**APPENDIX**

The basic framework of the SMART model was introduced by the Laird and Yeats in the year 1986 in the series of equations. The descriptions of the notations are given in below table:

|  |  |  |  |
| --- | --- | --- | --- |
| **Notations** | **Description** | **Notations** | **Description** |
| M | imports | Em | elasticity of import demand with respect to domestic price |
| X | exports | Ex | elasticity of export supply with respect to export price |
| P | price | Es | elasticity of substitution with respect to relative prices of the same product from different sources of supply |
| W | welfare | TC | trade creation |
| Y | national income | TD | trade diversion |
| Mn | imports from non-preference receiving countries | i | subscript denoting commodity |
| V | output in the importing country | j | subscript denoting domestic/importing country data |
| R | revenue | k | subscript denoting foreign/exporting country data(In certain equations k denotes the data of an alternative foreign/exporting country) |
| t | tariff rate or non-tariff distortion in ad valorem terms | d | prefix denoting change |

Source: Laird, S., & Yeats, A. (1986). The UNCTAD Trade Policy Simulation Model-A note on the methodology, data and uses. United Nations Conference on Trade and Development, 19.

The import demand function of importing country j for product i produced in country k can be expressed as follows:

**Mijk= F(Yj, Pij, Pik) (i)**

The exporting country k’s export supply function for commodity i can be expressed as follows:

**Xijk= F(Pikj) (ii)**

The partial equilibrium is attended when equation (1) is equal to equation (2) as given below:

**Mijk= Xijk (iii)**

In case of free trade, the commodity i’s price in the importing country j will be equal to the price in exporting market k in addition to transport and insurance charges. In this situation price will increase by an portion similar to the ad valorem incidence of any tariff or non tariff distortion applied on commodities. Hence:

**Pijk= Pikj (1+tijk) (iv)**

Country k’s export revenues can be expressed as follows:

**Rikj= Xikj. Pikj (v)**

**Trade Creation**

Trade Creation refers to the increase in imports of commodity i by country j from country k due to the tariff concession or elimination. The trade creation equation can be written as follows:

**TCijk= Mijk. Em. dtijk/ ((1+tijk). (1.(Em/Ex)) (vi)**

**Trade Diversion**

If the tariff concession on commodity i from country k is a preferential tariff concession and it is not apply to other countries then there is a further increase in imports demand of commodity i from country k due to the substitution away from imports demand of commodity i from other countries that becomes relatively more expensive. This is known as trade diversion in SMART.

 **d(P ijk /P ijK )**

 **ΣM ijk .ΣM ijK.Es.\_\_\_\_\_\_\_\_\_\_\_\_\_**

 **M ijk P ijk /P ijK**

**TD ijk = \_\_\_\_ . \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ (vii)**

 **ΣM ijk d(P ijk /P ijK )**

 **ΣM ijk + ΣM ijK + ΣM ijk .Es.\_\_\_\_\_\_\_\_\_\_\_\_**

 **P ijk /P ijK**

**The Price Effect**

The price effect occurs when the world price increases of the commodity which demand have rises due to the reduction of tariff. The price effect occurs when there is finite export supply elasticity. There will be no price effect if export supply elasticity is infinite. The price effect can be express as below:

**dPikj/Pikj= (dtijk/(1+tijk)).(Em/(Em-Ex)) (viii)**

The present study ignores the price effect because SMART assumes the infinite export supply elasticity.

**The Revenue Effect**

As we discussed above that there will be no price effect when export supply elasticity is infinite. Consequently, revenue will increase to the extent of increase in exports. Otherwise, the summation of percentage rise in exports and percentage rise in prices is equivalent to the percentage increase in revenue. The revenue effect can be expressed as:

**dRikj/Rikj= (dtijk/ (1+tijk)).Em.((1+Ex)/(Ex-Em)) (x)**

**The Welfare Effect**

The welfare effect occurs when the gains arises to the importing country’s consumers due to the reduction or elimination of tariffs or ad valorem incidence of non tariff distortions which lead to reduction in domestic prices. The welfare gain can also be taken as the increase in consumer surplus. It can be express as:

**Wijk= 0.5(dtijk. dMijk) (x)**