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Abstract

The present study attempts a quantitative assessment of the impact of recently signed ASEAN-India FTA (AIFTA) for selected plantation commodities (coffee, tea and pepper) in India. We use partial equilibrium modeling approach (SMART model and gravity model) to simulate the likely import increase of the plantation commodities under the proposed tariff reduction schedule of the AIFTA. Overall, the results suggest that the AIFTA will cause significant increase in India's import of plantation commodities. The increase in imports is mostly driven by trade creation rather than trade diversion. From the economic efficiency point of view, trade creation improves welfare as the new imports replace the high-cost domestic production. The analysis shows that the proposed tariff reduction may lead to significant tariff revenue loss to the government. However, the gain in consumer surplus (due to the fall in domestic price and the consequent reduction in dead-weight loss) outweighs the loss in tariff revenue leading to net welfare gain. By and large, the simulations based on the SMART and gravity models provide similar results on the magnitude of total increase in imports. The surge of new imports may have adverse impact for the livelihood of the Indian farmers engaged in the production of these commodities. Farmers will have to realign the structure of production according to the changing price signals and hence it is critical to provide adjustment assistance to the affected farmers.

Keywords:

SMART Model, Gravity Model, Simulation Analysis

JEL Code:

F10, F14, F17

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I. Introduction

The last two decades have witnessed a virtual explosion in the number of free trade agreements (FTAs), some of them involving several countries, many of them bilateral. The proliferation of FTAs has led to fierce debate about the merits of these agreements. While some herald the FTAs as stepping-stones towards worldwide free trade, others such as Bhagwati (1994), fear that preferential trading arrangements may lead to trade diversion and welfare loss. Recently, with the signing of the FTA with the 10 member states of the Association of South East Asian Nations (ASEAN), India too has belatedly joined the bandwagon. According to this agreement, about 80 percent of the traded goods will be subjected to tariff reduction or tariff elimination.

The present study focuses on the impact of the agreement in the selected plantation commodities (i.e., coffee, tea and pepper), which is part of what is called the "special products" in India's tariff reduction negotiations. India's present tariff rates in these commodities are quite high by international standards. The ASEAN-India FTA (henceforth AIFTA) envisages that the tariff rates in these commodities will be brought down in a phased manner during 2010-19. Since these commodities have been overly protected in India, tariff reduction may lead to a significant increase of India's imports from the ASEAN countries. The possible surge in imports may have adverse impact on the domestic prices in India with significant implications for the livelihood of the Indian farmers engaged in the production of these commodities.

Against this background, the present study attempts to quantify the extent of import increase in plantation commodities as result of India's tariff reduction commitments. Trade creation and trade diversion effects of the proposed tariff reduction schedules are simulated using an *ex ante* partial equilibrium model, called the SMART model, developed jointly by UNCTAD and World Bank. The SMART model also allows us to analyze the welfare and revenue effects associated with tariff reduction. The results of the SMART model, however, are sensitive to the underlying assumptions about the various elasticity parameters. Therefore, the SMART model simulations are complemented with simulations based on gravity model analysis. The advantage with the gravity model simulation is that it does not depend on any elasticity parameters. Tariff rates in the importing countries are used as one of the explanatory variables in the gravity model. The coefficient of the tariff variable in the estimated gravity model measures the responsiveness of imports to tariff changes. The estimated model is then used for analyzing the impact of different tariff reduction scenarios.

The remainder of this paper is organized as follows. Section I discusses the main features of the AIFTA as applicable to the selected commodities. Section II analyses the trends and patterns of India and ASEAN bilateral trade in these commodities. Section III deals with the SMART model simulations, where we quantify the extent of total import increase and decompose this into trade creation and trade diversion under different tariff reduction scenarios. This section also analyzes the revenue and welfare effects associated with tariff reduction. Section IV estimates the gravity model and then, using the estimated model, quantifies the extent of the increase in India's imports under different tariff reduction scenarios.

II. AIFTA's Tariff Reduction Schedules

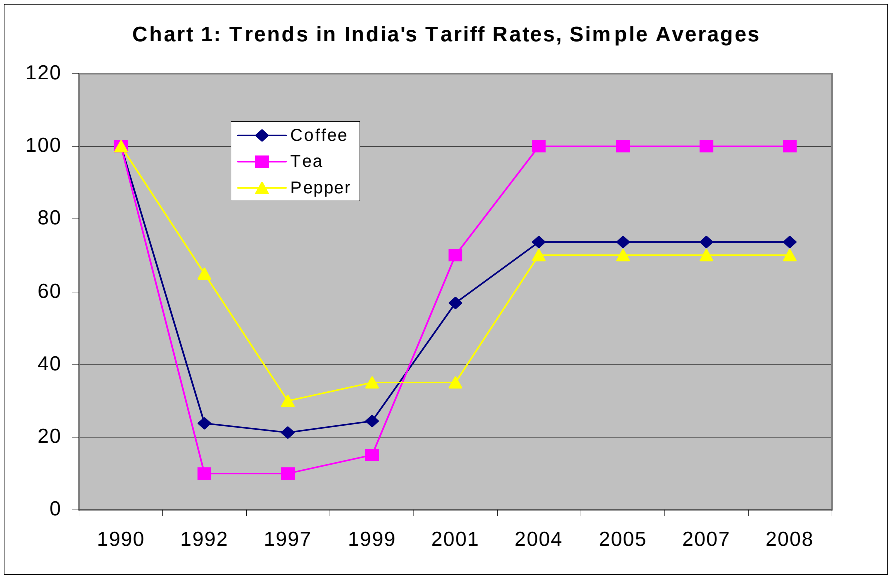
As per the agreement, the tariff lines (HS 8-digit items) subject to tariff reduction and/or elimination are categorized into four groups[1]. First, about 74% of India's tariff lines are under the 'normal track' category, where tariff rates will be reduced first and subsequently eliminated. Second, about 15% of the tariff lines are under the 'sensitive track', where tariff rates are to be reduced to 5% or less by a certain date. Third, a few tariff lines (about 40) are refereed to as India's 'special products', where India has decided to reduce tariff rates at a much more gradual pace than either the normal track or the sensitive track. The 'special products' include plantation commodities such as coffee, tea, pepper and palm oil. Finally, there is an 'exclusion list', where no tariff reduction commitments have been made[2]. The agreement provides for safeguard measures in the event of imports causing substantial injury to the domestic producers. The agreement also has quite strict provisions for rules of origin.

Chart 1 shows the changes in India's import tariff rates in the three plantation commodities during the period 1990-2008. It can be seen that the tariff rates in all the products were as high as 100% in 1990. As part of the trade liberalization process initiated in India since 1991, the tariff rates had

[1] More detailed analysis of the agreement can be seen in Pal and Dasgupta (2009). Joseph (2009) discusses the implications of the AIFTA with special reference to the plantation sector.
[2] About 10.6% of India's tariff lines are under the 'exclusion list', which include items such as oilseeds /oils, fish, fisheries, natural rubber, tapioca, jaggery, vanilla, cardamom, turmeric, coconut, copra, cashew kernel, areca nut, betel nut, banana, pineapple, guava, papaya and natural honey.

been brought down considerably during the 1990s. However, in a significant reversal of this trend, the tariff rates have been raised significantly during the early 2000s and remained high till 2008.

Table 1 shows the AIFTA's proposed tariff reduction schedule for the selected plantation commodities. The applied tariff rates for these products will be reduced in accordance with the tariff reduction schedule shown in the Table. It can be seen that, during the period from 2010 to December 2019, the tariff rates for these commodities will be brought down from the base rate at an average annual rate of 6.9% for Coffee and Tea and at 3.1% for Pepper. It may be noted that the extent of tariff reduction in these products are rather modest and even by 2019 tariff rates would remain quite high. However, since these products have been overly protected in India, even a modest tariff reduction can lead to significant increase of imports.



Source: TRAINS - WITS

Table 1: Tariff Reduction Schedule for the Selected Plantation Commodities

Commodities	Base Rate	Proposed Tariff Rates										
		2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	Dec 2019
Coffee	100	95	90	85	80	75	70	65	60	55	50	45
Tea	100	95	90	85	80	75	70	65	60	55	50	45
Pepper	70	68	66	64	62	60	58	56	54	52	51	50

Source: India-ASEAN Trade in Goods Agreement

III. India-ASEAN Trade in Plantation Commodities: General Trends and Patterns

The year wise variations in the quantities of India's exports and imports in each of the commodities during the post-trade liberalization period (1993-2008) are depicted in Chart A1 to A3 in Appendix A[3]. It can be seen that India's imports are generally are higher than exports in Coffee and Tea, while it is generally the reverse in the case of Pepper. India's coffee imports increased sharply in 2005 and then declined in 2006 and 2007. India's tea imports show significant fluctuation throughout the period 1995-2008 while exports showed some increase in 2006 and then declined in 2008. As far as Pepper is concerned, India's exports are generally higher than imports, and exports showed considerable increase in the later half of the 2000s.

In order to gauge, from the past data, the effect of tariff rates on import growth rate, we identify two distinct phases based on the tariff data shown in Chart 1: low tariff phase (1993-1999) and high tariff phase (2004-2008)[4]. Table 2 reports the average annual growth rates of India's exports and imports (in quantity terms) in the three commodities during the two phases. It may be noted that the pattern of import growth in the three commodities matches well with the observed changes in tariff rates. As expected, the imports of all the three commodities showed a very high growth rates during the low tariff phase while the growth rates have been negative during the high tariff phase. The growth rates of exports remain positive during the two phases, except in Tea where it was negative during the low tariff phase. Therefore, the analysis indicates that the reduction in tariff may cause significant increase in imports while its impact on exports is not clear.

Table 2: Average Annual Growth Rates of Exports and Imports, Quantities (KG)

Commodities	Export		Import	
	Low tariff phase:	High tariff phase:	Low tariff phase:	High tariff phase:
Coffee	31.1	17.2	63.9	-0.44
Tea	-12.6	25.4	136.6*	-26.4
Pepper	22.4	21.8	17.9	-11.0

Note: (*i*) * Import growth rate for Tea is calculated for the period 1995-99 due to non-availability of data for 1993 and 1994.
Source: COMTRADE-WITS

[3] The period starting from 1993 is considered since the full convertibility on current account was adopted in India in the year 1993.
[4] The tariff rates started showing an increasing trend in the year 2001, except for Pepper. However, tariff data are not available for 2002 and 2003. Therefore, based on the available information, we consider the sub period 2004-2008 as the high tariff phase. During this period, tariff rates remained high for all the commodities – that is, 100% for Tea and above 70% for Coffee and Pepper.

IV. Simulation Analysis

In what follows, we explain the features of the partial equilibrium models used to simulate the trade impact of the AIFTA in subsection IV.1. Subsections IV.2 and IV.3 discuss the simulation results based on the SMART and gravity models respectively.

IV.1 Partial Equilibrium Analytical Tools for Trade Policy Simulations

According to the theory of customs unions, whether or not the increase in trade caused by the FTA would be welfare improving depends on the source of the increased trade; that is the extent of trade creation relative to trade diversion (Viner, 1950). Trade creation occurs when the lowering of tariffs allows partner country imports to replace high-cost domestic production; this improves welfare. Trade diversion, on the other hand, occurs when the removal of tariffs causes trade to be diverted from a third country to the partner country despite the fact that, were the countries treated equally, the third country would be the low cost source of imports.

In order to simulate the trade creation and trade diversion effects of the proposed tariff reduction in the selected commodities, we use an *ex ante* partial equilibrium model (called the SMART model), measuring the first-round effects of the simulated tariff changes. Unlike the general equilibrium models, the partial equilibrium models do not take into account the second-round effects of trade policy changes. However, the general equilibrium models rely on extensive underlying assumptions and the results are generally very sensitive to these assumptions. Further, the general equilibrium models generally use highly aggregated sectoral classification. A major advantage of the partial equilibrium approach is that it is relatively simple to compute and can be applied at a very fine level of detail.

The SMART model, developed by UNCTAD and World Bank, is available in the World Bank's World Integrated Trade Solution (WITS)[5]. The WITS brings together the various databases on trade flows and trade policy instruments. It also integrates analytical tools that support simulation analysis. The SMART model is one of the analytical tools in the WITS used for simulation purposes. The SMART contains in-built analytical modules that support trade policy analysis, covering the effects of multilateral tariff cuts and preferential trade liberalization. It focuses on one importing market (in our case India) and its exporting partners (in our case ASEAN countries) and assesses the impact of a tariff change scenarios by estimating new values for a set of variables.

[5] The underlying theory and other details of the WITS/SMART model can be seen in Laird and Yeats (1986).

In addition to decomposing the total trade effect in to trade creation and trade diversion, the SMART model can be used to analyze welfare and revenue effects. The net welfare gain/loss estimated in the SMART model, depends on (*i*) the additional tariff revenue entailed by the increase in imports and (*ii*) the additional consumer surplus entailed by the increase in imports.

We have replaced the import demand elasticities used in the current version of the SMART model with the latest import demand elasticities calculated by the World Bank research team (Kee, Nicita, and Olarreaga, 2008). The elasticity values in the current version of the SMART model are primarily based on the calculations by Stern et al (1976), which is quite dated[6]. Similarly, the SMART model in its current version assumes infinite export supply elasticity (i.e. 99) - that is, the export supply curves are flat and the world prices of each variety are exogenously given. In other words, changing the level of demand in the considered market (India, in our case) does not affect world prices and exporters can supply any level of demand for the considered market. The World Bank Research Department provides estimates of finite export supply elasticity values at the 6-digit level HS classification[7]. The finite elasticity values imply relatively inelastic export supply. We report the results based on the assumption of both infinite and finite export supply elasticities.

The SMART model relies on Armington assumption – that is, similar products from different countries are imperfect substitutes. The representative agent maximizes her welfare through a two-stage optimization process: First, given a general price index, she chooses the level of total spending/consumption on a 'composite good'. The relationship between changes in the price index and the impact on total spending is determined by given import demand elasticities. Second, within this composite good, she allocates the chosen level of spending among the different 'varieties' of the good, depending on the relative price of each variety. The extent of the between-variety allocative response to change in the relative price is determined by the Armington substitution elasticity (1.5 in the SMART model).

As mentioned earlier, the results of the SMART model are very sensitive to the choice of the different elasticity values. Gravity model does not rely on any elasticity parameters and can be used to simulate *ex ante* the potential increase in imports under different tariff reduction scenarios. These models have been widely used to analyze the bilateral trade flows between country pairs and

[6] Kee, Nicita and Olarreaga (2008) report the import demand elasticity values at the 6-digit level of HS for each country. However, for a few number of 6-digit items, India specific elasticity values are not available. In such cases, we have used simple average of the values for developing countries. The next version of the SMART model is likely to use the updated elasticity parameters calculated by Kee, Nicita, and Olarreaga (2008).
[7] This can be downloaded at the following link: http://wits.worldbank.org/witsweb/download/data/Export-Supply-Elasticity_byHS6.xls

have been successful to a high degree in explaining trade flows[8]. We estimate augmented gravity models for each of the selected plantation commodities. In addition to the standard gravity variables, we also include the tariff rate in the importing countries as a separate independent variable. The coefficient of the tariff variable in the estimated gravity model measures the responsiveness of imports to tariff changes. The estimated model is then used for analyzing the impact of different tariff reduction scenarios.

IV. 2. Simulation Analysis using the SMART Model

We now turn to quantify the trade impact of the proposed tariff reduction scenarios in each of the plantation commodities. It is evident from the tariff reduction schedule shown in Table 1 that the tariff rate in Coffee and Tea will be reduced from the base rate of 100% to 70% by 2015 and further to 45% by December 2019. As far as Pepper is concerned, the tariff rate will be brought down from the base rate 70% to 58% by 2015 and to 50% by December 2019. Accordingly, two tariff reduction scenarios have been considered for each of the commodities, as follows:

> *Scenario 1*: base tariff rate to be reduced to the scheduled rate for the year 2015; tariff rates for Coffee and Tea will be brought down from 100% to 70% and that for Pepper will be brought down from 70% to 58%.
>
> *Scenario 2*: base tariff rate to be reduced to the scheduled rate for December 2019; tariff rates for Coffee and Tea will be brought down from 100% to 45% and that for Pepper will be brought down from 70% to 50%.

The simulation results for each of the commodities at the aggregate level under the above two scenarios are shown in Table 3 and 4. The simulation results in Table 3 are based on the assumption of infinite export supply elasticity while the results in Table 4 are obtained based on the assumption of finite export supply elasticity values. The table reports the commodity wise increase in total imports and its decomposition in to trade creation and trade diversion. It also reports the loss in tariff revenue and the overall welfare effects.

The results in both the tables reveal that trade creation dominate over trade diversion in all the three sectors and under both the scenarios. Under both the scenarios, trade creation is the highest in tea followed by coffee. Trade creation is the lowest for pepper, which is expected since the percentage reduction in tariff rates is the lowest for this commodity under both the scenarios.

[8] Comprehensive review of the theoretical foundations of the gravity model can be seen in Harrigon (2001) and Anderson and van Wincoop (2004).

Table 3: Aggregate Impacts in each Commodity under Different Tariff Reduction Scenarios, Simulation Results Based on the SMART Model (values in 000 US$)

Scenario 1							
Commodity	Base Year Import (2007)	Total Increase in Imports		Trade Creation	Trade Diversion	Loss in Tariff Revenue	Total Welfare
		Value	%	%	%	Value	Value
Coffee	19446	4109	21.1	15.9	5.2	-4007	2424
Pepper	16505	2483	15.0	9.6	5.4	-1165	1060
Tea	10312	3801	36.9	23.2	13.7	-1841	2207
Total	46263	10394	22.5	15.3	7.2	-7012	5691
Scenario 2							
Coffee	19446	7725	39.7	29.2	10.5	-9180	3840
Pepper	16505	4200	25.4	16.1	9.4	-2284	1698
Tea	10312	7065	68.5	42.5	26.0	-5170	3671
Total	46263	18990	41.0	27.5	13.6	-16634	9209

Table 4 Aggregate Impacts in each Commodity under Different Tariff Reduction Scenarios, Simulation Results Based on the SMART Model (values in 000 US$)

Scenario 1								
Commodity	Base Year Import 2007)	Total Increase in Imports		Trade Creation	Trade Diversion	Price Effect	Loss in Tariff Revenue	Total Welfare
		Value	%	%	%	%	Value	Value
Coffee	19446	3817	19.6	10.8	3.8	5.1	-4039	2378
Pepper	16505	2242	13.6	6.4	3.5	3.7	-1237	964
Tea	10312	3603	34.9	20.0	11.7	3.2	-1903	2096
Total	46263	9663	20.9	11.3	5.4	4.1	-7179	5437
Scenario 2								
Coffee	19446	7133	36.7	19.8	7.4	9.4	-9174	3770
Pepper	16505	3772	22.9	10.7	6.0	6.2	-2368	1545
Tea	10312	6683	64.8	36.7	22.2	5.9	-5183	3492
Total	46263	17588	38.0	20.3	10.2	7.5	-16725	8807

Overall, the results suggest that the total increase in imports is mostly driven by trade creation. It is evident that, at least in the context of plantation commodities, the AIFTA does not lead to significant trade diversion. As discussed earlier, trade creation improves welfare as the new imports replace high-cost domestic production.

The analysis shows that the proposed tariff reduction may lead to significant tariff revenue loss to the government under both the scenarios. Revenue loss is the highest in coffee followed by tea, which is expected since the proposed tariff reduction for these commodities is higher than that for pepper. However, the gain in consumer surplus (due to the fall in domestic price) outweighs the loss in tariff revenue leading to net welfare gain. The net welfare gain is the highest in coffee followed by tea.

The assumption of infinite export supply elasticity implies that trade does not affect domestic prices and hence the results in Table 3 do not include price effects (which is zero). The assumption of finite export supply elasticity, however, implies that tariff change will generate price effects (positive or negative). Therefore, the results in Table 4, which assume finite export supply elasticity, show the price effect. It can be seen that the price effects in Table 4 are positive, which implies a terms of trade gain for India. The mechanisms that lead to India's terms of trade gain can be explained as follows.

There will be a downward pressure on prices in India due to her higher imports (or excess supply) and there will be an upwards pressure in the ASEAN due to higher exports (or excess demand). If the downward pressure on price (in India) is higher than the upward pressure (in ASEAN), there will be a net fall in the prevailing price in ASEAN post tariff reduction[9]. India, being an importing country, derives a terms of trade gain (loss) if the ASEAN price falls (increases) in the post tariff reduction equilibrium. It may be noted that India derives a terms of trade gain in all the commodities, the largest gain being in Coffee.

The values at the aggregate commodity level as reported in Table 3 may mask important heterogeneities at the disaggregated level of the commodity classification. It may be of interest to understand how the total trade creation in each commodity is distributed across the individual tariff lines (i.e., at the HS 6 digit level). Therefore, Table 5 reports trade creation at the 6-digit level in each commodity. It can be seen that, in each commodity, trade creation (and base year import) is highly concentrated in the sense that just one 6-digit item (which is mostly unprocessed) accounts for more than 95% of the total trade creation (and the total base year import) in that commodity.

We now turn to examine how the total trade creation in each commodity is distributed across the ASEAN trading partners (Table 6). In the case of tea and pepper, Vietnam accounts for the largest

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[9] The Indian price (p_i) is related to the ASEAN price (p_a) as follows: $p_i = (1+t)\, p^a$, where t is the tariff rate. Therefore, $p^a = p^i / (1+ t)$.

share of trade creation while Indonesia accounts for the largest share in coffee. The contributions of Malaysia, Singapore and Thailand are not significant.

While we have noted that trade creation generally dominates over trade diversion, it is of interest to identify the countries from which trade is being diverted to the ASEAN. In the present context, trade diversion is said to occur when the removal of tariffs causes trade to be diverted from a non-ASEAN country to one or more of the ASEAN country. Table 7 provides a list of the top 10 non-ASEAN countries whose trade is being diverted to the ASEAN due to the AIFTA. It can be seen that, as expected, the list contains a large number of least developed or developing countries. The most affected countries in coffee, tea and pepper are respectively Uganda, Kenya, and Sri Lanka.

Table 5: Trade Creation in each Commodity at the Disaggregated Level (HS 6 digit) (values in 000 US$)

		Scenario 1	*Scenario 2*
Commodity (HS)	Base Year Import (2007)	Trade Creation	Trade Creation
	Value	Value	Value
<u>Coffee</u>	**19446**	**2105**	**3860**
Coffee, not roasted or decaffeinated (090111)	18578 (95.5)	1989 (94.5)	3646 (95.4)
Coffee other (090190)	3 (0.0)	0 (0.0)	0 (0.0)
Extracts, essences & concentrates of coffee (210111)	808 (4.2)	109 (5.2)	199 (5.2)
Preparations with a basis of extracts, essences & concentrates of coffee (210112)	57 (0.3)	8 (0.4)	14 (0.4)
<u>Tea</u>	**10312**	**2063**	**3782**
Green tea, nes (090220)	53 (0.5)	16 (0.8)	30 (0.8)
Black tea (fermented) and partly fermented (090240)	10259 (99.5)	2047 (99.2)	3752 (99.2)
<u>Pepper</u>	**16505**	**1055**	**1759**
Dried pepper (excl. crushed or ground) (090411)	16491 (99.9)	1054 (99.8)	1756 (99.8)
Fruits of genus Capiscum or Pimenta, dried, crushed (090420)	14 (0.1)	1 (0.2)	3 (0.2)
Total	**46263**	**5223**	**9400**

Note: (*i*) figures in parentheses are percentage shares of each commodity total; (*ii*) finite export supply elasticity values are assumed.

Table 6: Trade Creation in each Commodity with each ASEAN Partner (values in 000 US$)

		Scenario 1	*Scenario 2*
Commodity	Base Year Import (2007)	Trade Creation	Trade Creation
	Value	Value	Value
Coffee	**19446**	**2105**	**3860**
Indonesia	11261 (57.9)	**1205** (57.3)	2210 (57.3)
Malaysia	856 (4.4)	**115** (5.5)	211 (5.5)
Singapore	8 (0.0)	1 (0.0)	2 (0.0)
Thailand	4 (0.0)	1 (0.0)	1 (0.0)
Vietnam	7317 (37.9)	**783** (37.2)	1436 (37.2)
Tea	**10312**	**2063**	**3782**
Indonesia	3014 (29.2)	607 (29.4)	1113 (29.4)
Malaysia	97 (0.9)	19 (0.9)	36 (0.9)
Singapore	0 (0.0)	0 (0.0)	0 (0.0)
Thailand	0 (0.0)	0 (0.0)	0 (0.0)
Vietnam	7201 (69.8)	1436 (69.6)	2633 (69.6)
Pepper	**16491**	**1055**	**1759**
Indonesia	6197 (37.6)	396 (37.5)	660 (37.5)
Malaysia	196 (1.2)	13 (1.2)	21 (1.2)
Singapore	52 (0.3)	3 (0.3)	6 (0.3)
Thailand	9 (0.1)	1 (0.1)	2 (0.1)
Vietnam	10051 (60.9)	642 (60.9)	1070 (60.9)
Total	**46263**	**5223**	**9400**

Note: (*i*) figures in parentheses are percentage shares of each commodity total; (*ii*) finite export supply elasticity values are assumed.

Table 7: List of Top 10 Non-ASEAN Countries whose trade is being diverted to the ASEAN Countries (values in 000US$), Scenario 2

S. No.	Coffee		Tea		Pepper	
	Country	Value	Country	Value	Country	Value
1	Uganda	-1105.8	Kenya	-1021.1	Sri Lanka	-1276.8
2	Rwanda	-301.1	Nepal	-593.6	Brazil	-52.9
3	Italy	-255.9	China	-235.7	Ecuador	-18.2
4	Tanzania	-73.3	Argentina	-230.5	China	-10.3
5	Kenya	-59.1	Papua New Guinea	-109.3	Madagascar	-2.6
6	China	-49.7	Sri Lanka	-91.2	Germany	-0.3
7	United States	-32.8	United Kingdom	-69.4	Peru	-0.2
8	Canada	-22.3	Malawi	-68.2	Spain	-0.1
9	Colombia	-17.8	Iran, Islamic Rep.	-49.2	Pakistan	-0.1
10	Brazil	-5.3	Brazil	-16.9	Korea, Rep.	-0.1

Note: (*i*) finite export supply elasticity values are assumed.

IV. 3. Gravity Model Analysis

As mentioned earlier, SMART simulation results are very sensitive to the choice of the elasticity parameters. An alternative approach, which does not rely on any elasticity parameters, is the gravity model. For each of the three commodities, we estimate gravity models using bilateral trade data for a large number of countries. Tariff rates in the importing countries are used as one of the explanatory variables. The coefficient of the tariff variable in the estimated gravity model measures the responsiveness of imports to tariff changes. The estimated model is then used to simulate the likely increase in imports under the different tariff reduction scenarios.

The main idea of the gravity model is borrowed from the Newtonian model of gravitational forces – that is, the force of attraction between two bodies is proportional to the product of their masses and inversely proportional to the square of the distance between them. The simplest gravity model predicts that the trade between two countries will be proportional to the product of their gross domestic products and inversely proportional to the physical distance between them. This basic model can be augmented using other variables that can facilitate or hinder bilateral trade flows. The reduced form of the augmented gravity model is specified as follows:

$$\ln X_{ij} = \alpha + \beta_1 \ln GDP_i + \beta_2 \ln GDP_j + \beta_3 \ln POP_i + \beta_4 \ln POP_j + \beta_5 \ln DIST_{ij} + \beta_6 BORD_{ij} + \beta_7 LANG_{ij} + \beta_7 COL_{ij} + \beta_8 SMCTY_{ij} + \beta_9 \ln TAR_j + \varepsilon_{ij}$$

where

ln	is natural logarithmic transformation
X_{ij}	is the value of exports from country i to country j in year t.
GDP_i	is the GDP (PPP, constant 2005 international $) of the exporting country in year t
GDP_j	is the GDP (PPP, constant 2005 international $) of the exporting country in year t
POP_i	is the population of the exporting country in year t
POP_j	is the population of the importing country in year t
$DIST_{ij}$	is the great circle distance between the capital cities of country *i* and country *j*
$BORD_{ij}$	is a dummy that takes a value of 1 if country *i* and country *j* share a common border; 0 otherwise
$LANG_{ij}$	is a dummy that takes a value of 1 if country *i* and country *j* share a common official language; 0 otherwise
COL_{ij}	is a dummy that takes a value of 1 if country *i* and country *j* have ever had a colonial link; 0 otherwise
$SMCTY_{ij}$	is a dummy that takes a value of 1 if country *i* and country *j* were the same country; 0 otherwise
TAR_j	is the average (simple /weighted) tariff rate in the country *j* (i.e., the importing country)

For the year 2007, COMTRADE-WITS provides data on export flows (current US $) of a large number of reporting countries to about 225 partner counties[10]. Import tariff data in 2007 for the three plantation commodities, however, are available only for 120 of the partner countries. We have included 29 more partner countries for which import tariff data are available for one of the previous two years (i.e., 2006 or 2005)[11]. Our final database, used for the regression analysis, contains more than 13 thousand observations for each commodity. Appendix B provides the sources of the various data used in the gravity model analysis.

Exports from some or all countries to some of the partners may be zero. We include the zero values since taking only the non-zero values may lead to sample selection bias problem. Since the logarithm of zero is not defined, the usual procedure is to use ln ($X_{ij} + 1$) as the dependent variable (Eichengreen and Irvin, 1995; Rojid, 2006). We follow the same procedure. The dependent variable, however, is left truncated at the value of zero ($ln\ 1 = 0$), which can lead to a non-zero mean of the disturbance and to biasedness and inconsistency of the least square estimators. Therefore, we use a Tobit model, which addresses the estimation problems arising from the truncation of the dependent variable.

The Tobit regression results are shown in Table 8. For each commodity, we have estimated two regression equations; one using simple average tariff rate and another using weighted average. It is evident that the coefficients of all the explanatory variables show correct signs and are statistically significant at 1 percent level. As expected, both the tariff variables yield negative signs with statistical significance for all the commodities. The point estimates suggest that the elasticity of import with respect to tariff is the highest for coffee (in the range of –0.45 to –0.60), followed by pepper (in the range of –0.25 to-0.33) and tea (in the range of –0.24 to –0.26). Taking the midpoint of the elasticity range for Coffee, the results imply that a 10% reduction in import tariff (TAR_j) increases import by about 5.3 percentage points, which is quite large.

Size of the exporting and importing countries are measured by their GDP. More specifically, GDP_i will capture the effect of the level of supply in the exporting country while GDP_j will capture the effect of the level of demand in the importing country. As expected both GDP_i and GDP_j show a statistically significant positive coefficient, which implies that higher output levels (GDP) in both the exporting and importing countries stimulate higher volume of trade. The results show that

[10] To be precise, the number of reporting countries and partner countries are respectively the following: 143 and 224 for coffee; 136 and 226 for Tea; and 133 and 216 for Pepper.
[11] For 24 of these countries, tariff data are available for the year 2006; for the remaining 5 countries data for the year 2005 is used. Using previous year's tariff data is not a problem as, by and large, tariff rates do not vary in such short time span.

higher population size of the exporting country (*POP_i*) causes higher volume of exports due to their higher supply. In contrast, higher population size of the importing country (*POP_j*) causes lower volume of imports.

That the volume of bilateral trade falls with geographical distance is a well documented fact (e.g., Leamer and Levinsohn, 1995). The volumes of bilateral trade between geographically closer countries tend to be higher due to the lower transport and search costs and other advantages arising from greater geographical proximity. Indeed, the variable *$DIST_{ij}$* yield a large statistically significant negative coefficient, indicating that the countries that are geographically closer trade more.

Table 8: Tobit Estimation Results of the Gravity Model, 2007

Explanatory Variables	**Coffee**		**Tea**		**Pepper**	
	(1)	(2)	(1)	(2)	(1)	(2)
GDP_i	1.308 (0.058)	1.320 (0.058)	1.090 (0.057)	1.091 (0.057)	1.146 (0.060)	1.146 (0.060)
GDP_j	2.270 (0.071)	2.034 (0.083)	1.462 (0.069)	1.463 (0.071)	1.671 (0.073)	1.715 (0.072)
POP_i	0.636 (0.064)	0.620 (0.064)	0.766 (0.063)	0.765 (0.063)	0.570 (0.064)	0.571 (0.064)
POP_j	-1.062 (0.074)	-0.842 (0.085)	-0.423 (0.075)	-0.424 (0.078)	-0.566 (0.076)	-0.608 (0.076)
$DIST_{ij}$	-2.310 (0.084)	-2.226 (0.084)	-2.001 (0.082)	-1.996 (0.082)	-1.891 (0.082)	-1.890 (0.082)
$BORD_{ij}$	1.663 (0.377)	1.742 (0.376)	1.550 (0.330)	1.562 (0.330)	1.384 (0.331)	1.392 (0.331)
$LANG_{ij}$	2.265 (0.190)	2.362 (0.190)	2.575 (0.177)	2.594 (0.177)	2.417 (0.181)	2.410 (0.181)
COL_{ij}	2.608 (0.387)	2.454 (0.386)	2.204 (0.343)	2.191 (0.343)	1.425 (0.345)	1.417 (0.345)
$SMCTY_{ij}$	2.465 (0.522)	2.500 (0.521)	1.878 (0.460)	1.878 (0.460)	1.796 (0.463)	1.807 (0.463)
***TAR_j* (*Simple Average*)**	**-0.454 (0.079)**		**-0.258 (0.059)**		**-0.325 (0.072)**	
***TAR_j* (*Weighted Average*)**		**-0.596 (0.078)**		**-0.235 (0.059)**		**-0.247 (0.068)**
Constant	-68.235 (1.730)	-66.551 (1.739)	-59.085 (1.629)	-59.205 (1.630)	-61.178 (1.755)	-61.799 (1.749)
Number of observation	19436	19436	18792	18792	18125	18125
Log likelihood	-14772.881	-14759.705	-10189.620	-10191.275	-9003.521	-9007.162
LR chi2(10)	6583.860	6610.210	5204.620	5201.310	4891.560	4884.280
Prob > chi2	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000

Note: (*i*) values in parenthesis represent standard error; (*ii*) all coefficients are significant at 1 percent level

Countries that share a common border are likely to trade more again due to lower transport and search costs and other advantages arising from greater geographical proximity. As expected the border dummy (*$BORD_{ij}$*) show a significant positive coefficient. Similarily, common cultural and political history can stimulate bilateral trade (Eichengreen and Irwin 1996; Fidrmuc and Fidrmuc 2003). Thus we include the dummies to capture common language (*$LANG_{ij}$*), colonial history (*COL_{ij}*) and political history (*$SMCTY_{ij}$*). As expected, the coefficients of all these variables are positive and statistically significant.

Using the estimated regression equations in Table 8, we now proceed to simulate the extent of import increase due to tariff reduction under the two scenarios considered earlier. The results of the simulation exercise are reported in Table 9. For simulation, we use the results of the equations that include simple average tariff rather than weighted average tariff. Comparison of the results in Table 9 with those in Table 4 (which shows the SMART model results) suggests broadly similar pattern on the likely increase in total imports under both the scenarios. Under *scenario 1*, the SMART model results in Table 4 show that the total import value of the three commodities will increase by 11%, which is very similar to the results in the gravity model (i.e., 12%). The SMART and gravity models provide similar results with respect to the total import increase under scenario 2 as well; this is respectively 20% and 27% in the two models. The SMART model results in Table 3 (which is based on the assumption of infinite export supply elasticity) also are not significantly different from the gravity model results.

While the SMART and gravity models provide very similar results at the aggregate level, at the individual commodity level, however, the two models indicate some differences on the relative magnitude of import increases across commodities. The gravity model suggests that under both the scenarios the percentage increase in import is the highest in coffee (17% and 43% respectively under *scenario 1* and *2*) followed by tea (10% and 22% respectively) while the SMART model indicates the reverse. Both SMART and gravity model confirm that the percentage increase of imports will be the lowest in pepper.

Finally, Table 10 shows the partner-wise distribution of import value increase in each commodity under the two scenarios. Overall, the pattern remains the same as discussed earlier with reference to the SMART simulation results.

Table 9: Import Increase in each Commodity under Scenario 1 & 2, Simulation Results based on the Gravity Model (values in 000 US$)

Commodity	Base Year Import (2007)	Import Increase under Scenario 1		Import Increase under Scenario 2	
		Value	%	Value	%
Coffee	19446	3377	17	8352	43
Tea	10312	981	10	2318	22
Pepper	16505	1023	6	1873	11
Total	46263	5381	12	12543	27

Table 10: Partner-wise Import Increase in each Commodity under Scenario 1 & 2, Simulation Results based on the Gravity Model (values in 000 US$)

		Scenario 1	*Scenario 2*
Commodity	Base Year Import (2007)	Import Increase	Import Increase
	Value	Value	Value
Coffee	**19446**	**3377**	**8352**
Indonesia	11261	1956	4837
Malaysia	856	149	368
Singapore	8	1	3
Thailand	4	1	2
Vietnam	7317	1271	3143
Tea	**10312**	**981**	**2318**
Indonesia	3014	287	678
Malaysia	97	9	22
Singapore	0	0	0
Thailand	0	0	0
Vietnam	7201	685	1619
Pepper	**16491**	**1023**	**1873**
Indonesia	6197	384	703
Malaysia	196	12	22
Singapore	52	3	6
Thailand	9	1	1
Vietnam	10051	623	1141
Total	**46263**	**5381**	**12543**

V. Conclusion

The present study attempts a quantitative assessment of the impact of recently signed ASEAN-India FTA (AIFTA) for selected plantation commodities (coffee, tea and pepper) in India. The study uses partial equilibrium modeling approach (SMART and gravity models) to simulate the likely import increase of the plantation commodities into India under the proposed tariff reduction schedules of the AIFTA. The SMART model allows the estimation of trade creation and trade diversion effects associated with tariff reduction at highly disaggregated level of commodity classification. The SMART model simulation results, however, are sensitive to the choice of the various elasticity parameters. The advantage with gravity model is that it does not rely on any elasticity values.

As per the AIFTA tariff reduction schedule, the tariff rate in coffee and tea will be reduced from the base rate of 100% to 70% by 2015 and further to 45% by December 2019. In the case of pepper, the tariff rate will be brought down from the base rate of 70% to 58% by 2015 and to 50% by December 2019. Accordingly, two tariff reduction scenarios have been considered for simulation: *Scenario 1* where the base rate will be reduced to the proposed rate in 2015; and *Scenario 2* where the base rate will be reduced to the proposed rate in December 2019.

Overall, the results suggest that the AIFTA will cause significant increase of plantation commodities into India. The increase in imports is mostly driven by trade creation rather than trade diversion. From the point of view of economic efficiency, trade creation improves welfare as the new imports replace the high-cost domestic production. The analysis shows that the proposed tariff reduction may lead to significant tariff revenue loss to the government. However, the gain in consumer surplus (due to the fall in domestic price and the consequent reduction in dead-weight loss) outweighs the loss in tariff revenue leading to net welfare gain.

We have estimated augmented gravity model for each of the commodities using the bilateral trade data for a large number of countries. The coefficients of all the gravity variables showed correct signs and were statistically significant. As expected, tariff rate shows negative coefficient with statistical significance for all the commodities. The results imply that a 10% reduction in tariff would cause an increase in imports, in term of percentage point, by about 5.3% for coffee, 2.5% for tea and 2.9% for pepper. The estimated gravity model is used to simulate the likely increase in imports under the two different tariff reduction scenarios. By and large, the simulation results based on the gravity model are consistent with those obtained from the SMART model.

Even though, the AIFTA envisages rather modest reduction of India's import tariff in the plantation commodities, our analysis shows that even such a small reduction in tariff will lead to significant import increases into India. While the AIFTA is welfare improving for the consumers of plantation commodities in India, the surge of new imports may have adverse impact for the livelihood of the farmers engaged in the production of these commodities. Farmers will have to realign the structure of production according to the changing price signals and hence it is critical to provide adjustment assistance to the affected farmers.

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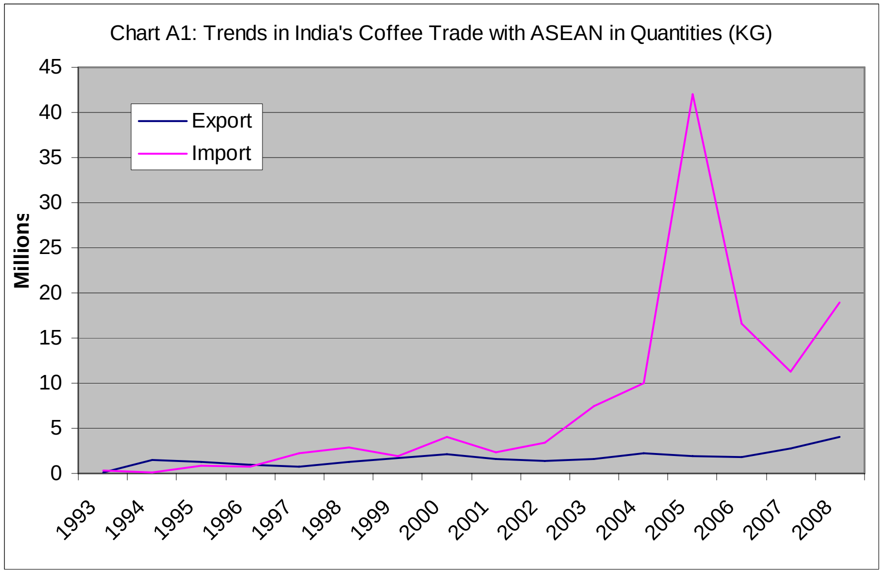
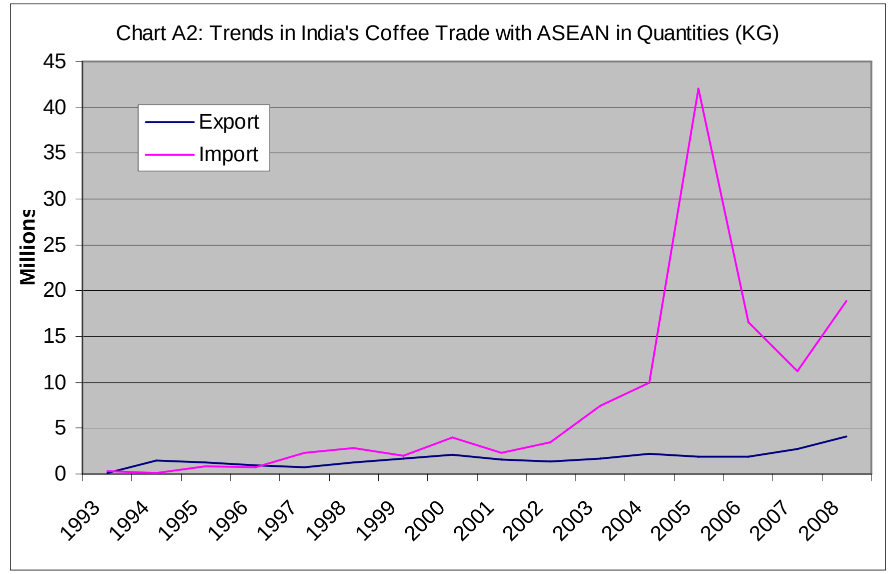
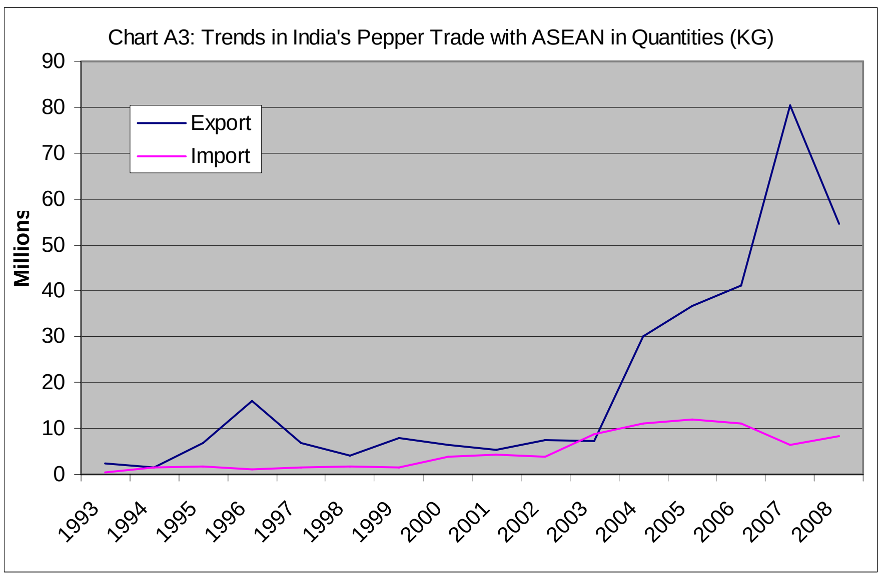
Appendix-A







Source: plotted using COMTRADE-WITS data

Appendix- B

Data Sources

	Data source
X_{ij}	UN COMTRADE – WITS
$GDP_{i;}$; GDP_j ; POP_i ; POP_j	World Development Indicators, World Bank
$DIST_{ij}$; $BORD_{ij}$; $LANG_{ij}$; COL_{ij}; $SMCTY_{ij}$	CEPII (http://www.cepii.fr/anglaisgraph/bdd/distances.htm)
TAR_j	UN COMTRADE - TRAINS