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IMPACT OF INDIA ASEAN FTA ON WELFARE: A GTAP MODEL APPROACH

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ABSTRACT

India signed a Free Trade Agreement with ASEAN on 13 August 2009. The FTA has given rise to considerable interest among researchers over the last few years. In this paper, we analyze the likely impact of this FTA on member countries, especially on the Indian economy, in a general equilibrium framework. We used the Global Trade Analysis Project (GATP) as an analytical tool for calculating the welfare effect during various tariff liberalization stages. The study reveals that the FTA is expected to have a negative welfare impact for India but a positive welfare impact for ASEAN members. India's loss in welfare emerges mainly from the adverse terms of trade effect. ASEAN's welfare gain originates from the allocative efficiency gain and the terms of trade effect. ASEAN's welfare gain originates from the allocative efficiency gain and the terms of trade effect. However, for ASEAN major contribution on aggregate welfare comes from terms of trade effect.

Keywords: India ASEAN Free Trade Agreement, General Equilibrium Analysis, Allocative Efficiency Effect, Terms of Trade.

JEL Code: F13, F15

1. INTRODUCTION

India signed an FTA with the Association of South East Asian Nations (ASEAN) on 13th August 2013 as a part of India's Look East Policy. This goods agreement is supposed to be a major initiative for establishing a full-fledged free trade area between ASEAN and India. In the post-independence period, this is the biggest preferential trade agreement for India. Since its conception, the FTA has faced vociferous dissent from some sectors in India. There was widespread apprehension that the FTA would drastically increase palm oil, rubber, coffee, black tea and pepper imports from ASEAN countries, which would hurt these industries in India.

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These and many other issues have been analyzed in various studies with the help of partial and general equilibrium frameworks. Veeramani and Saini (2011) analyzed the impact of this agreement on plantation commodities with the help of the SMART (Software for Market Analysis and Restrictions on Trade) model and the gravity model. The authors stated there would be a significant decrease in tariff revenue due to tariff liberalization. However, the gains in consumer surplus outweigh the loss of tariff revenue, which results in a net welfare gain. Chandran and Sudarsan (2012) quantified the impact of the proposed decreased tariff on fisheries by using a SMART simulation. The results showed that eliminating tariffs leads to reasonable trade creation and a marginal welfare increase with a nominal tariff revenue decline. Pal and Dasguta (2008, 2009) pointed out that there was a significant correspondence between India's service-oriented economy and ASEAN's light manufacturing-driven economy. Using the general equilibrium framework, Nag and Sikdar (2011) argued that in the partial liberalization of tariffs India would experience a negative welfare gain but relatively bigger ASEAN members would derive more benefits in terms of welfare gain. However, during the full liberalization stage, India would experience a positive welfare change.

The objective of the present paper is to analyze the welfare impact of the India ASEAN FTA in a general equilibrium framework by using the Global Trade Analysis Project (GTAP) as an analytical tool. GTAP is widely used for trade policy analysis and there is a huge volume of literature that uses this project. As far as India ASEAN FTA is concerned there are at least two papers (Ahmed [2012] and Nag & Sikdar [2011]) that have used this approach in analyzing the impact of the FTA. Nag and Sikdar considered both partial and full liberalization scenarios with 20 regions and 35 sectors under perfect as well as imperfect competitions. They however looked at the aggregate welfare change only. The disguising feature of Ahmed (2012) is that he looked at the impact of the agreement at the sectoral level. Unlike these two papers, in this paper our main focus is on the impact of the agreement on employment. Moreover the aggregation of the industries is done in such a way that it internalizes the role of the debated commodities. The aggregation scheme is such that the impact on these debated commodities is highlighted through the analysis.

The paper is arranges as follows. Section 2 reports a verbal description of the GTAP model. Section 3 gives the details of methodology and data. Section 4 describes welfare impact of the FTA and finally section 5 concludes the paper.

2. A VERBAL DESCRIPTION OF THE GTAP MODEL

The most widely used Computable General Equilibrium (CGE) model is the Global Trade Analysis Project (GTAP) model. There are two broad categories of CGE models. The first category includes the standard GTAP model (Hertel 1997); the classic example deals with static

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effects of policy related to general equilibrium resource allocation. The assumption is perfect competition with constant returns to scale. The second category incorporates scale economies and imperfect competition (Francois 1998). GTAP as an applied general equilibrium model is well documented in Hertel's (1997) work. It is a multiregional CGE model designed for comparative static analysis of trade policies. The model gives a detailed analysis of the impact of policy changes on the output mix, factor usage, trade effects and resulting welfare distribution in different countries as a result of trade policy. The economic impact of trade policy reforms has been captured by various studies (Ando and Urata (2006), Antimiani et al. (2008), Igawa and Kim (2005), Lee and Park (2004), Mukhopadhyay et al. (2008) and Das and Powell (2001)). GTAP has also been applied in other areas such as the environmental impact of trade policy (Strutt and Anderson 1998, Bovenberg and Goulder 1996) and energy (Truong 1999, Burniaux and Truong 2002, McDougall and Golub 2007).

The GTAP model captures several markets and regions. The markets include markets for final goods, intermediate goods, traded goods and production factors. Multi-region framework represents either a country or a group of countries. The main agents in the GTAP framework are regional households, firms and the government. The agents in the regions behave according to standard neoclassical assumptions. The regional household associated with each country or composite region collects all income generated in the economy (Figure 1). It is similar to the concept of GDP from the expenditure or income side (Burfisher 2011). Regional income is exhausted by private household expenditures (PRIVEXP), government expenditures (GOVEX) and savings (SAVE). These components of final demand roughly maintain a constant share of the total regional income (McDougall 2001). Therefore, an increase in regional income leads to an equi-proportional change in the components of final demand. Regional households and firms together form a closed economy. On the other hand producers pay the value of the output at the agent's price (VOA) to the regional household for the use of endowment commodities. In Figure 1, government consumption is denoted as the value of domestic government purchases evaluated at the agent's prices (VDGA). Private consumption is represented as the value of the domestic private household purchases evaluated at the agent's prices (VDPA). The producers receive payments for selling consumption goods to private households and the government, investment goods to the savings sector and intermediate inputs to other producers (value of domestic firm purchases evaluated at the agent's price, VDFA). Figure 1 also shows that savings are completely exhausted on investment (NETINV). Demand for investment is savings driven in the GTAP model. Private households, firms and the government pay taxes to the regional household. Therefore, regional income consists of the VOA paid for the use of endowment commodities and the sum of the taxes net subsidies. Tax revenues and subsidy expenditures are computed by comparing the transaction values evaluated at agent and market prices. Therefore, taxes and subsidies serve as the difference between the agent's price and the market price. The link

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between these two prices is established through multiplying the market price of a particular commodity with the power of the associated ad valorem tax or subsidy.

This closed economy model is extended by introducing a trading sector in the model. Countries and regions in the global economy are linked together through trade. Trade between nations or regions follows the Armington assumption, which implies imperfect substitutability between varieties of goods by country of origin. Therefore, the assumption provides for the possibility of distinguishing imports by their origin and explains intra-industry trade of similar products. The standard GTAP model assumes perfect competition with constant returns to scale production function technology. Production in each sector of a region is represented by Leontief and constant elasticity of substitution (CES) functions. Figure 2 presents the assumed technology of the firms in the form of a production tree. The production tree describes the separable and constant returns to scale technologies. The individual inputs (primary factors and intermediate inputs) demanded by the firm are given at the bottom of the inverted tree. Firms must purchase some of the intermediate inputs from domestic producers and some from foreign producers. Furthermore, the imported intermediate inputs are assumed to be separable from domestically produced intermediate inputs by the Armington assumption. Therefore, these two intermediate inputs are combined in an additional nest in the production tree. The elasticity of substitution between the individual primary factor and intermediate inputs is equal in the input nest. The firm first decides on the source of the imported intermediate inputs. In the next step, the firm determines the optimal combination of imported and domestic intermediate inputs based on the composite import price.

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Figure 1: One Region Closed Economy with Government Intervention

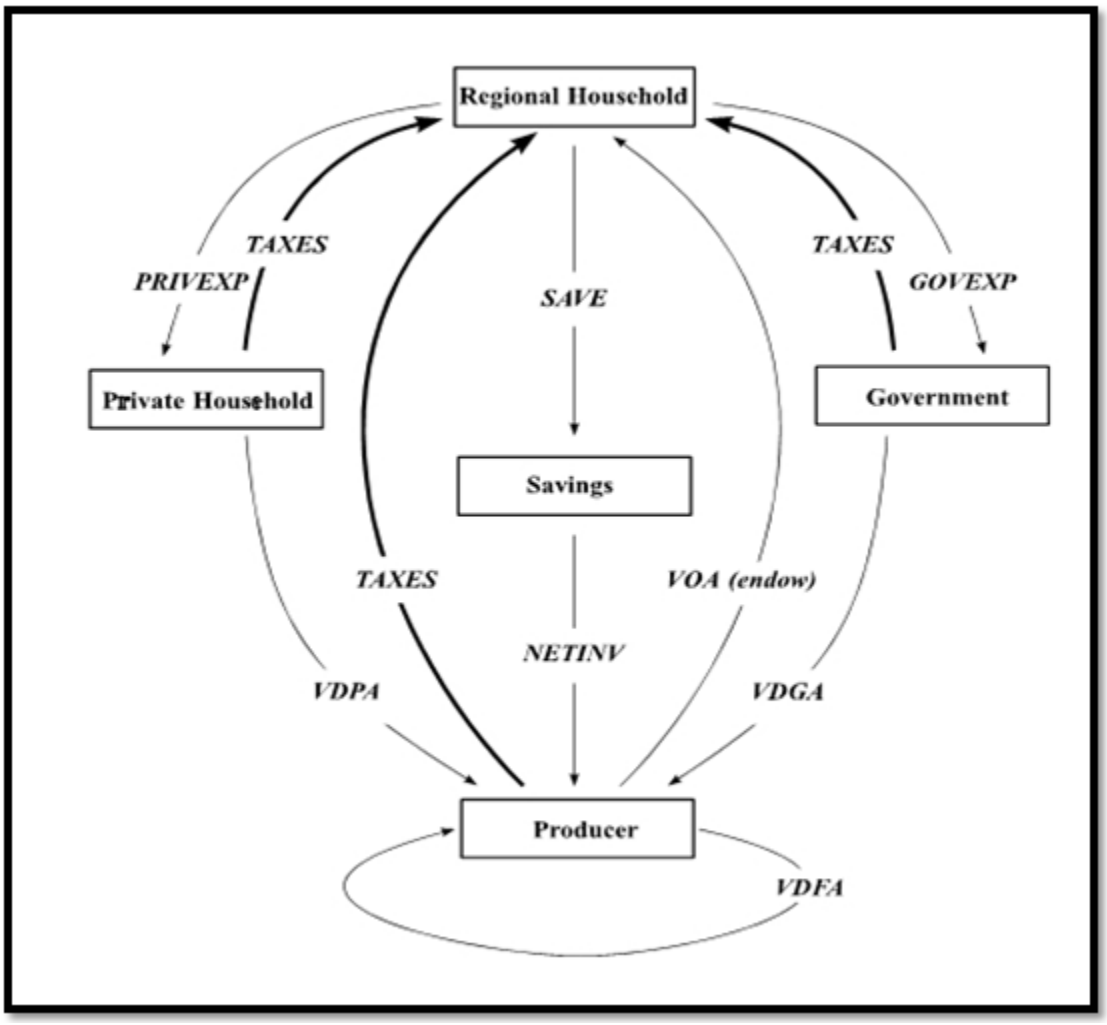

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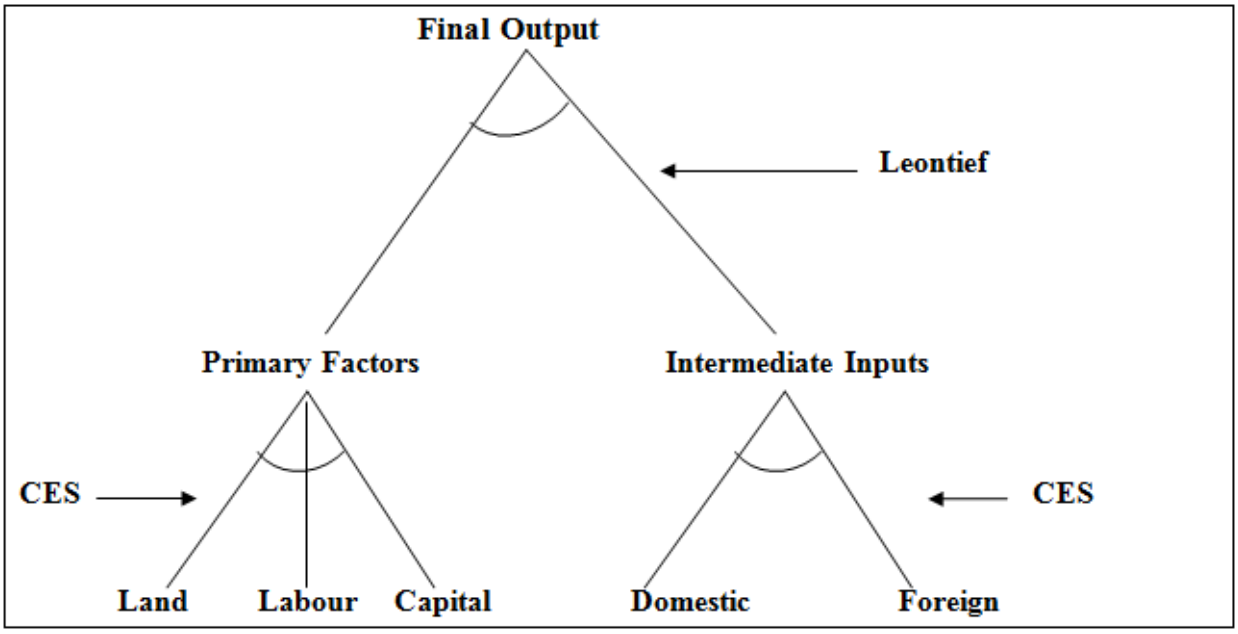
Figure 2: Nested Production Structure



In the GTAP model, economic welfare is represented as derived from the allocation of national income among private consumption, government consumption and savings. Therefore, households benefit from their own current consumption. They also benefit from current savings in terms of future household consumption. Finally, households benefit from the government's provision of public goods and services as represented by government expenditure. The functional form of the aggregate utility function of the regional household reveals that successive increases in household or government expenditures or savings generate an equi-proportional increase in economic well-being. Therefore, any trade policy affects the welfare of an economy by affecting consumption and savings. In the GTAP model, welfare is measured by the percentage change in the aggregate per-capita utility for a region. The model also captures a money metric equivalent of this utility change and any change in the region's population. This convenient measure is known as the equivalent variation (EV). It captures the regional welfare changes resulting from a policy shock in dollar value ($US million). The EV measures the difference between the expenditure required to obtain the post-simulation level of the utility at initial prices (Y_{EV}) and that available initially ($\bar{Y}$).

$$EV = Y_{EV} - \bar{Y}$$

Differentiating both sides, we get

$dEV = (0.01)Y_{EV}y_{EV}$, where y_{EV} is the percentage change in Y_{EV}.

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Thus, dEV represents the percentage change in the regional welfare in the GTAP model. According to McDougall (2001), the demand for regional households can be represented in a per-capita basis. Therefore, y_{EV} can be decomposed into the percentage change in the population (n) and the percentage change in per-capita expenditure (X_{EV}) required to achieve new per-capita utility at initial prices: $y_{EV} = n + X_{EV}$. Thus, the expression for the change in regional welfare can be written as

$dEV = (0.01)Y_{EV}n + (0.01)Y_{EV}\emptyset_{EV}u$ where $\emptyset_{EV}$ is the elasticity of expenditure for utility (u).

To identify the sources of dEV, we need to decompose the regional income. Decomposition of the total regional real income can be written as:

$D \equiv Y(y - p)$ where p represents the percentage change in price.

Therefore, decomposition of equivalent variation (EV) as a function of regional income can be written as:

$$dEV = (0.01)\left(1 - \frac{\emptyset_{EV}}{\emptyset}\right)Y_{EV}n + (0.01)\frac{\emptyset_{EV}}{\emptyset}\frac{Y_{EV}}{Y}D$$

In the this model, any contribution in welfare change comes from endowments, technical changes and changes in pre-existing distortions in the economy. The endowment contribution to welfare comes from changes in the availability of primary factors such as an increase in the stock of machinery, buildings and agricultural land. Technical efficiency contribution deals with the changes in the use of available inputs in the production process. Finally, the allocative efficiency contribution refers to the contribution that comes from changes in the allocation of resources relative to pre-existing distortions. Each component of the welfare change is related to the policy-induced quantity change interacting with a distortion in the model. A commodity tax clearly indicates a distortion in the system. The initial tax distortion is the difference between the contribution to the output from an additional unit of the commodity and the price for which the commodity could be obtained in the absence of the tax. Tax distortion takes the form of tax on output, tax on the use of endowment, trade taxes (import and export), tax on intermediate inputs and taxes on household and government consumption. The product of the distortion and the change in the quantity therefore captures the net contribution to the output for change in the quantity of the good. With fixed population, endowments and technology, the only means of increasing welfare is by reducing the excess burden owing to existing distortions. There are many such distortions in the multi-regional general equilibrium model. The size of the welfare gain is thus a function of size of the initial distortion, the degree of policy change (e.g., trade reform) and the responsiveness of various markets to the policy change. The derivation of the

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money metric equivalent of this welfare change can be found in Huff and Hartel (2000) and Hanslow (2000). They have decomposed this money metric equivalent of welfare change into three main components: the allocative efficiency effect, the terms of trade effect and the investment savings effect. The first effect deals with the efficiency change due to a policy shock as a result of re-allocation of resources among the sectors. The second effect corresponds to the welfare effect due to changes in the terms of trade which may be a result of contraction and expansion of sectors involved in international trade and/or domestic sales. The last effect explains the impact of changes in the prices of savings and investment on investment-savings balance and subsequently on the level of welfare. Thus the effectiveness of a policy change in terms of welfare in a region depends on the overall change in the real income reflected through the change in prices.

3. METHODOLOGY AND DATA

We have used version 6 of the GTAP database (base year 2001) although later versions are available since it is freely available online. This version of the model captures global economic activity in 57 different industries in 87 regions with a base year of 2001. The 57 commodity groups provide a broad disaggregation of the industrial sectors in each country and/or region. The database captures the trade flows of all 57 sectors for the 87 regions. The bilateral exports and imports of 57 tradable commodities are distinguished by their countries of origin and destination. In this paper since our objective is to estimate the welfare impact of the India ASEAN FTA, the 87 regions are aggregated into three regions. The regions are India, ASEAN and the Rest of the World (ROW). The 57 sectors are aggregated into 10 sectors. These 10 sectors include 5220 commodities in the Harmonized System (HS) six digit level. The industry aggregation has been done based on several factors. First, we have observed growth and level of imports of these commodity groups into India from ASEAN members during the period from 2010 to 2013. The high growth rate combined with the high level of imports was used as a yardstick to choose the commodity groups in order to assess the welfare impact of the India ASEAN FTA on the Indian economy. Further, labor intensive sectors among those chosen in the first step were given preference over others given the likely larger impact on employment and welfare in such sectors. Sikdar and Nag (2011) in their study of Indo ASEAN FTA show that employment of skilled labor declined by 7.6% and unemployment of unskilled labor climbed to 4.9% in India (Francis [2011] and Salim & Geetha [2011] are other studies which dealt in this aspect). For example, it was found that sectors such as coal, leather, food products, forestry and wood products consist of goods that not only experienced high import both in terms of growth and levels but are also highly labor intensive. Details of the sector and regional aggregations used in this paper are reported in the appendix. The Welfare Decomposition of the GTAP model are also discussed in the appendix.

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As discussed earlier, the FTA follows the tariff reduction commitments in different tracks. The tariff reduction offers are given on different tariff lines according to the HS code and not as per the product categories used in the GTAP model. Therefore, the average tariff reduction schedule was calculated according to the commodity aggregation in GTAP. The country wise tariff reduction schedule of different categories was analyzed to arrive at an average tariff figure for the 10 aggregated industrial sectors. Similarly the average tariff rates imposed by India and ASEAN members on the ROW for the same set of 10 sectors were calculated. Using the average tariff reduction schedule of the different sectors, simulations were performed to assess the welfare impact of the FTA. The simulation corresponds to the partial tariff reform over the entire period of tariff reduction or elimination proposed for the products on the normal tracks, sensitive track and special product list. Changes were incorporated for India and all ASEAN members. We have projected the impact on welfare and other aspects once the changes scheduled to happen till 2014 is implemented. The selection of 2014 is based on the fact that tariffs for all products under normal track 1 are reduced to zero by this year (except for Philippines and CLMV members).

For the simulation exercise, the static GTAP model with a base year of 2001 is inappropriate since the global economic scenario has changed drastically. The FTA was implemented in 2010, and the simulation exercise needs to take the changes that have happened during this time before making the projections. The database thus needs to be updated. We have used the altertax procedure (Malcolm 1998) to update the data by including information on GDP changes, population changes and tariff changes. This procedure allows incorporation of updated information without impacting the consistency of the model. This procedure is designed to incorporate improved information on taxes in the existing GTAP data aggregation. However, the internal consistency of the database will be disturbed if we simply change one tax and leave the rest of the database unchanged. Therefore, the procedure for altering the tax aims to minimize the impact of the tax change on the value flows in the database and to maintain its accounting consistency. This procedure improves the quality of the base year data by incorporating improved information about the data. In this procedure, the model structure and the parameter values are chosen to minimize disturbances to the database. The database was first updated to 2011. Subsequently the tariff rates scheduled to change in the subsequent periods for India and ASEAN under various tracks were then included to shock the data to update it to 2014. Finally, the projections in welfare changes are made based on changes scheduled to happen in 2014 when all the changes under the Normal Track 1 are supposed to be implemented (except for Philippines and CLMV members). Thus we are looking at impact on welfare for India and ASEAN after the changes are taken into account. The results should be interpreted as all other things remaining same other than these tariff changes.

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4. WELFARE IMPACT

4.1 Aggregate Welfare

The basic objective of the paper is to investigate the welfare impact of the India ASEAN FTA using the GTAP model as an analytical tool. The analysis starts with the results of the overall welfare change expected due to changes in tariffs till 2014 in a general equilibrium framework. A summary of the regional welfare changes is reported in table 1.

Table 1: Decomposition of Welfare Change (Value in Million US$)

Components of Aggregate Welfare Change	India	ASEAN	ROW	Total
Allocative Efficiency Effect	7.65	7.93	-34.54	-18.96
Terms of Trade Effect	-14.58	82.08	-67.50	0.00
Investment Savings Effect	0.40	-8.30	7.90	0.00
Total Effect	-6.53	81.71	-94.14	-18.96

Source: GTAP Model Estimations.

The decomposition of welfare change in the allocative efficiency effect (AEE), the terms of trade effect (TOTE) and the investment savings effect (I-S E) is provided in this table. It is seen from the welfare decomposition results that India is expected to experience an overall welfare loss to the tune of 6.53 million US$. This is majorly due to the loss related to terms of trade (TOT) deterioration amounting to 14.58 million US$ in money terms. For ASEAN on the other hand there is an overall gain in welfare to the tune of 81.71 million US$ contributed mainly by positive terms of trade effect (82.08 Million US $). The ROW experiences loss in welfare (94.14 Million US $). Reasons behind terms of trade deterioration thus need to be identified to understand India's loss in welfare.

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Table 2: Explanatory Factors - TOT Deterioration for India

Sr. No.	Factors	Values
1	Tariff Revenue Change (Billion US$)	4.054
2	Import Quantity (% Change)	1.6
3	Bilateral Import Price – ASEAN (% Change)	0.02
4	Bilateral Import Price – ROW (% Change)	-0.10
5	Domestic Market Price of Imports (% Change)	-4.39
6	Factor Price Exchange Rate (% Change)	-0.004
7	Bilateral Export Price (% Change)	-0.003
8	Export Volume (% Change)	0.56

Source: GTAP Model Estimations.

Overall import tariff revenue have increased by around 4.1 billion US$ for India due to implementation of scheduled reductions of tariffs in 2014. As expected, imports are projected to increase positively (1.6% on an average). This contributes to negative terms of trade changes for India given bilateral import prices for goods coming from ASEAN are seen to rise in table 2. The reason being, due to increase in imports domestic economy contracts (details in table 6). Hence demand for factors of production comes down due to which their prices fall which is similar to a real depreciation in exchange rate. It makes Indian goods relatively inexpensive in the World market. Both decline in resource demand and real depreciation in the exchange rate cause Indian exports to become relatively cheaper. Given the rise in import prices and fall in export prices TOT deteriorates.

Alternatively, since India has made higher offers than ASEAN, the country's import prices should fall more than the export prices. In addition, India's imports are highly elastic (Bhattacharyya and Mandal [2010]); therefore, the price fall is associated with a very high rise in imports. The standard GTAP closure considers trade to be balanced to obtain the changes from one equilibrium to the other. Thus exports should be concomitant with this rise in imports. However, as mentioned earlier the price elasticity of exports is lower than that of imports in India. Thus, the decrease in export prices required to usher in the extra exports is much higher than the fall in import prices. The terms of trade thus would deteriorate. The results (Table 1) also reveal that ASEAN's welfare change is positive due to positive terms of trade effect. ASEAN's terms of trade improve because import prices fall more than export prices. In this case price elasticity of exports is higher than that of imports. Thus exports would have to increase significantly to match the rise in imports due to the balance of trade closure in GTAP. Therefore, a small reduction in price is required for a significant increase in tariff elastic exports. Hence the decrease in export prices will be lower than that of the import prices leading to an improved

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terms of trade. Thus, implementation of the FTA provisions would be beneficial for the ASEAN countries mainly due to the improved terms of trade.

In case of ROW, the allocative efficiency effects and the terms of trade effects are negative. Table 1 also provides a summary of the regional welfare changes for ROW that resulted from the trade agreement between India and ASEAN. The table shows that ROW suffers a huge loss in welfare (94.14 million US$) due to the FTA between India and ASEAN countries. The major contribution to this welfare loss comes from the loss in terms of trade effect (67.50 million US$) and allocative efficiency effect (34.54 million US$).

Commodity group wise breakups and tax components of the allocative efficiency effect are reported in tables 3 and 4 respectively. In India, the commodity group contribution of the allocative efficiency effect as reported in table 3 clearly reveals that the maximum contribution is from vegetable oil and fats resulting from the India ASEAN FTA. Thus, the vegetable oil sector has been identified as the major source of allocative efficiency gain due to the increase in India's imports from ASEAN members. During the FTA negotiations, there was a more than 50% reduction in the tariffs on vegetable oil and fats from 2007 to 2012. Therefore, the reallocation of resources from low value use such as vegetable oil and fats to a relatively high social marginal value use improves the welfare level by a significant amount through the significant decrease in distortions. Among the other sectors, crops, forestry and manufacturing have a higher contribution. However, only 24% of the allocative efficiency effect comes from vegetable oil and fats for ASEAN due changes in tariffs till 2014. All sectors show a negative allocative efficiency gain for the ROW. Table 4 decomposes allocative efficiency effects by tax instruments for India, ASEAN and Rest of the World. It reveals that import tax contributes the most to the total allocative efficiency gain for both India and ASEAN. It also highlights the fact that the import tax component represents the most important tax instrument for all the regions. The higher and significant contribution of import taxes in the allocative efficiency effect can be explained by the fact that the allocative efficiency will increase due to the increased tariff revenues through the significant increase in imports.

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Table 3: Commodity Group Wise Breakups of Allocative Efficiency Effect (Value in Million US$)

Commodity Groups	India	ASEAN	ROW
Coal	-0.15	0.00	-0.10
Crops	1.50	-0.12	-0.40
Food	0.14	0.44	-0.69
Forestry	0.65	0.16	-0.15
Leather	0.14	-0.62	-0.65
Manufacture	1.18	0.44	-0.32
Metals	0.11	0.00	-0.22
Oil	-0.42	0.20	-0.83
Vegetable oil & Fats	23.09	1.90	-0.6
Others	-18.58	5.66	-30.2
Total	7.65	7.93	-34.54

Source: GTAP Model Estimations.

Table 4: Tax Instrument Wise Decomposition of Allocative Efficiency Effect of Partial Tariff Liberalization (Value in Million US$)

Components of Tax	India	ASEAN	ROW
Endowment Tax	0.00	-0.13	-0.38
Output Tax	1.75	-2.50	-0.04
Intermediate Input Tax	0.15	0.08	-2.53
Household Consumption Tax	1.06	1.17	-4.18
Govt. Consumption Tax	0.00	0.00	-0.01
Export Tax	0.65	-1.89	-0.61
Import Tax	4.05	11.20	-26.78
Total	7.65	7.93	-34.54

Source: GTAP Model Estimations.

4.2 Impact on Output and Trade

Tables 5 and 6 provide a summary of the output changes that result from the tariff liberalization between India and ASEAN. The tables show the adversely and favorably affected sectors in terms of changes in output due to the implementation of tariff reforms. For India, 50 percent of

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the commodity groups indicate a change in domestic output in a positive direction with a relatively higher increase in manufacturing, food and leather. Output of vegetable oil and fat falls substantially followed by forestry, crops, oil and coal. India's higher reduction of tariffs in these sectors will substitute the domestic product with cheap imports from ASEAN members. However, ASEAN members experience the maximum increase in output in vegetable oil and fats due to tariff liberalization till 2014. In aggregate, domestic output will decrease both for India and ASEAN while the ASEAN members show a smaller decrease in output.

Table 5: Commodity Wise Output Changes due to Partial Liberalization of Tariff (% Change)

Commodity Group	India	ASEAN	ROW
Coal	-0.59	0.22	0.70
Crops	-6.45	-0.96	2.36
Food	13.96	-12.95	-5.46
Forestry	-7.77	8.16	-0.68
Leather	7.02	-12.65	8.08
Manufacture	35.2	-18.76	-18.83
Metals	6.15	-0.30	-4.67
Oil	-1.06	2.43	-2.55
Vegetable oil & Fats	-85.5	140.95	-46.83
Others	19.73	-124.86	35.13
Total	-19.30	-18.73	-32.73

Source: GTAP Model Estimations.

Now we turn to the impact of this FTA on global trade as predicted by the GTAP model. Table 6 shows the change in global imports for all the regions. The GTAP results indicate that India's global imports increase substantially (132%). The highest increase in imports is observed in vegetable oil and fats (86%) followed by forestry (9.4%), crops (5.9%) and food (2.2%). The vegetable oil sector dominates India's imports because this sector observes the maximum decrease in domestic output. The allocative efficiency gain in this sector is the maximum since resources will be reallocated from this inefficient sector to efficient sectors. The vegetable oil sector also experiences a significant decrease in tariffs from 2007 to 2012. For ASEAN members, the increase in global imports (41%) is smaller than India. The manufacturing sector (5.3%) shows the highest increase in imports followed by food (4.7%) and leather (1.2%). However, there is a decrease in the ROW's aggregate imports (52%), which is reported in table 6.

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Table 6: Commodity Wise Import Change from Partial Liberalization of Tariffs (% Change)

Commodity Group	India	ASEAN	ROW
Coal	0.02	0.00	-0.03
Crops	5.89	0.63	-0.72
Food	2.22	4.73	-1.90
Forestry	9.41	0.00	-0.17
Leather	0.17	1.20	-2.42
Manufacture	-0.11	5.28	-0.04
Metals	0.00	0.01	-0.03
Oil	0.00	0.00	0.00
Vegetable oil & Fats	86.03	0.21	-1.34
Others	28.69	28.73	-36.48
Total	132.32	40.79	-43.12

Source: GTAP Model Estimations.

Table 7 provides the global export change due to the India ASEAN FTA. India's global exports increase by 255% due to partial liberalization of tariffs between India and ASEAN till 2014. The GTAP results clearly show the highest increase in India's exports in the manufacturing sector (36%) followed by food (16%), leather (6%) and crops (4%). The results also show that ASEAN's increase in exports is substantially smaller in terms of percentage change (63%) compared to India's increase in global exports. The major contribution of this rise in exports comes from vegetable oil and fats (97%). However, the GTAP results also show a decrease in leather (10%), manufacturing (7%) and food sector (5.5%) exports for ASEAN members. The GTAP model also highlights a significant decrease in global exports for ROW (54%).

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Table 7: Commodity Wise Export Change (% Change)

Commodity Group	India	ASEAN	ROW
Coal	0.15	0.59	-0.95
Crops	3.73	1.11	0.17
Food	15.82	-5.54	-5.08
Forestry	0.15	8.90	-1.87
Leather	5.75	-9.98	4.31
Manufacture	32.52	-6.74	-16.27
Metals	4.26	2.30	-5.31
Oil	0.00	17.57	-10.87
Vegetable oil & Fats	1.83	96.78	-44.33
Others	190.54	-42.02	25.76
Total	254.75	62.96	-54.44

Source: GTAP Model Estimations.

Now we turn to the bilateral exports of India and ASEAN members. Table 8 shows the bilateral exports of India and ASEAN for different commodity groups. It is hardly surprising that the GTAP model predicts a substantial increase in ASEAN's exports (645%) to India compared to India's exports (189%) to ASEAN, since the average tariff in India is much higher than that of ASEAN. The results also highlights that the highest increase in India's exports to ASEAN is observed in the manufacturing sector (23%) followed by food (14.4%) and leather (3.6%). The dominance of the manufacturing sector in India's exports to ASEAN members is mainly due to the cheap availability of intermediate inputs. However for ASEAN, the vegetable oil sector shows the highest increase in exports (100%) to India followed by oil (54%), forestry (12%) and metals (10%).

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Table 8: India ASEAN Bilateral Export Change (% Change)

Commodity Group	India's Export	ASEAN's Exports
Coal	0.02	4.21
Crops	2.03	8.05
Food	14.39	3.78
Forestry	0.04	11.66
Leather	3.58	0.85
Manufacture	23.07	4.41
Metals	3.41	10.13
Oil	0.00	53.93
Vegetable oil & Fats	1.28	99.92
Others	140.88	447.91
Total	188.71	644.85

Source: GTAP Model Estimations.

4.3 Impact on Employment and GDP

The employment effect of the partial liberalization of tariffs is reported in table 9. The GTAP results clearly indicate that the aggregate impact on employment is negligible. However, the employment effect varies significantly across sectors. Let us first consider the employment effect on India. The highest increase is observed in the manufacturing sector (12%), mainly because of the substantial rise in this sector's output due to the cheap availability of intermediate inputs. The results also show that the vegetable oil sector experiences the highest decrease in employment (15%) especially in unskilled labor in India. Five out of 10 sectors show a decrease in labor employment in India. In contrast, ASEAN members experience the highest increase in employment in the vegetable oil sector (56%) due to the huge increase in this sector's output. However, six out of 10 sectors suffer from a decrease in employment. In the ROW, the maximum decrease in employment is in the vegetable oil sector (9%). Impact of tariff liberalization on the GDP quantity index is reported in table 10. The GTAP results clearly reveal that for all regions the change in GDP is very small. India and ASEAN have a negligible gain in GDP. However, the ROW shows a small decrease in GDP during the post simulation period.

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Table 9: Employment Change (% Change)

Commodity Group	India	ASEAN	ROW
Coal	-0.40	0.15	0.37
Crops	-5.04	-0.71	1.39
Food	3.35	-3.21	-1.54
Forestry	-7.01	6.25	-0.38
Leather	2.03	-4.34	2.00
Manufacture	12.08	-5.31	-6.30
Metals	1.15	-0.06	-0.94
Oil	-0.92	1.74	-1.35
Vegetable oil & Fats	-15.32	56.15	-9.31
Others	10.08	-50.66	16.06
Total	0.00	0.00	0.00

Source: GTAP Model Estimations.

Table 10: Change in GDP Quantity Index (Value in Million US$)

Predicted GDP Quantity Index	India	ASEAN	ROW
Pre Simulation	424793.91	604800.31	30273290.00
Post Simulation	424801.56	604808.25	30273256.00
Change	39.40	7.94	-34.00

Source: GTAP Model Estimations.

5. CONCLUSIONS

Global exports and imports have increased significantly both for India and ASEAN. The GTAP model used in this paper predicts a substantial increase in ASEAN's exports (645%) to India. On the other hand India's export to ASEAN is expected to increase at a much slower rate (189%). The highest increase in India's exports to ASEAN is observed in the manufacturing sector followed by food and leather. However for ASEAN, the vegetable oil sector shows the highest increase in exports to India followed by oil, forestry and metals. This paper also identifies the sources of welfare gain due to the tariff liberalization till 2014. At the aggregate level the FTA will have a positive welfare impact on ASEAN and negative impact on India after incorporating all the changes in tariffs till 2014. India's loss in welfare is mainly due to deterioration in terms of trade. However, the FTA has positive impact in allocative efficiency through the reallocation of resources from inefficient sectors to efficient sectors. The vegetable oil sector has been identified as the major source of allocative efficiency gain due to the increase in India's imports from ASEAN members. In contrast, major source of ASEAN's welfare gain is the positive terms

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of trade effect. The analysis also highlights the fact that the import tax component represents the most important tax instrument for all the regions.

REFERENCES

Ahmed, S (2012): *A Sectoral and Gender Implications for India-ASEAN FTA: A CGE Analysis for India*, Centre for Development Studies.

Anderson, J.E. (1979): *A Theoretical Foundation for the Gravity Equation*, American Economic Review, 69, 106-16.

Bhattacharyya, R and A. Mandal (2014): *Estimating the Impact of India ASEAN Free Trade Agreement on Indian Industries*, South Asia Economic Journal, 15(1), 93-114.

Burniaux, J. and T. Truong (2002): *GTAP-E: An Energy-Environmental Version of the GTAP Model*, Center for Global Trade Analysis, Purdue University, GTAP Technical Paper No. 16.

Chandran, B. P.S. and Sudarsan, P. K. (2012): *India-ASEAN Free Trade Agreement Implications for Fisheries*, Economic and Political Weekly, 16, 65-70.

Dixit, A.K and V. Norman (1980): Theory of International Trade. Cambridge, Cambridge University Press.

Feenstra, R.C (2004), Advance International Trade: Theory and Evidence, Princeton University Press.

Ferrantino, M (1999): *Modelling the Effects of Trade Liberalization on Forest Cover: Some Methodological Issues* (online).

Francis, S. (2011): *A Sectoral Impact Analysis of the ASEAN-India Free Trade Agreement*, Economic and Political Weekly, 2, 46-55.

Francois, J. F. (1998): *Scale Economies and Imperfect Competition in the GTAP Model*, Centre for Global Trade Analysis, Purdue University, GTAP Technical Paper No. 14.

Grinols, E.L. and K. Wong (1991): *An Exact Measure of Welfare Change*, Canadian Journal of Economics, 24, 429-49.

Hertel, T.W. (1997): Global Trade Analysis Project: Modelling and Applications, Cambridge University Press.

Huff, K and T.W. Hertel (2001): *Decomposing Welfare Changes in GTAP*, Center for Global Trade Analysis, Purdue University, GTAP Technical Paper No. 5.

ISSN: 2455-8834

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Joseph, K.J. and Parayil, G. (2004): *India ASEAN Cooperation in Information and Communication Technologies: Issues and Prospects*, Research and Information System for Non-Aligned and Other Developing Countries (RIS), New Delhi, Discussion Paper No. 70.

Ju, J and K. Krishna (2000): *Evaluating Trade Reforms with many Consumers*, Canadian Journal of Economics, 33, 787-798.

Karmakar, S. (2005): *India ASEAN Cooperation in Services: An Overview,* Indian Council for Research on International Economic Relation, Working Paper No. 176.

Kemp, M. C and H. Y. Wan Jr. (1976): *An Elementary Proposition Concerning the Formation of Customs Union*, Journal of International Economics, 6, 95-97.

Krishna, P and A. Panagariya (2002): *On Necessarily Welfare Enhancing Free Trade Areas,* Journal of International Economics, 57, 353-367.

Lipsey, R.G and K. Lancaster (2000): *The General Theory of Second Best*, Review of Economic Studies, 24, 11-32.

McDougall (2001): *A New Regional Household Demand System for GTAP*, Center for Global Trade Analysis, Purdue University, GTAP Technical Paper no. 20.

McDougall, R. and Golub, A. (2007): *GTAP-E :A Revised Energy- Environmental Version of the GTAP Model*, Center for Global Trade Analysis, Purdue University, GTAP Research Memorandum No. 15.

Mukhopadhyay, K, Thomassin P. J. And Chakraborty, D (2008): *Impact of ASEAN+ 3 Trade Agreements on the South Asian Economy : An Analysis in GTAP framework*, Foreign trade Review Quarterly Journal of Indian Institute OF Foreign Trade, XLIII, 1, 3-26.

Nag, B and Sikdar, C (2011): *Welfare Implication of India-ASEAN FTA: An Analysis using GTAP Model*, Working Paper No. EC-11-06, Indian Institute of Foreign Trade, New Delhi.

Nagoor, B. H. and Kumar, C.N. (2010): *Assessing the Impact of the ASEAN-India FTA on the Tea Industry*, Economic and Political Weekly, 44,112-116.

Nishiguchi, K (2002): "Regional Economic Cooperation in East Asia after the Crisis", Center for Japanese Research, University of British Colombia, Vancouver.

Pal, P. and Dasgupta, M. (2008): *Does a Free Trade Agreement with ASEAN Make Sense?*, Economic and Political Weekly. 46, 8-12.

ISSN: 2455-8834

Volume:03, Issue:05 "May 2018"

Pal, P. and Dasgupta, M. (2009): *The ASEAN India Free Trade Agreement: An Assessment*, Economic and Political Weekly, 38, 11-15.

Strutt, A. and K. Anderson (1998): *Will Trade Liberalization Harm the Environment? The Case of Indonesia in 2010 to 2020*, Seminar Paper 98-04 (Center for Internaitonal Economics Studies, University of Adelaide, 1998).

Truong, T. (1999): *Incorporating Energy Substitution into the GTAP Model*, Center for Global Trade Analysis, Purdue University, GTAP Technical Paper No. 16.

Appendix A.1

Table A.1: Sectoral Aggregation in GTAP Database

GTAP Code	Commodity Descriptions
08	Crops
13	Forestry
15	Coal
16	Oil
21	Vegetable Oil and Fats
25	Food
29	Leather
36	Metals
42	Manufacture
Other (other 48 GTAP product codes)	Others include Paddy Rice (01); Wheat (02); Cereal Grains (03); Vegetables, Fruit & Nuts (04); Oil Seeds (05); Sugar Cane & Sugar Beet (06); Plant-Based Fibers (07); Bovine Cattle, Sheep and Goats, Horses (09); Animal Products (10); Raw Milk (11); Wool, Silk-Worm Cocoons (12); Fishing (14); Gas (17); Minerals (18); Bovine Meat Products (19); Meat Products (20), Dairy Products (22); Processed Rice (23); Sugar (24); Beverages and Tobacco Products (26); Textiles (27); Wearing Apparel (28); Wood Products (30); Paper Products, Publishing (31); Petroleum, Coal Products (32); Chemical, Rubber, Plastic Products (33); Mineral Products (34); Ferrous Metals (35); Metal Products (37); Motor Vehicles and Parts (38); Transport Equipment (39); Electronic Equipment (40); Machinery and Equipment (41), Electricity (43); Gas Manufacture, Distribution (44); Water (45); Construction (46); Trade (47); Transport (48); Water Transport (49);

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	Air Transport (50); Communication (51); Financial Services (52); Insurance (53); Business Services (54); Recreational and Other Services (55); Public Administration, Defence, Education, Health (56); and Dwellings (57).

Source: GTAP Database Version 6.
Note: The Figures in the Brackets are GTAP Product Codes.

Table A.2: Regional Aggregation in GTAP Database

Region Code	Region Description	Countries
ASEAN	Southeast Asia	Indonesia, Malaysia, Philippines, Singapore, Thailand, Vietnam and Rest of South East Asia
India	India	India
Rest of the World (ROW)	Rest of the World	Albania, Argentina, Australia, Austria, Bangladesh, Belgium, Botswana, Brazil, Bulgaria, Canada, Central America, Chile, China, Columbia, Croatia, Cyprus, Czech Republic, Denmark, Estonia, Finland, France, Germany, Greece, Hong Kong, Hungary, Ireland, Italy, Japan, Korea, Latvia, Lithuania, Luxembourg, Madagascar, Malawi, Malta, Mexico, Morocco, Mozambique, Netherlands, New Zealand, Peru, Poland, Portugal, Rest of Andean Pact, Rest of Caribbean, Rest of East Asia, Rest of EFTA, Rest of Europe, Rest of Former Soviet Union, Rest of Free Trade Areas of America, Rest of Middle East, Rest of North Africa, Rest of North America, Rest of Oceania, Rest of South African Customs Union, Rest of South America, Rest of South Asia, Rest of Southern African Development Community, Rest of Sub-Saharan Africa, Romania, Russian Federation, Slovakia, Slovenia, South Africa, Spain, Sri Lanka, Sweden, Switzerland, Taiwan, Tanzania, Tunisia, Turkey, Uganda, United Kingdom, United States of America, Uruguay, Venezuela, Zambia, Zimbabwe.

Source: GTAP Database Version 6.

