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Welfare and Poverty Impacts of Trade Liberalization: A Dynamic CGE Microsimulation Analysis

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ABSTRACT: This case study focuses on the application of a dynamic top-down CGE microsimulation model of the Bangladesh economy. Specifically, this paper examines the macroeconomic, poverty and welfare impacts of complete and unilateral domestic trade liberalization in Bangladesh over the last two decades. Two different poverty lines for rural and urban households are used, which are endogenously determined by the model taking into account the rural and urban Consumer Price Indices (CPIs). The results suggests marked differences between the short and long run impacts of tariff liberalization. In the short run there are possibilities of reduced welfare and increased poverty. However, in the long run, resources are reallocated towards the more efficient and expanding sectors, generating positive outcomes in terms of welfare gains and poverty reduction.

Keywords: trade liberalization; CPI; top-down; CGE; Bangladesh

I. INTRODUCTION

Trade liberalization is one of the major policy reform issues in Bangladesh. Stretching back to the 1980s, when successive governments pursued reforms to make the economy more outward-oriented there has been a remarkable simplification in import procedures, a substantial decline in quantitative restrictions and sufficient opening up of trade in many restricted items. The rationalization of the tariff structure and floating of the exchange rates may have facilitated this process of trade liberalization. Trade policy reform also introduced generous promotional measures for exports including lower rate of interests on bank loans, duty drawbacks and exemption from value-added and other taxes. All this has helped reduce policy-induced anti-export biases. Between 1991-92 and 2004-05 the un-weighted average rate of tariff fell from 70 percent to 13.5 percent. A drastic reduction in unweighted tariff rates during the 1990s also resulted in the fall in import-weighted tariff rates which declined from 42.1 percent in 1990-91 to 11.5 percent in 2003-04. In 1991-92, average industrial and agricultural tariff rates were 73 percent and 76 percent respectively. However, there has been greater reduction in tariff rates for the industrial sector during that period which resulted in average industrial tariff to be 26.7 percent as against 39.7 percent average agricultural tariff rate in 2003-04 (Raihan, 2008).

This paper examines the macroeconomic, poverty and welfare impacts of complete and unilateral domestic trade liberalization in Bangladesh.

II. METHODOLOGY

A dynamic top-down CGE microsimulation model for the Bangladesh economy has been applied in the present study. This top-down microsimulation model is developed in line with Savard (2003) and Robilliard *et al*. (2008), and the dynamic CGE model for Bangladesh is an extension of the model developed by Annabi *et al*. (2005). The CGE model is calibrated with a Social Accounting Matrix (SAM) of Bangladesh for the year 2005. The 2005 SAM identifies the economic relations through four types of accounts: (i) production activity and commodity accounts for 26 sectors; (ii) four factors of productions: skilled and unskilled labour, agricultural and non-agricultural capital; (iii) four institutional agents: households, firms, government and the rest of the world; and (iv) two consolidated capital accounts to capture the flows of savings and investment by private and public institutions.

This model is a sequentially dynamic CGE model where the economic agents do not have any intertemporal optimization behaviour. Rather, these agents are myopic. This amounts to a series of static CGE models that are linked between periods with an updating procedure for dynamic exogenous variables (e.g. labour force, capital stock, etc).

The loss in government revenue due to any tariff cut is compensated by indirect or direct tax mechanism, which is inbuilt in the model. In each period the nominal exchange rate acts as the numéraire.

The model has an investment demand function which determines the pattern of reallocation of new investment among sectors after any shock according to the ratio of the rate of return to capital and its user cost. Total labour supply increases at an exogenous rate, which is equal to the population growth rate and the labour force growth rate. Other nominal variables, such as transfers and the minimal level of consumption in the LES function, and government savings, current account balance also increase at the same rate. An adjustment variable, which is introduced in the investment demand function, helps in bringing the equality between total savings and total investment in each period. The model allows all variables in the baseline to increase at the same rate in level, and the prices remain constant. This method is useful for the welfare and poverty analysis since all prices remain

constant along the business as usual (BAU) path.

The poverty and welfare effects of different policy shocks are estimated using the Bangladesh Household Income and Expenditure Survey (HIES) 2005. A total of 10047 households were covered in this survey. Changes in poverty indices are determined by changes in the poverty line and changes in nominal consumption (or income). The variations in consumption for each household group from the dynamic model are applied to generate new consumption vectors for individual households from the Bangladeshi household survey. Two different poverty lines for rural and urban households are used, which are endogenously determined by the model taking into account the rural and urban CPIs. Changes in poverty indexes are determined by changes in the poverty line and changes in nominal consumption (or income). The poverty line represents the cost of a basic-needs basket of goods. If the change in poverty line is greater (smaller) than the change in nominal consumption, then poverty is likely to decrease (increase).

III. SIMULATION AND RESULTS

According to SAM 2005, the tariff rates vary across the sectors and range from as low as 0 percent to as high as 40.19 percent (food). Other Textile has the highest sectoral import penetration ratio (42.66 percent), followed by Other Industry (39.94 percent). The highest share in total imports is for Other Industry (65.89 percent), followed by Other Textile (17.55 percent). The sectoral export orientation ratio is the highest for Knit RMG (99.32 percent) followed by Woven RMG (80.26 percent). Together Woven and Knit RMG exports account for 76.2 percent of total exports. In the case of value addition, all the service and construction sectors together account for 61.69 percent of total value added in the economy. The aggregated agricultural and the manufacturing sectors constitute 20.4 percent and 17.88 percent of the total value added respectively.

A scenario incorporating full trade liberalization, where tariffs on all imports are reduced to zero, is simulated. The base values of all other parameters are retained.

The macroeconomic impacts are reported in Table 1. The impacts on GDP and welfare illustrate the importance of analyzing trade liberalization in a dynamic framework; both measures decline in the short run (2008) and then strongly increase in the long run (2020) compared to the business-as-usual (BaU) simulation. The short-run negative impact is explained by the fact that trade liberalization contracts the import-competing and highly protected sectors, and capital cannot be quickly reallocated to the expanding export-oriented sectors. Positive growth is observed in the domestic terms of trade (TOT, the ratio of export to import prices on domestic markets) in both the short run and the long run, given the decline in domestic import prices. Imports and exports register strong positive growth, particularly in the long run. Reduced domestic import prices lead to a fall in consumer prices for both rural and, slightly more, urban households. Skilled and unskilled wage rates decline, although less so in the long run when capital is reallocated toward the expanding sectors. The reduction in unskilled wage rates is somewhat smaller, given the expansion of unskilled labour–intensive textile and garment sectors. The user cost of capital also declines in both the short run and the long run.

Table 1 Macroeconomic Effects (% change from the base year value)

Variables	*SR*	*LR*
Real GDP	-0.18	1.32
Welfare	-0.37	0.85
Headcount Ratio	0.74	-4.57
Domestic Terms of Trade	10.73	8.98
Imports	11.45	25.28
Exports	18.22	41.13
Urban CPI	-9.13	-6.84
Rural CPI	-8.75	-6.61
Skilled wage rate	-10.51	-6.49
Unskilled wage rate	-8.86	-4.81
Agricultural capital rental rate	-8.63	-8.96
Non-agricultural capital rental rate	-9.65	-9.03
User cost of capital	-9.41	-7.32

Source: Author's calculations, based on simulation results.
Notes: Short run (SR) refers to year 2008 and long run (LR) refers to year 2020; Welfare is measured as the sum of individual household equivalent variations; Domestic Terms of Trade are represented by the ratio of the domestic export and import price indexes.

Tariff elimination leads to an immediate reduction in the domestic price of imports that is proportional to the initial sectoral tariff rates. Domestic consumers respond by increasing import demand, once again in rough proportion to the fall in import prices, with the strongest increases in the grain mill, food, other textile and other industry. The sectors that had low initial tariff rates (grains, livestock, other fish, woven and knit ready-made garments) register negative import growth in the short run as consumers substitute toward goods for which prices drop more dramatically. In the long run, import volumes grow more (or contract less) in all sectors except leather.

The current account balance is fixed in the short run and subsequently increases at a fixed rate equal to the exogenous rate of population growth. Thus, the increase in imports leads to a real devaluation and an increase in exports. The export response is generally smaller in the long run, with the dramatic exception of woven and knit ready-made garments and other textiles. In the long run, the woven and knit ready-made garments sector flourishes, and their export volume increase by nearly 18 and 32 percent respectively compared to the BaU scenario (Table 2). With a

Table 2 Percentage Changes in Volumes from the BaU Path

	Imports		Domestic Output		Exports		Domestic Consumption		Domestic sales of local goods	
	SR	*LR*	*SR*	*LR*	*SR*	*LR*	*SR*	*LR*	*SR*	*LR*
Paddy			-2.08	-2.67			-0.45	-0.58	-2.08	-2.67
Grains	-7.85	-10.06	0.85	1.09			-2.61	-3.34	0.85	1.09
Other Crops	9.65	12.37	1.83	2.34	9.4	12.05	2.18	2.8	1.73	2.22
Livestock	-9.96	-12.77	-0.85	-1.09			-0.89	-1.14	-0.85	-1.09
Poultry			-0.72	-0.92			0.95	1.22	-0.72	-0.92
Shrimp			4.1	5.26	13.78	17.67	0.49	0.63	-1.16	-1.49
Other Fish	-9.1	-11.67	-0.48	-0.62	7.57	9.71	-0.58	-0.74	-0.58	-0.74
Rice Mill	2.53	3.24	-0.58	-0.74			-0.46	-0.59	-0.58	-0.74
Grain Mill	27.89	35.76	-2.6	-3.33			-2.18	-2.8	-2.6	-3.33
Food	35.07	44.96	-2.24	-2.87	5.97	7.65	3.88	4.98	-3.2	-4.1
Mill Cloth			-2.62	-3.36			-1	-1.28	-2.62	-3.36
Woven RMG	-7.27	-9.32	18.35	23.53	21	26.92	6.84	8.77	6.98	8.95
Knit RMG	-5.43	-6.96	31.57	40.48	31.69	40.63	-4.25	-5.45	13.22	16.95
Other Textile	16.51	21.17	18.29	23.45	21.33	27.35	17.47	22.4	18.23	23.37
Other Industry	9.04	11.59	-2.74	-3.51	5.01	6.42	2.14	2.74	-3.23	-4.14
Urban Construction			1.11	1.42			2.81	3.6	1.11	1.42
Rural Construction			0.2	0.26			1.89	2.42	0.2	0.26
Public Construction			1.42	1.82			3.13	4.01	1.42	1.82
Utility			0.13	0.17			1.81	2.32	0.13	0.17
Trade			-0.76	-0.98			0.9	1.16	-0.76	-0.98
Transport			-0.42	-0.54			1.25	1.6	-0.42	-0.54
Housing			-1.19	-1.53			0.46	0.59	-1.19	-1.53
Education & Health			0.11	0.14			1.79	2.29	0.11	0.14
Pub Admin			1.17	1.5			2.88	3.69	1.17	1.5
Private Service			-0.89	-1.14			0.77	0.99	-0.89	-1.14

Source: Author's calculations, based on simulation results.
Notes: Short run (SR) refers to year 2008 and long run (LR) refers to year 2020.

negative sloping demand curve for exports, FOB export prices fall.

Output expands most in woven and knit garments and other textile sectors. Export-intensive ready-made garments benefit from export expansion, and all these sectors register input cost savings, as evidenced by the positive evolution in value added prices despite falling output prices. Greatly increased import competition for textiles is offset by increased input demand from the ready-made garments sector. In contrast, production contracts in the heavier manufacturing sectors for which export demand stagnates or declines. As a result, non-agricultural capital and labour migrate to the textile and garments sectors and away from the other manufacturing sectors, with relatively little movement in the agricultural sectors. In the long run, the non-agricultural capital stock response is much larger and tempers the reallocation of skilled and unskilled labour. There are also moderate capital stock increases in the agricultural and service sectors.

In the short run, nominal factor returns fall by roughly 10 percent as a result of declining domestic prices. Overall investment falls in response to the average reduction in capital returns relative to the user cost of capital. This makes the long-term reduction in wage rates somewhat smaller, especially for unskilled wages. The average returns to capital fall slightly more in the non-agricultural sector, although these rates converge after long-term adjustment in sectoral investment rates.

Under both the scenarios, a fall in nominal income for all households is observed in both the short run and the long run (Table 3). This reduction is smallest among the poorest households—urban households with illiterate or low-educated heads and rural landless or marginal households—given their reliance on unskilled wages. Medium- and high-educated urban households, as well as non-agricultural rural households, are the biggest losers as a result of their high endowments in non-agricultural capital and skilled labour. In the short run, real consumption decreases for all households as nominal income falls more than consumer prices. However, the opposite is true in the long run. The figures of Equivalent Variation (EV) are very much in line with real consumption growth, with the poorest household categories emerging as the biggest winners.

The poverty effects of two simulations are reported in Table 4. Foster-Greer-Thorbecke (FGT) poverty measures (Foster *et al*., 1984) are applied in this study. The FGT indices allow us to compare three measures of poverty: head count ratio,

Table 3 Income and Welfare Effects (percentage change from BaU path)

		Rural					Urban			
Variable	Period	Landless	Marginal farmer	Small farmer	Large farmer	Non-Agric-ultural	Illiterate	Low education	Medium education	High education
Income	SR	-8.25	-8.47	-8.59	-8.48	-8.72	-8.42	-8.59	-9.08	-8.93
	LR	-4.60	-5.08	-5.39	-5.91	-5.33	-4.91	-5.32	-5.92	-5.96
CPI	SR	-8.06	-8.02	-8.03	-8.01	-8.18	-8.35	-8.43	-8.53	-8.69
	LR	-6.09	-6.05	-6.05	-6.04	-6.18	-6.27	-6.33	-6.37	-6.46
Welfare (EV)	SR	-0.19	-0.46	-0.52	-0.28	-0.52	-0.06	-0.15	-0.47	-0.10
	LR	1.61	1.01	0.62	0.11	0.86	1.41	0.99	0.40	0.23

Source: Author's calculations, based on simulation results.

Notes: Short run (SR) refers to year 2008 and long run (LR) refers to year 2020; EV = Equivalent Variation.

Table 4 Poverty Effects (percentage point change from the BaU Poverty Levels)

		Rural Households						Urban Households				
								Education				
Poverty Index	Period	Landless	Marginal Farmer	Small farmer	Large farmer	Non-Agric-ulture	Total Rural	Illiterate	Low	Medium	High	Total Urban
P0	2005	0.63	0.56	0.37	0.17	0.45	0.55	0.54	0.45	0.23	0.11	0.32
	SR	0.21	0.77	1.83	2.95	0.91	0.92	0.00	0.00	1.43	0.00	0.06
	LR	-6.30	-3.12	-3.88	0.00	-4.56	-4.83	-4.28	-6.75	0.00	0.00	-4.71
P1	2005	0.171	0.136	0.076	0.027	0.112	0.12	0.15	0.11	0.05	0.02	0.08
	SR	0.43	1.25	2.17	1.74	2.31	1.47	-0.11	0.54	3.30	0.00	0.12
	LR	-7.02	-6.13	-4.45	-2.52	-4.30	-5.62	-6.06	-6.58	-1.51	0.00	-6.04
P2	2005	0.063	0.046	0.021	0.007	0.038	0.051	0.065	0.045	0.032	0.01	0.035
	SR	0.57	1.67	2.59	2.46	2.90	1.80	-0.14	0.71	3.36	0.00	0.09
	LR	-3.34	-2.92	-2.12	-1.20	-2.05	-2.68	-2.89	-3.13	-0.72	0.00	-2.88

Source: Author's calculations, based on simulation results.

Notes: Short run (SR) refers to year 2008 and long run (LR) refers to year 2020; P0 = Head-count poverty; P1 = Poverty gap; P2 = Squared poverty gap.

poverty gap index and squared poverty gap index. In the short run, the poverty head-count increases for all households, except those headed by highly educated heads, for which there is no change, and those headed by illiterate heads, for which poverty falls. Also the depth of poverty and the severity of poverty increase in the short run. However, in the long run, poverty indices fall dramatically for all households, especially among the poorer households. This suggests that accumulation effects captured by the model play a major role in alleviating poverty.

IV. CONCLUSION

Use of a dynamic computable general equilibrium model coupled with household survey consumption data suggests that there are marked differences between the short run impacts and the long run impacts of tariff liberalization. In the short run there are possibilities of reduced welfare and increased poverty. However, in the long run, resources are reallocated towards the more efficient and expanding sectors, generating positive outcomes in terms of welfare gains and poverty reduction.

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