Impact of ASEAN-India Preferential Trade Agreement on Plantation Commodities: A Simulation Analysis

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This study analyses the impact of the ASEAN-India Preferential Trade Agreement on plantation commodities – coffee, tea and pepper – using the SMART and gravity models. This reveals that the agreement may cause a significant increase in India's imports of plantation commodities from the ASEAN countries, which is mostly driven by trade creation rather than trade diversion. The proposed tariff reduction may lead to some loss of tariff revenue to the government. However, the gains in consumer surplus outweigh the loss in tariff revenue resulting in a net welfare gain. Simulations based on both the models yield broadly similar results regarding the magnitude of total increase in imports. During the years to come, the plantation sector will have to realign the production structure according to the changing price signals. It is thus important to devise appropriate adjustment assistance schemes for plantation workers who might face displacement.

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1 Introduction

The last two decades have witnessed a virtual explosion in the number of preferential trade agreements (PTAs), many of them bilateral in nature while some of them involved several countries. Preferential, as opposed to non-discriminatory, trade liberalisation entails both costs and benefits for the countries concerned. The PTAs, according to some economists, are stepping-stones towards worldwide free trade (for example, Baldwin 1997). Many others, however, fear that the welfare loss due to trade diversion might outweigh any benefits (for example, Bhagwati 1994). Trade diversion occurs when countries within the bloc trade more with one another at the cost of the lower cost countries outside the bloc. At the same time, lower tariff rates within the bloc can generate new trade (trade creation), which is welfare enhancing since imports replace the high cost domestic production. Thus, whether the PTA increases or decreases the net welfare depends on the relative strengths of trade creation and trade diversion and requires empirical analysis to determine the outcome.[1]

Recently, India has signed a PTA with the 10 member states of the Association of South East Asian Nations (ASEAN). According to this agreement, about 80% of the traded goods will be subjected to tariff reduction or tariff elimination.[2] The present study analyses the impact of the agreement on selected plantation commodities, coffee, tea and pepper.[3] Due to their sensitivity for Indian agriculture, these commodities have been treated separately within India's tariff reduction commitments and have been referred to as "special products". India's present tariff rates in these commodities are quite high by international standards and the agreement envisages that the rates be brought down in a phased manner during 2010-19. The tariff reduction may cause a significant increase in India's imports from the ASEAN countries (mainly from Vietnam and Indonesia) that have productivity advantages over India in some of the commodities.

The surge in imports may lead to some contraction in production, and the inevitable restructuring would cause displacement and adjustment difficulties for planters, farmers and the plantation workers in India. Therefore, voices of dissent have been raised against the agreement from states such as Kerala that have a significant presence of plantation agriculture (Harilal 2010).[4] However, the union minister for commerce and industry, who had signed the agreement, pointed out that India's plantation sector is fully protected and that the apprehensions expressed in this regard are unwarranted.[5]

The arguments for and against notwithstanding, there have not been any systematic attempts to quantify the magnitude of the potential impact. Appropriate schemes may have to be devised if the impact is regarded as high enough to cause significant adjustment difficulties. The present study attempts to quantify the likely increase in India's imports of plantation commodities as result of the ASEAN-India Preferential Trade Agreement (AIPTA).

Trade creation and trade diversion effects are analysed using the Single Market Partial Equilibrium Modeling Tool (SMART) model, which is an ex ante partial equilibrium approach developed jointly by the United Nations Conference on Trade and Development (UNCTAD) and World Bank. The SMART model also allows us to analyse the welfare and revenue effects associated with tariff reduction. The results of the SMART model, however, can be sensitive to the assumptions pertaining to the various behavioural parameters (elasticities). The gravity model is an alternative approach, without requiring any elasticity parameters, to estimate the potential increase in imports. We estimate separate gravity equations for each of the three commodities where the tariff rate in the importing country is included as one of the regressors. The estimated coefficient of the tariff variable, which measures the responsiveness of imports to tariff changes in the given commodity, can be used to quantify the potential import increase under different tariff reduction scenarios.

The remainder of this paper is organised as follows. Section 2 discusses the tariff reduction commitments under the AIPTA as applicable to the selected plantation commodities. Section 3 is concerned with a comparative analysis of the general trends and patterns of production and trade in plantation commodities in India and the ASEAN countries. Section 4.2 deals with the SMART model simulations, under different tariff reduction scenarios, where we quantify the extent of total import increase and decompose this into trade creation and trade diversion. This section also analyses the revenue and welfare effects associated with tariff reduction. Section 4.3 estimates the gravity model and then, using the estimated model, quantifies the likely increase in India's imports under different scenarios. Finally, Section 5 provides some concluding remarks.

2 Tariff Reduction Commitments

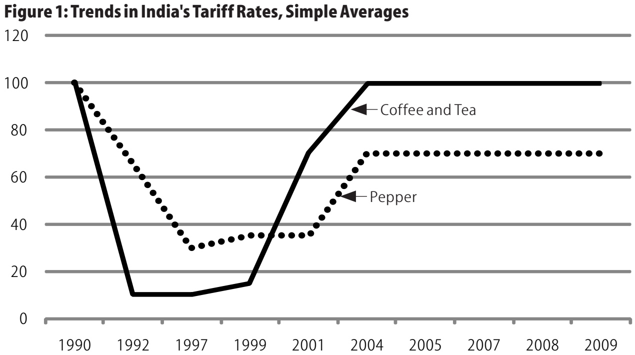
The tariff lines subject to tariff reduction or elimination, under the AIPTA, are categorised into four groups.[6] First, about 74% of India's tariff lines are under the "normal track" category, where tariff rates would be reduced first and subsequently eliminated. Second, about 15% of the tariff lines are under the "sensitive track", where tariff rates are to be reduced to 5% or less by a certain date. Third, a few number of tariff lines (about 40) have been treated separately, and referred to as "special products", where India has decided to reduce the tariff rates at a much more gradual pace than either the normal track or the sensitive track. The category of "special products" includes plantation commodities such as coffee, tea, and pepper. Finally, there is an "exclusion list" (EL), where no tariff reduction commitments have been made.[7]

It may be noted that some of the tariff lines within coffee, tea and pepper are under the EL. However, from the point of view of India, those tariff lines where the tariff reduction commitments apply are the most significant ones. Table 1 (p 85) lists the 6-digit Harmonised System (HS) codes, within each of the three commodities, where the tariff reduction commitments are applicable. In the case of coffee, all the tariff lines under the HS code 090111 ("coffee, not roasted or decaffeinated") will be subjected to tariff reduction. It must be noted that this HS code accounts for almost 100% of India's total imports as well as exports of coffee. The particular 6-digit code subjected to tariff reduction within tea is HS 090240 ("black tea fermented and partly fermented"), which accounts for over three-fourths of India's total imports (and exports) of tea. As far as pepper is concerned, India's tariff reduction commitment is applicable for HS 090411 ("dried pepper excluding crushed or ground"); this item contributes to 100% of India's imports and over three-fourths of India's exports.

Considering the commodity coverage of the tariff reduction commitments, the empirical analysis in this paper makes use of the trade and tariff data pertaining to only the above three HS codes rather than the aggregate groups. For convenience, however, we continue to use the broad terms, coffee, tea and pepper, but they represent the above three 6-digit HS codes, respectively.

In order to view the extent of India's tariff reduction commitments in a proper perspective, it may be useful first to have some understanding of India's trade policies in plantation commodities in retrospective. Figure 1 shows the changes in India's import tariff rates in the three commodities during the period 1990-2008. It can be seen that, in all the commodities, the tariff rates were as high as 100% in 1990, which were brought down considerably over the subsequent years of the 1990s. However, imports of the plantation commodities were subjected to quantitative restrictions (QRs) throughout the 1990s (Mehta 2000; Goldar 2005). While QRs were lifted in 2000 and 2001 (due to India's World Trade Organisation (WTO) commitments), tariff rates were raised significantly during the early 2000s and remained high thereafter.

Figure 1: Trends in India's Tariff Rates, Simple Averages



Tariff data are available only for the years marked on the X-axis.
Source: TRAINS – WITS.

As per the AIPTA, the applied tariff rates will be reduced in accordance with the schedule shown in Table 1. The tariff rates will be brought down, during the period 2010-19, at an average annual rate of 6.9% for both coffee and tea. The rate of tariff reduction in pepper is much lower at 3.1% per annum, which is consistent with India's productivity disadvantage vis-à-vis the ASEAN countries being the largest in the case of pepper (see Section 3).

It may be noted that the proposed tariff reduction in the plantation commodities is rather modest, and that the rates would

Table 1: Tariff Reduction Schedules for Coffee, Tea and Pepper

	Coffee	Tea	Pepper
6-digit HS codes where India's tariff reduction commitments apply →	HS 090111: coffee, not roasted or decaffeinated ↓	HS 090240: black tea fermented and partly fermented ↓	HS 090411: dried pepper excluding crushed or ground ↓
Share of the 6-digit HS code in the total import of the commodity (%) →	98.9	78.5	100
Share of the 6-digit HS code in the total export of the commodity (%) →	99.3	76.0	76.0
Base Tariff Rates →	100	100	70
Proposed Tariff Rates → 2010	95	95	68
2015	70	70	58
2019	45	45	50
No of tariff lines where the tariff changes would apply→	20	07	09
No of tariff lines which are under the Exclusion List →	08	13	01

(i) Base tariff rates are for the year 2007; (ii) Tariff lines represent the number of 8-digit HS codes; (iii) Import and export shares are for the year 2008.
Source: Department of Commerce, GoI.

remain relatively high even after the completion of the process in December 2019. It may also be noted that India's actual tariff rates during the 1990s (see Figure 1) had been significantly lower than what the AIPTA aims to achieve by 2019. However, considering the presence of QRs, the effective import regime during the 1990s would have been much more restrictive compared to the post 2010 period. In general, import quotas are more restrictive than tariffs in the sense that the volume of import is completely inflexible under quotas, whereas it is still variable under tariffs. In the absence of QRs post 2000, even a modest tariff reduction can cause a significant increase in India's imports, given the country's productivity disadvantage vis-à-vis the ASEAN countries in some of the plantation commodities.

In attempting to make an overall assessment of the AIPTA's impact for India, it is important to ask if the tariff reduction by the ASEAN countries would result in any export gains for India. The potential export gains for India would depend on: (i) the demand for India's plantation commodities in the ASEAN markets; (ii) the existing rate of tariffs in the ASEAN countries; and (iii) the extent of tariff reduction commitments by the ASEAN countries. The considerations of all these aspects suggest that the potential export gains for India, in plantation commodities, are trivial. Table 2 summarises the information regarding base tariff rates and tariff reduction commitments by the individual ASEAN countries. Also reported in the table are the shares of the individual ASEAN countries in India's total exports of the commodity under consideration. The particular HS codes shown in Table 2 account for almost 100% of India's total coffee and pepper exports and over 93% of India's total tea exports.

It is clear that the ASEAN countries account for a meagre share in India's exports of plantation commodities. It is also clear that the base rates of tariffs are already very low in the ASEAN countries and further reductions are only marginal. The base tariff rates in Indonesia, the largest country within the group, are already close to zero. In Thailand, the second largest country, all the three commodities are under the EL. Tariff rates are already zero in Malaysia for coffee and pepper while tea is under the EL. Overall, India's export changes are likely to be very small and hence we ignore these in our analysis.

3 Production and Trade in Plantation

Table 3 summarises the relative importance of India and ASEAN in terms of the production of plantation commodities. It is evident that India's share in the total world production of tea has fallen significantly in 2008 compared to 1993.[8] Yet, India retains its position as the major producer. As regard to coffee and pepper, Vietnam has surpassed Indonesia in 2008 with the largest share (among the countries in Table 3) in world production. In terms of the share of total harvested area in the world, India ranks above the ASEAN countries both in tea and pepper. The mismatch in area and production shares in pepper reflects the low level of

Table 3: Share in World Production (Tonnes)

Countries	1993			2008		
	Coffee	Tea	Pepper	Coffee	Tea	Pepper
India	2.9 (2.6)	26.9 (19.3)	21.0 (51.3)	3.2 (3.5)	17.0 (16.9)	15.9 (44.5)
Indonesia	7.9 (8.0)	6.3 (4.4)	27.2 (22.0)	8.3 (10.1)	3.2 (3.8)	18.4 (21.2)
Malaysia	0.2 (0.1)	0.2 (0.1)	7.4 (2.5)	0.3 (0.5)	0.1 (0.1)	5.7 (2.4)
Thailand	1.3 (0.7)	0.2 (0.7)	4.5 (0.7)	0.6 (0.6)	0.1 (0.7)	1.4 (0.4)
Vietnam	2.4 (0.7)	1.4 (2.7)	4.0 (1.8)	12.8 (5.5)	3.7 (4.6)	22.7 (9.0)

Figures in parentheses show the percentage share of total harvested area in the world.
Source: Estimated using FAOSTAT database.

Table 2: Tariff Reduction Schedules for the ASEAN Countries

	Coffee			Tea						Pepper					
	HS 090111			HS 090230			HS 090240			HS 090411			HS 090412		
	Base Rate	New Rate	Share	Base Rate	New Rate	Share	Base Rate	New Rate	Share	Base Rate	New Rate	Share	Base Rate	New Rate	Share
Brunei	11¢kg	3¢kg	0	22¢kg	6¢kg	0	22¢kg	6¢kg	0	0	0	0	0	0	0
Cambodia	15	5	0	7	7	0	7	7	0.6	15	0	0	15	0	0
Indonesia	2.5	0	0	5	5	0.2	4	2.5	0.2	5	0	0	5	0	0
Laos	40	5	0	40	5	0	40	5	0	30	5	0	30	5	0
Malaysia	0	0	0	11(EL)	11	0.2	11(EL)	11	0.1	0	0	0.4	0	0	0.1
Myanmar	5(EL)	5	0	15	0	0	15	0	0	3	0	0	3	0	0
Singapore	0	0	0.2	0	0	0.2	0	0	0.1	0	0	1.9	0	0	0
Thailand	30(EL)	30	0	30(EL)	30	1.2	30(EL)	30	0	27(EL)	27	0.4	27(EL)	27	0.5
Vietnam	20	0	0	39.4	30	0	40	30	0	30	0	4.1	30	0	4.0
Philippines	35	26	0	3	0	0.6	3	0	0.1	12	8	0.3	12(EL)	12	0.7

(i) Share represents the share of the particular ASEAN nation in India's total export under the given HS code; (ii) EL implies that the particular HS code, in the given country, is under the "exclusion list" (iii) See Table 6 for the description of the HS codes.
Source: Department of Commerce, GoI and COMTRADE database.

yield (kg/hectare) in India. Table 4 reports productivity ratios defined as the yield in individual ASEAN countries divided by the yield in India. It is evident that India's productivity in pepper is lower compared to not only the ASEAN countries but also in relation to the world average. However, the productivity of tea in India is similar to the world average and somewhat better than that of the major ASEAN competitors – Vietnam and Indonesia. In sum, India has a major productivity disadvantage vis-à-vis the ASEAN countries in the case of pepper followed by coffee.

Table 4: Productivity Ratios (yield in ASEAN country/yield in India)

	1993			2008		
	Coffee	Tea	Pepper	Coffee	Tea	Pepper
Indonesia	0.89	1.02	3.02	0.91	0.83	2.42
Malaysia	1.24	1.31	7.38	0.75	1.18	6.48
Thailand	1.59	0.19	16.03	1.06	0.18	10.13
Vietnam	3.11	0.38	5.43	2.60	0.80	7.01
World	0.89	0.72	2.45	1.11	0.99	2.79

Source: Estimated using FAOSTAT database.

The index of Revealed Comparative Advantage (RCA) and world market shares are shown in Table 5 with a view to understand the relative importance of India and ASEAN in world export markets. The RCA of county j in commodity k is defined as $RCA_{jk} = \frac{(x_{jk}/X_j)}{\sum_j x_{jk}/\sum_j X_j}$. The numerator of the RCA index represents the value-share of commodity k in the overall export basket of country j. The denominator represents the value-share of k in total world exports. If the RCA index for a commodity is greater than 1, it implies that the country holds a comparative advantage in that commodity (Balassa 1965).

It is evident that India, Indonesia and Vietnam hold comparative advantages in all the three commodities. Vietnam records the highest RCA index in coffee and pepper while India shows the highest RCA in tea. In terms of export shares in world market, India holds the top position in tea and Vietnam in coffee and pepper.

Table 5: Revealed Comparative Advantage and World Market Shares (2008)

	RCA			World Market Shares		
	Coffee	Tea	Pepper	Coffee	Tea	Pepper
India	2.6	14.5	8.9	2.6	14.5	8.9
Indonesia	7.2	4.4	21.0	6.6	4.0	19.1
Malaysia	0.0	0.1	3.5	0.0	0.1	4.6
Thailand	0.0	0.1	0.1	0.0	0.1	0.1
Vietnam	33.8	6.8	71.0	14.1	2.8	29.5

Source: Estimated using COMTRADE database.

Table 6 shows the structure of exports and imports at the HS 6-digit level for India, Indonesia and Vietnam. A high degree of similarity in their export structures underscores the intense competition among these three countries. Further, the export and import structures are highly similar, particularly for India, which is again a reflection of the high degree of import competition in the plantation sector.

The annual changes in the quantities of India's imports in each of the commodities during the period (1993-2008) are depicted in Figure 2. It can be seen that India's imports of plantation commodities were virtually stagnant during the 1990s even though the tariff rates were low during this period (see Figure 1). The presence of QRs might have been responsible for the stagnation in imports during the 1990s. Imports increased rapidly as the QRs were lifted during 2000 and 2001. However, the later half of the 2000s record a fall in imports as the tariff rates have been increased to as high as 100% for coffee and tea and 70% for pepper. A similar trend can be seen in the share of imports in total production (Figure 3). Clearly, the descriptive analysis of trends indicates a negative relationship between tariffs/QRs and imports. Since the QRs have been lifted, India's imports of plantation commodities

Table 6: Structure of Exports and Imports: India, Indonesia and Vietnam (2008, % shares)

HS Code	Product Name	Export Share			Import Share		
		India	Indonesia	Vietnam	India	Indonesia	Vietnam
	Coffee	100	100	100	100	100	100
090111	Coffee, not roasted or decaffeinated	99.3	99.7	99.7	98.9	69.0	97.5
090112	Decaffeinated coffee, not roasted	0.0	0.1	0.2	0.0	0.1	0.0
090121	Roasted coffee, not decaffeinated	0.3	0.1	0.0	0.9	11.2	1.8
090122	Roasted, decaffeinated coffee	0.3	0.0	0.0	0.0	17.5	0.7
090140	Coffee substitutes containing coffee	0.1	0.1	0.0	0.2	2.2	0.0
	Tea	100	100	100	100	100	100
090210	Green tea in immediate packings	3.3	18.2	4.8	1.7	8.0	7.9
090220	Green tea, nes	3.6	3.1	33.4	8.9	18.0	71.8
090230	Black tea (fermented) and partly fermented in immediate packings	17.1	4.0	5.7	10.9	3.0	5.7
090240	Black tea (fermented) and partly fermented, nec	76.0	74.7	56.1	78.5	71.0	14.6
	Pepper	100	100	100	100	100	100
090411	Dried pepper (excl crushed or ground)	76.0	98.7	91.2	100.0	95.8	96.1
090412	Pepper, crushed or ground	24.0	1.3	8.8	0.0	4.2	3.9

Figure 2: Trends in India's Import Quantities (Tonnes)

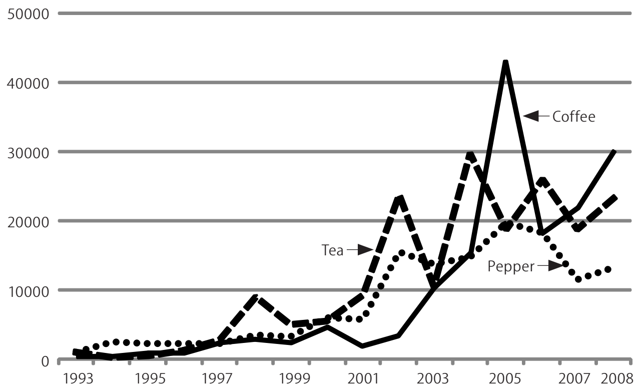


Figure 3: Share of Imports in Production (Quantity), Percentage Shares

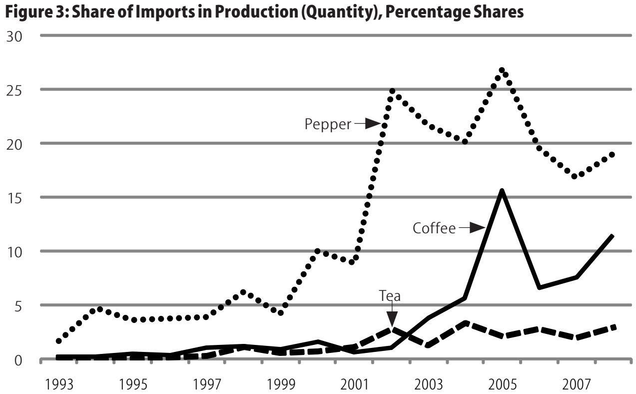
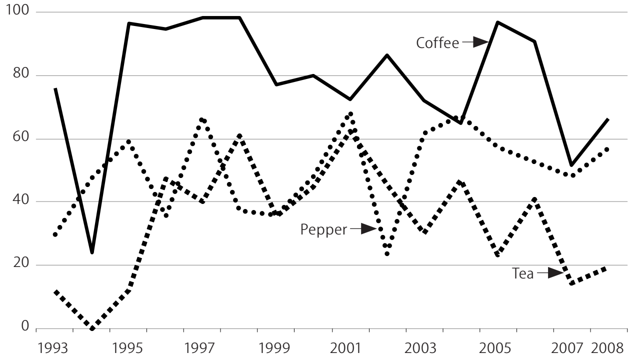


Figure 4: Share (Value) of ASEAN in India's Imports



are likely to record significant growth as the tariff reductions under the AIPTA come into effect.

A growing share of imports relative to domestic production, particularly in pepper and coffee, is evident from Figure 3. Between 1993 and 2008, the share of imports in total production has increased from 1.7% to 19% for pepper, from 0.3% to 11.5% for coffee, and from 0.1% to 2.9% in tea.

While the ASEAN countries are not a major destination for India's exports, they play a major role in India's imports of plantation commodities (Figure 4). The ASEAN's share in India's imports is the largest in coffee followed by pepper and tea. There is no evidence, so far, to suggest an increasing share of ASEAN in India's imports over time. The AIPTA is likely to change this situation, in the years to come, by raising the share of ASEAN in India's imports.

4 Simulation Analysis

4.1 Methodology

Computable General Equilibrium (CGE) models have been generally employed to analyse the economy-wide impact of policy changes. The CGE models usually use highly aggregate sectoral classification for a number of practical reasons including data availability and model tractability. Clearly, a CGE model is not appropriate for the present purpose since we are interested in the detailed analysis of selected and narrowly defined commodities.

Instead, we use an ex ante partial equilibrium simulation model, called SMART model, developed jointly by the UNCTAD and World Bank. The major advantages of the partial equilibrium model include its application at a fine level of detail within a given sector and the simplicity of its computation. The partial equilibrium approach assumes that the sector under consideration has no linkages with other sectors of the economy, which is not an unreasonable assumption for primary commodities with relatively weak inter-sectoral linkages.[9]

World Integrated Trade Solution (WITS), the software developed by the World Bank, brings together different databases on trade flows and trade policy instruments. The SMART model is one of the analytical tools available in the WITS for simulation purposes.[10] The model 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 scenario by estimating new values for a set of variables.

In addition to decomposing the total change in imports into trade creation and trade diversion, the SMART model can be used to analyse the welfare and revenue effects. The net welfare gain/loss, as estimated by the SMART model, depends on the relative magnitudes of the change in consumer surplus and tariff revenue.

Instead of the default import demand elasticity values in the SMART model, we use the latest estimates at the HS 6-digit level by Kee et al (2008). The default elasticity values in the SMART model are based on the calculations by Stern et al (1976), which are quite dated. The SMART model, by default, assumes infinite export supply elasticity, which implies that the export supply curves are flat and that the world prices of each variety are exogenously given. In other words, infinite export supply elasticity implies that the prices in exporting countries (for e g, ASEAN) are not affected as a result of the higher demand by the importing country (for e g, India). Therefore, the exporting country would supply higher quantity of the commodity at the same price as earlier. That is, under the assumption of infinite export supply elasticity, tariff reduction generally results in a positive "quantity effect" while the "price effect" is always zero.

Given that India is a much bigger country compared to the individual ASEAN countries, the assumption that the higher import demand by the former will have no effect on prices in the latter may appear unrealistic. The SMART model, however, allows using finite export supply elasticity values instead of the default assumption of infinite export supply elasticity. The World Bank Research Department provides estimates of export supply elasticity values at the 6-digit level of HS classification.[11] We make use of these estimates and report the results based on the assumption of infinite as well as finite values of export supply elasticities. Use of finite export supply elasticity values implies that higher demand from importing countries would cause price increases in the exporting countries. In other words, the exporting country would supply higher quantity only at a higher price, implying that tariff reduction generally results in a positive "price effect" as well as a positive "quantity effect".

The SMART model relies on the assumption that similar products from different countries are imperfect substitutes (Armington assumption). This assumption rules out the possibility that the entire import demand for the given commodity by the tariff reducing country (India) would be met by the beneficiary countries (ASEAN countries). In other words, the Armington assumption ensures that the tariff reducing country would continue to depend on non-beneficiary countries for meeting a part of its import demand.

In the model, welfare maximisation by a representative agent is done through a two-stage optimisation process. First, given a general price index, the agent chooses the level of total consumption on a "composite good". The relationship between the price index and total spending is determined by the values of the import demand elasticities. Second, within the "composite good", the agent allocates the chosen level of spending among different "varieties" depending upon their relative prices. The agent's allocation of total spending among different varieties would change as a result of the changes in relative prices. The extent of this allocative response, in turn, is determined by the value of elasticity of substitution, which is assumed to be 1.5.

As mentioned earlier, the results of the SMART model can be sensitive to the elasticity values. The gravity model is an alternative approach, without requiring any elasticity parameters, to estimate the potential increase in imports. We estimate separate gravity equations for each of the three commodities. In addition to the standard gravity variables, we include tariff rate in the importing country as an independent variable. The estimated coefficient of the tariff variable, which measures the responsiveness of imports to tariff changes, can be used to quantify the potential import increase under different tariff reduction scenarios.

4.2 Simulation Analysis Using the SMART Model

This section attempts to quantify the impact of the proposed tariff reduction scenarios in each of the plantation commodities. It is evident from 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 of 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; accordingly, tariff rate 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; accordingly, tariff rate 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 Tables 7 and 8. The results in Table 7 are based on the assumption of infinite export supply elasticity while those in Table 8 are based on the assumption of finite export supply elasticity values. The tables report the commodity-wise increase in total imports and its decomposition in to trade creation and trade diversion. Also reported in the tables are the estimated loss of tariff revenue and the overall welfare effects.

Table 7: Aggregate Impact in Each Commodity under Different Tariff Reduction Scenarios, Simulation Results Based on the SMART Model (values in '000 $)

Commodity	Base Year Import (2007)	Total Increase in Imports		Trade Creation	Trade Diversion	Tariff Revenue Loss	Total Welfare
		Value	%	%	%	Value	Value
Scenario 1							
Coffee	18,578	3,624	19.5	14.2	5.3	-4,023	2,302
Tea	10,259	3,758	36.6	23.0	13.6	-1,845	2,175
Pepper	16,491	2,476	15.0	9.6	5.4	-1,166	1,056
Total	45,328	9,858	21.7	14.5	7.2	-7,034	5,534
Scenario 2							
Coffee	18,578	6,836	36.8	26.0	10.8	-9,142	3,646
Tea	10,259	6,985	68.1	42.2	25.9	-5,157	3,615
Pepper	16,491	4,188	25.4	16.0	9.4	-2,286	1,691
Total	45,328	18,008	39.7	26.0	13.7	-16,585	8,952

Results based on the assumption of infinite export supply elasticity.
Source: Simulations using the SMART model (WITS).

The results in both the tables reveal that trade creation dominates over trade diversion in all the three commodities and under both the scenarios. Thus, it is clear that, the AIPTA will not lead to significant trade diversion in the case of plantation commodities. As discussed earlier, trade creation improves welfare as the new imports replace high-cost domestic production. The extent of trade creation, under both the scenarios, is the highest in tea followed by coffee. Trade creation is the smallest for pepper, which is expected since the extent of tariff reduction is the lowest for this commodity.

Table 8: Aggregate Impact in Each Commodity under Different Tariff Reduction Scenarios, Simulation Results Based on the SMART Model (values in '000 $)

Commodity	Base Year Import 2007	Total Increase in Imports		Trade Creation	Trade Diversion	Price Effect	Tariff Revenue Loss	Total Welfare
		Value	%	%	%	%	Value	Value
Scenario 1								
Coffee	18,578	3,647	19.6	10.7	3.9	5.0	-3,993	2,335
Tea	10,259	3,576	34.9	19.9	11.7	3.2	-1,900	2,076
Pepper	16,491	2,239	13.6	6.4	3.5	3.7	-1,237	962
Total	45,328	9,463	20.9	11.2	5.5	4.1	-7,130	5,373
Scenario 2								
Coffee	18,578	6,821	36.7	19.6	7.7	9.4	-9,066	3,700
Tea	10,259	6,634	64.7	36.6	22.2	5.9	-5,164	3,457
Pepper	16,491	3,768	22.8	10.6	6.0	6.2	-2,367	1,542
Total	45,328	17,222	38.0	20.2	10.4	7.4	-16,597	8,699

Results based on the assumption of finite values of export supply elasticity.
Source: Simulations using the SMART model (WITS).

The results show that the proposed tariff reduction may lead to significant tariff revenue loss to the government. Revenue loss (in absolute value) is the highest in coffee followed by tea, which is expected since the simulated tariff reduction in coffee and tea are higher than that in pepper. 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 (due to gain in consumer surplus) is higher for coffee because of its higher absolute value of imports compared to tea.

The assumption of infinite export supply elasticity implies that tariff reduction by India will not affect the prices in the ASEAN countries – that is, the "price effects" are zero (hence not shown in Table 7). Finite values of export supply elasticity, however, would mean that the tariff change will generate price adjustments in addition to quantity adjustments. Therefore, the "price effects", reported in Table 8, capture that part of the increase in India's import value (in $) attributable to higher prices in the ASEAN. It is evident that the quantity effect (i e, trade creation) dominates over the price effect, which means that the major part of India's import growth is due to higher quantity rather than higher price.

Table 9 shows the distribution of total trade creation in each commodity across the ASEAN trading partners. It is clear that Vietnam and Indonesia together account for nearly 100% of the trade creation in all the commodities. Vietnam accounts for the largest share of trade creation in tea and pepper while Indonesia holds the largest share in coffee.

Table 9: Trade Creation in Each Commodity with Each ASEAN Partner (values in '000 $)

Commodity	Base Year Import (2007) Value	Scenario 1 Trade Creation Value	Scenario 2 Trade Creation Value
Coffee	18,578	1,989	3,646
Indonesia	11,261	1,205	2,210
Vietnam	7,317	783	1,436
Tea	10,259	2,047	3,752
Indonesia	2,961	591	1,083
Malaysia	97	19	36
Singapore	0	0	0
Thailand	0	0	0
Vietnam	7,201	1,436	2,633
Pepper	16,491	1,054	1,756
Indonesia	6,192	396	659
Malaysia	196	13	21
Singapore	52	3	6
Thailand	0	0	0
Vietnam	10,051	642	1,070
Total	45,328	5,089	9,154

Results based on the assumption of finite values of export supply elasticity.
Source: Simulations using the SMART model (WITS).

While trade creation generally dominates over trade diversion, it is of interest to identify the non-ASEAN countries whose trade is being diverted to the ASEAN as a result of India's preferential tariff liberalisation. Table 10 provides a list of top 10 non-ASEAN countries that account for the largest extent of trade diversion. To put it simply, this list shows the major non-ASEAN countries whose exports to India are affected as a result of the latter's higher imports from the ASEAN countries. As expected, the list contains a large number of least developed or developing countries. The most affected countries are Uganda for coffee, Kenya for tea and Sri Lanka for pepper.

Table 10: Top 10 Non-ASEAN Countries That Account for the Largest Extent of Trade Diversion (values in '000 $), Scenario 2

S No	Coffee		Tea		Pepper	
	Country	Value	Country	Value	Country	Value
1	Uganda	-1,105.8	Kenya	-1,019.7	Sri Lanka	-1,276.8
2	Rwanda	-301.1	Nepal	-593.7	Brazil	-52.9
3	Italy	-254.8	Argentina	-230.5	Ecuador	-18.2
4	Tanzania	-73.3	China	-228.5	China	-10.0
5	Kenya	-59.1	Papua New Guinea	-109.3	Madagascar	-2.6
6	China	-49.6	Sri Lanka	-91.0	Germany	-0.3
7	United States	-26.2	Malawi	-68.2	Korea, Rep	-0.1
8	Canada	-22.3	United Kingdom	-67.8	United States	-0.0
9	Colombia	-17.8	Iran, Islamic Rep	-49.2	Italy	-0.0
10	Jamaica	-4.5	Brazil	-16.9	Japan	-0.0

Results based on the assumption of finite values of export supply elasticity.
Source: Simulations using the SMART model (WITS).

4.3 Gravity Model Analysis

As noted earlier, the SMART model simulation results can be sensitive to the different elasticity parameter values. An alternative approach, without relying on elasticity parameters, is the gravity model. 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.[12]

4.3.1 Data and Specification

For each commodity, a gravity equation has been estimated using the bilateral export data of a sample of developing countries for the year 2008.[13] A country has been selected for the analysis if it has reported any positive export value in 2008 for the commodity under consideration. For a given commodity, no exporting country in our sample reports positive export values for all the importing countries. In other words, exports from every country to a subset of the importing countries are zero. Ignoring the zeros induces a selection bias if the zero export flows are not random, as is usually the case. Recently, Helpman et al (2008) have proposed a theoretical model rationalising the zero trade flows and have suggested estimating the gravity equation with a correction for the probability of countries to trade. Heckman selection-correction model can be used to assess whether selection bias is present, identify factors contributing to the selection bias, and to control for this bias.

We employ the two-step Maximum Likelihood Heckman model by first estimating a selection equation, and then the outcome equation adjusting for selection bias (Greene 2008). The selection model is specified as follows:

$$SX_{ij} = \alpha + \beta_1 \ln GDP_i + \beta_2 \ln GDP_j + \beta_3 \ln PCI_i + \beta_4 \ln PCI_j + \beta_5 \ln TAR_j + \beta_6 DIST_{ij} + \beta_7 BORD_{ij} + \beta_8 LANG_{ij} + \beta_9 COL_{ij} + \beta_{10} SCTY + u_{ij} \quad \ldots(1)$$

where

ln is natural logarithmic transformation

SX_{ij} = 1 if country i reports any positive value to country j, and 0 otherwise

GDP_i is the GDP (constant 2000 $) of the exporting country in year t

GDP_j is the GDP (constant 2000 $) of the importing country in year t

PCI_i is the per capita GDP of the exporting country in year t

PCI_j is the per capita GDP of the importing country in year t

TAR_j is the tariff rate in the given commodity faced by the exporting country i in the importing country j[14]

$DIST_{ij}$ 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

$SCTY_{ij}$ is a dummy that takes a value of 1 if country i and country j were the same country in the past; 0 otherwise

Heckman selection models require an "exclusion restriction" that at least one variable, called the identification variable, used in the first stage (selection equation) is not included in the second stage (outcome equation). Therefore, to aid identification, three variables have been excluded from the outcome equation, namely, $LANG_{ij}$, COL_{ij}, and $SCTY_{ij}$. This restriction is based on the conjecture that the excluded variables are more important in determining the probability, rather than the volume, of export.[15] The outcome equation is specified as follows:

$$\ln X_{ij} = \alpha + \beta_1 \ln GDP_i + \beta_2 \ln GDP_j + \beta_3 \ln PCI_i + \beta_4 \ln PCI_j + \beta_5 \ln TAR_j + \beta_6 DIST_{ij} + \beta_7 BORD_{ij} + \varepsilon_{ij} \quad \ldots(2)$$

where X_{ij} is the value of exports from country i to country j in year t while the remaining variables are the same as defined above. Since the logarithm of zero is not defined, we follow the usual approach in the literature by converting the export values into $ln (X_{ij} + 1)$ (see Eichengreen and Irwin 1995; Rojid 2006). The dependent variable $[ln (X_{ij} + 1)]$, is still left truncated at the value of zero because $ln\ 1 = 0$.

Bilateral export (current $) data are from COMTRADE database while the commodity-wise tariff rates of the importing countries for the year 2008 come from UNCTAD-TRAINS database.[16] The gross domestic product (GDP) data are taken from the World Bank's World Development Indicators and the remaining variables are obtained from the CEPII database.[17]

4.3.2 Regression Results

The estimation results of the selection and outcome equations are shown in Tables 11 and 12 respectively. Two specifications have been considered for each commodity; one including the exporting country dummies and the other without the dummies. The inclusion of exporter dummy necessitates that other variables specific to the exporting country (GDP_i and PCI_i) be excluded since all exporter-specific effects are accounted for by the dummies.[18]

The independence of the selection and outcome equations can be tested using a likelihood ratio test. Specifically, rejection of the null hypothesis that rho (ρ) is equal to zero means that sample selection bias is significant, where ρ measures the correlation between the error terms of the selection and outcome equations (that is the correlation between u_{ij} and ε_{ij} in equations 1 and 2, respectively). Indeed, the null that $\rho = 0$ is rejected for all the commodities and the coefficient of "Athrho" (inverse hyperbolic tangent of ρ) is statistically significant (Table 11). Both these tests confirm that Heckman selection model is statistically justified and that estimation without considering zero export values would produce biased estimates.

It is evident that most of the variables in the outcome equations show correct signs with statistical significance for all the three commodities. The variables that are significant in the outcome equations are significant in the selection equations as well with the signs of the coefficients being the same in the two equations.

Table 11: Selection Model (Factors Determining the Probability of Countries to Trade) (2008)

	Coffee		Tea		Pepper	
	(1)	(2)	(1)	(2)	(1)	(2)
ln GDP_i	0.241$^\tau$	-	0.312$^\tau$	-	0.364$^\tau$	
	(13.77)		(17.73)		(18.88)	
ln PCI_i	-0.231$^\tau$	-	-0.318$^\tau$	-	-0.228$^\tau$	
	(-8.43)		(-11.80)		(-7.60)	
ln GDP_j	0.236$^\tau$	0.334$^\tau$	0.212	0.312$^\tau$	0.224$^\tau$	0.309$^\tau$
	(15.43)	(17.60)	(14.18)	(16.21)	(13.17)	(14.83)
ln PCI_j	0.050$^\psi$	0.048	-0.082$^\tau$	-0.090$^\tau$	0.018	-0.006
	(1.87)	(1.54)	(-3.22)	(-2.90)	(0.67)	(-0.20)
ln TAR_j	-0.156	-0.227$^\tau$	-0.151$^\tau$	-0.190$^\tau$	-0.066$^\varphi$	-0.102$^\tau$
	(-5.81)	(-7.25)	(-5.94)	(-6.20)	(-2.39)	(-3.18)
ln $DIST_{ij}$	-0.232$^\tau$	-0.538$^\tau$	-0.350$^\tau$	-0.613$^\tau$	-0.428$^\tau$	-0.711$^\tau$
	(-5.69)	(-10.23)	(-9.39)	(-12.21)	(-10.64)	(-13.56)
$BORD_{ij}$	0.605$^\tau$	0.394$^\tau$	0.515$^\tau$	0.657$^\tau$	0.408$^\tau$	0.458$^\tau$
	(4.25)	(2.45)	(4.00)	(4.38)	(3.05)	(2.91)
$LANG_{ij}$	0.392$^\tau$	0.166	0.319$^\tau$	0.416$^\tau$	0.524$^\tau$	0.551$^\tau$
	(6.15)	(0.48)	(4.49)	(4.87)	(7.88)	(5.73)
COL_{ij}	-0.258	0.015	-0.055	-0.171	0.471$^\varphi$	0.727$^\tau$
	(-0.85)	(0.07)	(-0.26)	(-0.67)	(2.27)	(2.69)
$SCTY_{ij}$	-0.013	0.015	0.113	0.419	-0.140	-0.095
	(-0.06)	(0.07)	(0.59)	(1.83)*	(-0.81)	-(0.41)
Constant	-9.409$^\tau$	-6.445$^\tau$	-7.844$^\tau$	-1.925	-10.617$^\tau$	-1.397$^\tau$
	(-16.26)	(-9.83)	(-14.40)	(-3.52)	(-17.16)	(-2.55)
Exporter dummy	No	Yes	No	Yes	No	Yes
Athrho	0.826$^\tau$	1.018$^\tau$	1.130$^\tau$	1.276$^\tau$	1.220$^\tau$	1.204$^\tau$
	(5.06)	(5.86)	(4.30)	(7.68)	(6.90)	(5.97)
Lnsigma	1.206$^\tau$	0.886$^\tau$	1.324$^\tau$	0.965$^\tau$	1.238$^\tau$	0.717$^\tau$
	(16.27)	(13.48)	(11.53)	(16.19)	(15.47)	(10.02)
L R test of indep of eqns (ρ =0): chi^2	14.47$^\tau$	27.59$^\tau$	7.21$^\tau$	33.02$^\tau$	34.65$^\tau$	15.79$^\tau$
No of obs	4,944	4,944	5,722	5,722	5,895	5,895
No of censored obs	4,378	4,378	5,173	5,173	5,448	5,448

(i) Values in parenthesis are z statistics; (ii) τ, φ and ψ implies significance at 1%, 5% and 10%, respectively; (iii) Athrho is the estimate of the inverse hyperbolic tangent of ρ, the correlation among the errors in the selection equation and the outcome equation; (iv) Lnsigma is the estimate of ln(σ) where σ is the standard error of the outcome equation.

As expected, tariff rate (TAR_j), the main variable of our interest, yields negative sign with statistical significance for all the three commodities and in all the specifications (see both Tables 11 and 12). Thus, tariff rates are important in determining both the probability and volume of trade. The point estimates in Table 12 suggest that the elasticity of import with respect to tariff is the highest for coffee (in the range of –0.46 to –0.59), followed by tea (in the range of –0.42 to-0.55) and pepper (in the range of –0.26 to –0.32). Taking the midpoint of the elasticity range, the results imply that a 10% reduction of tariff (TAR_j) would increase the value of imports by about 5.3 percentage points for coffee, 4.9 percentage points for tea and 2.9 percentage points for pepper.

Table 12: Outcome Model (Factors Determining the Value of Trade) (2008)

Second Stage:	Coffee		Tea		Pepper	
Dep Variable: ln Xij	(1)	(2)	(1)	(2)	(1)	(2)
ln GDP_i	0.916$^\tau$	-	1.004$^\tau$		1.145$^\tau$	
	(8.34)		(5.63)		(8.99)	
ln PCI_i	-1.247$^\tau$	-	-1.745$^\tau$		-0.966$^\tau$	
	(-8.07)		(-8.69)		(-6.50)	
ln GDP_j	0.727$^\tau$	0.894$^\tau$	0.866$^\tau$	1.002$^\tau$	0.768$^\tau$	0.802$^\tau$
	(7.42)	(12.04)	(7.04)	(14.68)	(8.23)	(12.00)
ln PCI_j	0.256$^\varphi$	0.042	-0.455$^\tau$	-0.468$^\tau$	-0.153	-0.183$^\varphi$
	(1.94)	(0.42)	(-3.49)	(-4.81)	(-1.26)	(-2.19)
ln TAR_j	-0.462$^\tau$	-0.592$^\tau$	-0.415$^\tau$	-0.549$^\tau$	-0.257	-0.321$^\tau$
	(-3.25)	(-5.30)	(-2.93)	(-5.69)	(-2.01)$^\varphi$	(-3.68)
ln $DIST_{ij}$	-0.274	-1.168$^\tau$	-1.260$^\tau$	-1.912$^\tau$	-0.997$^\tau$	-1.757$^\tau$
	(-1.40)	(-6.65)	(-4.67)	(-10.85)	(-4.44)	(-9.38)
$BORD_{ij}$	1.733$^\tau$	0.661	0.723	0.819$^\tau$	1.140$^\varphi$	0.249
	(2.97)	(1.49)	(1.28)	(1.92)	(2.16)	0.66
Constant	-29.145$^\tau$	-9.990$^\tau$	-19.355$^\tau$	-1.456	-31.629$^\tau$	-3.925$^\tau$
	(-7.37)	(-4.40)	(-3.86)	(-0.86)	(-8.03)	(-2.42)
Exporting country fixed effect	No	Yes	No	Yes	No	Yes
Wald Chi^2	115.4$^\tau$	597.24$^\tau$	99.14$^\tau$	653.56$^\tau$	111.61$^\tau$	679.22$^\tau$
Log likelihood	-2,676.0	-2,152.4	-2,691.2	-2,084.8	-2,128.0	-1,638.6
No of uncensored obs	566	566	549	549	447	447

(i) Values in parenthesis are z statistics; (ii) τ, φ and ψ implies significance at 1%, 5% and 10%, respectively.

The size of the exporting and importing countries are measured by their GDP. As expected, both GDP_i and GDP_j show a statistically significant positive coefficient, which implies that the bigger countries trade more. This result also implies that the supply effect dominates over the demand effect for the exporting countries while the opposite holds for the importing countries. In other words, higher values of export by the bigger exporting countries are due to their higher supply of the commodity (relative to their domestic demand) while higher imports by the bigger importing countries are related to their higher demand (relative to their domestic supply).

Per capita income of the exporting country (PCI_i) is negative and significant for all the commodities, which implies that the relatively poorer countries are the major exporters. The per capita income of the importing country (PCI_j) yields a positive coefficient in the case of coffee and a negative coefficient in the case of tea and pepper.

That the volume of bilateral trade falls with geographical distance is a well documented fact (see, for instance, 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. Similarly, the countries that share a common border are likely to trade more again due to the same factors. Indeed, as expected, the coefficient of the variable $DIST_{ij}$ is negative while that of $BORD_{ij}$ is positive and both are statistically significant.

Common cultural and political background can stimulate bilateral trade (Eichengreen and Irwin 1996; Fidrmuc and Fidrmuc 2003). Thus, the selection equation includes the dummies to capture common language ($LANG_{ij}$), colonial history (COL_{ij}) and political history ($SCTY_{ij}$). As expected, the variable $LANG_{ij}$ shows positive coefficient for all the three commodities while COL_{ij} shows the correct sign with statistical significance only for pepper (Table 11). The variable, $SCTY_{ij}$, generally fails to yield the correct sign with significance except in specification (2) for tea. The results in Table 12 are not affected if COL_{ij} and $SCTY_{ij}$ are dropped from the selection equation.

Using the estimated regression equations in Table 12, we now proceed to estimate the extent of import increase due to tariff reduction under the two scenarios considered earlier. The results are reported in Table 13. It is clear that India's total import of the three commodities will increase by 16.5% under scenario 1 and by 40.5% under scenario 2. These values are comparable to the percentage increase of total imports obtained from the SMART model simulation – that is 20.9% under scenario 1 and 38% under scenario 2. According to the estimation based on gravity model, the percentage increase of import would be the highest in coffee (23% and 59%, respectively under scenario 1 and 2) followed by tea (21% and 54% respectively) while the SMART model indicates that the import increase would be higher in tea than in coffee. Both SMART and gravity models confirm that the percentage increase of imports will be the lowest in pepper.

Table 13: Import Increase in Each Commodity under Scenario 1 and 2, Simulation Results Based on the Gravity Model (values in '000 $)

Commodity	Base Year Import (2007)	Import Increase under Scenario 1		Import Increase under Scenario 2	
		Value	%	Value	%
Coffee	18,578	4,310	23.2	11,017	59.3
Tea	10,259	2,185	21.3	5,540	54.0
Pepper	16,491	989	6.0	1,814	11.0
Total	45,328	7,485	16.5	18,371	40.5

The simulation, for each commodity, is based on the tariff elasticity shown in specification (2) in Table 12.

Finally, we may assess the magnitude of the import changes relative to the size of domestic production by asking a counter factual question of the following type: what would have been the share of imports in production, say in 2008, had India's actual tariff rates in 2008 been as under scenario 2. For the year 2008, the actual share of imports in production (both expressed in terms of quantity) was 11.5% for coffee, 2.9% for tea and 19% for pepper (see Figure 3). Our calculations, using the counterfactual that tariff rates under scenario 2 apply for the year 2008, reveal that the share of imports in production would have been 18.3% (instead of 11.5%) for coffee, 4.4% (instead of 2.9%) for tea and 21% (instead of 19%) for pepper.[19] The bottom line is that the magnitudes of import increases are quite significant in relation to the size of domestic production.

5 Conclusion

The present study attempts a quantitative assessment of the impact of the recently signed AIPTA for selected plantation commodities – coffee, tea and pepper. The study uses partial equilibrium modelling approach (SMART and gravity models) to estimate the likely increase of imports into India under the proposed tariff reduction schedules of the AIPTA. The SMART model allows the estimation of trade creation and trade diversion effects associated with tariff reduction. The SMART model simulation results, however, can be sensitive to the choice of the various elasticity parameters. An advantage of the gravity model is that it does not rely on any elasticity values.

As per the AIPTA 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 for 2015; and scenario 2 where the base rate will be reduced to the proposed rate for December 2019.

Overall, the analysis shows that the agreement may cause a significant increase in India's imports of plantation commodities from the ASEAN countries. The augmented gravity model, estimated for each of the commodities, showed expected results for most of the explanatory variables. In particular, the coefficient of tariff rate showed negative sign with statistical significance.

Import growth is mostly driven by trade creation rather than trade diversion. 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 some 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.

While the consumers in India would gain from falling prices, the surge of new imports may have an adverse impact on the livelihood of the small farmers and workers engaged in the plantation sector. During the years to come, the plantation sector will have to realign the production structure according to the changing price signals. It is important to devise appropriate adjustment assistance schemes for planters as well as for the plantation workers who might be displaced.

NOTES

1 There exists a great deal of theoretical analysis of PTAs. See Panagariya (2000) for an excellent survey.

2 It is appropriate to call this as a PTA rather than a free trade agreement (FTA) since tariffs are not going to be eliminated completely for all goods (see discussion in Section 2). Even when the tariff reduction process is completed in 2019, India's tariff rates for plantation commodities, in particular, would remain relatively high.

3 The remaining major plantation commodities in India (such as natural rubber, cashew nut, coconut, areca nut and cardamom) are under the "exclusion list" of the agreement.

4 As a mark of protest against the agreement, hundreds of thousands of Kerala residents took to the streets on 2 October 2009 to form a mammoth human chain from one end of the state to the other.

5 See, for instance, Patronobish (2009) in *The Hindu*.

6 Tariff lines refer to the 8-digit codes of Harmonised System (HS) classification. A more detailed description of the agreement can be seen in Pal and Dasgupta (2009) and Harilal (2010). Joseph (2009) discusses the features of the AIPTA with reference to the plantation sector.

7 About 11% of India's tariff lines are under the EL, 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.

8 India faced a balance of payment crisis in July 1991, and subsequently full convertibility on current account was adopted in the year 1993. Therefore, we chose the period starting from 1993 in further empirical analysis.

9 India's input-output table for the year 2006-07 confirms that tea and coffee are not used as an input in any sector (except in "tea and coffee processing") nor do these commodities depend significantly on other sectors for inputs (except for fertiliser, pesticides and some services). Input-output information is not available for pepper separately.

10 See Laird and Yeats (1986) for a detailed discussion of the theoretical underpinnings of the SMART model.

11 This can be downloaded at the following link: http://wits.worldbank.org/witsweb/download/data/Export-Supply-Elasticity_byHS6.xls

12 Comprehensive review of the theoretical foundations of the gravity model can be seen in Harrigan (2001) and Anderson and van Wincoop (2004).

13 The group of low and middle income countries (World Bank classification) has been considered as developing countries.

14 The tariff data from UNCTAD-TRAINS shows that, in the case of the commodities under consideration, all exporting countries face same tariff rates in any given importing country. Therefore, we do not add the subscript *i*.

15 In any case, further analyses confirm that the results, particularly those related to the main variable of our interest (TAR_j), are not sensitive to the choice of the exclusion restriction.

16 COMTRADE and TRAINS database have been accessed through WITS software.

17 See http://www.cepii.fr/anglaisgraph/bdd/distances.htm

18 In a given importing country, the same tariff rates are applicable to all the countries exporting the commodity under consideration (see endnote 14). The inclusion of importing country dummies would require that tariff rate (TAR_j) be excluded since tariffs are specific to the importing country (rather than to the country pair). Since tariff rate is the main variable of our interest, we do not include the importer dummies.

19 In order to compute the import share (counterfactual) we used the actual quantity of production in 2008. Import shares will be even higher if we assume that the increase in imports will cause a fall in domestic production.

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