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Welfare Implication of  
India-ASEAN FTA:  
An Analysis using GTAP Model

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# Welfare Implication of India-ASEAN FTA: An Analysis using GTAP Model

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## Abstract

The welfare effect under GTAP model computes a money metric equivalent of the utility change. This is calculated by measuring 'equivalent variation' (EV) which summarizes the regional welfare changes resulting from any policy shock and is given in dollar values (US \$ million). In GTAP, this money metric change is broken down into different components, each of which relates to a quantity change interacting with a distortion in the model. Considering the welfare decomposition effect under multiple regions as proposed by Huff & Hurtel (2001), the current study gives an insight into the sources of welfare gain under various simulations describing stages of India-ASEAN FTA. ASEAN is so far the biggest bloc with which India has an operational FTA. Almost 9% of India's trade is with ASEAN as a group. In this context, the paper makes an attempt to assess the welfare implication of this agreement considering various implementation stages.

It has been noticed that relatively bigger ASEAN members will derive more benefits in terms of welfare growth. India will have higher benefits only when the agreement gets fully implemented. ASEAN members will gain from higher 'terms of trade' effect while India's gain mainly will be from the resource reallocation and change in domestic production activities reflected through 'allocative efficiency'. However, the overall gain gets dampened due to the presence of negative 'terms of trade' in India's welfare equation. India's import demand of several intermediate as well as final goods will remain high and ASEAN will have advantage to supply these at a higher price yet lower than average prevailing import price in India which will lead to negative 'terms of trade' effect for India. The value of 'allocative efficiency' for India increases significantly once there is full liberalization. With full liberalization India extends tariff concessions for large number of products which are otherwise included in its negative list and not allowed any concessions. This adds to allocative efficiency- firstly due to removal of protection from several inefficient production processes and second due to increased import taxes contributed by increased imports of many of the products otherwise featuring in the country's negative list. Once we incorporate imperfect competition and presence of increasing return to scale in selected sectors in India, 'scale economy' effect, 'profit shifting', and various tax contributions will lead to more welfare gain in India. This indicates that with the presence of imperfect competition, profit shifting will allow India to invest in capital goods and technology leading to high 'scale effect' and thereby to increase exports further to ASEAN. The study brings up a very crucial issue that the gain from FTA with ASEAN hinges on India's big firm's ability to reduce average cost bringing better technology and quality inputs. This will improve production system in India which in turn will further boost the export sector.

**JEL Classification:** F12, F13, F14, F15, C68, D58

**Keywords:** India-ASEAN FTA, Welfare Measurement, GTAP, CGE

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# Welfare Implication of India-ASEAN FTA: An Analysis using GTAP Model

## 1. Introduction

The India-ASEAN Free Trade Agreement (AIFTA) came into effect on January 1, 2010 with respect to Malaysia, Singapore and Thailand. For the remaining ASEAN members it will come into force after they complete their internal requirements. Of the ten countries India's trade with ASEAN is mainly concentrated in Indonesia, Malaysia, Singapore and Thailand. Singapore happens to be the largest destination for Indian goods<sup>1</sup> and also the largest source of imports for India except in 2009 in which imports from Indonesia surpassed Singapore<sup>2</sup>. India sells almost 10-11% of its global export to ASEAN members and buys around 8.5-9% of its global import (as per figure of 2008 and 2009) from ASEAN as a group.

The on-going negotiations between India and the ASEAN representatives during the last few years have given rise to considerable interest among researchers across the world. The studies used various models to analyse the possible impact of this agreement. Pal and Dasgupta (2008, 2009), Harilal (2010) used tariff and trade data extensively through partial equilibrium framework. On the other hand, Sen et. al. (2004) and Karmakar (2005) used descriptive framework and Lee & Liew (2007) used time series analysis to study the possible impact. Veeramani (2010) used SMART and gravity model for the same. Few studies such as Kawai et al (2007), Sasatra and Prasopchoke (2007) also used CGE framework. Kawai et al (2007) highlights that the consolidation at the ASEAN+6 level would yield the largest gains to East Asia among plausible regional trade arrangements. The study by Sasatra and Prasopchoke (2007) also shows that ASEAN-5 would achieve greater benefits from the FTAs if they fully liberalized trade among themselves. Veermani (2010) argues that AIFTA will cause significant increase of imports of plantation commodities into India. The increase in imports will be mostly driven by trade creation rather than trade diversion. The proposed tariff reduction as per the India-ASEAN trade agreement may lead to significant tariff revenue loss to the Indian government. However, the gain in consumer surplus (due to the fall in domestic

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<sup>1</sup> Almost 38% of India's total exports to ASEAN in 2009 has gone to Singapore

<sup>2</sup> 26% of India's total imports from ASEAN in 2009 comes from Singapore and 31% comes from Indonesia

price and the consequent reduction in dead-weight loss) outweighs the loss in tariff revenue leading to net welfare gain. Ahmed (2010) investigates the sectoral dimensions of India –ASEAN Free Trade Agreement as a result of tariff liberalization. Using a GTAP and SMART model this study reveals that both India and ASEAN gain in terms of welfare while the terms of trade for India deteriorates. It concludes that India will be affected significantly in processed food products, grain crops, textile and wearing apparel, light manufacturing and heavy manufacturing sectors. As a result, India’s trade balance will be worsened and it will cause revenue losses for India

It is important to note that none of these studies used the final tariff schedule as agreed by India and ASEAN members. Also, they mostly looked into the possible final outcome of the agreement overlooking the steps of liberalisation. It has been clarified earlier that the depth and coverage of AIFTA will unfold gradually as more and more ASEAN members start the implementation process and hence it is important to study the change of impact at various stages. These studies highlight the varied impact of this agreement on different macroeconomic variables. The general equilibrium framework provides an integrated approach to arrive at the comparative statics of these variables. More complex issue is the impact on welfare due to the agreement. It takes into account income effect, price effect, revenue effect etc. Earlier studies have provided a hint that though trade would increase between India and ASEAN members, welfare gain will be more for ASEAN than India. In fact India’s trade deficit will grow sharply despite the increase of India’s exports. However, production activities within India will increase due to the availability of cheap inputs and intermediate goods from South East Asia. The current study will look into the welfare effect more closely analyzing its components so that sources of welfare effect become clear. Considering the GTAP database and model, the study will conduct several simulations to analyse the welfare impact both on India and ASEAN members.

## **2. India ASEAN FTA: A Brief Overview**

As mentioned above, AIFTA has come into effect on January 1, 2010 with respect to Malaysia, Singapore and Thailand. For the remaining ASEAN members it will come into force gradually once they complete the internal requirements. The FTA will lead to the elimination of tariff for about 4000 products including electronics, chemicals, machinery and textiles. Out of these, 3200 products are expected to have duties reduced by end of the year 2013, and rest would be lowered to zero or near zero by end of 2016. The tariff

lines are divided into five broad categories viz., Normal Track, Sensitive Track, Special Products, Highly Sensitive Lists and Exclusion List according to the intensity of tariff reduction or elimination commitments. Tariff cut formula is based on the applied rates (not the bound rates) as of 1 July 2007, except for products identified as Special Products. All the member countries of this agreement have indicated product-wise tariff concessions or no concessions. The schedule of tariff reduction commitments undertaken by the AIFTA members varies significantly among them.

Normal Track products are divided into two sub-groups Normal Track 1 and Normal Track 2. In Normal Track 1 for India, Brunei, Indonesia, Malaysia, Singapore, and Thailand the reduction process is expected to be completed by 31 December 2013. Philippines, Cambodia, Lao PDR, Myanmar, and Viet Nam are given a grace period up to 31 December 2018 for completely eliminating the tariffs. In Normal Track 2, complete elimination would be achieved before 31 December 2016 for Brunei, Indonesia, Malaysia, Singapore, Thailand and India. But, Cambodia, Lao PDR, Myanmar, and Viet Nam can wait till 31 December 2021 for achieving complete elimination.

ASEAN members have kept nearly 90 per cent of the tariff lines under the reduction commitments. However, it varies from country to country. It is also important to note that there are no tariff reduction commitments under exclusion list. The proportion of tariff lines kept under the Highly Sensitive Lists (HSL) also varies significantly among members. India has not kept any tariff line under these lists. Indonesia has nearly 6.4 per cent of the tariff lines kept under the HSL. Malaysia (1.2 %), Philippines (4.4 %), Vietnam (5.6 %) and Cambodia (0.2 %) are the other members using the HSL facility. Instead, India has kept 14.8% tariff lines in the sensitive category which includes some spices, products of animal origin, chemical products including pharmaceutical products, specific plastic, polymer, rubber and leather products, some cotton woven etc. Apart from this, India's list consists of special products which are not there in the list of other countries that are part of this agreement. Special Product is an exclusive group designed for the five product groups viz., crude and refined palm oil, coffee, black tea and pepper<sup>3</sup>.

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<sup>3</sup> For further details of the commitment schedule, refer to the text of the agreement available in <http://commerce.gov.in/trade/ASEAN-India%20Trade%20in%20Goods%20Agreement.pdf>

### 3. Welfare Change Measurement and Decomposition in GTAP models

In GTAP modeling framework, regional household behavior is governed by an aggregate utility function specified over per capita private household consumption, per capita government spending and per capita savings. Economic welfare is represented as being derived from the allocation of national income among these three variables (private consumption, government consumption and savings)<sup>4</sup>. This recognises that households gain benefits from their own current household consumption expenditure. They also benefit from current net national saving, since this increases their future household consumption. Finally, they benefit from the government's provision of public goods and services, as indicated by current government expenditure. Any distortion in the model has an effect on consumption, savings and even on future consumption. The welfare change variable makes an estimate of the change of utility due to any distortion. The percentage change in the aggregate per capita utility for a region is the welfare change variable that is computed in a standard GTAP model during simulations.

The model computes a money metric equivalent of this utility change and any change in population in the region. This convenient measure referred to as equivalent variation (EV) summarizes the regional welfare changes resulting from any policy shock and is given in dollar values (US \$ million). The regional household's EV is given by the difference between the expenditure required to obtain the post simulation level of utility at initial prices and that available initially. In GTAP, this money metric change is broken down into different components, each of which relates to a quantity change interacting with a distortion in the model. This enables the user to assess, for example, how much of the gains from trade reform are attributable to a given commodity and/or a given region. Different welfare gain components are related to change in trade structure and prices, efficiency gain of an economy due to enhanced activities and revenue collected, etc. Given the above mentioned definition of economic welfare, how well off a policy change actually makes a region depends on what the change does to its national income. It also depends on the effect of the policy change on prices, and hence the

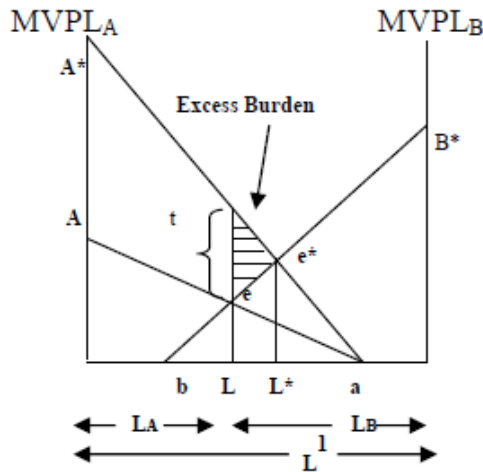
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<sup>4</sup> National income is allocated between aggregate private consumption, aggregate government consumption and saving to maximise a top-level Cobb-Douglas utility function. With this functional form, successive increases in real household or government expenditure or saving generate equi-proportional increases in economic wellbeing. Aggregate private and government consumption are allocated between particular commodities to maximise constant difference elasticity (CDE) and Cobb-Douglas utility functions, respectively. As the CDE utility function is non-homothetic, this recognises that successive increases in private consumption of *particular* goods or services need not lead to equi-proportional increases in economic wellbeing.

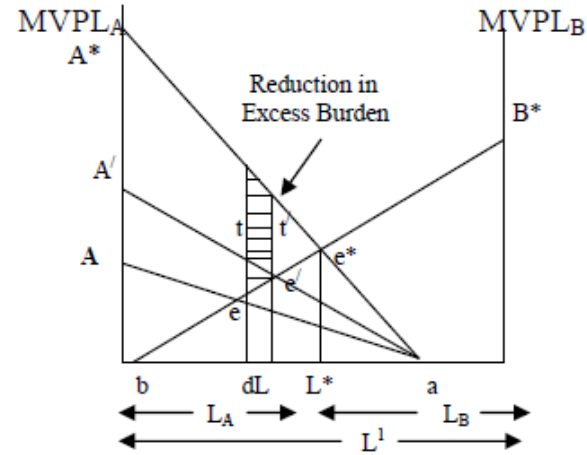
purchasing power of that income. Finally, it depends on how households evaluate the benefits of additional real expenditure.

The decomposition of the welfare effect followed in the GTAP structure is important to study as the overall welfare change is constructed calculating the value of its components first. Huff & Hurltel (2001) explains this decomposition in a step by step approach.

In Fig 1 below welfare effect is explained through a two sector closed economy. Labour is the only factor of production which is divided into two productions A and B. Labour used in two sectors are  $L_A$  and  $L_B$  so that  $L_A + L_B = L^1$ . The two lines,  $aA^*$  and  $bB^*$ , portray the social marginal value product of labor in each of the two sectors. The optimal allocation of labor between A and B,  $L^*$ , is defined by the intersection of these two lines. By equating the social marginal value product of labor in the two sectors, this is the allocation which maximizes welfare in the economy. Suppose an ad valorem tax ( $t$ ) is imposed on labour usage in production of A, then we observe a distortion in the system and actual allocation diverges from the optimal point  $e^*$ . The marginal value product (MVP) of labor, net of this tax, is represented by the line  $aA$ . This discourages the employment of labor in A, resulting in an equilibrium at point  $e$ . The overall employment for A reduces from  $L^*$  to  $L$ . As a consequence, the economy experiences a deadweight loss equal to the shaded triangle. To compensate this loss or to keep the welfare level constant, as in case of comparative static analysis, the economy has to reduce the excess burden associated with this distortion. In general equilibrium model there are many such distortions which arise from a shock in the model. Huff and Hartel (2001) identifies such distortions and measures the money metric value in order to calculate the overall welfare change. In the second figure, if the tax on labour reduces from  $t$  to  $t'$ , net of tax MVP curve of A shifts upward and represented by  $aA'$ . Accordingly the equilibrium point changes from  $e$  to  $e'$ . The resulting reallocation of labor from sector B to sector A ( $dL$ ) reduces the excess burden associated with the labor tax, and generates an improvement in allocative efficiency equal to the shaded trapezoid. The size of this gain is seen to be a function of the size of the initial distortion ( $t$ ), the degree of reform ( $t-t'$ ), and the responsiveness of the labor market to this change ( $dL$ ). While calculating EV, GTAP takes into account this information.



**Fig 1: Excess Burden in a Two Sector Economy**



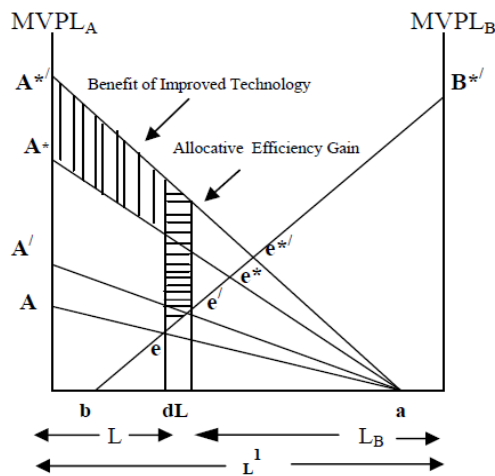
**Fig 2: Reduction in Excess Burden in the Two Sector Economy**

Further, welfare may increase even when the system is not perturbed by reduction of taxes but there is change in technology or endowments (Figure 3). Welfare change in these cases is due to change in allocative efficiency. Suppose due to technological improvement social MVP and net of tax MVP curves rotate upwards further. This has the effect of shifting the equilibrium allocation of labor in the economy to  $e'$ . The gains from technological improvement now can be decomposed into two parts. The first is the direct gain due to the use of improved technology to produce current levels of good A. However, there is also an indirect gain which results from the reallocation of labor between sectors in the face of the pre-existing labor market distortion. This allocative efficiency effect stems from the fact that any external shock (in this case technological improvement) which causes labor to be reallocated from the relatively low social MVP sector B to the higher social MVP sector A will bring gains to the economy. In other words, this is the gain which is forgone, if for some reason the labor were prevented from moving from B to A in the wake of this technological improvement. This area is a function of the size of the pre-existing distortion ( $t$ ) and the amount of labor reallocated across this distortion as a result of the simulation ( $dL$ ). GTAP calculates the value of these gains independently and sum them up to calculate the value of EV.

Huff and Hartel (2001) described the detailed calculation for EV measurement both in case of single and multiple regions. It starts from the basic calculation of the utility for regional household as described by McDougall (2001). The regional household's EV is equal to the difference between the expenditure required to obtain the new (post-

simulation) level of utility at initial prices ( $EV = E(U, \bar{P}) - E(\bar{U}, \bar{P})$ , where E is expenditure function,  $\bar{U}$  and  $\bar{P}$  are initial utility and price). The percentage change in expenditure at per capita level to obtain new level of utility at initial price depends on percentage change in population and the percentage change in *per capita* expenditure or change in real income in the region.

As mentioned, in a comparative static AGE model, with fixed population, endowments and technology, the only means of increasing welfare is by reducing the excess burden owing to existing distortions. Furthermore, as was shown in Fig 2 and Fig 3, any change in allocative efficiency may be directly related to taxes (or tax changes) interacting with equilibrium quantity changes. In a single region model the change in income may be due to change in endowments (in the model it is zero), various taxes such as tax on output, use of endowment, intermediate goods, private household consumption, government consumption etc. Each tax is linked with a relevant quantity change which defines the nature of the tax. For example, if there is endowment tax, relevant quantity change in the usage of endowment is visible due to the taxes which in other way have an impact on production and consumption. The final calculation also depends on the existing prices of various inputs and output.



**Fig 3: Allocative Efficiency Consequences of Advancement in Technology in Sector A**

Following the three diagrams as described above it is welfare-improving to increase the level of a relatively highly taxed activity, since this involves the reallocation of a commodity or endowment from a low value use into a relatively high social marginal value usage. Conversely, if the simulation in question reduces the level of a subsidized

activity, this will tend to benefit the economy in question, since it involves the reallocation of resources away from a relatively low social marginal value product use. Moreover, if there are no taxes in the initial equilibrium, and the nature of the shock is something other than a tax/subsidy intervention, then there will be no allocative efficiency effect from the simulation.

In contrast to a single region model with zero or very few distortions, the standard, multiregional model starts with many pre-existing distortions and general equilibrium relationships among the model sectors and is more complex. Also, there is a new area of distortion due to the presence of trade taxes. Apart from this the calculation has to capture the effect of changes in regional terms of trade. The other significant difference is the added regional dimension of the decomposition. These differences result in the addition of three more sets in the welfare decomposition equations, namely, regions, traded commodities, and margins commodities respectively. Changes in welfare in the multiregional model are therefore attributed to the interactions between taxes (both pre-existing and newly introduced taxes) and quantity changes along with the effect of changes in regional terms of trade and changes in the relative prices of savings and investment.

Welfare gain is decomposed into various components: allocative efficiency effect, terms of trade effect and investment –savings effect. Any change in 'allocative efficiency' may be directly related to tax or tax changes interacting with equilibrium quantity changes. Thus, the components that result in changes in real income arising due to the policy simulation under study are – change in income due to change in endowments net of depreciation (this is normally zero in a comparative static situation), tax on output of any good, tax on use of any endowment in any industry, tax on use of intermediate input in any industry, tax on private household consumption and government consumption of any good, trade taxes (export and import) on any good, changes in regional 'terms of trade' (ToT) and changes in relative price of 'savings and investment' (Inv-Sav) (Huff & Hertel, 2000). Intuitively, it is welfare improving to increase the level of a relatively taxed activity since this involves the reallocation of a commodity or endowment from a low value use to a relatively high social marginal usage. The same is true for endowments and for goods traded. Any good that yields trade tax to the economy benefits the economy. The terms-of-trade for a region which is defined as the ratio of export price index of the region to its import price index contributes positively to

the society if export prices rise more than import prices post simulation. Saving-investment term does not contribute to welfare changes but both investment and savings appear in welfare decomposition. This is because investment sales generate income but do not enter into regional utility while savings enter regional utility but does not generate current income.

#### 4. Welfare Change under FTA Involving Increasing Returns to Scale

The welfare decomposition discussed in the above section assumes perfect competition for both a single region and a multiple region. However, it is quite possible that some important sectors of an economy are having substantial economies of scale. As a result, firms have market power and they charge prices following imperfect completion. This section represents a brief exposition of the main channels of welfare changes that happens due to an FTA implementation involving increasing return to scale (IRS) in sectors. This is done by using the decomposition proposed by Baldwin & Venables (1995) and by implementing this decomposition in the GTAP model. This helps one to understand the forces that determine the impact of FTA on the developing country. Following Baldwin & Venables the welfare decomposition for a developing economy may be represented as follows:

$$dV/V_E = t.dm - m.dp + [p + t - a] . dX - X.a_x .dx + [(r/\rho) - 1].dI \quad \dots\dots(1)$$

where, V: indirect utility function of the regional household,  $V_E$ : marginal utility of expenditure, m: net imports, p: prices, t: tariffs, a: average cost, X: industry output,  $a_x$ :  $\partial a/\partial x$ , x: output per firm, r: social rate of return augmenting capital stock,  $\rho$ : rate of discount

The first term on the RHS of (1) – ‘t. dm’ represents the trade volume effect. Net imports ‘m’ is subject to a price wedge that is created by trade barriers ‘t’. Thus changes in imports following an FTA implementation have first order effects on welfare. This trade volume effect implies that trade liberalization will increase welfare of a country by increasing imports in those sectors of the economy where domestic prices are above the world prices.

The second term of the expression – ‘m. dp’ represents the ‘terms-of-trade’ effect. A decrease in the world price ( $dp < 0$ ) of net imports ( $m > 0$ ) as a result of tariff liberalization, results in welfare increase.

The third term on the RHS of expression (1) is  $(p + t - a) \cdot dX$ . This is referred to as the profit-shifting effect. This term captures the welfare consequences of changes in total output ( $dX$ ) in those industries which are characterized by IRS i.e. where the domestic prices ( $p + t$ ) differ from average cost ( $a$ ). All other things constant, reallocation of resources to these sectors having excess profits is no doubt desirable. But this however, might pose a conflict with the much desired outcome of the trade volume effect captured by the first term ( $t \cdot dm$ ) of the equation. For instance, let an economy have more of its import competing sectors characterized by oligopoly rather than the sectors which are export oriented. In such a case, with tariff liberalization, more imports should come in to replace the output of the domestic oligopolistic sectors and thereby increase welfare as suggested by the trade volume effect. However, the profit shifting effect as represented by the third term suggests just the opposite – output of oligopolistic sectors should increase for welfare to go up.

The fourth term of the equation (1) is  $X \cdot a_x \cdot dx$  which is nothing but the scale effect. This implies that increase in output per firm ( $dx > 0$ ) lowers average cost of production ( $a_x < 0$ ). Thus, the cost of producing total output ( $X$ ) falls and increases total welfare. This term captures the effect of economies of scale which are unrealized. The implications of this term too might result in a conflict with the implications of the first trade volume term. As per the scale effect the expansion of average output of a firm is needed to increase welfare but as suggested by trade volume effect total output in import competing industries should fall if welfare is to increase from trade liberalization. However, these two terms might work in sync if an industry is characterized by exit. As number of firms exit, output per firm will increase (as required by scale effect) even when total output falls (as required by trade volume effect).

The last term on the RHS of expression (1)  $[(r/\rho) - 1] \cdot dI$  is the accumulation effect. Change in investment, though costly instantaneously results in augmenting capital stock at the social rate of return  $r$ . This is discounted back to the present at the rate of discount  $\rho$  to obtain the present value  $r/\rho$ . If this ratio is greater than one, then investment flows that happens in a country following an FTA implementation has a first order effect on welfare. In this study, we are interested in the static welfare effect which includes volume-of-trade, profit-shifting and scale effects. Due to the lack of information on  $r/\rho$ , it is difficult to analyse the welfare implication of the inflow of foreign capital that follows an FTA. Thus, this aspect of the welfare decomposition represented by

expression (1) is ignored and focus is on understanding and analyzing the welfare implications of the first three static effects of welfare.

Hence, under the assumption of IRS, welfare being measured by Equivalent Variation (as done in GTAP model) which is decomposed into – allocative efficiency, terms of trade, scale economics and labour endowment effects (this is not shown in expression 1). The allocative efficiency in the GTAP welfare decomposition includes both trade volume effect (term 1 of expression 1) and profit shifting effect (term 3 of expression 1). Terms of trade effect in GTAP is same as term 2 in expression 1 and scale economies is the same as term 4 in expression 1. Allocative efficiency effect as shown in the GTAP simulations also includes the interactions between trade and domestic policy taxes or subsidies with respect to input use, consumption and tax replacement. These are not explicitly included in equation 1.

## **5. Methodology and Simulations**

The welfare effect of a FTA requires an analytical structure based on general equilibrium framework involving many sectors and macroeconomic variables. The ‘tariff shock’ following the FTA not only changes the value of export and import, it also affects the production system of an economy and thereby changes the demand pattern of factors and their prices. As the economic activity is expected to change several macroeconomic variables experience changes which include output, employment, government’s revenue etc. This is also important to note that there are not only inter linkages present between various sectors of an economy but sectors in an economy are also linked to rest of the world by the way of exports, imports of final products, intermediate goods, capital goods and so on. Thus, linkages are present at the national, regional as also at the global level both in product as well as in the input markets. The present study makes an attempt to integrate these linkages considering the Global Trade Analysis Project (GTAP) as the analytical tool. The global computable general equilibrium (CGE) modelling framework of the GTAP is one of the best possible ways to analyze ex ante the economic consequences and trade implications of multilateral and bilateral trade agreements. In this study we’ll closely analyse the welfare change effect of India-ASEAN FTA.

The database used here is the version 7 of the GTAP database. The reference year for this database corresponds to the global economy in 2004. This database is compiled for bilateral exports and imports and tariffs inclusive of other flows for 113 regions across

the world and for 57 tradable commodities of the World. The present paper does various simulations using this database and accordingly, the 113 regions of the GTAP model is aggregated into 20 regions. Similarly, the 57 sectors of the GTAP model has been aggregated into 35 sectors for all the simulations conducted (see Appendix for details). The detailed schedule of tariff commitments of each of the member countries of the AIFTA is available in the FTA document. But the commitments are not corresponding to product categories. They are corresponding to specific tariff lines at six, eight or ten digit tariff classification of HS code. The tariff lines under same product category are often found to belong to different tracks. After having scrutinized the schedules for each country various categories of tariff commitments have been worked out for different commodities (as aggregated in GTAP) and then they have been converted into 35 sectors.

A number of simulations have been run to assess the likely impact of the India-ASEAN FTA. They include situations such as full liberalization and partial liberalization with tariff elimination for products in normal track, tariff reductions for the sensitive track products and no tariff change for the products in the exclusion list. This has been experimented considering the world classified into twenty regions (aggregated from the GTAP database). Finally, imperfect competition in product market and production function subject to increasing returns to scale for some production sectors (see Appendix for details) in India have been assumed. As it is difficult to get firm level information about each ASEAN member we could not calculate the required variables for scale economies in case of ASEAN and continued to assume perfect competition for them. Also, we assume that competition level in ASEAN is quite intense and they may be experiencing a near perfect competition among themselves as ASEAN FTA is in place for some time. Table 1 below provides a synoptic views about various simulations run in this study.

**Table 1: Various simulations conducted in the study by using the GTAP 7 databases**

<b>Simulations</b>	<b>Regional aggregation</b>	<b>Sectoral aggregation</b>	<b>Model Specification</b>
Tariff elimination for products in Normal track, tariff reductions for the sensitive track products and no tariff change for the products in the exclusion list for India, Malaysia, Singapore & Thailand only	India, Malaysia, Singapore, Thailand, Cambodia, Indonesia, Laos, Philippines, Vietnam, Myanmar & Rest ASEAN comprising of Brunei and USA, EU, China, Rest of West Asia, Bangladesh, Pakistan, Sri Lanka, Rest of South Asia and Rest of the World	35 sectors	Perfect competition in factors and product markets and production function subject to constant returns to scale – this is standard GTAP specification
Tariff elimination for products in Normal track, tariff reductions for the sensitive track products and no tariff change for the products in the exclusion list for India and all the 10 ASEAN members	India, Malaysia, Singapore, Thailand, Cambodia, Indonesia, Laos, Philippines, Vietnam, Myanmar & Rest ASEAN comprising of Brunei and USA, EU, China, Rest of West Asia, Bangladesh, Pakistan, Sri Lanka, Rest of South Asia and Rest of the World	35 sectors	<ul style="list-style-type: none"> <li>• Perfect competition in factors and product markets and production function subject to constant returns to scale</li> <li>• Imperfect competition in product market and production function subject to increasing returns to scale for some production sectors in India</li> </ul>
Full liberalization	India, Malaysia, Singapore, Thailand, Cambodia, Indonesia, Laos, Philippines, Vietnam, Myanmar & Rest ASEAN comprising of Brunei and USA, EU, China, Rest of West Asia, Bangladesh, Pakistan, Sri Lanka, Rest of South Asia and Rest of the World	35 sectors	<ul style="list-style-type: none"> <li>• Perfect competition in factors and product markets and production function subject to constant returns to scale – this is standard GTAP specification</li> <li>• Imperfect competition in product market and production function subject to increasing returns to scale for some production sectors in India</li> </ul>

## 6. Welfare Change Under Various scenarios

GTAP as an analytical tool provides the possible welfare effect at various stages of this agreement. As mentioned earlier that currently the agreement is operational for few countries only. Gradually more ASEAN members will join and the tariff concessions will deepen. In the long run, we'll experience a full liberalization. This section will describe the welfare effect on members of this agreement at each stage.

Table 2 below describes the overall welfare change due to different phases of liberalization under FTA. The size of welfare effect as percentage of GDP is also given to understand the relative position. We assume that in India some manufacturing sectors experience economies of scale and note that welfare effect changes drastically compared to all other simulations which assume perfect competition in both the countries.

At the initial stage, India's welfare gain is quite low and in fact it is expected to experience a negative welfare effect during the time of partial liberalization. Singapore, Malaysia and Thailand will drive home large gain at the partial liberalization stage. Their gain comes down as more and more ASEAN members make the FTA operational. Indonesia, Vietnam will also have positive gain from this agreement. As the FTA proceeds towards deeper level of liberalization, India's welfare gain will increase and it is important to note that during the stage of full liberalization India will experience positive welfare change. Malaysia and Indonesia will also gain substantially after full liberalization.

As mentioned above, it has been experimented that if India already has or achieves economies of scale in some sector during the course of time, then the welfare change scenario provides a completely different view. India's gain increases substantially. Indonesia and Malaysia also have large gain under this situation. All these require a detailed analysis of different components of welfare change.

**Table 2: Change in Welfare Effect (US \$ Million)**

	Partial Liberalisation (India, Malaysia, Singapore and Thailand)		Partial Liberalisation (All ASEAN Members and India)		Partial Liberalisation (All ASEAN Members and India) and imperfect competition in India		Full Liberalisation (All ASEAN Members and India)		Full Liberalisation (All ASEAN members and India) and imperfect competition in India	
	Total Welfare Effect	Welfare as % of GDP	Total Welfare Effect	Welfare as % of GDP	Total Welfare Effect	Welfare as % of GDP	Total Welfare Effect	Welfare as % of GDP	Total Welfare Effect	Welfare as % of GDP
India	-399.34	-0.062	-307.57	-0.048	1279.7	0.20	453.39	0.071	3480.5	0.54
Malaysia	292.65	0.25	278.84	0.24	273.91	0.24	407.51	0.35	401.77	0.35
Singapore	407.77	0.38	388.76	0.36	379.63	0.35	352.24	0.33	339.48	0.31
Thailand	156.04	0.10	130.41	0.08	130.42	0.08	176.55	0.11	178.39	0.11
Cambodia	-2.04	-0.04	-4.2	-0.09	-3.91	-0.08	-5.26	-0.11	-4.86	-0.10
Indonesia	-23.3	-0.10	231.11	0.09	233.07	0.09	651.46	0.25	655.68	0.25
Lao	-0.95	-0.04	-0.92	-0.04	-0.85	-0.03	-1.15	-0.05	-1.05	-0.04
Myanmar	-4.26	-0.06	10.37	0.13	12.11	0.16	57.78	0.72	60.69	0.76
Philippines	-9.54	-0.01	-3.86	-0.005	-1.97	-0.002	-11.64	-0.014	-8.66	-0.01
Vietnam	-8.30	-0.02	71.95	0.17	77.11	0.18	64.81	0.15	71.38	0.17
Rest ASEAN	-1.88	-0.03	14.70	0.26	14.06	0.25	14.77	0.26	-1.88	-0.03

Note: Partial Liberalisation implies tariff elimination for products in normal track, tariff reductions for the sensitive track products

Table 3 below describes the decomposition of welfare effect under perfect competition. Three situations clearly identify that India's welfare gain will increase as the agreement expands and deepens. At the initial stage India will suffer from both negative terms of trade and allocative efficiency effect. Over the time terms of trade effect gets worsened but allocative efficiency improves. On the contrary, for major economies in ASEAN such as Singapore, Malaysia, Thailand, Indonesia the major gain is from the terms of trade effect. In fact they will have very small allocative efficiency effect. Welfare change for other countries will be minimal or negative except for Vietnam which will experience positive gain as the agreement gets fully operational.

**Table 3: Decomposition of Welfare effect with Perfect Competition (US \$ Million)**

	Partial Liberalisation (India, Malaysia, Singapore and Thailand)			Partial Liberalisation (All ASEAN Members and India)			Full Liberalisation (All ASEAN Members and India)		
	Allocative Efficiency Effect	ToT Effect	Inv-Sav Effect	Allocative Efficiency Effect	ToT Effect	Inv-Sav Effect	Allocative Efficiency Effect	ToT Effect	Inv-Sav Effect
India	-229.26	-139.45	-30.63	-124.3	-171.18	-12.1	1253.3	-723.2	-76.7
Malaysia	-19.49	354.16	-42.03	-18	337.45	-40.6	-40.99	517.10	-68.60
Singapore	22.71	396.47	-11.41	23.95	375.93	-11.12	13.81	349.04	-10.60
Thailand	18.10	165.56	-27.61	15.85	139.74	-25.18	24.57	180.78	-28.79
Cambodia	-0.35	-1.68	-0.006	-0.98	-3.62	0.36	-1.18	-4.61	0.54
Indonesia	-0.40	-23.62	0.71	21.58	226.2	-16.7	38.31	667.49	-54.34
Lao	-0.13	-0.76	-0.06	-0.17	-0.72	-0.04	-0.23	-0.85	-0.07
Myanmar	-0.08	-4.1	-0.08	0.33	9.5	0.55	-0.65	56.31	2.13
Philippines	0.72	-10.44	0.19	1.12	-5.93	0.94	-1.77	-11.29	1.42
Vietnam	-0.59	-7.73	0.02	-6.03	74.3	3.67	-12.02	73.16	3.68
Rest ASEAN	-0.07	-0.87	-0.95	1.19	17.95	-4.44	1.25	18.03	-4.50

Note: Partial Liberalisation implies tariff elimination for products in normal track, tariff reductions for the sensitive track products

Now, the important question for India is why it will continue to have negative terms of trade effect. Though India's export to ASEAN will increase following the FTA, it will not be able to drive home the price advantage. The terms of trade gain accruing to most of the ASEAN countries is due to the larger fall in prices of their import items relative to their exports as a result of bilateral trade liberalization under the FTA.

As India is experiencing high growth in the manufacturing sectors it is expressing huge demand for imported intermediate goods. Table 4 shows that in selected sectors domestic firms' share in increased import demand is very high. For several other products, the private household accounts for large share of India's import demand from ASEAN. ASEAN takes advantage of this increased demand (both intermediate and final). However, the share of ASEAN in either of this import demand is not high. As a result, despite trade liberalization, the price of imported goods remains quite high and fall in prices of 'import composite' is miniscule. In this situation, exporters from ASEAN will be able to sell their goods in a relatively higher price (yet lower than on going price of 'import composite'). This drives the fact that ASEAN will continue to maintain larger terms of trade benefit as the FTA deepens and India will experience a negative effect.

**Table 4: Demand of ASEAN imports in Selected Indian Manufacturing Sectors**

Selected Sectors	Domestic Firms' share in increased import demand (%)	Market share of the ASEAN region in total composite* of the good imported by India (%)	Fall in prices of 'import composite' available in India (%)	The % fall in price (relative to average price of import composite) offered by the main exporters from ASEAN
Chemicals, rubber & plastic	87.9	13	2.53	Singapore (9.7), Malaysia (11.2)
Other manufacturing	79.4	5	0.88	Singapore (11.9) and Thailand (10.8)
Machinery equipment	98.9	5	1.06	Singapore (9.9), Thailand (11.4)
Transport equipment	94.7	8	1.26	Singapore (8.3) and Indonesia (11.2)

Note: Based on Simulation: Partial liberalization of all countries

\*Import composite refers to bundle comprising of all imports of the product into India from different countries of the world including ASEAN region

The main driving force behind this welfare gain is the allocative efficiency. It can be argued that under full liberalization allocative efficiency improves significantly. This is true even when we assume imperfect competition in India. Table 5 below describes the sources of welfare gain under imperfect competition. This is important to note that large gain is visible as there is a now scale economy which was not realized in previous scenarios. Due to the existence of scale economies and availability of cheaper imported materials the production will increase and average cost will come down bringing up more efficiency.

**Table 5: Decomposition of India's Welfare effect with Imperfect Competition (US \$ Million)**

Sources of welfare in India	IRS, Imperfect Competition under the scenario of Partial liberalisation	IRS, Imperfect Competition under the scenario of Full liberalisation
Total welfare	1279.72	3480.5
• Allocative Efficiency	-21.44	1353.04
• Scale Economics	1294.87	2700.74
• Terms of trade	-44.62	-575.06
• Investment-Saving	-12.1	1.75
Change in welfare as % change in GDP	0.20	0.54

Allocative efficiency as mentioned above is achieved due to more production activities in sectors which contribute substantial taxes and due to expansion of output in some of the

profit-generating imperfectly competitive sectors of the economy (referred to as profit-shifting in table 6). Following the trade shock, there will be change in income and endowment which creates new kinds of demand for endowment, input and output. More production in the presence of various taxes increase the social MVP as discussed in section 3 and thereby increasing the allocative efficiency in the system. Table 6 below describes the sources of allocative efficiency in presence of imperfect competition.

**Table 6: Sources of Allocative Efficiency**

	<b>IRS, Imperfect Competition under the scenario of Partial liberalisation</b>	<b>IRS, Imperfect Competition under the scenario of Full liberalisation</b>
Allocative Efficiency	-21.44	1353.04
Profit shifting	44.37	156.04
Input tax	13.79	22.92
Consumption tax	65.13	141.00
Export tax	-7.34	5.00
Import tax	-137.4	1029.58

### **7. Towards Generalising India's Welfare gain/loss from AIFTA**

In this section, we'll make an attempt to understand analytically India's welfare gain and loss reviewing the components of total welfare effect as pursued under various simulations. GTAP divides the change in welfare into three effects: Allocative efficiency effect, ToT effect and Investment-Savings (IS) effect. As mentioned earlier the main variables in altering the overall welfare effect are allocative efficiency and ToT. Hence we write the change in welfare effect as  $\omega = a + t$  where a: allocative efficiency effect and t stands for ToT effect. Both a and t are also function of market size (N) and state of liberalization (L).

Market size can increase when new ASEAN members (other than Singapore, Malaysia, Thailand) open up as well as the market of older ones grow. We assume three states of liberalization (L: 0 or 1 or 2). 0 stands for partial liberalization in which normal track (NT) gets reduced and 1 stands for the state when NT gets eliminated. Liberalisation state 2 implies full liberalization in all countries. The basic functions of a and t can be written as

$$a = f(N, L) \dots\dots\dots (i)$$

$$f = \text{constant, when } L=0, \Rightarrow f'_N = 0 \text{ and } f'_N \geq 0 \text{ when } L \neq 0$$

$$f''_N \geq 0 \text{ and } f''_N|_{L=2} > f''_N|_{L=1}$$

This implies that when there is partial liberalization if Rest of ASEAN opens up the effect on India's allocative efficiency remains constant or does not change. However, if the status of liberalization changes, India opens up further, its allocative efficiency rises due to resource reallocation and more production revenue, efficient use of resources etc. The second derivative ensures that as liberalization deepens (L moves from 0 to 1 and then to 2) the rate of improvement in allocative efficiency increases.

$$t = g(N, L) \dots\dots\dots (ii)$$

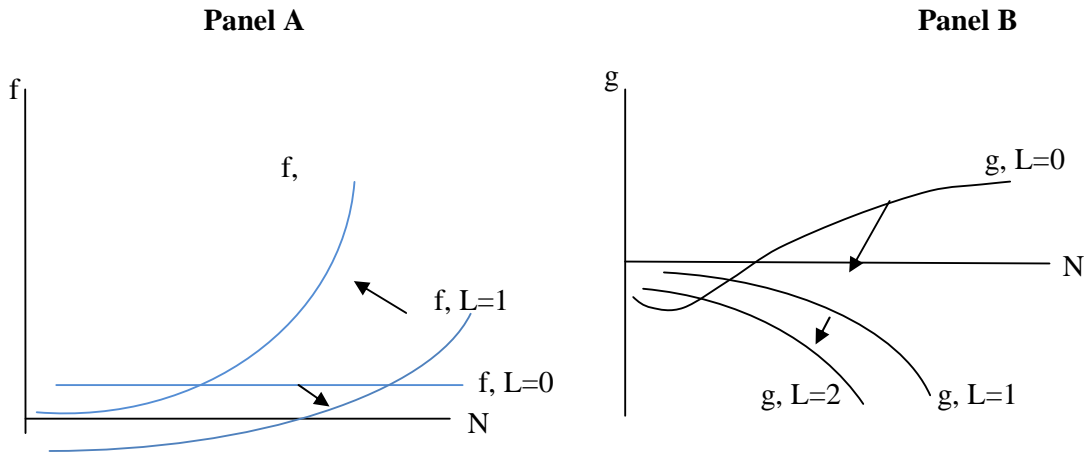
$$g'_N < 0, N < \bar{N}, g'_N > 0, N > \bar{N} \text{ and } \bar{N} \rightarrow g'_N = 0 \text{ for } L=0, \text{ where } \bar{N} \text{ is a threshold level}$$

beyond which ToT effect starts rising

$$g''_N < 0, L \neq 0 \text{ and } g''_N \leq 0, \text{ and } g''_N|_{L=2} < g''_N|_{L=1}$$

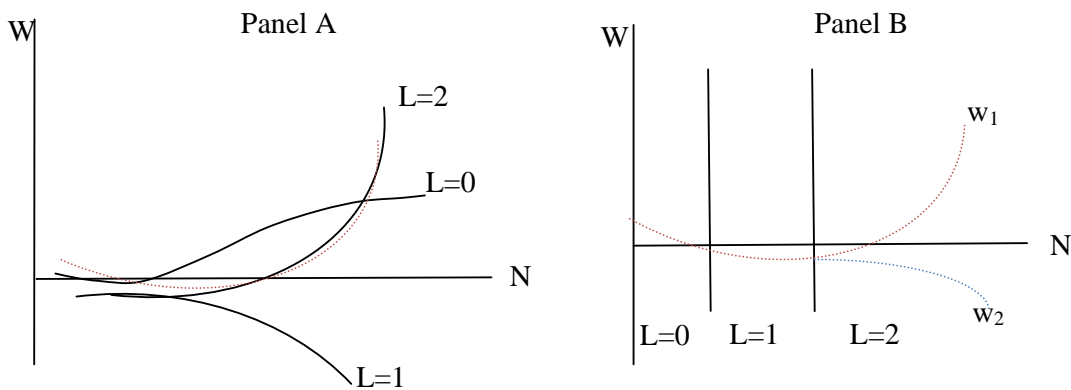
This implies that given that there is partial liberalization (L=0), as Rest of ASEAN opens their market though initially, India's ToT effect will worsen, eventually India gets market access and its ToT starts improving (beyond  $\bar{N}$ ). However, when the state of liberalization changes India needs to open up further by reducing the tariffs of the products in sensitive list and reducing the size of exclusion list. In that case India's import increases significantly and ToT worsens. The second derivative ensures that the rate in which ToT effect worsens speeds up as more country joins and exports to India.

The overall welfare effect depends on the strength of these two opposing forces ( a and t). Figure 4 below summarises the behavior of these two equations. Panel A and B describe f & g function under different state of L. Vertical sum of f and g provides the welfare effect which is described in Figure 5.



**Fig 4: Allocative efficiency and ToT effect for India with respect to market size given the state of liberalization**

It is important to note that in reality the increase in market size and state of liberalization moves together and what we see is the combined effect. At the initial stage, if Rest of ASEAN starts opening up under partial liberalization scheme, India tends to gain marginally. However, India's gains are short lived. As the liberalization deepens, India's benefit from market access gets neutralized by negative terms of trade effect due to high influx of imports from ASEAN and their price effect. Relocation of resources, higher production revenue, etc help India to enjoy positive allocative efficiency effect but that is not sufficient to cover negative ToT effect. As a result overall welfare effect produces negative figure.



**Fig 5: Welfare gain and loss for India under different state of liberalization**

In the Panel A of Figure 4 separate welfare effects are drawn for different state of liberalization. The dotted line shows the combined effect which is properly drawn in the Panel B. During the full liberalization, as described in the simulation India's welfare will increase substantially. This is depicted under the curve  $w_1$ . The underlying assumption for that  $|f_N''| > |g_N''|$  especially at the  $L=2$ . A careful look into the Figure 3 will explain this. This implies that India's long run benefit is dependent on the increase in its allocative efficiency effect as compared to its loss in ToT as Rest of ASEAN joins and state of liberalization deepens. This is possible when allocative efficiency gain leads to better production and thereby some gain in the export market. With an assumption of increasing return to scale in India we find that overall welfare starts increasing keeping negative ToT effect under control. If it does not happen or in other words the condition reverses [ $|f_N''| < |g_N''|$ ] we get a curve like  $w_2$ . In this case, TOT effect supersedes allocative efficiency as liberalization deepens. Hence, in the conclusion we can argue that India's benefit is lying in its attempts to link the allocative efficiency for further investment and production efficiency gain in export oriented sectors. Through this, it can increase its export in ASEAN and specifically in the Rest of ASEAN to control the further fall in ToT. The situation becomes further strengthened, if Indian economy brings up positive scale effect through investment and technology upgradation. With the assumption of IRS, we have noticed that negative effect of ToT slows down and other effects such as 'scale effect' and 'profit sharing' help Indian economy to get boost in production efficiency and increase overall welfare. This will ensure that welfare effect takes the path of  $w_1$ .

## 8. Conclusion

The study gives an insight into the sources of welfare gain providing its decomposition under various simulations describing stages of India-ASEAN FTA. It has been noticed that relatively bigger ASEAN members will derive more benefits in terms of welfare growth. India will have higher benefits only when the agreement will fully get implemented. ASEAN members will gain from higher ToT effect while India's gain mainly will be from the resource reallocation and change in domestic production activities reflected through allocative efficiency. India's import demand of several intermediate goods as also final goods will remain high and ASEAN will have advantage to supply these at a higher price yet lower than average prevailing import price in India. As a result, India will continuously be having negative ToT effect. However, situation will

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change significantly, if we assume IRS in some sectors in India. This will allow India to invest in capital goods and technology leading to high 'scale effect' and thereby to increase exports further to ASEAN. The study brings up a very crucial and pertinent issue that the gain from FTA with ASEAN hinges on India's big firm's ability to reduce average cost bringing better technology and quality inputs. This will improve production system in India which in turn will boost the export sector further.

## Appendix

### Regional Aggregation

The 113 regions of the World as in GTAP database are aggregated into twenty regions for the purpose of this study. They are - India, Malaysia, Singapore, Thailand, Cambodia, Indonesia, Lao, Philippines, Vietnam, Myanmar & Rest ASEAN (comprising of Brunei Darussalam & Timor Leste) and USA, EU, China & Rest of West Asia (comprising of Bahrain, Iraq, Israel, Jordan, Kuwait, Lebanon, Palestinian Territory, Oman, Qatar, Saudi Arabia, Syrian Arab Republic, UAE & Yemen), Bangladesh, Pakistan, Sri Lanka, Rest of South Asia and Rest of the World. Timor Leste which is a part of Southeast Asia but not a part of ASEAN is clubbed together with Brunei Darussalam in the GTAP 7 database. As such in the regional aggregation used in the present paper Timor Leste which could not be separated from Brunei comes under Rest ASEAN. The other countries of the world have been classified keeping in mind the main trading partners and the neighbouring countries of India so that the impact of the free trade agreement between India and ASEAN on these countries may be examined.

### Sectors undertaken in simulations (Sectoral Aggregation)

The 57 sectors of the GTAP model have been aggregated into 35 sectors in this study considering the importance of these sectors in this agreement. The sectors are namely, Wheat, Rice, Other cereals, Vegetable & fruits, Oilseeds, Other crops, Meat & meat products, Milk, Dairy products, Other animal products, Forestry, Fishing, Coal, Oil & gas, Minerals, Vegetable oil & fat, Sugar, Food products, Beverages & tobacco, Textiles, Wearing apparels, Leather & leather products, Wood & wood products, Paper & paper products, Petroleum products, Chemical, rubber & plastic, Ferrous metals, Other metals, Mineral products, Motor vehicles, Transport equipment, Electrical equipment, Machinery equipment, Other manufacturing and Services.

### Sectors identified for IRS

Out of the thirty five sectors considered in this study, twelve sectors, namely, textiles, wearing apparels, petroleum products, chemicals, rubber & plastic, ferrous metals, other metals, mineral products, motor vehicles, transport equipment, electrical equipment, machinery equipment and other manufactured goods are considered to be oligopolistic

in nature with presence of scale economies for the Indian economy. The calibration of the oligopoly model and scale economies for these twelve manufacturing sectors has been based on the data obtained from Indian database<sup>5</sup>. Scale economies related calculations are based on the ideas given by (Francois, 1998; Elbehri et al, 2004).

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<sup>5</sup> The firm level data for Indian corporate sector is available in Prowess database (of Centre for Monitoring Indian Economy (CMIE)) which have been used to calculate various cost related variables used in the model.

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## List of working papers of IIFT

Sinha, Deepankar (2010), "Multi-Dimensional Approach to Management of Port Life Cycle: The Case of Major Ports in India" Working Paper No: LD-10-01, Indian Institute of Foreign Trade, New Delhi and Kolkata. This paper can be downloaded from <http://cc.iift.ac.in/research/Docs/WP/01.pdf>

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