Impact of tariff reduction according to Doha modalities on India's trade of agriculture products

Bishwanath Goldar, Devender Pratap and Yashobanta Parida

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Institute of Economic Growth
University of Delhi Enclave
North Campus, Delhi – 110 007
Tel: +91-11-27667365, Fax: +91-11-27667410

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1. Object and Scope of the Study

The object of the study is to assess the increase in India's imports of agricultural products and the increase in India's exports of agricultural products to the US and EU that is likely to occur if the tiered formula of tariff reduction given in the revised draft modalities for agriculture (TN/AG/W/4 dated 6th December 2008, Section on market access) is applied.

In assessing the likely impact of the tiered formula of tariff reduction on India's exports to the US and the EU, the issue of preferential access to these markets available to some countries is important. The reduction in MFN tariff would cause preference erosion, giving India an advantage at the cost of the countries currently having preferential access. Thus, how India's market access gets enhanced by erosion of preferences assumes significance. Evidently, while making an estimate of increase in India's exports due to the application of the tiered formula of tariff reduction, this aspect needs to be incorporated into the analysis.

The analysis of the likely effect on India's imports of agricultural products has been carried out at the 6-digit HS level covering about 600 tariff lines. The analysis of the likely effect on India's exports to the US and EU has also been carried out at the 6-digit HS level, but in these cases the top 100 agricultural products exported by India are considered, separately for the US and the EU. The applied tariff rates considered for the analysis is for 2008. The trade data considered for the analysis relate to 2006-07 to 2008-09.

The paper is organized as follows. The next section briefly describes the tiered formula of tariff reduction. The methodology adopted for the assessment of the likely effect of the tiered formula of tariff reduction on India's agricultural trade is outlined in Section 3. The estimates are presented and discussed in Sections 4 and 5. Some econometric issues relating to the estimates of the likely effect on India's exports are taken up in Section 6. The final section, Section 7, summarizes and concludes.

2. Tiered formula of tariff reduction

The tiered formula applicable to developed countries given in the December 2008 document (paragraph 61) on the draft modalities for agriculture is reproduced below:

> **"Developed country Members shall reduce their final bound tariffs in six equal annual instalments over five years in accordance with the following tiered formula:**
>
> **(a) where the final bound tariff or *ad valorem* equivalent is greater than 0 and less than or equal to 20 per cent, the reduction shall be 50 per cent;**
>
> **(b) where the final bound tariff or *ad valorem* equivalent is greater than 20 per cent and less than or equal to 50 per cent, the reduction shall be 57 per cent;**
>
> **(c) where the final bound tariff or *ad valorem* equivalent is greater than 50 per cent and less than or equal to 75 per cent, the reduction shall be 64 per cent; and**
>
> **(d) where the final bound tariff or *ad valorem* equivalent is greater than 75 per cent, the reduction shall be 70 per cent."**

The four slabs of final bound rate or *ad valorem* equivalent for developed countries, as given above, are (a) 0-20%, (b) greater than 20% and less than or equal to 50%, (c) greater than 50% and less than or equal to 75%, and (d) greater than 75%. The tariff cuts to be made for each of the slabs have been specified. For developing countries, the four corresponding slabs are (a) 0-30%, (b) greater than 30% and less than or equal to 80%, (c) greater than 80% and less than or equal to 130%, and (d) greater than 130%. The proposed tariff cuts for the four slabs for developing countries are two-thirds of the cuts specified for developed countries.

It will be noticed that the cuts have been specified for the final bound rate or *ad valorem* equivalent. In the cases of non-*ad valorem* tariffs, their conversion into *ad valorem* equivalents (AVEs) is to be done following the methodology set out in Annex A to TN/AG/W/3 of 12 July 2006.

It has been proposed that the developed countries will be required to make a minimum average cut of 54 percent. On the other hand, the maximum overall average cut on final bound tariffs that any developing country Member shall be required to undertake as a result of the application of the formula inclusive of the treatment for Sensitive Products is 36 per cent. Regarding the cut to be made by development country members, the document specifies, "Should application of the tiered formula treatment …, inclusive of the treatment for Sensitive Products … and additional cuts made as provided for elsewhere in these modalities relating to tariff escalation and tropical products result in an overall average cut less than 54 per cent, an additional effort shall be made

proportionately across all bands to reach that target." There is a similar provision for developing country Members. The developing country Members are to be given the flexibility to apply lesser reductions applied in a proportionate manner across the bands, to keep within the maximum specified average level of 36 percent.

3. Methodology

The estimation of the likely increase in India's imports of agricultural products and the likely increase in India's exports of agricultural products to the US and the EU that will take place after applying the tiered formula of tariff reduction has been done in the following way. First, the final bound rates or *ad velorem* equivalents for the selected tariff lines are considered and the tiered formula of tariff reduction is applied. This yields the new bound rates. Then, these are compared with the applied rates for 2008 to derive the cuts that have to be made in the applied rates to bring them within the bound rates. This gives the change in applied MFN tariff and hence the percent change in the price (tariff inclusive) of imported goods, imported on MFN basis. Given the change in price and the price elasticity, the changes in India's imports and India's exports of agricultural products are computed. As mentioned earlier, the analysis is carried out at 6-digit HS level. For analyzing increases in India's imports, all tariff lines for agriculture are considered. On the other hand, for analyzing increases in India's exports, the top 100 items (tariff lines) exported to the US market and to the EU market are considered.

A key parameter in the estimation of the likely effect of tariff reduction on agricultural trade is the price elasticity of demand. This is discussed next. The theoretical framework underlying the estimates of increases in imports and exports is taken up first, followed by the methods actually applied to obtain price elasticity.

Price elasticity

Let XA denote aggregate demand for an agricultural product in a country, say the US. Let XD and XM be respectively the domestic and imported components of the demand parts of demand. The substitution elasticity at this level is given by σ^m. The demand functions, following Mensbrugghe (2009), may accordingly be specified as:

$$XD = \alpha^D \left(\frac{PA}{PD} \right)^{\sigma^m} XA \quad \ldots(1)$$

$$XMT = \alpha^M \left(\frac{PA}{PMT} \right)^{\sigma^m} XA \quad \ldots(2)$$

$$PA = \left[\alpha^D PD^{1-\sigma^m} + \alpha^M PMT^{1-\sigma^m} \right]^{1/(1-\sigma^m)} \quad \ldots(3)$$

In these equations, PA is the aggregate price of the agricultural product, which is taken as a non-linear aggregation of two component prices: the price of domestically sourced product (PD) and the price of imported product (PMT).

In the second nest, aggregate imports, XMT, are broken up by regions. Two exporting regions are considered: one comprising of countries that have a preferential access to the market (hereafter, region with preferential access or region p) and the other comprising of countries that are subject to MFN tariff (hereafter, MFN region or region m). For these two regions, subscripts p and m are used. Following Mensbrugghe (2009), the demand functions for imports from regions p and m may be specified as:

$$XM_p = \alpha^p \left(\frac{PMT}{PM_p} \right)^{\sigma^w} XMT \quad \ldots(4)$$

$$XM_m = \alpha^m \left(\frac{PMT}{PM_m} \right)^{\sigma^w} XMT \quad \ldots(5)$$

$$PMT = \left[\alpha^p PM_p^{1-\sigma^w} + \alpha^m PM_m^{1-\sigma^w} \right]^{1/(1-\sigma^w)} \quad \ldots(6)$$

In the above equations, the substitution elasticity between imports from the two regions is denoted by σ^w. The prices of imports from the two regions are given by PM_p and PM_m. Without loss of generality, it may be assumed that PM_p includes cost, insurance and freight, while PM_m is the CIF value plus MNF tariff at the rate τ. It may be noted that the aggregate price of imports, PMT, is a non-linear combination of the prices of imports from the two regions.

The nested structure of demand function, as given in equations (1) to (6) above, is commonly applied in computable general equilibrium models dealing with trade; there is a substitution elasticity between domestically sourced product and imports and another substitution elasticity between alternate sources of imports (see, for instance, Polaski et al., 2008).

From the demand functions in equations (1) to (6) above, the price elasticities can easily be derived (for derivation, see Mensbrugghe, 2009). The formula to be used for the computation of the price elasticities are given below.

Notation used:

σ^m = elasticity of substitution between aggregate imports of a product and domestic supply of the product

σ^w = elasticity of substitution between imports of a product from the region paying MFN tariff and imports of the product from the region that has preferential access to the market

s_D = share of absorption met from domestic supply of the product

s_M = share of imports in domestic absorption of the product

s_m = share of MFN imports in aggregate imports of the product

$s_{m,T}$ = share of MFN imports out of total absorption of the product

Given these notation, the price elasticities may be derived:

Price elasticity:

Elasticity of demand for domestically sourced product with respect to price of MFN imports (tariff inclusive)

$$\varepsilon_{d,m} = \sigma^m . s_{m,T} \quad \ldots(7)$$

Elasticity of demand for total imports of the product with respect to price of MFN imports (tariff inclusive)

$$\varepsilon_{MT,m} = -\sigma^m . s_D . s_m \quad \ldots(8)$$

Elasticity of demand for MFN imports of the product with respect to price of MFN imports (tariff inclusive)

$$\varepsilon_{m,m} = -\sigma^w + s_m[\sigma^w - \sigma^m s_D] \quad \ldots(9)$$

Elasticity of demand for preferential imports of the product with respect to price of MFN imports (tariff inclusive)

$$\varepsilon_{p,m} = s_m[\sigma^w - \sigma^m s_D] \quad \ldots(10)$$

Computation of Price Elasticities

For estimating the likely increase in India's agricultural exports to the US and EU markets (top 100 6-digit tariff lines chosen in each case), the formula in equation (9) has been used. For some of the tariff lines out of the selected 100, India has a preferential market access. In those cases, a somewhat different treatment has been given, which is discussed further at the end of this section. To apply the formula in equation (9), the substitution elasticites (σ^w and σ^m) have been taken from the GTAP database. These are shown in Annex-1, Table A.1.

Besides σ^w and σ^m, data are needed on s_m and s_D for the computation of price elasticity, $\varepsilon_{m,m}$. The share of domestically sourced product in total absorption, s_D, has been computed from the data on production, imports and exports. Since domestic production data are not available at 6-digit HS level, it is not possible to compute s_D at that level. However, such data could be obtained for 57 sectors of the economy[1] and these have been used to compute s_D. Let Q denote domestic production, X exports and MT imports. Then, the share of imports in total absorption, i.e. $s_{m,T}$, is obtained as

$$s_{m,T} = MT/(Q+MT-X) \quad \ldots(11)$$

After $s_{m,T}$ is computed, s_D is obtained as

$$s_D = 1- s_{m,T} \quad \ldots(12)$$

The computed figures on s_D are available only for a limited number of sectors. The computed figure for each sector has been applied to all six-digit tariff lines falling within that sector. The same applies to the GTAP elasticities of substitution. The elasticities are available for a limited number of sectors. The elasticity for each sector is applied to the 6-digit HS lines falling within the sector.

To compute the share of MFN import in US imports of agriculture products for each 6-digit HS tariff lines, a list of countries which have been gaining substantially from preferential access to US markets of agricultural products has been drawn up based on a study undertaken by Dean and Wainio (2009). This list includes over 20 countries. Next, data on total US imports of agricultural imports and imports from the countries in the list have been obtained at 6-digit HS level for the year 2008. The ratio of the latter to the former gives the import share of the region with preferential access; and one minus the ratio gives the share of MFN imports, i.e s_m in equation (9).

In a similar way, the share of MNF imports in agricultural imports has been computed for the EU at 6-digit HS level. In this case, the list of countries that have been gaining from preferential access to EU markets has been prepared with the help of the study

[1] These data related to 2004.

undertaken by Low et al. (2009). The list of countries with substantial preferential access to the US market and the EU market of agricultural products is given in Annex-2.

Turning next to the study of the likely increase in India's imports, the price elasticity in this case was computed with the help of equation (8) above. The substitution elasticities were taken from the GTAP database (see Annex-1, Table A.1). The share of domestically sourced product in total absorption was computed from the Input-Output table for 2006-07 prepared by the CSO (Central Statistical Organization, Government of India). As in the case of the US and EU, the share of domestically sourced product in domestic consumption of agricultural products in India is available for a limited number of sectors, and the share computed for a sector has to be applied to all six-digit HS codes falling within a sector.

To compute the price elasticity by using equation (8), data are needed also on s_m, the share of MFN imports. This does not seem to be an important issue in the analysis of the effect of tariff reduction on India's agricultural imports. Hence, this aspect has not been taken into account in the estimation of price elasticity for each of the 590 tariff lines. In the case of products where an increase in imports of about or more than Rs 25 lakhs is indicated by preliminary calculations, the price elasticity has been more accurately computed by taking into account the decomposition of total imports into MFN imports and preferential imports. In other cases, this aspect is ignored, i.e. s_m is taken as one. This would not make much difference to the results. For most of the items for which s_m is taken as one, there is no change in applied tariff rate after applying the tiered formula of tariff reduction, and therefore a more accurate estimation of price elasticity will make no difference. For others, the expected increase in small, and a more accurate estimation of price elasticity will change the final results only marginally.

Attention may be drawn here to the fact that studies using GTAP data apply a common set of substitution elasticities to all countries. In many studies on preference erosion or on the effect of agricultural trade reforms, a common set of substitution elasticities have been applied across a large number of countries (see, for instance, the papers included in the edited book of Anderson and Martin, 2006, particularly the paper by Anderson, Martin and Mensbrugghe). One may raise questions about applying the same substitution elasticity to India's imports as those being used for the US, the EU and other developed countries. To address this concern, an alternate set of estimates of increase in India's imports of agricultural products following the implementation of the tiered formula of tariff reduction has been made using econometrically estimated price elasticity from India's trade, price and tariff data (rather than using the GTAP substitution elasticities).

For econometrically estimating price elasticity of import demand, one important product (6-digit HS level) has been chosen for each chapter included in the list of agricultural products. Data on quantity and value of the product has been taken for 10 years from the Import-Export Databank of the Ministry of Commerce. The data relate to 1999-00 to 2008-09. Unit value of imports is taken as a proxy for the price of imported goods. The tariff rates for the products have been taken from diverse sources. An index of price of imported goods inclusive of tariff has been formed. This has been divided by the

domestic price of the product. For this purpose, the best available price index from the official series on wholesale price index has been taken. Quantity imported is regressed on relative price and real GDP (which is the activity/income variable). A log-linear specification is used. The equation has been estimated first for each product separately, and then on the basis of the estimates of price elasticity obtained, the products have been grouped. Finally, fixed effects model has been estimated for the groups (the estimates are shown in Annex-3, and the construction of the relative price variable is shown in Annex-4). The price elasticity estimated for a selected item of a chapter has then been taken as the price elasticity applicable to all other tariff lines in the chapter. Having estimated the price elasticity, it is applied to the change in MFN tariff to compute the change in India's imports.

Treatment of Items in which India has preferential market access in the US and EU

For the estimation of likely increase in India's exports of agricultural products to the US and EU market in respect of products for which India has a preferential market access, one cannot apply equation (9). If India had a duty free access the markets, equation (10) could have been used. However, India has preferential access to the US and EU markets under GSP, while a number of other countries have access under GSP and also under other arrangements which provide substantially greater benefits. The tariff preference enjoyed by such countries is often much more than the preference that India enjoys under GSP. To explain this point further, consider the US imports of agricultural products from India. GSP coverage is 40% and the average tariff preference is 4.2% (Dean and Wainio, 2009). This may be contrasted with the level of tariff preference that some other countries have under other arrangements. Belize for instance has 11% tariff preferences under CBTPA as against 3.2% under GSP. Columbia has 6.6% average tariff preference under ATPA as against 4.6% under GSP. Antigua has 14.8% average tariff preference under CBERA as against 0.2% under GSP. Zambia has 92.4% average tariff preference under AGOA as against 5.8% under GSP. There is a similar picture in the EU market. Making a comparison of the overall preference margins for agricultural products enjoyed by different countries in the EU market, it is found that the differences are sharp. The overall average preference margin for India is1.5%, while it is 10% for Bangladesh, 9.9% for Zimbabwe, 9.4% for Malawi, 9.2% for Zambia, and 8.9% for Tanzania (Mensbrugghe, 2009). The fact that the level of tariff preference enjoyed by India is significantly less than the preference enjoyed some other countries in the US and EU markets implies that a reduction of MFN tariff need not always be disadvantageous to India even though India has a preferential access. If data were available on the imports made by the US and EU from different countries along with the level of tariff preference being given to each of them for each of the 100 products chosen for the study, a careful assessment of the likely impact on India's exports could have been done. In the absence of such detailed information, a simplified method has been adopted to estimate the effect of MFN tariff reduction on India's exports as explained below:

(a) For products in which the market share of countries with preferential market access listed in Annex-2 is more than 25%, it is assumed that the increase in

India's exports will be half of the estimate based on equation (9)(i.e. half of what it have been if India were supplying on MFN basis).

(b) For products, in which the market share of the countries with preferential market access listed in Annex-2 is between 5 and 25%, it is assumed that the increase in India's exports will be a quarter of the estimate based on equation (9).

(c) For products in which the market share of the countries with preferential market access listed in Annex-2 is less than 5%, it is assumed that there will be no increase in India's exports. In such market, the supply is expected to be predominantly on MFN basis, and a reduction in MFN tariff would have an adverse effect on the suppliers currently enjoying GSP benefit. Therefore, the assumption of no increase in India's exports seems reasonable.

4. Increase in India's Imports of Agricultural Products

At 6-digit HS level, there are about 650 tariff lines for agricultural products. Of these, India's imports were nil during the three year period 2006-07 through 2008-09 for about 60 products. Analysis of the impact of tariff reduction has therefore been carried out for 590 6-digit tariff lines in which there were imports during the period 2006-07 to 2008-09.

The average bound rate of duty in India for the selected 590 agricultural tariff lines is about 112 percent. Average applied rate (2008) is about 32 percent. In a vast majority of tariff lines, the applied rate is substantially lower than the bound rate. As shown in Table 1, in 263 tariff lines (out of 590), the bound rate is in the range of 80 to 130 percent, while the average applied rate is only about 28 percent. The implication is that even if the bound rate is cut according to the tiered formula of tariff reduction, the applied rate will in most cases be lower than the reduced bound rate and no cut in the applied rate will be necessary to bring it within the bound rate.

Table 1: India's tariff rates on agricultural products

Bound rate, range, %	No. of lines	Percent of lines	Value of imports* (Rs crore)	Percent of imports	Average applied rate	No. of lines in which applied rate will fall after applying the tiered formula	Percent out of total number of lines
0-30	24	4.1	1170	3.4	5.8	4	16.7
>30 and<=80	86	14.6	6730	19.6	27.5	34	39.5
>80 and <=130	263	44.6	13513	39.3	28.1	10	3.8
>130	217	36.8	12997	37.8	40.8	23	10.6
Total	590	100.0	34411	100.0	31.8	71	12.0

* annual average for the period 2006-07 to 2008-09

There are 217 tariff lines in which the bound rate exceeds 130 percent (for line-wise tariff rates and cuts, see Annex-5). The average applied tariff rate in these lines is about 41 percent. Clearly, in most these items, the applied rate is well below the bound rate. Combining this tariff slab with the one below that, there are 480 tariff lines in which the bound rate is more than 80 percent. Out of these 480 lines, only in 33 lines, a cut in applied tariff will be necessary after applying the tiered formula of tariff reduction.

It may be mentioned here that when the tiered formula is applied to the bound rates of India for agricultural products, the average reduction in bound tariff is found to be about 43 percent. Since this is higher than the specified maximum value of the average tariff cut for developing countries (36 percent), the rates of reduction in bound rates of duty in the different slabs have been have lowered proportionately to ensure that the average value of tariff cuts does not exceed 36 percent.

Out of the 590 tariff lines selected for the study, a cut in the applied rate from the 2008 level will be necessary in 71 cases. These 71 tariff lines accounted for about 4.5 percent of India's agricultural imports in the period 2006-07 to 2008-09. Evidently, the effect of the tiered formula of tariff reduction on India's imports of agricultural products will be small.

Table 2 provides information on the cuts in applied rates that will have to be made after applying the tiered formula for tariff reduction. In the tariff slab, 30 to 80 percent bound rate of duty, there are 86 lines. Of these, a cut in applied rate will be necessary in 34 lines. In the slab, 80 to 130 percent, a cut in applied tariff will be necessary for 10 lines. The average cut will be about 18 percentage points. In the tariff slab of over 130 percent, a cut in applied rate will be necessary in 23 lines. The average cut will be by about 41 percent. It will noticed that in the last two stabs, there are some tariff lines attracting a high rate of duty and a significant reduction will have to be made in the applied tariff rate for those lines.

The increase in India's imports of agricultural products that would take place due to the tariff cuts described above is estimated (based on GTAP elasticities; see Annex-6 for the price elasticities used) at about Rs 302 crore, which is only about 0.9 percent of the average annual value of agricultural imports in the period 2006-07 to 2008-09 (Rs 34.4 thousand crore).

Table 2: Cuts in Applied Tariff according the Tiered Formula, India, Agricultural Products

Bound rate, range, %	no. of lines	Lines in which applied tariff will have to be cut			Average applied tariff in lines in which applied tariff rates need not be cut
		no of lines	average applied tariff, 2008	percentage point cut necessitated by lowering of bound rate of duty	
0-30	24	4	22.4	6.3	2.5
>30 and<=80	86	34	33.7	5.5	23.4
>80 and <=130	263	10	83.6	17.6	25.9
>130	217	23	132.6	41.1	29.9
Total	**590**	**71**			

Table 3 shows a list of 28 tariff lines in which the expected increase in imports due to tariff cuts is about Rs 50 lakh or greater (a longer list is given in Annex-7). These 28 items account for an increase of about Rs 297 crore out of the total expected increase of Rs 302 crore. The largest increases are expected to take place in HS codes 90111 (coffee neither roasted nor decaffeinated), 220830 (whiskies) and 80810 (apples fresh).

The estimates presented above are based on GTAP substitution elasticities. As mentioned earlier, an alternate set of estimates of the impact of tariff reduction has been made using econometrically estimated price elasticity of India's agricultural imports (see Annex-3).

According to the alternate set of estimates made, the increase in agricultural imports (following the tariff cuts necessitated by the reduction in bound rates of duty) will be about Rs 356 crore, i.e. about 1.0 percent of the average annual value of agricultural imports in the period 2006-07 to 2008-09. This is broadly in agreement with the first set of estimates.

Going by the alternate set of estimates, in about 24 products, there will an increase in imports by about Rs 50 lakh or more. This, by and large, is the same list as in Table 3. However, the order differs somewhat. The top three lines in terms of increase in imports according to the second set of estimates are: HS codes 220830 (whiskies), 220890 (other undrd ethyle acchl) and 220429 (wine of fresh grapes).

Table 3: Increase in India's Imports of Agricultural Products due to Tariff Cuts

HS Code	Description	Change in Imports, Rs crore
90111	COFFEE NEITHER ROASTED NOR DECAFFEINATED	102.1
220830	WHISKIES	44.2
80810	APPLES FRSH	42.5
220890	OTHER UNDRD ETHYLE ACCHL	20.1
80290	OTHER NUTS FRESH OR DRIED	11.5
90411	PEPPER NEITHER CRUSHED NOR GROUND	10.9
220429	WINE OF FRESH GRAPES(EXCL SPARKLING WINE);GRAPE MUST WTH FRMNTATN ARSTD BY THE ADDTNOF ALCOHL IN CONTNRS HOLDNG EXCS 2 LTRS	10.9
90240	OTHR BLCK TEA/OTHR PRTLY FRMNTD TEA	8.8
40590	OTHERS	7.9
220870	LIQUEURS AND CORDIALS	7.4
120791	POPPY SEEDS W/N BROKEN	5.7
220421	WINE OF FRSH GRAPES(OTHR THN SPRKLNG WINE)GRAPE MUST WTH FRMNTATN ARSTD BY THE ADDTNOF ALCOHL IN CONTNRS HOLDNG 2 LTRS/LESS	4.6
220850	GIN & GENEVA	3.5
220820	SPRTS OBTND BY DISTLNG GRPE WINE/GRPE MARC	2.4
40210	MILK & CREAM IN PWDR,GRNLS OR OTHR SOLID FORMS CONTNG FAT NOT EXCEEDING 1.5% BY WT	2.3
80820	PEARS & QUINCES FRSH	1.8
220860	VODKA	1.8
40410	WHEY	1.2
90220	OTHER GREEN TEA(NOT FERMENTED)	1.1
90230	BLACK TEA(FRMNTD) & PRTLY FRMNTD TEA IN IMMDTE PACKNG OF A CONTNT NOT EXCDNG 3 KG	0.9
71290	OTHER VEG MIX OF VEG,DRIED	0.8
200911	ORANG JUIC FROZN	0.8
80610	GRAPES FRESH	0.7
220840	RUM & TAFIA	0.7
80620	GRAPES DRIED	0.6
200919	OTHER ORNG JUICE NOT FROZEN/EXCLDING FROZN	0.5
40690	OTHER CHEESE	0.5
80510	ORANGES FRESH OR DRIED	0.5

5. Increase in India's Exports of Agricultural Products to the US and the EU

Assessment of increase in India's exports to the US and EU markets has been done for the top 100 6-digit tariff lines in each of the two markets. Table 4 shows the average bound rate and applied rates in the 100 products.

Table 4: Tariff Rates, Agricultural Products, US and EU (Top 100 6-digit HS lines of India's Exports)

Indicator	US	EU
Average bound rate (%)	16.76 (9.93)	12.51
Average applied rate (%)	16.71(9.87)	12.48
Percentage point cut necessitated by lowering of bound rate of duty	10.69 (5.89)	7.35

Note: Figures in brackets show values of tariff rates and tariff cuts if two items attracting a very high duty rate of over 350% are excluded.

In most products, the bound rates and the applied rates are the same or similar, and therefore the cuts in the bound rate after making tariff reduction according the tiered formula will translate into cuts in the applied rate. In the 100 products chosen for the EU, the reduction in the applied tariff rate is expected to be about 7.35 percentage points. In the case of the US, the reduction is by 10.69 percentage points (Annex 8 and 10 show the tariff rates and cuts for different tariff lines for the US and EU respectively). However, there are two products with exceptionally high tariff. If those two products are not considered, the reduction in applied tariff is by 5.89 percentage points.

In the period 2006-07 to 2008-09, India's average annual exports of top 100 agricultural products to the US market were about Rs 4780 crore. Based on the computed changes in the applied tariff and the price elasticities of demand for different products, the expected increase in exports is estimated at about Rs 101 crores which is about 2.1% of the value of exports of top 100 agricultural products to the US.

For the EU-15, the corresponding figure on the value of exports of top 100 items (6-digit HS) is Rs 7505 crore, and the expected increase in India's exports of these items is estimated as Rs 311 crore, which comes to about 4.1%.[2]

Tables 5 and 6 gives lists of items in which increase of exports will be more than Rs one crore in the US market and the EU market respectively. Detailed product-wise estimates of exports increase are given in Annex 9 and 11. The price elasticities on which the estimates of exports increase are based are shown in Annex 12 and 13.

[2] For the other 12 members of EU, the average annual value of exports of top 100 items during 2007-08 to 2008-09 was about Rs 550 crore and the increase would probably be of the order of Rs 15 to 20crore.

Table 5: Increase in India's Exports of Agricultural Products to the US Resulting from tariff cuts according to Tiered Formula

HS Code	Description	Change in exports,Rs crore
240120	TOBACCO PARTLY OR WHOLLY STEMMED/STRIPPED	28.3
151620	VEGTBL FATS & OILS & THEIR FRACTNS	8.4
240110	TOBACCO NOT STEMMED / STRIPPED	7.4
71220	ONIONS DRIED	5.5
240399	OTHR MNFRD TOBACO EXTRCTS & ESSNCS NES	5.3
330124	ESSNTL OIL OF PEPPERMINT(MENTHA PIPERITA)	5.2
200310	MUSHROOMS PREPD/PRSVD	4.8
40590	OTHERS	4.0
190190	OTHER MLT EXTRCT & FOOD PRPNS	3.8
240310	SMOKING TOBACCO W/N CONTNG TOBACO SUBSTUS	3.6
90420	FRUTS OF GENS CAPSCM/PMNTA,DRED/CRSHD/GRND	3.1
200590	OTHR VETBLS & ITS MXTRS PRPD/PRSVD,NT FRZN	2.2
150810	GROUND NUT OIL CRUDE	2.1
190110	FOOD PRPNS FR INFNT USE PUT UP FR RTL SALE	2.1
60499	FOLIAGE BRANCHS ETC,NOT FRSH WTHOUT FLWR/ FLWR BUDS & GRESSES SUITABLE FOR BOUQUETS/ORNAMENTAL PURPOSES EXCLDG FRSH	2.0
71080	OTHER VEGETABLES FRZN	1.6
200599	OTHER VEGETABLES AND MIXTURES OF VEGETABLES	1.6
170490	OTHER SUGR CNFCTNRY NT CONTAINING COCOA	1.3
60390	OTHR CUT FLWRS & FLOWER BUDS SUITABLE FOR BOQETS/FOR ORNMNTL PURPSES	1.2
520100	COTTON, NOT CARDED OR COMBED	1.1

Table 6: Increase in India's Exports of Agricultural Products to the EU-15 Resulting from tariff cuts according to Tiered Formula

HS code	Description	Change in exports Rs crore
100630	SEMI/WHOLLY MILED RICE W/N POLISHED/GLAZED	173.8
240120	TOBACCO PARTLY OR WHOLLY STEMMED/STRIPPED	38.4
240110	TOBACCO NOT STEMMED / STRIPPED	15.5
80610	GRAPES FRESH	10.8
40891	BIRDS' EGGS, IN SHELL, FRESH, PRESE (DRIED UNDER OTHERS)	8.4
210690	OTHER FOOD PREPARATIONS	7.8
200799	OTHRS	7.8
20230	BONELESS (CARCASSES AND HALFCARCASSES)	7.7
170310	CANE MOLSES RSLTD FRM EXTRCTN/RFNG OF SUGR	7.0
40811	EGG YOLKS DRIED	4.8
71220	ONIONS DRIED	4.1
240130	TOBACCO REFUSE	4.1
60390	OTHR CUT FLWRS & FLOWER BUDS SUITABLE FOR BOQETS/FOR ORNMNTL PURPSES	3.3
100700	GRAIN SORGHUM	2.8
200899	OTHER FRUIT PREPARATIONS	2.4
70990	OTHER VEG OF HEADING 0709 FRSH/CHLD	2.2
100590	OTHER MAIZE (CORN)	1.9
100820	MILLET	1.6
110290	OTHER CEREAL FLOUR	1.5
220720	ETHYL ALCHL & OTHR SPIRITS DENATURD OF ANYSTRUNGTH	1.4

6. Econometric Issues

An econometric issue in the estimation of the likely increase in India's exports to the US and the EU may now be taken up for discussion. The procedure that has been followed to make the estimates implicitly assumes that when the MFN tariff rate is reduced and the MFN imports go up, all MFN suppliers gain proportionately and hence their market shares do not change. Is this a reasonable assumption to make?

To discuss this issue theoretically, the following question may be posed: if the prices of all suppliers to a market reduce their price by a fixed percentage, say 5%, is there a reason to expect the consumers to shift from one supplier to another? There is probably no good reason to expect that. Since the relative prices remain the same, the market shares of the supplier should also not change. It should be noted that a cut in the MFN tariff has the effect of reducing the tax inclusive price of MFN supplier proportionately leaving the relative prices unchanged. The demand for different suppliers should therefore go up proportionately. This seems to be a reasonable assumption. Rather, to

assume the opposite seems unrealistic. There does not seem to be any strong ground to argue that when the prices of all suppliers go down proportionately, some will gain at the cost of others.

It may be added here that the assumption mentioned above is almost universally present in multi-country empirical studies on the impact of trade reforms including the computable general equilibrium models. It is difficult to find a study which is not making the assumption of proportionate effect of MFN tariff reduction on the demand for products of different MFN suppliers.

While the above arguments provide a good justification for making the assumption of proportionate effect of MFN tariff cuts on the demand for products of different MFN suppliers, there is obviously need for empirical verification. An adequate verification of the assumption is beyond the scope of this paper, but an attempt is made in that direction. For this purpose, an econometric analysis of inter-temporal variations in imports of agricultural products from a number of selected developing countries has been carried out.[3] Using data on US imports of agricultural products (15 major groups) from 12 developing countries[4] for five years (2005 to 2009),[5] the following model has been estimated for each of the countries covered in the study:

$$\ln M^{C}_{jt} = \alpha_j + \lambda \ln M^{T}_{jt} + u_{jt} \quad \ldots(13)$$

For any agricultural product, M^C denotes imports from country C and M^T denotes total US imports of the product. The subscript j is for product (group) and t for year. The hypothesis to be tested is that λ is equal to one. In the model in equation (13), if λ is equal to one for a country, then an increase in aggregate US imports of a particular product will raise imports from that country by the same proportion and hence its market share will remain the same. The empirical question is whether the estimates of λ are close to one for most of the countries selected for the study, particularly whether it holds for India.

The model in equation (13) is obviously incomplete. Imports of a product from a specific country will not only depend on total imports of the product by the US but also on inter-temporal changes in price competitiveness of the country in question as well as that of its competitors. The changes in exchange rate may have a significant effect. Nonetheless, a simple model, as in equation (13), could be a starting point of empirical verification of an assumption that is widely being used in empirical trade literature without much questioning.

[3] The countries have been selected on the basis of their agricultural exports to the markets of US, EU, Japan and Canada (Quad economies) in 2003 (data taken from Low et al. 2009), with the additional consideration that their preferential access to these markets should be moderate or low.

[4] The countries selected for the study are: Argentina, Brazil, China, Columbia, Cote d'lvoire, Ecuador, Guatemala, India, Indonesia, Malaysia, Philippines and Thailand,

[5] US Census Bureau, Foreign Trade Statistics.

The estimation of the model in equation (13) has been done by both the fixed effects model and the random effects model. The Results are reported in Tables 7 and 8; the former shows the results of the fixed effects model and the latter the random effects model.

Table 7: Estimation of Elasticity of Demand for Imports of Agricultural Products from Developing Countries with respect to Aggregate US Imports of the Product, Fixed Effects Model

Country	**Estimate of λ**	**Standard Error**	**t-statistic for the test of the null hypothesis, H_0 : λ=1**	**Inference based on t-statistic**
Argentina	0.626	0.271	-1.38	Not rejected
Brazil	0.581	0.325	-1.29	Not rejected
China	1.263	0.441	0.60	Not rejected
Columbia	1.533	0.734	0.73	Not rejected
Cote d'lvoire	0.926	0.378	-0.20	Not rejected
Ecuador	1.592	0.656	0.90	Not rejected
Guatemala	0.907	0.468	-0.20	Not rejected
India	1.314	0.621	0.51	Not rejected
Indonesia	1.115	0.435	0.26	Not rejected
Malaysia	1.175	0.960	0.18	Not rejected
Philippines	0.964	0.527	-0.07	Not rejected
Thailand	0.956	0.450	-0.10	Not rejected

It is seen from Tables 7 and 8 that the estimated elasticity is relatively high for China, Columbia, Ecuador and Malaysia, and it is relatively low for Argentina and Brazil. In other cases, the estimate is around one, in the range of 0.8 to 1.3. These results suggest that an increase in US imports of an agricultural products, other things remaining the same, leads to a more than proportionate increase in imports from China, Columbia, Ecuador and Malaysia (their market shares rise), a less than proportionate increase in imports from Argentina and Brazil (their market shares fall), and more or less proportionate increase in imports from the other selected countries including India, Indonesia, Philippines and Thailand (their market shares do not change or change only marginally).

It should be noted at the same time that the estimated elasticity is not statistically significantly different from one in all cases. Thus, the hypothesis that the elasticity is equal to one is not rejected in any of the cases. This provides support to the assumption that an increase in demand for imports following a lowering of MFN tariff will be shared proportionately by different MFN suppliers.

Table 8: Estimation of Elasticity of Demand for Imports of Agricultural Products from Developing Countries with respect to Aggregate US Imports of the Product, Random Effects Model

Country	Estimate of λ	Standard Error	t-statistic for the test of the null hypothesis, H_0 : λ=1	Inference based on t-statistic
Argentina	0.629	0.261	-1.42	Not rejected
Brazil	0.400	0.427	-1.41	Not rejected
China	1.430	0.394	1.09	Not rejected
Columbia	1.376	0.602	0.62	Not rejected
Cote d'lvoire	0.941	0.357	-0.17	Not rejected
Ecuador	1.210	0.564	0.37	Not rejected
Guatemala	1.061	0.432	0.14	Not rejected
India	0.862	0.554	-0.25	Not rejected
Indonesia	0.913	0.415	-0.21	Not rejected
Malaysia	1.576	0.765	0.75	Not rejected
Philippines	0.962	0.482	-0.08	Not rejected
Thailand	0.857	0.419	-0.34	Not rejected

Even if the assumption of unitary elasticity done not seem acceptable for all countries selected for the study, it will be noticed from Tables 7 and 8 that the estimated coefficients for India are 0.86 in the random effects model and 1.31 in the fixed effects model. These are not significantly different from one. Thus, the hypothesis that the elasticity is equal to one seems plausible and acceptable for India.

7. Conclusion

The estimates presented in the paper indicate that the tariff reduction in agricultural products according to the tiered formula of draft modalities (December 2008) will lead to an increase in India's imports of agricultural products by about one percent. Imports will increase by about Rs 300 to 350 crore. By comparison, the increase in India's exports of agricultural products to the US and EU markets will go up by about 2 to 4%. The increase will be by about Rs 400 crore. This estimate is based on the top 100 products exported by India to these markets. Considering other agricultural products exported to these markets, as also the exports made to other developed countries and to developing countries, the overall increase will probably be in the range of Rs 700 to 1000 crore, or even more. Evidently, India has more to gain from the implementation of tariff cuts according to the tiered formula than to lose from it.

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Annexure

Annex-1

Table A.1: Elasticity of Substitution, agriculture, mining and manufacturing

Description	GTAP elasticity	
	ESUBD	ESUBM
Paddy rice	5.1	10.1
Wheat	4.5	8.9
Cereal grains nec	1.3	2.6
Vegetables, fruit, nuts	1.9	3.7
Oil seeds	2.5	4.9
Sugar cane, sugar beet	2.7	5.4
Plant-based fibers	2.5	5.0
Crops nec	3.3	6.5
Cattle, sheep, goats, horses	2.0	4.0
Animal products nec	1.3	2.6
Raw milk	3.7	7.3
Wool, silk-worm cocoons	6.5	12.9
Forestry	2.5	5.0
Fishing	1.3	2.5
Coal	3.1	6.1
Oil	5.2	10.4
Gas	17.2	34.4
Minerals nec	0.9	1.8
Meat: cattle, sheep, goats, horse	3.9	7.7
Meat products nec	4.4	8.8
Vegetable oils and fats	3.3	6.6
Dairy products	3.7	7.3
Processed rice	2.6	5.2
Sugar	2.7	5.4
Food products nec	2.0	4.0
Beverages and tobacco products	1.2	2.3
Textiles	3.8	7.5
Wearing apparel	3.7	7.4
Leather products	4.1	8.1
Wood products	3.4	6.8
Paper products, publishing	3.0	5.9
Petroleum, coal products	2.1	4.2
Chemical, rubber, plastic prods	3.3	6.6
Mineral products nec	2.9	5.8
Ferrous metals	3.0	5.9
Metals nec	4.2	8.4
Metal products	3.8	7.5
Motor vehicles and parts	2.8	5.6
Transport equipment nec	4.3	8.6
Electronic equipment	4.4	8.8
Machinery and equipment nec	4.1	8.1
Manufactures nec	3.8	7.5

ESUBD: Elasticity of Substitution between domestically sourced and imported
ESUBM: Elasticity of Substitution between different import sources
Note: In GTAP database, ESUBM is taken as two times of ESUBD

Annex-2

1. List of countries getting substantial preferential access to the US market for agricultural products

Anguilla
Bangladesh
Barbados
Belize
Bosnia and Herzegovina
Columbia
Cambodia
Costa Rica
Ecuador
Guinea
Guatemala
Heard Island and McDonald Island
Honduras
Lebanon
Malawi
Paraguay
Peru
Pitcrain lsland
Senegal
Togo
Tonga
Trinidad and Tobago

2. List of countries getting substantial preferential access to the EU market for agricultural products

Bangladesh
Barbados
Belize
Botswana
Dominica
Domincan republic
Fiji
Georgia
Guyana
Jamaica
Kenya
Mauritius
Namibia
Papua New Guinea
St Lucia
St Vincent
Swaziland
Trinidad and Tobago
Zimbabwe

Note: List 1 is prepared on the basis of the study undertaken by Dean and Wainio (2009). List 2 is prepared on the basis of the study undertaken by Low et al. (2009). The value of agricultural imports from these countries, the proportion of imports which enjoy preferential access and the gains accruing from preferential access are parameters considered for preparing the list.

Annex-3

Table A.2: Estimates of price elasticity of demand for imports

Group	Coefficient of relative price variable, price elasticity	Coefficient of real GDP	HS Code
1	-0.432 (-3.18)	3.369 (11.64)	10511,20329,50100, 60290, 71310, 80131, 90111,120991,130190,140490, 151110, 180690, 200980, 210690, 230990, 330129, 350510, 380991,430130, 530121
2	-1.632 (-9.34)	2.438 (7.09)	160100, 240220, 290545, 410221, 500200, 510119
3	-3.527 (-8.63)	1.858 (2.39)	40590, 100590, 110900, 170111, 190219, 220720, 520100

Note: Import demand function has been estimated from data for 10 years, 1999-00 to 2008-09. One important tariff line from each chapter has been taken and then these have been grouped.

( ) t-statistic

[Other annexes are given in the Excel File attached]