Impact of a Commodity Price Spike on Poverty Dynamics: Evidence from a Panel of Rural Households in Bangladesh

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Abstract

In this paper we assess the effects of the dramatic rise in agricultural commodity prices during 2007-2008 on income dynamics and poverty among rural households in Bangladesh. We use data from a nationally representative longitudinal survey of rural households in Bangladesh collected in four waves in 1988, 2000, 2004, and 2008. Nargis and Hossain (2006) analysed income dynamics and poverty incidence for the first three waves, finding a declining trend in both the incidence and depth of poverty, aided by in particular by human capital development and the off-farm labor opportunities. Here we update the analysis to include data collected in 2008, at the height of the aforementioned spike in agricultural prices. We find that various measures of rural poverty in Bangladesh had sunk back to pre-2000 levels. The price of a balanced food basket more than doubled from 2000-2008, while household incomes rose only 15 percent during the same time period. We present updated analysis of income determinants and document a reduction in upward poverty mobility during 2004-2008. Moreover, we present new analysis that suggests that determinants of poverty have not been time-invariant.

Keywords: poverty, income, commodity price spike, rural households, Bangladesh, panel data

Introduction

Prior to the recent global crises in commodity and financial markets Bangladesh had enjoyed two decades of relative success in alleviating rural poverty (Sen 2003). From 1988 to 2004 the percentage of rural households below the poverty line fell nearly 20 percentage points, from 62 percent to 44 percent, a reduction that was associated with a shift towards nonfarm employment facilitated by human capital accumulation (Nargis and Hossain 2006). However the surge in commodity prices and, more narrowly, the global rice price crisis, may have slowed or reversed previous economic growth, and potentially changed the overall economic environment faced by rural households in Bangladesh.

We use longitudinal survey data from rural households to document changes in household income and poverty during 2004-2008, compare those changes to trends during 1988-2004, and quantify the impact of various the household characteristics on household income and poverty before and during the commodity price spike.

Survey Design and Summary Statistics

We evaluate rural income dynamics using data from four waves of panel data collected from rural households in Bangladesh over the past two decades (1987-88, 1999-00, 2003-04, and 2007-08). The data are drawn from a repeat survey of a nationally representative sample of rural households in Bangladesh conducted to assess changes in rural livelihood systems. The benchmark survey was implemented in 1987–1988 among 1,240 rural households from 62 villages in 57 out of 64 districts in Bangladesh. The sample was drawn using a multistage random sampling method. In the first stage, 64 unions were randomly selected from a list of all unions in the country. In the second stage, one village was selected from each union that best represented the union with regard to the size of land holding and literacy rate. A census of all the households in the selected villages was conducted to stratify the households by the size of landownership and land tenure. A random sample of 20 households was drawn from each village such that each stratum is represented by its probability proportion.

The same villages were revisited in 1999-2000, 2003-2004, and 2007-2008 in order to survey the original households plus their offshoots, as well as additional households to address sample attrition problems. The total sample size in the 2nd wave of survey (in 1999-2000) was 1,880 households comprising 30 to 31 households from each of the 62 villages. The sample was drawn using the stratified random sampling method. The stratification was based on a wealth ranking technique of the participator rural appraisal method. The total sample size in the 3rd wave of survey (in 2003-2004) was 1,927 covering the households present in the first two waves and their offshoots. The total sample size in the final wave of survey (in 2007-2008) was 2,010 following the households present in the first three waves and their offshoots. The 1987-1988 and 2007-2008 waves offer a wide window of 20 years allowing us to examine long-run poverty dynamics, while the most recent wave of 2003-2004 and 2007-2008 permits an understanding of the shorter-run poverty dynamics.

The survey instrument is a semi-structured questionnaire designed to collect information on multiple aspects of rural economy and livelihoods, including resource endowments, farm and non-farm activities, income and expenditure, employment, commodity prices, poverty, gender, and government welfare programs.

We report summary statistics from the four rounds of surveys in Table 1. The average area of cultivated land per household has fallen since 1988, but appears to have stabilized at just less than 0.5 hectares since 2004. Among farm households in 2008, approximately half owned all of the land they farmed in 2008—an increase from 2004—and one-fourth were pure tenants. Tenancy accounted for only 14 percent of cultivated land, a large drop from the 2004 share of 40 percent, and a reverse of the trend from 1988-2004. The large portion of nonfarm households in the sample indicates an increasing importance of nonfarm income among rural households.

The value of physical capital rose significantly from 2004-2008. Growth of agricultural capital was particularly strong, rising 88 percent since 2004 and more than doubling since 2000. Meanwhile, human capital has shifted away from agriculture. The average number of agricultural workers per household has continued to fall, while the average number of domestic and overseas migrant workers per household has risen.

Agricultural production technology continues to evolve. Adoption of modern rice varieties rose to 86 percent of cultivated rice area in 2008. And rural electrification, which Ahmed and Hossain (1990) showed to contribute to agricultural productivity, has expanded to cover 83 percent of households.

Finally trends in household demographics have continued through 2008. The average household size fell below 5.0 and the average age of the household head approached 40 in 2008. Nargis and Hossain (2006) linked these shifts to a marked decline in population growth beginning in the 1990s.

Household Income: Trends and Determinants

We report a summary of household income composition for each of the four waves of the survey in Tables 2 and 3. Average real household income continued to grow through 2008, rising to 94,633 Taka from 82,064 Taka in 2004. The implied annual of growth rate of 3.6 percent during that period exceeded income growth from 1988-2000 (2.3 percent) and 2000-2004 (1.8 percent). Farm income accounted for 43 percent of total income in 2008, virtually unchanged from the 2000 and 2004 surveys. Income from rice, income from other crops, and agricultural wages grew at the same pace as total income during 2004-2008. Rice income recovered from a down period during 2000-2004 to rise above its 2000 levels in 2008, and accounted for more than a third of farm income and 15 percent of total income in 2008.

Total non-farm income grew at a slightly faster rate than agricultural income during 2004-2008. But perhaps the most striking feature of non-farm income is the dramatic shift in the composition of non-farm income. Income from services (including teaching, medical care, religious services) and business, which accounted for 35 percent of total income in 2004, fell by 18.5 percent from 2004-2008. The shortfall was made up by large gains in remittance income (17 percent average annual growth) and non-farm wages (10.7 percent average annual growth). Remittances grew to account for 23 percent of total income in 2008, nearly as much as the contribution from crop income (26 percent), and higher than the contribution from rice income.

Using these data we estimate an income regression in order to assess the determinants of household income. We use as our dependent variable log household income, and include various household demographics and production characteristics as regressors[1], as follows:

$$\ln y_i = \boldsymbol{X}_i'\boldsymbol{\beta} + \varepsilon_i, \;\; i = 1, \ldots, N$$

where y_i is household income, and $\boldsymbol{X}_i$ is a vector of household characteristics believed to influence income. In Table 4 we report results from the regression estimated on each of the four cross sections. In each case we estimate the model by least squares, and employ a robust estimator of the covariance matrix with village-wise clusters.[2]

Farming households have higher income on average. Household income was 8 percent lower among nonfarm households than farm households, and 7 percent lower among farm households reliant entirely on rented land in 2008. Among land-owning households, an additional hectare of land raised household income by approximately 20 percent in 2008.

The number of agricultural workers in the household does not have a significant effect on household income. However other types of workers increase household income. In 2008 an additional non-agricultural worker (e.g.,) raised household income by 16 percent, a domestic migrant worker by 3 percent, and an overseas migrant worker by 49 percent.

The qualitative and quantitative impacts of various determinants on household income in the sample have remained largely unchanged over the two decades that we observe the households. However, a couple exceptions are worth noting. Since 1988, when an additional domestic migrant worker raised household income by 30 percent, access to this market has not had an important impact on household income. Also, the impact of modern rice varieties on household income has steadily declined over the life of the survey.

A well-known limitation of cross-sectional analyses of household income is that unobserved, household-specific factors that influence income cause least squares to be biased if those factors are also correlated with right-hand side variables included in the model. We are able to eliminate this problem by estimating panel models of household income. Specifically, we estimate a fixed effects version of the income equation, which includes a household-specific intercept to capture otherwise unmeasured household-specific attributes. We also include time fixed effects to capture market or macroeconomic conditions that differ across survey years. We report fixed effects estimates of the household income model in Table 5.

Fixed effects estimates of the household income model are largely consistent with the cross-section results. A few differing results are worth noting. The number of agricultural workers, which had a small, statistically insignificant effect in the cross-sectional analyses, has a small, statistically significantly positive effect on household income in the panel model. Also, the contribution of overseas migrant workers to household income, which varies between 0.3 and 0.7 in the cross-sectional analyses, is estimated to be 0.3 in the panel model. Finally, the time

[1] Estimating the model on log per capita income yields very similar results.

[2] Nargis and Hossain (2006) report WLS results for the same model estimated by feasible weighted least squares for 1988, 2000, and 2004.

fixed effects reported in Table 6 are consistent with growing average household income over time (Table 2).

Measuring Poverty

We now turn to assessing poverty dynamics. We follow Nargis and Hossain (2006) in using Foster et al.'s (1984) measures of poverty:

$$P_\alpha = \frac{1}{n}\sum_{y_i<z}\left[\frac{z-y_i}{z}\right]^\alpha,$$

where y_i is real per capita income for household i, n is the total household population, z, is the poverty line, and α is a degree of aversion to inequality. Thus we have three measures of poverty for three different values of α:

i. For α = 0, P_0 is the share of poor people in the population, a measure of the incidence of poverty;

ii. For α = 1, P_1 is a weighted average of the distance below the poverty line, or a measure of the depth of poverty;

iii. For α = 2, the distance below the poverty line is squared, such that P_2 is an alternative measure of poverty depth giving greater weight to those households deeper in poverty.

The Foster et al. (1984) poverty measures follow in the tradition of Mellor (1978) and later Deaton (2000) who recommended assuming zero price elasticity of demand for staple food commodities when measuring effects of commodity price changes on consumer income. This assumption is plausible for stable foods, and we apply it here based on the fact that households in our sample allocate a large share of their food expenditure to staple foods, and that the 2007-08 price increases affected a wide of food items. As Wood et al. (2012) demonstrate in their evaluation of the welfare impacts of rising food prices in Mexico, this first-order approximation can significantly overstate the true welfare measure effects of food-price increases when there is significant substitution. We leave as a topic for future research the potential for rural households in Bangladesh to mitigate the welfare impacts of food-price increases through substitution.

In Table 6 we report the sample averages for the three poverty measures calculated for each wave of the survey, as well as the poverty threshold itself. We calculate the poverty line, z, based on a the FAO's measure of "moderate" poverty, which includes a 2100 kcal diet and non-food expenditures that are assumed to be 30 percent of total expenditure. We use an assumed mix of calories from various food sources, and multiply by average food prices in rural Bangladesh to calculate z.

From 1988 to 2004 all three poverty measures fell for rural Bangladesh, as reported in Nargis and Hossain (2006). During this time period, the poverty threshold remained relative stable, while household income and per capita income tended to rise (Table 2). Average per capita income continued to rise between 2004 and 2008. Indeed, after growing at approximately 2 percent per year from 2000-2004, income growth accelerated to a rate of nearly 15 percent per year between 2004 and 2008. However, food prices also rose rapidly; the poverty threshold

grew at an annual rate of 10 percent per year between 2004 and 2008. Thus, despite continued income growth, both the incidence and depth of poverty reversed course and increased between 2004 and 2008.

Based on the household poverty measures, we also can evaluate that portion of the sample that is in chronic poverty—those who we observe to be in poverty in all four survey waves. In Table 7 we report summary statistics for these chronic poor and the non-chronic poor in two years 1988 and 2008. One key phenomenon observed in this table is that the chronic poor have not diversified away from agriculture to the extent that the rest of the population. While both the chronically poor and the non-chronically poor built up agricultural capital over the 20 years spanning the survey, the non-chronically poor accumulated non-agricultural capital at an even faster rate. The value of non-agricultural capital owned by the non-chronically poor more than doubled from 1988 to 2008. At the same time, the value of non-agricultural capital owned by the chronically poor shrunk to 64 percent of its 1999 value.

Household labor allocation also reflects the absolute and relative reliance of chronically poor households on agriculture. Chronically poor households have had smaller reductions in the number of agricultural workers. Further, the chronically poor households have half as many workers in the domestic migrant labor market, and just one-seventh as many workers in the international migrant labor market as do the non-chronically poor. These labor and capital figures suggest that while most households diversified away from agriculture, the chronically poor have become more reliant on agricultural income.

The differences in resource allocation between the chronic poor and non-chronic poor also appear in an analysis of income determinants. In the far columns of Table 5, we present results from a fixed effects model of household income that interacts an indicator variable for chronic poverty with each of the regressors, thus allowing separate sets of parameters for the chronic poor and the non-chronic poor. Here we see that return to an additional agricultural worker is zero for the non-chronic poor, but positive for the chronic poor, while the returns to additional non-agricultural workers and migrant workers are positive for the non-chronic poor and statistically indistinguishable from zero for the chronic poor. These results suggest that observed household resource allocation may be rational; the chronic poor are better off allocating marginal labor to agricultural production, while the non-chronically poor are better off sending marginal labor into non-agricultural employment.

Poverty Dynamics

Next we turn to documenting and explaining poverty dynamics. We follow Scott (2000) in using poverty mobility matrices to quantify the extent and nature of poverty mobility. For a subsample of 964 households that we observe in each of the four waves we track poverty outcomes in adjacent survey waves.[3] Using the four survey waves, we calculate three poverty mobility matrices, which we report in Tables 8a-8c.

[3] In on-going work we are assessing whether the sub-sample of households that we observe in all four years suffers from selection bias.

The time pattern of poverty incidence for the sub-sample reported in Tables 8a-8b follows that of the whole sample reported in Table 6. The poverty head count fell between 1988 and 2004, from 61 percent in 1988, to 46 percent in 2000, and 41 percent in 2004. Then poverty incidence increased between 2004 and 2008 to 45 percent.

Poverty mobility was relatively high between 1988 and 2000. Nearly half (48 percent) of households that were poor in 1988 had climbed out of poverty by 2000. Over the same period, 38 percent of the households that were non-poor in 1988 had fallen into poverty by 2000, resulting in a 25 percent net decrease in the incidence of poverty.

We observe less poverty mobility between the second and third (2000-2004), and third and fourth (2004-2008) waves of the survey, perhaps because the latter waves span much shorter periods of time. However, time difference cannot explain differences in poverty mobility observed in 2000-2004 and 2004-2008. From 2000 to 2004, 40 percent of the households that were poor in 2000 were able to climb out of poverty, and 25 percent of the non-poor households in 2000 fell into poverty. From 2004 to 2008, the share of poor households that managed to escape poverty was 36 percent, a 10-percent decline in upward poverty mobility. At the same time, the share of the non-poor households that fell into poverty by the end of 2008 increased to 32 percent, a 28-percent increase in downward poverty mobility. Thus the reversal of the long-run decline in poverty incidence that occurred during 2004-2008 was associated with a decrease in upward poverty mobility.

We next turn to analyses of factors that may have contributed to these changes. Specifically, we estimate probit models of poverty as a function of household characteristics in order to identify determinants of poverty. Our probit model is as follows:

$$\Pr(poor_i = 1|\boldsymbol{X}_i) = \Phi(\boldsymbol{X}_i'\boldsymbol{\beta})$$

where $poor_i$ is an indicator variable equal to one if household i has household income below the poverty level, and equal to zero otherwise, Φ is the cumulative distribution function for standard normal distribution, $\boldsymbol{X}_i$ is a vector of household i's characteristics, and $\boldsymbol{\beta}$ is a vector of parameters to be estimated. We estimate the model for the probability of being poor in 2004, and again for the probability of being poor in 2008. In each case, regressors reflect household characteristics in the previous survey wave. That is, we estimate the probability of being poor in 2004 (2008) as a function of household characteristics in 2000 (2004). We estimate the model by maximum likelihood with village-clustered standard errors.

In table 9 we report estimated marginal effects—the change in the probability of being poor for marginal changes in each regressor. Several factors influence poverty in similar ways in both years. As we saw in Tables 8b-8c, being poor in one wave significantly raises the probability of being poor in the next wave. Nonfarm households are more susceptible to poverty, and an additional family member slightly increases the probability of falling into poverty.

However Table 9 also reveals some striking changes to the determinants of poverty between 2004 and 2008. Migrant workers had small, mixed effects on poverty in 2004. But in 2008 an additional migrant worker—especially an overseas migrant workers—greatly reduced the probability of being poor. Perhaps more striking are the marginal effects of the share of income from agriculture. From 2000 to 2004, a greater dependence on agricultural income increased the likelihood that household would be poor in 2004. However, between 2004 and

2008, the effect of farm income reverses; a greater dependence on agricultural income decreased the likelihood that a household would be poor in 2008.

These results raise questions regarding determinants of poverty and, hence, pathways out of poverty. Does access to migrant labor markets decrease incidence of poverty? An answer based on our 2004 results would be maybe, a little; an answer based our 2008 results would be a resounding yes. Does a dependence on farm income increase or decrease poverty incidence? Again, our answer depends on which year we consider: in 2004, dependence on farm income increased poverty incidence; in 2008, dependence on farm income decreased poverty incidence. These mixed findings do not lend themselves to clear, unambiguous policy prescriptions.

Discussion

The results reported here suggest that the period between 2004 and 2008 was characterized by a change in a change in income and poverty trends in rural Bangladesh. Three household surveys conducted between 1988 and 2004 (and previously reported on by Nargis and Hossain, 2006) reveal dramatic reductions in the incidence and depth of rural poverty. Analysis of income determinants during this period further suggests that access to non-agricultural labor markets and investments in non-agricultural capital tended to raise household income and thus reduce poverty. Also, among farming households, land expansion and tenancy seemed appear to raise incomes. A corollary policy prescription for the reduction of poverty was to invest in human and physical capital that allow households to tap non-agricultural income sources or better capitalize scale economies in farming (Nargis and Hossain, 2006).

We report on a new round of the household survey, collected in 2008, a time associated with a dramatic rise in agricultural commodity prices that has had potentially important impacts on the rural poor (e.g., Ahmed 2008; Ivanic and Martin 2008). Our analysis of the survey reveals that poverty incidence and depth reversed trend, increasing to pre-2000 levels (Table 6). We also find that the increase in poverty incidence is caused by a decrease in upward poverty mobility and an increase in downward poverty mobility (Tables 8a-8b).

Our fixed effects model of household income improves on previous work by exploiting the panel structure to eliminate endogeneity caused by unobserved, household-specific factors affecting income. Our panel estimates of the income equation largely confirm previous cross-sectional work, with some important modifications. A key finding here is that an additional overseas migrant worker raises household income by approximately 30 percent; a big impact, but towards the lower end of the range suggested by cross-sectional analysis.

Our panel data also allows us to assess the chronic poor—those households with income below the poverty line in every survey spanning 21 years. Simple summary statistics reveal that the chronic poor are quite different than the rest of the rural population (Table 7). In particular, while the rest of the rural population in Bangladesh has dramatically increased its holdings of non-agricultural capital and diversified income away from agriculture, the chronic poor have concentrated their assets and labor in agriculture. We find evidence that this divergence in resource allocation may be rational; the chronic poor have higher returns to labor in agriculture, while the non-chronic poor have higher returns to labor in non-agricultural employment (Table 5).

Finally, to further evaluate poverty dynamics we estimate probit models to quantify the effects of various household characteristics on the probability of being poor. Results of these poverty regressions are largely consistent with the previous findings: households with more landholdings are less likely to fall into poverty, households with greater access to overseas migrant labor markets are less likely to fall into poverty, and being poor in one survey significantly elevates the chance of being poor in the next. However our analysis also reveals a few important caveats. In particular, we find that the marginal effects of some key factors on poverty are not stable over time. An additional overseas migrant worker reduces the probability of falling into poverty by 2 percent in 2004, and by 22 percent in 2008. A greater dependence on agricultural income increased the likelihood of being poor in 2004, but significantly decreased the likelihood of being poor in 2008.

This last result, in particular, requires some additional discussion. While on the surface it appears contradictory, perhaps it is not so surprising. The first three waves of the survey spanned a period (1988-2004) of generally declining prices for agricultural commodities. Thus agricultural incomes shrunk or stagnated during this time (Table 3), and households that were able to diversify away from agriculture or expand production fared relatively well. In this context, and under an assumption that agricultural prices would continue to decline, a policy to encourage further diversification away from agriculture was reasonable.

However, the dramatic, unexpected reversal in agricultural price trends since 2004 reversed the fortunes of farm households with access to agricultural markets. At the same time, a global economic recession may have limited income opportunities in other sectors. Thus, whereas diversification away from agriculture seemed like a promising escape route from poverty in 2004 (Hossain and Nargis, 2006), in retrospect we find that the wisdom of that approach depended in part on a forecast of agricultural prices that turned out to be erroneous.

These results suggest a great deal of caution in prescribing policies based on a still-developing understanding of the causes of poverty and on imperfect forecasts of economic conditions, especially agricultural prices. These, of course, remain fruitful topics for important further research.

References

Ahmed, S. 2008. “Global Food Price Inflation: Implications for South Asia, Policy Reactions, and Future Challenges.” World Bank Policy Research Working Paper 4796. The World Bank.

Deaton, A. 2000. Analysis of Household Surveys: A Microeconometric Approach to Development Policy. Johns Hopkins University Press.

Foster, J.E., J. Greer, and J. Thorbecke. 1984. “A class of decomposable poverty measures.” *Econometrica* 52(3): 7610765.

Hertel, T.W., R. Keeney, I. Maros, and L.A. Winters. 2007. “Distributional effects of WTO agricultural reforms in rich and poor countries.” *Economic Policy* 22: 289-337.

Ivanic, M. and W. Martin. 2008. “Implications of Higher Global Food Prices for Poverty in Low-Income Countries.” World Bank Policy Research Working Paper No. 4594.

Jalan, J. and M. Ravallion. 2000. “Is transient poverty different? Evidence for rural China.” *Journal of Development Studies* 36(6): 82-99.

Mellor, J.W. 1978. “Food price policy and income distribution in low-income countries.” *Economic Development and Cultural Change* 27(1): 1-26.

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

Scott, Christopher D. 2000. “Mixed fortunes: A study of poverty mobility among small farm households in Chile, 1968-86.” *Journal of Development Studies* 36(6): 155-180.

Sen, B. 2003. “Drivers of escape and descent: changing household fortunes in rural Bangladesh.” *World Development* 31(3): 513-534.

Wood, B.D.K., C.H. Nelson, and L. Noguieira. 2012. “Poverty effects of food price escalation: The importance of substitution effects in Mexican households.” *Food Policy* 37(1): 77-85.

Table 1. Characteristics of sample households, 1988–2008

	1988	2000	2004	2008
Number of households	1,238	1,872	1,927	2,010
Farm size(hectare)	0.61	0.53	0.48	0.47
Land tenure status				
Non-farm households (%)	34	42	39	43
Pure tenant households	9	12	17	15
Owner-cum-tenant households (%)	20	20	19	13
Owner farmer households (%)	37	26	26	29
Area under tenancy (% of holding)	22	33	40	14
Non-land fixed assets				
Agricultural capital (2004 constant US$)	138	145	167	314
Non-agricultural capital (2004 constant US$)	153	402	269	426
Human capital				
Number of agricultural workers	1.17	0.95	0.97	0.82
Number of non-agricultural workers	0.65	0.88	0.92	0.71
Average education of agricultural workers (years)	3.07	3.66	3.78	3.11
Average education of non-agricultural workers (years)	3.73	5.23	5.62	3.90
Number of domestic migrant workers per household	0.24	0.35	0.44	0.48
Number of overseas migrant workers per household	0.01	0.10	0.13	0.17
Technology and infrastructure				
Rice land cropped with modern varieties (%)	33	70	78	86
Villages with access electricity (%)	21	40	61	83
Household demographics				
Number of members household	5.92	5.4	5.29	4.94
Age of the household head (years)	42	45	47	48

Table 2. Sources of rural household income in Bangladesh (%), 1988–2008[a]

	1988	2000	2004	2008
a. Crop income (i + ii)	34	24	26	26
i. Rice income	26	16	15	15
ii. Non-rice crop income	8	8	11	11
b. Non-crop agricultural income	11	13	12	11
c. Agricultural wage income	13	5	6	6
A. Total farm income (a + b + c)	58	43	44	43
d. Trade/business income	9	21	19	15
e. Service income	18	17	16	10
f. Remittance income	5	13	14	23
g. Non-agricultural wage income	9	7	7	9
B. Total nonfarm income (d + e + f + g)	42	57	56	57
Total household income (A + B)	100	100	100	100
Average income (Taka)				
Total household income (in current Taka)	36,070	72,324	82,064	121,324
Total household income (in 2004 Taka)	64,998	77,935	82,064	94,633
Total household income (in 2004 US$)	1,105	1,325	1,395	2,062
Average per capita income (in 2004 US$)	187	245	264	417
Number of households	1,231	1,872	1,927	2010

[a] Nominal income variables are converted to 2004 constant prices using the national GDP deflator of 64.78, 115.7, and 132.1 for 1987–1988, 1999–2000, and 2003–2004, respectively (base-year = 1995–1996). The real income variables are reported in 2004 constant prices and converted to 2004 constant US$ using the exchange rate US$1 = 58.83 in 2003–2004. Average total household income and per capita income are weighted by household size.

Table 3. Sources of rural household income in Bangladesh (2004 Taka), 1988–2008[a]

	1988	2000	2004	2008
a. Crop income (i + ii)	22,099	18,704	21,337	24,605
i. Rice income	16,899	12,470	12,310	14,195
ii. Non-rice crop income	5,200	6,235	9,027	10,410
b. Non-crop agricultural income	7,150	10,132	9,848	10,410
c. Agricultural wage income	8,450	3,897	4,924	5,678
A. Total farm income (a + b + c)	37,699	33,512	36,108	41,103
d. Trade/business income	5,850	16,366	15,592	14,203
e. Service income	11,700	13,249	13,130	9,193
f. Remittance income	3,250	10,132	11,489	21,500
g. Non-agricultural wage income	5,850	5,455	5,744	8,633
B. Total nonfarm income (d + e + f + g)	27,299	44,423	45,956	53,530
Total household income (A + B)	64,998	77,935	82,064	94,633

[a] Nominal income variables are converted to 2004 constant prices using the national GDP deflator of 64.78, 115.7, and 132.1 for 1987–1988, 1999–2000, and 2003–2004, respectively (base-year = 1995–1996). The real income variables are reported in 2004 constant prices and converted to 2004 constant US$ using the exchange rate US$1 = 58.83 in 2003–2004. Average total household income and per capita income are weighted by household size.

Table 4. Determinants of Log Household Income: Cross-section models for 1987, 2000, 2004, 2008

	1987	***2000***	***2004***	***2008***
Land (ha)	0.18***	0.164***	0.207***	0.205***
	0.031	*0.031*	*0.033*	*0.039*
Tenancy status				
Nonfarm	-0.188***	-0.153*	-0.17***	-0.083*
	0.049	*0.060*	*0.048*	*0.045*
Pure tenant	-0.079	-0.107*	-0.122**	-0.072
	0.068	*0.060*	*0.057*	*0.054*
Owner-tenant	0.08*	0.105*	0.095*	0.051
	0.041	*0.054*	*0.045*	*0.054*
Nonland fixed assets ('000 Taka)				
Ag. capital	0.006	0.011***	0.005***	0.004***
	0.004	*0.002*	*0.002*	*0.001*
Non-ag. capital	0.007***	0.001***	0.002***	0.000**
	0.001	*0.000*	*0.000*	*0.000*
Human capital				
No. of ag. workers	0.022	-0.025	-0.009	0.007
	0.029	*0.040*	*0.034*	*0.033*
No. of non-ag. workers	0.127***	0.255***	0.185***	0.161***
	0.035	*0.030*	*0.036*	*0.034*
Edu. of ag. workers (years)	0.001	0.018***	0.018***	0.014***
	0.005	*0.005*	*0.004*	*0.005*
Edu. of non-ag. workers (years)	0.013***	0.017***	0.005	0.026***
	0.005	*0.004*	*0.004*	*0.004*
Domestic migrant workers (no.)	0.299***	-0.011	-0.018	0.028***
	0.039	*0.023*	*0.018*	*0.009*
Overseas migrant workers (no.)	0.675***	0.415***	0.328***	0.486***
	0.115	*0.098*	*0.061*	*0.040*
Technology				
Land with modern variety rice (%)	0.275***	0.086	0.075*	0.055**
	0.036	*0.038*	*0.040*	*0.025*
Access of village to electricity	0.063	0.108**	0.092**	-0.033
	0.094	*0.053*	*0.045*	*0.061*
Household demographics				
Household size	0.049***	0.057***	0.068***	0.064***
	0.010	*0.008*	*0.010*	*0.009*
Age of head	0.002	-0.002	-0.001	-0.002*
	0.001	*0.002*	*0.002*	*0.001*
Intercept	9.138***	9.697***	9.967***	10.386***
	0.073	*0.089*	*0.084*	*0.083*
No. of observations	1231	1872	1927	2010
R^2	0.52	0.51	0.45	0.54

Standard errors are reported in italics. ***, **, and * denote statistical significance at the 1%, 5%, and 10% levels. The standard errors are based on the White robust estimator of the covariance matrix with village-wise clusters.

Table 5. Determinants of Log Household Income: Panel model for 1987- 2008

	Pooled	***Separate regressors for Chronic Poor***	
		Not chronic poor	*Chronic poor*
Land (ha)	0.182***	0.193***	-0.057
	0.028	*0.017*	*0.079*
Tenancy status			
Nonfarm	-0.121***	-0.137**	0.104*
	0.041	*0.42*	*0.062*
Pure tenant	-0.054	-0.022	0.052
	0.046	*0.040*	*0.076*
Owner-tenant	0.094***	0.087***	-0.111*
	0.026	*0.028*	*0.066*
Nonland fixed assets ('000 Taka)			
Ag. capital	0.005***	0.006***	0.000
	0.001	*0.001*	*0.003*
Non-ag. capital	0.001***	0.001***	0.011***
	0.000	*0.000*	*0.002*
Human capital			
No. of ag. workers	0.094***	0.000	0.091*
	0.026	*0.019*	*0.047*
No. of non-ag. workers	0.194***	0.175***	-0.104**
	0.027	*0.023*	*0.043*
Edu. of head (years)	0.005**	0.010***	-0.004
	0.002	*0.003*	*0.005*
Edu. of ag. workers (years)	-0.005	0.004	0.002
	0.004	*0.003*	*0.006*
Edu. of non-ag. workers (years)	-0.004*	0.002	0.005
	0.003	*0.003*	*0.007*
Domestic migrant workers (no.)	0.029**	0.028***	-0.040
	0.012	*0.010*	*0.050*
Overseas migrant workers (no.)	0.289***	0.323***	-0.020
	0.026	*0.039*	*0.140*
Technology			
Land with modern variety rice (%)	0.032	0.060	-0.396
	0.047	*0.040*	*0.059*
Household demographics			
Household size	0.044***	0.048***	0.073***
	0.007	*0.005*	*0.017*
Age of head	0.002*	0.003**	-0.007***
	0.001	*0.001*	*0.002*
Intercept	9.725***	9.822***	-0.600***
	0.078	*0.076*	*0.115*
Year = 2000	0.063***	0.046	-0.194***
	0.051	*0.053*	*0.068*
Year = 2004	0.178***	0.125**	-0.151*
	0.059	*0.060*	*0.081*
Year = 2008	0.264***	0.224	0.090
	0.059	*0.060*	*0.077*
No. of observations	3850		3850
No. of households	964		964

Standard errors are reported in italics. ***, **, and * denote statistical significance at the 1%, 5%, and 10% levels. The standard errors are based on the White robust estimator of the covariance matrix with village-wise clusters.

Estimates for chronic poor and non-chronic poor come from a single model with an indicator variable for chronic poverty interacting with all regressors.

Table 6. Measures of rural poverty in Bangladesh

Poverty measures	1988	2000	2004	2008
Est. poverty line [a] (current Taka)	4,609	7,023	8,332	15,194
Est. poverty line[a] (2004 Taka)	8,305	7,568	8,332	11,851
Head count index	61.6	48.2	43.9	55.9
Poverty gap ratio	26.4	19.1	16.5	21.9
Squared poverty gap	14.4	10.2	8.5	11.1

a. The poverty line is calculated on the basis of a minimum daily intake of 2,100 kcal per person.

Table 7. Characteristics of sample households, chronically poor and non-chronically poor, 1988–2008

	1988		2008	
Chronically poor?	Yes	No	Yes	No
Number of households	130	834	130	834
Farm size(hectare)	0.29	0.67	0.19	0.36
Land tenure status				
Non-farm households (%)	45	29	22	12
Pure tenant households	15	7	13	8
Owner -tenant households (%)	15	23	18	40
Owner farmer households (%)	24	41	47	40
Area under tenancy (% of holding)	43	26	60	33
Non-land fixed assets				
Agricultural capital (2004 Taka)	5,336	9,528	11,853	15,673
Non-agricultural capital (2004 Taka)	2,676	11,363	1,709	25,388
Human capital				
Number of agricultural workers	1.16	1.22	1.01	0.91
Number of non-agricultural workers	0.58	0.61	0.46	0.77
Average education of agricultural workers (years)	1.96	4.23	2.56	3.71
Average education of non-agricultural workers (years)	1.03	2.77	1.47	4.47
Number of domestic migrant workers per household	0.15	0.23	0.32	0.64
Number of overseas migrant workers per household	0.00	0.02	0.03	0.20
Technology and infrastructure				
Rice land cropped with modern varieties (%)	18	27	41	46
Household demographics				
Number of members household	5.58	6.08	5.17	5.12
Age of the household head (years)	40.6	41.9	49.6	51.6

Note: For the purposes of this table we include only those households that are observed in all four survey waves. A household is classified as chronically poor if it falls below the poverty line in all four survey waves.

Table 8a. Poverty mobility matrix by household, 1988-2000

	2000 (row %)		
1988 (col %)	Poor (row %)	Non-poor (row %)	Total (row %)
Poor (col %)	306 (69) (52)	286 (55) (48)	592 (61) (100)
Non-poor (col %)	140 (31) (38)	232 (45) (62)	372 (39) (100)
Total (col %)	446 (100) (46)	518 (100) (54)	964 (100) (100)

Table 8b. Poverty mobility matrix by household, 2000-2004

	2004 (row %)		
2000 (col %)	Poor (row %)	Non-poor (row %)	Total (row %)
Poor (col %)	270 (68) (60)	176 (31) (40)	446 (46) (100)
Non-poor (col %)	127 (32) (25)	391 (69) (75)	518 (54) (100)
Total (col %)	397 (100) (41)	567 (100) (59)	964 (100) (100)

Table 8c. Poverty mobility matrix by household, 2004-2008

	2008 (row %)		
2004 (col %)	Poor (row %)	Non-poor (row %)	Total (row %)
Poor (col %)	255 (58) (64)	142 (27) (36)	397 (59) (100)
Non-poor (col %)	183 (42) (32)	384 (73) (68)	567 (41) (100)
Total (col %)	438 (100) (45)	526 (100) (55)	964 (100) (100)

Table 9. Probit estimates of poverty, marginal effects in 2004 and 2008

	2004	***2008***
Poverty in previous survey	0.194***	0.222***
	0.037	0.037
Land (ha) in previous survey	-0.101***	-0.139**
	0.030	*0.070*
Tenancy status in previous survey		
Nonfarm	0.169***	0.122**
	0.052	*0.056*
Pure tenant	0.105	0.189***
	0.069	*0.062*
Owner-tenant	0.134**	0.076
	0.059	*0.053*
Share of income from agriculture in previous survey	0.180**	*-0.139***
	0.072	*0.070*
Nonland fixed assets ('000 Taka) in previous survey		
Ag. capital	-0.006***	-0.002
	0.002	*0.001*
Non-ag. capital	-0.001	-0.000
	0.000	*0.000*
Human capital in previous survey		
No. of ag. workers	0.030	-0.008
	0.028	*0.021*
No. of non-ag. workers	-0.048**	-0.101***
	0.023	*0.027*
Edu. of head (years)	-0.005	0.001
	0.004	*0.002*
Domestic migrant workers (no.)	0.032*	-0.065***
	0.017	*0.023*
Overseas migrant workers (no.)	-0.023***	-0.219***
	0.043	*0.039*
Household demographics		
Household size	0.014**	0.037***
	0.006	*0.008*
Age of head	-0.001	0.000
	0.001	*0.001*
No. of observations	962	964
Pseudo R^2	0.17	0.16