AgEcon SEARCH
RESEARCH IN AGRICULTURAL & APPLIED ECONOMICS

The World's Largest Open Access Agricultural & Applied Economics Digital Library

This document is discoverable and free to researchers across the globe due to the work of AgEcon Search.

Help ensure our sustainability.

Give to AgEcon Search

AgEcon Search
http://ageconsearch.umn.edu
aesearch@umn.edu

*Papers downloaded from **AgEcon Search** may be used for non-commercial purposes and personal study only. No other use, including posting to another Internet site, is permitted without permission from the copyright owner (not AgEcon Search), or as allowed under the provisions of Fair Use, U.S. Copyright Act, Title 17 U.S.C.*

Tracing the Poverty Impact of Market Reforms in Bangladesh

Mohammad Jahangir Alam [a,1], Nazmul Bhuiyan[b], Ismat Ara Begum [c] and Guido Van Huylenbroeck [d]

[a] Department of Agribusiness and Marketing, Bangladesh Agricultural University, Mymensingh-2202, Bangladesh; E-mail: alambau2003@yahoo.com

[b] Ministry of Public Administration, Government of the People's Republic of Bangladesh, Bangladesh

[c] Department of Agricultural Economics, Bangladesh Agricultural University, Mymensingh-2202, Bangladesh

[d] Department of Agricultural Economics, Ghent University, 653 Coupure Links, 9000 Ghent, Belgium

Selected Paper prepared for presentation at the International Association of Agricultural Economists (IAAE) Triennial Conference, Foz do Iguaçu, Brazil, 18-24 August, 2012.

Copyright 2012 by [authors]. All rights reserved. Readers may make verbatim copies of this document for non-commercial purposes by any means, provided that this copyright notice appears on all such copies.

[1] **Corresponding author:** Department of Agribusiness and Marketing, Faculty of Agricultural Economics and Rural Sociology, Bangladesh Agricultural University, Mymensingh-2202, Bangladesh, E-mail: alambau2003@yahoo.com; Tel. +88-01760648754

Abstract

The paper analyse the impact of market reforms on poverty in Bangladesh. To estimate the poverty impact at household level, a binary logit model has been estimated with two latest waves of household income and expenditure data from Bangladesh. The results show that a significant improvement has been made in reducing poverty in the recent decades. As a net importing country, liberalization might has direct impact on household's real income through the changes of real rice prices. The results also show that net rice buyer households are poorer than net rice sellers. So, decreased rice prices in domestic markets induced by liberalization have benefited the net rice buyers in Bangladesh, hence poverty declines.

Key words: market reforms, poverty, Bangladesh

1. Introduction

In Bangladesh, more than 60 percent of the population directly or indirectly depends on agriculture. So changes in any domestic and boarder policies in agriculture might have an effect on the rural poor. However, during the last two decades, the agricultural policy reforms were undertaken to the domestic input and the output markets- from a public planned economy to market oriented economy. Moreover, both tariff and non-tariff barriers have been reduced at border. The average un-weighted tariff rate was reduced substantially, maximum tariff rates have been reduced from 350% to 25%. Total number of restricted items has been decreased as well (MOF, 2009).

The market liberalization at the border and at the domestic level might have integrated domestic markets to the world. So, it is expected that the polices accelerates economic and productivity growth in the developing economies like Bangladesh which leads to reducing poverty. However, market liberalization might bring both gains and losses for Bangladesh. Mujeri (2002) shows that Bangladesh gained relatively less from trade liberalization in the 1990s. On contrary, Khondkar et al. (2006) show that the economic benefits from trade liberalization have been apprehend sooner than other reforms. Raihan (2007) analyzes the impact of global agricultural trade liberalization on Bangladesh economy using GTAP framework and finds that global agricultural liberalization will lead to a high welfare loss in Bangladesh therefore poverty will increase. Ahmed and Sattar (2004) concludes that trade liberalization had large contribution to the economic growth and poverty reduction in Bangladesh. Nargis (2006) examines poverty dynamics using longitudinal survey data of 1987, 2000 and 2004 and finds that shifting labour from farm to non-farm is positively

associated with rural poverty. The openness of the economy increased real wage for both the skilled and unskilled labour (Durevall and Munshi, 2006), hence brings income effect in the labour markets. Arndt et al. (2002) show that increased rice productivity and lowering import prices resulted to fall in real rice prices and hence reducing poverty. But decline in real prices of rice will results to decreases of farmer`s real income for the net sellers, on contrary, decreases of real rice prices will be beneficial for the net buyers in the expense of net sellers. The matter of fact is that net buyers of rice is about 80% in Bangladesh (HIES, 2005 and 2005). However, there is no evidence whether the policies brought significant poverty impact in Bangladesh because all of the studies are based on the ex-ante analyses of different liberalization scenarios but it is already more than decades, so, time has come to measure the impact `what have happened` because of the policy reforms. Moreover, because of the price-surge and volatility of production and prices at the world markets, the domestic policy makers are in the debates whether the liberalization policies should be continued or should go back to the protectionism policies on the ground of poverty and food security.

Given this backdrop, this study is an attempt to examine the impact of market reforms on the household poverty in Bangladesh. An empirical analysis is carried out using logit regression based on two recent waves of household income and expenditure data of Bangladesh.

The remainder of the paper is organized as follows: Section 2 presents the modelling framework and data which is then followed by results and discussions in section 3. Last section concludes.

2. Econometric model and data

The logit regression estimate the probability of an event whether it occurs or not, by predicting a binary dependent outcomes from a set of independent variables. The predictor variables in a logistic regression can be quantitative or qualitative, continuous, discrete, dichotomous, or categorical (Bewick *et al.*, 2005; Cantor, 2002).

In our analysis, the household poverty status is a dependent variable (whether the households belong to a poor or non-poor group) in relation to a set of predictor variables. Therefore, the linear probability model can be depicted as

$$P_i = E(Y = 1 | X_i) = \alpha + \beta_1 X_i$$

where X_i (i= 1, 2, 3……n) is the predictors and Y =1 means that the household belongs to poor category.

Let consider the following illustration:

$$P_i = E(Y = 1 | X_i) = \frac{1}{1 + \exp[-(\alpha + \beta_1 X_i)]} = \frac{1}{1 + \exp(-Z_i)} \qquad (1)$$

$$\text{where } Z_i = \alpha + \beta_1 X_i$$

The equation (1) is known as the cumulative logistic distribution function. Here Z_i ranges from - ∞ to +∞; P_i ranges between 0 and 1 and is non-linearly related to Z_i (i.e. X_i) thus satisfying two conditions required for a probability model.

Here, P_i is the probability of a household to be poor and is given by

$$\frac{1}{1 + \exp(-Z_i)}$$

Then (1-P_i), the probability of a household not to be poor which is then given by

$$\frac{1}{1 + \exp(Z_i)}$$

Therefore, we can write the following function-

$$\frac{P_i}{(1 - P_i)} = \frac{1 + \exp(Z_i)}{1 + \exp(-Z_i)} \qquad (2)$$

Here, P_i / (1-P_i) is an odds ratio in favour of household being a poor i.e.; the ratio of the probability that a household to be poor to the probability that household not to be poor. Taking natural logarithm we can obtain a function as follows

$$L_i = \ln[P_i / (1 - P_i)] = Z_i = \alpha + \beta_1 X_i$$

L is called as logit and is a log of the odds ratio which is linear in X and also in the parameters.

Household poverty determination

For determining the household poverty we have followed Ocran et al. (2006). A household is considered to be poor, if $c'p \leq \bar{c}p$. Where c is the household consumption basket, p is the price vector and $\bar{c}$ denotes the poverty basket.

Now, aggregate consumption can be determined as the aggregate income less savings as follows:

$$c'p = \tau'p + \lambda'r + m - s \qquad (3)$$

where, τ indicates the production vector (positive for output and negative for input), p is the price vector of production, λ is the vector of other household income from different income

generating assets, *r* is the related vector of the returns, *m* is the other non-produced households` income and *s* is savings.

Aggregate consumption less than the official `poverty line` indicated by the standard expenditure per month per person is denoted by 1 as a poor and otherwise is denoted by 0 as a non-poor household.

Empirical model

The empirical model postulated in this study can be presented as follows

$$P_{status} = f(D_i, L_i, R_i, E_i, O_i, I_i, H_i, S_i, C_i, F_i, T_i, e_i) \qquad (4)$$

where, P_{status} means the poverty status of a household, D_i is household demographics, L_i is administrative division of the household, R_i is household location (urban or rural), E_i is educational qualification attained by household head, O_i is occupation status of household head, I_i is illness shock of household head during last 12 month, H_i indicates land holding of household, S_i is social infrastructure facilities available for household in terms of drinking water sources and electricity availability, C_i is cereal producing household, F_i is food expenditure share and T_i is a trade dummy indicating the household net position whether `net rice buyer` or `net rice seller`.

Data

Two available waves (2000 and 2005) of household income and expenditure survey (HIES) data have been used to estimate the impact of market reforms on household poverty. Total number of sample was 7440 in 2000 and 10080 in 2005. Two stage stratified random sampling technique was used in both the surveys. The design is consisted of 1000 primary sampling units (PSUs) throughout the country from where 640 rural PSU were from rural areas and remaining 360 PSU from urban areas. In HIES 2000 consisted of 442 PSUs from 5 administrative divisions from where 252 were from rural areas and 190 were from urban areas. In the first stage, a total of 442 PSUs were drawn from the sampling frame with the probability proportional to size. These PSUs were selected from 14 different strata of which 5 were from rural and 9 were from urban (4 statistical metropolitan areas (SMA) and 5 municipal areas consisting 140 and 50 PSUs respectively). In the second stage, 20 households were selected from each PSU of rural and municipal strata and 10 households from each PSUs of SMA by systematic random sampling.

In the HIES 2005, the total number of PSUs is 504. In the first stage, these 504 PSUs were drawn from 6 administrative divisions. These PSUs were selected from 16 different strata.

There were 6 rural, 6 municipality and 5 SMA strata where the number of PSUs under each strata were 320, 135 and 45 respectively. In the second stage, using random sampling method 20 households were selected from each of the PSUs.

Poverty line

The poverty line used in our study is an official poverty line. Three steps are followed for estimating the cost of basic needs. First, the cost of a fixed food bundle is estimated. The bundle of food consists of eleven items: rice, wheat, pulses, milk, oil, meat, fish, potato, other vegetables, sugar and fruits (Ravallion and Sen, 1996). This bundle provides minimal nutritional requirements i. e., 2122 kilo calorie per day per person. The price of each item in the bundle is estimated by unit prices reported by the reference household group. The food poverty line is estimated by multiplying the prices with the quantities in the food bundle. The second step consisted of computing two non-food allowances for non-food consumption. One is obtained by taking the median amount spent on non-food items by those households whose per capita total expenditure is close to food poverty line, which is called `lower non-food allowance`. Other one is estimated by taking the median amount of spending for non-food items by a group of household whose per capita food expenditure is close to food poverty line, which is called `upper non-food allowance`. The third step consisted of simply adding the food poverty lines with lower and upper non-food allowances to generate the lower and upper poverty line. The upper poverty line is considered in our analysis to find out the household belongs to either poor or non-poor groups. In 2000 and 2005, the upper poverty line is estimated to be 738 Taka (US$ 14.67; US$ 1=50.31 Taka in 2000) and 905 Taka (US$ 14.74; US$ 1=61.39 Taka in 2005) per person per month respectively.

3. Empirical results and discussions

The empirical results of two different poverty models are presented and discussed in this section. The first model is estimated as a trade variable-exclusive general poverty model and the second model is estimated as a trade variable-inclusive model. Apart from these, poverty models are also estimated for both rural and urban households. Recall that for capturing the market reforms, a trade dummy is defined as follows- the value 1 is for net buyers of rice and o for net sellers of rice.

In 2000 model, the significant correlates of household`s poverty are household demographics, educational status of household head, occupation of household head, land holding size, access to electricity and trade dummy. Among the household demographics, size of the family and number of earning member in the family shows significant relationship

to household poverty status. The odds ratio of family size shows that with an increase of family size by 1 unit, the households are 1.3 times more likely to be poor. Number of earning member in the household is negatively associated with the poverty level. Result show that 1 unit more earning member in the family are 32% less likely to be poor.

In the case of divisional location, households in Chittagong division are less likely to be poor but households in Khulna and Rajshahi divisions are 1.54 and 2.22 times more likely to be poor in compare to the reference division Dhaka. The plausible reason is, the business opportunities and the associated employments are higher in Chittagong. On contrary, the employment opportunities are less in the northern part of the country such as Rajshahi because of underdevelopment in one hand and very often the region suffers from sudden and unpredicted floods and droughts on the other resulting to the higher rate of poor people. The variable `household location` shows significant relation to the household poverty. The odds ratio shows that households located in rural areas are 1.41 times more likely to be poor than the households located in urban areas. This happens because of the employment opportunities are higher in the urban areas than its counterpart rural, which induces higher urban migration.

Educational status of household head shows significant contribution to the poverty status. With the increase of level of education, the poverty declines. This is very well recognized that education widening the scope of income earnings, hence escaping poverty.

Table 1: Logit regression for poverty likelihood, 2000

Poverty status	Odds ratio	Std. Err.	t	P>|t|
HH demographics				
HH head male (Ref. female)	1.022	0.133	0.17	0.866
Family size	1.262	0.025	11.70	0.000
Earning member	0.682	0.028	-9.15	0.000
Household location				
Administrative division (Ref. Dhaka)				
Barisal	0.881	0.151	-0.73	0.465
Chittagong	0.516	0.078	-4.36	0.000
Khulna	1.544	0.217	3.08	0.002
Rajshahi	2.221	0.332	5.33	0.000
Rural/Urban (Ref. urban)				
Rural	1.409	0.193	2.50	0.013
HH head education (Ref. no education)				
Primary	0.598	0.052	-5.84	0.000
Secondary	0.577	0.056	-5.57	0.000
SSC	0.279	0.042	-8.31	0.000
HSC	0.209	0.046	-7.00	0.000
Graduate	0.202	0.060	-5.34	0.000

Above graduate	0.128	0.068	-3.84	0.000
HH head occupation (Ref. formal service)				
Agriculture	1.620	0.250	3.12	0.002
Construction	1.201	0.252	0.87	0.384
Sales worker	1.145	0.237	0.66	0.512
Service worker	0.995	0.153	-0.03	0.976
Manufacturing	0.950	0.183	-0.26	0.794
Not in work	1.008	0.189	0.05	0.964
Illness of head (Ref. no illness)	0.937	0.069	-0.88	0.378
Land holdings	0.932	0.020	-3.21	0.001
Social infrastructure				
Source of drinking water (Ref. tube well)				
Supply water	0.431	0.134	-2.70	0.007
Pond	0.780	0.157	-1.23	0.220
Open well	1.124	0.464	0.28	0.776
Waterfall	4.986	2.371	3.38	0.001
Other source	1.191	0.709	0.29	0.769
Electricity (Ref. no electricity)	0.468	0.048	-7.34	0.000
Cereal producer (Ref. others)	0.767	0.076	-2.66	0.008
Food expenditure share	1.045	0.003	12.82	0.000
Trade variable (Ref. net seller)				
Net rice buyer HH	1.606	0.207	3.67	0.000
F(31, 398)				
Prob. > F				

Household head having primary education is less likely to be poor than illiterate head. The education of the household head shows that having education of household head at secondary, SSC, HSC, graduate or above are less likely to be poor than illiterate household head. Education increases the skills, experiences for making productive decision therefore increases employment opportunities..

With respect to occupation of household head, only agricultural household shows significant relation to the poverty. The involvement of household head in agriculture results 1.62 times more likely to be poor in compare with formal services. The reasons are straightforward, the subsistence agriculture is not sufficiently remunerative. Moreover, the variability of agricultural production induces lower income. Also, the wage rate in agriculture in the developing country like Bangladesh is comparatively low. Illness of households head during last 12 months do not shows any significant influence on poverty. Land holding size of the household also shows significant influence on household poverty status.

The infrastructure shows significant influence, for instance the variables, sources of drinking water and access to electricity. The people using supply water are less likely to be poor in compare to the people those who are using tube well water; however, supply water facilities

are available only in urban and semi-urban areas. Although source of drinking water from waterfall shows significant result, very small number of households use this source for the purpose of drinking. The variable `household's access to electricity` is also significant, households having electricity access are less likely to be poor in compare with the households do not have electricity access. It is highly likely that access to electricity could create income generating activities and higher productivity which might contribute to higher income. The matter of fact that, these two variables could raise the question of endogeneity, but these are used as the poverty explanatory variables keeping in mind the real situation in Bangladesh.

The variable `cereal producer` shows significant relation to the poverty. The cereal producers are less likely to be poor than non-cereal producer. However, the cereal producers produce mainly rice and what along with some other crops and vegetables. One plausible reason is that non-cereals markets are not fairly developed and therefore it is likely that non-cereals producers are in loss which severely reduces the household income. Expenditure share on food have significant relation to household poverty, peoples spending more on food items are more likely to be poor. Result shows that one unit increase of food expenditure share resulting 1.05 times more likely to be poor. Households having higher expenditures on food has lower productive investment capacity, hence undermine household income.

Our main and important variable `trade dummy` shows the significant relation to the household poverty status. The net rice buyers are 1.61 times more likely to be poor than net sellers. The twist of this finding is, that liberalization policy induced decreases of real rice prices which is resulting to income gain of the net rice buyer household. Therefore, policy of market reforms benefits to net rice buyer households in Bangladesh.

The sign and significant levels of estimated model 2005 are almost similar. The results are presented in Table 2. The `trade variable` indicates that there is a significant relation between being a net rice buyer household and the likelihood of being poor. Net rice buyers are 1.44 times more likely to be poor than net rice seller households which indicate that there is a significant difference in poverty status between net rice buyer and net rice seller households. The general poverty models without trade dummy are presented in appendix 1 and 2 for interested readers.

Table 2: Logit regression for poverty likelihood, 2005

Poverty status	Odds Ratio	Std. Err.	t	P>|t|
HH demographics				
HH head male (Ref. female)	0.810	0.084	-2.02	0.044

Family size	1.379	0.024	17.76	0.000
Earning member	0.506	0.021	-16.06	0.000
Household location				
Administrative division (Ref. Dhaka)				
Barisal	1.116	0.190	0.64	0.520
Chittagong	0.535	0.069	-4.79	0.000
Khulna	1.656	0.228	3.66	0.000
Rajshahi	1.314	0.139	2.58	0.010
Sylhet	0.6983	0.129	-1.93	0.054
Rural/Urban (Ref. urban)				
Rural	1.106	0.106	1.05	0.294
HH head education (Ref. no education)				
Primary	0.645	0.050	-5.60	0.000
Secondary	0.508	0.043	-7.86	0.000
SSC	0.360	0.047	-7.71	0.000
HSC	0.263	0.052	-6.69	0.000
Graduate	0.135	0.038	-6.96	0.000
Above graduate	0.137	0.054	-5.05	0.000
HH head occupation (Ref. formal service)				
Agriculture	1.932	0.261	4.86	0.000
Construction	0.853	0.167	-0.81	0.421
Sales worker	0.749	0.118	-1.83	0.068
Service worker	1.024	0.138	0.18	0.858
Manufacturing	1.209	0.234	0.98	0.326
Not in work	0.661	0.104	-2.62	0.009
Illness of HH head (Ref. no illness)	0.995	0.067	-0.07	0.945
Land holdings	0.375	0.046	-7.85	0.000
Social infrastructure				
Source of drinking water (Ref. tube well)				
Supply water	0.771	0.162	-1.23	0.219
Pond	0.978	0.368	-0.06	0.954
Open well	1.484	0.351	1.67	0.096
Waterfall	1.110	0.463	0.25	0.802
Other source	1.546	0.246	2.73	0.006
Electricity (Ref. no electricity)	0.410	0.029	-12.57	0.000
Cereal producer (Ref. others)	1.160	0.101	1.71	0.088
Food expenditure share	1.045	0.002	17.12	0.000
Trade variable (Ref. net seller)				
Net rice buyer HH	1.440	0.152	3.44	0.001
F(32, 457)				
Prob. > F				

To check the overall goodness of the models` fit, the value of adjusted Wald is used. Test statistics shows that the models are significant. It is noted that for survey logit regression, the log pseudo likelihood value is not important to explain the model`s fit (Survey data analysis with STATA, UCLA).

Now we present the results from our trade inclusive rural and urban models for 2000 and 2005 in Table 3. The variable `food expenditure` share shows significant in all the models. Very interesting that the estimated rural trade-inclusive poverty models for both 2000 and 2005 show that trade dummy has significant relation to the poverty level where for the urban model (for the same period) it is insignificant. The net rice buyers households are more likely to be poor than the net sellers. Since market reforms resulted to the decreases of the real prices of rice, nevertheless, the net buyers households are benefitted from the price decreases, hence less poverty. However, direction of odds ratio is same for both rural and urban model i.e. net rice buyer households are more likely to be poor than net sellers.

Table 3: Summary of trade-inclusive rural and urban models for 2000 and 2005

Poverty status	2000		2005	
	Rural	Urban	Rural	Urban
	Odds Ratio	Odds Ratio	Odds Ratio	Odds Ratio
HH demographics				
HH head male (Ref. female)	1.0899	0.6492*	0.8076	0.8390
Family size	1.2537*	1.3694*	1.4239*	1.2697*
Earning member	0.6773*	0.6700*	0.4950*	0.5351*
Household location				
Administrative division (Ref. Dhaka)				
Barisal	0.9000	0.7483	1.0276	1.4714
Chittagong	0.5358*	0.3261*	0.4200*	1.1324
Khulna	1.5676*	1.5372	1.4113*	2.8705*
Rajshahi	2.4144*	1.1425	1.1856	1.9351*
Sylhet	NI	NI	0.6470	0.6485
HH head education (Ref. no education)				
Primary	0.6520*	0.3736*	0.6424*	0.6396*
Secondary	0.6267*	0.3988*	0.5432*	0.3967*
SSC	0.3098*	0.1952*	0.3978*	0.3059*
HSC	0.2546*	0.0637*	0.3487*	0.1642*
Graduate	0.2452*	0.1189*	0.2182*	0.0545*
Above graduate	0.1835*	dr	0.3155*	0.0358*
HH head occupation (Ref. formal service)				
Agriculture	1.8238*	0.7720	2.1734*	1.5373
Construction	1.4389	0.6556	0.7082	1.4318
Sales worker	1.2094	0.8890	0.7783	0.8133
Service worker	1.0725	0.7128	1.1028	1.1216
Manufacturing	1.0893	0.6074	1.3792	1.1971
Not in work	1.1651	0.4897	0.7474	0.6030
Illness of head (Reference: no illness)	0.9078	1.2108	1.0272	0.8356
Land holdings	0.9309*	0.9885	0.3424*	0.6066
Social infrastructure				
Drinking water Source (Ref. tube well)				
Supply water	3.0735*	0.3271*	0.9696	0.8591
Pond	0.7821	3.1941	0.9415	2.9224
Open well	1.1469	0.8809	1.6584*	1.6510

Waterfall	dr	1.2794	1.3863	0.2521*
Other source	1.2798	0.8204	1.6755*	dr
Electricity (Ref. no electricity)	0.4710*	0.3658*	0.4108*	0.4340*
Cereal producer (Ref. others)	0.7162*	1.9314	1.1369	1.1391
Food expenditure share	1.0445*	1.0502*	1.0436*	1.0505*
Trade variable (Ref. net seller)				
Net rice buyer HH	1.6468*	1.5087	1.4065*	1.3656

Notes: for details see appendix Tables 3, 4, 5 and 6; * = significant at 5% level; NI = not included in the model; dr = dropped due to zero

However, the results of the models are similar to the findings in the literature on the poverty dynamics and linkage between the agricultural trade liberalization and the poverty. The contribution of this study to the literature is to trace the impact of market reforms proxies by `trade dummy`. The trade variable in both the estimated model shows significant results however. As net rice buyers, households are more likely to be poor than net rice sellers. In general, net buyers of an imported commodity will be benefited in a net importing country like Bangladesh because liberalization has resulted to lower prices of that specific commodity. Klytchnikova (2006) shows that liberalization of irrigation equipments and fertilizer markets has led to increase in rice productivity and has declined both the producer and consumer prices in Bangladesh. It is estimated that nearly 80% of the households in Bangladesh are net rice buyer (BBS, HIES 2005). Since the net buyers are tend to be poorer than net sellers, decreased real price of rice in domestic market induced by liberalization obviously benefited the net rice buyers. As a result, net rice buyers have realized real income gain which in turn helped them to overcome poverty level.

4. Conclusions

Our results show the poverty dynamics and correlates of poverty dynamics in Bangladesh including tracing the impact of our main variable `trade dummy` on poverty. The significant correlates to poverty are family size, number of earning member, education of household head, occupation status of the household head, infrastructure such as access to electricity, cereal producers, etc.

The variable ` trade dummy` shows significant. As a net rice buyer, households are more likely to be poor than net rice seller households. Since the net buyers are tended to be poorer than net sellers, decreased real price of rice in domestic market induced by trade liberalization have obviously benefited the net rice buyers which in turn helps households to escaping from poverty. Since, Bangladesh is a net importing country and majority of the households are net buyers, the policy makers should focus to the correlates of poverty dynamics, do not going back to the protectionism policies. Also, policy makers have to be

very cautious to formulate any policy based on this analysis, therefore more rigorous analysis using longer period data is needed.

References

Ahmed, S. and Sattar, Z. (2004). Trade liberalization, growth and poverty reduction-The Case of Bangladesh. International Economics and Trade in South Asia, World Bank, Washington D.C.

Arndt, C., P. Dorosh, Fontana, M. and Zohir, S. (2002). Opportunities and challenges in agriculture and garments: A general equilibrium analysis of the Bangladesh economy. TMD Discussion Paper no. 107, IFPRI, Washington D.C.

BBS (Bangladesh Bureau of Statistics). (2005). Statistical Yearbook of Bangladesh. Statistics Division, Ministry of Planning, Government of the People's Republic of Bangladesh.

Bewick, V., Cheek, L. and Ball, J. (2005). Statistical review 14: Logistic regression. Critical Care. 9(1): 112-118.

Cantor, A. B. (2002). Understanding logistic regression. Evidence-based Oncology. 3: 52-53.

Durevall, D. and Munshi, F. (2006). Trade liberalization and wage inequality: empirical evidence from Bangladesh. Working Paper 205, Department of economics, School of Business, Economics and Law, University of Gothenburg, Sweden.

HIES (2000). Household Income and Expenditure Survey. Planning Division, Ministry of planning, Government of the People's Republic of Bangladesh.

HIES (2005). Household Income and Expenditure Survey. Planning Division, Ministry of planning, Government of the People's Republic of Bangladesh.

Khondker, B., Mujeri, M. and Raihan, S. (2006). Welfare and poverty impacts of tariff reforms in Bangladesh: A general equilibrium approach. MPIA Working Paper 2006-05, World Bank. Washington D.C.

Klytchnikova, I. and Doip, N. (2006). Trade reforms, farm productivity and poverty in Bangladesh. Policy research working paper 3980. World Bank, Washington, D.C.

MOF (Ministry of Finance). (2009). Bangladesh Economic Review 2007. Finance Division, Ministry of Finance, Government of the People's Republic of Bangladesh.

Mujeri, M. K. (2002). Globalization-poverty links in Bangladesh: Some broad observations in a review of Bangladesh's development 2001. Centre for Policy Dialogue, University Press Limited, Dhaka.

Nargis, N. and Hossain, M. (2006). Income dynamics and pathways out of rural poverty in Bangladesh, 1988-2004. Agricultural Economics, 35 (3): 425-435.

Ocran, M. K., Osei, R. D. and Adjasi, C. K. D. (2006). Trade liberalization and poverty: empirical evidence from household surveys in Ghana. A paper presented at the CASE conference on the reducing poverty and inequality: How can Africa be included? Oxford, UK, 17-22 March, 2006.

Raihan, S. and Razzaque, A. (2007). Global agricultural trade liberalization: Implications for the Bangladesh economy. In Raihan, S. and A. Razzaque (eds.). WTO and regional trade negotiation outcomes: Quantitative assessment of potential Implications on Bangladesh. Pathak Shamabesh, Dhaka, Bangladesh.

Ravallion, M. and Sen, B. (1996). When methods matters: monitoring poverty in Bangladesh. Economic Development and Cultural Change, 44 (4): 761-792.

Survey Data Analysis with STATA. UCLA: Academic Technology Services, Statistical Consulting Group. From http://www.ats.ucla.edu/stat/stata/ seminars/ svy_stata_8/ movies/survey_stata2.html (accessed July 20, 2008).

Winters, L. A. (2002). Trade, trade policy and poverty: what are the links? The World Economy, 25 (9): 1339-1367.

Appendix 1: Logit regression for poverty likelihood 2000 (Base model)

Poverty status	Odds ratio	Std. Err.	t	P>|t|
HH demographics				
HH head male (Ref. female)	1.022	0.133	0.17	0.862
Family size	1.264	0.025	11.79	0.000
Earning member	0.683	0.028	-9.17	0.000
Household location				
Administrative division (Ref. Dhaka)				
Barisal	0.882	0.154	-0.71	0.476
Chittagong	0.522	0.079	-4.28	0.000
Khulna	1.581	0.225	3.21	0.001
Rajshahi	2.175	0.327	5.16	0.000
Rural/Urban (Ref. urban)				
Rural	1.412	0.195	2.50	0.013
HH head education (Ref. no education)				
Primary	0.591	0.052	-5.92	0.000
Secondary	0.564	0.055	-5.79	0.000
SSC	0.270	0.040	-8.62	0.000
HSC	0.202	0.045	-7.12	0.000
Graduate	0.193	0.057	-5.48	0.000
Above graduate	0.124	0.066	-3.93	0.000
HH head occupation (Ref. formal service)				
Agriculture	1.540	0.240	2.77	0.006
Construction	1.186	0.251	0.81	0.421
Sales worker	1.114	0.230	0.52	0.600
Service worker	0.982	0.152	-0.11	0.909
Manufacturing	0.936	0.181	-0.34	0.736
Not in work	0.976	0.184	-0.12	0.902
Illness of head (Ref. no illness)	0.951	0.069	-0.67	0.500
Land holdings	0.921	0.023	-3.19	0.002
Social infrastructure				
Source of drinking water (Ref. tube well)				
Supply water	0.437	0.137	-2.63	0.009
Pond	0.778	0.153	-1.27	0.204
Open well	1.206	0.507	0.45	0.655
Waterfall	5.061	2.392	3.43	0.001
Other source	1.220	0.758	0.32	0.748
Electricity (Ref. no electricity)	0.466	0.048	-7.39	0.000
Cereal producer (Ref. others)	0.669	0.062	-4.26	0.000
Food expenditure share	1.047	0.003	13.20	0.000
F(30, 399)				
Prob. > F				

Appendix 2: Logit regression for poverty likelihood 2005 (Base model)

Poverty status	Odds Ratio	Std. Err.	t	P>|t|
HH demographics				
HH head male (Reference: female)	0.809	0.084	-2.04	0.042
Family size	1.386	0.024	18.23	0.000
Earning member	0.510	0.021	-15.87	0.000
Household location				
Administrative division (Ref. Dhaka)				
Barisal	1.117	0.192	0.65	0.517
Chittagong	0.526	0.069	-4.89	0.000
Khulna	1.646	0.227	3.61	0.000
Rajshahi	1.283	0.135	2.36	0.019
Sylhet	0.693	0.130	-1.95	0.051
Rural/Urban (Ref. urban)				
Rural	1.109	0.107	1.07	0.284
HH head education (Ref. no education)				
Primary	0.645	0.050	-5.64	0.000
Secondary	0.503	0.043	-7.97	0.000
SSC	0.357	0.047	-7.77	0.000
HSC	0.260	0.052	-6.72	0.000
Graduate	0.134	0.038	-7.06	0.000
Above graduate	0.136	0.052	-5.15	0.000
HH head occupation (Ref. formal service)				
Agriculture	1.897	0.256	4.73	0.000
Construction	0.852	0.167	-0.81	0.417
Sales worker	0.741	0.116	-1.89	0.059
Service worker	1.022	0.137	0.17	0.868
Manufacturing	1.207	0.234	0.97	0.332
Not in work	0.661	0.104	-2.62	0.009
Illness of head (Ref. no illness)	1.007	0.067	0.11	0.913
Land holdings	0.328	0.039	-9.31	0.000
Social infrastructure				
Source of drinking water (Ref. tube well)				
Supply water	0.772	0.163	-1.22	0.223
Pond	0.981	0.376	-0.05	0.961
Open well	1.466	0.344	1.63	0.104
Waterfall	1.093	0.470	0.21	0.835
Other source	1.614	0.260	2.97	0.003
Electricity (Ref. no electricity)	0.404	0.028	-12.82	0.000
Cereal producer (Ref. others)	1.036	0.089	0.42	0.678
Food expenditure share	1.045	0.002	17.27	0.000
F(31, 458)				
Prob. > F				

Appendix 3. Logit regression for poverty likelihood 2000 (Rural model)

Poverty status	Odds ratio	Std. Err.	t	P>|t|
HH demographics				
HH head male (Ref. female)	1.089	0.160	0.58	0.560
Family size	1.253	0.027	10.26	0.000
Earning member	0.677	0.031	-8.36	0.000
Household location				
Administrative division (Ref. Dhaka)				
Barisal	0.900	0.167	-0.57	0.572
Chittagong	0.535	0.090	-3.71	0.000
Khulna	1.567	0.247	2.85	0.005
Rajshahi	2.414	0.404	5.26	0.000
HH head education (Ref. no education)				
Primary	0.652	0.064	-4.31	0.000
Secondary	0.626	0.073	-3.98	0.000
SSC	0.309	0.054	-6.68	0.000
HSC	0.254	0.062	-5.60	0.000
Graduate	0.245	0.087	-3.95	0.000
Above graduate	0.183	0.105	-2.94	0.004
HH head occupation (Ref. formal service)				
Agriculture	1.823	0.292	3.75	0.000
Construction	1.438	0.347	1.51	0.134
Sales worker	1.209	0.288	0.80	0.426
Service worker	1.072	0.174	0.43	0.668
Manufacturing	1.089	0.244	0.38	0.703
Not in work	1.165	0.229	0.78	0.438
Illness of head (Reference: no illness)	0.907	0.074	-1.18	0.240
Land holdings	0.930	0.021	-3.13	0.002
Social infrastructure				
Source of drinking water (Ref. tube well)				
Supply water	3.073	0.557	6.19	0.000
Pond	0.782	0.158	-1.21	0.226
Open well	1.146	0.517	0.30	0.761
Other source	1.279	0.850	0.37	0.711
Electricity (Ref. no electricity)	0.471	0.054	-6.50	0.000
Cereal producer (Ref. others)	0.716	0.072	-3.29	0.001
Food expenditure share	1.044	0.004	11.38	0.000
Trade variable (Ref. net seller)				
Net rice buyer HH	1.646	0.217	3.79	0.000
F(29, 219)				
Prob. > F				

Appendix 4. Logit regression for poverty likelihood 2000 (Urban model)

Poverty status	Odds ratio	Std. Err.	t	P>|t|
HH demographics				
HH head male (Ref. female)	0.649	0.137	-2.04	0.043
Family size	1.369	0.057	7.50	0.000
Earning member	0.670	0.058	-4.58	0.000
Household location				
Administrative division (Ref. Dhaka)				
Barisal	0.748	0.275	-0.79	0.432
Chittagong	0.326	0.087	-4.19	0.000
Khulna	1.537	0.388	1.70	0.090
Rajshahi	1.142	0.312	0.49	0.626
HH head education (Ref. no education)				
Primary	0.373	0.069	-5.30	0.000
Secondary	0.398	0.059	-6.20	0.000
SSC	0.195	0.061	-5.22	0.000
HSC	0.063	0.038	-4.59	0.000
Graduate	0.118	0.068	-3.70	0.000
HH head occupation (Ref. formal service)				
Agriculture	0.772	0.346	-0.58	0.565
Construction	0.655	0.304	-0.91	0.365
Sales worker	0.889	0.377	-0.28	0.782
Service worker	0.712	0.262	-0.92	0.358
Manufacturing	0.607	0.239	-1.26	0.208
Not in work	0.489	0.223	-1.56	0.119
Illness of head (Ref. no illness)	1.210	0.171	1.35	0.179
Land holdings	0.988	0.067	-0.17	0.865
Social infrastructure				
Source of drinking water (Ref. tube well)				
Supply water	0.327	0.094	-3.86	0.000
Pond	3.194	3.410	1.09	0.278
Open well	0.880	0.602	-0.19	0.853
Waterfall	1.279	0.5231	0.60	0.548
Other source	0.820	0.598	-0.27	0.786
Electricity (Ref. no electricity)	0.365	0.068	-5.39	0.000
Cereal producer (Ref. others)	1.931	0.648	1.96	0.051
Food expenditure share	1.050	0.007	7.29	0.000
Trade variable (Ref. net seller)				
Net rice buyer HH	1.508	0.726	0.85	0.394
F(29, 153)				
Prob. > F				

Appendix 5. Logit regression for poverty likelihood 2005 (Rural model)

Poverty status	Odds Ratio	Std. Err.	t	P>|t|
HH demographics				
HH head male (Ref. female)	0.807	0.094	-1.83	0.068
Family size	1.423	0.031	16.16	0.000
Earning member	0.495	0.024	-14.11	0.000
Household location				
Administrative division (Ref. Dhaka)				
Barisal	1.027	0.197	0.14	0.887
Chittagong	0.420	0.064	-5.62	0.000
Khulna	1.411	0.235	2.06	0.040
Rajshahi	1.185	0.145	1.39	0.165
Sylhet	0.647	0.135	-2.07	0.039
HH head education (Ref. no education)				
Primary	0.642	0.056	-5.02	0.000
Secondary	0.543	0.053	-6.21	0.000
SSC	0.397	0.063	-5.79	0.000
HSC	0.348	0.087	-4.20	0.000
Graduate	0.218	0.082	-4.04	0.000
Above graduate	0.315	0.153	-2.37	0.018
HH head occupation (Ref. formal service)				
Agriculture	2.173	0.346	4.87	0.000
Construction	0.708	0.168	-1.45	0.148
Sales worker	0.778	0.153	-1.27	0.204
Service worker	1.102	0.182	0.59	0.554
Manufacturing	1.379	0.342	1.29	0.197
Not in work	0.747	0.139	-1.56	0.120
Illness of head (Ref. no illness)	1.027	0.076	0.36	0.717
Land holdings	0.342	0.045	-8.11	0.000
Social infrastructure				
Source of drinking water (Ref. tube well)				
Supply water	0.969	0.422	-0.07	0.944
Pond	0.941	0.381	-0.15	0.882
Open well	1.658	0.399	2.10	0.037
Waterfall	1.386	0.622	0.73	0.468
Other source	1.675	0.297	2.91	0.004
Electricity (Ref. no electricity)	0.410	0.032	-11.16	0.000
Cereal producer (Ref. others)	1.136	0.106	1.37	0.170
Food expenditure share	1.043	0.003	14.13	0.000
Trade variable (Ref. net seller)				
Net rice buyer HH	1.406	0.155	3.08	0.002
F(31, 284)				
Prob. > F				

Appendix 6. Logit regression for poverty likelihood 2005 (Urban model)

Poverty status	Odds Ratio	S. E	t	P>|t|
HH demographics				
HH head male (Ref. female)	0.839	0.192	-0.76	0.446
Family size	1.269	0.040	7.43	0.000
Earning member	0.535	0.044	-7.54	0.000
Household location				
Administrative division (Ref. Dhaka)				
Barisal	1.471	0.465	1.22	0.223
Chittagong	1.132	0.253	0.56	0.579
Khulna	2.870	0.504	6.00	0.000
Rajshahi	1.935	0.426	2.99	0.003
Sylhet	0.648	0.239	-1.17	0.243
HH head education (Ref. no education)				
Primary	0.639	0.100	-2.85	0.005
Secondary	0.396	0.068	-5.34	0.000
SSC	0.305	0.074	-4.88	0.000
HSC	0.164	0.054	-5.40	0.000
Graduate	0.054	0.022	-7.16	0.000
Above graduate	0.035	0.022	-5.26	0.000
HH head occupation (Ref. formal service)				
Agriculture	1.537	0.433	1.52	0.129
Construction	1.431	0.468	1.10	0.274
Sales worker	0.813	0.205	-0.82	0.415
Service worker	1.121	0.248	0.52	0.605
Manufacturing	1.197	0.365	0.59	0.556
Not in work	0.603	0.186	-1.63	0.104
Illness of head (Ref. no illness)	0.835	0.132	-1.13	0.260
Land holdings	0.606	0.283	-1.07	0.287
Social infrastructure				
Source of drinking water (Ref. tube well)				
Supply water	0.859	0.198	-0.66	0.512
Pond	2.922	3.740	0.84	0.403
Open well	1.651	1.394	0.59	0.553
Waterfall	0.252	0.066	-5.23	0.000
Electricity (Ref. no electricity)	0.434	0.065	-5.53	0.000
Cereal producer (Ref. others)	1.139	0.281	0.53	0.598
Food expenditure share	1.050	0.004	10.88	0.000
Trade variable (Ref. net seller)				
Net rice buyer HH	1.365	0.427	0.99	0.321
F(30, 145)				
Prob. > F				