by it will help to bring out the impacts more clearly and accurately.

## 2.2 Agricultural Trade Liberalisation

Agriculture has been at the centre stage of multilateral trade negotiations during the past 20 years. Despite major progress in improving the rules for trade, the overall achievement in terms of increasing market access for agricultural goods was considered to be 'disappointing' at the end of the Uruguay Round (Martin and Winters, 1996). Although under the WTO Agreement on Agriculture (AoA), members committed to deepening of reforms, not much progress has so far been made in opening up the markets further.

Nevertheless, agriculture continues to be an active area of negotiation. While the modalities for future liberalisation in the sector are being negotiated, the potential implications arising from such liberalisation have drawn a lot of attention. Several studies (e.g., Hertel *et al.*, 2000; Diao *et al.*, 2001; Beghin *et al.*, 2002; Elbehri and Leetmaa, 2002; van Meijl and van Tongeren, 2001; Dimaranan *et al.*, 2003; Francois *et al.*, 2003) predict that, with the elimination of export and production subsidies, prices of agricultural commodities are likely to increase. This will be beneficial to a number of developing countries that have clear comparative advantage in the sector. Liberalisation will also imply enhanced market access opportunities for these countries as a result of reduced tariff barriers in developed country markets.

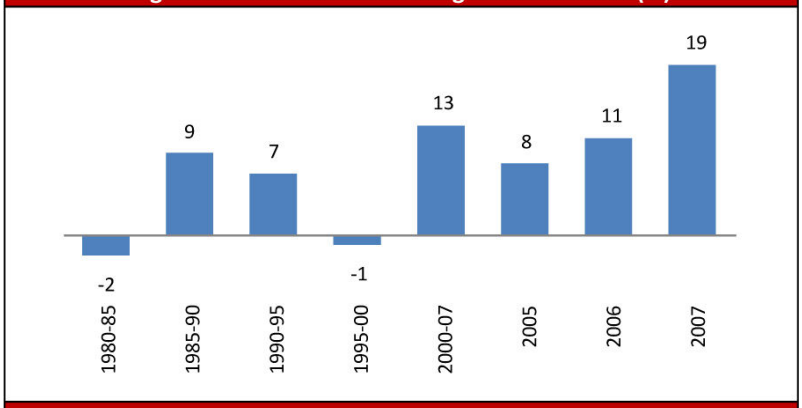
Agricultural trade liberalisation is likely to affect the current pattern of global production and trade of many agricultural commodities. Rise in prices following liberalisation will be on the whole welfare-enhancing for a net-exporter country, but welfare diminishing for a net-importer. Since tariff reduction and removal of subsidies are two inherent components of global agricultural trade liberalisation, these should be considered simultaneously in assessing welfare consequences. While tariff reduction through WTO commitments will potentially depress prices, subsidy cuts will tend to exert an opposite effect with the net result depending on the relative strengths of these two differing forces.

It has generally been concluded that the implementation of the Doha AoA would in all likelihood increase the prices of food grains and commercial crops in the world market (Panagariya 2002, Beghin et al. 2002). However, the impact on developing countries of increased world agricultural prices is unclear and it is argued that potential exporters of food could benefit and net food importers lose out (Panagariya 2002).

Simulation results of various global trade models offer competing predictions about such impact. Some studies foresee expansion of world trade, real output, wages and incomes in developing countries (Beghin et al. 2002, Conforti and Salvatici 2004, Polaski, 2006). On the other hand, some studies raise concerns about potential negative impact on net food importing countries (François et al. 2003, Fabiosa et al. 2003).

*2.2.1 World Agricultural Trade: Where does India Stand?*

**Figure 2.1: Growth in World Agricultural Trade (%)**




Source: International Trade Statistics 2008

There have been fluctuations in the world trade in agricultural products over the last two decades (Figure 2.1). However, in recent times there has been an increasing trend in volumes and values. During the first half of the 1990s there was a positive rate of growth. Negative growth followed in the second half. During 2000-2007 the annual average growth rate in agricultural trade was 13 percent, attained because of rapid growth in the second half of this period. 2005 actually marked a break in trend with doubling of the rate of growth; thus, in 2007 the growth rate stood at 19 percent.

It also appears that agricultural products constitute a sizeable share of world merchandise exports (Table 2.1). In 2007, trade in agriculture was around US$1128bn which was around 30 percent of world trade in primary products. However, the share of agricultural trade in total world merchandise trade was only 8.3 percent (Table 2.1).

**Table 2.1: World Trade in Agricultural Products, 2007**

| | |
|---|---|
| Value in 2007 | 1127.7 $bn |
| Share in world merchandise trade % | 8.3 |
| Share in world exports of primary products % | 29.8 |

Source: International Trade Statistics 2008

**Table 2.2: Agricultural products' share in trade, by region, 2007**

| Share in total **merchandise** trade, % | Exports | Imports |
|---|---|---|
| **World** | **8.3** | **8.3** |
| North America | 9.6 | 6.0 |
| South and Central America | 25.1 | 8.7 |
| Europe | 9.0 | 9.2 |
| CIS | 7.6 | 10.9 |
| Africa | 8.1 | 14.0 |
| Middle East | 2.5 | 10.2 |
| Asia | 5.6 | 7.4 |

Note: CIS = Commonwealth of Independent States
Source: International Trade Statistics 2008

Table 2.2 shows that Latin America is the world leader in the share of agricultural exports in total regional merchandise exports (25.1 percent) while the Middle East and Asian countries bring up the rear in this regard. In the case of the corresponding statistic for imports, Asia continues its laggard behaviour but North America trails even behind Asia. The African countries, on average, appear to have the highest import orientation as far as agricultural products are concerned.

| Table 2.3: Top 15 Agricultural Exporters and Importers, 2007 | | | | | |
|---|---|---|---|---|---|
| | Value $bn | Share in World Exports % | | Value $bn | Share in World Imports % |
| Exporters | | | Importers | | |
| European Union (27) | 487.74 | 43.3 | European Union (27) | 528.54 | 44.4 |
| extra-EU (27) exports | 108.66 | 9.6 | extra-EU (27) imports | 149.46 | 12.5 |
| United States | 113.51 | 10.1 | United States | 109.40 | 9.2 |
| Canada | 48.67 | 4.3 | Japan | 68.86 | 5.8 |
| Brazil | 48.22 | 4.3 | China | 65.24 | 5.5 |
| China | 38.85 | 3.4 | Canada b | 27.34 | 2.3 |
| Argentina | 28.81 | 2.6 | Russian Federation a, b | 26.88 | 2.3 |
| Thailand | 24.96 | 2.2 | Korea, Republic of | 21.94 | 1.8 |
| Russian Federation a | 23.52 | 2.1 | Mexico b | 21.90 | 1.8 |
| Indonesia | 23.43 | 2.1 | Hong Kong, China | 13.43 | 1.1 |
| Australia | 22.35 | 2.0 | retained imports | 8.60 | 0.7 |
| Malaysia | 20.51 | 1.8 | Saudi Arabia | 12.45 | 1.0 |
| New Zealand | 16.04 | 1.4 | United Arab Emirates a | 11.29 | 0.9 |
| India | 16.02 | 1.4 | Taipei, Chinese | 10.78 | 0.9 |
| Mexico | 15.59 | 1.4 | Malaysia | 10.61 | 0.9 |
| Chile | 13.63 | 1.2 | Indonesia | 10.46 | 0.9 |
| | | | Switzerland | 10.37 | 0.9 |
| | | | | | |
| Above 15 | 941.87 | 83.5 | Above 15 | 944.68 | 79.3 |

Source: International Trade Statistics 2008
Note: a Includes Secretariat estimates b Imports are valued f.o.b.

Table 2.3 suggests that EU member countries are the largest traders of agricultural products. They, among themselves, perform more than 43 percent of the world trade in agriculture, and account for another 10-12 percent through trade with the rest of the world. US is another important player in world agricultural trade. Among the developing countries, Brazil and China are also important exporters of agricultural products. On the other hand, apart from the EU and the US, Japan and China are major importers of agricultural products. India is among the top 15 exporters of agricultural products with a 1.4 percent share in world exports of such products as of 2007.

India is a net exporter of many agricultural commodities including rice. Rice is one of the most important crops produced in India. It is the staple food for a large number of people and major means of livelihood for millions of farm households in the country. Table 2.4 suggests that though India is the second biggest rice consuming country in the world it is also the second largest rice producing and exporting country in the world. Therefore, if global agricultural trade liberalisation, as envisaged by the Doha Round of negotiations, results in rise in the price of rice in the world market, India, being a net exporter of rice, is likely to gain from such liberalisation.

| Table 2.4: Leading Countries in Production, Consumption, Exports and Imports of rice in 2003 | | | | |
|---|---|---|---|---|
| Rank | Producing | Consuming | Exporting | Importing |
| 1 | China | China | Thailand | Indonesia |
| 2 | India | India | India | Nigeria |
| 3 | Indonesia | Indonesia | Vietnam | Bangladesh |
| 4 | Bangladesh | Bangladesh | United States | Iran |
| 5 | Vietnam | Vietnam | China | Philippines |
| 6 | Thailand | Japan | Pakistan | Brazil |
| 7 | Japan | Thailand | Uruguay | Iraq |
| 8 | Myanmar | Myanmar | Argentina | Saudi Arabia |
| 9 | Philippines | Philippines | Egypt | EU |
| 10 | Brazil | Brazil | Myanmar | Senegal |
| 11 | United States | Korea, Rep. of | Australia | China |
| 12 | Korea, Rep. of | United States | Japan | South Africa |
| 13 | Pakistan | Nigeria | EU | Co^te d´ Ivory |
| 14 | Egypt | Egypt | Guyana | Malaysia |
| 15 | Cambodia | Iran | Ecuador | Cuba |

Source: World Bank (2005)

*2.2.2 Negotiations on Global Agricultural Trade Liberalisation*

In WTO terminology, subsidies in general are identified by "boxes" which have been assigned the colours of traffic lights: green (permitted), amber (slow down – i.e. be reduced), red (forbidden). In agriculture, things are, as usual, more complicated. The Agriculture Agreement has no red box, although domestic support exceeding the reduction commitment levels in the amber box is prohibited; and there is a blue box for subsidies that are tied to programmes limiting production. There are also exemptions for developing countries (sometimes called an "S&D box", including provisions in Article 6.2 of the agreement).

While the Uruguay Round Agreement on Agriculture made some significant progress on rules of trade in agriculture by replacing Quantitative Restrictions (QRs) with tariffs and in specifying initial commitments on reduction of tariffs and subsidies, the momentum could not be maintained under the WTO-sponsored negotiations. The domestic support given to agriculture in the developed countries has not come down since implementation of the commitments of the Uruguay Round began in 1995 (Naik, 2005). Although in the Doha Ministerial Declaration, member countries vowed to achieve substantial improvements in market access through phasing out of all forms of export subsidies and substantial reductions in trade-distorting domestic support (WTO 2001, para. 13), no major breakthrough has been made after the conclusion of the Hong Kong Ministerial conference held in December 2005. While members are still negotiating modalities for further liberalisation, consensus has been reached on abolishing all export subsidies only by 2013 (WTO 2005, para 6)[1]. It however appears that export subsidies constitute a very insignificant part of the domestic support programme for agriculture in developed countries.

Despite the lack of progress related to agricultural liberalisation in the post Uruguay Round period, the agricultural sector has long been the most protected sector in regard to world trade. Thus, any significant liberalisation measure in this sector is likely to have huge welfare implications.

**2.3 Liberalisation of the Manufacturing Sector**

WTO negotiations with respect to non-agricultural commodities (all those that are not covered under the negotiations on agriculture, sometimes referred to as industrial or manufactured goods) centre around the enhancement of NAMA, and are therefore focussed on the elimination or the reduction of bound tariff rates, bringing unbound tariff rates under binding commitments subject to formula cuts, and identification and removal of NTBs The important considerations under the NAMA negotiations are the extent and modalities of tariff cuts for industrial goods so as to facilitate reduction and ultimate elimination of tariff rates bound at high levels, tariff peaks and tariff escalation.

Although developed countries have bounds on their tariff lines, in the case of developing countries, the proportion of tariff lines that are bound is quite low. As trade theory suggests, for small and vulnerable economies, industrial tariffs are used as a tool to protect domestic industries by artificially maintaining prices at a high level in the local market. It is also true that for many developing countries, tariffs acts as a major source of government revenue. Therefore, it is quite common for developing countries to not bind tariff rates through WTO

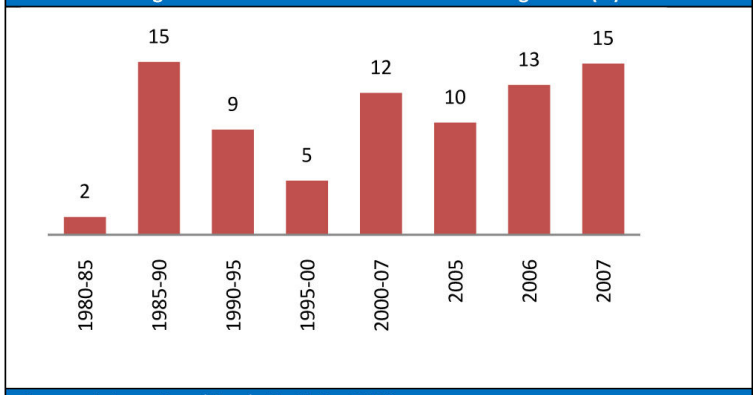
[1] In the case of cotton, export subsidies by the developed countries were abolished in 2006.

commitments and thus provide themselves with room to adjust to economic shocks through unrestricted tariff escalation.

*2.3.1 World Manufacturing Trade: Where does India Stand?*

Figure 2.2 shows the growth rate in world manufacturing trade over the last two decades. It appears that during the first half of the 1980s the annual average growth in trade in manufacturing products was very low at only two percent. It increased to 15 percent during the second half of the 1980s. However, during the 1990s the growth rate again declined only to increase considerably during the 2000s. Since 2005 there has been an increasing trend in the growth rate.

**Figure 2.2: Growth in World Manufacturing Trade (%)**




Source: International Trade Statistics 2008

| Table 2.5: World Trade in Manufacturing Products, 2007 | |
|---|---|
| Value in 2007 | 9500 $bn |
| Share in world merchandise trade % | 69.8 |
| Source: International Trade Statistics 2008 | |

Table 2.5 shows that trade in manufacturing products dominates world trade in value. In 2007, the total value of trade in manufacturing products was US$9500bn which was 69.8 percent of the total merchandise trade in that year.

Table 2.6 suggests that the Asian region leads all regions of the world in terms of share of manufacturing exports in total regional merchandise exports (81.6 percent) while African countries bring up the rear in this regard. On the other hand, the Asian region has the lowest import-orientation in manufacturing products while Commonwealth of Independent States (CIS) countries lead the world in this regard.

**Table 2.6: Manufacturing products' share in trade, by region, 2007**

| Share in total **merchandise** trade, % | Exports | Imports |
|---|---|---|
| **World** | **69.8** | **69.8** |
| North America | 72.2 | 72.8 |
| South and Central America | 30.9 | 69.1 |
| Europe | 78.6 | 72.1 |
| CIS | 25.1 | 76.7 |
| Africa | 18.8 | 68.0 |
| Middle East | 21.0 | 75.7 |
| Asia | 81.6 | 63.7 |

Note: CIS = Commonwealth of Independent States
Source: International Trade Statistics 2007

| Table 2.7: Top 15 Manufacturing Exporters and Importers, 2007 | | | | | |
|---|---|---|---|---|---|
| | Value $bn | Share in World Exports % | | Value $bn | Share in World Imports % |
| Exporters | | | Importers | | |
| European Union (27) | 4249.1 | 44.7 | European Union (27) | 4029.7 | 41.0 |
| extra-EU (27) exports | 1406.5 | 14.8 | extra-EU (27) imports | 1187.2 | 12.1 |
| China a | 1134.8 | 11.9 | United States | 1409.6 | 14.3 |
| United States | 909.4 | 9.6 | China a, c | 677.6 | 6.9 |
| Japan | 640.9 | 6.7 | Hong Kong, China | 333.6 | 3.4 |
| Hong Kong, China | 331.2 | 3.5 | retained imports | 14.7 | 0.1 |
| domestic exports | 12.3 | 0.1 | Japan | 314.4 | 3.2 |
| re-exports | 318.9 | 3.4 | Canada d | 293.8 | 3.0 |
| Korea, Republic of | 330.4 | 3.5 | Mexico a, d | 227.9 | 2.3 |
| Singapore | 227.1 | 2.4 | Korea, Republic of | 206.2 | 2.1 |
| domestic exports | 104.4 | 1.1 | Singapore | 188.1 | 1.9 |
| re-exports | 122.7 | 1.3 | retained imports | 65.4 | 0.7 |
| Canada | 224.5 | 2.4 | Russian Federation b, d | 185.6 | 1.9 |
| Taipei, Chinese | 209.6 | 2.2 | Taipei, Chinese | 142.6 | 1.5 |
| Mexico a | 204.2 | 2.1 | Switzerland | 132.2 | 1.3 |
| Switzerland | 155.5 | 1.6 | Australia d | 118.1 | 1.2 |
| Malaysia a | 125.0 | 1.3 | Malaysia a | 110.7 | 1.1 |
| Thailand | 116.5 | 1.2 | Turkey b | 106.6 | 1.1 |
| India | 92.4 | 1.0 | | | |
| Turkey b | 85.4 | 0.9 | | | |
| Above 15 | 8716.9 | 91.8 | Above 15 | 8158.0 | 83.0 |

Source: International Trade Statistics 2008

Note: a Includes significant shipments through processing zones b Includes Secretariat estimates.

c In 2007, China reported imports of manufactures from China amounting to $84.1 billion.

d Imports are valued f.o.b.

According to Table 2.7, European Union (EU) member countries are the largest traders of manufacturing products, performing more than 41-44 percent of world trade in manufacturing products among themselves and another 12-15 percent with the rest of the world. China and USA are two important players in world manufacturing trade. Apart from China, the other developing countries having important shares in world exports of manufacturing products are Malaysia, Thailand, India and Turkey. India is among the top 15 exporters of manufacturing products with a share of 1.0 percent in world manufacturing trade in 2007. On the other hand, apart from the EU and the US, the major importers of manufacturing products are China and Japan.

*2.3.2 Negotiations on NAMA*

Trade negotiations in the Uruguay Round, under the broad title of NAMA, achieved progress by reducing developed country average tariff rates from 6.3 percent to 3.8 percent, and facilitating an increase in binding coverage (proportion of tariff lines that are bound) for developing countries from 21 percent to 73 percent. Under the ongoing Doha Round, the negotiations on NAMA incorporate the reduction or elimination of overall industrial tariff rates as well as the reduction or elimination of tariff peaks and tariff escalation, as also the removal of NTBs. In line with the work programmes, set out in article 16 of the Doha Ministerial declaration, negotiations on NAMA were launched in January 2002 with the creation of a Negotiating Group on Market Access (NGMA). The NGMA in 2003 proposed that the following sectors be covered by the formula approach for tariff reduction:

(i) electronics and electrical goods;
(ii) fish and fish products;
(iii) footwear;
(iv) leather goods;
(v) motor vehicle parts and components;
(vi) stones, gems, and precious metals; and
(vii) textiles & clothing.

The July 2004 package tried to make further progress by coming up with a framework for establishing modalities for NAMA negotiations, and the 6th Ministerial Declaration in Hong Kong in December 2005 set out the mandate for using a 'Swiss type' formula for reduction in bound tariff rates.

There have been intense debates, and a number of proposals have been put up in regard to the value and the number of coefficients used in the tariff-cut formula but no consensus has yet been reached. According to the July 2004 framework, NAMA tariff reduction should have comprehensive product coverage and commence from bound rates, and all non-*ad-valorem* duties need to be converted to *ad-valorem* equivalents and bound in *ad-valorem* terms. Although the tariff reductions are to be in terms of bound tariff rates, the implication will extend to applied rates as well as in most cases, developed country Most-favoured Nation (MFN) applied tariffs and bound tariffs do not have wide spreads for industrial commodities.

The rationale for applying a formula cut approach for tariff reduction lies in the transparency, efficiency, equitability and predictability that such an approach will bring to tariff reduction. There were intense discussions among member countries regarding the development of modalities for NAMA which finally resulted in a consensus on applying the formula approach. A broad agreement has been reached through negotiations that the formula will be a 'Swiss type with coefficients'.

**2.4 Services Trade Liberalisation**

In the present day world, services is the fastest growing sector in the global economy and accounts for two thirds of global output, 30 percent of global employment and 20 percent of global trade. Service sector related activities in low and middle income countries have been expanding faster than GDP for the last two decades. An implication of this continuous shift toward services is that the overall growth of productivity in the economy is becoming increasingly determined by developments in the services sector.

Even though the services sector is the largest contributor to GDP in most countries, trade in services is relatively a new phenomenon, and has a low share in total world trade. 'Intangibility' and 'non storability' are characteristics of services that constitute major impediments to trade in services. The services sector was not included in the ambit of the world trade negotiation process till the inception of the Uruguay Round. The GATS is a new phenomenon; negotiations relating to this agreement at the WTO are a relatively recent phenomenon. GATS is the first initiative with the aim of progressive liberalisation of trade in services. The WTO has administered the agreement with effect from January 1995, following which services trade is getting due importance in WTO negotiations

In the era of global economic integration, competitiveness plays a vital role in the success of international trade. The services sector plays a fundamental role in ensuring the competitiveness of an economy. Services are used intensively in the production of all goods, making up around 10-20 percent of production costs in both manufacturing and agriculture, and sometimes more (Sauvé, 2006)[2].

*2.4.1 Global Trade in Services: Where does India Stand?*

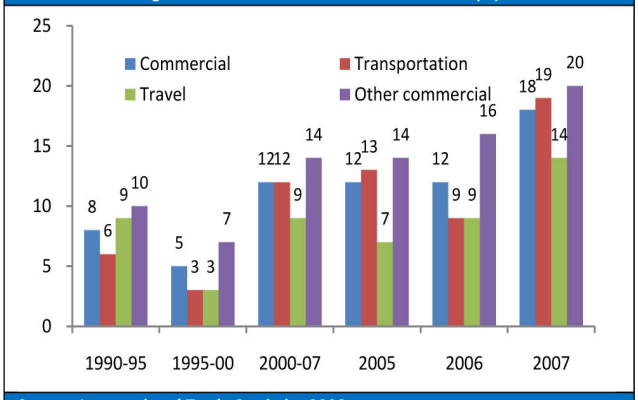
Table 2.8 presents the figures on global trade in services. It appears that global trade in services amounted to more than US$3000bn in 2007. Transportation and travel sectors together accounted for around 50 percent of the world trade in commercial services. The remaining 50 percent was accounted for by other commercial services.

**Table 2.8: World Trade in Commercial Services by Category in 2007**

| | Exports (Billion US$) | Share Export | Imports (Billion US$) | Share Import |
|---|---|---|---|---|
| **Transportation** | 750 | 22.8 | 890 | 28.9 |
| **Travel** | 855 | 26.0 | 775 | 25.2 |
| **Other commercial** | 1685 | 51.2 | 1415 | 45.9 |
| **All commercial services** | **3290** | **100.0** | **3085** | **100.0** |

Source: International Trade Statistics 2008

**Figure 2.3: Growth in World Services Trade (%)**




Source: International Trade Statistics 2008

The growth in service trade over the last two decades is depicted in Figure 2.3. After a slowdown in such growth in the second half of the 1990s, all major services categories registered an increasing growth rate in their trade after the turn of the century. More recently, growth rates in service sector trade in 2007 have been much higher than those in 2006. For instance, trade in transportation services in 2007 experienced a very high growth rate (19 percent) after modest growth in 2006 (9 percent).

In terms of exports and imports of services as a whole as well as specific types of such services, India ranked among the top 15 countries of the world in 2007. In 2007, the biggest contributor to export earnings from services was 'other business services'. In the case of exports of 'computer and information services' and 'other business services', India ranked 2nd and 3rd in the world

**Table 2.9: Indian Exports and Imports of Services and Ranking among the Top 15 Countries in 2007**

| Service Categories | Exports (million US$) | Export Rank | Imports (million US$) | Import Rank |
|---|---|---|---|---|
| Transport | 8.8 | 11 | 31.1 | 5 |
| Travel | 11.1 | 13 | 8.8 | 15 |
| Commercial | 69.8 | 4 | 37.3 | 5 |
| Communication | 2191 | 5 | 899 | 8 |
| Telecommunication | 1096 | 4 | 450 | 6 |
| Construction | 403 | 12 | 906 | 10 |
| Insurance | 1116 | 8 | 2664 | 8 |
| Financial | 2071 | 8 | 1316 | 7 |
| Computer and information | 21461 | 2 | 2199 | 4 |
| Personal, cultural and recreational | 218 | 13 | - | - |
| Other business | 30923 | 3 | 21453 | 4 |

Source: WTO International Trade Statistics 2008

[2] The figure is 20-25 percent for ready-made garments in some countries (United Nations, 2005).

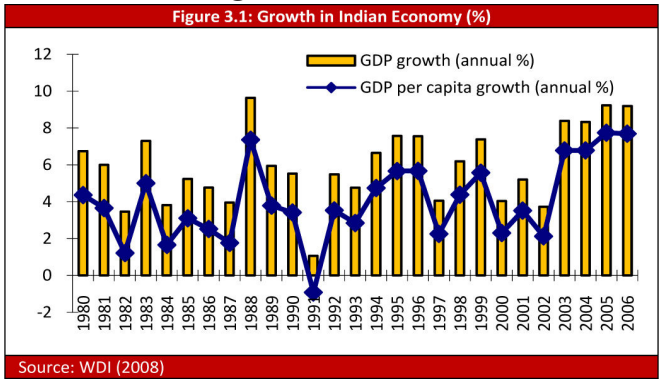
respectively. India is also a large importer of commercial services. In 2007, import payment for 'other business services' was the biggest item in our import bill with India ranked 4th in the world.

India has experienced a significant shift in the structure of her economy with the increasing dominance of the services sector in national production and employment. At present, the contribution of the services sector to GDP is above 50 percent. Among the different service categories, India's success lies in sectors such as information technology (IT), business process outsourcing, tourism, banking and construction and especially in exports of labour intensive services. Private participation in provision of services has increased significantly with deregulation of infrastructure and business services.

# CHAPTER 3: AN OVERVIEW OF INDIAN ECONOMY

## 3.1 Structural Change and Economic Growth

Figure 3.1: Growth in Indian Economy (%)




Source: WDI (2008)

The average rate of GDP growth in India since the 1980s has been 5.82 percent per year with wide variations across sub-periods (Figure 3.1). There has been remarkable growth performance during 2003-2006 when the annual GDP growth rate exceeded eight percent.

The structure of the Indian economy has undergone significant changes since the 1980s with the share of agriculture in GDP declining by about half in 2006 (Table 3.1). The agriculture sector, for so long the mainstay of the Indian economy, now accounts for only about 20 percent of GDP though it continues to employ over 50 percent of the work force. For some years after independence, India depended on foreign aid to meet its food needs, but in the last 35 years, food production has risen steadily, mainly due to increase in irrigated area and widespread use of high yielding seeds, fertilisers, and pesticides. The country has large grain stockpiles and is a net exporter of food grains.

Table 3.1: Structure of Indian Economy

| Sectors | Shares in GDP | | | | | | |
|---|---|---|---|---|---|---|---|
| | 1980 | 1985 | 1990 | 1995 | 2000 | 2005 | 2006 |
| Agriculture | 35.7 | 31.2 | 29.3 | 26.5 | 23.4 | 18.3 | 17.5 |
| Industry | 24.7 | 26.1 | 26.9 | 27.8 | 26.2 | 27.6 | 27.9 |
| Services | 39.6 | 42.7 | 43.8 | 45.7 | 50.5 | 54.1 | 54.6 |
| Total | 100.0 | 100.0 | 100.0 | 100.0 | 100.0 | 100.0 | 100.0 |

Source: WDI (2008)

Table 3.2: Sectoral Growth in India

| | 1981 - 85 | 1986 - 90 | 1991 - 95 | 1996 - 2000 | 2001 - 2005 |
|---|---|---|---|---|---|
| Agriculture | 3.3 | 3.8 | 2.4 | 3.2 | 3.0 |
| Industry | 5.2 | 7.2 | 6.0 | 5.1 | 7.3 |
| Services | 6.3 | 6.9 | 6.7 | 8.0 | 8.5 |
| GDP | 5.2 | 6.0 | 5.1 | 5.8 | 7.0 |
| Per Capita GDP | 2.9 | 3.8 | 3.2 | 4.0 | 5.4 |

Source: WDI (2008)

India's growth performance during the last one decade or so has been largely driven by growth in the services sector. Also in the 21st century, India has been able to maintain a high growth rate in the industrial sector and a stable growth rate in the agricultural sector.

The growth performance over the period was associated with relatively steady rates of savings and investment and improvements in other macroeconomic indicators (Table 3.3). As a share of GDP, investment increased to 34 percent in 2006 along with increases in domestic and national savings rates. The changes in the external sector were significant with exports as a share of GDP rising to 23 percent in 2006 from only six percent in the early 1980s. At the same time, the share of imports in GDP rose from only 8.7 percent in 1981 to around 26 percent in 2006.

| Table 3.3: Selected Indicators of Indian Economy (As % of GDP) | | | | | | | |
|---|---|---|---|---|---|---|---|
| | 1981 | 1985 | 1990 | 1995 | 2000 | 2005 | 2006 |
| Consumption | 80.5 | 79.0 | 77.3 | 74.6 | 76.1 | 69.6 | 68.9 |
| General Government | 10.0 | 11.3 | 11.7 | 10.9 | 12.6 | 11.3 | 11.3 |
| Private | 70.5 | 67.7 | 65.6 | 63.7 | 63.5 | 58.3 | 57.6 |
| Investment | 22.2 | 23.5 | 24.2 | 26.6 | 24.8 | 33.4 | 33.9 |
| Gross Domestic Saving | 19.5 | 21.0 | 22.7 | 25.4 | 23.9 | 30.4 | 31.1 |
| Gross National Saving | 20.8 | 21.5 | 22.1 | 26.7 | 25.6 | 32.7 | 33.5 |
| Exports | 6.0 | 5.3 | 7.1 | 11.0 | 13.2 | 20.3 | 23.0 |
| Imports | 8.7 | 7.7 | 8.5 | 12.2 | 14.2 | 23.3 | 25.8 |
| Source: WDI (2008) | | | | | | | |

### 3.2 Structure of Government Revenue

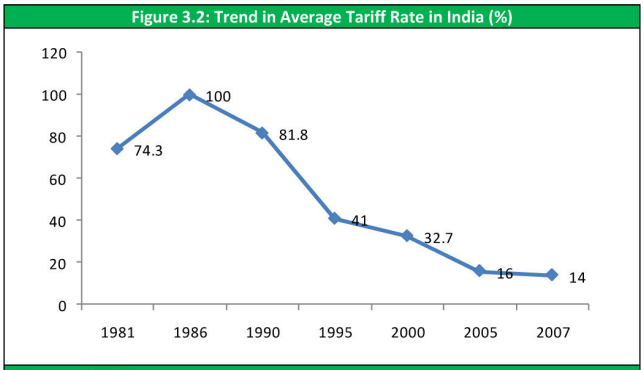
| Table 3.4: Structure of Government Revenue | | | | |
|---|---|---|---|---|
| | 1990 | 1995 | 2000 | 2006 |
| Total Revenue Excluding Grants (Billion LCU) | 715.9 | 1466.5 | 2504.4 | 5237.8 |
| Tax Revenue | 575.7 | 1112.4 | 1885.3 | 4421.5 |
| Non - tax Revenue | 140.1 | 354.1 | 619.1 | 816.3 |
| Total Revenue Excluding Grants as % of GDP | 12.6 | 12.3 | 11.9 | 12.7 |
| | % Share of Major Taxes in Total Revenue | | | |
| Taxes on Incomes, Profits & Capital Gains | 14.8 | 22.5 | 27.0 | 39.2 |
| Taxes on International Trade | 28.6 | 24.2 | 18.9 | 14.6 |
| Taxes on Domestic Production | 56.6 | 53.3 | 54.1 | 46.1 |
| Total | **100.0** | **100.0** | **100.0** | **100.0** |
| Source: WDI (2008) | | | | |

The changes in the structure of government revenue are given in Table 3.4. The share of government revenue in GDP remained low over the last one and half decades. There are two major sources of government's revenue earnings – tax revenue and non-tax revenue, of which tax revenue contributes almost 85 percent. It also appears that the share of taxes on international trade in tax revenue has declined over time, mainly due to trade liberalisation measures, whereas that of taxes on income, profits and capital gains has increased considerably. On the other hand, the share of taxes on domestic production decreased significantly during 2000-2006. Non-tax revenue (e.g. income from state-owned enterprises, fees and other miscellaneous receipts) provided about 20 percent of total revenue in 1990 but only around 16 percent in 2006.

### 3.3 Changes in Trade Policies

After independence from British rule in 1947, India embarked on a strategy of import substitution, and emphasised the role of the government in providing infrastructure, as a regulator, and as a provider of goods and services. The predominance of government during the 1960s and 1970s was associated with stagnation in the growth rate of GDP at

Figure 3.2: Trend in Average Tariff Rate in India (%)




Source: UNCTAD

3-3.5 percent per annum. In fact, the trade regime in the early 1980s was characterised by high nominal tariffs and NTBs coupled with a complex import licensing system.

However, during the late 1980s, the government took the first steps towards reducing state control not only on the external policy front but also in regard to domestic industrial policy. Industrial and import licensing was eased, quantitative restrictions along with tariff barriers reduced, and the tariff structure simplified, However, these measures were too inadequate and left a lot to be desired. Figure 3.2 shows that the average tariff rate was as high as 100 percent in 1986 but came down to 14 percent in 2007. There has also been substantial reduction in the import-weighted average rate during this period. The highest rate of duty declined from 335 percent in 1990-91 to 35 percent in 2000-01. Note that the decrease in tariffs on consumer goods was greater than that on intermediate and capital goods.

The trade policy reforms brought about significant changes in the external sector of the economy. Growth and structural change in merchandise trade is evident from Table 3.5. Compared with average annual growth of around 5.4 percent during 1980-1990, merchandise exports increased annually on average by 12.7 percent during 1991-2000, and at a similar rate during 2001-2006. In the case of imports, the rates increased to around 14 percent during the 1990s compared with 7.2 percent during the 1980s. However, growth slowed down a bit during 2001 -2006.

**Table 3.5: Growth & Structural Change in Merchandise Trade**

| | Billion US$ | | | | Average Annual % Growth | | |
|---|---|---|---|---|---|---|---|
| | 1980 | 1990 | 2000 | 2006 | 1981-1990 | 1991-2000 | 2001-2006 |
| Export | 11406 | 18984 | 60880 | 122266 | 5.4 | 12.7 | 12.7 |
| Import | 10806 | 19417 | 65126 | 119812 | 7.2 | 13.3 | 10.8 |
| | % of Total Exports | | | | % of Total Imports | | |
| | 1980 | 1990 | 2000 | 2005 | 1980 | 1990 | 2000 | 2005 |
| Food | 28.2 | 15.6 | 12.9 | 8.9 | 9.0 | 3.2 | 4.8 | 3.3 |
| Agricultural raw materials | 5.0 | 4.1 | 1.2 | 1.5 | 1.7 | 4.0 | 3.5 | 2.0 |
| Fuels | 0.4 | 2.9 | 4.3 | 11.4 | 44.6 | 27.3 | 36.7 | 36.3 |
| Ores and Metals | 7.5 | 5.2 | 2.8 | 6.9 | 5.9 | 8.1 | 5.2 | 5.0 |
| Manufactures | 58.6 | 70.7 | 76.5 | 70.3 | 38.7 | 51.2 | 47.9 | 52.4 |

Source: WDI, 2008

The trade basket indicates an increasing concentration of manufactured goods which accounted for as much as 70 per cent of total merchandise exports in 2005. The shares of food and agricultural raw materials in total exports declined over time. In the case of imports, manufacturing presently accounts for slightly more than 50 percent of total imports and its share has increased over time. Fuels account for more than one third of total imports. The shares of food and agricultural raw materials have declined over time.

### 3.4 Changes in Poverty and Inequality

**Table 3.6: Head- count Ratio ( %)**

| Year | Rural | Urban |
|---|---|---|
| 1973-74 | 56.4 | 49.0 |
| 1977-78 | 53.1 | 45.2 |
| 1982-83 | 45.7 | 40.8 |
| 1987-88 | 39.1 | 38.2 |
| 1993-94 | 37.3 | 32.4 |
| 1999-00 | 27.8 | 23.6 |
| 2005-06 | 18.7 | 21.8 |

Source: Government of India (2003)
The Economic Survey 2002- 2003, NSS 2005-06

Poverty in India is a multi-dimensional phenomenon and can be characterised as both income and human poverty. The inter-temporal estimates of income poverty in India show substantial variations due to differences in underlying assumptions and methodologies. Some trends, however, can be discerned with available data.

From Table 3.6, which shows the time trend in head count poverty ratio since 1973-74, it can be seen that rural poverty has always been higher than urban poverty till the late 1990s. Approximately 80 percent of the total poor live in rural areas. There has generally been a reduction in poverty over the last three decades in both rural and urban areas. However, the reduction was sharp in rural as well as urban rates in the period between 1993-94 and 1999-00 but in 2001-2006, reduction in rural poverty has been significant while that in urban poverty rather modest.

In the case of inequality, Table 3.7 depicts the levels of rural and urban inequality in India for the period 1993-1994-1999-2000. It shows that both rural and urban Gini coefficients increased in the period between 1993-1994 and 1997, and declined between 1997 and 1999-2000.

**Table 3.7: Trends in rural and urban inequality in India**

| | 1993-94 | 1994-95 | 1995-96 | 1996-97 | 1999-00 |
|---|---|---|---|---|---|
| Rural Gini | 28.5 | 29.2 | 28.9 | 30.1 | 26.2 |
| Urban Gini | 34.5 | 33.4 | 35.4 | 36.1 | 34.4 |

**Source: Jha (2004)**

# CHAPTER 4: DESCRIPTION OF THE DATA

## 4.1 Background

In this study, a dynamic CGE model has been numerically calibrated with the help of an updated Social Accounting Matrix (SAM) for the Indian economy. The latest available SAM for India for 2004 was updated to 2006. The 2004 SAM consists of 73 production sectors and is based on a classification of factors into two types and that of households, separately for rural and urban areas, into five categories on the basis of expenditure levels.

Although the 2004 SAM is comprehensive with regard to activity/sector classification, it is not adequate for capturing income distribution due to the adoption of a classification that involves only 2 factors and a household classification based on expenditure rather than socio-economic characteristics. A review of Indian SAMs suggests that in previous SAMs, household groups were classified in terms of socio-economic characteristics. For instance, the 1977-78 SAM constructed by De Janvy and Subbarao (1986) classified households into seven social classes on the basis of socio-economic features: (a) rural landless agricultural workers; (b) rural small farmers; (c) rural medium size farmers; (d) rural large farmers; (e) urban workers; (f) urban marginal groups; and (g) urban capitalists. This SAM was later updated to 1981 and expanded by Subramanian (1993). In another SAM, Pradhan and Sahoo (1996) considered the income distribution of households by occupational class. A major limitation of their classification was the inclusion of the entire urban household population into one class.

## 4.2 Construction of an Updated Social Accounting Matrix for India for 2006

**Table 4.1: Features of 2006 SAM of India**

| | |
|---|---|
| **Activities** | |
| Agriculture (10) | paddy, wheat, oilseeds, cotton, other agriculture, livestock, forestry and logging, fishing, minerals, sugar |
| Industries (11) | misc food, cotton textiles, other textiles, leather products, misc chemicals, cement, metal products, machinery, electrical appliances, electronic equipments, misc manufacturing |
| Services (8) | construction, utility, other transport services, communication, hotels and restaurants, insurance, other services, misc services |
| **Institutions** | |
| Households (9) | **Rural:** 5 categories: rural non-agricultural self employed, rural agricultural labour, rural other labour, rural agricultural self employed, rural other households<br>**Urban:** 4 categories: urban self employed, urban salaried class, urban casual labour, urban other households |
| Others (2) | Government, Rest of the World |
| **Factors of production** | |
| Labour (2) | Unskilled: Class 0-IX<br>Skilled: Class X and above |
| Capital (2) | Agricultural capital<br>Non agricultural capital |
| **Source: SAM 2006 of India** | |

The 2004 SAM has been updated to 2006. The major tasks involved in SAM updating consisted of extending factor and household accounts used in the 2004 SAM. The main sources for this SAM update are: (a) 2004 SAM prepared by India Development Foundation; (b) 2005-06 Household Expenditure Survey; (c) 2005-06 Labour Force Survey; and (d) National Accounts Estimates.

The detailed description of the updating of the SAM is presented in Annex 1. For modelling purposes, we use an aggregated version of the SAM that includes 29 sectors and, four factors

of production: skilled and unskilled labour, agricultural and non-agricultural capital. An important feature of the SAM is the decomposition of households into nine representative groups. Households are classified in terms of location: urban and rural, and within each of these categories into occupational classes.

### 4.3 The Structure of the SAM 2006

**Table 4.2: Basic Structure of the SAM 2006**

| | Tariff rates | Import penetration ratio | Import share | Export orientation ratio | Export share | Value-added share | Share of intermediate demand in output | Share of intermediate demand in absorption |
|---|---|---|---|---|---|---|---|---|
| PDR | 3.8 | 0 | 0 | 4.5 | 0.7 | 2.3 | 29.5 | 31.9 |
| WHT | 3.8 | 0 | 0 | 4.1 | 0.4 | 1.5 | 31.8 | 37.3 |
| OIL | 3.8 | 0 | 0 | 10.8 | 0.8 | 1.3 | 22.6 | 60 |
| COT | 0 | 0 | 0 | 2.9 | 0.1 | 0.5 | 21.6 | 77.2 |
| OGR | 4.3 | 2.9 | 0.9 | 3 | 1.2 | 6.7 | 21.6 | 41.9 |
| LIV | 5.2 | 0.3 | 0.1 | 0.1 | 0 | 4.2 | 34.8 | 22.8 |
| FOS | 5.2 | 15.1 | 0.5 | 5.3 | 0.2 | 0.8 | 9.5 | 27.4 |
| FSH | 5.2 | 0.5 | 0 | 16.3 | 0.8 | 1 | 12.2 | 7.8 |
| MIN | 5.2 | 74.8 | 25.2 | 24.6 | 3.7 | 2.8 | 16.3 | 94.2 |
| SUG | 12.4 | 3.4 | 0.1 | 6 | 0.2 | 0.1 | 96.5 | 15 |
| MFD | 16.1 | 4 | 1.4 | 4.4 | 1.9 | 2 | 81.9 | 17 |
| CTX | 12.4 | 6.3 | 0.5 | 19.7 | 2.3 | 0.7 | 72 | 62.2 |
| OTX | 12.6 | 23.1 | 1.9 | 52.4 | 8.8 | 1.2 | 71.2 | 22.5 |
| LEA | 13.6 | 12.3 | 0.2 | 17.6 | 0.5 | 0.2 | 69.9 | 73.2 |
| CHM | 11.8 | 21.3 | 11.1 | 26.5 | 16.5 | 3.9 | 82.9 | 87 |
| CEM | 0 | 0 | 0 | 4.8 | 0.2 | 0.2 | 67.1 | 123.1 |
| MET | 5.7 | 26.7 | 9.8 | 8.9 | 3.2 | 2.2 | 76.7 | 84 |
| MCH | 13.2 | 48.2 | 12.2 | 11.7 | 2.2 | 1.3 | 70.1 | 17.6 |
| ELA | 14 | 43.5 | 0.6 | 41 | 0.6 | 0.1 | 72.7 | 18.9 |
| ELE | 14 | 37.5 | 1.9 | 5.3 | 0.2 | 0.2 | 76.6 | 5.6 |
| MMN | 12.5 | 39.7 | 18.7 | 37.4 | 20.2 | 4 | 72.3 | 42.5 |
| CON | 0 | 0 | 0 | 0 | 0 | 6.8 | 58.8 | 3.2 |
| UTL | 0 | 0 | 0 | 0 | 0 | 2 | 38.3 | 77.1 |
| OTS | 7.8 | 18.4 | 5.6 | 23.1 | 9.2 | 5.8 | 33.1 | 11.8 |
| COM | 7.8 | 0.7 | 0.1 | 1 | 0.1 | 2 | 18.2 | 86.6 |
| HOT | 7.8 | 10.8 | 1.1 | 16.8 | 2.3 | 1.1 | 64.2 | 23.2 |
| INS | 7.8 | 10.9 | 0.7 | 5.9 | 0.5 | 1.3 | 22.1 | 60.9 |
| OSV | 7.8 | 21.4 | 7.4 | 22.8 | 10.6 | 7.1 | 30 | 66.1 |
| MSV | 0 | 0 | 0 | 6.3 | 12.6 | 36.7 | 15.2 | 23.4 |
| TOTAL | - | - | 100.0 | - | 100.0 | 100.0 | - | - |

Note: PDR = paddy, WHT = wheat, OIL = oilseeds, COT = cotton, OGR = other agriculture,
LIV = livestock, FOS = forestry and logging, FSH = fishing, MIN = minerals, SUG = sugar,
MFD = misc food, CTX = cotton textiles, OTX = other textiles, LEA = leather products,
CHM = misc chemicals, CEM = cement, MET = metal products,
MCH = machinery, ELA = electrical appliances, ELE = electronic equipments(incl.TV),
MMN = misc manufacturing, CON = construction, UTL = utility,
OTS = other transport services, COM = communication, HOT = hotels and restaurants,
INS = insurance, OSV = other services, MSV = misc services
The model assumes that the elasticity of substitution between capital and labour = 1.2;
the elasticity of substitution between skilled and unskilled labour = 0.8;
and the capital stock depreciation rate = 5 percent.
Import penetration ratio = ratio of imports to domestic demand;
Export orientation ratio = ratio of exports to output

The basic structure of the Indian SAM for 2006 is summarised in Table 4.2. Tariff rates vary across sectors and range from as low as 0 percent (cotton and cement) to as high as 16.1 percent (miscellaneous food). The tariff rates on paddy, wheat and oilseeds are only 3.8 percent. In general, the tariff rates on agricultural products are low compared to manufacturing products. Among the agricultural products, sugar appears to have the highest tariff rate. In the manufacturing sector, textile and clothing sub sectors exhibit higher tariff rates than other. The

highest import penetration ratio is for the minerals sector, and this sector has the highest share in imports as well. In the case of exports, 'other textiles' appears to have the highest export orientation ratio (52.4 percent).

India's export basket is fairly diversified. In the case of value addition, the service and construction sectors together account for around 63 percent of total value added in the economy. The agricultural and manufacturing sectors contribute 18 and 19 percent of the total value added respectively. The share of intermediate consumption in total demand is highest for the sugar sector.

### 4.4 Income Composition of the Households

Table 4.3: Income Composition of the Households

| Household Categories | Percentage Contributions to the Household Income from | | | | | | |
|---|---|---|---|---|---|---|---|
| | Skilled labour | Unskilled labour | Non-agricultural capital | Land | Public transfers | Remit-tances | Total |
| Rural | | | | | | | |
| Rural non-agricultural self employed | 36.7 | 12.4 | 37.5 | 0 | 12.1 | 1.3 | 100.0 |
| Rural agricultural labour | 24.7 | 65.6 | 0.1 | 0 | 8 | 1.6 | 100.0 |
| Rural other labour | 30.4 | 58.1 | 5.1 | 0 | 5.9 | 0.5 | 100.0 |
| Rural agricultural self employed | 10.1 | 20.7 | 35.1 | 21.1 | 12 | 1 | 100.0 |
| Rural other households | 10.9 | 11.7 | 61.9 | 0 | 10.9 | 4.6 | 100.0 |
| Urban | | | | | | | |
| Urban self employed | 20.3 | 20.1 | 41.7 | 0 | 10.6 | 7.3 | 100.0 |
| Urban salaried class | 64.6 | 19.5 | 3.4 | 0 | 9.1 | 3.4 | 100.0 |
| Urban casual labour | 6.5 | 77.3 | 11.3 | 0 | 3.7 | 1.2 | 100.0 |
| Urban other households | 5 | 14.5 | 51.8 | 0 | 9.5 | 19.2 | 100.0 |
| **All** | **28.7** | **26** | **26.5** | **5.2** | **10.1** | **3.5** | **100.0** |

Source: SAM 2006 for India.

The income composition of households, which is derived from SAM 2006, is presented in Table 4.3. It appears that all nine household categories receive most of their income from factor remuneration. In rural areas, agricultural labour and rural other labour households are heavily dependent on unskilled labour income. In contrast, rural non-agricultural self employed households derive incomes mostly from two sources: skilled labour and non agricultural capital. The 'rural other' households are heavily dependent on non-agricultural capital income.

In urban areas, 'casual labour' households derive more than three-fourth of their income from unskilled labour whereas the 'urban salaried class' (another household category) derives around two-third of its income from skilled labour. For 'urban other households' and 'urban self employed households' income from non-agricultural capital seems to be significant. For some household categories such as rural non-agricultural self employed households, rural agricultural self employed households, urban self employed households and urban other households, public transfer is also an important source of income. For the urban self employed households, urban other households and rural other households, remittance constitutes a notable source of their income. These considerable differences in income sources for different households are expected to generate varying income and poverty effects when different policy shocks are introduced in the model.

## 4.5 Consumption Composition of the Households

| Table 4.4: Percentage Contributions to the Household Consumption | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| | Rural Households | | | | | Urban Households | | | |
| | RH1 | RH2 | RH3 | RH4 | RH5 | UH1 | UH2 | UH3 | UH4 |
| PDR | 4.3 | 6.5 | 1.3 | 2.5 | 1.2 | 1.2 | 1.1 | 1.4 | 0.3 |
| WHT | 3.8 | 5.8 | 1.1 | 2.2 | 1.0 | 1.1 | 1.0 | 1.2 | 0.3 |
| OIL | 1.0 | 0.7 | 0.5 | 0.4 | 0.6 | 0.0 | 0.2 | 1.3 | 0.3 |
| COT | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| OGR | 5.7 | 10.8 | 20.1 | 7.3 | 12.8 | 2.9 | 3.6 | 28.7 | 9.6 |
| LIV | 10.5 | 7.1 | 10.2 | 8.6 | 7.1 | 6.3 | 5.3 | 3.6 | 4.5 |
| FOS | 2.3 | 3.1 | 0.7 | 1.4 | 0.7 | 0.5 | 0.4 | 0.5 | 0.1 |
| FSH | 2.3 | 1.1 | 0.7 | 1.3 | 0.6 | 1.3 | 1.1 | 0.8 | 0.7 |
| MIN | 0.0 | 0.1 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| SUG | 0.5 | 1.1 | 2.8 | 0.8 | 1.2 | 0.1 | 0.2 | 2.0 | 0.5 |
| MFD | 16.1 | 14.9 | 15.2 | 12.9 | 9.7 | 8.8 | 9.6 | 10.2 | 12.9 |
| CTX | 2.6 | 1.8 | 0.8 | 1.7 | 1.0 | 1.6 | 1.8 | 0.7 | 0.5 |
| OTX | 2.7 | 2.8 | 3.1 | 2.2 | 1.6 | 2.8 | 2.8 | 1.8 | 6.9 |
| LEA | 0.5 | 0.3 | 0.1 | 0.3 | 0.2 | 0.3 | 0.3 | 0.1 | 0.1 |
| CHM | 3.6 | 3.9 | 1.3 | 2.4 | 2.0 | 3.0 | 3.3 | 2.0 | 0.9 |
| CEM | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| MET | 0.6 | 0.2 | 0.2 | 0.4 | 0.3 | 0.6 | 0.6 | 0.3 | 0.1 |
| MCH | 0.3 | 0.1 | 0.1 | 0.1 | 0.0 | 0.1 | 0.0 | 0.2 | 0.2 |
| ELA | 0.1 | 0.0 | 0.0 | 0.0 | 0.0 | 0.1 | 0.0 | 0.0 | 0.0 |
| ELE | 0.3 | 0.1 | 0.1 | 0.3 | 0.0 | 0.6 | 0.2 | 0.3 | 0.3 |
| MMN | 4.9 | 4.3 | 2.3 | 3.9 | 2.7 | 3.6 | 4.4 | 2.3 | 1.7 |
| CON | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| UTL | 1.4 | 1.3 | 0.7 | 1.3 | 0.8 | 1.4 | 1.1 | 0.9 | 1.5 |
| OTS | 9.6 | 10.9 | 14.1 | 13.5 | 15.4 | 13.6 | 10.0 | 8.7 | 16.2 |
| COM | 0.3 | 0.2 | 0.2 | 0.4 | 0.3 | 0.9 | 0.8 | 0.4 | 0.3 |
| HOT | 3.2 | 2.8 | 1.5 | 3.2 | 2.2 | 4.5 | 5.2 | 2.3 | 1.6 |
| INS | 1.0 | 0.9 | 0.5 | 1.0 | 0.7 | 1.4 | 1.7 | 0.7 | 0.5 |
| OSV | 2.9 | 3.1 | 10.9 | 5.2 | 7.1 | 4.4 | 5.4 | 10.5 | 8.4 |
| MSV | 19.7 | 16.1 | 11.3 | 26.5 | 30.8 | 38.9 | 39.7 | 19.1 | 31.6 |
| TOTAL | 100.0 | 100.0 | 100.0 | 100.0 | 100.0 | 100.0 | 100.0 | 100.0 | 100.0 |
| Source: SAM 2006 of India | | | | | | | | | |

The consumption composition of households, as derived from SAM 2006, is reported in Table 4.4. It appears that, on average, agricultural commodities account for 40 percent of the consumption of households. However, this share is around 45 percent for rural households and only 30 percent for urban households. This obviously implies that shares of many non food items in urban household expenditure are higher than in rural household expenditure. For both rural agricultural labour (RH2) and rural other labour (RH3), this share is around 52 percent – much higher than even the rural average. These differences in consumption composition across household categories are expected to lead to variation in consumption effects in response to a given policy shock.

# CHAPTER 5: DESCRIPTION OF THE MODEL

## 5.1 Introduction

To assess the effects of trade policies on trade, production, factor markets and poverty in India we use a general equilibrium framework. A dynamic CGE model is constructed and is calibrated using a social accounting matrix for 2006. A representative household approach is followed and information from Household Expenditure Survey (HES) of India for 2006-07 is used to subsequently estimate poverty effects of different trade policy shocks. It is also important to mention here that initially Doha scenarios are generated using the global general equilibrium model, namely the Global Trade Analysis Project (GTAP) model. The price results obtained from the GTAP model are then introduced as shocks into the Indian dynamic CGE model. The following sections provide a description of some features of the model and the database.

## 5.2 Some Features of the Indian Dynamic CGE Model

Much of the current debate focuses on the role of growth in reducing poverty. However, a majority of CGE models used in poverty and inequality analysis are static in nature. The inability of this class of models to account for growth effects makes them inadequate for long-run analysis of poverty impacts of economic policies. They do not study accumulation effects or the transition path of an economy. Such study is important as short run policy impacts are likely to be different from those in the long-run. To overcome this limitation we use a sequential dynamic CGE model. This kind of dynamics assumes myopic behaviour by economic agents and not inter-temporal optimisation. Such dynamics can be observed through a series of static CGE models that are linked across periods through updating procedures for exogenous and endogenous variables. Capital stock is updated endogenously through a capital accumulation equation, whereas population (and total labour supply) is updated exogenously. It is also possible to add updating mechanisms for other variables such as public expenditure, transfers, technological change or debt accumulation. Annex 2 presents the set of equations used in this dynamic model. Below we present a brief description of static and dynamic aspects of the model.

### *5.2.1 Static Module*

In each sector, there is a representative firm which earns capital income and pays dividends to households as well as direct income taxes to the government. A nested structure for production is adopted. Sectoral output is a Leontief function of value added and total intermediate consumption. Value added is in turn represented by a CES function of capital and composite labour. The latter is also represented by a CES function of two labour categories: skilled labour and unskilled labour. Both labour categories are assumed to be fully mobile in the model. Capital is fully mobile only after the first year. In different production activities, it is assumed that a representative firm remunerates factors of production and pays dividends to households.

Households earn their income from production factors: skilled and unskilled labour, agricultural and non-agricultural capital. They also receive dividends, transfers from other households, government transfers and remittances, and pay direct income tax to the government. Household savings are a fixed proportion of total disposable income. Household demand is represented by a linear expenditure system (LES) derived from the maximisation of

a Stone-Geary utility function. The model includes nine household categories according to characteristics of the household head, as identified in the HES household survey. Five of these categories pertain to rural households and four to urban households. Minimal consumption levels are calibrated by using guess- estimates of income elasticity and Frisch parameters.

We assume that foreign and domestic goods are imperfect substitutes, as per the standard Armington assumption associated with a constant elasticity of substitution function (CES) between imports and domestic goods. On the supply side, producers optimally distribute their production between exports and local sales according to a constant elasticity of transformation (CET) function. Furthermore, we assume a finitely elastic export demand function that reflects the limited market power of the local producers in the world economy. In order to increase exports, local producers may decrease their free on board (FoB) prices.

The government receives direct tax revenue from households and firms and indirect tax revenue on domestic and imported goods. Its expenditure is allocated between the consumption of goods and services (including public wages) and transfers. The model accounts for indirect or direct tax compensation in the case of a tariff cut.

General equilibrium, associated with the solution of the model, is defined by equality (in each period) between supply and demand of goods and factors and the investment-saving identity. The nominal exchange rate is the numeraire in each period.

*5.2.2 Dynamic Module*

In every period capital stock is updated through a capital accumulation equation. We assume that the stocks are measured at the beginning of the period and their flows are measured at the end of the period. We use an investment demand function to determine how new investments will be distributed across different sectors. This can also be done through a capital distribution function[3]. Investment here is not by origin (product) but rather by sector of destination. The investment demand function used here is similar to those proposed by Bourguignon et al. (1989), and Jung and Thorbecke (2003). The capital accumulation rate (ratio of investment to capital stock) is increasing with respect to the ratio of the rate of return to capital and its user cost. The latter is equal to the dual price of investment times the sum of the depreciation rate and the exogenous real interest rate. The elasticity of the accumulation rate with respect to the ratio of return to capital and its user cost is assumed to be equal to two. Investment by destination is used to calibrate the sectoral capital stock in the base run.

Total labour supply is an endogenous variable, although it is assumed to simply increase at the exogenous population growth rate. Note that the minimal level of consumption in the LES function also increases (as do other nominal variables such as transfers) at the same rate. The exogenous dynamic updating of the model applies to nominal variables (that are indexed), government savings and the current account balance. The equilibrium between total savings and total investment is reached by means of an adjustment variable introduced in the investment demand function. Moreover, the government budget equilibrium is met by a neutral tax adjustment.

[3] Abbink et al (1995) use a sequential dynamic CGE model for Indonesia where total investment is distributed as a function of base year sectoral shares in total capital remuneration and sectoral profits

The model is formulated as a static model that is solved sequentially over a 30 period time horizon[4]. The model is homogenous in prices and calibrated so as to generate "steady state" paths. In the baseline all the variables are increasing at the same rate with prices remaining constant. The homogeneity test (for example, a shock on the *numéraire* – the nominal exchange rate – with "steady state" characteristics) generates the same shock in regard to prices and unchanged real values along the counterfactual path. This method is used to facilitate welfare and poverty analysis since all prices remain constant along the business-as-usual (BaU) path.

It is, however, important to note that in contrast to static CGE models, which make counterfactual analysis with respect to the base run (generally the initial SAM), a dynamic CGE model allows the economy to grow even in the absence of a shock. This scenario of the economy (absence of a shock) is termed as the BaU scenario. The counterfactual analysis of any simulation under the dynamic CGE model is, therefore, done with respect to this growth path. One of the salient features of the dynamic model is that it takes into account not only efficiency effects, as also done by static models, but also accumulation effects. The sectoral accumulation effects are linked to the ratio of the rate of return to capital stock to the cost of investment goods.

### 5.3 GTAP Model

Trade issues by nature require an analytical framework that allows a holistic view of world economies. This is not only because of the inter-linkages among various sectors in any given economy but also the relationships between sectors in one economy and the rest of the world. These national, regional and global linkages may occur either in the input or product markets or (as is usually the case) in both. Therefore, in order to avoid ignoring these linkages, a general equilibrium methodology such as the one using the GTAP model is used in this study.

The global CGE modelling framework of the GTAP (Hertel, 1997) is the best possible way to conduct *ex-ante* analysis of the economic and trade consequences of multilateral or bilateral trade agreements. The GTAP model is a comparative static model and uses a common global database for CGE analysis[5]. The study uses version 7 of the GTAP database which has 2004 as the base year. The GTAP database has been updated to 2008 by incorporating different changes in global trade scenarios occurring between 2005 and 2008.

### 5.4 Linking the Global Model with the Country Model

The Indian dynamic CGE model assumes mobility of capital and labour across sectors, and imperfect substitutability between exports and domestically produced goods resulting in domestic and export prices being non-identical. The two types of goods are related via a CET frontier. This gives individual export supply functions a marked upward slope. For each good the export price, which determines the export and domestic quantity ratio for that good, can be shocked independently and export quantities will adjust accordingly. This type of model also assumes that import prices inclusive of cost, insurance and freight (CIF) are fixed, and

[4] The model is formulated as a system of non linear equations solved simultaneously as a constrained non-linear system (CNS) with GAMS/Conopt3 solver.

[5] Full documentation of the GTAP model and the database can be found in Hertel (1997) and also in Dimaranan and McDougall (2002)

users substitute between imports and domestic goods via a CES nest, with the ease of substitution governed by an Armington elasticity. Changes in world import prices can be directly introduced into the model.

To link the global economy with the Indian one, the changes generated in world import and export prices from the GTAP model are fed into the country CGE model as external shocks. It is, however, important to note that in the GTAP framework world prices of imports and exports for any commodity are not uniquely determined. Each country or region that is an integral part of the world economy through economic linkages with other regions faces a different price. In other words, for any given commodity there are different world prices, each specific to a given region. In the Indian dynamic model, we have assumed downward sloping export demand functions for India's export items. Therefore, any changes in the world export prices for India are plugged into the export demand functions of the Indian dynamic model. The same process is repeated for imports.

# CHAPTER 6: THE IMPACTS OF AGRICULTURAL LIBERALISATION

## 6.1 Introduction

As has been mentioned in Chapter 2, agriculture remains a major area of negotiations under the Doha Round. The possible implications of agricultural liberalisation for the Indian economy and concerns regarding it have also been discussed in that chapter. In the current chapter we examine the impact of such liberalisation on the Indian economy using the dynamic CGE model for India

## 6.2 Simulation Design

Table 6.1: Price and Volume Shocks from GTAP Simulation on Doha-Agriculture

| | % Change in World Export Price | % Change in World Import Price |
|---|---|---|
| Paddy | 2.03 | 1.51 |
| Wheat | 3.23 | 0.64 |
| Oilseeds | 1.10 | 0.72 |
| Cotton | 1.14 | 0.85 |
| Other agriculture | 0.68 | 0.95 |
| Livestock | 0.31 | 0.91 |
| Forestry and logging | 0.36 | 0.15 |
| Fishing | 0.49 | 0.16 |
| Minerals | -0.98 | 0.04 |
| Sugar | 0.30 | 0.67 |
| Misc Food | 0.77 | 0.60 |
| Cotton textiles | 0.31 | 0.21 |
| Other textiles | 0.28 | 0.10 |
| Leather products | 0.24 | 0.10 |
| Misc chemicals | -0.84 | 0.04 |
| Cement | -0.39 | 0.06 |
| Metal products | 0.06 | 0.08 |
| Machinery | 0.16 | 0.05 |
| Electrical appliances | 0.13 | 0.10 |
| Misc Manufacturing | 0.17 | 0.07 |
| Other transport services | 0.08 | 0.04 |
| Communication | 0.37 | 0.02 |
| Hotels and restaurants | 0.29 | 0.07 |
| Insurance | 0.41 | 0.01 |
| Other services | 0.39 | 0.02 |

Source: GTAP Simulation Results

Using the GTAP model we simulate a moderate Doha scenario for agricultural liberalisation under which developed countries cut agricultural tariffs by 36 percent and developing countries including India cut the same by 24 percent. Furthermore, both developed and developing countries reduce domestic agricultural subsidies by 33 percent and completely eliminate agricultural export subsidies. The GTAP results for changes in world export and import prices are reported in Table 6.1. It appears from the GTAP simulation results that all agricultural sectors would experience rise in export prices and the rise is more prominent for the paddy and wheat sectors. Also, the import prices of these products increase. The interesting feature to observe from Table 6.1 is that because of the general equilibrium effect the price shock in agriculture caused by the liberalisation of agricultural sectors is transmitted to different manufacturing and services sectors in the economy. Apart from mineral and miscellaneous chemicals, all sub sectors in the manufacturing and services sectors would experience some rise in export prices. On the other hand, all sectors would face a rise in import prices.

As mentioned in Chapter 5, the price and volume changes from the GTAP model are introduced into the Indian dynamic CGE model as shocks. Also, as per stated assumptions,

reduction of tariffs on agricultural products by 24 percent is captured in the Indian dynamic CGE model. The results of the simulation conducted on this model are reported in subsequent sections.

### 6.3 Macroeconomic Effects

The macroeconomic impacts for both short run (year 2008) and long run (year 2030) are reported in Table 6.2. In addition, Figures 6.1, 6.2, 6.3, 6.4, 6.5 and 6.6 show the trends in these macro variables over the same period of time. The impacts on the macro variables illustrate the importance of analysing trade liberalisation in a dynamic framework as such analysis brings out the significant difference between long and short run changes from the business-as-usual (BaU) scenario. The impacts on GDP and welfare are positive both in the short and long run. Figure 6.1 and 6.2 respectively show the paths of percentage change in real GDP and welfare between 2008 and 2030. Figure 6.1 suggests that the rate of percentage increase in real GDP with respect to time keeps on increasing throughout this period. The corresponding statistic for welfare increase depicted by Figure 6.2 shows a constant time trend.

**Table 6.2: Macroeconomic Effects (% change from the base year value)**

| Variables | 2008 | 2030 |
|---|---|---|
| Real GDP | 0.003 | 0.04 |
| Welfare | 0.18 | 0.26 |
| Headcount Ratio | -0.16 | -0.24 |
| Imports | 0.08 | 0.09 |
| Exports | 0.11 | 0.12 |
| Urban CPI | 0.17 | 0.08 |
| Rural CPI | 0.16 | 0.07 |
| Skilled wage rate | 0.18 | 0.06 |
| Unskilled wage rate | 0.19 | 0.06 |
| Agricultural capital rental rate | 0.26 | 0.11 |
| Non-agricultural capital rental rate | 0.24 | 0.12 |

Note: Welfare is measured as the sum of individual household EVs.
Source: Author's calculations, based on simulation results.

The impact of the Doha agricultural scenario on real GDP appears to be very small. At the same time, there is a decline in head count index of poverty both in the short and long runs, with the latter effect being more prominent. The small impact on GDP can be explained by the generation of two types of opposing shocks – export price rise associated with a rise in exports and outputs of different sectors; and rise in imports, because of domestic trade liberalisation in the agricultural sectors, tending to decrease production. The net effect will depend on the relative strength of these two effects.

There are also some small but positive impacts on imports and exports in the short run and these increase further in the long run. Figure 6.3 suggests that both imports and exports would deviate positively from the BaU path in a similar fashion – there would be an increasing trend in the initial few years which would weaken a bit and get reduced to a constant time trend in the later years.

The rural and urban consumer price indices would experience some rise in the short run though the extent of rise would diminish in the long run. Figure 6.4 highlights the declining deviations of both rural and urban Consumer Price Indexes (CPIs) from the BaU path over the period under consideration.

Skilled and unskilled wage rates rise, although less so in the long run when capital is reallocated towards the expanding sectors. The rise in unskilled wage rates is somewhat larger, given the

expansion of unskilled labour–intensive agricultural sectors. Figure 6.5 suggests that percentage deviations of these two wage rates from the BaU path gradually decline over time.

The rental rate of agricultural capital increases more than the rental rate of non-agricultural capital in the short run, and these eventually decline. Figure 6.6 illustrates an interesting pattern: the former appears to have a higher growth rate than the latter during the first couple of years, then a period follows in which the inequality gets reversed, and finally towards the end of the period under consideration these growth rates become similar.

**Figure 6.1: Percentage change in GDP from the BaU Path**

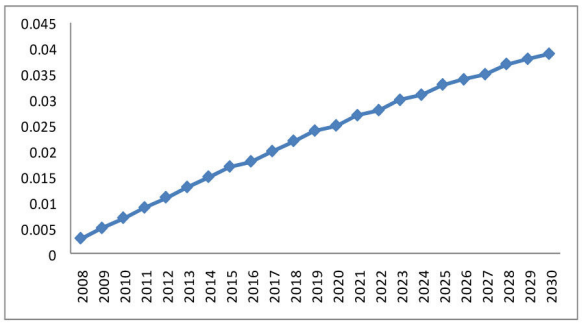



**Figure 6.2: Percentage Change in EV from the BaU Path**

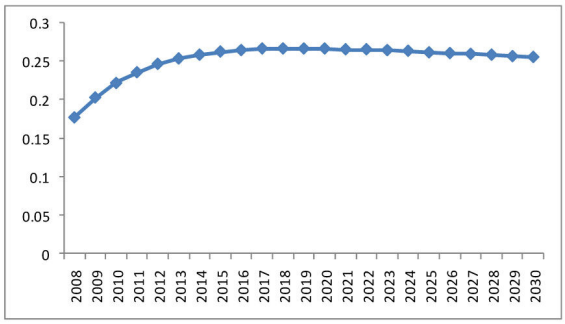



**Figure 6.3: Percentage Change in Imports and Exports from the BaU Path**

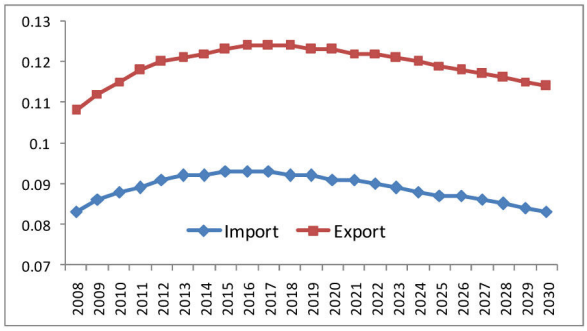



**Figure 6.4: Percentage Change in Urban CPI and Rural CPI from the BaU Path**

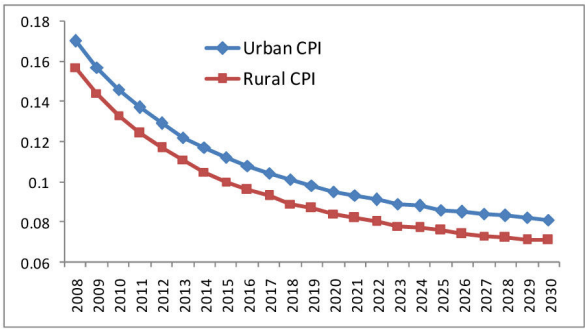



**Figure 6.5: Percentage Change in Skilled Wage Rate and Unskilled Wage Rate from the BaU Path**

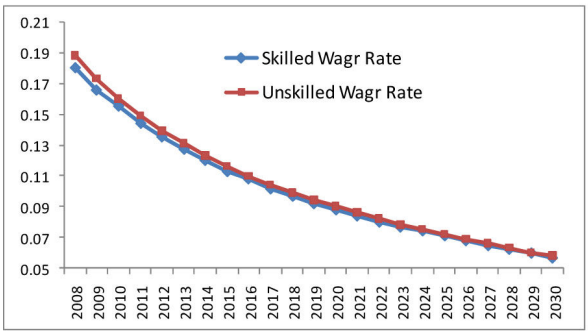
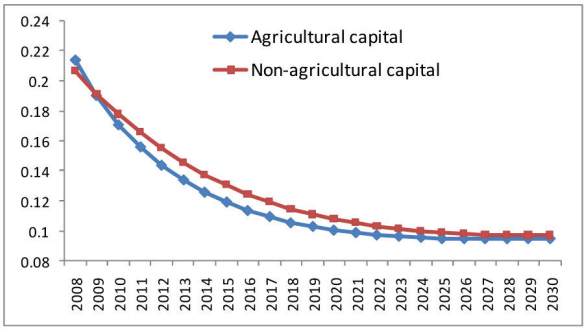



**Figure 6.6: Percentage change in Agricultural and Non-agricultural Capital Rental Rates from the BaU Path**




Source: Simulation Results

## 6.4 Sectoral Effects

| Table 6.3: Percentage Changes in Prices of Agricultural Commodities from the BaU Path | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | PM | | PD | | PV | | PX | | PQ | | PE_FOB | |
| | 2008 | 2030 | 2008 | 2030 | 2008 | 2030 | 2008 | 2030 | 2008 | 2030 | 2008 | 2030 |
| Paddy | 0.62 | 0.62 | 0.11 | -0.03 | 0.26 | 0.07 | 0.19 | 0.05 | 0.20 | 0.06 | 1.71 | 1.68 |
| Wheat | -0.24 | -0.24 | 0.08 | -0.07 | 0.30 | 0.07 | 0.19 | 0.05 | 0.15 | 0.01 | 2.69 | 2.67 |
| Oilseeds | -0.16 | -0.16 | 0.07 | -0.05 | 0.23 | 0.07 | 0.17 | 0.05 | 0.14 | 0.03 | 0.93 | 0.91 |
| Cotton | 0.00 | 0.00 | 0.15 | 0.03 | 0.26 | 0.08 | 0.17 | 0.06 | 0.23 | 0.12 | 0.96 | 0.94 |
| Other agri | -0.05 | -0.05 | 0.12 | 0.04 | 0.17 | 0.07 | 0.13 | 0.06 | 0.18 | 0.12 | 0.59 | 0.58 |
| Livestock | -0.28 | -0.28 | 0.18 | 0.08 | 0.16 | 0.07 | 0.17 | 0.08 | 0.27 | 0.19 | 0.29 | 0.28 |
| Forestry | -1.03 | -1.03 | 0.06 | 0.05 | 0.07 | 0.08 | 0.08 | 0.07 | -0.11 | -0.07 | 0.33 | 0.34 |
| Fishing | -1.02 | -1.02 | 0.14 | -0.01 | 0.22 | 0.07 | 0.19 | 0.07 | 0.22 | 0.09 | 0.43 | 0.41 |
| Sugar | -1.99 | -1.99 | 0.17 | 0.09 | 0.11 | 0.07 | 0.17 | 0.09 | 0.15 | 0.09 | 0.29 | 0.28 |
| Misc Food | -2.74 | -2.74 | 0.08 | 0.01 | 0.12 | 0.07 | 0.10 | 0.03 | -0.02 | -0.07 | 0.67 | 0.66 |

Note: PD = Domestic goods price, PV=Value-added price, PX=Aggregate output price, PQ=Price of composite goods, PE_FOB=FOB export price
Source: Author's calculations, based on simulation results.

The sectoral price and volume effects for the agricultural sectors are presented in Table 6.3 and Table 6.4. Tariff elimination leads to an immediate reduction in the domestic prices of imports of all agricultural commodities, except paddy, that is proportional to the initial sectoral tariff rates. Domestic consumers respond by increasing import demand, once again in rough proportion to the fall in import prices, with the strongest increases in sugar and miscellaneous food. As mentioned before, because of the general equilibrium effect, the manufacturing and services sub-sectors are also affected. The results for these sectors are reported in Annex 3.

| Table 6.4: Percentage Changes in Volumes of Agricultural Commodities from the BaU Path | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | M | | X | | E | | Q | | D | |
| | 2008 | 2030 | 2008 | 2030 | 2008 | 2030 | 2008 | 2030 | 2008 | 2030 |
| Paddy | -0.74 | -0.95 | 0.17 | 0.18 | 3.24 | 3.45 | 0.02 | 0.00 | 0.01 | 0.00 |
| Wheat | 0.49 | 0.26 | 0.24 | 0.26 | 5.34 | 5.58 | 0.02 | 0.00 | 0.00 | -0.01 |
| Oilseeds | 0.30 | 0.09 | 0.11 | 0.12 | 1.68 | 1.85 | -0.06 | -0.07 | -0.10 | -0.11 |
| Cotton | 0.00 | 0.00 | 0.15 | 0.25 | 1.76 | 2.03 | 0.10 | 0.20 | 0.10 | 0.20 |
| Other agri | 0.24 | 0.11 | -0.02 | -0.03 | 0.92 | 1.02 | -0.03 | -0.02 | -0.04 | -0.06 |
| Livestock | 0.66 | 0.51 | -0.04 | -0.05 | 0.19 | 0.30 | -0.02 | -0.04 | -0.04 | -0.05 |
| Forestry | 1.43 | 1.04 | -0.28 | -0.31 | 0.31 | 0.40 | 0.02 | 0.01 | -0.31 | -0.34 |
| Fishing | 1.75 | 1.41 | 0.08 | 0.11 | 0.57 | 0.77 | -0.01 | -0.02 | -0.02 | -0.03 |
| Sugar | 3.21 | 3.06 | -0.17 | -0.18 | 0.07 | 0.16 | -0.02 | -0.01 | -0.03 | -0.20 |
| Misc Food | 4.21 | 4.08 | -0.19 | -0.20 | 0.99 | 1.06 | 0.00 | -0.06 | -0.15 | -0.26 |

Note: M =Imports, X=Domestic Sales, E=Exports, Q= composite goods, D=Domestic Sales.
Source: Author's calculations, based on simulation results.

It appears that since only the agricultural sub-sectors have been liberalised, the protection on the non-agricultural sectors makes these sectors profitable for increased investment. The current account balance is fixed in the short run and subsequently increases at a fixed rate. Thus, the increase in imports leads to a real devaluation and an increase in exports. The export response is generally smaller in the long run. With negatively sloping demand curves for exports and rising world prices of exports, FoB export prices rise. It also appears from Annex 3 that except for miscellaneous chemicals and cement, FoB export prices would rise for all other manufacturing and services sectors.

As a result of the rise in export demand, sectoral outputs deviate positively in paddy, wheat, oilseeds and cotton sectors in the short run as well as the long run from the BaU path, with the deviation being higher in the latter. Figure 6.7 suggests an increasing trend in production of cotton during the period under consideration. All other agricultural sectors would however experience fall in production despite their export demand also rising. It is due to an increase in imports as a result of tariff liberalisation in these sectors. The impacts on the manufacturing and services sectors are reported in Annex 3. It appears that in terms of production, the impacts on most of the manufacturing and services sub-sectors are minimal.

**Table 6.5: Percentage Changes in demand for Labor and Capital and Investment In the Agricultural Sectors from the BaU Path**

| | SKL | | USKL | | K | | I | |
|---|---|---|---|---|---|---|---|---|
| | 2008 | 2030 | 2008 | 2030 | 2008 | 2030 | 2008 | 2030 |
| Paddy | 0.25 | 0.18 | 0.24 | 0.18 | 0.10 | 0.15 | 0.51 | 0.12 |
| Wheat | 0.36 | 0.26 | 0.35 | 0.25 | 0.13 | 0.23 | 0.74 | 0.19 |
| Oilseeds | 0.20 | 0.17 | 0.19 | 0.17 | 0.08 | 0.14 | 0.43 | 0.11 |
| Cotton | 0.22 | 0.29 | 0.21 | 0.29 | 0.07 | 0.25 | 0.48 | 0.24 |
| Other agri | 0.01 | 0.01 | 0.00 | 0.01 | 0.01 | -0.02 | 0.05 | -0.06 |
| Livestock | -0.03 | -0.03 | -0.04 | -0.03 | 0.00 | -0.06 | -0.03 | -0.09 |
| Forestry | -0.28 | -0.20 | -0.29 | -0.20 | -0.09 | -0.23 | -0.51 | -0.26 |
| Fishing | 0.12 | 0.13 | 0.11 | 0.13 | 0.05 | 0.10 | 0.28 | 0.07 |
| Sugar | -0.16 | -0.10 | -0.17 | -0.11 | -0.05 | -0.13 | -0.27 | -0.16 |
| Misc Food | -0.16 | -0.11 | -0.17 | -0.11 | -0.05 | -0.14 | -0.28 | -0.17 |

Note: SKL =Skilled Labour, USKL= Unskilled Labour, K=Capital, I= Investment.
Source: Author's calculations, based on simulation results.

As the four major agricultural sectors (paddy, wheat, oil seeds and cotton) expand they also attract increased investment. In the short run, the highest percentage rise in investment is observed in the wheat sector followed by the paddy sector (Table 6.5). However, in the long run the percentage deviation of investment from the BaU path appears to be lessened. Because of increased investment in those four agricultural sectors, resources are also reallocated from other contracting sectors to these sectors. Annex 3 suggests that sub-sectors in the manufacturing and services sectors enjoying high protection (it should be remembered that under this simulation the manufacturing and services sectors have not been liberalised) should also experience increased investment both in the short and long run.

**Figure 6.7: Percentage change in Production from the BaU Path**

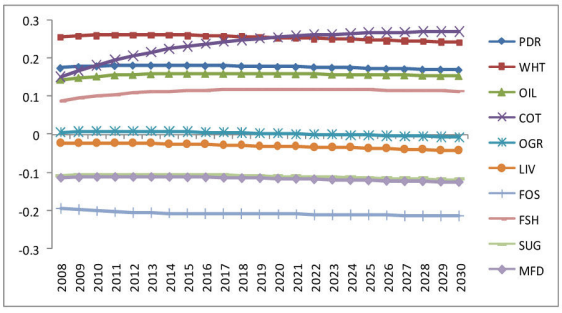



**Figure 6.8: Percentage Change in Exports from the BaU Path**

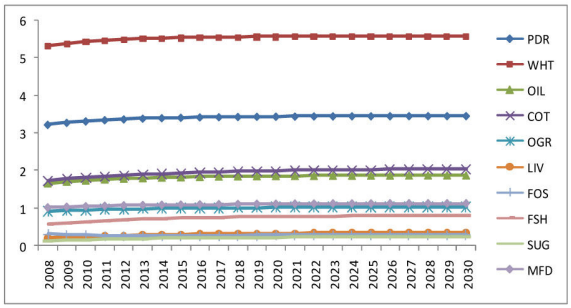



**Figure 6.9: Percentage Change in Imports from the BaU Path**

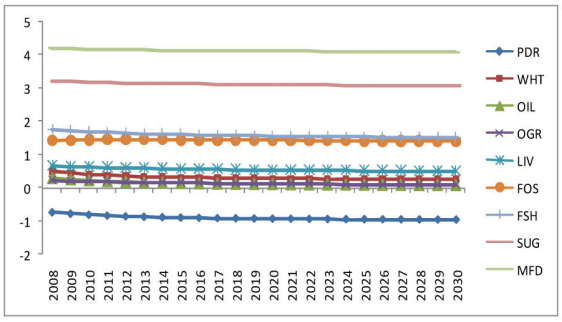
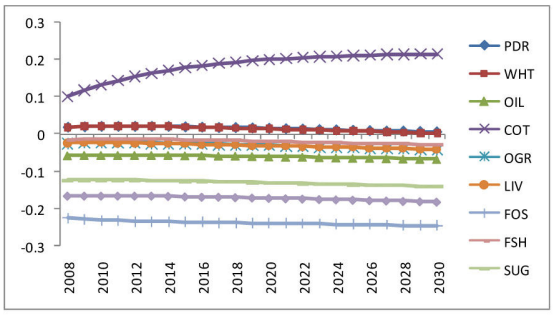



**Figure 6.10: Percentage Change in Domestic Sales from the BaU Path**




Source: Simulation Results

## 6.5 Welfare Effects

**Table 6.6: Income and Welfare Effects (percentage change from BaU path)**

| Variables | Period | Rural | | | | | Urban | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | | RH1 | RH2 | RH3 | RH4 | RH5 | UH1 | UH2 | UH3 | UH4 |
| Income | 2008 | 0.19 | 0.17 | 0.18 | 0.11 | 0.20 | 0.18 | 0.17 | 0.18 | 0.17 |
| | 2030 | 0.10 | 0.07 | 0.08 | 0.00 | 0.11 | 0.10 | 0.08 | 0.08 | 0.10 |
| CPI | 2008 | 0.15 | 0.14 | 0.16 | 0.16 | 0.18 | 0.18 | 0.18 | 0.17 | 0.18 |
| | 2030 | 0.07 | 0.07 | 0.09 | 0.09 | 0.10 | 0.10 | 0.10 | 0.09 | 0.10 |
| EV | 2008 | 0.12 | 0.25 | 0.25 | 0.17 | 0.13 | 0.16 | 0.19 | 0.18 | 0.14 |
| | 2030 | 0.22 | 0.40 | 0.40 | 0.25 | 0.23 | 0.25 | 0.26 | 0.27 | 0.23 |

RH1 = rural non-agricultural self employed, RH2 = rural agricultural labour,
RH3 = rural other labour, RH4 = rural agricultural self employed,
RH5 = rural other households
UH1 = urban self employed, UH2 = urban salaried class,
UH3 = urban casual labour, UH4 = urban other households
Source: Authors' calculations, based on simulation results

Under this scenario, a rise in nominal income for all households is observed in both the short run and the long run (see Table 6.6). This rise is largest among RH5 (rural other households) as these households derive substantial income from land, and the rate of return on land increases more than the rate of return on any other factor of production (see Table 6.2). However, the rate of change in CPI is also high for this category of households. Both in the short and long run, real consumption increases for all households as nominal income rises more than consumer prices. All the household categories also experience rise in welfare both in the short and long run and the RH2 (rural agricultural labour) and RH3 (rural other labour) emerge as the biggest winners.

### 6.6 Poverty Effects

FGT poverty indices (Foster, Greer, and Thorbecke 1984) are used to evaluate the impacts of the simulation on the poverty profiles of the nine representative household groups (see Table 6.7). The variations in consumption of each household group emerging from the simulation are applied to data from the Indian household survey to generate new consumption vectors for individual household categories. The FGT indices allow comparison of three measures of poverty: headcount ratio; poverty gap index, and squared poverty gap index. To estimate these three indexes, a poverty line is first defined. The poverty line is the minimum income that is required to maintain a subsistence level of consumption. The first indicator, the headcount ratio, is the proportion of the population with a per capita income below the poverty line. This is the simplest measure of poverty. The second indicator, the poverty gap, measures the depth of poverty as the average distance separating the income of poor households from the poverty line. The final indicator, the squared poverty gap index, measures the severity of poverty, taking account of the inequality of income distribution among the poor. Two different poverty lines for rural and urban households are used, which are endogenously determined by the model taking into account the rural and urban CPIs. Changes in poverty indices are determined by changes in the poverty line and changes in nominal consumption (or income). The poverty effects of the simulation are reported in Table 6.7.

**Table 6.7: Poverty Effects (percentage point change from the BaU Poverty Levels)**

| Poverty Index | Period | Rural | | | | | Urban | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | | RH1 | RH2 | RH3 | RH4 | RH5 | UH1 | UH2 | UH3 | UH4 |
| P0 | 2008 | -0.12 | -0.21 | -0.29 | -0.22 | -0.12 | -0.08 | -0.09 | -0.14 | -0.17 |
| | 2030 | -0.27 | -0.35 | -0.39 | -0.28 | -0.19 | -0.13 | -0.16 | -0.21 | -0.25 |
| P1 | 2008 | -0.13 | -0.29 | -0.10 | -0.21 | -0.16 | -0.16 | -0.24 | -0.13 | -0.12 |
| | 2030 | -0.21 | -0.36 | -0.11 | -0.28 | -0.20 | -0.24 | -0.27 | -0.19 | -0.18 |
| P2 | 2008 | -0.18 | -0.28 | -0.23 | -0.20 | -0.21 | -0.19 | -0.15 | -0.19 | -0.15 |
| | 2030 | -0.15 | -0.33 | -0.29 | -0.27 | -0.28 | -0.26 | -0.27 | -0.26 | -0.19 |

P0 = Head count poverty, P1 = poverty gap, P2 = poverty gap squared
RH1 = rural non-agricultural self employed, RH2 = rural agricultural labour,
RH3 = rural other labour, RH4 = rural agricultural self employed,
RH5 = rural other households
UH1 = urban self employed, UH2 = urban salaried class,
UH3 = urban casual labour, UH4 = urban other households
Source: Authors' calculations, based on simulation results.

In the short run, head-count poverty declines for all households. Also the depth of poverty (P1 – poverty gap) and the severity of poverty (P2 – poverty gap squared) decrease in the short run and even further in the long run. Poverty indices fall more for the poorer households. It suggests that accumulation effects captured by the model play a major role in alleviating poverty.

# CHAPTER 7: THE IMPACTS OF NAMA

## 7.1 Introduction

| Table 7.1: Price and Volume Shocks from GTAP Simulation on Doha-Agriculture | | |
|---|---|---|
| | % Change in World Export Price | % Change in World Import Price |
| Paddy | -0.17 | 0.27 |
| Wheat | -0.13 | 0.16 |
| Oilseeds | -0.11 | 0.20 |
| Cotton | 0.40 | 0.02 |
| Other agriculture | -0.05 | 0.13 |
| Livestock | -0.03 | 0.07 |
| Forestry and logging | 0.06 | 0.26 |
| Fishing | -0.07 | 0.01 |
| Minerals | -0.04 | 0.03 |
| Sugar | -0.09 | 0.18 |
| Misc Food | -0.13 | 0.07 |
| Cotton textiles | -0.15 | -0.16 |
| Other textiles | -0.17 | -0.29 |
| Leather products | -0.23 | -0.18 |
| Misc chemicals | -0.35 | -0.03 |
| Cement | -0.14 | -0.01 |
| Metal products | -0.74 | 0.00 |
| Machinery | -1.00 | -0.11 |
| Electrical appliances | -0.86 | -0.09 |
| Misc Manufacturing | -0.53 | -0.05 |
| Other transport services | -0.18 | -0.04 |
| Communication | -0.02 | -0.06 |
| Hotels and restaurants | -0.26 | -0.08 |
| Insurance | -0.01 | -0.11 |
| Other services | -0.02 | -0.08 |
| Source: GTAP Simulation Results | | |

There are many concerns with respect to the possible implications of multilateral liberalisation in the non-agricultural sector for the Indian economy. In the current chapter, we examine the impact of such liberalisation on the Indian economy using the dynamic CGE model for India.

Using the GTAP model we simulate a moderate Doha-NAMA scenario in which developed countries cut industrial tariffs by 36 percent whereas developing countries, including India, cut these tariffs by 24 percent. The GTAP simulation results for the NAMA scenario are presented in Table 7.1. It appears that because of the tariff cut on non-agricultural commodities all the industrial commodities experience fall in world export prices. The highest fall in export price is observed for the machinery sub-sector. Also, because of sectoral inter-linkages the export prices of agricultural and services sub-sectors also decline. On the other hand, import prices of all manufacturing commodities decline whereas those of agricultural ones increase. The largest fall in import prices is observed in the 'other textiles' sector.

The price and volume results from the GTAP model are introduced into the Indian dynamic CGE model as shocks. As per our assumptions, tariffs on manufacturing products are reduced by 24 percent in the Indian dynamic CGE model. The results of the simulations incorporating these changes of the dynamic CGE model for India are reported in the subsequent sections.

### 7.2 Macroeconomic Effects

**Table 7.2: Macroeconomic Effects (% change from the base year value)**

| Variables | 2008 | 2030 |
|---|---|---|
| Real GDP | 0.04 | 0.16 |
| Welfare | -0.14 | -0.02 |
| Headcount Ratio | 0.22 | 0.12 |
| Imports | 0.53 | 0.58 |
| Exports | 0.93 | 0.99 |
| Urban CPI | -0.76 | -0.75 |
| Rural CPI | -0.74 | -0.72 |
| Skilled wage rate | -0.86 | -0.68 |
| Unskilled wage rate | -0.91 | -0.71 |
| Agricultural capital rental rate | -0.97 | -1.09 |
| Non-agricultural capital rental rate | -1.13 | -1.10 |

Note: Welfare is measured as the sum of individual household equivalent variations.
Source: Authors' calculations, based on simulation results.

The macroeconomic effects of the NAMA simulation are reported in Table 7.2. The NAMA scenario would lead to a rise in real GDP. However, aggregate welfare would fall both in the short and long run. This can be attributed to factor returns falling more than the fall in CPI both in rural and urban areas. The negative effect on welfare, however, appears to be less prominent in the long run. It appears that imports and export would experience some positive growth both in the short and long run and the growth in exports would be higher than that of imports.

Contrary to the agricultural liberalisation scenario (see Chapter 6), CPIs, both in the rural and urban areas, would fall, though to a lesser effect in the long run. All the factor returns would also experience negative growth, the highest decline occurring in the rental rate of non-agricultural capital. Figures 7.1-7.6 show the trend path of the percentage deviation in the macro variables from the BaU path

**Figure 7.1: Percentage change in GDP from the BaU Path**

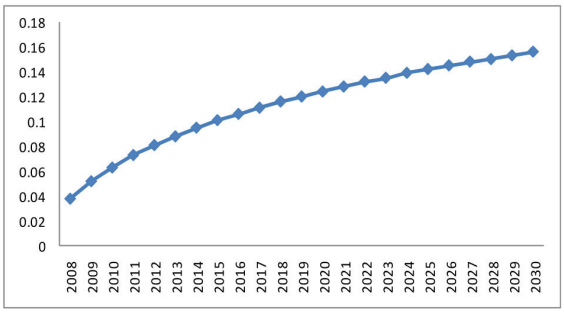



**Figure 7.2: Percentage Change in EV from the BaU Path**

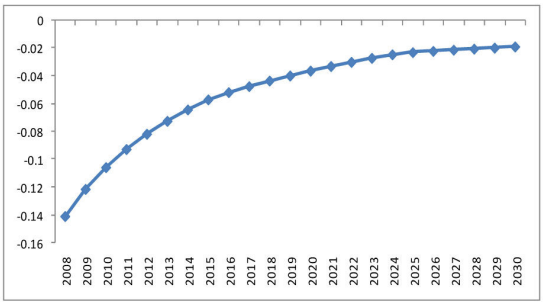



**Figure 7.3: Percentage Change in Imports and Exports from the BaU Path**

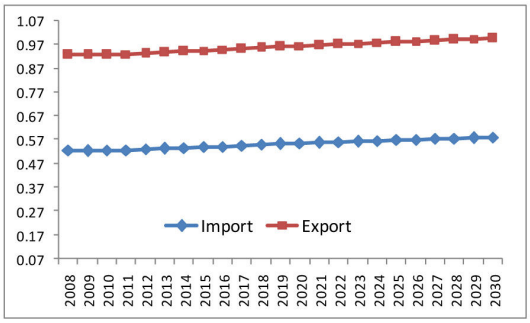



**Figure 7.4: Percentage Change in Urban CPI and Rural CPI from the BaU Path**

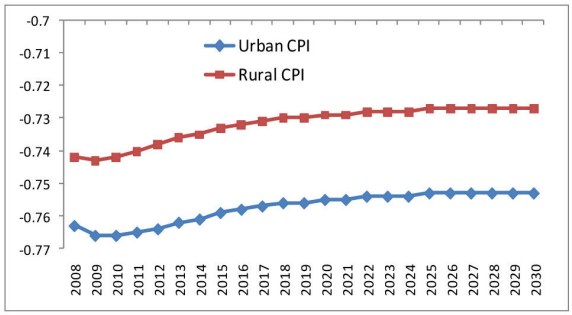



**Figure 7.5: Percentage Change in Skilled Wage Rate and Unskilled Wage Rate from the BaU Path**

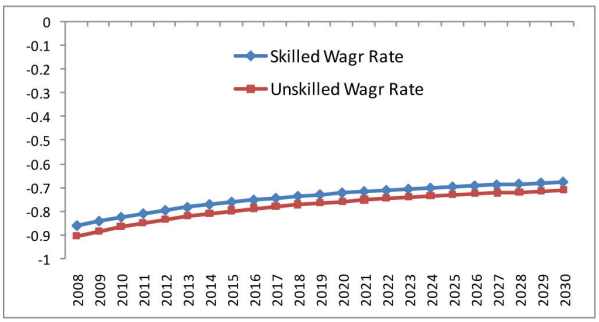
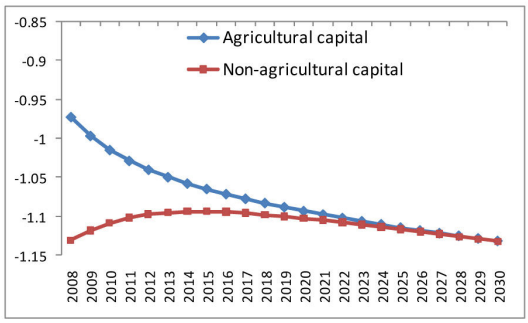



**Figure 7.6: Percentage change in Agricultural and Non-agricultural Capital Rental Rates from the BaU Path**




## 7.3 Sectoral Effects

The effects on the manufacturing sub-sectors are presented in Table 7.3 and 7.4. Annex 5 presents the full results of the NAMA simulations. Tariff elimination leads to an immediate reduction in the domestic prices of imports of manufacturing goods that is proportional to the initial sectoral tariff rates. Because of the fall in import prices, the domestic prices also fall. Sectors with high initial tariff rates register large import growth in the short run as consumers substitute toward goods for which prices drop more dramatically. In the long run, import volumes grow more in all manufacturing sectors. Thus, the increase in imports leads to a real devaluation and an increase in exports. The export response is the greatest for the textile and leather sectors though some other sectors like metal, machinery and electrical goods experience negative growth in exports. The export growth effect is generally larger in the long run. With a negatively sloping demand curve for exports, FoB export prices fall.

| Table 7.3: Percentage Changes in Prices of Non-agricultural Commodities from the BaU Path | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | PM | | PD | | PV | | PX | | PQ | | PE_FOB | |
| | SR | LR | SR | LR | SR | LR | SR | LR | SR | LR | SR | LR |
| Cotton textiles | -2.44 | -2.44 | -0.85 | -0.90 | -0.79 | -0.91 | -0.73 | -0.78 | -0.75 | -0.80 | -0.27 | -0.29 |
| Other textiles | -2.97 | -2.97 | -1.37 | -1.49 | -0.65 | -0.87 | -0.81 | -0.89 | -1.54 | -1.64 | -0.33 | -0.36 |
| Leather product | -3.04 | -3.04 | -1.30 | -1.22 | -0.94 | -0.85 | -1.13 | -1.07 | -1.31 | -1.25 | -0.38 | -0.37 |
| Misc chemicals | -2.57 | -2.57 | -0.74 | -0.60 | -1.62 | -1.04 | -0.64 | -0.53 | -0.93 | -0.83 | -0.36 | -0.34 |
| Cement | 0.00 | 0.00 | -0.71 | -0.74 | -1.03 | -1.02 | -0.69 | -0.72 | -0.51 | -0.54 | -0.22 | -0.23 |
| Metal products | -1.29 | -1.29 | -0.81 | -0.68 | -1.42 | -0.99 | -0.80 | -0.68 | -0.74 | -0.64 | -0.71 | -0.68 |
| Machinery | -2.91 | -2.91 | -1.06 | -0.87 | -1.40 | -0.95 | -1.05 | -0.87 | -1.76 | -1.67 | -0.95 | -0.91 |
| Electrical goods | -3.04 | -3.04 | -1.07 | -0.86 | -1.34 | -0.97 | -0.98 | -0.83 | -1.74 | -1.62 | -0.84 | -0.79 |
| Electronic equip | -3.04 | -3.04 | -1.17 | -1.02 | -1.42 | -1.01 | -1.15 | -1.01 | -1.68 | -1.59 | -0.87 | -0.85 |
| Misc Manufac | -2.72 | -2.72 | -1.16 | -1.01 | -1.18 | -0.94 | -0.94 | -0.84 | -1.58 | -1.50 | -0.57 | -0.54 |

Note: PD = Domestic goods price, PV=Value-added price, PX=Aggregate output price, PQ=Price of composite goods, PE_FOB=FOB export price.
Source: Author's calculations, based on simulation results.

| Table 7.4: Percentage Changes in Volumes of Non-agricultural Commodities from the BaU Path | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | M | | X | | E | | Q | | D | |
| | SR | LR | SR | LR | SR | LR | SR | LR | SR | LR |
| Cotton textiles | 2.48 | 2.60 | 0.26 | 0.45 | 1.20 | 1.44 | 0.17 | 0.36 | 0.02 | 0.21 |
| Other textiles | 1.95 | 1.95 | 0.62 | 0.88 | 1.61 | 1.97 | 0.05 | 0.19 | -0.52 | -0.33 |
| Leather product | 2.33 | 2.47 | -0.04 | -0.05 | 1.50 | 1.38 | -0.04 | 0.00 | -0.37 | -0.35 |
| Misc chemicals | 2.16 | 2.39 | -0.46 | -0.51 | 0.10 | 0.13 | -0.06 | -0.01 | -0.66 | -0.65 |
| Cement | 0.00 | 0.00 | -0.19 | -0.11 | 0.76 | 0.88 | -0.24 | -0.16 | -0.24 | -0.16 |
| Metal products | 0.20 | 0.31 | -0.50 | -0.62 | -0.31 | -0.62 | -0.33 | -0.37 | -0.52 | -0.62 |
| Machinery | 2.17 | 2.37 | -0.66 | -0.78 | -0.46 | -0.86 | 0.69 | 0.74 | -0.68 | -0.77 |
| Electrical goods | 2.34 | 2.56 | -0.52 | -0.76 | -0.23 | -0.68 | 0.62 | 0.65 | -0.70 | -0.81 |
| Electronic equip | 2.46 | 2.67 | -0.41 | -0.45 | 0.15 | 0.13 | 0.65 | 0.70 | -0.44 | -0.47 |
| Misc Manufac | 1.63 | 1.82 | -0.34 | -0.45 | 0.41 | 0.14 | 0.18 | 0.24 | -0.77 | -0.80 |

Note: M =Imports, X=Domestic Sales, E=Exports, Q= composite goods, D=Domestic Sales.
Source: Author's calculations, based on simulation results.
Source: Author's calculations, based on simulation results.

Because of increased flow of imports, output shrinks in most manufacturing sectors except cotton textile and 'other textiles'. Under such a scenario, only two manufacturing sectors expand: cotton textile and 'other textiles'. Though the leather sector experiences a slight fall in production, its exports rise as a result of decreased domestic sales of leather products. The largest percentage fall in production in the manufacturing sector appears to be in the machinery sub-sector followed by electrical goods. The effects on production (either positive or negative) are more prominent in the long run. Annex 5 points out the gainers in this scenario among the agricultural and services sub sectors: cotton, oilseeds, transport services and other services.

| Table 7.5: Percentage Changes in demand for Labor and Capital and Investment In the Non-Agricultural Sectors from the BaU Path | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| | SKL | | USKL | | K | | I | |
| | 2008 | 2030 | 2008 | 2030 | 2008 | 2030 | 2008 | 2030 |
| Cotton textiles | 0.31 | 0.30 | 0.36 | 0.33 | 0.19 | 0.67 | 1.25 | 0.74 |
| Other textiles | 0.79 | 0.76 | 0.84 | 0.80 | 0.36 | 1.13 | 2.20 | 1.22 |
| Leather product | -0.11 | -0.17 | -0.06 | -0.13 | 0.07 | 0.21 | 0.39 | 0.26 |
| Misc chemicals | -1.07 | -0.77 | -1.02 | -0.73 | -0.33 | -0.40 | -1.43 | -0.33 |
| Cement | -0.33 | -0.36 | -0.28 | -0.32 | -0.15 | 0.02 | 0.16 | 0.08 |
| Metal products | -0.96 | -0.83 | -0.91 | -0.79 | -0.26 | -0.46 | -1.25 | -0.40 |
| Machinery | -1.10 | -0.95 | -1.05 | -0.92 | -0.31 | -0.59 | -1.53 | -0.51 |
| Electrical goods | -0.90 | -0.95 | -0.85 | -0.91 | -0.19 | -0.58 | -1.22 | -0.52 |
| Electronic equip | -0.87 | -0.68 | -0.81 | -0.65 | -0.26 | -0.32 | -1.02 | -0.24 |
| Misc Manufac | -0.59 | -0.62 | -0.54 | -0.58 | -0.09 | -0.24 | -0.61 | -0.18 |

Note: SKL = Skilled labour, USKL = Unskilled Labour, K = Capital, I = Investment
Source: Author's calculations, based on simulation results.

As a result of the expansion of the textile sector, non-agricultural capital and labour migrate to this sector and away from the other manufacturing sectors. There is relatively little movement in the agricultural and services sectors. In the long run, the response in the level of non-agricultural capital stock is much larger, tempering the reallocation of skilled and unskilled

labour. Investment in the textile sector also increases though the percentage rise peters out in the long run. The average returns to capital fall slightly more in the non-agricultural sector than in the agricultural sector, although these rates converge after long-term adjustment in sectoral investment rates (see Figure 7.6).

### 7.4 Welfare Effects

Table 7.6: Income and Welfare Effects (percentage change from BaU path)

| Variable | Period | Rural | | | | | Urban | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | | RH1 | RH2 | RH3 | RH4 | RH5 | UH1 | UH2 | UH3 | UH4 |
| Income | 2008 | -0.92 | -0.88 | -0.90 | -0.90 | -0.93 | -0.88 | -0.86 | -0.91 | -0.78 |
| | 2030 | -0.81 | -0.75 | -0.76 | -0.78 | -0.82 | -0.77 | -0.76 | -0.77 | -0.76 |
| CPI | 2008 | -0.76 | -0.75 | -0.71 | -0.74 | -0.73 | -0.77 | -0.77 | -0.72 | -0.76 |
| | 2030 | -0.74 | -0.73 | -0.70 | -0.73 | -0.72 | -0.76 | -0.73 | -0.71 | -0.69 |
| EV | 2008 | -0.16 | -0.14 | -0.19 | -0.16 | -0.21 | -0.12 | -0.09 | -0.19 | -0.03 |
| | 2030 | -0.03 | -0.02 | -0.01 | -0.02 | -0.08 | -0.02 | -0.02 | -0.07 | -0.01 |

RH1 = rural non-agricultural self employed, RH2 = rural agricultural labour,
RH3 = rural other labour, RH4 = rural agricultural self employed,
RH5 = rural other households
UH1 = urban self employed, UH2 = urban salaried class,
UH3 = urban casual labour, UH4 = urban other households
Source: Authors' calculations, based on simulation results.

Under the NAMA scenario, a fall in nominal income is observed in all household categories in both the short run and the long run (see Table 7.6). This reduction is the highest among RH5 (rural other households) and smallest among UH4 (urban other households). There are also reductions in the consumer price indices facing all household categories. However, in all categories, the fall in nominal income offsets that in CPI resulting in a decline in real consumption. Welfare changes are also in line with changes in real consumption. The worst sufferers are RH5 (rural other labour) in rural areas and UH3 (urban casual labour) in urban areas. Negative welfare effects in the long run are smaller than those in the short run.

### 7.5 Poverty Effects

The poverty effects of the NAMA scenario are presented in Table 7.7. All household categories experience rise in head-count poverty both in the short and long runs, though the long run effects are smaller than short run effects. In the rural areas, RH5 (Rural other households) and in the urban areas, UH3 (urban casual labour) experience the largest rise in head count index of poverty. For all household categories, poverty gap and poverty depth (P2) also increase and again RH5 and UH3 are the worst sufferers in rural and urban areas respectively.

Table 7.7: Poverty Effects (percentage point change from the BaU Poverty Levels)

| Poverty Index | Period | Rural | | | | | Urban | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | | RH1 | RH2 | RH3 | RH4 | RH5 | UH1 | UH2 | UH3 | UH4 |
| P0 | 2008 | 0.22 | 0.29 | 0.23 | 0.16 | 0.32 | 0.11 | 0.13 | 0.21 | 0.17 |
| | 2030 | 0.10 | 0.17 | 0.18 | 0.10 | 0.24 | 0.07 | 0.07 | 0.14 | 0.12 |
| P1 | 2008 | 0.17 | 0.21 | 0.23 | 0.17 | 0.30 | 0.20 | 0.15 | 0.22 | 0.16 |
| | 2030 | 0.11 | 0.13 | 0.17 | 0.13 | 0.19 | 0.13 | 0.10 | 0.20 | 0.11 |
| P2 | 2008 | 0.17 | 0.15 | 0.22 | 0.23 | 0.24 | 0.18 | 0.16 | 0.22 | 0.17 |
| | 2030 | 0.15 | 0.13 | 0.17 | 0.17 | 0.19 | 0.12 | 0.12 | 0.14 | 0.11 |

P0 = Head count poverty, P1 = poverty gap, P2 = poverty gap squared
RH1 = rural non-agricultural self employed, RH2 = rural agricultural labour,
RH3 = rural other labour, RH4 = rural agricultural self employed,
RH5 = rural other households
UH1 = urban self employed, UH2 = urban salaried class,
UH3 = urban casual labour, UH4 = urban other households
Source: Authors' calculations, based on simulation results.

# CHAPTER 8: THE IMPACT OF FULL DOHA SCENARIO

## 8.1 Introduction

The discussions in Chapter 6 and 7 suggest that agricultural trade liberalisation under the Doha round would be beneficial whereas the NAMA scenario would have negative impact on poverty and welfare in the context of the Indian economy. However, it should be mentioned here that under the WTO's Doha round of negotiations agricultural and NAMA liberalisation would be executed under a single undertaking. Therefore, it is more plausible to examine the joint effects of these two scenarios on the Indian economy. This is the exercise carried out in this chapter through the dynamic CGE model for India.

## 8.2 Simulation Design

Table 8.1: Price and Volume Shocks from GTAP Simulation on Doha-Agriculture

| | % Change in World Export Price | % Change in World Import Price |
|---|---|---|
| Paddy | 1.76 | 1.86 |
| Wheat | 0.79 | 3.09 |
| Oilseeds | 0.92 | 0.98 |
| Cotton | 0.87 | 1.54 |
| Other agriculture | 1.08 | 0.62 |
| Livestock | 0.98 | 0.27 |
| Forestry and logging | 0.41 | 0.41 |
| Fishing | 0.18 | 0.41 |
| Minerals | 0.07 | -1.01 |
| Sugar | 0.85 | 0.2 |
| Misc Food | 0.67 | 0.64 |
| Cotton textiles | 0.04 | 0.15 |
| Other textiles | -0.20 | 0.10 |
| Leather products | -0.08 | 0.00 |
| Misc chemicals | 0.01 | -1.18 |
| Cement | 0.05 | -0.53 |
| Metal products | 0.08 | -0.68 |
| Machinery | -0.06 | -0.85 |
| Electrical appliances | 0.01 | -0.73 |
| Misc Manufacturing | 0.02 | -0.35 |
| Other transport services | -0.01 | -0.1 |
| Communication | -0.02 | -0.21 |
| Hotels and restaurants | 0.00 | -0.10 |
| Insurance | -0.03 | 0.34 |
| Other services | -0.02 | 0.02 |

Source: GTAP Simulation Results

Using the GTAP model we simulate a moderate Doha scenario in which developed countries cut their agricultural and industrial tariffs by 36 percent whereas developing countries, including India, cut these tariffs by 24 percent. In addition, both developed and developing countries reduce domestic agricultural subsidies by 33 percent and completely eliminate agricultural export subsidies.

The GTAP simulation results for the Doha scenario are presented in Table 8.1. It appears that all agricultural prices would rise in the world market. The changes in export prices would be smaller than under the NAMA scenario, because of the combined and countervailing effects of agriculture and NAMA liberalisation replacing the solitary effect of NAMA liberalisation (see Table 7.1). In contrast, the import price changes are relatively higher than under the NAMA scenario.

Finally, the price and volume changes from the GTAP model are introduced into the Indian dynamic CGE model as shocks. The assumption of reduction of Indian tariffs across the board by 24 percent is also introduced in the Indian dynamic CGE model to conduct simulations. Simulation results are reported in the subsequent sections.

### 8.3 Macroeconomic Effects

**Table 8.2: Macroeconomic Effects (% change from the base year value)**

| Variables | 2008 | 2030 |
|---|---|---|
| Real GDP | 0.04 | 0.11 |
| Welfare | -0.19 | -0.01 |
| Headcount Ratio | 0.05 | 0.01 |
| Imports | 0.61 | 0.67 |
| Exports | 1.04 | 1.11 |
| Urban CPI | -0.59 | -0.67 |
| Rural CPI | -0.58 | -0.65 |
| Skilled wage rate | -0.68 | -0.62 |
| Unskilled wage rate | -0.72 | -0.65 |
| Agricultural capital rental rate | -0.61 | -1.03 |
| Non-agricultural capital rental rate | -1.01 | -1.03 |

Note: Welfare is measured as the sum of individual household equivalent variations.
Source: Authors' calculations, based on simulation results.

The macroeconomic effects of the Doha simulation are reported in Table 8.2. The Doha scenario would lead to a rise in real GDP in the short as well as long run with the latter effect being stronger. Welfare change on the other hand is negative in both short and long runs but minimal in the latter. The head count index of poverty rises in the short run as well as the long run but, in a manner similar to trends in other variables, the long run effect is very minimal. There are positive impacts on exports and imports with long run effects being more prominent than those in the short run. Both urban and rural CPIs fall but by more in the long run. All the factors of production experience fall in their rates of returns, with that in the rental rate of non-agricultural capital being the most prominent. Figures 8.1-8.6 show the long run path of changes in the mentioned macro variables.

**Figure 8.1: Percentage change in GDP from the BaU Path**

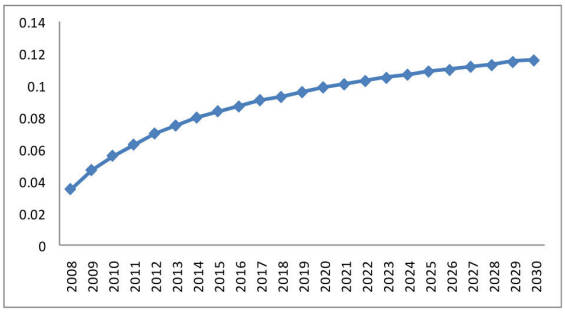



**Figure 8.2: Percentage Change in EV from the BaU Path**

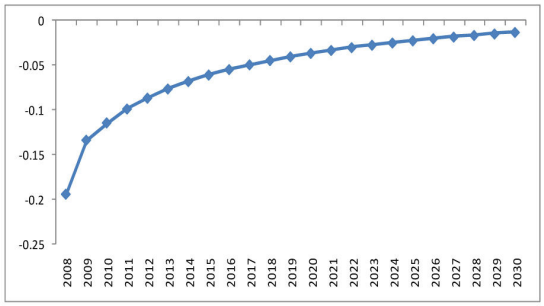



**Figure 8.3: Percentage Change in Imports and Exports from the BaU Path**

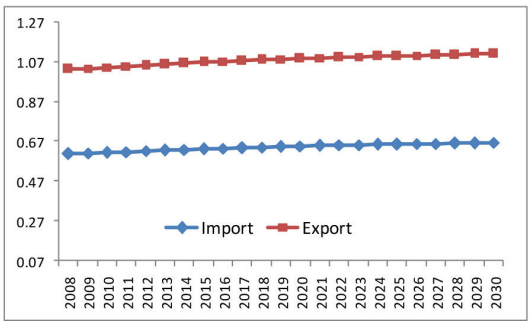



**Figure 8.4: Percentage Change in Urban CPI and Rural CPI from the BaU Path**

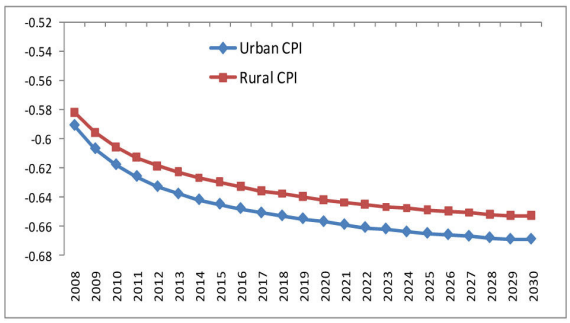



**Figure 8.5: Percentage Change in Skilled Wage Rate and Unskilled Wage Rate from the BaU Path**

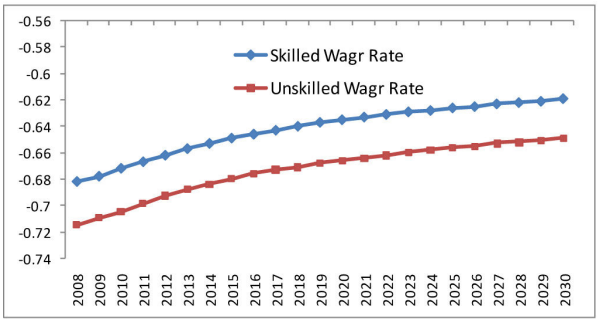
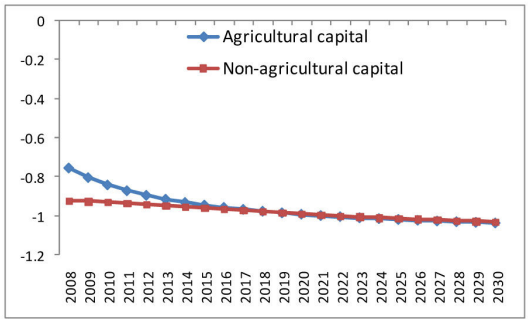



**Figure 8.6: Percentage change in Agricultural and Non-agricultural Capital Rental Rates from the BaU Path**



## 8.4 Sectoral Effects

| Table 8.3: Percentage Changes in Prices from the BaU Path | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | PM | | PD | | PV | | PX | | PQ | | PE_FOB | |
| | SR | LR | SR | LR | SR | LR | SR | LR | SR | LR | SR | LR |
| Paddy | 0.87 | 0.87 | -0.83 | -0.90 | -0.69 | -0.82 | -0.72 | -0.79 | -0.55 | -0.64 | 1.41 | 1.39 |
| Wheat | -0.09 | -0.09 | -0.86 | -0.94 | -0.66 | -0.81 | -0.72 | -0.79 | -0.59 | -0.68 | 2.43 | 2.40 |
| Oilseeds | 0.04 | 0.04 | -0.89 | -1.00 | -0.64 | -0.82 | -0.71 | -0.81 | -0.62 | -0.74 | 0.67 | 0.65 |
| Cotton | 0.00 | 0.00 | -0.72 | -0.87 | -0.58 | -0.81 | -0.67 | -0.81 | -0.45 | -0.61 | 1.14 | 1.09 |
| Other agri | 0.08 | 0.08 | -0.83 | -0.84 | -0.78 | -0.81 | -0.79 | -0.80 | -0.53 | -0.55 | 0.38 | 0.37 |
| Livestock | -0.21 | -0.21 | -0.73 | -0.74 | -0.83 | -0.82 | -0.73 | -0.74 | -0.45 | -0.48 | 0.11 | 0.10 |
| Forestry | -0.77 | -0.77 | -0.86 | -0.88 | -0.79 | -0.82 | -0.79 | -0.82 | -0.57 | -0.60 | 0.21 | 0.20 |
| Fishing | -1.00 | -1.00 | -0.88 | -1.01 | -0.64 | -0.79 | -0.68 | -0.81 | -0.60 | -0.75 | 0.20 | 0.17 |
| Minerals | -1.11 | -1.11 | -1.19 | -0.93 | -1.18 | -0.93 | -1.14 | -0.93 | -0.86 | -0.80 | -1.01 | -0.94 |
| Sugar | -1.82 | -1.82 | -0.63 | -0.66 | -0.84 | -0.83 | -0.59 | -0.62 | -0.40 | -0.44 | 0.08 | 0.06 |
| Misc Food | -2.68 | -2.68 | -0.72 | -0.76 | -0.83 | -0.81 | -0.67 | -0.71 | -0.52 | -0.58 | 0.43 | 0.42 |
| **Cotton textiles** | -2.61 | -2.61 | -0.70 | -0.88 | -0.54 | -0.83 | -0.56 | -0.71 | -0.55 | -0.73 | 0.00 | -0.06 |
| **Other textiles** | -2.88 | -2.88 | -1.29 | -1.60 | -0.36 | -0.79 | -0.65 | -0.84 | -1.39 | -1.64 | -0.09 | -0.17 |
| **Leather prod** | -2.94 | -2.94 | -1.06 | -1.07 | -0.76 | -0.74 | -0.90 | -0.92 | -1.03 | -1.05 | -0.15 | -0.16 |
| **Misc chemi** | -2.53 | -2.53 | -1.04 | -0.77 | -1.62 | -0.97 | -1.06 | -0.85 | -1.09 | -0.88 | -1.11 | -1.06 |
| **Cement** | 0.00 | 0.00 | -0.84 | -0.88 | -0.88 | -0.95 | -0.82 | -0.86 | -0.56 | -0.62 | -0.56 | -0.57 |
| **Metal prod** | -1.21 | -1.21 | -0.83 | -0.74 | -1.17 | -0.89 | -0.82 | -0.73 | -0.66 | -0.60 | -0.67 | -0.65 |
| **Machinery** | -2.86 | -2.86 | -0.98 | -0.84 | -1.23 | -0.85 | -0.96 | -0.83 | -1.63 | -1.56 | -0.81 | -0.78 |
| **Electrical gds** | -2.95 | -2.95 | -1.02 | -0.89 | -1.09 | -0.85 | -0.90 | -0.81 | -1.60 | -1.53 | -0.73 | -0.70 |
| **Electronic eq** | -2.95 | -2.95 | -1.04 | -0.94 | -1.29 | -0.93 | -1.02 | -0.93 | -1.49 | -1.44 | -0.74 | -0.72 |
| **Misc Manufac** | -2.65 | -2.65 | -1.12 | -1.06 | -0.92 | -0.83 | -0.86 | -0.82 | -1.46 | -1.44 | -0.42 | -0.41 |
| **Construction** | 0.00 | 0.00 | -0.79 | -0.76 | -0.77 | -0.71 | -0.79 | -0.76 | -0.51 | -0.50 | 0.00 | 0.00 |
| **Utility** | 0.00 | 0.00 | -0.74 | -0.71 | -0.73 | -0.70 | -0.74 | -0.71 | -0.46 | -0.45 | 0.00 | 0.00 |
| **Oth trans serv** | 0.00 | 0.00 | -0.87 | -0.97 | -0.60 | -0.78 | -0.72 | -0.81 | -0.44 | -0.54 | -0.24 | -0.27 |
| **Communi** | -0.03 | -0.03 | -0.80 | -0.88 | -0.74 | -0.84 | -0.79 | -0.87 | -0.52 | -0.61 | 0.14 | 0.12 |
| **Hotels & res** | -0.02 | -0.02 | -0.68 | -0.79 | -0.63 | -0.84 | -0.58 | -0.68 | -0.34 | -0.45 | -0.10 | -0.13 |
| **Insurance** | -0.10 | -0.10 | -0.79 | -0.89 | -0.73 | -0.84 | -0.73 | -0.83 | -0.44 | -0.55 | 0.19 | 0.17 |
| **Other services** | -0.06 | -0.06 | -0.71 | -1.10 | -0.42 | -0.83 | -0.50 | -0.82 | -0.30 | -0.62 | 0.17 | 0.08 |
| **Misc services** | 0.00 | 0.00 | -0.84 | -0.90 | -0.78 | -0.84 | -0.77 | -0.83 | -0.56 | -0.64 | 0.17 | 0.15 |

Note: PD = Domestic goods price, PV=Value-added price, PX=Aggregate output price, PQ=Price of composite goods, PE_FOB=FOB export price.
Source: Authors' calculations, based on simulation results.

Domestic tariff cuts under the Doha scenario lead to reduction in domestic prices of imports which is proportional to the magnitudes of initial tariffs. Moreover, the fall in import prices leads to decline in domestic prices (see Table 8.3). Since the manufacturing sectors have higher initial tariffs than agricultural sectors, the Doha scenario would result in higher reduction in domestic prices of imports in the former class of sectors. The price of value added and producer prices would fall for all sectors with the fall again being higher in the manufacturing sector.

The current account balance is fixed in the short run and subsequently increases at a fixed rate. Thus, the increase in imports leads to a real devaluation and an increase in exports. The export response is generally higher in the long run, with most agricultural sectors, textile sectors and most services sector experiencing a rise in exports. In general, the agricultural sectors and the services sectors and a few sectors in manufacturing, namely the textile sectors, are the beneficiaries of this scenario. In contrast, production contracts in most manufacturing sectors. As a result, non-agricultural capital and labour migrate to the textile and garments sectors and away from the other manufacturing sectors, with relatively little movement in the agricultural

sectors. The long run effects are more prominent than those in the short run. In the long run, the response in terms of change in magnitude of non-agricultural capital stock is much larger and tempers the reallocation of skilled and unskilled labour. There are also moderate increases in the capital stock of agricultural and service sectors.

**Table 8.4: Percentage Changes in Volumes of Non-agricultural Commodities from the BaU Path**

| | M | | X | | E | | Q | | D | |
|---|---|---|---|---|---|---|---|---|---|---|
| | SR | LR | SR | LR | SR | LR | SR | LR | SR | LR |
| Paddy | -2.55 | -2.57 | 0.19 | 0.27 | 4.52 | 4.73 | -0.04 | 0.05 | -0.04 | 0.05 |
| Wheat | -1.22 | -1.22 | 0.24 | 0.35 | 6.68 | 6.91 | -0.06 | 0.05 | -0.06 | 0.05 |
| Oilseeds | -1.47 | -1.54 | 0.29 | 0.39 | 3.10 | 3.36 | -0.08 | 0.01 | -0.08 | 0.01 |
| Cotton | 0.00 | 0.00 | 0.39 | 0.69 | 4.07 | 4.57 | 0.27 | 0.57 | 0.27 | 0.57 |
| Other agriculture | -1.44 | -1.35 | 0.00 | 0.10 | 2.39 | 2.48 | -0.12 | -0.02 | -0.08 | 0.02 |
| Livestock | -0.89 | -0.80 | -0.11 | -0.01 | 1.59 | 1.69 | -0.11 | -0.01 | -0.11 | -0.01 |
| Forestry and logging | -0.25 | -0.20 | 0.00 | 0.09 | 2.03 | 2.15 | -0.14 | -0.06 | -0.12 | -0.04 |
| Fishing | 0.09 | -0.01 | 0.29 | 0.41 | 2.08 | 2.40 | -0.10 | 0.00 | -0.11 | 0.00 |
| Minerals | -0.46 | -0.46 | -0.26 | -0.74 | 0.01 | -0.75 | -0.43 | -0.53 | -0.35 | -0.73 |
| Sugar | 1.63 | 1.68 | -0.10 | -0.01 | 1.23 | 1.37 | -0.13 | -0.04 | -0.19 | -0.10 |
| Misc Food | 2.80 | 2.86 | -0.12 | -0.01 | 2.10 | 2.26 | -0.11 | 0.00 | -0.23 | -0.11 |
| **Cotton textiles** | 3.02 | 3.10 | 0.36 | 0.74 | 1.49 | 2.07 | 0.25 | 0.57 | 0.07 | 0.40 |
| **Other textiles** | 1.97 | 1.81 | 0.82 | 1.38 | 1.95 | 2.76 | 0.08 | 0.28 | -0.48 | -0.17 |
| **Leather product** | 2.51 | 2.64 | -0.07 | 0.06 | 1.46 | 1.59 | -0.04 | 0.10 | -0.40 | -0.26 |
| **Misc chemicals** | 1.76 | 2.15 | -0.58 | -0.73 | -0.69 | -1.17 | -0.05 | 0.00 | -0.54 | -0.57 |
| **Cement** | 0.00 | 0.00 | -0.24 | -0.19 | 0.29 | 0.40 | -0.27 | -0.22 | -0.27 | -0.22 |
| **Metal products** | 0.14 | 0.22 | -0.41 | -0.49 | -0.11 | -0.33 | -0.29 | -0.31 | -0.44 | -0.50 |
| **Machinery** | 2.20 | 2.31 | -0.66 | -0.80 | -0.36 | -0.70 | 0.70 | 0.68 | -0.70 | -0.81 |
| **Electrical goods** | 2.32 | 2.46 | -0.41 | -0.56 | -0.05 | -0.34 | 0.65 | 0.66 | -0.65 | -0.72 |
| **Electronic equip** | 2.46 | 2.58 | -0.46 | -0.50 | 0.11 | -0.08 | 0.62 | 0.63 | -0.49 | -0.52 |
| **Misc Manufac** | 1.62 | 1.74 | -0.21 | -0.22 | 0.68 | 0.60 | 0.20 | 0.26 | -0.74 | -0.71 |
| **Construction** | 0.00 | 0.00 | -0.22 | -0.18 | 0.00 | 0.00 | -0.22 | -0.18 | -0.22 | -0.18 |
| **Utility** | 0.00 | 0.00 | -0.06 | 0.02 | 0.00 | 0.00 | -0.06 | 0.02 | -0.06 | 0.02 |
| **Other trans serv** | -1.21 | -1.23 | 0.41 | 0.58 | 1.38 | 1.67 | -0.15 | -0.03 | 0.09 | 0.24 |
| **Communication** | -1.07 | -1.04 | 0.11 | 0.25 | 2.00 | 2.26 | 0.08 | 0.23 | 0.09 | 0.23 |
| **Hotels & restaur** | -0.93 | -0.94 | 0.26 | 0.44 | 1.23 | 1.54 | -0.05 | 0.09 | 0.06 | 0.21 |
| **Insurance** | -1.04 | -1.09 | 0.12 | 0.23 | 1.99 | 2.25 | -0.12 | -0.03 | 0.00 | 0.10 |
| **Other services** | -0.82 | -1.16 | 0.59 | 0.98 | 1.95 | 2.82 | -0.05 | 0.08 | 0.16 | 0.41 |
| **Misc services** | 0.00 | 0.00 | 0.05 | 0.12 | 1.95 | 2.11 | -0.09 | -0.02 | -0.09 | -0.02 |

Note: M =Imports, X=Domestic Sales, E=Exports, Q= composite goods, D=Domestic Sales.
Source: Author's calculations, based on simulation results.

Among the agricultural sectors, the cotton sector expands the most in terms of output, whereas in the manufacturing sector the 'other textiles' sector is the leader. The largest reduction in output is seen in the machinery sector. As result of increased demand from the expanding sub-sectors in agriculture and manufacturing, a number of services sectors also expand with the largest expansion seen in the 'other services' sub-sector.

| Table 8.5: Percentage Changes in demand for Labor and Capital and Investment In the Non-Agricultural Sectors from the BaU Path | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| | SKL | | USKL | | K | | I | |
| | 2008 | 2030 | 2008 | 2030 | 2008 | 2030 | 2008 | 2030 |
| Paddy | 0.17 | 0.11 | 0.21 | 0.14 | 0.17 | 0.46 | 0.97 | 0.49 |
| Wheat | 0.25 | 0.18 | 0.29 | 0.22 | 0.19 | 0.53 | 1.13 | 0.57 |
| Oilseeds | 0.31 | 0.22 | 0.35 | 0.26 | 0.23 | 0.57 | 1.25 | 0.61 |
| Cotton | 0.47 | 0.53 | 0.51 | 0.56 | 0.26 | 0.86 | 1.60 | 0.93 |
| Other agriculture | -0.09 | -0.06 | -0.05 | -0.03 | 0.08 | 0.28 | 0.47 | 0.33 |
| Livestock | -0.24 | -0.17 | -0.20 | -0.14 | 0.02 | 0.17 | 0.18 | 0.21 |
| Forestry and logging | -0.10 | -0.09 | -0.06 | -0.05 | 0.08 | 0.26 | 0.44 | 0.30 |
| Fishing | 0.32 | 0.27 | 0.36 | 0.31 | 0.22 | 0.61 | 1.27 | 0.66 |
| Minerals | -0.67 | -0.99 | -0.63 | -0.96 | -0.08 | -0.62 | -0.76 | -0.66 |
| Sugar | -0.24 | -0.18 | -0.20 | -0.14 | 0.02 | 0.16 | 0.17 | 0.20 |
| Misc Food | -0.25 | -0.17 | -0.21 | -0.13 | 0.02 | 0.18 | 0.16 | 0.22 |
| **Cotton textiles** | 0.47 | 0.56 | 0.51 | 0.60 | 0.24 | 0.89 | 1.62 | 0.97 |
| **Other textiles** | 1.07 | 1.24 | 1.11 | 1.27 | 0.44 | 1.55 | 2.84 | 1.67 |
| **Leather product** | -0.14 | -0.05 | -0.10 | -0.01 | 0.05 | 0.29 | 0.38 | 0.35 |
| **Misc chemicals** | -1.33 | -1.02 | -1.29 | -0.98 | -0.42 | -0.67 | -1.91 | -0.65 |
| **Cement** | -0.40 | -0.46 | -0.37 | -0.42 | -0.20 | -0.11 | 0.08 | -0.08 |
| **Metal products** | -0.81 | -0.71 | -0.77 | -0.67 | -0.19 | -0.37 | -0.95 | -0.33 |
| **Machinery** | -1.10 | -0.99 | -1.06 | -0.95 | -0.30 | -0.65 | -1.52 | -0.61 |
| **Electrical goods** | -0.74 | -0.75 | -0.70 | -0.71 | -0.13 | -0.41 | -0.86 | -0.37 |
| **Electronic equip** | -0.95 | -0.75 | -0.91 | -0.72 | -0.29 | -0.42 | -1.14 | -0.38 |
| **Misc Manufac** | -0.41 | -0.39 | -0.37 | -0.36 | -0.02 | -0.05 | -0.21 | -0.01 |
| **Construction** | -0.30 | -0.26 | -0.26 | -0.23 | 0.02 | 0.08 | 0.02 | 0.13 |
| **Utility** | -0.10 | -0.05 | -0.06 | -0.01 | 0.08 | 0.28 | 0.42 | 0.34 |
| **Other trans serv** | 0.46 | 0.43 | 0.50 | 0.47 | 0.27 | 0.78 | 1.57 | 0.83 |
| **Communication** | 0.06 | 0.07 | 0.10 | 0.11 | 0.14 | 0.41 | 0.72 | 0.46 |
| **Hotels & restaur** | 0.30 | 0.25 | 0.34 | 0.29 | 0.21 | 0.60 | 1.25 | 0.64 |
| **Insurance** | 0.08 | 0.06 | 0.12 | 0.09 | 0.15 | 0.39 | 0.75 | 0.44 |
| **Other services** | 0.80 | 0.82 | 0.84 | 0.85 | 0.38 | 1.15 | 2.23 | 1.22 |
| **Misc services** | -0.03 | -0.06 | 0.01 | -0.02 | 0.11 | 0.28 | 0.55 | 0.32 |

All the expanding sub-sectors in agriculture, manufacturing and services attract inflows of skilled and unskilled labour and capital. In the short run, among the agricultural sub-sectors, cotton experiences the largest rise in demand for factors of production whereas in the manufacturing sector 'other textiles' is the leader. Also, the services sub-sectors see increased demand for factors. All contracting sectors however confront reduction in factor demands. The long run changes in demand for skilled and unskilled labour as well as capital seem to be higher than short run changes. Moreover, long run changes in demand for capital are more than those for labour as the rate of return to capital declines more than that to labour (see Table 8.1). All the expanding sectors also see increased investment while contracting sectors experience fall in investment. The long run impacts on investment appear to be smaller than short run effects.

## 8.5 Welfare Effects

| Table 8.6: Income and Welfare Effects (percentage change from BaU path) | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| Variable | Period | Rural | | | | | Urban | | | |
| | | RH1 | RH2 | RH3 | RH4 | RH5 | UH1 | UH2 | UH3 | UH4 |
| Income | 2008 | -0.75 | -0.70 | -0.72 | -0.78 | -0.77 | -0.72 | -0.68 | -0.72 | -0.65 |
| | 2030 | -0.69 | -0.63 | -0.65 | -0.76 | -0.74 | -0.63 | -0.61 | -0.68 | -0.58 |
| CPI | 2008 | -0.57 | -0.56 | -0.49 | -0.53 | -0.50 | -0.54 | -0.54 | -0.50 | -0.52 |
| | 2030 | -0.68 | -0.67 | -0.63 | -0.63 | -0.63 | -0.67 | -0.67 | -0.63 | -0.68 |
| EV | 2008 | -0.13 | -0.10 | -0.17 | -0.20 | -0.20 | -0.11 | -0.08 | -0.17 | -0.05 |
| | 2030 | -0.02 | 0.02 | -0.03 | -0.10 | -0.08 | 0.01 | 0.05 | -0.03 | 0.08 |

RH1 = rural non-agricultural self employed, RH2 = rural agricultural labour,
RH3 = rural other labour, RH4 = rural agricultural self employed,
RH5 = rural other households
UH1 = urban self employed, UH2 = urban salaried class,
UH3 = urban casual labour, UH4 = urban other households
Source: Authors' calculations, based on simulation results

Under the Doha scenario, a fall in nominal income for all household categories is observed in both the short run and the long run (see Table 8.6). This reduction is the smallest in RH2 (rural agricultural labour) in the rural areas and in urban areas in UH4 (urban other

households). The consumer price indices also decline both in the short and long run though the long run impacts are stronger.

In the short run, since the fall in nominal income is larger than that in CPIs, all household categories, would experience negative growth in real consumption, However, in the long run, some household categories such as RH2 (rural agricultural labour), UH1 (urban self employed), UH2 (urban salaried class) and UH4 (urban other households) would experience a fall in income which would be more than offset by that in CPI, leading to a rise in real consumption. The figures for welfare change are very much in line with real consumption growth.

### 8.6 Poverty Effects

Table 8.9: Poverty Effects (percentage point change from the BaU Poverty Levels)

| Poverty Index | Period | Rural | | | | | Urban | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | | RH1 | RH2 | RH3 | RH4 | RH5 | UH1 | UH2 | UH3 | UH4 |
| P0 | 2008 | 0.10 | 0.08 | 0.09 | 0.02 | 0.02 | 0.05 | 0.04 | 0.07 | 0.01 |
| | 2030 | 0.03 | -0.05 | 0.02 | 0.03 | -0.01 | -0.06 | -0.09 | 0.03 | -0.13 |
| P1 | 2008 | 0.09 | 0.07 | 0.07 | 0.02 | 0.02 | 0.04 | 0.04 | 0.06 | 0.01 |
| | 2030 | 0.02 | -0.04 | 0.02 | 0.02 | -0.01 | -0.05 | -0.07 | 0.02 | -0.11 |
| P2 | 2008 | 0.07 | 0.05 | 0.06 | 0.01 | 0.01 | 0.03 | 0.03 | 0.04 | 0.01 |
| | 2030 | 0.02 | -0.03 | 0.01 | 0.02 | -0.01 | -0.04 | -0.05 | 0.02 | -0.08 |

P0 = Head count povert, P1 = poverty gap, P2 = poverty gap squared
RH1 = rural non-agricultural self employed, RH2 = rural agricultural labour,
RH3 = rural other labour, RH4 = rural agricultural self employed,
RH5 = rural other households
UH1 = urban self employed, UH2 = urban salaried class,
UH3 = urban casual labour, UH4 = urban other households
Source: Authors' calculations, based on simulation results

If we compare the results under agricultural trade liberalisation (Chapter 6) with those of NAMA liberalisation (Chapter 7), we observe that there is a tendency for the incidence of poverty to increase in all household categories under NAMA type of liberalisation and to decrease under agricultural trade liberalisation. Under the full Doha scenario, these two effects coexist and offset each other with net impact depending on the relative strength of these effects.

It appears from Table 8.9 that a full Doha scenario would result in a rise in head-count poverty for all household categories in the short run. In the long run the outcomes would be mixed with some household categories (RH2 in rural areas and UH1 and UH2 in the urban areas) experiencing a decline in head count poverty. Even for the sectors experiencing a rise in the long run such rise would be far more modest than that in the short run. The trends in poverty gap and squared poverty gap indices are similar to those for the head count index.

# CHAPTER 9: THE IMPACT OF SERVICES TRADE LIBERALISATION

## 9.1 Introduction

Services trade liberalisation is one of the major areas of negotiations under the Doha Round. However, there are difficulties in modelling services trade liberalisation because of the lack of data on the protection of the services sector. Given this reality, in the current chapter we have considered a simple approach to model service sector protection in the Indian economy and thus examine the impact of liberalisation of this protection on the Indian economy through the dynamic CGE model for India.

## 9.2 Simulation Design

There are many forms of barriers and protection in services trade and it is very difficult to quantify these. In the current exercise, we assume that the five importing services sectors exhibit a tariff equivalent of protection equal to the average tariff rate on manufacturing and agricultural sectors and we simulate a full liberalisation of these protections. In addition, we also assume that along with such liberalisation there would be a 10 percent rise in foreign direct investment into these service sectors.

## 9.3 Macroeconomic Effects

**Table 9.1: Macroeconomic Effects (% change from the base year value)**

| Variable | 2008 | 2030 |
|---|---|---|
| Real GDP | 0.22 | 0.39 |
| Welfare | 0.13 | 0.19 |
| Headcount Ratio | -0.08 | -0.13 |
| Imports | 0.77 | 0.85 |
| Exports | 1.04 | 1.21 |
| Urban CPI | -0.86 | -0.82 |
| Rural CPI | -0.83 | -0.79 |
| Skilled wage rate | -0.69 | -0.72 |
| Unskilled wage rate | -0.68 | -0.74 |
| Agricultural capital rental rate | -0.62 | -0.46 |
| Non-agricultural capital rental rate | -0.43 | -0.45 |

Note: Welfare is measured as the sum of individual household equivalent variations.
Source: Authors' calculations, based on simulation results.

The macroeconomic impacts are reported in Table 9.1. This scenario would lead to a rise in real GDP and aggregate welfare both in the short and long run with the latter effects being larger. Aggregate head count poverty falls in the short run and even further in the long run. Exports and imports register positive growth in the short run and further growth in the long run. The consumer price indices for both rural and urban households decline. All factor returns register negative growth with long run deviations from the BaU path being larger than short run deviations

## 9.4 Sectoral Effects

Table 9.2: Percentage Changes in Prices of from the BaU Path

| | PM | | PD | | PV | | PX | | PQ | | PE_FOB | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | 2008 | 2030 | 2008 | 2030 | 2008 | 2030 | 2008 | 2030 | 2008 | 2030 | 2008 | 2030 |
| Paddy | 0.00 | 0.00 | -0.63 | -0.64 | -0.71 | -0.71 | -0.61 | -0.61 | -0.48 | -0.47 | -0.11 | -0.10 |
| Wheat | 0.00 | 0.00 | -0.59 | -0.61 | -0.70 | -0.71 | -0.57 | -0.59 | -0.44 | -0.45 | -0.10 | -0.09 |
| Oilseeds | 0.00 | 0.00 | -0.63 | -0.69 | -0.62 | -0.70 | -0.57 | -0.63 | -0.47 | -0.53 | -0.11 | -0.12 |
| Cotton | 0.00 | 0.00 | -0.39 | -0.61 | -0.40 | -0.68 | -0.38 | -0.59 | -0.23 | -0.44 | -0.11 | -0.16 |
| Other agri | 0.00 | 0.00 | -0.63 | -0.66 | -0.67 | -0.71 | -0.61 | -0.64 | -0.45 | -0.48 | -0.11 | -0.11 |
| Livestock | 0.00 | 0.00 | -0.65 | -0.66 | -0.70 | -0.71 | -0.65 | -0.66 | -0.49 | -0.49 | -0.11 | -0.11 |
| Forestry | 0.00 | 0.00 | -0.60 | -0.71 | -0.57 | -0.69 | -0.57 | -0.67 | -0.35 | -0.44 | -0.12 | -0.13 |
| Fishing | 0.00 | 0.00 | -0.68 | -0.80 | -0.62 | -0.72 | -0.58 | -0.68 | -0.53 | -0.63 | -0.12 | -0.13 |
| Minerals | 0.00 | 0.00 | -0.20 | -0.56 | -0.11 | -0.46 | -0.17 | -0.46 | 0.11 | 0.02 | -0.07 | -0.16 |
| Sugar | 0.00 | 0.00 | -0.59 | -0.60 | -0.64 | -0.69 | -0.56 | -0.57 | -0.41 | -0.42 | -0.11 | -0.10 |
| Misc Food | 0.00 | 0.00 | -0.64 | -0.64 | -0.68 | -0.71 | -0.62 | -0.61 | -0.46 | -0.45 | -0.11 | -0.10 |
| Cotton textiles | 0.00 | 0.00 | -0.55 | -0.75 | -0.19 | -0.64 | -0.47 | -0.63 | -0.36 | -0.54 | -0.14 | -0.18 |
| Other textiles | 0.00 | 0.00 | -0.76 | -1.09 | -0.16 | -0.66 | -0.44 | -0.64 | -0.43 | -0.68 | -0.17 | -0.23 |
| Leather products | 0.00 | 0.00 | -0.45 | -0.59 | -0.53 | -0.75 | -0.39 | -0.52 | -0.23 | -0.36 | -0.13 | -0.16 |
| Misc chemicals | 0.00 | 0.00 | -0.22 | -0.32 | -0.35 | -0.50 | -0.18 | -0.25 | -0.02 | -0.09 | -0.05 | -0.06 |
| Cement | 0.00 | 0.00 | -0.46 | -0.49 | -0.49 | -0.54 | -0.44 | -0.47 | -0.31 | -0.33 | -0.05 | -0.05 |
| Metal products | 0.00 | 0.00 | -0.37 | -0.42 | -0.45 | -0.60 | -0.35 | -0.39 | -0.12 | -0.15 | -0.08 | -0.09 |
| Machinery | 0.00 | 0.00 | -0.54 | -0.52 | -0.69 | -0.66 | -0.49 | -0.46 | -0.12 | -0.10 | -0.08 | -0.07 |
| Electrical appli | 0.00 | 0.00 | -0.60 | -0.70 | -0.44 | -0.64 | -0.40 | -0.46 | -0.18 | -0.23 | -0.10 | -0.11 |
| Electronic equip | 0.00 | 0.00 | -0.55 | -0.48 | -0.71 | -0.57 | -0.52 | -0.46 | -0.18 | -0.14 | -0.08 | -0.05 |
| Misc Manufact | 0.00 | 0.00 | -0.60 | -0.71 | -0.41 | -0.66 | -0.42 | -0.50 | -0.20 | -0.27 | -0.11 | -0.13 |
| Construction | 0.00 | 0.00 | -0.63 | -0.63 | -0.80 | -0.82 | -0.63 | -0.63 | -0.47 | -0.46 | 0.00 | 0.00 |
| Utility | 0.00 | 0.00 | -0.56 | -0.61 | -0.76 | -0.82 | -0.56 | -0.61 | -0.41 | -0.45 | 0.00 | 0.00 |
| Other trans serv | -7.26 | -7.26 | -1.15 | -0.85 | -0.41 | -0.77 | -0.48 | -0.65 | -2.16 | -1.91 | -0.07 | 0.00 |
| Communication | -7.26 | -7.26 | -0.86 | -0.65 | -0.54 | -0.68 | -0.45 | -0.64 | -0.75 | -0.53 | -0.11 | -0.06 |
| Hotels & resta | -7.26 | -7.26 | -0.86 | -0.64 | -0.22 | -0.69 | -0.42 | -0.53 | -1.42 | -1.23 | -0.06 | 0.00 |
| Insurance | -7.26 | -7.26 | -1.24 | -0.75 | -0.24 | -0.68 | -0.37 | -0.51 | -1.76 | -1.32 | -0.12 | -0.02 |
| Other services | -7.26 | -7.26 | -1.71 | -1.11 | -0.35 | -0.73 | -0.34 | -0.54 | -2.78 | -2.30 | -0.14 | -0.01 |
| Misc services | 0.00 | 0.00 | -0.72 | -0.74 | -0.61 | -0.66 | -0.48 | -0.50 | -0.56 | -0.58 | -0.13 | -0.13 |

Note: PD = Domestic goods price, PV=Value-added price, PX=Aggregate output price, PQ=Price of composite goods, PE_FOB=FOB export price. Source: Author's calculations, based on simulation results.

Because of the removal of restrictions on import in the services sectors, the import prices as well as the domestic prices in these sectors fall. As a result of sectoral inter-linkages and decline in rates of return to factors, domestic prices in most manufacturing and agricultural sectors fall. The value-added price falls to a lesser extent in the services sectors in general because of the increased flow of foreign direct investments into these sectors. The FoB export prices also fall for most sectors which indicates a rise in export competitiveness. The current scenario entails two opposing effects: contraction in domestic services sectors because of trade liberalisation; and their expansion due to increased flow of FDI into these sectors. The net impact would depend on the relative strength of these two effects.

| Table 9.3: Percentage Changes in Volumes from the BaU Path | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | M | | X | | E | | Q | | D | |
| | 2008 | 2030 | 2008 | 2030 | 2008 | 2030 | 2008 | 2030 | 2008 | 2030 |
| Paddy | -0.95 | -1.06 | 0.05 | 0.05 | 0.06 | 0.98 | 0.01 | 0.11 | 0.01 | 0.11 |
| Wheat | -0.86 | -1.01 | 0.07 | 0.05 | 0.01 | 0.95 | 0.02 | 0.10 | 0.02 | 0.10 |
| Oilseeds | -0.86 | -1.05 | -0.20 | -0.12 | 0.12 | 0.16 | 0.08 | -0.01 | -0.08 | -0.01 |
| Cotton | 0.00 | 0.00 | 0.61 | 0.75 | 0.14 | 0.62 | 0.59 | 0.72 | 0.59 | 0.72 |
| Other agri | -0.85 | -1.02 | -0.12 | -0.01 | 0.12 | 0.09 | 0.06 | -0.06 | -0.08 | -0.03 |
| Livestock | -0.91 | -1.04 | -0.06 | -0.05 | 0.14 | 0.06 | 0.05 | -0.06 | -0.06 | -0.05 |
| Forestry | -0.69 | -0.90 | 0.27 | 0.22 | 0.18 | 0.32 | 0.08 | 0.00 | 0.21 | 0.16 |
| Fishing | -0.95 | -1.20 | 0.28 | 0.22 | 0.21 | 0.33 | 0.07 | -0.02 | 0.07 | -0.01 |
| Minerals | 0.12 | -0.02 | 0.49 | 1.04 | 0.69 | 0.63 | 0.19 | 0.20 | 0.42 | 0.83 |
| Sugar | -0.80 | -0.93 | -0.14 | -0.03 | 0.06 | 0.09 | 0.05 | -0.06 | -0.08 | -0.03 |
| Misc Food | -0.90 | -1.02 | -0.11 | -0.02 | 0.13 | 0.01 | 0.02 | -0.11 | -0.06 | -0.07 |
| Cotton textiles | -0.23 | -0.41 | 0.77 | 0.94 | 0.43 | 0.86 | 0.55 | 0.64 | 0.60 | 0.71 |
| Other textiles | -0.64 | -1.04 | 1.14 | 1.53 | 0.70 | 0.36 | 0.24 | 0.23 | 0.50 | 0.61 |
| Leather products | -0.05 | -0.19 | 0.73 | 0.85 | 1.27 | 1.58 | 0.53 | 0.59 | 0.62 | 0.70 |
| Misc chemicals | -0.24 | -0.42 | 0.19 | 0.20 | 0.45 | 0.59 | 0.03 | -0.04 | 0.10 | 0.06 |
| Cement | 0.00 | 0.00 | -0.24 | -0.33 | 0.54 | 0.51 | -0.28 | -0.37 | -0.28 | -0.37 |
| Metal products | -0.33 | -0.41 | 0.28 | 0.28 | 0.82 | 0.89 | 0.08 | 0.05 | 0.23 | 0.22 |
| Machinery | -0.92 | -0.99 | 0.00 | -0.11 | 0.82 | 0.68 | -0.50 | -0.59 | -0.11 | -0.22 |
| Electrical appli | -0.93 | -1.06 | 0.38 | 0.46 | 0.99 | 1.15 | -0.42 | -0.47 | -0.03 | -0.02 |
| Electronic equip | -0.97 | -1.03 | -0.10 | -0.27 | 0.79 | 0.54 | -0.46 | -0.58 | -0.15 | -0.32 |
| Misc Manufact | -0.74 | -0.91 | 0.52 | 0.60 | 1.13 | 1.34 | -0.20 | -0.27 | 0.16 | 0.16 |
| Construction | 0.00 | 0.00 | -0.25 | -0.33 | 0.00 | 0.00 | -0.25 | -0.33 | -0.25 | -0.33 |
| Utility | 0.00 | 0.00 | 0.03 | -0.04 | 0.00 | 0.00 | 0.03 | -0.04 | 0.03 | -0.04 |
| Other trans serv | 4.41 | 4.68 | 2.96 | 3.29 | 0.68 | 0.00 | 1.27 | 1.15 | 1.49 | 1.69 |
| Communication | 5.10 | 5.21 | 2.38 | 3.61 | 1.12 | 1.57 | 1.33 | 1.55 | 0.39 | 0.62 |
| Hotels and restar | 4.35 | 4.48 | 1.78 | 2.06 | 0.55 | 1.01 | 1.01 | 1.16 | 1.07 | 1.28 |
| Insurance | 4.35 | 4.78 | 2.89 | 3.14 | 1.23 | 1.43 | 1.00 | 1.13 | 1.02 | 1.23 |
| Other services | 3.19 | 3.84 | 2.00 | 2.55 | 1.42 | 1.61 | 1.10 | 1.03 | 1.76 | 2.07 |
| Misc services | 0.00 | 0.00 | 0.11 | 0.16 | 1.28 | 1.39 | 0.08 | 0.02 | 0.08 | 0.02 |

Note: M =Imports, X=Domestic Sales, E=Exports, Q= composite goods, D=Domestic Sales.
Source: Author's calculations, based on simulation results.

Table 9.3 shows that the services sectors under consideration expand both in the short and long run, which suggests a much stronger latter effect. Exports from these services sectors also increase. Because of the overall rise in competitiveness, we also observe enhanced export performance from some of the agricultural and manufacturing sectors.

| Table 9.4: Percentage Changes in demand for Labor and Capital and Investment In the Non-Agricultural Sectors from the BaU Path | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| | SKL | | USKL | | K | | I | |
| | 2008 | 2030 | 2008 | 2030 | 2008 | 2030 | 2008 | 2030 |
| Paddy | 0.12 | 0.09 | 0.11 | 0.11 | 0.04 | 0.36 | 0.33 | 0.48 |
| Wheat | 0.15 | 0.08 | 0.14 | 0.09 | 0.03 | 0.37 | 0.28 | 0.51 |
| Oilseeds | -0.34 | -0.27 | -0.33 | -0.28 | 0.04 | -0.19 | -0.12 | -0.31 |
| Cotton | 0.93 | 0.91 | 0.92 | 0.92 | 0.21 | 0.45 | 1.33 | 0.33 |
| Other agri | -0.22 | -0.14 | -0.21 | -0.16 | 0.00 | -0.31 | -0.13 | -0.44 |
| Livestock | -0.14 | -0.09 | -0.13 | -0.10 | -0.03 | -0.36 | -0.30 | -0.49 |
| Forestry | 0.45 | 0.38 | 0.44 | 0.39 | 0.07 | -0.08 | 0.33 | -0.21 |
| Fishing | 0.42 | 0.35 | 0.41 | 0.36 | 0.06 | -0.11 | 0.28 | -0.23 |
| Minerals | 1.04 | 1.43 | 1.03 | 1.45 | 0.24 | 0.93 | 1.57 | 0.91 |
| Sugar | -0.27 | -0.19 | -0.25 | -0.20 | -0.02 | -0.26 | -0.04 | -0.39 |
| Misc Food | -0.20 | -0.11 | -0.19 | -0.13 | -0.00 | -0.34 | -0.18 | -0.48 |
| Cotton textiles | 0.27 | 0.13 | 0.26 | 0.28 | 0.33 | 0.67 | 0.51 | 0.34 |
| Other textiles | 0.32 | 035 | 0.35 | 0.41 | 0.44 | 0.52 | 0.83 | 0.52 |
| Leather product | 0.35 | 0.38 | 0.27 | 0.32 | 0.21 | 0.48 | 0.38 | 0.31 |
| Misc chemicals | -0.55 | -0.54 | -0.54 | -0.55 | -0.12 | -0.07 | -0.52 | -0.02 |
| Cement | -0.01 | -0.02 | -0.00 | -0.01 | -0.31 | -0.49 | -0.19 | -0.58 |
| Metal products | 0.56 | 0.52 | 0.55 | 0.53 | 0.12 | 0.06 | 0.53 | -0.05 |
| Machinery | -0.08 | -0.06 | -0.07 | 0.08 | -0.07 | -0.39 | -0.38 | -0.52 |
| Electrical goods | 0.66 | 0.64 | 0.65 | 0.66 | 0.14 | 0.18 | 0.76 | 0.06 |
| Electronic equip | 0.04 | 0.01 | 0.05 | 0.01 | 0.12 | 0.47 | 0.59 | 0.58 |
| Misc Manufac | 0.83 | 0.77 | 0.82 | 0.78 | 0.20 | 0.31 | 1.09 | 0.19 |
| Construction | -0.25 | -0.30 | -0.26 | -0.29 | -0.19 | -0.74 | -1.02 | -0.90 |
| Utility | 0.05 | -0.01 | 0.04 | 0.00 | -0.06 | -0.46 | -0.45 | -0.62 |
| Other trans serv | 1.23 | 1.20 | 1.24 | 1.18 | 3.03 | 1.64 | 3.03 | 1.78 |
| Communication | 0.50 | 0.44 | 0.51 | 0.42 | 1.51 | 0.89 | 1.51 | 1.01 |
| Hotels & restaur | 1.12 | 0.89 | 1.13 | 0.88 | 2.77 | 1.34 | 2.77 | 1.46 |
| Insurance | 1.25 | 0.97 | 1.26 | 0.95 | 2.93 | 1.42 | 2.93 | 1.54 |
| Other services | 1.45 | 1.42 | 1.46 | 1.41 | 3.41 | 1.86 | 3.41 | 2.01 |
| Misc services | 0.32 | 0.30 | 0.30 | 0.32 | 0.07 | 0.16 | 0.07 | 0.26 |

Liberalisation in services trade, along with an increased flow of foreign direct investment, results in a rise in net investment into these sectors. There are also increased demands for skilled and unskilled labour as well as capital from these sectors. As a result, some of the sectors with weaker linkages with services sectors experience contraction and reduced demand for the factors of production. Among the services sectors, the largest rise in investment would be in 'other services'. This sector would also experience the highest increase in demand for factors.

## 9.5 Welfare Effects

| Table 9.5: Income and Welfare Effects (percentage change from BaU path) | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| Variable | Period | Rural | | | | | Urban | | | |
| | | RH1 | RH2 | RH3 | RH4 | RH5 | UH1 | UH2 | UH3 | UH4 |
| Income | 2008 | -0.72 | -0.74 | -0.67 | -0.56 | -0.67 | -0.67 | -0.64 | -0.69 | -0.57 |
| | 2030 | -0.70 | -0.71 | -0.60 | -0.51 | -0.63 | -0.62 | -0.69 | -0.62 | -0.51 |
| CPI | 2008 | -0.75 | -0.77 | -0.77 | -0.65 | -0.71 | -0.70 | -0.75 | -0.77 | -0.60 |
| | 2030 | -0.81 | -0.87 | -0.87 | -0.71 | -0.76 | -0.76 | -0.82 | -0.87 | -0.64 |
| EV | 2008 | 0.13 | 0.13 | 0.15 | 0.15 | 0.17 | 0.11 | 0.09 | 0.10 | 0.17 |
| | 2030 | 0.17 | 0.22 | 0.20 | 0.21 | 0.23 | 0.17 | 0.11 | 0.12 | 0.28 |

RH1 = rural non-agricultural self employed, RH2 = rural agricultural labour,
RH3 = rural other labour, RH4 = rural agricultural self employed,
RH5 = rural other households
UH1 = urban self employed, UH2 = urban salaried class,
UH3 = urban casual labour, UH4 = urban other households
Source: Authors' calculations, based on simulation results.

The nominal incomes of households as well as the CPIs fall both in the short and long run. However, the reductions in nominal incomes are smaller than those in CPIs, which lead to a rise in real consumption of households. The

figures for welfare change are very much in line with real consumption growth. All household categories would register an increase in welfare both in the short and long run. In the short run, RH5 (rural other households) and UH4 (urban other households) would experience the largest positive deviation in welfare from the BaU path. However, in the long run, UH4 (urban other households) would register the largest increase in welfare.

### 9.6 Poverty Effects

Services trade liberalisation, along with associated increased flow of foreign investment into the services sectors, would result in a drop in head count poverty for all household categories. In the rural areas, RH5 (rural other households) and in the urban areas, UH4 (urban other households) would experience the largest fall in head count poverty. The same trends would be observed for the depth (P1) and severity (P2) measures. The long run poverty reducing effects are stronger than the short run effects for all three indices of poverty.

Table 9.6: Poverty Effects (percentage point change from the BaU Poverty Levels)

| Poverty Index | Period | Rural | | | | | Urban | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | | RH1 | RH2 | RH3 | RH4 | RH5 | UH1 | UH2 | UH3 | UH4 |
| P0 | 2008 | -0.07 | -0.12 | -0.07 | -0.12 | -0.16 | -0.04 | -0.05 | -0.08 | -0.09 |
| | 2030 | -0.15 | -0.19 | -0.10 | -0.15 | -0.21 | -0.07 | -0.09 | -0.12 | -0.14 |
| P1 | 2008 | -0.07 | -0.16 | -0.09 | -0.12 | -0.06 | -0.09 | -0.13 | -0.07 | -0.07 |
| | 2030 | -0.12 | -0.20 | -0.11 | -0.15 | -0.06 | -0.13 | -0.15 | -0.10 | -0.10 |
| P2 | 2008 | -0.08 | -0.15 | -0.12 | -0.11 | -0.13 | -0.10 | -0.08 | -0.10 | -0.08 |
| | 2030 | -0.10 | -0.18 | -0.15 | -0.15 | -0.16 | -0.14 | -0.15 | -0.14 | -0.10 |

P0 = Head count povert, P1 = poverty gap, P2 = poverty gap squared
RH1 = rural non-agricultural self employed, RH2 = rural agricultural labour,
RH3 = rural other labour, RH4 = rural agricultural self employed,
RH5 = rural other households
UH1 = urban self employed, UH2 = urban salaried class,
UH3 = urban casual labour, UH4 = urban other households
Source: Authors' calculations, based on simulation results.

# CHAPTER 10: CONCLUSION

The objective of this research has been to examine the impact of Doha round negotiations on the Indian economy. This research has looked into the separate impacts of negotiations relating to liberalisation of agricultural trade and NAMA under the Doha Round, the combined effects of the two, and finally the impact of liberalisation of the domestic service sectors. With a view to address these important issues, this study has examined the effects of the Doha agreement on the Indian economy in a sequential dynamic CGE framework. A Social Accounting Matrix for 2006 has been used as the database. The major findings of this exercise are as follows:

**Agricultural Trade Liberalisation**

- Agricultural liberalisation under the Doha Round would have very little effect on Indian GDP.
- The welfare effects are positive and the effects are stronger in the long run.
- Paddy, wheat, oilseeds and cotton would emerge as the major beneficiaries of liberalisation
- All household categories appear to benefit from growth in real consumption and welfare.
- Poverty falls for all household categories both in the short and long run.
- In sum, agricultural trade liberalisation would generate positive outcomes for the Indian economy.

**Trade Liberalisation under NAMA Negotiation**

- The NAMA scenario would lead to a rise in real GDP despite contraction in a number of manufacturing sectors. This is because of the more than offsetting effect of the expansion of textiles and cotton as well as some services and agricultural sectors.
- All household categories would experience fall in real consumption and welfare because of fall in nominal income offsetting the fall in CPI.
- Poverty indices would rise for all household categories with categories relying more on non-agricultural capital income as well as unskilled labour income experiencing higher increases.
- In sum, the NAMA scenario would lead to some negative outcomes for the Indian economy.

**The Full Doha Scenario**

- The Doha scenario would lead to rise in real GDP in both short and long runs, with the effect being higher in the latter.
- In short and long runs, aggregate welfare declines though this decline is insignificant in the latter.
- In general, agricultural and services sectors and a few sectors in manufacturing, namely textile sectors, are beneficiaries. In contrast, production contracts in most manufacturing sectors.
- Among the agricultural sectors the cotton sector expands the most, whereas in the manufacturing sector it is the 'other textiles' sub-sector which is the biggest gainer. The largest reduction in output would be seen in the machinery sector.

- In the short run, all household categories would experience fall in real consumption and welfare because of fall in nominal income offsetting that in CPI. However, in the long run, for some household categories, such as rural agricultural labour, urban self employed, urban salaried class and urban other households, the opposite would be true and real consumption would rise. The magnitudes of welfare gains are very much in line with real consumption growth.
- It appears that a full Doha scenario would result in a rise in poverty for all household categories in the short run, while in the long run the outcomes are mixed with decline in poverty in some categories and increases in others, and increase, whenever it exists, being less pronounced.
- In sum, the Doha scenario would lead to mixed results.

**Services Trade Liberalisation**

- Liberalisation of services sectors would lead to a rise in real GDP and aggregate welfare both in the short and long run with impacts in the latter being larger.
- The changes assumed in this scenario would result in two opposite effects on output: contraction from freer trade and expansion from increased flow of FDI. The net impact would obviously depend on the relative strength of these two effects. However, results from simulations indicate net expansion both in the short and long run, which suggests that impacts of increase in foreign investment flows dominate. Exports from these services sectors would also increase. There is also an accompanying general rise in competitiveness which leads to enhanced export performance by some agricultural and manufacturing sectors.
- Liberalisation in services trade and increased flow of FDI result in a rise in net investment into service sectors, with 'other services' showing the largest increase in net investment as well as highest increase in factor demand.
- The nominal incomes of the households as well as the CPIs fall both in the short and long run. However, the reductions in incomes are smaller than the fall in CPIs, which suggests rise in real consumption of the households. The figures of EVs are very much in line with real consumption growth.
- Services trade liberalisation, along with increased flow of foreign investment into the services sectors, would result in drop in poverty indices for all the household categories. The long run poverty reducing effects are stronger than the short run effects.
- In sum, the services trade liberalisation scenario would lead to some positive outcomes for the Indian economy.

# ANNEX 1

# AN EXTENDED SOCIAL ACCOUNTING FOR INDIA, 2006: METHODOLOGY AND RESULTS

## Introduction and objective

A Social Accounting Matrix (SAM) is a generalization of the production relations and extends this information beyond the structure of production to include: (a) the distribution of value added to institutions generated by production activities; (b) formation of household and institutional income; (c) the pattern of consumption, savings and investment; (d) government revenue collection and associated expenditures and transactions; and (e) the role of the foreign sector in the formation of additional incomes for household and institutions. In particular, the accounting matrix of a SAM identifies the economic relations through six accounts: (1) total domestic supply of commodities; (2) activity accounts for producing sectors; (3) main factors of productions (e.g. labour types and capital); (4) current account transactions between main institutional agents such as-households and unincorporated capital, corporate enterprises, government and the rest of the world and the use of income by the representative households; (5) the rest of the world; and (6) one consolidated capital account (domestic and rest of the world) to capture the flows of savings and investment by institutions and the rest of the world respectively.

Social accounting matrices can serve two basic purposes: (i) as a comprehensive and consistent data system for descriptive analysis of the structure of the economy and (ii) as a basis for macroeconomic modeling. As a data framework, a SAM is a snapshot of a country at a point in time (Pyatt and Thorbecke, 1976). To provide as comprehensive a picture of the structure of the economy as possible, a particular novelty of the SAM approach has been to bring together macroeconomic data (such as national accounts) and microeconomic data (such as household surveys), within a consistent framework. The second purpose of a SAM is the provision of a macroeconomic data framework for policy modeling. The framework of a SAM can often help in establishing the sequence of interactions between agents and accounts which are being modeled. A SAM provides an excellent framework for exploring both macroeconomic and multi-sectoral issues and is useful starting point for more complex models (Robinson, 1989).

The prime of objective this study is to produce an updated SAM for India for 2006 using existing 2003-04 SAMs (Saluja et. al., 2004 and Ojha et. al., 2004), supplemented with official information on production, consumption and macro-economic aggregates and the Household Income and Expenditure. In addition to capturing the structure of Indian economy for 2006, the SAM 2006 is served as a consistent data base to construct a dynamic CGE model for Indian economy to assess the '*Doha impact on India*'. Among others, the new SAM 2006 includes a representation of commodity taxes (both on domestic and imported) on commodities rather than on institutional purchases captured by in other India SAMs in particular in Saluja et al and Ojha et al. The key features of the new SAM 2006 in comparison to the SAMs produced by Saluja and Ojha are discussed below.

The paper is organized in five sections. Section 2 provides a review of the past India SAMs and key features of the new SAM 2006. Section 3 provides a detailed description of the SAM structure and the methodology adopted to update/construct the SAM 2006. Major adjustments that were invoked to reconcile conflicting data sources are also highlighted in this section. Derivation of the factor account estimates is presented in section 4. Estimates of data sets for the institutions, including household, are discussed in section 5. An analysis of SAM results is presented the final section.

## Review of India SAM

The main features of the India SAM built by various researchers and institutions are provided in the table below.

**Table 1: Salient Features of India SAMs**

| | Base Year | Coverage | |
|---|---|---|---|
| | | **Sectors** | **Factors/Institutions** |
| Sarkar,H. & Subbarao, (1981). | 1979-80 | **3:** agriculture, industry and services. | Non-agricultural wage income class, non-agricultural non-wage income class, agricultural income class, and government |
| Sarkar, H. & M. Panda, (1986). | 1983-84 | **6:** agriculture (2), industry (2), infrastructure and services. | Non-agricultural wage income class, non-agricultural non-wage income class, agricultural income class, and government. |
| Bhide, S. and S. Pohit, (1993). | 1985-86 . | **6:** agriculture (2), livestock & forestry, industry (2), infrastructure and services. | Government, non-agricultural wage income earners, non-agricultural profit income earners, and agricultural income earners |
| Pradhan, B. and A. Sahoo, (1996). | 1989-90 | **8:** agriculture (2), mining and quarrying, industry (2), construction, electricity combined with water and gas distribution, and services (3). | Government, agricultural self-employed, agricultural labour, and non- agricultural self-employed and other labour. |
| Pradhan, B. Sahoo, A. and M.R. Saluja, (1999). | 1994-95 | **60:** agriculture (4), livestock products (2), forestry sector, mining (4), manufacturing (27), machinery and equipment (6), construction, electricity, transport (2), gas and water supply, other services (11). | Government, self employed in agriculture (rural & urban), self employment in non-agriculture (rural & urban), agricultural wage earners (rural & urban), other households (rural & urban), private corporate, and public non-departmental enterprises. |
| Pradhan, B. K. M.R. Saluja and S. K. Sing (2006). | 1997-98 | **57:** agriculture (4), livestock products (2), forestry, mining, manufacturing (27), machinery and equipment (6), construction, electricity, transport (2), gas and water supply, other services (11). | Government, self employed in agriculture (rural & urban), self employment in non-agriculture (rural & urban), agricultural wage earners (rural & urban), other households (rural & urban), private corporate, and public non-departmental enterprises. |
| Sinha, A. Siddiqui. K. A, and Munjal. P (2007). | 1999-00 | **13:** agriculture (informal), formal manufacturing (9), construction (informal), other services (formal & informal), and government service. | Casual labour (rural & urban), regular wage earner (rural & urban), own account worker (rural & urban), employer (rural & urban), and government. |
| M.R.Saluja & Yadav.B (2006). | 2003-04 | **73:** agriculture (12), livestock products (4), forestry, mining (4), manufacturing (28), machinery and equipment (7), construction, energy, gas distribution, water supply, transport (2), other services (10). | Five rural households' expenditure classes, 5 urban households expenditure classes, private corporation, public enterprises and government. |
| V. P. Ojha, Barun Deb Pal, Sanjib Pohit and Joyashree Roy | 2003-04 | **36:** agriculture (4), livestock products, forestry, fishing, mining (4), manufacturing (11), machinery and equipment, construction, energy (4), water supply, transport (5), other services (2). | Three factors-labour, capital and land. Nine household groups based location and occupation. Other current institution includes private corporation, public enterprises and government. |

Source: Based on Table 2, Page 6 (V. P. Ojha et al 2006)

Although a number of SAMs were available for India, our concentration was on two recent SAMs (i.e. Saluja et al 2004 and Ojha et al 2004) to assess whether the exsiting SAMs are adequate to construct a dynamic CGE model for India to conduct 'Doha' simulations. Thorough reviews of these two SAMs reveal followings concerns which were addressed in SAM 2006. We treat this exercise as major extension to the existing 2004 SAM structures of India.

i. In the existing India SAMs commodity taxes were booked under institutional purchases (e.g. against household and government purchases etc.) instead against domestic commodity supply and imports. Moreover, effective indirect tax rates as percent of household consumption/purchase have been found same for various representative household groups (please see Table 2). Equality of effective indirect tax rates by representative household groups' envisaged that indirect tax reform unlikely to produce differentiated impacts on household consumption and hence on commodity demand and supply. Such booking of commodity tax and tariff is not useful for tax and trade policy simulations and analysis. Thus commodity tax and tariff booked under institutional purchases has been transformed into commodity tax and tariff against commodity supplies. We believe this is a major modification on the existing India SAM structures.

**Table 2: Effective Indirect Tax Rates by Representative Household Groups**

| | **Saluda et al SAM 2004** | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| Household Groups | RH1 | RH2 | RH3 | RH4 | RH5 | UH1 | UH2 | UH3 | UH4 | UH5 |
| Tax Rate as % of HH Consumption | 3.52597 | 3.52598 | 3.52598 | 3.52598 | 3.52599 | 3.52598 | 3.52598 | 3.52600 | 3.52600 | 3.52600 |
| | **Ohja et al SAM 2004** | | | | | | | | | |
| Household Groups | RH1 | RH2 | RH3 | RH4 | RH5 | UH1 | UH2 | UH3 | UH4 | |
| Tax Rate as % of HH Consumption | 3.65054 | 3.63456 | 3.67651 | 3.68424 | 3.73739 | 3.72742 | 3.78544 | 3.73960 | 3.88510 | |

ii. Since gross fixed capital formation and changes in stocks are booked under the 'consolidated capital account' it is not clear whether the use concept or origin concept of capital formation was adopted in the above two 2004 SAMs. The 'consolidated capital account' of a SAM usually show the capital formation (or origin of investment) by few capital producing sectors such as livestock, construction, machinery etc. In line with SAM convention, in SAM 2006 the origin concept has been adopted. This is a major improvement on the existing India SAM structures.

iii. Serious inconsistency was observed with regard to the treatment of stock changes (i.e. inventory investment) in both of these two 2004 SAMs. Since services are produced and consumed instantaneously, supply of services can never be stocked. Contrary to the concept, stocks were recorded against various services in both of these two 2004 SAMs (for instance, electricity, communications, other services, and transport etc.). Appropriate treatment of stocks, that is, stock of goods only has been incorporated in SAM 2006. We again believe this is a major improvement on the existing India SAM structures.

iv. Labour market classification of the existing 2004 SAMs has been extended by incorporating classifications based on 'skilled' and 'unskilled' labour types in 2006 SAM. This extension allows a deeper understanding of distribution of factorial income generation in the production process to the representative household groups as a result of intervention at the commodity and activity levels via tax, subsidy and tariff rate changes. This is a major extension on the existing India SAM structures.

## Construction of 2006 India SAM

The 2006 SAM for India identifies the economic relations through **eight accounts**: (1) total domestic supply of 73 commodities; (2) production accounts for 73 activities; (3) 4 factors of productions-2 labour types and 2 capital categories; (4) current account transactions between 4 current institutional agents- households and unincorporated capital, corporate enterprises, government and the rest of the world; household account includes 9 representative groups (5 rural and 4 urban); and (8) one consolidated capital account. The classifications for SAM 2006 have been derived from the classifications of the existing 2004 SAMs constructed by Saluja et al and Ojha et al. The India SAM 2006 is thus represented by 167 accounts – activity (73); commodity (73); factors of production (4); indirect tax account (2); household (9); corporation (1); rest of the world (1); and consolidated (1). The structure of the India SAM is described in Table 3.

**Table 3: Description of India SAM Accounts for 2006**

| Set | Description of Elements |
|---|---|
| **Activity (73)** | |
| Agriculture, Forestry & Fishing (17) | Paddy, Wheat, Other cereals, Pulses, Sugarcane, Oilseeds, Jute, Cotton, Tea & coffee, Rubber, Tobacco, Other crops, Milk and milk products, Animal services, Other livestock products, Forestry and logging, Fishing |
| Mining & Quarrying (04) | Coal and lignite, Crude petroleum and natural gas, Iron ore, Other Minerals |
| Manufacturing (35) | Sugar, Khandsari-boora, Edible & Vanaspati, Misc food products, Beverages & tobacco products,<br>Cotton textiles, Wool synthetic, silk fiber textiles, Jute- hemp- mesta textiles, Textile products<br>Furniture and wood products, Paper- paper products. & newsprint, Printing and publishing, Leather products, Rubber and plastic products,<br>Petroleum products, Coal tar products, Inorganic heavy chemicals, Organic heavy chemicals, Fertilizers, Pesticides, Paints, varnishes and lacquers, Miscellaneous chemicals, Cement, Other non metallic mineral products, Iron & steel, Non-ferrous basic metals, Metal products,<br>Other non electric machinery, Electrical appliances, Communication equipments, Electronic equipments (incl.TV), Other electrical Machinery, Rail equipments, Other transport equipments, Miscellaneous Manufacturing |
| Construction (01) | Construction |
| Electricity, Gas and Water Supply (03) | Electricity, Gas, Water supply |
| Trade, Hotels, Transport & Communication (06) | Railway transport services, Other transport services, Storage and warehousing, Communication, Trade, Hotels and restaurants |
| Financial, Real Estate & Business Services (03) | Banking, Insurance, Ownership of dwellings |
| Community, Social & Personal Services (04) | Education and research, Medical and health, Other services, Public administration |
| **Commodity (73)** | **Same as activity classification.** |
| **Factors of Production (9)** | |
| Labour (2) | Labour: Unskilled |
| | Labour: Skilled |
| Capital (2) | Capital and Land |
| **Institutions (5)** | |
| Households (9) | Rural non-agricultural self employed, Rural agricultural labour, Rural other labour, Rural agricultural self employed and Rural other households |
| | Urban self employed, Urban salaried class, Urban casual labour and Urban other households |
| Other Institutions (4) | Government; Corporation; Rest of the World and Capital |

The year 2006 was chosen as the base year to update/construct the India SAM as most of data of the key components of activity-commodity and institutional accounts are available for the year 2006. However, the input-output table is not available for 2006 and hence an earlier input-output for the year 2003-04 has been used to update the inter-industry transaction matrix for the base year. The updated the inter-industry transaction matrix has been used with the activity-commodity data (i.e. supply and demand vectors by the classified activity-commodity sets–explained above) to derive a consistent input-output table for 2006. The consistent activity-commodity accounts then formed the base on which the factors and institutional accounts were disaggregated to derive the India SAM 2006.

The construction of 2006 SAM is based on several data sets drawn from diverse sources. They are listed below.

1. Main Economic Aggregates and Population (1999-2000 to 2005-2006)
2. Relationship: National Income and Other Aggregate (1999-2000 to 2005-2006)
3. Consolidated Account of Nation - National Disposable Income and Its Appropriation (At Current Prices) in India (1999-2000 to 2005-2006)
4. Consolidated Account of Nation - Capital Finance (At Current Prices) in India (1999-2000 to 2005-2006)
5. Consolidated Account of Nation - External Transactions (At Current Prices) in India (1999-2000 to 2005-2006)
6. Gross Domestic Product at Factor Cost by Kind of Economic in India at current/1999-2000 Prices (2003-2004 to 2006-2007)
7. Net Domestic Product (NDP) by Economic Activity in Rural and Urban Areas (at Current Prices) (1999-2000)}
8. Quarterly Estimates of GDP (At 1999-2000 Prices) in India (2005-2006 and 2006-2007)
9. Consolidated Account of Nation - Gross Domestic Product and Expenditure (At Current Prices) in India(1999-2000 to 2005-2006)
10. Consolidated Account of Nation - National Disposable Income and Its Appropriation (At Current Prices) in India (1999-2000 to 2005-2006)
11. Performance of Public Sector (At Current Prices) in India (1999-2000 to 2005-2006)
12. Consolidated Account of Nation - Gross Domestic Product and Expenditure (At Current Prices) in India (1999-2000 to 2005-2006)
13. Imports of Principal Commodities by India (2000-2001 to 2007-2008)
14. Product-wise Exports from India (2003-2004 to 2005-2006 and April-January, 2005-2006 and 2006-2007)
15. Commodity-wise Central Excise Revenue Released in India (2005-2006 and 2006-2007)
16. Value of Imports and Customs Import Duty Collected in India (1997-1998 to 2006-2007
17. Amount Collected from Indirect Taxes in India (2005-2006 to 2007-2008)
18. Macro Economic Aggregates and Population (At Current Prices) in India (1999-2000 to 2005-2006)
19. National Sample Survey Organization 2000-2001
20. Social Accounting Matrix 2004 by Saluja et al (2004)
21. Social Accounting Matrix 2004 by Ojha et al (2004)
22. Basanta K. Pradham, M. R. Saluja and Shalabh K. Singh (2006) edited “Social Accounting Matrix for India: Concepts, Construction and Applications”

The updating/construction procedure proceeded in two steps. In the first step, a ‘proto-SAM’ was constructed using the data collected from diverse sources. Since the data came from different sources as well as for different years, in line with the expectation, the estimated ‘proto-SAM’ was

unbalanced. In the second step, the SAM was balanced by adjusting the activity and commodity (i.e. private consumption, intermediate demand vectors) accounts as explained below.

The updating a SAM is not only an exercise in putting together a complete data set, but also an estimation process on the basis of insufficient and partly inconsistent data. In this current exercise, the first step to generate a consistent and balanced SAM is to build a macroeconomic SAM (i.e. the Macro SAM). The main objective of the Macro SAM is to summarize and to show the circular flow in the economy in general and inter-dependence between commodity, activity, consumption, and flow-of-funds without sectoral or institutional detail. Thus, in the second step a preliminary disaggregated SAM (i.e. also referred to as the Micro SAM) is constructed using available disaggregated information drawn from various data producing agencies. Subject to data availability, the disaggregated SAM segregates most of the Macro SAM accounts to desired sectoral and institutional breakdowns. While ensuring balance between the receipts and outlays for all accounts, the disaggregated or micro SAM must reproduce the control totals of the macro SAM. The correspondence between accounts of the aggregated micro SAM and macro SAM thus ensure its desired consistency with the national account data.

## Overview of the India Macro SAM for 2006

The macro SAM for the year 2006 contains 31 non-zero entries. The India macro SAM is "anchored" primarily to the 'National Accounts' data and other macro aggregates provided by the India Bureau of Statistics, India Economic Review and the Central Board of Excise and Customs. Table 4 shows the macro totals for the India economy based on information obtained from the above sources.

**Table 4: Macro aggregates for 2006**

(Million Rupees)

| | NA 06 | SAM 06 | Balance |
|---|---|---|---|
| | (1) | (2) | 3= (1) –(2) |
| Net GDP at Factor | 287173100 | 287173100 | 0 |
| + Consumption of Fixed Capital | 37920000 | 37920000 | 0 |
| + Indirect Tax | 43286800 | 43286800 | 0 |
| (-) Subsidies | 11662300 | 11662300 | 0 |
| = Gross Domestic Product (GDP) | 356717600 | 356717600 | 0 |
| Imports Goods/Services | 83067800 | 83067800 | 0 |
| **Supply (Ts =GDP + Imports + Rent)** | **439785400** | **439785400** | **0** |
| | | | |
| Private Consumption (Cp) | *206463800* | *212096600* | *5632800* |
| Government Consumption (Cg) | 40451100 | 40451100 | 0 |
| Exports Goods/Services (E) | 72512400 | 72512400 | 0 |
| Gross fixed capital formation (GFCF) | 100076000 | 100076000 | 0 |
| Change in stocks (Sc) | 10403600 | 10403600 | 0 |
| Valuables (Vb) | 4245700 | 4245700 | 0 |
| **Demand (Td =Cp + Cg + E + GFCF + Sc + Vb)** | **434152600** | **439785400** | **5632800** |
| Computational imbalance (=>Ts – Td= 0) | *5632800* | *0* | *-5632800* |
| Imbalance as % of Total Supply (NA 06) | 1.3 | | 1.3 |
| Imbalance as % of GDP (NA 06) | 1.6 | | 1.6 |

Source: Consolidated Account of Nation - Gross Domestic Product and Expenditure (At Current Prices) in India.

The compilation of macro aggregates for 2006 produced by above sources reveal a computational discrepancy (i.e. 1.3 % of GDP) between supply and the final use. In order to remove this discrepancy, in line with the approaches adopted in national accounts and input-output computation, private consumption is re-estimated by deducting public consumption and gross fixed capital formation from the total absorption. As a result the private consumption increases to Indian Rupees 212,096,600 million from the initial estimate of Indian Rupees 206,463,800 million.

The complete Macro SAM for 2006 containing the national accounts and other data including transfers, taxes and foreign transactions is shown in Table 5. The distribution of labor value-added to households and capital value-added channeled through the enterprise account is derived from information contained in the Ojha SAM (2004). Indirect and Direct taxes data by major commodity types are obtained the Central Board of Excise and Customs (2006). Savings of households and enterprises have been adjusted to fulfill the macroeconomic balance of the SAM. Government savings are computed as the difference between total government receipts and total government spending.

**Table 5: India Macro SAM 2006**

(Billion Indian Rupees)

| SAM Accounts | SNA Accounts | Code | | Activity | Commodity | Factors | | | | | Domestic Institutions | | | Capital | Rest of the Word | Total of Income A/C |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | 1 | 2 | 3 | | | | | 4 | | | 5 | 6 | |
| | | | | | | Labour | Capital | Land | Indirect Tax | Import Duty | Household | Government | Corporation | | | |
| **Activity A/C** | Activities | **1** | | 0 | 594600 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 594600 |
| **Production A/C** | Commodities | **2** | | 254915 | 0 | 0 | 0 | 0 | 0 | 0 | 213097 | 40451 | 0 | 114725 | 72512 | 695701 |
| **Distribution of Primary Income** | Income Generation by Institutions | **3** | Compensation To Employees | 168816 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | -2497 | 166319 |
| | | | Operating Surplus | 140134 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 140134 |
| | | | Land Return | 16143 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 16143 |
| | | | Indirect Tax | 14592 | 10526 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 25118 |
| | | | Import Duty | 0 | 7507 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 7507 |
| **Use of Income** | Primary Income of Institutions | **4** | Household | 0 | 0 | 166319 | 81659 | 16143 | 0 | 0 | 0 | 31148 | 0 | 0 | 10683 | 305953 |
| | | | Government | 0 | 0 | 0 | 4606 | 0 | 25118 | 6507 | 8594 | 0 | *10797* | 0 | 0 | 55621 |
| | | | Corporation | 0 | 0 | 0 | 15948 | 0 | 0 | 1001 | 0 | 0 | 0 | 0 | 0 | 16949 |
| **Consolidated Capital AC** | Capital Account | **5** | | 0 | 0 | 0 | 37920 | 0 | 0 | 0 | 84262 | -15978 | 6152 | 0 | 2369 | 114725 |
| **Rest of World** | Rest of the World-Imports (current) | **6** | | 0 | 83068 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 83068 |
| **Total of Expenditure A/C** | | | | 594600 | 695701 | 166319 | 140134 | 16143 | 25118 | 7507 | 305953 | 55621 | 16949 | 114725 | 83068 | 2221838 |

Note: Based on the SNA-SAM Relationship

## The Accounts of the India SAM 2006

Compilation of the disaggregated SAM involves a process where the non-zero entries of the macro SAM are disaggregated into desired level of classification to provide comprehensive flows of the accounts of the economy. A number of factors are considered while deciding on the level of disaggregation. Since the objective of this exercise is to spilt the balanced disaggregated SAM into rural-urban for better handling of the policy impacts on location (as opposed to national only) special care were taken to decide the number of sectors, factors and household groups. However, level of disaggregation is largely dictated by the data availability. Various sources were used and several informed judgments were needed due to missing information or inconsistencies between different data sets to compile data sets for the disaggregated SAM.

**Table 6: Account Description**

| Macro SAM AC | Disaggregated SAM AC (Micro SAM) | Description | Links with SALUJA SAM 04 |
|---|---|---|---|
| Activity | 73. Activities | Agri-17; Min-03; Manuf-07; Cons-01; Util-03; Trans-06; BusiSrv-03; OthSrv-04 | 73 activities |
| Commodity | 73. Commodities | Agri-17; Min-03; Manuf-07; Cons-01; Util-03; Trans-06; BusiSrv-03; OthSrv-04 | 73 commodities |
| Indirect tax | 2. Indirect Tax | Bases: Domestic 1 & Trade 1 | 2 Domestic 1 & Trade 1 |
| Factor | 4. Factors | Labour – 2 and Capital -2 | 4 types Labour-2 & Capital-2* |
| Household | 9. Household | Rural – 5 and Urban -4 | 9 types- 5 Rural & 4 Urban** |
| Enterprise | 1. Enterprise | | 1 Enterprise |
| Rest of the World | 1. Rest of the World | | 1 Rest of the World |
| Capital Public | 1. Capital Public | | 1 Capital Public |
| Account=8 | Accounts=167 | | Accounts=1 |

Notes:
* Factor classification has been borrowed from a classification used by IFPRI for SAM 2002 for Bangladesh.
** Household classification correspondence to the classification adopted in Ojha SAM.

### Activity and Commodity Accounts

Activity and commodity accounts of a SAM deal with the supply and demand components of the economy. Derivation of activity-commodity accounts thus imply generation of each element of supply and demand by the representative (elaborated in Table 6) activity-commodity classification. In the current exercise it envisages derivation of supply and demand components by 73 representative activities and commodities.

Value Added: According to the 'National Accounts' of India, estimates of value added are provided for 8 sectors (this is referred to as 'NA 8 sector'). Value added data by 8 sectors are available for 2006 which is the base for the value added update. These value added information are used to derive the value added by 73 SAM activity sectors. The generation of value added by 73 SAM activity accounts from 8 sector information is discussed below.

In the **first** step a mapping is defined to establish a correspondence between the NA 8 sectors and SAM 73 activities. Classification of value added sectors according to these groups is shown in the Table 7.

**Table 7: Classification of SAM Value added Sectors by Groups**

| NA 8 Sector | SAM 73 Activity |
|---|---|
| Agriculture, Forestry and Fishing (1) | Paddy, Wheat, Other cereals, Pulses, Sugarcane, Oilseeds, Jute, Cotton, Tea & coffee, Rubber, Tobacco, Other crops, Milk and milk products, Animal services, Other livestock products, Forestry and logging, Fishing (1..17) |
| Mining and Quarrying (2) | Coal and lignite, Crude petroleum and natural gas, Iron ore, Other Minerals (18..21) |
| Manufacturing (3) | Sugar, Khandsari-boora, Edible & Vanaspati, Misc food products, Beverages & tobacco products, Cotton textiles, Wool synthetic, silk fiber textiles, Jute- hemp- mesta textiles, Textile products ,Furniture and wood products, Paper- paper products. & newsprint, Printing and publishing , Leather products, Rubber and plastic products, Petroleum products, Coal tar products, Inorganic heavy chemicals, Organic heavy chemicals, Fertilizers, Pesticides, Paints, varnishes and lacquers, Miscellaneous chemicals, Cement, Other non metallic mineral products, Iron & steel, Non-ferrous basic metals, Metal products, Other non electric machinery, Electrical appliances, Communication equipments, Electronic equipments (incl.TV), Other electrical Machinery, Rail equipments, Other transport equipments, Miscellaneous Manufacturing (22..56) |
| Construction (4) | Construction (57) |
| Electricity, Gas and Water Supply (5) | Electricity, Gas, Water supply (58..60) |
| Trade, Hotels, Transport and Communication (6) | Railway transport services, Other transport services, Storage and warehousing, Communication, Trade, Hotels and restaurants (61..66) |
| Financial, Real Estate and Business Services (7) | Banking, Insurance, Ownership of dwellings (67..69) |
| Community, Social and Personal Services (8) | Education and research, Medical and health, Other services, Public administration (70..73) |
| Set Definition: j=1..8 | K= 1…73; a=1…17; b=18..21; c=22..56; e=57; d=58..60; f=61..66, m=67..69; x=70..73<br>K= 1…73; g=1…57 (goods); and s= 58-73 (services). |

In the **second** step, value added for SAM 73 sectors is derived using the value added information of the 8 sectors. For example, value added for agriculture sub-sector for 2006 ( ${}_{NA}VA_j^{06}$ ) is distributed between the 17 SAM agriculture activities using their observed shares in 2004 SAM (i.e. $shVA_a^{04}$ ) to generate value added for 2006 for these 17 sectors ( $VA_a^{06}$ ). This is specified below as:

$$VA_a^{06} = shVA_a^{04} \cdot {}_{NA}VA_j^{06} \qquad (1)$$

This procedure is applied to derived 2006 value added for the remaining 56 SAM sectors using the value added of the remaining 7 NA sectors. Adding of the derived value added using the above procedures generates the value added for the 73 SAM activities for 2006.

$$VA_K^{06} = VA_a^{06} + VA_b^{06} + VA_c^{06} + VA_d^{06} + VA_e^{06} + VA_f^{06} + VA_m^{06} + VA_x^{06} \qquad (2)$$

<u>Intermediate Input Use:</u> Inter-industry transaction matrix for 2006 is not available from which input use for the SAM 73 activities can be obtained. In the absence of updated technical coefficients for the base year, the observed technical coefficients of 2004 (i.e. $T_K^{04}$ ) have been applied to the value

added vector of 2006 to derive the intermediate input use by 73 SAM activities (i.e. $IU_K^{06}$ = $\mathrm{T}_K^{04} \cdot VA_K^{06}$) for 2006.

Indirect Tax: Information of indirect tax mobilized from the domestic bases for 2006 ($_{CBEC}IT_W^{06}$) by selected commodity (i.e. referred as w) is obtained from the 'Central Board of Excise and Customs (CBEC)'. The sector classification used by CBEC is different from the 73 SAM activity classifications. Hence a mapping scheme relating the CBEC classification to SAM sector classification was defined. This procedure is however also supplemented by tax shares obtained from the 2004 Saluja-SAM. Thus using both the CBEC information and 2004 tax shares of indirect tax by 73 SAM activities the indirect tax vector for 2006 ($IT_K^{06}$) was derived.

Outputs or Domestic Supply: The estimates of input use ($IU_K^{06}$) and indirect tax ($IT_K^{06}$) are added to the value added ($VA_K^{06}$) to derive domestic output. This is specified as:

$$Q_K^{06} = IU_K^{06} + IT_K^{06} + VA_K^{06} \qquad (3)$$

Imports of Goods and Services: Information of imports of goods for 2006 year ($_{NA}M_Z^{06}$) is acquired from the NA. Again, the sector classification (i.e. denoted as z) used by NA varies from the 57 SAM activity goods classifications (i.e. g). Hence a mapping scheme linking the NA classification to SAM sector classification is used to derive imports by 57 SAM activities for 2006 ($M_g^{06} = {}_{NA}M_Z^{06}$). The observed service import shares of the 2004 Saluja-SAM were used to generate service imports for the year 2006 ($M_s^{06} = shM_s^{04} \cdot {}_{NA}M^{06}$). The total imports for 2006 are thus composed of estimated goods imports and services imports.

$$M_K^{06} = M_g^{06} + M_s^{06} \qquad (4)$$

Revenue from import bases for 2006 fiscal year ($_{CBEC}dM_W^{06}$) is obtained from the CBEC. The goods sector classification used by CBEC is different from the 57 SAM goods import classifications. Hence a mapping scheme relating the CBEC classification to SAM classification is used to derive import duty by 57 goods imports for 2006 ($dM_g^{06} = {}_{CBEC}dM_W^{06}$). The total import duties for 2006 are thus composed of duties on imports.

$$dM_K^{06} = dM_g^{06} \qquad (5)$$

Total Supply: Main components of supply side of an economy are domestically produced goods and services or outputs ($Q_K^{06}$) and imports of goods and services ($M_K^{06}$). Total supply of goods and services ($SS_K^{06}$) for 2004/05 by 23 SAM activities is generated by adding outputs to imports. Total supply is given as:

$$SS_K^{06} = Q_K^{06} + M_K^{06} + dM_K^{06} \qquad (6)$$

The estimates of supply and its components by NA 8 sectors are reported in tables below.

**Table 8: Estimates of Total Supply and Components**

(Million Indian Rupees)

| Activity/ Commodity | Input Use | Value Added | Indirect Tax | Import | Import Duty | Total Supply |
|---|---|---|---|---|---|---|
| Agriculture, Forestry & Fishing | 23454283 | 59505800 | -1213073 | 1372654 | 64082 | 83183747 |
| Mining & Quarrying | 1899366 | 9048300 | 214909 | 23259582 | 1202059 | 35624217 |
| Manufacturing | 134943417 | 51974600 | 21720404 | 45660299 | 5240572 | 259539293 |
| Construction | 36211272 | 22211000 | 1959752 | 0 | 0 | 60382024 |
| Electricity, Gas & Water Supply | 4197821 | 6598000 | 427377 | 0 | 0 | 11223198 |
| Trade, Hotels, Transport & Communication | 31329351 | 82493700 | 1091511 | 5636314 | 441493 | 120992370 |
| Financial, Real Estate & Business Services | 7897549 | 46449300 | 147930 | 608449 | 47660 | 55150888 |
| Community, Social & Personal Services | 14982025 | 46812400 | 768976 | 6530501 | 511535 | 69605438 |
| Total | 254915085 | 325093100 | 25117786 | 83067800 | 7507402 | 695701174 |
| Share of Total SS (%) | 36.64 | 46.73 | 3.61 | 11.94 | 1.08 | 100.00 |

Private or Household Consumption: Vector of private or household consumption has been obtained from the information of 'National Sample Survey Organisation (NSSO)' 2001 and Ohja SAM 2004. Commodity classification of NSSO is different than the SAM commodity classification. Hence in the *first step*, NSSO consumption estimates are mapped to 73 SAM commodities classification to derive commodity shares. Derivation of private consumption vector for 2006 is shown below.

$$pC_K^{06} = shpC_K^{01} \cdot pC^{06} \qquad (7)$$

Where, $shpC_K^{01}$ and $pC^{06}$ refer to normalized share of initial estimates of private consumption vector based on NSSO 2001/Ojha 04 and 'adjusted macro control total for the private consumption.

Government Consumption: Government consumption usually confines to three sectors such as 'public administration' and 'education' and 'health'. The rationale is that different of purchase (e.g. agriculture, commodities and services) by government are included under the sector public administration. However, in India, more disaggregated data for government consumption is used where government consumption is recoreded against agriculture and livestock products; minerals products; manufacturing commodities; electricity; water supply; transport and other services. Information of government expenditure for 2006 fiscal year ( ${}_{NA}gC^{06}$) used to derive government consumption by 73 SAM activities for 2006 ( $gC_K^{06} = {}_{NA}gC^{06}$).

Exports of Goods and Services: Information on exports of goods for 2006 ( ${}_{NA}E_Z^{06}$ ) is obtained from National Accounts. Again the sector classification of NA is different from the 57 SAM-goods classification. Hence a mapping scheme linking the NA classification to SAM goods sector classification is used to derive exports by 57 SAM goods for 2006 ( $E_g^{06} = {}_{NA}E_Z^{06}$ ). The observed services export shares of the 2004 Saluja-SAM were used to generate service exports for the year 2006 ( $E_s^{06} = shE_s^{04} \cdot E^{06}$ ). The total exports for 2006 are thus composed of estimated goods and services imports.

$$E_K^{06} = E_g^{06} + E_s^{06} \qquad (8)$$

Investment: National account experts and Input-output and SAM builders are well conversant to the special treatment of goods and services with respect to capital formation and stock change. It is well known that only goods can be stored. Furthermore, only some specific goods can generate investment or form capital which assists further production. On the other hand, services must be consumed instantaneously implying that it cannot be stored and hence last for longer time duration to be able to form capital. Thus, recording of stocks and capital formation against some services in some SAMs of India appear erroneous. Therefore, in SAM 2006, stocks and capital formations are recorded only against goods and not against services. National accounts section contains information on origin of capital formation or investment, stock change and valuables for 2006. These information is used to derive gross fixed capital vector invoking 2004 SAM shares (i.e. $I_K^{06} = shI_K^{04} \cdot I^{06}$).

Final Demand: Above estimates of consumption, exports and investment are added together to derive final demand vector for the 73 SAM commodities ( $FD_K^{06}$ ). This is specified as:

$$FD_K^{06} = pC_K^{06} + gC_K^{06} + E_K^{06} + I_K^{06} \qquad (9)$$

Intermediate Input Demand: Final demand ( $FD_K^{06}$ ) has been deducted from the total supply ( $SS_K^{06}$ ) to derive intermediate input demand by 73 SAM commodities ( $ID_K^{06} = SS_K^{06} - FD_K^{06}$ ). The resulting input demand in the first instance did not produce equality between supply and demand vectors. Hence an iterative balancing technique was used to re-estimate the input demand vector such that use of it ensures the equality between sectoral supply and demand. In this process specific elements of the consumption vector, value added vector and intermediate input vector have been modified not only to ensure supply-demand but also to restrict significant deviation of the technical coefficients for the year 2006 from the observed technical coefficients of 2004. In order to verify the degree of deviation of the technical coefficients the estimated backward linkages are reported in Annex 1. Except for one or two activities, significant deviations are not observed between year 2006 and year 2004. The finalized estimates of the intermediate input demand are then added to the estimates of final demand to equate demand and supply ( $ID_K^{06} + FD_K^{06} - SS_K^{06} = 0$). The estimates of demand are reported in the table below.

**Table 9: Estimates of Total Demand and Components**

(Million Indian Rupees)

| Activity/ Commodity | Input Demand | Private Consumption | Public Consumption | Export | GFC | Total Demand |
|---|---|---|---|---|---|---|
| Agriculture, Forestry & Fishing | 28245205 | 47890274 | 118913 | 3133440 | 3795916 | 83183747 |
| Mining & Quarrying | 31018393 | 58956 | 56453 | 2691781 | 1798634 | 35624217 |
| Manufacturing | 115102627 | 50116652 | 1677122 | 41147946 | 51494946 | 259539293 |
| Construction | 1948438 | 0 | 797781 | 0 | 57635805 | 60382024 |
| Electricity, Gas and Water Supply | 8377649 | 2430977 | 414572 | 0 | 0 | 11223198 |
| Trade, Hotels, Transport & Communication | 43382234 | 59059335 | 996825 | 17553975 | 0 | 120992370 |
| Financial, Real Estate & Business Services | 24391515 | 30188584 | 236852 | 333937 | 0 | 55150888 |
| Community, Social & Personal Services | 2449024 | 23352508 | 36152583 | 7651322 | 0 | 69605438 |
| Total | 254915085 | 213097286 | 40451101 | 72512401 | 114725300 | 695701174 |
| Share of Total Demand (%) | 36.64 | 30.63 | 5.81 | 10.42 | 16.49 | 100.00 |

## Factors Accounts

Factors of production (FP) play an important role in the process of producing and distributing the fruits of growth and development, i.e. by providing factor services to production activities and in return factors receive value-added in the form of wages and salaries, profits and rents. The level of the distribution is in accordance to the level and kind of endowments; hence, the income subsequently transferred to household groups (i.e. as owners of labour and capital) will be heavily influenced, thereby typifying household behaviour.

The FP can be classified into three main categories of factor ownership (a) labour, (b) fixed assets and (c) capital services. Unlike the first the last two are not straightforward. It must be taken into account that only households provide labour services, whereas fixed assets, land and capital services are provided both by households and other institutions (i.e. corporation and government). Classifications of labour types should aim at grouping individuals into homogeneous groups of income-earners. For the grouping differences regarding average factor incomes and gender within or between labour groups must be taken into account. Among others, the most important could be labour skills reflecting different occupational categories or different income groups of earners using gender as an additional criterion. More concretely, for most production activities the factor labour can be distinguished according to highly-skilled professionals, managers, traders, government employees, personal services employees, blue-collar labourers or street vendors. For agricultural activities these could be agricultural farm owners, farm administrators and land workers of distinct labour types: landless farmers, subsistence farmers, etc. It is should be clear that all or most could be classified according to gender.

Information from developing countries as well as India appears to be no different, inevitably show a high incidence of self-employed or family-based activities, hence, differences according to the ownership of fixed assets and capital incomes generated by unincorporated and corporate sectors should be taken into account. Incomes from unincorporated capital (mainly family enterprises) can additionally distinguish imputed wage for the self-employed worker and the remaining capital income. A desirable classification of factors of production is presented below.

**Table 10: A Desirable Factor Classification**

| Labour | Capitalist and Others |
|---|---|
| 1. Self-employed Labour | 1. Unincorporated or mixed income |
| 2. High Skilled Professionals and Managers | 2. Corporate |
| 3. Medium Skilled Professionals and Technicians | 3. Rentiers |
| 4. Government and non-Government Office Clerks (employees) | |
| 5. Workers (Transport Workers, Mechanics and Other Industrial Workers) | |
| 6. Artisans and Handicraftsmen | |
| 7. Informal (Street-vendors and non economic services n.e.s.) | |
| 8. Agricultural Owners/Administrators | |
| 9. Agricultural Workers | |
| 10. Agriculture Subsistence farmers | |

Even though the above classification of factors appears to be desirable it was not possible at this point to derive a desirable classification of factors as stated above. In the present version of the SAM

2006 the factors are classified into two types of labour, one aggregate type of capital and one aggregate type of land. The factor classifications are based on the information of Saluja and Ojha SAMs for India. The aggregate one labour category is further split between 'skilled' and 'unskilled' labour categories using the information contained in table 23 of NSS 62nd Round (July 05 – June 06) report "Employment and Unemployment: Situation in India 2005-06".

Factor Income by Activities: Detailed information on sectoral employment for the different factor categories was extracted from the 2004 SAMs for India. The information of two India SAMs are added together to define a factor-sector share matrix 2004 ( $shyF_{Fk}^{04}$ ). Derived value added vector by 73 SAM activities for 2006 ( $VA_{K}^{06}$ ) is distributed among 4 factor types using the factor-activity share matrix 2004 ( $shyF_{Fk}^{04}$ ) to update the factorial income matrix by activity for 2006 ( $yF_{Fk}^{06}$ ). The derivation is shown below.

$$yF_{Fk}^{06} = shyF_{Fk}^{04} \cdot VA_{K}^{06} \qquad (10)$$

Distribution of sectoral value added by the 4 representative factors and 8 NA sectors is reported below.

**Table 11: Estimates of Factor Incomes by Activities**

(Million Indian Rupees)

| | Labour | | Capital | | |
|---|---|---|---|---|---|
| **Activity** | **Unskilled** | **Skilled** | **Capital** | **Land** | **Value Added** |
| Agriculture, Forestry & Fishing | 25097273 | 8333952 | 9931342 | 16143234 | 59505800 |
| Mining & Quarrying | 857277 | 2004348 | 6186675 | 0 | 9048300 |
| Manufacturing | 8510054 | 12766312 | 30698234 | 0 | 51974600 |
| Construction | 12175763 | 6085171 | 3950066 | 0 | 22211000 |
| Electricity, Gas & Water Supply | 881557 | 4518518 | 1197924 | 0 | 6598000 |
| Trade, Hotels, Transport & Communication | 24096892 | 18819144 | 39577665 | 0 | 82493700 |
| Financial, Real Estate & Business Services | 6013459 | 16234423 | 24201418 | 0 | 46449300 |
| Community, Social & Personal Services | 2642525 | 19779526 | 24390349 | 0 | 46812400 |
| Share of Value Added (%) | 24.7 | 27.2 | 43.1 | 5.0 | 100.0 |

## Institutions Accounts

Current account transactions are captured between 4 institutional agents; households and unincorporated capital, corporate enterprises, government and the rest of the world. Household account includes 9 representative groups (5 rural and 4 urban). One consolidated capital account is also defined to capture the flows of savings and investment by institutions and the rest of the world respectively.

## Household Accounts

Households (HHs) should be conceptualized as consumption units, different from income earning agents (e.g. labourers, rentiers and capitalists), which receive "transfers" from the factor of production which they own and "sell" to production activities. This distinction is important because the income sources of earning agents can be diverse, (as many as the activities which use the factor(s) owned by the agents), while 'income' to households (viewed as a group of income earning agents) may come from the different factor endowments which the members of the household possess and may simultaneously come from several factor endowments.

Generally, in specifying household classifications the following criteria are considered:

1) Regional differences, i.e. urban and rural households;
2) Educational level of the head of the household;
3) Gender of the head of the household; and
4) Access to productive forms of material wealth particularly, agricultural land and land rights.

The above criteria can be justified on the grounds that:

a) Urban-rural income differentials are usually large. The average per capita disposable income of urban households is considerably higher than that of rural households. And often female headed household are more vulnerable;
b) Among the factors that can help to generate homogeneity the most relevant appear to be classifications according to homogeneity in consumption expenditure or savings patterns;
c) In urban areas differences in household income levels and consumption patterns are closely related to the educational level of the household head, while for rural households the size of farm landholdings appears to be most significant determinant; and
d) Significant differences in consumption pattern and in income generating capacity are found between those rural households primarily engaged in agricultural activities and those whose main income source is derived from non-agricultural activities.

The 2006 SAM distinguishes nine household types, classified according to location and occupation of the household's head. Household classifications contained in SAM 2006 are based on classifications adopted in SAM 2004 built by Ojha et al and NSSO (2001). The details are provided in the table below.

**Table 12: Household Types and Their Definition**

| SAM HH Classification | HIES Classification |
|---|---|
| rNgSe | Rural non-agricultural self employed |
| rAgLb | Rural agricultural labour |
| rOtLb | Rural other labour |
| rAgSe | Rural agricultural self employed |
| rOtHh | Rural other households |
| uSe | Urban self employed |
| uSclass | Urban salaried class |
| uCaLb | Urban casual labour |
| uOthHh | Urban other households |

Main sources of household's income are factor returns and various transfer from domestic and external institutions. Generation of household income from these sources is discussed below.

Household Income from Factors: Direct factor incomes (i.e. wages and mixed income) constitute the major source of household income. Compensation to employees or labour factor payments is paid entirely to the household groups, as they are the only suppliers of the labour factor. Control totals for labour incomes by the 2 factor types are already estimated above which must be distributed among the 9 representative households according to their factor endowments. Factor endowment information ( $shfY_{FH}^{04}$ ) are contained in Ojha SAM 2004[1]. Control totals for factor income ( $yF_{Fk}^{06}$ ) are applied on the factor endowment shares to generate households income from factors ( $fY_{FH}^{06} = shfY_{FH}^{04} \cdot \sum_{K} yF_{FK}^{06}$ ). This procedure ensures that the observed factor endowment structure (i.e. reflecting the factorial income distribution) of 2004 as well as the factor control totals for 2006 are preserved.

Household Receipts from Other Sources: Besides labour and mixed incomes, households also receive income from other sources, namely remittances or factor incomes from abroad, government transfers and transfers from the corporations.

Information of foreign remittance for 2006 fiscal year ( $rowR^{06}$ ) is obtained from the 'national accounts'. Remittance share information by household groups ( $shfR_{H}^{04}$ ) are contained in Ojha SAM 2004. Control totals for remittance ( $rowR^{06}$ ) are applied on the remittance shares to generate households income from remittance ( $rowR_{H}^{06} = shfR_{H}^{04} \cdot_{row} R^{06}$ ). This procedure ensures that the observed remittance structures of 2004 as well as the remittance control totals are preserved.

Similar procedures are also applied to distribute institutional transfers by representative household groups. Again institutional transfer (i.e. by government) share information by the representative household groups are obtained from Ojha SAM 2004. Control totals for the institutional transfers are applied on these shares to generate households' income from government transfers ( $gTr_{H}^{06} = shgTr_{H}^{04} \cdot_{NA} gTr^{06}$ ).Total receipts by household groups are derived from all the above sources and this is defined as:

$$R_{H}^{06} = \sum_{F} fY_{FH}^{06} + rowR_{H}^{06} + gTr_{H}^{06} \qquad (10)$$

Estimated household's receipts from different sources are provided in table below.

**Table 13: Estimates of Household's Receipts from Different Sources**

(Million Indian Rupees)

| Household Groups | Labour Income | Capital Income | Land Income | Government Transfer | Remittance | Total |
|---|---|---|---|---|---|---|
| Rural non-agricultural self employed | 13776741 | 10751290 | 0 | 3463153 | 376935 | 28630799 |
| Rural agricultural labour | 26631113 | 81514 | 0 | 2376747 | 471997 | 29561371 |
| Rural other labour | 8285405 | 482953 | 0 | 562246 | 43343 | 9373948 |
| Rural agricultural self employed | 23155433 | 26486492 | 16143234 | 9212617 | 739979 | 75925384 |
| Rural other households | 5849906 | 15736395 | 0 | 2865433 | 1198990 | 25650725 |
| Urban self employed | 16922342 | 17484928 | 0 | 4501810 | 3085971 | 42340274 |

[1] This was supplemented by additional information from SAM 2002 produced for Bangladesh by IFPRI.

| Household Groups | Labour Income | Capital Income | Land Income | Government Transfer | Remittance | Total |
|---|---|---|---|---|---|---|
| Urban salaried class | 60759661 | 3769027 | 0 | 6701980 | 2463190 | 73693859 |
| Urban casual labour | 8768417 | 1196171 | 0 | 397058 | 131419 | 10493065 |
| Urban other households | 2170275 | 5670283 | 0 | 1067055 | 2171177 | 11283944 |
| Income Share (%) | 54.36 | 26.69 | 5.28 | 10.18 | 3.49 | 100.00 |
| Ojha SAM 2004 Income Share (%) | 53.55 | 26.14 | 5.17 | 10.30 | 4.83 | 100.00 |

Household Expenditure Pattern: Consumption expenditure constitutes the major component of their outlays. Consumption expenditure by the 9 representative household groups and 73 SAM commodities is estimated using the expenditure structure contained in the NSSO and 2004 Ojha SAM. Both NSSO and 2004 Ojha SAM provides detailed breakdown of expenditure by 9 household groups and products. In particular, the product classifications adopted in NSSO and 2004 Ojha SAM which are different are mapped to 73 commodity groups. Household consumption by 73 SAM commodities ( $pC_K^{06}$ ) has already been derived using the private consumption control total and the private consumption structure for the 73 SAM commodities. Derived consumption vector is then distributed among the 9 household groups using their derived expenditure structures ( $shpC_{HK}^{06}$ ). The procedure generates a consumption matrix for 2006 by 9 representative household groups and 73 SAM commodities ( $pC_{HK}^{06} = shpC_{HK}^{06} \cdot pC_K^{06}$ ).

Household Outlays: Other notable expenditures incurred by household groups are income tax payment. Income tax payment shares contained in 2004 Ojha SAM ( $shdT_H^{04}$ ) and NA income tax payment control total ( ${}_{NA}dT^{06}$ ) are used to derive income tax payments by household groups ( $dT_H^{06} = shdT_H^{04} \cdot {}_{NA}dT^{06}$ ).

Total outlays by household groups are defined as:

$$P_H^{06} = \sum_K pC_{HK}^{06} + dT_H^{06} \qquad (11)$$

Household savings are determined by deducting household payments from household income in such way that savings close the account as well as reflect a savings pattern reflected in 2004 Ojha SAM. The household's outlays by these three categories are shown in Table 14.

**Table 14: Estimates of Household's Outlays by Categories**

(Million Indian Rupees)

| Household Groups | Consumption | Direct Tax | Savings | Total Outlay | Savings % | Savings % Ojha SAM |
|---|---|---|---|---|---|---|
| Rural non-agricultural self employed | 16819470 | 236638.39 | 11344613 | 28400721 | 13.6 | 13.4 |
| Rural agricultural labour | 27724194 | 0 | 1737344.5 | 29461538 | 2.0 | 1.9 |
| Rural other labour | 8882390 | 0 | 492281.88 | 9374671.9 | 0.6 | 0.4 |
| Rural agricultural self employed | 52930760 | 2758024.1 | 20419199 | 76107982 | 22.8 | 22.6 |
| Rural other households | 17762022 | 945059.16 | 7484221.9 | 26191303 | 8.8 | 8.3 |
| Urban self employed | 28875863 | 0 | 13392240 | 42268103 | 16.1 | 16.7 |
| Urban salaried class | 45289623 | 1584401.4 | 25515873 | 72389897 | 31.6 | 32.3 |
| Urban casual labour | 6763871.5 | 2647239.1 | 1091470.1 | 10502581 | 1.0 | 0.6 |
| Urban other households | 8049093.9 | 422337.87 | 2784450.7 | 11255882 | 3.5 | 3.9 |

| Household Groups | Consumption | Direct Tax | Savings | Total Outlay | Savings % | Savings % Ojha SAM |
|---|---|---|---|---|---|---|
| Outlay Share (%) | 69.4 | 2.8 | 27.8 | 100.0 | 100.0 | 100.00 |
| Ojha SAM 2004 (Share (%) | 70.0 | 3.3 | 26.7 | 100.0 | | |

## Other Institutions Accounts

Receipts and outlays of other three current institutions are discussed below.

Government Account: Sources of government income include tax and non-tax revenues. The main sources of tax revenue are (i) indirect taxes on imports and domestic production and (ii) direct taxes in the form of corporate and income taxes. Amounts for all of the four elements of tax revenues (i.e. $IT_K^{06}$, $dM_K^{06}$, $dT_H^{06}$ and $cT^{06}$) are already defined in the supply-demand section. The main sources of other than tax revenue ($nT^{06}$) are the income from the government owned corporations, financial institutions etc. Moreover, part of the value added which accrues to government in accordance to her participation in the production process is also included under the 'non tax' head. Total government receipt ($gR^{06}$) is thus defined as:

$$gR^{06} = \sum_K IT_K^{06} + \sum_K dM_K^{06} + \sum_H dT_H^{06} + cT^{06} + nT^{05} \qquad (12)$$

Government spends most of her income on purchase of goods and services ($gC_K^{06}$) and transfer programmes ($gTr_H^{06}$). Rest of the income constitutes government savings. Government savings ($gS^{06}$) act as the balancing factor between its receipts and outlays. The balancing condition envisages that receipt must equate the outlay. This is specified as:

$$gR^{06} = \sum_K gC_K^{06} + \sum_H gTr_H^{06} + gS^{06} = 0 \qquad (13)$$

Corporate Account: Part of the value addition accrues to the corporation in accordance to its participation in the production of goods and services ($cVA^{06}$). Part of corporate income is transferred to government in the form of corporation tax ($cT^{06}$). Rest of the corporate income constitutes savings for the corporation. Corporate savings ($cS^{06}$) act as the balancing factor between corporate receipts and outlays. The balancing condition envisages that receipt must equate the outlay. This is specified as:

$$(cVA^{06} + mTr^{06}) - cT^{06} + cS^{06} = 0 \qquad (14)$$

Rest of the World Account: Rest of the world account records inflow and outflow of foreign resources in a country in a fiscal year. The major sources of inflows are: imports of goods and services and foreign assistance (i.e. $rowS^{06}$ also known as foreign savings). Major form of outflow includes exports of goods and services, net factor returns and net current transfer (remittances). Amounts for all of these four elements which are defined above are assembled in this account to complete the account as well as to verify its balance. The balancing condition envisages that sum of inflows must equates the sum of the outflows. This is specified as:

$$\sum_K M_K^{06} + rowS^{06} - \sum_K E_K^{06} + \sum_{FK} yF_{Fk}^{06} + \sum_H rowR_H^{06} = 0 \qquad (15)$$

## Some Key Features of SAM 2006

Salient features of the SAM 2006 are discussed here in terms of economic structure and the household profile. In order to examine structural changes, the SAM 2006 results are compared with results produced by Saluja SAM and Ojha SAM.

### Demand and Supply Structure

The 2006 structures of demand and supply are reported in Table 15 and Table 16. Key observations are discussed below.

**Table 15: Composition of Demand in Various Data Sets**

(In percent)

| | NA 06 | SAM 06 | | NA 04 | SALUJA SAM 04 |
|---|---|---|---|---|---|
| **Final Demand Composition** | | | | | |
| *Private Consumption* | 47.0 | 48.3 | | 53.3 | 56.3 |
| *Public Consumption* | 9.2 | 9.2 | | 9.7 | 10.2 |
| *Exports Goods and Services* | 16.5 | 16.5 | | 12.7 | 13.9 |
| *GFC* | 26.0 | 26.0 | | 22.9 | 19.5 |
| *Statistical Discrepancy* | 1.3 | 0 | | 1.4 | 0.0 |
| Total Final Demand | 100.00 | 100.00 | | 100.00 | 100.00 |
| **Demand Composition** | | | | | |
| *Intermediate Demand* | '----' | 36.64 | | '----' | 40.00 |
| *Final Demand* | '----' | 63.36 | | '----' | 60.00 |
| Total Demand | 100.00 | 100.00 | | 100.00 | 100.00 |

Source: SAM 2006, Saluja SAM 2004, and Consolidated Account of Nation - Gross Domestic Product and Expenditure (At Current Prices) in India

- According to national account 2006 (i.e. first column of the above table), total consumption (private + public) accounted for about 56 percent of final demand of India in 2006. Total investment is around 26 percent of final demand. The share of exports is around 27 percent. Statistical discrepancy is around 1.3 percent.

- Final demand composition according to national account 2004 (i.e. third column of the above table), show substantial difference from the final demand composition of 2006. Total consumption (private + public) in 2004 accounted for about 63 percent of final demand. This suggests that total consumption in 2006 declined by 7 percentage point compared to 2004. The fall is consumption in 2006 was compensated by rises in GFC (i.e. 3.2 percentage point rise) and exports of goods and services (i.e. 3.8 percentage point rise).

- A desirable property of a SAM is the exact or close association between NA values and SAM values. The final demand composition of SAM 06 is shown in the second column of the above table. Except for the private consumption component, all other components of the SAM 06 preserved exact correspondence with their counterpart values in NA 06. As mentioned in the earlier section, statistical discrepancy of 1.3 percent found in NA 06 was absorbed in the private consumption component of SAM 06. As a result, the share of private consumption increased to 48.3 percent from 47 percent share found in NA 06.
- The final demand composition of Saluja SAM 04 did not preserve the demand composition reported in the NA 04.

**Table 16: Composition of Supply in Various Data Sets**

(In percent)

| | NA 06 | SAM 06 | | NA 04 | SALUJA SAM 04 |
|---|---|---|---|---|---|
| **GDP Composition** | | | | | |
| Net GDP at Factor Cost | 80.5 | 80.5 | | 81.9 | 85.6 |
| Consumption of Fixed Capital | 10.6 | 10.6 | | 10.3 | 9.6 |
| Indirect Tax less Subsidies | 8.9 | 8.9 | | 7.8 | 4.8 |
| Gross Domestic Product | 100.0 | 100.0 | | 100.0 | 100.0 |
| **Supply Composition (Excluding Intermediate Use)** | | | | | |
| *Domestic* | 81.1 | 81.1 | | 86.2 | 84.4 |
| *Imports* | 18.9 | 18.9 | | 13.8 | 15.6 |
| Total Supply | 100.00 | 100.00 | | 100.00 | 100.00 |
| **Supply Composition** | | | | | |
| *Intermediate Use* | '----' | 36.64 | | '----' | 40.00 |
| *Final Use (including taxes, tariff, imports etc.)* | '----' | 63.36 | | '----' | 60.00 |
| Total Supply | 100.00 | 100.00 | | 100.00 | 100.00 |

Source: SAM 2006, Saluja SAM 04, and Consolidated Account of Nation - Gross Domestic Product and Expenditure (At Current Prices) in India

- Unlike the demand composition, substantial differences are not observed between GDP compositions between 2006 and 2004. The largest component of GDP is factor returns which accounted for about 81 percent in 2006 and 82 percent in 2004. Consumption of fixed capital or depreciation was around 10 percent both in 2006 (i.e. 10.6 percent) and in 2004 (i.e. 10.3 percent). Share of the net indirect tax however rose more than 1 percentage point in 2006 compared to 2004.

- Decomposition of supply by domestic and external sources reveals substantial difference between 2006 and 2004. The share of imported supply in 2006 is 19 percent envisaging 5 percentage points rise from 2004 share (i.e. 14 percent). The rise in imported share in 2006 is compensated by fall of domestic supply in 2006 (i.e. 81 percent) compared to the share of domestic supply on 2004 (i.e. 86 percent).

- Again the desirable property of exact/close association between NA values and SAM values has been preserved for the GDP and supply compositions in SAM 06.

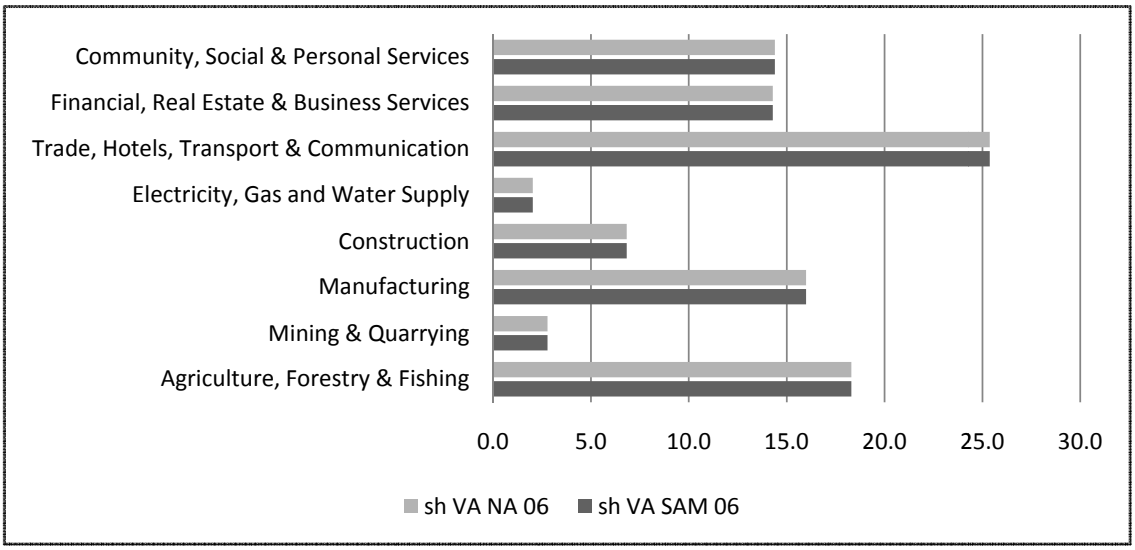
- Both GDP and supply compositions of SAM 04 show substantial variations from the compositions reported in NA 04. For instance, share of net factor GDP in SAM 04 is 86 percent compared to the 82 percent share reported in NA 04.

- Observed changes in demand and supply compositions of 2006 (i.e. contained both by NA 06 and SAM 06) compared to 2004 compositions suggest that intermediate use and demand of SAM 06 would vary from the intermediate use and demand reported in SAM 04. In line with the expectation, these variations are captured by variations in endogeneity degrees and linkages of SAM 06 compared to SAM 04.

**Structure of 2006 Indian Economy by Key Sectors**

The economic structure of India as contained in SAM 2006 by 73 producing activities is presented by 8 national account sectors for comparison with national account data for the same year. According to the SAM 2006 data, three service sectors together accounts for about 54 percent of gross domestic product. National account also report 54 percent contribution by service sectors. *The service sector has thus emerged as the leading sector in India for income generation.* Service sector is followed by agriculture sub-sector accounting for about 18 percent of GDP. The contribution of manufacturing sub-sector is around 16 percent of GDP. National account estimates also report 18 and 16 percent contributions by agriculture and manufacturing sub-sectors respectively. Exact correspondences between national account data and SAM 2006 for other sub-sectors are also found and reported below. Establishing exact correspondence between national account estimates and SAM is an important criterion to validate the SAM.

**Figure 1: Value added shares by NA 06 and SAM 06**




The desirable characteristic of the exact or close correspondence between national account data and estimates generated by the SAM has been preserved in SAM 2006.

**Activity Level Endogeneity Degree and Linkages**

The representation of economic structure of an economy as contained in a SAM is best understood by assessing the activity level endogeneity degree and backward linkage. To proceed with the analysis of multipliers and linkages it is necessary to calculate the matrix of technology coefficients (e.g. Leontief I-O technology coefficients). The inverse of the coefficient matrix after deducting for the identity matrix represents the so-called matrix of production multipliers.

The backward linkages, which are the total column sum of the inverse, provide valuable information about the degree of integration of an activity across and with the rest of the economy. Using this indicator it is possible to determine which activities contribute most to growth as a result of an exogenous increase in final demand, say exports. Forward linkages on the other hand help us to understand the importance of a commodity for the rest of the economy in terms of intermediate demand or marketing. Therefore a commodity that exhibits high forward linkages it is said to be important in the process of expansion or high growth, in this context potential bottleneck can be identified.

List of activities with highest backward linkages are shown in table below.

**Table 17: Ten Economic Activities with the Highest Backward Linkage SAM 06**

| C ode | Activity | Endogeneity Degree | Backward Linkages | Forward Linkages |
|---|---|---|---|---|
| 34 | Leather products | 0.684 | 2.660 | 2.307 |
| 47 | Non-ferrous basic metals | 0.739 | 2.448 | 3.135 |
| 52 | Electronic equipments(incl.TV) | 0.683 | 2.333 | 1.093 |
| 46 | Iron & steel | 0.728 | 2.328 | 4.805 |
| 28 | W ool synthetic, silk fiber textiles | 0.728 | 2.327 | 1.186 |
| 23 | Khandsari, boora | 0.861 | 2.311 | 1.012 |
| 24 | Edible & Vanaspati | 0.869 | 2.305 | 1.032 |
| 51 | Communication equipments | 0.681 | 2.289 | 1.254 |
| 22 | Sugar | 0.842 | 2.286 | 1.041 |
| 55 | Other transport equipments | 0.656 | 2.281 | 1.113 |

- The activities with backward linkages over 2.2 are Leather Products, Metal Products, Iron and steel etc. In economic terms these are the activities to be incentivized if fast growth is a strategy. However, due consideration has to be given to the importance of the sector in the total economy. In our case the activities that show high backward linkages are not surprisingly by and large coincide with the endogeneity degree but the order is not the same.

- The highest degree of endogeneity, 65% and higher is observed for several manufacturing commodities and some primary activities. The finding seems to support the thesis that manufacturing of primary activities with high input structure tend to have higher backward linkages.

- Activities with higher (highest) backward linkages usually are associated with lower (lowest) forward linkages. Except for few activities, such inverse associations between the backward and forward linkages are also found in the case of SAM 2006.

Table below shows the list of activities with lowest backward linkages.

**Table 18: Ten Economic Activities with the Lowest Backward Linkage SAM 06**

| C ode | Activity | Endogeneity Degree | Backward Linkages | Forward Linkages |
|---|---|---|---|---|
| 73 | Public administration | 0.017 | 1.033 | 1.048 |
| 69 | Ownership of dwellings | 0.062 | 1.131 | 1.001 |
| 19 | Crude petroleum, natural gas | 0.100 | 1.165 | 7.908 |
| 70 | Education and research | 0.106 | 1.171 | 1.043 |
| 16 | Forestry and logging | 0.100 | 1.180 | 1.309 |
| 17 | Fishing | 0.132 | 1.227 | 1.029 |
| 9 | Tea & coffee | 0.160 | 1.273 | 1.039 |
| 65 | Trade | 0.189 | 1.294 | 8.145 |
| 67 | Banking | 0.194 | 1.296 | 5.488 |
| 64 | Communication | 0.195 | 1.367 | 2.372 |

- It is important to note that activities with relatively low backward linkages are associated with low endogeneity degrees. Relatively low backward linkages for these activities may be due to their heavy reliance of imported raw material or higher payments to the primary factors.

- At the other end it is also interesting to see that mainly service activities as well as nature based activities (e.g. forestry, crude petroleum etc.) are the one showing the lowest endogeneity degree. In most economies services are indeed poorly linked with the rest of the economy; therefore this is not surprising in the case of India.

- As mentioned above, due to observed changes in demand and supply compositions of 2006 compared to 2004 compositions suggest that intermediate use and demand of SAM 06 would vary from the intermediate use and demand reported in SAM 04. These variations are captured by variations in endogeneity degrees and linkages of SAM 06 compared to SAM 04. The list of activities with highest and lowest backward linkages of SAM 04 is reported in Table 19.

**Table 19: Ten Economic Activities with the Highest and Lowest Backward Linkage SAM 04**

| C ode | Activity | Endogeneity Degree | Backward Linkages | Forward Linkages |
|---|---|---|---|---|
| **Activities with Highest Backward Linkages** | | | | |
| 52 | Electronic equipments(incl.TV) | 0.770 | 2.681 | 1.059 |
| 42 | Paints, varnishes and lacquers | 0.744 | 2.581 | 1.301 |
| 47 | Non-ferrous basic metals | 0.756 | 2.561 | 2.885 |
| 28 | W wool synthetic, silk fiber textiles | 0.746 | 2.553 | 1.450 |
| 40 | Fertilizers | 0.819 | 2.540 | 2.252 |
| 46 | Iron & steel | 0.733 | 2.532 | 5.200 |
| 51 | Communication equipments | 0.695 | 2.515 | 1.308 |
| 37 | Coal tar products | 0.883 | 2.468 | 1.513 |
| 54 | Rail equipments | 0.646 | 2.456 | 1.257 |
| 24 | Edible & Vanaspati | 0.880 | 2.447 | 1.232 |
| **Activities with Lowest Backward Linkages** | | | | |
| 9 | Tea & coffee | 0.143 | 1.254 | 1.049 |
| 17 | Fishing | 0.130 | 1.250 | 1.047 |

| C ode | Activity | Endogeneity Degree | Backward Linkages | Forward Linkages |
|---|---|---|---|---|
| 19 | Crude petroleum, natural gas | 0.119 | 1.236 | 4.073 |
| 70 | Education and research | 0.127 | 1.225 | 1.008 |
| 11 | Tobacco | 0.103 | 1.220 | 1.040 |
| 13 | Milk and milk products | 0.142 | 1.207 | 1.168 |
| 10 | Rubber | 0.094 | 1.205 | 1.114 |
| 16 | Forestry and logging | 0.089 | 1.177 | 1.433 |
| 69 | Ownership of dwellings | 0.070 | 1.145 | 1.000 |
| 73 | Public administration | 0.000 | 1.000 | 1.000 |

## Household Receipt and Outlay Profiles

Household classifications contained in SAM 2006 are based on classifications adopted in SAM 2004 developed by Ojha et al. Household classifications of Ojha SAM were based on NSSO (2001) data (please see NSSO 2000-01, pp A-20). Since the income and outlay profiles of the nine representative household groups captured in the Ojha SAM are based on NSSO, they represent profiles of the all household groups of the country. Since the household accounts of SAM 06 adhere to the classifications and profiles of Ojha SAM 04 and close or exact correspondence between the household profiles of these two SAMs envisaged that SAM 06 satisfactorily represent the household profiles of India. Income and outlay profiles of SAM 06 are provided in Table 20 and Table 21 respectively.

**Table 20: Household Income Profile**

(In percent)

| Household Groups | Labour Unskilled | Labour Skilled | Labour (Unskilled + Skilled) | Capital | Land | Transfer Gov. | Remittance | Total Income |
|---|---|---|---|---|---|---|---|---|
| **Income Profile SAM 2006** | | | | | | | | |
| Rural non-ag. self employed | 4.4 | 11.8 | 8.3 | 13.1 | 0.0 | 11.1 | 3.5 | 9.3 |
| Rural agricultural labour | 24.4 | 8.3 | 16.0 | 0.0 | 0.0 | 7.6 | 4.4 | 9.6 |
| Rural other labour | 6.9 | 3.3 | 5.0 | 0.6 | 0.0 | 1.8 | 0.4 | 3.1 |
| Rural ag. self employed | 19.7 | 8.7 | 13.9 | 32.9 | 100.0 | 29.6 | 6.9 | 24.9 |
| Rural other households | 3.8 | 3.2 | 3.5 | 19.9 | 0.0 | 9.2 | 11.2 | 8.6 |
| Urban self employed | 10.7 | 9.7 | 10.2 | 21.7 | 0.0 | 14.5 | 28.9 | 13.8 |
| Urban salaried class | 17.8 | 53.5 | 36.5 | 3.0 | 0.0 | 21.5 | 23.1 | 23.7 |
| Urban casual labour | 10.2 | 0.8 | 5.3 | 1.5 | 0.0 | 1.3 | 1.2 | 3.4 |
| Urban other households | 2.0 | 0.6 | 1.3 | 7.2 | 0.0 | 3.4 | 20.3 | 3.7 |
| Total | 100.0 | 100.0 | 100.0 | 100.0 | 100.0 | 100.0 | 100.0 | 100.0 |
| **Income Profile OJHA SAM 2004** | | | | | | | | |
| Rural non-ag. self employed | | | 8.3 | 13.2 | 0.0 | 11.1 | 3.5 | 9.2 |
| Rural agricultural labour | | | 16.0 | 0.1 | 0.0 | 7.6 | 4.4 | 9.6 |
| Rural other labour | | | 5.0 | 0.6 | 0.0 | 1.8 | 0.4 | 3.0 |
| Rural ag. self employed | | | 13.9 | 32.4 | 100.0 | 29.6 | 6.9 | 24.5 |
| Rural other households | | | 3.5 | 19.3 | 0.0 | 9.2 | 11.2 | 8.4 |
| Urban self employed | | | 10.2 | 21.4 | 0.0 | 14.5 | 28.9 | 13.9 |
| Urban salaried class | | | 36.5 | 4.6 | 0.0 | 21.5 | 23.1 | 24.1 |
| Urban casual labour | | | 5.3 | 1.5 | 0.0 | 1.3 | 1.2 | 3.4 |
| Urban other households | | | 1.3 | 6.9 | 0.0 | 3.4 | 20.3 | 3.8 |
| Total | | | 100.0 | 100.0 | 100.0 | 100.0 | 100.0 | 100.0 |

- Household income profiles of SAM 06 closely correspondence the household income profiles of SAM 04 and hence NSSO profiles. Almost 37 percent of labour income accrues to unban salaried class followed by rural agricultural labour household (16 percent) and rural agricultural self-employed households.

- Almost 68 percent of capital income (i.e. mixed income) accrues to the three self-employed household groups namely rural agricultural self-employed (33 percent); urban self-employed (22 percent); and rural non-agricultural self-employed (13 percent). These three household groups are closely followed by two other household groups receiving around 27 percent capital income. Remaining 5 percent of capital income is thus shared by other four labour household groups.

- Around 60 percent of the government transfers are received by the rural household groups. Two major beneficial rural households are rural agricultural self-employed (30 percent) and rural non-agricultural self-employed (11 percent).

- Foreign remittances are received predominantly by three urban household groups namely urban self-employed (29 percent); urban salaried class (23 percent); and urban other households (20 percent). Together they receive more than 72 percent of foreign remittance. Among rural household major remittance recipients are rural other households and rural agricultural self-employed groups.

**Table 21: Household Outlay Profile**

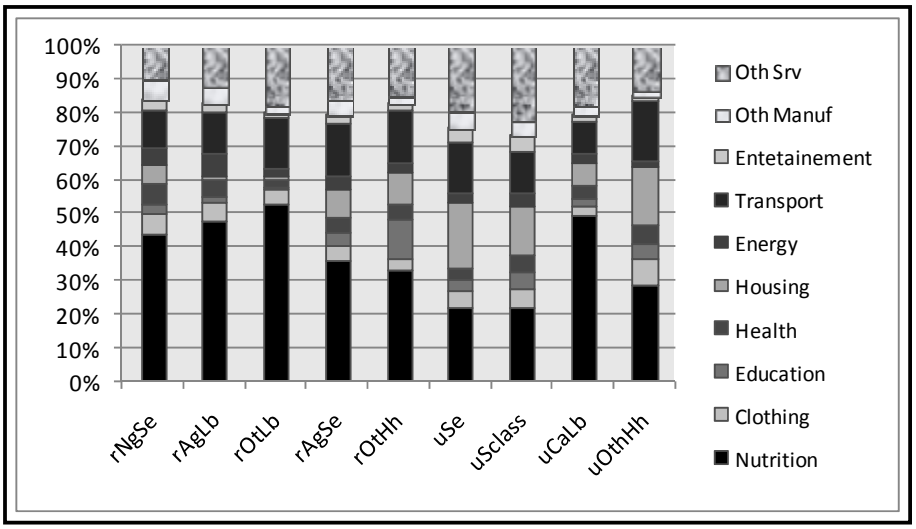
(In percent)

| | SAM 06 | | | OJHA SAM 04 | | | |
|---|---|---|---|---|---|---|---|
| **Household Groups** | **Consumption** | **Direct Tax** | **Savings** | **Consumption** | **Direct Tax** | **Savings** | **Tax on Purchase** |
| Rural non-ag. self employed | 7.9 | 2.8 | 13.5 | 7.9 | 2.8 | 13.4 | 7.8 |
| Rural agricultural labour | 13.0 | | 2.1 | 13.0 | | 1.9 | 12.7 |
| Rural other labour | 4.2 | | 0.9 | 4.2 | | 0.4 | 4.1 |
| Rural ag. self employed | 24.8 | 32.1 | 24.2 | 24.8 | 32.1 | 22.6 | 24.6 |
| Rural other households | 8.3 | 11.0 | 8.9 | 8.3 | 11.0 | 8.3 | 8.4 |
| Urban self employed | 13.6 | | 15.9 | 13.5 | | 16.7 | 13.6 |
| Urban salaried class | 21.3 | 18.4 | 30.3 | 21.2 | 18.4 | 32.3 | 21.6 |
| Urban casual labour | 3.2 | 30.8 | 1.3 | 3.2 | 30.8 | 0.6 | 3.2 |
| Urban other households | 3.8 | 4.9 | 3.3 | 3.8 | 4.9 | 3.9 | 3.9 |
| Total | 100.0 | 100.0 | 100.0 | 100.0 | 100.0 | 100.0 | 100.0 |

## Consumption Pattern

The basic needs (BN) classification is introduced to capture the situation of the household groups in terms of those wants which characterizes their well being situation. For reasons of importance 10 types of wants have been distinguished. The household consumption matrix of SAM 06 has been re-classified by 10 basic needs using a mapping between 73 SAM commodity classification and 10 basic needs classification (please see Table 23). The consumption by basic needs categories and by nine household groups is shown in figure below.

**Figure 2: Consumption Pattern by Basic Needs and Household Groups**




- On average, households in India spent around 33 percent of their resources on nutrition. Income spent by rural household nutrition is almost double (i.e. 40 percent) than that spent by their urban counter part (25 percent).

- Out of five rural households, three households have found to spend more than 40 of their income on nutrition. They are: rural agricultural other labour (52 percent); rural agricultural labour (48 percent); and rural non-agricultural self-employed (44 percent). Out of four urban households, two households have spent more than 25 of their income on nutrition. They are: urban casual labour (49 percent); and urban other household (29 percent).

- On average, households in India spent around 10 percent of their resources on housing. There may be some under estimation of housing expenditure as imputed values for owner occupied houses are usually under-valued. However, expenditures on housing by urban household groups (i.e. 16 percent) are significantly higher than the expenditures reported by their rural counterparts (i.e. 6 percent).

- Household in India on average spent 14 percent of their total incomes on transport services. Significant differences have not been observed between transport expenditure patterns of rural and urban household groups.

- Another basic needs on which household in India on average spent around 17 percent of their total incomes is other services (i.e. this is mixed category inclusive of various types of services). In line with acceptation, expenditures on other services by urban household groups (i.e. 21 percent) are significantly higher than the expenditures reported by their rural counterparts (i.e. 15 percent).

## Annex 1: Endogeneity Degree and Linkages

**Table 22: Endogeneity Degree and Backward Linkages**

| | Activity | SAM 2006 | | SAM 2004 | |
|---|---|---|---|---|---|
| | | Endogeneity Degree | Backward Linkage | Endogeneity Degree | Backward Linkage |
| 1 | Paddy | 0.341 | 1.583 | 0.312 | 1.611 |
| 2 | Wheat | 0.384 | 1.674 | 0.352 | 1.709 |
| 3 | other cereals | 0.343 | 1.619 | 0.313 | 1.673 |
| 4 | Pulses | 0.325 | 1.576 | 0.297 | 1.608 |
| 5 | Sugarcane | 0.331 | 1.565 | 0.177 | 1.339 |
| 6 | Oilseeds | 0.273 | 1.496 | 0.248 | 1.515 |
| 7 | Jute | 0.214 | 1.388 | 0.193 | 1.411 |
| 8 | Cotton | 0.266 | 1.491 | 0.241 | 1.513 |
| 9 | Tea & coffee | 0.160 | 1.273 | 0.143 | 1.254 |
| 10 | Rubber | 0.249 | 1.468 | 0.094 | 1.205 |
| 11 | Tobacco | 0.290 | 1.527 | 0.103 | 1.220 |
| 12 | Other crops | 0.207 | 1.368 | 0.139 | 1.291 |
| 13 | Milk and milk products | 0.357 | 1.518 | 0.142 | 1.207 |
| 14 | Animal services(agricultural) | 0.935 | 2.281 | 0.995 | 2.396 |
| 15 | Other livestock products | 0.302 | 1.441 | 0.276 | 1.409 |
| 16 | Forestry and logging | 0.100 | 1.180 | 0.089 | 1.177 |
| 17 | Fishing | 0.132 | 1.227 | 0.130 | 1.250 |
| 18 | Coal and lignite | 0.215 | 1.386 | 0.249 | 1.500 |
| 19 | Crude petroleum, natural gas | 0.100 | 1.165 | 0.119 | 1.236 |
| 20 | Iron ore | 0.220 | 1.387 | 0.255 | 1.506 |
| 21 | Other Minerals | 0.218 | 1.380 | 0.150 | 1.293 |
| 22 | Sugar | 0.842 | 2.286 | 0.864 | 2.212 |
| 23 | Khandsari, boora | 0.861 | 2.311 | 0.897 | 2.270 |
| 24 | Edible & Vanaspati | 0.869 | 2.305 | 0.880 | 2.447 |
| 25 | Misc food products | 0.801 | 2.239 | 0.816 | 2.342 |
| 26 | Beverages & tobacco products | 0.656 | 2.181 | 0.560 | 1.972 |
| 27 | Cotton textiles | 0.719 | 2.189 | 0.741 | 2.341 |
| 28 | Wool synthetic, silk fiber textiles | 0.728 | 2.327 | 0.746 | 2.553 |
| 29 | Jute, hemp, mesta textiles | 0.600 | 1.937 | 0.626 | 2.099 |
| 30 | Textile products | 0.629 | 2.176 | 0.653 | 2.350 |
| 31 | Furniture and wood products | 0.585 | 1.922 | 0.464 | 1.751 |
| 32 | Paper, paper prods. & newsprint | 0.535 | 1.879 | 0.705 | 2.404 |
| 33 | Printing and publishing | 0.521 | 1.936 | 0.465 | 1.968 |
| 34 | Leather products | 0.684 | 2.660 | 0.706 | 2.363 |
| 35 | Rubber and plastic products | 0.660 | 2.064 | 0.683 | 2.316 |
| 36 | Petroleum products | 0.673 | 1.786 | 0.688 | 1.893 |
| 37 | Coal tar products | 0.872 | 2.247 | 0.883 | 2.468 |
| 38 | Inorganic heavy chemicals | 0.632 | 2.128 | 0.655 | 2.327 |
| 39 | Organic heavy chemicals | 0.630 | 2.132 | 0.650 | 2.362 |
| 40 | Fertilizers | 0.800 | 2.081 | 0.819 | 2.540 |
| 41 | Pesticides | 0.630 | 2.183 | 0.654 | 2.398 |

| | Activity | SAM 2006 | | SAM 2004 | |
|---|---|---|---|---|---|
| | | Endogeneity Degree | Backward Linkage | Endogeneity Degree | Backward Linkage |
| 42 | Paints, varnishes and lacquers | 0.729 | 2.256 | 0.744 | 2.581 |
| 43 | Misc chemicals | 0.580 | 1.927 | 0.600 | 2.136 |
| 44 | Cement | 0.683 | 2.035 | 0.706 | 2.214 |
| 45 | Other non metallic mineral products | 0.564 | 1.939 | 0.589 | 2.046 |
| 46 | Iron & steel | 0.728 | 2.328 | 0.733 | 2.532 |
| 47 | Non-ferrous basic metals | 0.739 | 2.448 | 0.756 | 2.561 |
| 48 | Metal products | 0.601 | 2.210 | 0.622 | 2.360 |
| 49 | Other non electric machinery | 0.639 | 2.279 | 0.658 | 2.435 |
| 50 | Electrical appliances | 0.605 | 2.156 | 0.625 | 2.349 |
| 51 | Communication equipments | 0.681 | 2.289 | 0.695 | 2.515 |
| 52 | Electronic equipments(incl.TV) | 0.683 | 2.333 | 0.770 | 2.681 |
| 53 | Other electrical Machinery | 0.613 | 2.182 | 0.634 | 2.374 |
| 54 | Rail equipments | 0.622 | 2.277 | 0.646 | 2.456 |
| 55 | Other transport equipments | 0.656 | 2.281 | 0.673 | 2.411 |
| 56 | Misc Manufacturing | 0.590 | 2.177 | 0.604 | 2.341 |
| 57 | Construction | 0.600 | 2.095 | 0.549 | 2.066 |
| 58 | Electricity | 0.381 | 1.528 | 0.645 | 2.180 |
| 59 | Gas | 0.387 | 1.562 | 0.182 | 1.277 |
| 60 | Water supply | 0.355 | 1.610 | 0.364 | 1.713 |
| 61 | Railway transport services | 0.421 | 1.710 | 0.469 | 1.943 |
| 62 | Other transport services | 0.319 | 1.554 | 0.544 | 2.018 |
| 63 | Storage and warehousing | 0.286 | 1.468 | 0.416 | 1.802 |
| 64 | Communication | 0.195 | 1.367 | 0.223 | 1.451 |
| 65 | Trade | 0.189 | 1.294 | 0.222 | 1.391 |
| 66 | Hotels and restaurants | 0.626 | 2.121 | 0.671 | 2.150 |
| 67 | Banking | 0.194 | 1.296 | 0.215 | 1.353 |
| 68 | Insurance | 0.236 | 1.385 | 0.301 | 1.532 |
| 69 | Ownership of dwellings | 0.062 | 1.131 | 0.070 | 1.145 |
| 70 | Education and research | 0.106 | 1.171 | 0.127 | 1.225 |
| 71 | Medical and health | 0.471 | 1.897 | 0.701 | 2.261 |
| 72 | Other services | 0.729 | 2.259 | 0.266 | 1.540 |
| 73 | Public administration | 0.017 | 1.033 | 0.000 | 1.000 |

**Table 23: Mapping between SAM Commodity Classification and Basic Needs Classification**

| Nutrition | Clothing | Education | Health | Housing | Energy | Transport | Entertainment | Other Manufacture | Other Service |
|---|---|---|---|---|---|---|---|---|---|
| Paddy | | | | | | | | | |
| Wheat | | | | | | | | | |
| Other cereals | | | | | | | | | |
| Pulses | | | | | | | | | |
| Sugarcane | | | | | | | | | |
| Oilseeds | | | | | | | | | |
| | Jute | | | | | | | | |
| | Cotton | | | | | | | | |
| Teacoffee | | | | | | | | | |
| | Rubber | | | | | | | | |
| Tobacco | | | | | | | | | |
| Other crops | | | | | | | | | |
| Milk products | | | | | | | | | |
| | | | | | | | | | Animal services |
| Other livestock products | | | | | | | | | |
| | | | | | Forestry | | | | |
| Fishing | | | | | | | | | |
| | | | | | Coal | | | | |
| | | | | | Crude petroleum natural gas | | | | |
| | | | | | | | | Iron | |
| | | | | | | | | Other Minerals | |
| Sugar | | | | | | | | | |
| Khandsari | | | | | | | | | |
| EdibleVanaspati | | | | | | | | | |
| Misc food prod | | | | | | | | | |
| Bev tobacco | | | | | | | | | |
| | Cotton text | | | | | | | | |
| | W wool text | | | | | | | | |
| | Jute text | | | | | | | | |
| | Textile prod | | | | | | | | |
| | | | | | | | | Furniture wood products | |
| | | | | | | | | Paper | |
| | | | | | | | | Printing | |
| | Leather prod | | | | | | | | |
| | Rubber prod | | | | | | | | |
| | | | | | Petroleum products | | | | |
| | | | | | Coal tar products | | | | |
| | | | | | | | | Inorganic heavy chemicals | |
| | | | | | | | | Organic heavy chemicals | |
| | | | | | | | | Fertilizers | |
| | | | | | | | | Pesticides | |
| | | | | | | | | Paints | |
| | | | | | | | | Mis chemicals | |
| | | | | | | | | Cement | |
| | | | | | | | | Other non metallic mineral products | |
| | | | | | | | | Ironsteel | |
| | | | | | | | | Nonferrous basic metals | |
| | | | | | | | | Metal products | |
| | | | | | | | | Other non electric machinery | |
| | | | | | | | | Electrical appliances | |
| | | | | | | | | Communication equipments | |
| | | | | | | | | Electronic equipments | |
| | | | | | | | | Other electrical | |

| Nutrition | Clothing | Education | Health | Housing | Energy | Transport | Entertainment | Other Manufacture | Other Service |
|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | | Machinery | |
| | | | | | | | | Rail equipments | |
| | | | | | | | | Other transport equipments | |
| | | | | | | | | Misc Manufacturing | |
| | | | | | | | | Construction | |
| | | | | | Electricity | | | | |
| | | | | | Gas | | | | |
| | | | | | Water supply | | | | |
| | | | | | | Railway transport services | | | |
| | | | | | | Other transport services | | | |
| | | | | | | | | | Storage |
| | | | | | | | | | Communication |
| | | | | | | | | | Trade |
| | | | | | | | Hotels | | |
| | | | | | | | | | Banking |
| | | | | | | | | | Insurance |
| | | | | Ownership dwellings | | | | | |
| | | Education | | | | | | | |
| | | | Health | | | | | | |
| | | | | | | | | | Other serv |
| | | | | | | | | | Public admin |
| **21** | **6** | **1** | **1** | **1** | **8** | **2** | **1** | **25** | **7** |

# ANNEX 2

# EQUATIONS OF THE INDIA DYNAMIC CGE MODEL

***Production***

(1) $XS_j = Min\left[\frac{CI_j}{io_j}, \frac{VA_j}{v_j}\right]$

(2) $VA_i = A_i^{KL}\left[\alpha_i^{KL} LD_i^{-\rho_i^{KL}} + \left(1-\alpha_i^{KL}\right) KD_i^{-\rho_i^{KL}}\right]^{-1/\rho_i^{KL}}$

(3) $LD_i = A_i^{LL}\left[\alpha_i^{LL} QL_i^{-\rho_i^{LL}} + \left(1-\alpha_i^{LL}\right) NQL_i^{-\rho_i^{LL}}\right]^{-1/\rho_i^{LL}}$

(4) $CI_j = io_j XS_j$

(5) $DI_{i,j} = aij_{i,j} CI_j$

(6) $LD_i = \left(\frac{\alpha_i^{KL}}{1-\alpha_i^{KL}}\right)^{\sigma_i^{KL}} \left(\frac{r_i}{w_i}\right)^{\sigma_i^{KL}} KD_i$

(7) $NQL_i = \left(\frac{\alpha_i^{LL}}{1-\alpha_i^{LL}}\right)^{\sigma_i^{LL}} \left(\frac{wq}{wnq}\right)^{\sigma_i^{LL}} QL_i$

***Income and savings***

(8)
$$YH_h = \lambda_h^{WQ} \cdot wq \sum_j QL_j + \lambda_h^{WNQ} \cdot wnq \sum_j NQL_j + \lambda_h^{R} \sum_{nag} r_{nag} KD_{nag}$$
$$+\lambda_h^{L} \cdot \sum_{ag} r_{ag} KD_{ag} + Pindex \cdot TG_h + Pindex \cdot TH_{h,hj} + Pindex \cdot TWH_h + DIV_h$$

(9) $YDH_h = YH_h - DTH_h$

(10) $SH_h = \nu \cdot \psi_h \cdot YDH_h$

(11) $YF = \lambda^{RF} \sum_i r_i KD_i + \lambda^{LF} \cdot rl \cdot LAND$

(12) $SF = YF - \sum_h DIV_h - e \cdot DIV^{ROW} - DTF$

(13) $YG = \sum_i TI_i + \sum_i TIE_i + \sum_i TIM_i + \sum_h DTH_h + DTF$

(14) $SG = YG - G - PINDEX \sum_h TG_h$

(15) $TI_i = tx_i\left(P_i XS_i - PE_i EX_i\right) + tx_i\left(1 + tm_i\right)\ e\ PWM_i M_i$

(16) $TIM_i = tm_i e\ PWM_i M_i$

(17) $TIE_i = te_i PE_i EX_i$

(18) $DTH_h = tyh_h YH_h$

(19) $DTF = tyf \cdot YF$

***Demand***

(20) $CTH_h = YDH_h - SH_h$

(21) $PC_i C_{i,h} = PC_i C_{i,h}^{\min} + \gamma_{i,h}\left(CTH_h - \sum_j PC_j C_{j,h}^{\min}\right)$

(22) $G = CG_{ser} PC_{ser}$

(23) $INV_i = \dfrac{\mu_i IT}{PC_i}$

(24) $DIT_i = \sum_j DI_j$

***Prices***

(25) $PV_j = \dfrac{P_j XS_j - \sum_i PC_i DI_{i,j}}{VA_j}$

(26) $r_i = \dfrac{PV_i VA_i - w_i LD_i}{KD_i}$

(27) $w_i = \dfrac{wq \cdot QL_i - wnq \cdot NQL_i}{LD_i}$

(28) $PD_i = (1 + tx_i)\ PL_i$

(29) $PM_i = (1 + tx_i)\ (1 + tm_i)\ e \cdot PWM_i$

(30) $PE_i = \dfrac{e \cdot PE\_FOB_i}{1 + te_i}$

(31) $PC_i Q_i = PD_i D_i + PM_i M_i$

(32) $P_i XS_i = PL_i D_i + PE_i EX_i$

(33) $Pinv = \prod_i \left(\dfrac{PC_i}{\mu_i}\right)^{\mu_i}$

(34) $Pindex = \sum_i \delta_i PV_i$

***International Trade***

(35) $XS_i = B_i^E \left[\beta_i^E EX_i^{\kappa_i^E} + \left(1 - \beta_i^E\right) D_i^{\kappa_i^E}\right]^{\frac{1}{\kappa_i^E}}$

(36) $EX_i = \left[\left(\dfrac{PE_i}{PL_i}\right)\left(\dfrac{1 - \beta_i^E}{\beta_i^E}\right)\right]^{\tau_i^E} D_i$

(37) $EXD_i = EXD_i^o \cdot \left(\dfrac{PWE_i}{PE\_FOB_i}\right)^{elast_i}$

(38) $Q_i = A_i^M \left[\alpha_i^M M_i^{-\rho_i^M} + \left(1 - \alpha_i^M\right) D_i^{-\rho_i^M}\right]^{\frac{-1}{\rho_i^M}}$

(39) $M_i = \left[\left(\dfrac{PD_i}{PM_i}\right)\left(\dfrac{\alpha_i^M}{1 - \alpha_i^M}\right)\right]^{\sigma_i^M} D_i$

(40)
$$CAB = \sum_i PWM_i M_i + \lambda^{ROW} \sum_i r_i KD_i \Big/ e + DIV^{ROW} - \sum_i PE\_FOB_i EX_i$$

***Equilibrium***

(41) $Q_i = DIT_i + \sum_h C_{i,h} + INV_i + Dstk_i$

(42) $EX_i = EXD_i$

(43) $LSQ = \sum_j QL_j$

(44) $LSNQ = \sum_j NQL_j$

(45) $IT + \sum_i PC_i Dstk_i = \sum_h SH_h + SF + SG + e \cdot CAB$

***Dynamic Equations***

(46) $KD_{i,t+1} = (1-\delta) KD_{i,t} + Ind_{i,t}$

(47) $LSQ_{t+1} = (1+ng) \cdot LSQ_t$

(48) $LSNQ_{t+1} = (1+ng) \cdot NQL_t$

(49) $C^{\min}_{i,h,\ t+1} = (1+ng) \cdot C^{\min}_{i,h\ ,t}$

(50) $\frac{Ind_{i,t}}{KD_{i,t}} = A_i^{IK} \cdot \left( \frac{R_{i,t}}{U_{i,t}} \right)^2$

(51) $U_{i,t} = Pinv_t \cdot (ir + \delta_i)$

(52) $IT_t = Pinv_t \cdot \sum_i Ind_{i,t}$

(53) $SG_{t+1} = (1+ng) \cdot SG_t$

(54) $CAB_{t+1} = (1+ng) \cdot CAB_t$

(55) $TG_{t+1} = (1+ng) \cdot TG_t$

(56) $CG_{t+1} = (1+ng) \cdot CG_t$

(57) $Dstk_{t+1} = (1+ng) \cdot Dstk_t$

(58) $DIV_{t+1} = (1+ng) \cdot DIV_t$

(59) $DIV\_ROW_{t+1} = (1+ng) \cdot DIV\_ROW_t$

(60) $TWH_{t+1} = (1+ng) \cdot TWH_t$

(61) $TH_{h,hj,t+1} = (1+ng) \cdot TH_{h,hj,t}$

(62) $EXD^o_{t+1} = (1+ng) \cdot EXD^o_t$

**Endogenous variables**

| | |
|---|---|
| $C_{i,h}$ : | Household *h*'s consumption of good *i* (volume) |
| $CF$ : | Composite agricultural capital-labor factor (volume) |
| $CI_j$ : | Total intermediate consumption of activity *j* (volume) |
| $CTH_h$ : | Household *h*'s total consumption (value) |
| $D_i$ : | Demand for domestic good *i* (volume) |
| $DI_{i,j}$ : | Intermediate consumption of good *i* in activity *j* (volume) |
| $DIT_i$ : | Intermediate demand for good *i* (volume) |
| $DTF$ : | Receipts from direct taxation on firms' income |
| $DTH_h$ : | Receipts from direct taxation on household *h*'s income |
| $EX_i$ : | Exports in good *i* (volume) |
| $G$ : | Public expenditures |
| $INV_i$ : | Investment demand for good *i* (volume) |
| $IT$ : | Total investment |
| $LD_j$ : | Activity *j* demand for labor (volume) |
| $M_i$ : | Imports in good *i* (volume) |
| $P_i$ : | Producer price of good *i* |
| $PC_i$ : | Consumer price of composite good *i* |
| $PD_i$ : | Domestic price of good *i* including taxes |
| $PE_i$ : | Domestic price of exported good *i* |
| $Pindex$ : | GDP deflator |
| $Pinv$ : | Price index of investment |
| $PL_i$ : | Domestic price of good *i* (excluding taxes) |
| $PM_i$ : | Domestic price of imported good *i* |
| $PV_j$ : | Value added price for activity *j* |
| $Q_i$ : | Demand for composite good *i* (volume) |
| $r_i$ : | Rate of return to capital in activity *i* |
| $rl$ : | Rate of return to agricultural land |
| $rc$ : | Rate of return to composite factor |
| $SF$ : | Firms' savings |
| $SG$ : | Government's savings |
| $SH_h$ : | Household *h*'s savings |
| $TI_i$ : | Receipts from indirect tax on *i* |
| $TIE_i$ : | Receipts from tax on export *i* |
| $TIM_i$ : | Receipts from import duties *i* |
| $VA_j$ : | Value added for activity *j* (volume) |
| $w$ : | Wage rate |
| $XS_i$ : | Output of activity *i* (volume) |
| $YDH_h$ : | Household *h*'s disposable income |
| $YF$ : | Firms' income |
| $YG$ : | Government's income |
| $YH_h$ : | Household *h*'s income |
| $LS$ : | Total labor supply (volume) |
| $KD_i$ : | Demand for capital in activity *i* (volume) |
| $CAB$ : | Current account balance |
| $Ind_{i,t}$ : | Demand for capital in activity *i* (volume) |

| | |
|---|---|
| $U_t$ : | Capital user cost |
| $C_{i,h}^{\min}$ : | Minimum consumption of good *i* by household *h* |

**Exogenous variables**

| | |
|---|---|
| $PWE_i$ : | World price of export *i* |
| $PWM_i$ : | World price of import *I* |
| $e$ : | Nominal Exchange rate (numéraire) |

**Parameters**

*Production functions*

| | |
|---|---|
| $A_j$ : | Scale coefficient (Cobb-Douglas production function) |
| $aij_{i,j}$ : | Input-output coefficient |
| $\alpha_j$ : | Elasticity (Cobb-Douglas production function) |
| $io_j$ : | Technical coefficient (Leontief production function) |
| $v_j$ : | Technical coefficient (Leontief production function) |

*CES function between capital and labor*

| | |
|---|---|
| $A_i^{KL}$ : | Scale coefficient |
| $\alpha_i^{KL}$ : | Share parameter |
| $\rho_i^{KL}$ : | Substitution parameter |
| $\sigma_i^{KL}$ : | Substitution elasticity |

*CES function between skilled and unskilled labor*

| | |
|---|---|
| $A_i^{LL}$ : | Scale coefficient |
| $\alpha_i^{LL}$ : | Share parameter |
| $\rho_i^{LL}$ : | Substitution parameter |
| $\sigma_i^{LL}$ : | Substitution elasticity |

*CES function between imports and domestic production*

| | |
|---|---|
| $A_i^{M}$ : | Scale coefficient |
| $\alpha_i^{M}$ : | Share parameter |
| $\rho_i^{M}$ : | Substitution parameter |
| $\sigma_i^{M}$ : | Substitution elasticity |

*CET function between domestic production and exports*

| | |
|---|---|
| $B_i^{E}$ : | Scale coefficient |
| $\beta_i^{E}$ : | Share parameter |
| $\kappa_i^{E}$ : | Transformation parameter |
| $\tau_i^{E}$ : | Transformation elasticity |

*LES consumption function*

| | |
|---|---|
| $\gamma_{i,h}$ : | Marginal share of good *i* |

Tax rates

| | |
|---|---|
| $te_i$ : | Tax on exports *i* |
| $tm_i$ : | Import duties on good *i* |
| $tx_i$ : | Tax rate on good *i* |
| $tyh_h$ : | Direct tax rate on household *h*'s income |
| $tyf$ : | Direct tax rate on firms' income |

Other parameters

| | |
|---|---|
| $\delta_j$ : | Share of activity *j* in total value added |
| $\lambda_h^L$ : | Share of land income received by household *h* |
| $\lambda^{LF}$ : | Share of land income received by firms |
| $\lambda^{LROW}$ : | Share of land income received by foreigners |
| $\lambda_h^R$ : | Share of capital income received by household *h* |
| $\lambda^{RF}$ : | Share of capital income received by firms |
| $\lambda^{ROW}$ : | Share of capital income received by foreigners |
| $\lambda_h^W$ : | Share of labour income received by household *h* |
| $\psi_h$ : | Propensity to save |
| $\mu_i$ : | Share of the value of good *i* in total investment |
| $ng$ : | Population growth rate |
| $\delta$ : | Capital depreciation rate |
| $\gamma_{1i}$ : | Parameter in the investment demand function |
| $\gamma_{2i}$ : | Parameter in the investment demand function |
| $ir$ : | Real interest rate |

# ANNEX 3

# DETAILED RESULTS OF AGRICULTURAL LIBERALISATION

**Table : Percentage Changes in Prices from the BaU Path**

| | PM | | PD | | PV | | PX | | PQ | | PE_FOB | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | 2008 | 2030 | 2008 | 2030 | 2008 | 2030 | 2008 | 2030 | 2008 | 2030 | 2008 | 2030 |
| Paddy | 0.29 | 0.29 | 0.10 | -0.03 | 0.26 | 0.09 | 0.18 | 0.05 | 0.20 | 0.06 | 1.71 | 1.68 |
| Wheat | -0.57 | -0.57 | 0.06 | -0.08 | 0.30 | 0.09 | 0.18 | 0.04 | 0.15 | 0.01 | 2.69 | 2.67 |
| Oilseeds | -0.49 | -0.49 | 0.04 | -0.06 | 0.23 | 0.09 | 0.15 | 0.05 | 0.14 | 0.03 | 0.93 | 0.91 |
| Cotton | 0.00 | 0.00 | 0.14 | 0.03 | 0.26 | 0.11 | 0.16 | 0.06 | 0.23 | 0.12 | 0.96 | 0.94 |
| Other agriculture | -0.43 | -0.43 | 0.10 | 0.04 | 0.17 | 0.09 | 0.12 | 0.06 | 0.18 | 0.12 | 0.59 | 0.58 |
| Livestock | -0.73 | -0.73 | 0.17 | 0.10 | 0.16 | 0.09 | 0.17 | 0.10 | 0.27 | 0.19 | 0.29 | 0.28 |
| Forestry and logging | -1.47 | -1.47 | 0.02 | 0.07 | 0.03 | 0.09 | 0.03 | 0.09 | -0.11 | -0.07 | 0.33 | 0.34 |
| Fishing | -1.46 | -1.46 | 0.13 | 0.01 | 0.22 | 0.09 | 0.19 | 0.08 | 0.22 | 0.09 | 0.43 | 0.41 |
| Minerals | -1.58 | -1.58 | -0.74 | 0.06 | -0.92 | -0.13 | -0.77 | -0.12 | -1.27 | -1.08 | -0.86 | -0.65 |
| Sugar | -3.00 | -3.00 | 0.17 | 0.10 | 0.09 | 0.09 | 0.17 | 0.11 | 0.15 | 0.09 | 0.29 | 0.28 |
| Misc Food | -4.00 | -4.00 | 0.05 | 0.00 | 0.08 | 0.09 | 0.08 | 0.03 | -0.02 | -0.07 | 0.67 | 0.66 |
| Cotton textiles | 0.21 | 0.21 | 0.16 | 0.05 | 0.28 | 0.12 | 0.19 | 0.09 | 0.26 | 0.15 | 0.28 | 0.25 |
| Other textiles | 0.10 | 0.10 | 0.09 | -0.08 | 0.29 | 0.13 | 0.17 | 0.08 | 0.19 | 0.06 | 0.25 | 0.21 |
| Leather products | 0.10 | 0.10 | 0.26 | 0.18 | 0.17 | 0.10 | 0.26 | 0.19 | 0.34 | 0.26 | 0.25 | 0.23 |
| Misc chemicals | 0.04 | 0.04 | -0.46 | -0.37 | 0.16 | 0.09 | -0.55 | -0.48 | -0.26 | -0.19 | -0.79 | -0.77 |
| Cement | 0.00 | 0.00 | -0.21 | -0.22 | 0.18 | 0.10 | -0.22 | -0.22 | -0.12 | -0.12 | -0.36 | -0.35 |
| Metal products | 0.08 | 0.08 | -0.07 | -0.12 | 0.28 | 0.10 | -0.06 | -0.10 | 0.07 | 0.03 | 0.03 | 0.02 |
| Machinery | 0.05 | 0.05 | 0.07 | 0.01 | 0.18 | 0.09 | 0.08 | 0.03 | 0.16 | 0.12 | 0.15 | 0.14 |
| Electrical appliances | 0.10 | 0.10 | 0.02 | -0.08 | 0.28 | 0.11 | 0.05 | -0.01 | 0.15 | 0.09 | 0.11 | 0.09 |
| Electronic equipments | 0.10 | 0.10 | 0.13 | 0.09 | 0.13 | 0.10 | 0.13 | 0.09 | 0.22 | 0.18 | 0.14 | 0.13 |
| Misc Manufacturing | 0.07 | 0.07 | 0.01 | -0.08 | 0.27 | 0.11 | 0.06 | -0.01 | 0.13 | 0.07 | 0.14 | 0.12 |
| Construction | 0.00 | 0.00 | 0.11 | 0.05 | 0.17 | 0.08 | 0.11 | 0.05 | 0.20 | 0.14 | 0.00 | 0.00 |
| Utility | 0.00 | 0.00 | -0.13 | -0.15 | 0.18 | 0.08 | -0.13 | -0.15 | -0.03 | -0.06 | 0.00 | 0.00 |
| Other transport services | 0.04 | 0.04 | 0.10 | 0.03 | 0.17 | 0.09 | 0.09 | 0.04 | 0.18 | 0.13 | 0.08 | 0.07 |
| Communication | 0.02 | 0.02 | 0.17 | 0.09 | 0.19 | 0.10 | 0.17 | 0.09 | 0.26 | 0.18 | 0.34 | 0.32 |
| Hotels and restaurants | 0.07 | 0.07 | 0.09 | 0.00 | 0.22 | 0.10 | 0.12 | 0.04 | 0.18 | 0.10 | 0.26 | 0.24 |
| Insurance | 0.01 | 0.01 | 0.16 | 0.08 | 0.19 | 0.10 | 0.17 | 0.10 | 0.24 | 0.16 | 0.37 | 0.36 |
| Other services | 0.02 | 0.02 | 0.16 | 0.04 | 0.22 | 0.11 | 0.21 | 0.11 | 0.23 | 0.13 | 0.35 | 0.33 |
| Misc services | 0.00 | 0.00 | 0.15 | 0.06 | 0.20 | 0.10 | 0.16 | 0.08 | 0.25 | 0.15 | 0.35 | 0.34 |

Note: PD = Domestic goods price, PV=Value-added price, PX=Aggregate output price, PQ=Price of composite goods, PE_FOB=FOB export price.

Source: Authors' calculations, based on simulation results.

**Table: Percentage Changes in Volumes from the BaU Path**

| | M | | X | | E | | Q | | D | |
|---|---|---|---|---|---|---|---|---|---|---|
| | 2008 | 2030 | 2008 | 2030 | 2008 | 2030 | 2008 | 2030 | 2008 | 2030 |
| Paddy | -0.28 | -0.48 | 0.17 | 0.16 | 3.24 | 3.45 | 0.01 | 0.00 | 0.01 | 0.00 |
| Wheat | 0.95 | 0.72 | 0.24 | 0.23 | 5.34 | 5.58 | 0.00 | -0.01 | 0.00 | -0.01 |
| Oilseeds | 0.70 | 0.53 | 0.11 | 0.11 | 1.68 | 1.85 | -0.10 | -0.11 | -0.10 | -0.11 |
| Cotton | 0.00 | 0.00 | 0.15 | 0.25 | 1.76 | 2.03 | 0.10 | 0.20 | 0.10 | 0.20 |
| Other agriculture | 0.75 | 0.64 | -0.02 | -0.03 | 0.92 | 1.02 | -0.03 | -0.04 | -0.05 | -0.06 |
| Livestock | 1.32 | 1.20 | -0.04 | -0.05 | 0.19 | 0.30 | -0.04 | -0.05 | -0.04 | -0.05 |
| Forestry and logging | 1.96 | 2.01 | -0.28 | -0.31 | 0.31 | 0.20 | 0.02 | 0.01 | -0.31 | -0.34 |
| Fishing | 2.42 | 2.22 | 0.08 | 0.11 | 0.57 | 0.77 | -0.01 | -0.02 | -0.02 | -0.03 |
| Minerals | 0.35 | 0.61 | -1.00 | -2.22 | -1.18 | -3.25 | 0.02 | -0.03 | -0.93 | -1.86 |
| Sugar | 4.74 | 4.62 | -0.17 | -0.18 | 0.07 | 0.16 | -0.02 | -0.04 | -0.18 | -0.20 |
| Misc Food | 6.13 | 6.04 | -0.19 | -0.20 | 0.99 | 1.06 | 0.00 | -0.02 | -0.25 | -0.26 |
| Cotton textiles | 0.02 | -0.06 | 0.13 | 0.26 | 0.32 | 0.59 | 0.08 | 0.17 | 0.09 | 0.18 |
| Other textiles | 0.01 | -0.16 | 0.20 | 0.42 | 0.35 | 0.69 | 0.03 | 0.05 | 0.03 | 0.11 |
| Leather products | 0.19 | 0.16 | -0.05 | 0.05 | -0.08 | 0.13 | -0.02 | 0.05 | -0.05 | 0.04 |
| Misc chemicals | -0.57 | -0.48 | 0.01 | -0.08 | -0.48 | -0.66 | 0.02 | 0.01 | 0.18 | 0.14 |
| Cement | 0.00 | 0.00 | -0.05 | -0.11 | -0.33 | -0.37 | -0.04 | -0.09 | -0.04 | -0.09 |
| Metal products | -0.11 | -0.15 | 0.13 | 0.16 | 0.31 | 0.41 | 0.06 | 0.06 | 0.12 | 0.14 |
| Machinery | 0.01 | -0.11 | 0.00 | -0.03 | 0.14 | 0.20 | 0.00 | -0.08 | -0.02 | -0.06 |
| Electrical appliances | -0.04 | -0.16 | 0.14 | 0.24 | 0.24 | 0.44 | 0.02 | -0.01 | 0.07 | 0.11 |
| Electronic equipments | -0.01 | -0.13 | -0.06 | -0.10 | -0.06 | -0.01 | -0.05 | -0.12 | -0.06 | -0.11 |
| Misc Manufacturing | -0.04 | -0.14 | 0.15 | 0.24 | 0.31 | 0.49 | 0.01 | -0.01 | 0.05 | 0.09 |
| Construction | 0.00 | 0.00 | -0.04 | -0.08 | 0.00 | 0.00 | -0.04 | -0.08 | -0.04 | -0.08 |
| Utility | 0.00 | 0.00 | 0.02 | 0.00 | 0.00 | 0.00 | 0.02 | 0.00 | 0.02 | 0.00 |
| Other transport services | 0.06 | -0.04 | -0.03 | -0.01 | -0.05 | 0.05 | -0.01 | -0.03 | -0.02 | -0.03 |
| Communication | 0.24 | 0.12 | 0.02 | 0.03 | 0.34 | 0.50 | 0.01 | 0.03 | 0.01 | 0.03 |
| Hotels and restaurants | 0.02 | -0.11 | 0.05 | 0.08 | 0.34 | 0.49 | 0.00 | -0.01 | -0.01 | 0.00 |
| Insurance | 0.20 | 0.08 | 0.00 | 0.02 | 0.39 | 0.54 | 0.00 | -0.01 | -0.02 | -0.02 |
| Other services | 0.17 | 0.03 | 0.06 | 0.14 | 0.35 | 0.58 | 0.01 | 0.01 | -0.04 | 0.00 |
| Misc services | 0.00 | 0.00 | 0.02 | 0.02 | 0.39 | 0.54 | 0.00 | -0.01 | 0.00 | -0.01 |

Note: M =Imports, X=Domestic Output, E=Exports, Q= composite goods, D=Domestic Sales.
Source: Authors' calculations, based on simulation results.

# ANNEX 4

# DETAILED RESULTS OF NAMA LIBERALISATION

**Table: Percentage Changes in Prices from the BaU Path**

| | PM | | PD | | PV | | PX | | PQ | | PE_FOB | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | 2008 | 2030 | 2008 | 2030 | 2008 | 2030 | 2008 | 2030 | 2008 | 2030 | 2008 | 2030 |
| Paddy | 0.27 | 0.27 | -0.94 | -0.88 | -0.96 | -0.90 | -0.91 | -0.85 | -0.74 | -0.68 | -0.29 | -0.29 |
| Wheat | 0.16 | 0.16 | -0.95 | -0.87 | -0.97 | -0.90 | -0.92 | -0.84 | -0.74 | -0.67 | -0.26 | -0.25 |
| Oilseeds | 0.20 | 0.20 | -0.97 | -0.95 | -0.90 | -0.90 | -0.89 | -0.87 | -0.77 | -0.76 | -0.25 | -0.25 |
| Cotton | 0.00 | 0.00 | -0.87 | -0.90 | -0.83 | -0.89 | -0.84 | -0.87 | -0.66 | -0.70 | 0.17 | 0.15 |
| Other agriculture | 0.13 | 0.13 | -0.96 | -0.89 | -0.97 | -0.90 | -0.93 | -0.87 | -0.72 | -0.67 | -0.20 | -0.19 |
| Livestock | 0.07 | 0.07 | -0.91 | -0.83 | -1.00 | -0.90 | -0.91 | -0.83 | -0.70 | -0.63 | -0.17 | -0.16 |
| Forestry and logging | 0.26 | 0.26 | -0.92 | -0.95 | -0.87 | -0.91 | -0.87 | -0.90 | -0.54 | -0.57 | -0.11 | -0.12 |
| Fishing | 0.01 | 0.01 | -1.02 | -1.02 | -0.86 | -0.88 | -0.88 | -0.89 | -0.81 | -0.82 | -0.22 | -0.23 |
| Minerals | 0.03 | 0.03 | -0.63 | -1.09 | -0.43 | -0.88 | -0.52 | -0.88 | 0.07 | -0.06 | -0.17 | -0.29 |
| Sugar | 0.18 | 0.18 | -0.80 | -0.76 | -0.96 | -0.91 | -0.77 | -0.72 | -0.57 | -0.53 | -0.20 | -0.20 |
| Misc Food | -0.16 | -0.16 | -0.80 | -0.77 | -0.96 | -0.89 | -0.77 | -0.75 | -0.57 | -0.55 | -0.24 | -0.24 |
| Cotton textiles | -2.44 | -2.44 | -0.85 | -0.90 | -0.79 | -0.91 | -0.73 | -0.78 | -0.75 | -0.80 | -0.27 | -0.29 |
| Other textiles | -2.97 | -2.97 | -1.37 | -1.49 | -0.65 | -0.87 | -0.81 | -0.89 | -1.54 | -1.64 | -0.33 | -0.36 |
| Leather products | -3.04 | -3.04 | -1.30 | -1.22 | -0.94 | -0.85 | -1.13 | -1.07 | -1.31 | -1.25 | -0.38 | -0.37 |
| Misc chemicals | -2.57 | -2.57 | -0.74 | -0.60 | -1.62 | -1.04 | -0.64 | -0.53 | -0.93 | -0.83 | -0.36 | -0.34 |
| Cement | 0.00 | 0.00 | -0.71 | -0.74 | -1.03 | -1.02 | -0.69 | -0.72 | -0.51 | -0.54 | -0.22 | -0.23 |
| Metal products | -1.29 | -1.29 | -0.81 | -0.68 | -1.42 | -0.99 | -0.80 | -0.68 | -0.74 | -0.64 | -0.71 | -0.68 |
| Machinery | -2.91 | -2.91 | -1.06 | -0.87 | -1.40 | -0.95 | -1.05 | -0.87 | -1.76 | -1.67 | -0.95 | -0.91 |
| Electrical appliances | -3.04 | -3.04 | -1.07 | -0.86 | -1.34 | -0.97 | -0.98 | -0.83 | -1.74 | -1.62 | -0.84 | -0.79 |
| Electronic equipments | -3.04 | -3.04 | -1.17 | -1.02 | -1.42 | -1.01 | -1.15 | -1.01 | -1.68 | -1.59 | -0.87 | -0.85 |
| Misc Manufacturing | -2.72 | -2.72 | -1.16 | -1.01 | -1.18 | -0.94 | -0.94 | -0.84 | -1.58 | -1.50 | -0.57 | -0.54 |
| Construction | 0.00 | 0.00 | -0.91 | -0.83 | -0.95 | -0.81 | -0.91 | -0.83 | -0.70 | -0.63 | 0.00 | 0.00 |
| Utility | 0.00 | 0.00 | -0.68 | -0.63 | -0.91 | -0.79 | -0.68 | -0.63 | -0.48 | -0.44 | 0.00 | 0.00 |
| Other transport services | -0.04 | -0.04 | -0.99 | -1.03 | -0.77 | -0.87 | -0.82 | -0.86 | -0.61 | -0.65 | -0.32 | -0.34 |
| Communication | -0.06 | -0.06 | -0.96 | -0.95 | -0.92 | -0.92 | -0.96 | -0.95 | -0.75 | -0.75 | -0.19 | -0.19 |
| Hotels and restaurants | -0.08 | -0.08 | -0.79 | -0.80 | -0.83 | -0.93 | -0.72 | -0.72 | -0.51 | -0.52 | -0.35 | -0.36 |
| Insurance | -0.11 | -0.11 | -0.95 | -0.96 | -0.91 | -0.92 | -0.90 | -0.91 | -0.65 | -0.67 | -0.17 | -0.18 |
| Other services | -0.08 | -0.08 | -0.87 | -1.10 | -0.64 | -0.90 | -0.70 | -0.89 | -0.50 | -0.69 | -0.18 | -0.23 |
| Misc services | 0.00 | 0.00 | -0.99 | -0.96 | -0.97 | -0.93 | -0.93 | -0.90 | -0.79 | -0.76 | -0.18 | -0.17 |

Note: 1. PD = Domestic goods price, PV=Value-added price, PX=Aggregate output price, PQ=Price of composite goods, PE_FOB=FOB export price.

Source: Authors' calculations, based on simulation results.

**Table: Percentage Changes in Volumes from the BaU Path**

| | M | | X | | E | | Q | | D | |
|---|---|---|---|---|---|---|---|---|---|---|
| | 2008 | 2030 | 2008 | 2030 | 2008 | 2030 | 2008 | 2030 | 2008 | 2030 |
| Paddy | -1.86 | -1.70 | 0.01 | 0.08 | 1.26 | 1.21 | -0.06 | 0.02 | -0.06 | 0.02 |
| Wheat | -1.73 | -1.53 | -0.02 | 0.06 | 1.31 | 1.26 | -0.08 | 0.01 | -0.08 | 0.01 |
| Oilseeds | -1.78 | -1.68 | 0.14 | 0.20 | 1.42 | 1.46 | -0.03 | 0.04 | -0.03 | 0.04 |
| Cotton | 0.00 | 0.00 | 0.26 | 0.41 | 2.31 | 2.49 | 0.20 | 0.35 | 0.20 | 0.35 |
| Other agriculture | -1.68 | -1.50 | 0.00 | 0.08 | 1.49 | 1.45 | -0.10 | -0.01 | -0.06 | 0.03 |
| Livestock | -1.55 | -1.35 | -0.08 | 0.00 | 1.41 | 1.35 | -0.09 | 0.00 | -0.09 | 0.00 |
| Forestry and logging | -1.66 | -1.63 | 0.19 | 0.28 | 1.74 | 1.86 | -0.16 | -0.09 | 0.10 | 0.18 |
| Fishing | -1.63 | -1.55 | 0.20 | 0.28 | 1.53 | 1.61 | -0.10 | -0.01 | -0.09 | 0.00 |
| Minerals | -0.62 | -0.84 | 0.60 | 1.28 | 1.30 | 2.50 | -0.37 | -0.41 | 0.37 | 0.85 |
| Sugar | -1.54 | -1.38 | 0.00 | 0.08 | 1.14 | 1.13 | -0.12 | -0.03 | -0.07 | 0.01 |
| Misc Food | -1.03 | -0.89 | -0.02 | 0.07 | 1.07 | 1.10 | -0.11 | -0.01 | -0.07 | 0.03 |
| Cotton textiles | 2.48 | 2.60 | 0.26 | 0.45 | 1.20 | 1.44 | 0.17 | 0.36 | 0.02 | 0.21 |
| Other textiles | 1.95 | 1.95 | 0.62 | 0.88 | 1.61 | 1.97 | 0.05 | 0.19 | -0.52 | -0.33 |
| Leather products | 2.33 | 2.47 | -0.04 | -0.05 | 1.50 | 1.38 | -0.04 | 0.00 | -0.37 | -0.35 |
| Misc chemicals | 2.16 | 2.39 | -0.46 | -0.51 | 0.10 | -0.13 | -0.06 | -0.01 | -0.66 | -0.65 |
| Cement | 0.00 | 0.00 | -0.19 | -0.11 | 0.76 | 0.88 | -0.24 | -0.16 | -0.24 | -0.16 |
| Metal products | 0.20 | 0.31 | -0.50 | -0.62 | -0.31 | -0.62 | -0.33 | -0.37 | -0.52 | -0.62 |
| Machinery | 2.17 | 2.37 | -0.66 | -0.78 | -0.46 | -0.86 | 0.69 | 0.74 | -0.68 | -0.77 |
| Electrical appliances | 2.34 | 2.56 | -0.52 | -0.76 | -0.23 | -0.68 | 0.62 | 0.65 | -0.70 | -0.81 |
| Electronic equipments | 2.46 | 2.67 | -0.41 | -0.45 | 0.15 | -0.13 | 0.65 | 0.70 | -0.44 | -0.47 |
| Misc Manufacturing | 1.63 | 1.82 | -0.34 | -0.45 | 0.41 | 0.14 | 0.18 | 0.24 | -0.77 | -0.80 |
| Construction | 0.00 | 0.00 | -0.19 | -0.12 | 0.00 | 0.00 | -0.19 | -0.12 | -0.19 | -0.12 |
| Utility | 0.00 | 0.00 | -0.07 | 0.00 | 0.00 | 0.00 | -0.07 | 0.00 | -0.07 | 0.00 |
| Other transport services | -1.30 | -1.25 | 0.45 | 0.57 | 1.46 | 1.64 | -0.14 | -0.03 | 0.12 | 0.24 |
| Communication | -1.27 | -1.15 | 0.10 | 0.20 | 1.67 | 1.74 | 0.07 | 0.18 | 0.08 | 0.19 |
| Hotels and restaurants | -1.00 | -0.89 | 0.22 | 0.33 | 0.95 | 1.06 | -0.05 | 0.07 | 0.07 | 0.19 |
| Insurance | -1.24 | -1.18 | 0.12 | 0.19 | 1.60 | 1.68 | -0.12 | -0.05 | 0.02 | 0.09 |
| Other services | -0.99 | -1.17 | 0.53 | 0.79 | 1.60 | 2.13 | -0.05 | 0.04 | 0.20 | 0.36 |
| Misc services | 0.00 | 0.00 | 0.03 | 0.08 | 1.56 | 1.56 | -0.09 | -0.03 | -0.09 | -0.03 |

Note: 1. M =Imports, X=Domestic Output, E=Exports, Q= composite goods, D=Domestic Sales.
Source: Authors' calculations, based on simulation results.

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