Microeconomic impact of remittances on household welfare: Evidences from Bangladesh

Syed Naimul Wadood, Amzad Hossain

Department of Economics, University of Dhaka, Bangladesh

corresponding e-mail: snwadood[at]econdu(dot)ac(dot)bd

address: Dr. Syed Naimul Wadood, Dept. of Economics, University of Dhaka, Dhaka-1000, Bangladesh

Abstract: This paper investigates effects of both international and domestic remittances and migration on household welfare in Bangladesh. We employ a number of variables such as different types of poverty measures, household consumption expenditure, expenditures on health and education, food calorie intake etc. to define household welfare. We use the Bangladesh Household Income and Expenditure Survey 2010 data to estimate impact of remittances on household welfare. To address the issue of self-selection associated with migration decision and thus scope for receiving remittances, we have used the Propensity Score Matching (PSM) technique. The econometric results reveal that although both internal and external remittances have statistically significant impact on reducing poverty and increasing consumption expenditure, the degree of impact is much higher for external remittances compared to internal remittances. However we find no impact of remittances on household expenditure on education and health care. Given subsidized public provision of education and healthcare in the rural areas, remittance-recipient households may need not spend higher amounts compared to non-remittance-recipient households, or they may not have sufficient scopes for spending more on human capital investments like education and health care.

1. Introduction

Overseas remittance earnings have become a major source of financial inflow for the Bangladesh economy in recent years. Remittance earnings, as equivalent to share of Bangladesh's Gross Domestic Product (GDP), have been consistently on the increase and by 2012 this has reached an equivalent of 12 per cent (Bangladesh Bank, 2014). A slightly fluctuating, but overall sustained inflow like this one for the last four decades, has arguably boosted the economy in many different ways. It has been argued that this has helped employment generation, reduction of unemployment, increases in the foreign exchange reserves and also immensely contributed to an acceleration of overall national economic development (Ministry of Finance, 2014). World Bank (2012) argues that remittances contribute to growth of output in the economy by augmenting consumption and investment demand as well as savings.

Consequently, the economic impact of migration and remittances has received an increasing interest from both researchers and policy makers. Remittances are often the most straightforward link between migration and welfare of the households in the origin country. According to the ***new economics of labor migration*** (NELM), migration is part of a household strategy to overcome market failures such as imperfect credit and insurance markets. Remittances that provide households with an income not correlated with farm income can loosen production and investment constraints and finance investments in new production technologies and input. Apart from the direct effects of

remittances, there can also be multiplier effects on income, employment and production in the migration sending country (Taylor, 1999). When emerged in the 1980's and 1990's, NELM contrasted a previously dominating but more pessimistic view on migration and development that argued that remittances often are used for non-productive investments and lead to the development of passive, non-productive and remittance-dependent communities (de Haas, 2007).

One interesting empirical query that follows from this discussion is, **whether remittance earnings enhance household well-being.** As we discuss in detail the methodology, we understand that the abovementioned empirical question has not yet been resolved in the context of Bangladesh, and this is the area of research where our study attempts to contribute.

A challenge when estimating the causal impact of migration and remittances on household welfare is **self-selection**. If migration is not a random decision, and remittances are not randomly assigned, there might be confounding factors that influence both the probability of migration and probability of receiving remittances and the outcome of interest, which would result in biased estimates of the impact of remittances on the outcome. In this study, **a matching approach will be applied** in order to address the possible self-selection issue. Treatment will in this case be whether the household receives remittances, in order to measure the average treatment effect of the treated (ATT). The advantage with this approach is that it allows us to compare households that receive remittances with otherwise similar households that do not receive remittances in order to mitigate the self-selection bias. Since the data contains retrospective information about household assets and subjective wellbeing five years ago, as well as information about when the household started receiving remittances, we are able to look at the change in welfare before and after households start receiving remittances.

The reminder of the paper is structured as follows: Section 2 gives a brief literature review of the impact of remittance on household welfare. Section 3 describes the migration and remittance patterns in Bangladesh; Section 4 describes the methodology used; the results are presented in Section 5 and Section 6 concludes.

2. Literature review

There has been a growing literature examining how migrant workers' remittances can affect households. Among these studies, some have documented how migrants have contributed to economic and social development in their country of origin. Thus, evidence suggests that remittances from abroad are crucial to the survival of communities in many developing countries as indicated in a World Bank Country Analyses report by Russell et al. (1990). One benefit expected from labor emigration was that migrants would be bringing an impetus to investments, transfer of technology and machinery and new enterprises. Russell et al. (1990) concluded that after satisfying subsistence needs, migrant remittances are used for investment purposes such as education, livestock, farming, and small scale enterprise.

Remittances significantly affect welfare and this was the focus of a study by Koc & Onan (2001). They examined the impact of remittances on the standard of living of left-behind families in Turkey and found that remittances have a positive effect on household welfare. Their study shows that remittances have both direct and indirect income effects, which potentially have important influences on production, income inequality and poverty, at least at the local level. They found that 12 per cent of households used about 80 per cent of remittances to improve their standard of living, although it is argued that dependency on the same leaves households vulnerable to changes in migration cycles.
Migrant remittances also serve as a source of income for savings and investment, as confirmed by Taylor (1996), and thereby lead to growth and development of an economy. This is corroborated in a study on Mali by Findley & Sow (1998), who report that

remittances not only covered basic food and cash needs but also allowed people to pay for irrigation in agriculture. Adams & Page (2003) using data from 74 low- and middle-income developing countries, found that international migration had a strong statistical impact on reducing poverty.

Whilst some researchers hold the view that remittance flows reduce income inequality between the rich and the poor, others are of the view that the reverse is true because it is the rich that are able to get their family members to migrate. In a study Adams (1991) used income data from households with and without migrants to determine the effects of remittances on poverty, income distribution and rural development and found that although remittances were helpful in alleviating poverty, paradoxically they also contributed to inequality in the distribution of income. By contrast, Gustafsson & Makonnen (1993) found that in Lesotho, migrant remittances actually decreased inequality. Chimhowu et al. (2004) support the view that remittances do increase inequality at the local level, but at the international level they transfer resources from developed to developing countries and so help to reduce inequality.

3. Trends in migration and remittances of Bangladesh

3.1 Observations from the macro data

Remittances sent by overseas migrants contribute quite significantly to the economic development of the country through augmenting foreign exchange reserves and income. Workers' remittances flow, as equivalent to percentage of GDP, has been showing increasing trend year by year since the inception of manpower export in 1976 (Figure 1). Remittances sent by the overseas migrants have increased from USD 23.71 million in 1976 to USD 14,338 million in 2012-13, preceded by USD 12,734 million in 2011-12 (Bangladesh Bank, 2014). The contribution of remittance to Gross Domestic Products (GDP) has grown from a meager less than 1 per cent in 1977-78 to around 12 per cent in 2012-13.

FIGURE 1. SHARE OF REMITTANCE AS A PERCENTAGE OF GDP
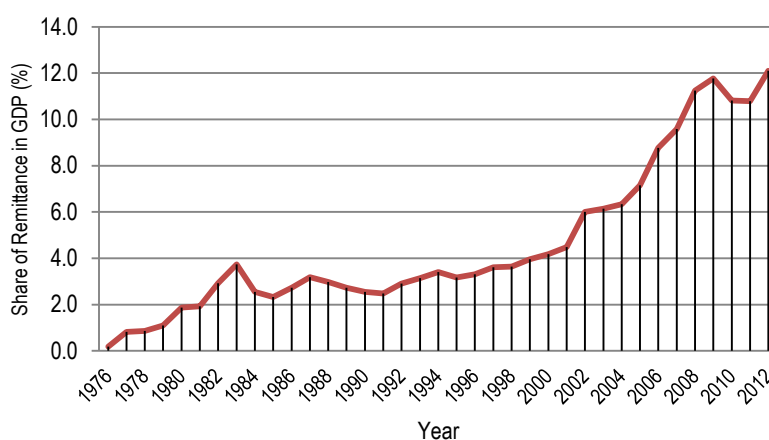
This rapid growth in overseas remittance earnings has been made possible by a rapid increase in overseas migration (here growth of remittance earnings has been principally propelled by growth in the stock of number of migrant workers, not by growth in

remittance per worker (World Bank, 2012). Overseas migration is essential for a developing country like Bangladesh since it not only produces large inflows of valuable foreign currencies but also offers an outlet for frustrated unemployed workers who might otherwise present serious domestic problems, and thereby reduces pressure in the domestic labor market. It is also important in order to reduce unemployment at home and accumulate valuable foreign exchange to stimulate economic growth. Migration also contributes immensely to development through technology transfers and diffusion, since migrant workers while working abroad learn new techniques, deal with latest technologies and once they return home, they are in a position to bring in the new knowledge and technology acquired abroad as well. Even the current migrant workers, whether having the intent to return or not, function as the embodiment of new technologies and ideas that can be easily transferred or diffused home through improved communication channels. Being a hugely labor surplus country Bangladesh participates in the supply side of the global labor market. Each year a large number of people of this country voluntarily migrate overseas for both long- and short-term employment. Figure 2 shows the trends in oversees employment from the period of 1976 to 2012. A total number of around 8.30 million manpower has been exported up till 2012 since the inception of manpower export in 1976. Up till 2006 the number of overseas employment grew steadily without a few exceptions. There was a sharp rise in overseas employment in 2007 and 2008 followed by a sharp decline in 2009. This sharp decline can be attributed to the ongoing Global Financial Crisis at that time.

3.2 Observations from the micro household data

We examine the micro data from the Household Income and Expenditure Survey of 2010 (HIES, 2010) in order to understand the issue of migration and remittance in this household-level questionnaire form of nationally representative data. The HIES 2010 contains responses from a total of 12,240 households from all throughout Bangladesh, out of which 7,840 are rural households and 4,400 are urban households (it consists of 620 PSUs (primary sampling units), each comprising of 20 sample survey respondents) (BBS, 2011). The HIES is representative up to the division level, and we find a total of 1,337 observations of foreign remittance observations throughout these 12,240 households (on an average, one remittance receipt observation as against 9.15 number of households) (source: own calculations). We discuss some interesting features of this micro-level migration and remittance data in this sub-section.

The East dominates while the West and the South are mostly absent

We observe overseas remittance receipts are much more prevalent among administrative divisions that are on the eastern part of the country, such as Chittagong, Dhaka and Sylhet and smaller numbers of remittance receipts are observed in the western as well as southern parts of the country, such as in the cases of Barisal, Khulna, Rajshahi and Rangpur divisions (Table 1). A total of around 72 per cent observations are recorded in Dhaka and Chittagong divisions only. This implies that the direct benefits of overseas remittances fall mostly on these two divisions whereas other divisions have been largely bypassed from these benefits. On an average, a Chittagong division remittance-recipient household received around Taka 145 thousand in a year whereas a Barisal division household recipient household received around Taka 94 thousand in a year, even though we do not claim this to be statistically significantly different due to disproportionate number of observations between the two groups and much smaller number of observations in the Barisal group. We do not find statistically significant differences between Chittagong versus non-Chittagong average remittance amount received or Dhaka versus non-Dhaka average remittance amount received.

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TABLE 1. REMITTANCE AMOUNT RECEIVED BY DIVISION CLASSIFICATION (HIES 2010 DATA)

Division	Number of observations	Percentage share of total number of observations	Average amount of remittance sent (TK.)	Standard error of mean remittance (TK.)
Barisal	67	5.01	93,988.06	10,529.15
Chittagong	556	41.59	144,916.7	11,135.49
Dhaka	413	30.89	134,877.4	7,159.11
Khulna	86	6.43	107,857.2	13,917.37
Rajshahi	88	6.58	141,517	16,010.23
Sylhet	127	9.50	135,262.3	17,604.55
Overall National	1,337	100.00	135,738	5,602

Even acknowledging problems of district data within the HIES due to smaller number of observations, if we still examine the district data, we find that Feni, Brahmanbaria and Comilla are the three districts with highest percentages of surveyed households reporting to have received overseas remittance (Table 2). We find that remittance receipts are more prevalent centering on Dhaka-Chittagong and Dhaka-Sylhet highways. In sharp contrast, the Northern districts such as Kurigram, Lalmonirhat, Netrokona, Nilphamari and Southern district such as Patuakhali reported no observations of remittance receipts among their respective surveyed households.

TABLE 2. RANKING OF DISTRICTS IN TERMS OF PERCENTAGE
OF HOUSEHOLDS RECEIVING REMITTANCES

Ranking of districts	Name of district	Percentage of remittance-receiving HHs	Ranking of districts	Name of district	Percentage of remittance-receiving HHs
1	Feni	39.38	55	Khulna	0.77
2	Brahmanbaria	33.00	56	Narail	0.71
3	Comilla	28.67	57	Panchagarh	0.71
4	Chandpur	25.00	58	Gaibandha	0.63
5	Lakshmipur	23.57	59	Dinajpur	0.50
6	Chittagong	17.50	60	Kurigram	0.00
7	Madaripur	17.14	61	Lalmonirhat	0.00
8	Sylhet	17.08	62	Netrokona	0.00
9	Dhaka	17.00	63	Nilphamari	0.00
10	Noakhali	16.00	64	Patuakhali	0.00
Highest 10 districts		22.21	Lowest 10 Districts		0.36

If we examine further probe into the data, we find a total of 612 Primary Sampling Units (PSUs) selected throughout the entire country, with each PSU having a total of 20 sample survey respondent households (Figure 2). A total of 265 PSUs (41 per cent) reported no cases of overseas remittances, likewise 110 PSUs reported only one case each, 80 PSUs reported two cases each, 48 PSUs reported three cases each, 27 PSUs reported four cases each and the remaining 109 PSUs reported 5 up to 14 cases. Whilst a total of 265 PSUs reported zero observations out of twenty households, there are some PSUs which reported 14 out of 20 households to be overseas remittance recipients.

This finding implies direct benefits from overseas remittance does not fall evenly on all sub-national regions - that the Eastern region dominates the picture whereas the Western regions does not have many cases of overseas remittance. World Bank (2012) opines that perhaps the explanation for this uneven distribution lies in "new economics of migration" (Hanson, 2010). According to the "new economics of migration", household, families or

other groups decide collectively to maximize income and minimize risks by sending one or more family members abroad to increase overall family income whereas other family members stay behind earning lower but more stable income. Modeling migration as a form of risk- portfolio diversification in the presence of the "network effects", this implies that migration would tend to be high from regions where the stock of migrants is already high (low from regions where the stock of migrants is low till now). Since Dhaka, Chittagong and Sylhet already have a large stock of migrant workers, it is more likely that new migrant workers would arise from these regions, whereas it is less likely a case for other divisions such as Rajshahi, Rangpur, Khulna and Barisal.

FIGURE 2. DISTRIBUTION OF PSUS IN TERMS OF OBSERVATIONS
OF OVERSEAS REMITTANCE RECEIPTS

Distribution of PSUs in terms of outward remittance observations
in HIES 2010 data (total of 612 PSUs)
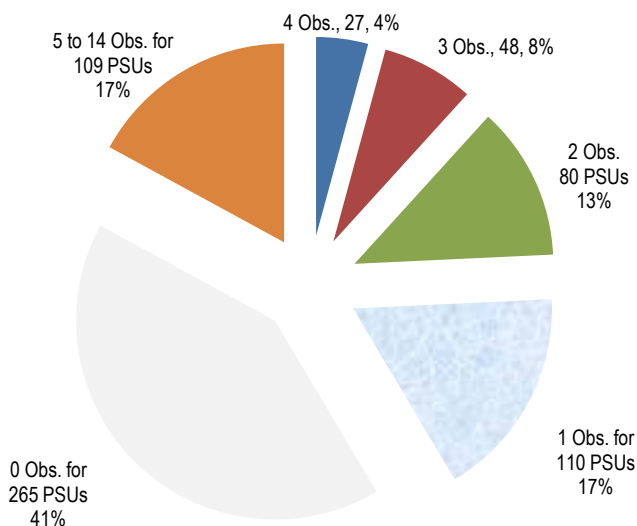
Low or medium skill service sector jobs dominate while only a few professionals are observed

In terms of occupations of the remittance-sender migrant workers, a total of five job classifications comprise of more than 41 per cent observations, and a total of some other 57 job classifications comprise the remaining 59 per cent observations (out of a total of 1,337 observations). The five job classifications include firstly, chef, cook, hotel boy and other related categories, secondly, unclassified sales worker, thirdly, unclassified service worker categories, fourthly, house caretaker, cleaner and related categories and fifthly, car driver & conductor, auto and manual works. Only a few professionals are present within the list of remittance-sending migrant workers whereas mostly service worker, commonly unskilled or semi-skilled and rarely skilled, are present within the list of remittance-senders. We do not find statistically significant difference of the average remittance

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amount sent among these classifications; additionally the number of observations is also small.

Time since the migrant left does not increase remittance amount sent

Out of a total of 1,337 observations, 39 per cent migrant workers left within below last two years, 22 per cent left in between two to four years ago, 11 per cent workers left within four to six years ago, and 29 per cent left more than six years ago. We do not find statistically significant differences among average remittance amount sent by these different groups according to time classifications.

Remittances from major host countries lower compared to other, non-major host countries

We find an interesting observation that the major four source country do not necessarily generate higher amount of remittance per migrant worker (Table 3). On an average, a remittance-sending migrant worker based in Suadi Arabia, U.A.E., Malaysia and Kuwait has sent an yearly amount of TK. 127,500 whereas his/her counterpart based in all other countries has sent an yearly amount of TK. 157,030, and this difference is statistically significant at 5per cent (p-value= 0.018). This implies that opportunities for sending larger amount of remittances do not necessarily associate with major host countries for Bangladeshi workers and there is a scope for higher amount of remittance to be sent from other countries (at the same time, variation is also higher as indicated by a higher standard error).

TABLE 3. CLASSIFICATION OF REMITTANCE OBSERVATIONS BY HOST COUNTRY

Country	Number of observations	Average remittance sent (TK.)	Standard error (TK.)
MAJOR FOUR COUNTRY GROUP (964 OBSERVATIONS)			
Major four countries	964	127,500	4,095
Saudi Arabia	478	143,121	6,877
U.A.E.	262	106,752	5,928
Malaysia	132	112,197	6,654
Kuwait	92	127,391	12,717
OTHER COUNTRIES (373 OBSERVATIONS)			
Other countries	373	157,030	17,031
t-test of mean differences t = 2.37 (with degrees of freedom 1,335); p-value= 0.018			

Note: Other countries include Qatar, Oman, Singapore, U.K., Italy, South Africa, Libya, U.S.A., Other European countries, Iraq, South Korea, Canada, Iran, Australia, Brunei, Federation of Russia, Japan, Other Countries.

Remittance amount increases with age of the remittance-senders

We find that Bangladeshi remittance senders are predominantly young since a total of around 75 per cent of them are within the age of 40, moreover around 42 per cent are within 30 years of age (Table 4). Whereas on an average, a migrant worker below 30 years of age sent TK. 121 thousand in a year, a migrant worker in the age group of 30 to 40 years sent TK. 16 thousand higher, someone in the age group of 40 to 50 years sent an additional TK. 12 thousand higher, and someone in the age group of 50 years and above sent an additional TK. 47 thousand higher. In terms of standard error calculations, the age group of within 30 years has exhibited less dispersion, whereas other age groups have exhibited much higher dispersion, implying experiences in terms of earnings bargained

and received (and thereby amount sent home) may have been more widespread when the worker enters more senior age categories. We do not find statistically significant differences in terms of average remittance amount sent home within the first three age groups, whereas there is statistically significant differences between the first group and the last group (p=0.00). A simple OLS regression of age on remittance amount sent exhibits a statistically significant estimated coefficient for independent variable "age" (p=0.00).

TABLE 4. CLASSIFICATION OF REMITTANCE OBSERVATIONS BY AGE GROUP

Age group (years)	No. of observations and per cent of total	Average remittance sent (TK.)	Standard error
Up to 30	567 (42.41)	120,900.4	4180.02
31 to 40	455 (34.03)	137,053.7	13027.19
41 to 50	236 (17.65)	148,540.4	12,890.4
Above 50	79 (5.91)	196,421.5	30,445.8
Total	1,337 (100.00)	135,738.8	5,602

Educational level matters for remittance amount sent, at least at the SSC level

Whereas a total of 65 per cent remittance-sender migrant workers have reported to have at least passed class 6 and all above, we can assess that most migrant workers are literate (though only 12 per cent have reported to have attained HSC examination-level of education and above) (Table 5). On an average, a migrant worker with HSC examination-level & above educational level has sent TK. 166 thousand which is TK. 52 thousand higher than the average remittance sent home by a migrant worker with educational level of class 1 to 5 and this result is statistically significant (p=0.00). Interestingly we do not find much strong evidence of educational level to have much impact on average remittance amount sent. An OLS regression of educational class achieved on remittance amount sent brings in an estimated coefficient of 3,850 for the educational class which is only statistically significant at 5per cent level (p= 0.033), with heteroskedasticity-robust standard error (the estimated constant term is 108, 292). This could be explained in the following way: one additional class obtained by the Bangladeshi migrant worker brings in an additional TK. 3.85 thousand as additional remittance amount sent home whereas with no class obtained the remittance amount sent is estimated at TK. 108 thousand. This remains to be examined whether this constitutes enough incentives among prospective Bangladeshi migrant workers to attain higher educational level.

TABLE 5. CLASSIFICATION OF REMITTANCE OBSERVATIONS BY EDUCATIONAL LEVEL

Educational level attained	No. of observations and per cent of total	Average remittance sent (TK.)	Std. error (TK.)
Illiterate	128 (9.57)	139,236	18,256
Class 1 to 5	343 (26.65)	114,401	5,777
Class 6 to SSC/Equiv.	706 (52.80)	138,505	8,460
HSC/Equiv. and Higher	160 (11.97)	166,480	20,584
Total	1,337 (100.00)	135,738.8	5,602

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Women remittance-senders are only few in numbers

The HIES 2010 data set fails to provide enough information regarding female remittance-senders since only 25 (1.87 per cent) out of total 1,337 observations are found to be women. The data which was compiled in bit earlier than 2010 does not have updated information regarding recent upward movements of female migrant workers within the Bangladeshi migrant workers. We find almost same amount of remittance amount that has been reported as for female workers (TK. 137 thousand) as compared to their male counterparts (TK. 136 thousand) and small number of observation does not allow for statistical significance tests.

4. Methodology and data

4.1 Methodology

Remittance-recipient and non-recipient households are likely to differ from each other in many observable and unobservable characteristics that might be correlated with the outcome variables. Selectivity issues therefore, complicate studies measuring the impact of remittances. Existing studies are mostly non-experimental and do not always use an appropriate method to deal with selection issues. Some authors use instrumental variables to overcome this problem; however, it is difficult to determine and test a correct instrument. So, in order to address potential bias due to unobserved heterogeneity we use propensity matching estimators introduced first by Rosenbaum & Rubin (1983; 1985). In this type of method each treated observation (remittance-receiving household) is matched to a fixed number of control observations (non-remittance-receiving household) based on a propensity score. With this approach we are able to calculate robust estimators in order to determine the effects of remittances on households' poverty levels. Basically, this method makes it possible to construct counterfactuals to find out what would happen to a remittance-receiving household's poverty level if the household does not receive remittances.

In matching estimators, two important assumptions are made: ***conditional independence assumption (CIA) (unconfoundedness) and common support***. Let us denote D = 1 if a household receives remittances and D = 0, otherwise. Then we can define the outcome for the recipients as Y (1) and the outcome for non-recipients as Y (0). In this study, the outcome variables will be per capita income, consumption per capita and poverty status. We further denote X as a set of socio-demographic variables. Then the two assumptions can be formally expressed as:

$$Y(0)Y(1) \perp D|X$$

$$0 < P(D = 1|X) < 1$$

The CIA implies that given the set of observables covariates X that are not affected by the treatment (receiving remittances), the potential outcomes P are orthogonal to treatment assignment (Khandker et al., 2010), which allows for selection on observables. The common support assumption sets of each remittance-receiving household can be matched to a corresponding non-remittance-receiving household in order to construct the counterfactual. Once these assumptions are made, the average treatment effect between D=1 and D=0 can be calculated.

Nevertheless, there are some computational problems due to dimensionality. To avoid these problems, Rosenbaum & Rubin (1983) propose constructing a statistical comparison group by estimating a propensity score (the probability of the observations to receive

remittances) given the set of covariates X. On the basis of the propensity score, remittance-receiving and non-remittance-receiving groups are matched. Then, the assumptions of conditional independence and common support imply

$$Y(0)Y(1) \perp D|P(X)$$

$$0 < P(D = 1|P(X)) < 1,$$

where $P(X)$ is the propensity score or the probability of the observations to receive remittances given X. This method of matching is known as propensity score matching. Basically, what this method implies is that if receiving remittances is independent to the observables covariates X, then it must be independent to $P(X)$. With this, the dimensionality problem is reduced to one dimension. There are no problems in the matching, as Dehejia & Wahba (1999) found, because observations with the same propensity score have the same distribution of the vector of covariates X.

The propensity score is calculated using a probit model subject to all the observable covariates that may determine receiving remittances. We estimate each observation (T=1 and T=0) probability to receive remittances and then test for the balancing property $(\hat{P}(X|D = 1) = (\hat{P}(X|D = 1))$. As suggested by Heckman et al. (1998), and Becker & Ichino (2002), some observations of the control group with weak common support are dropped in order to make inferences of causality. If the balancing property is not satisfied, then another specification of higher order terms and interactions of covariates are included in the probit model, until the balancing property is satisfied. Once the propensity scores are estimated and the balancing property is satisfied, we estimate a uni-variate nonparametric regression to obtain the ***average treatment effect on the treated*** (ATT) between the remittance-receiving households and the non-remittance-receiving households, which can be defined as

$$ATT = E[Y(1) - Y(0) | D = 1] = E[Y(1) | D = 1] - E[Y(0) | D = 1]$$

We use three types of matching criteria in order to obtain robust ATT. First, we use a ***nearest-neighbor matching criterion***, which matches remittance-receiving households with the closest propensity score of non-remittance-receiving households. Then, we use a ***kernel matching criterion***, which uses a weighted average for non-remittance-receiving households to construct the counterfactual match for each remittance-receiving household (Khandker et al., 2010). Finally, we use a stratification criterion in order to match treated observations with control observations. This type of matching criterion separates observations into different strata and then matches similar observations within each stratum (***stratified matching criterion***).

Finally, it is important to note that the variance for the treatment effect in propensity score matching is estimated incorrectly (Heckman et al., 1998). Nevertheless, correcting this problem is straightforward by bootstrapping the standard errors (Efron & Tibshirani, 1993; Horowitz, 2003). Therefore, bootstrapped standard errors with 100 replications are estimated for the treatment effect for two matching criteria, kernel and stratification.

4.2 Data

The data used to show the impact of remittance on household welfare has been taken from HIES 2010. HIES 2010 covers data on both domestic and international migration and the socio-demographic characteristics of the migrants and migrant households. Variables which will be used to estimate Propensity score are listed below:

Household Head's sex	No. of household members	Source of Drinking Water
Household Head's age	Access to electricity	Wall Material
Household Head's education level	Access to mobile	Sanitation type
Household Head's occupation	Land size	Rural/Urban dummy
	Household Usable Space (Sq. feet)	Division Dummies

5. Econometric exercises and discussions of the results

The first step in the empirical exercise is the estimation of the propensity score (Table 6). For our purposes this is the propensity of being treated i.e. of receiving remittances. The following tables show the results of the logit regressions for each of the model. We see that Household size has a significant impact on the probability of receiving remittance. Household assets such as land size and mobile also increase the likelihood of receiving remittance. However, while electricity connection raises the probability of receiving foreign remittance, it lowers the probability of receiving internal remittance. Other household standard of living proxies such as source of drinking water, type of latrine and material of wall of house also have significant impact. Generally households having brick-built-wall has a higher likelihood of receiving remittance compared to other types of wall materials. Households having access to tube-well water have more likelihood of receiving remittance compared to other sources of drinking water like pond, river and others. Similarly household having access to sanitary latrine has higher probability of receiving remittance compared to other types of latrine. All these indicate that household standard of living positively affects the probability of receiving remittance (see Khan, 2008) for an application of the PSM in Bangladesh context).

TABLE 6. LOGIT MODEL RESULTS FOR PROPENSITY SCORE MATCHING

VARIABLES	(1) Household received any type of remittance	(2) Household received internal remittance	(3) Household received foreign remittance
Household size	0.000235***	0.000130***	0.000160***
	(5.79e-05)	(3.85e-05)	(4.81e-05)
mobile	0.662***	0.153**	1.017***
	(0.0512)	(0.0598)	(0.0776)
telephone	-0.0745	-0.000646	-0.0671
	(0.132)	(0.169)	(0.149)
electricity	0.120***	-0.0962*	0.255***
	(0.0421)	(0.0547)	(0.0523)
Sex of HH head	-1.381***	-0.785***	-1.312***
	(0.0441)	(0.0541)	(0.0490)
Age of HH Head	0.0107***	0.0164***	0.00398**
	(0.00134)	(0.00159)	(0.00166)
Education of HH Head	-0.0151***	0.00870	-0.0252***
	(0.00484)	(0.00624)	(0.00569)
Land	0.136***	0.0833***	0.139***

TABLE 6. LOGIT MODEL RESULTS FOR PROPENSITY SCORE MATCHING

VARIABLES	(1)	(2)	(3)
	Household received any type of remittance	Household received internal remittance	Household received foreign remittance
	(0.0150)	(0.0185)	(0.0175)
WALL MATERIALS (BASE: BRICK)			
Wood	-0.0974*	0.0919	-0.150**
	(0.0520)	(0.0734)	(0.0585)
Mud Brick	-0.188***	0.115	-0.305***
	(0.0690)	(0.0921)	(0.0790)
Bamboo	-0.144**	0.181**	-0.290***
	(0.0668)	(0.0892)	(0.0801)
Others	-0.291	-0.182	-0.275
	(0.326)	(0.477)	(0.312)
TYPE OF LATRINE (BASE: SANITARY)			
Pacca Latrine (water seal)	-0.0536	0.0250	-0.0704
	(0.0590)	(0.0791)	(0.0687)
Pacca Latrine (pit)	0.137**	0.264***	0.00203
	(0.0582)	(0.0745)	(0.0693)
Kacha Latrine	0.0414	0.0717	0.0322
	(0.0574)	(0.0758)	(0.0662)
Kacha Latrine (pit)	-0.166**	-0.0273	-0.206***
	(0.0667)	(0.0875)	(0.0798)
Others	-0.262*	-0.113	-0.357*
	(0.153)	(0.167)	(0.190)
SOURCE OF DRINKING WATER (BASE: SUPPLIED WATER)			
Tube well	0.402***	0.197	0.413***
	(0.0891)	(0.127)	(0.0977)
Pond	-0.205(0.266)	-0.132(0.316)	-0.356(0.355)
Well	0.0204	0.361	-0.562
	(0.227)	(0.236)	(0.390)
Others	0.0997(0.156)	0.329(0.227)	-0.0478(0.196)
Rural (dummy: 0 urban, 1 Rural)	0.331***	0.331***	0.251***
	(0.0502)	(0.0680)	(0.0578)
DIVISION DUMMIES (BASE: BARISAL)			
Chittagong	0.211***	-0.458***	0.775***
	(0.0671)	(0.0822)	(0.0934)
Dhaka	-0.191***	-0.564***	0.344***
	(0.0636)	(0.0732)	(0.0908)
Khulna	-0.522***	-0.663***	-0.0433
	(0.0796)	(0.0926)	(0.110)
Rajshahi	-0.497***	-0.727***	0.0257
	(0.0846)	(0.104)	(0.113)
Rangpur	-0.636***	-0.536***	-0.685***
	(0.0982)	(0.100)	(0.168)
Sylhet	-0.226***	-0.933***	0.431***
	(0.0870)	(0.133)	(0.110)
Constant	-1.885***	-2.417***	-2.606***
	(0.141)	(0.182)	(0.172)
Observations	12,240	12,240	12,240

Note: Robust standard errors in parentheses *** p<0.01, ** p<0.05, *p<0.1

Households with female head are also more likely to receive remittance compared to their male counterpart. This result can be misleading unless we take care of the fact that most of these female headed household had male migrant who used to be the household head and in the absence of them, their wives act as household heads. Age of Household head

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also positively affects the probability of receiving remittance. Finally, education of household head has a negative impact on the probability of receiving remittance.

The community level characteristics also influence the probability of receiving remittance. Household locating in the rural areas have higher likelihood of receiving remittance compared to the ones locating in the urban area (see Katz, 2000). Besides the likelihood of receiving remittance also vary according to the region. Households in Chittagong are more likely to receive both types of remittance compared to the baseline region (Barisal). Households residing in Dhaka and Sylhet on the other hand, while have higher probability of receiving foreign remittance; have less likelihood of receiving domestic remittance. Households residing in other division have lower/or not significantly different likelihood of receiving remittance compared to the ones residing in Barisal.

5.1 All kinds of remittance cases (both internal and external)

Tables 7 through 12 report the results of the PSM matches under the various outcome variables and model specifications discussed above. Table 7 reports the impact of all type of remittances on per capita consumption. The result suggests that for every matching algorithm, the *ATT* is positive and significant, which means that remittances account for a positive and statistically significant difference between the matched treated (remittance receiving) and control groups in terms of per capita consumption (measured in Taka). Similarly for every type of matching algorithm, the ATT of remittance on per capita food expenditure is positive and significant (Table 8). Besides, remittance recipient household suffer less from poverty compared to the control groups and this results hold true for all types of matching algorithm (Table 9). Further the treatment groups spend more on health expenses compared to the non-recipient ones. However we do not see any significant difference between the treatment and control group in terms of education expenditure. On the other hand the impact of remittance on calorie intake is ambiguous--while Stratification Matching and Kernel Matching suggest the impact is positive and significant the Nearest-neighbor matching suggest that the impact while positive is not significant.

TABLE 7. PER CAPITA CONSUMPTION

Matching	N (treatment)	N (Control)	ATT	Stan. Error	t
Nearest neighbor	1,688	1,115	483.79	123.90	3.91
Stratification	1,688	10,488	606.55	81.45	7.45
Radius	1,518	10,440	734.53	61.23	12.00
Kernel	1,688	10,488	558.78	74.12	7.54

TABLE 8. PER CAPITA FOOD EXPENDITURE

Matching	N (treatment)	N (Control)	ATT	Stan. Error	t
Nearest neighbor	1,688	1,115	207.70	38.96	5.33
Stratification	1,688	10,488	246.24	30.24	8.14
Radius	1,518	10,440	303.88	25.95	11.71
Kernel	1,688	10,488	228.96	28.71	7.97

TABLE 9. POVERTY RATE (UPPER POVERTY LINE)

Matching	N (treatment)	N (Control)	ATT	Stan. Error	t
Nearest neighbor	1,688	1,115	-0.06	0.02	-3.37
Stratification	1,688	10,488	-0.1	0.01	-8.60
Radius	1,518	10,440	-0.16	0.01	-15.42
Kernel	1,688	10,488	-0.09	0.01	-7.04

TABLE 10. HEALTH EXPENDITURE

Matching	N (treatment)	N (Control)	ATT	Stan. Error	t
Nearest neighbor	1,688	1,115	2210.88	640.30	3.45
Stratification	1,688	10,488	2137.83	585.57	3.65
Radius	1,518	10,440	2754.62	581.47	4.74
Kernel	1,688	10,488	2012.87	.	.

TABLE 11. EDUCATION EXPENDITURE

Matching	N (treatment)	N (Control)	ATT	Stan. Error	t
Nearest neighbor	1,688	1,115	-2275.08	1648.53	-1.38
Stratification	1,688	10,488	-285.95	618.44	-0.46
Radius	1,518	10,440	614.32	420.75	1.46
Kernel	1,688	10,488	-635.29	.	.

TABLE 12. CALORIE INTAKE

Matching	N (treatment)	N (Control)	ATT	Stan. Error	t
Nearest neighbor	1,688	1,115	10.88	27.54	0.40
Stratification	1,688	10,488	51.86	21.32	2.43
Radius	1,518	10,440	110.57	17.20	6.43
Kernel	1,688	10,488	45.31	.	.

5.2 Only internal remittance cases

Tables 13 through 17 show the impact of internal remittances on various outcome variables under different matching algorithm discussed in the methodology part. Table 13 reports the impact of internal remittance on per capita consumption. The result suggests that for Stratification Matching and Radius Matching, the ATT is positive and significant, which means that remittances account for a positive and statistically significant difference between the matched treated (remittance receiving) and control groups in terms of per

capita consumption (measured in Taka). However, the impact while positive is not significant for Nearest-neighbor Matching. However for every type of matching algorithm, the ATT of remittance on per capita food expenditure is positive and significant. Besides, remittance recipient household suffer less from poverty compared to the control groups but this results hold true only for Stratification Matching and Radius Matching. Further there was not any significant difference between the treatment groups and control groups in terms of health expenses for all matching algorithm other than Nearest Neighbor Matching. On the other hand the impact of remittance on per capita calorie intake is found to be positive and significant regardless of the matching algorithm.

TABLE 13. PER CAPITA CONSUMPTION

Matching	N (treatment)	N (Control)	ATT	Stan. Error	t
Nearest neighbor	540	498	95.36	145.41	0.66
Stratification	539	11,695	244.48	87.58	2.79
Radius	517	11,609	327.43	84.63	3.87

TABLE 14. PER CAPITA FOOD EXPENDITURE

Matching	N (treatment)	N (Control)	ATT	Stan. Error	t
Nearest neighbor	540	498	119.09	55.17	2.16
Stratification	539	11,695	140.25	40.45	3.47
Radius	517	11,609	179.05	38.28	4.68

TABLE 15. POVERTY RATE (UPPER POVERTY LINE)

Matching	N (treatment)	N (Control)	ATT	Stan. Error	t
Nearest neighbor	540	498	-0.05	0.03	-1.96
Stratification	539	11,695	-0.07	0.02	-4.08
Radius	517	11,609	-0.09	0.02	-4.90

TABLE 16. HEALTH EXPENDITURE

Matching	N (treatment)	N (Control)	ATT	Stan. Error	t
Nearest neighbor	540	498	1435.39	624.05	2.3
Stratification	539	11,695	802.66	528.13	1.52
Radius	517	11,609	802.66	528.13	1.52
Kernel	540	11,694	627.08	.	.

TABLE 17. CALORIE INTAKE

Matching	N (treatment)	N (Control)	ATT	Stan. Error	t
Nearest neighbor	540	498	108.13	38.77	2.79
Stratification	539	11,695	119.50	29.81	4.01
Radius	517	11,609	118.35	28.76	4.12
Kernel	540	11,694	104.19	.	.

5.3 Only external remittance cases

Tables 18 through 23 report the results of external remittance various outcome variables. Table 18 reports the impact of external of remittance on per capita consumption. The result suggests that for every matching algorithm, the *ATT* is positive and significant, which means that remittances account for a positive and statistically significant difference between the matched treated (remittance receiving) and control groups in terms of per capita consumption (measured in Taka). Similarly for every type of matching algorithm, the ATT of remittance on per capita food expenditure is positive and significant. Besides, remittance recipient household suffer less from poverty compared to the control groups and this results hold true for three types of matching algorithm. Further the treatment groups spend more on health expenses compared to the non-recipient ones. However we do not see any significant difference between the treatment and control group in terms of education expenditure except for the *Radius Matching*. On the other hand the impact of remittance on calorie intake is ambiguous- while stratification matching and Kernel matching suggest the impact is positive and significant the Nearest-neighbor matching suggest that the impact although negative is not significant.

TABLE 18. PER CAPITA CONSUMPTION

Matching	N (treatment)	N (Control)	ATT	Stan. Error	t
Nearest neighbor	1,104	785	500.29	126.88	3.94
Stratification	1,104	10,611	701.18	100.46	6.98
Radius	995	10,421	909.24	86.42	10.52

TABLE 19. POVERTY RATE (UPPER POVERTY LINE)

Matching	N (treatment)	N (Control)	ATT	Stan. Error	t
Nearest neighbor	1,104	785	-0.08	0.02	-4.06
Stratification	1,104	10,611	-0.16	0.01	-9.58
Radius	995	10,421	-0.17	0.01	-15.9

TABLE 20. PER CAPITA FOOD EXPENDITURE

Matching	N (treatment)	N (Control)	ATT	Stan. Error	t
Nearest neighbor	1,104	785	191.38	45.95	4.17
Stratification	1,104	10,611	256.75	37.36	6.88
Radius	995	10,421	333.42	34.49	9.67

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TABLE 21. HEALTH EXPENDITURE

Matching	N (treatment)	N (Control)	ATT	Stan. Error	t
Nearest neighbor	1,104	785	1919.22	1156.63	1.66
Stratification	1,104	10,611	2714.04	800.54	3.39
Radius	995	10,421	3086.42	817.29	3.78
Kernel	1,104	10.611	2579.19	.	.

TABLE 22. EDUCATION EXPENDITURE

Matching	N (treatment)	N (Control)	ATT	Stan. Error	t
Nearest neighbor	1,104	785	-197.26	995.17	-0.2
Stratification	1,104	10,611	935.05	663.47	1.4
Radius	995	10,421	1612.95	530.20	3.04
Kernel	1,104	10.611	201.85	.	.

TABLE 23. CALORIE INTAKE

Matching	N (treatment)	N (Control)	ATT	Stan. Error	t
Nearest neighbor	1,104	785	-7.40	31.29	-0.24
Stratification	1,104	10,611	40.92	24.12	1.7
Radius	995	10,421	84.11	20.42	4.11
Kernel	1,104	10,611	30.28	.	.

Conclusion and policy implications

In this paper we have investigated the causal relationship between remittances and household welfare using household data. For this investigation we employed Propensity score matching technique. The results of the empirical exercise tend to support the conclusion that remittances have a positive impact on per capita incomes and, crucially, contribute to a decline in poverty status. By establishing such a quantified microeconomic result on the effect of foreign remittances in Bangladesh, we strengthen the case for remittances as a poverty alleviating policy tool.

Our empirical results reveal therefore that appropriate policy to explore more foreign employment and more proficient use of remittances would help the well-being of the households. In essence, the beneficial consequences of foreign remittances may lead us towards the path of adopting a "foreign employment" policy so as to "bring in" more of the same. In this regard, some policy considerations under different objective headings are offered below.

First, high fees charged by financial institutions, coupled with insufficient ATM facilities are still pushing some workers into remitting money home through the Hundi system (D8 Secretariat, 2008). While the Bangladesh Ministry of Finance made headway in curtailing Hundi transfer when they introduced strict time limits on official transfers and promoted electronic banking, competition within the banking sector needs to be encouraged to mitigate fees and harness a greater number of formal remittances.

Second, there are also significant gender issues that must be addressed if migration and remittance payments are to be effectively utilized. Women are of particular concern in the workforce. Currently, women migrants are an immensely unutilized asset. This is largely due to government restrictions on the number of unskilled and semi-skilled women who can migrate. However, problems are also faced by those women who manage to migrate (whether legally or not), with many reported cases of exploitation. Therefore, in order to capitalize on this untraditional market effectively the government must promote and empower women in the workforce.

Third, our study finding echoes the findings of World Bank (2012) such that direct benefits of remittance earning fall disproportionately on the Eastern part of the country, whereas the Western and the Southern part of the country have been largely bypassed. The districts within Dhaka, Chittagong and Sylhet divisions are the one where there have been long traditions of overseas migration and remittance earning. The economic theory predicts that, if not controlled, new migration would occur, where the stock of migrant population is already higher. This implies that the government of Bangladesh should proactive measures to increase the number of migrant workers from the Southern and western belt in order to reduce this regional disparity.

Fourth, the overseas migration in Bangladesh traditionally have been limited to mostly Middle East and only recently in some South-East Asian countries. But as the macroeconomic data suggests remittance received from countries like the USA, the UK and Italy has been significant despite smaller migration trends to these countries. This may imply higher remittance earning per migrant worker in these countries compared to the traditional ones in the Middle East. Therefore GOB should take steps to explore new market opportunities not only limited to these ones, but also include other European countries like Federation of Russia, Sweden, Norway, Germany, the Netherlands as well as some South East Asian countries like Brunei, Malaysia, Singapore and Hong Kong.

Fifth, the amount of illegal migration that still occurs in Bangladesh warrants further attention. With the creation of the Ministry of Expatriates' Welfare and Overseas Employment (MoEWOE) in 2001, the Government of Bangladesh attempted to curtail the amount of undocumented migration. Due to a number of loopholes and disjointed efforts among different anti-trafficking groups there is still insufficient regulation of recruitment agencies and human traffickers. While promotion of formal remittances would likely help, the governments must show persistent vigilance against human trafficking through coherent and strictly enforced law. There should also be increased cooperation between origin countries and countries of destination so that there is a more coordinated and uniform effort in regulation of migration and enforcement of ethical practices and laws.

Sixth, it is also important that institutions introduce new savings instruments as well as further opportunities whereby migrants can channel their remittance funds into productive sectors of the economy (World Bank, 2005). Education in financial planning and business development/management would be effective in harnessing the development impact of remittances. As mentioned earlier, remittance income is used primarily for consumption purposes. While this is valuable to the economy via the multiplier effect, further economic progress would be expected if there was broader development. Migrant workers investing their remittances in business opportunities within their local towns would create employment and growth opportunities; however, for this to happen incentives need to be offered by the government. These incentives could include public infrastructure and development in region centers to encourage remittances investment in these areas, as well as tax incentives for certain projects deemed suitable for development.

Finally, while it is clear that remittances improve welfare, it is the households that are better able to afford the initial cost of the overseas migration that benefit the most (World Bank, 2007). Policy initiatives such as the expansion of social programs in microfinance and skills development, and the lowering of interest rates on pre-departure loan schemes

(World Bank, 2005) could provide the necessary help for struggling households not yet meeting the initial cost of migration. Currently, there are only a few training centers in Bangladesh to provide prospective migrant workers with the skills needed to successfully migrate and remain employed. Expanding these training institutions, especially beyond city boundaries would increase the skill base of prospective migrants as well as provide access to training for the more disadvantaged households on city outskirts.

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