

to identify the rules of negotiation that serve to protect the welfare of the governments that are not participating in the bilateral negotiation. Eaton and Kortum (1997) developed a Ricardian model to explore the role of bilateral trade in spreading the benefits of innovation. Their theory delivers an equation for bilateral trade and identifies the underlying parameters of technology. The parameter estimates allow us to simulate the model to investigate the role of trade in spreading the benefits of innovation and to examine the effects of lower trade barriers. Deardorff (1995) in his work has discussed the determinants of bilateral trade, while Chen and Liu (1995) have reviewed the history of bilateral trade negotiations between Taiwan and the U.S. The question posed at the outset is: does bilateralism enhance or jeopardize multilateralism? The U.S.-Taiwan experience seems to suggest a negative answer.

Thus, free trade and its impact on the participating countries and the regional groupings to which they belong, have been intensely debated in the literature. We now turn to review similar studies conducted for the SAARC region.

Katti (2001) attempts to study Indo-Nepal economic relations between 1950 and 1998. The Indo-Nepal Trade treaties have been analyzed and the changing composition of Indo-Nepal trade has been examined. A similar work by Eusufzai (2000) has likewise given an in-depth analysis of the factors that explains the widening trade deficit of Bangladesh with India and traces the shifts and structural changes over time in Indo-Bangladesh trade. The issue of financing trade is also given due attention in the analysis. The author also examines the potential for cooperation within the SAARC on a bilateral basis. Ghuman and Madan (1999), on the other hand, attempt an analysis and discussion of the emerging trend of Indo-SAARC trade scenario since the inception of SAARC. Besides, an effort has also been made to work out India's terms of trade with each of the member country of SAARC. Mukherjee (1999)

describes trade in services of SAARC member countries and proposes that it becomes an integral part of SAPTA. She emphasizes that trade in services constitutes an inseparable part of commodity trade among SAARC countries, both by default and by voluntary trading. Hence, as far as SAARC countries are concerned, any preferential arrangement for trade in goods without trade in services is neither effective nor comprehensive.

Long before these studies ten Raa and Chakraborty (1991) tried to locate the comparative advantage of the Indian economy vis-à-vis the European economy. They developed a linear program, which maximized the foreign earnings of India and Bangladesh at given world prices subject to material balances and factor endowments. This maximization gave solutions on the basis of which the comparative advantages of the respective economies were identified. ten Raa and Mohnen (2000) likewise located the comparative advantages of the European and Canadian economies linked by trade. Following ten Raa and Chakraborty, Roy and Chakraborty (2000) applied a similar linear program to locate the comparative advantage of the Indian economy vis-à-vis the economy of Bangladesh.

Other studies which need to be mentioned in connection with the present survey are Sen (1972), Waqif (1987, 1991), Raghavan (1995), Prakash, Chowdhury, Singh and Sharma (1996), Mukherjee (1996), Raychowdhuri and Chatterjee (1996), Dubey (1996), ten Raa (1996), Panchmukhi (1996), Bhattacharjee (1997), Gonsalves and Jety (1999), Ahmed (2000), Haque (2000), Mukharji (2000), Minto (2000), Hyder (2000), and Singh (2000).

Following ten Raa and Chakraborty, Roy and Chakraborty located the comparative advantage of India vis-à-vis Bangladesh by maximizing the foreign earnings of India and Bangladesh at given world prices subject to the material balance and factor endowments of the two economies. It is more realistic to assume that the economies seek to maximize

their consumption rather than their foreign earnings. Thus, in the present paper, the comparative advantages of India and Bangladesh are determined in a different way.

3. The Model

We have framed a neoclassical model of international trade based on the well-known Input-Output method. It is developed in a linear programming framework. Each country is assumed to have fixed domestic endowments, with tradable and non-tradable commodities, which are used for domestic or final consumption and Leontief functions represent the technologies and preferences for both the economies. The efficient allocation of resources is obtained by maximizing the level of domestic final demand (including consumption and investment) in one economy, subject to a given proportion of final consumption in the two economies.

Let c denote the level of final consumption in India and c^* the same for Bangladesh and let $c^* = \gamma c$, i.e. γ is Bangladesh-Indian final consumption ratio. γ will be chosen so as to maintain the actual bilateral balance of payments.

The linear program is

$$\max e \cdot (\gamma + y) c$$

$$x, x^*, e$$

subject to

$$1. (I-A)x + (I-A^*)x^* \geq (\gamma + y)c + z + z^* \dots \dots \dots \text{for tradable commodities}$$

$$2. (I-A)x \geq yc, (I-A^*)x^* \geq y^*c \dots \dots \dots \text{for non-tradable commodities}$$

$$3. kx \leq K, lx \leq L \dots \dots \dots \text{for factor inputs in India}$$

$$4. k^*x^* \leq K^*, l^*x^* \leq L^* \dots \dots \dots \text{for factor inputs in Bangladesh}$$

where

$$e = (1 \dots 1)$$

x, x^* = gross output vector in India and Bangladesh, respectively

y, y^* = domestic final demand vector (including consumption and investment, excluding trade) in India and Bangladesh, respectively

z, z^* = net exports vector (except for bilateral trade) in India and Bangladesh, respectively

A, A^* = input-output coefficients matrix in India and Bangladesh

K, K^* = capital stock in India and Bangladesh

L, L^* = labour stock in India and Bangladesh

k, k^* = capital input coefficients row vector in India and Bangladesh

l, l^* = labour input coefficients row vector in India and Bangladesh

For every value of the final consumption ratio, γ , we denote the optimum (Indian) consumption level by $c(\gamma)$ and the outputs in the two countries by $x(\gamma)$ and $x^*(\gamma)$, respectively. For low values of γ , consumption of Bangladesh is not important and the bulk of the net output is exported to India. Similarly, for high values of γ the trade balance shows an Indian surplus.

The following vector gives Indian net exports to Bangladesh:

$$5. (I - A)x(\gamma) - y \cdot c(\gamma) - z$$

In a general equilibrium framework, the supporting competitive prices are given by the shadow prices of the linear program. These are denoted by $p(\gamma)$.

Indian surplus on bilateral trade account is equal to the product of $p(\gamma)$ and (5) and is denoted by $s(\gamma)$. For γ low, $s(\gamma)$ is negative, and for γ high, $s(\gamma)$ is positive. For some intermediate value, $s(\gamma)$ matches the observed surplus on the bilateral trade account,

$$6. s^0 = e \cdot (x^0 - Ax^0 - y - z)$$

where x^0 is the observed value of the gross output vector. We shall find the intermediate value of γ by the Newton-Raphson algorithm,

$$7. \gamma_{n+1} = [(s(\gamma_n) - s^0) / \gamma_n] - [s(\gamma_n) - s^0] / [s(\gamma_n) - s(\gamma_{n-1})]$$

with initial values $\gamma_0 = 0$ and $\gamma_1 = 1$. The limit process (7) solves $s(\gamma) = s^0$ and this gives the general equilibrium value of the Indo-Bangladesh final consumption expansion ratio, $\gamma = c^*/c$. For this value, the linear program determines the levels, $c(\gamma)$ and $c^*(\gamma)$, the allocations, $x(\gamma)$ and $x^*(\gamma)$, and the bilateral trade vector, (5).

The comparative advantages of the two economies will be located on the basis of the sign pattern of the bilateral trade. This is done solely on the basis of the fundamentals of the two economies (taste, technology and endowments). Endogenous are the prices of commodities (shadow prices corresponding to constraint (1)), and of the factors (shadow prices corresponding to constraints (2) and (3)).

The data required for the model are presented in the Appendix.

4. Results and Explanations

In this section we present the results of the above model.

TABLE 6.2

ACTUAL AND FREE TRADE GROSS OUTPUT FIGURES FOR INDIA AND BANGLADESH (RS. MILLION)

Sector	India		Bangladesh	
	Actual	Free	Actual	Free
1. Agriculture	15,24,646	19,21,695	1,57,424	1,62,152
2. Livestock, fishing and forestry	5,91,447	5,17,111	1,45,533	5,63,940
3. Other food	5,12,477	0	49,430	8,83,286
4. Textile	6,93,454	10,09,547	71,398	0
5. Manufacturing	15,26,168	27,71,635	79,361	0
6. Chemicals	2,60,958	5,81,248	68,711	0

(Continued to page 181)

Sector	India		Bangladesh	
	Actual	Free	Actual	Free
7. Machinery	7,46,435	12,13,388	3,687	0
8. Construction	7,06,010	10,10,486	82,963	1,31,507
9. Electricity & gas	2,72,912	4,22,680	30,656	0
10. Services	31,36,425	50,71,343	3,24,939	0

The gross output figures, (Table 6.2) show the commodities which each of the economy would produce under free competition and bilateral trade. Though observed trade shows that both countries have positive outputs of all the ten commodities mentioned in the above Table 6.2, but in a perfectly competitive world with free bilateral trade as postulated by the model presented in Section 3 India produces all commodities barring Other food. On the other hand, Bangladesh would specialize in Agriculture, Livestock, fishing and forestry, Other food, Construction and Electricity, leaving Textile, Manufacturing, Chemicals, Machinery and Services to India.

The respective comparative advantages of the two economies are located on the basis of the sign pattern of bilateral trade. The effect of free competition and bilateral trade on the pattern of trade would be as given in Table 6.3.

TABLE 6.3

FREE BILATERAL TRADE FROM INDIA TO BANGLADESH CONTRASTED WITH THE ACTUAL FIGURES (RS. MILLION)

Sector	Actual Net Exports of India to Bangladesh	Free Net Exports of India to Bangladesh
1. Agriculture	169	148965

(Continued to page 182)

Sector	Actual Net Exports of India to Bangladesh	Free Net Exports of India to Bangladesh
2. Livestock, fishing and forestry	1284	-499413
3. Other food	1410	-550696
4. Textile	59	43396
5. Manufacturing	889	185408
6. Chemicals	-64369	52667
7. Machinery	943	17248
8. Construction	0	0
9. Electricity & gas	-434528	-328174
10. Services	-481	435901

Note: Actual Net Exports are at observed prices and Free Net Exports are at endogenous prices.

The figures in Table 6.3 reveal that the comparative advantages of the Indian economy vis-à-vis Bangladesh in a competitive set up with free bilateral trade are in Agriculture, Textile, Manufacturing, Chemicals, Machinery and Services while India's observed trade figures suggest that she actually exports Agriculture, Livestock, Fishing and Forestry, Other Food, Textile, Manufacturing and Machinery, Construction being the non-tradable commodity. On the other hand, comparative advantage of Bangladesh, in a similar set up, is observed to be resting in Livestock, Fishing, Forestry, Other food and Electricity while, as observed from Table 6.3, Bangladesh actually exports to India Chemicals, Electricity and gas and Services and imports the rest from India, Construction being the non-tradable commodity.

Thus, it is seen that the comparative advantages of the economies as obtained by solving the linear program sometimes contrast with the actual trade figures of the countries. Chemicals and Services, for example, feature as export items of Bangladesh in reality but here we see that

both these goods appear as export items for the economy of India. For India the actual trade figures show that she exports Livestock, fishing, forestry and Other Food products while free trade figures suggest that these are import items for India. But otherwise the resulting trade pattern does not differ much compared to the reality. The contrast that sometimes arises may be due to market failures or certain model limitations, like, land is not treated as a separate factor of production, rest of the world is not taken into consideration, etc.

5. Gains from Free Trade

Given the results to our model in Section 4, we, now, in this section turn to assess the gains from free trade accruing to the two economies.

The solution to the linear programming model developed in Section 3 yields $\gamma = c^*/c$ and c . The consequent expansion factors for final consumption in India and Bangladesh are

$$(8) \quad c = 1.43 \text{ and } c^* = 1.97$$

Thus, free bilateral trade in a perfectly competitive world would boost Indian economy by 43% and the economy of Bangladesh by 97%. Thus, both the economies gain from free bilateral trade but the magnitude of gain is more for Bangladesh than for India. This shows bilateral trade is relatively more important for Bangladesh than for India.

However, total gains from free trade can be divided into two component parts: Gains by eliminating domestic waste of resources due to misallocation and less than full utilization, and gains due to free trade only.

We now proceed to isolate the gains from free trade only. For this we have to solve yet another linear program, which will enable us to determine the domestic efficiency gains that the economies can achieve without having departed from the observed bilateral trade pattern, which was obtained by solving the previous linear program.