

Impact of migration on household consumption expenditures in Bangladesh using the coarsened exact matching (CEM) approach

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Abstract

Purpose – The study aims to examine the impact of migration on household consumption expenditures in Bangladesh.

Design/methodology/approach – The paper uses coarsened exact matching methods to examine the causal impact between migration and household welfare using the dataset on Bangladesh Household Income and Expenditure Survey 2010 on 12,213 households.

Findings – The study reveals that migration has a positive impact on household welfare improvement through increases in their consumption expenditures. Households with migration status are found to spend more on food, non-food (housing, durable goods, fuel, cosmetics, cleaning, transport, clothing, taxes, insurance, recreation) items and medical. However, the authors do not find any evidence of impacts on education expenditures.

Research limitations/implications – The availability of panel data and the use of other variables (e.g. household investment expenditures, household budget allocation for agricultural input expenses, etc.) would have been able to provide vivid results.

Originality/value – This paper adds to the Bangladeshi migration literature by offering a novel empirical assessment of the Bangladeshi migrants and its impact on household welfare by drawing upon a recently published, nationally representative sample of Bangladeshi households.

Keywords Bangladesh, Migration, Household consumption, Expenditure, Coarsened exact matching

Paper type Research paper

1. Introduction

Migration plays a vital role in reducing poverty and improving household welfare in developing countries (Ramos, 2018). Therefore, it has drawn an ongoing attention to development issues over recent decades (Nguyen *et al.*, 2017). Researchers have often investigated whether migration has an impact on the welfare of households that send migrants (Martey and Armah, 2021). It is expected that migration increases the income and consumption of households through remittances, in the form of both the cash and goods that migrants' remit to their family members remaining in the country of origin (Adams and



Cuecuecha, 2010). This impact can be examined through changes in the household migration status and their consumption expenditure patterns (To *et al.*, 2017), and it is necessary since changes in household consumption expenditure patterns can explain whether remittances sent by migrants contribute to the improvement of household welfare. Furthermore, if remittances are devoted to health and education expenditures, they contribute to the development of human capital in the long term (Nguyen *et al.*, 2017). The flow of remittances also eases liquidity constraints and allow households to invest in farm or non-farm activities that require substantial investment (López-Feldman and Chávez, 2017). However, migration is considered a potential threat to agricultural productivity at the place of origin (Sharma *et al.*, 2016). Cuong and Linh (2018) mentioned that migration is the absence of labors in the home households. Taylor and Lopez-Feldman (2010) stated that due to the migration, a shortage of labor is being created, which reduces labor-intensive production of household. In short, migration is a rational decision of an individual or a group of individual household members having an impact on household welfare, which can be examined by examining the household consumption pattern.

The study of migration has been observed from multiple angles. Several researchers have studied the impact of migration on household welfare (Tang, 2020; Nguyen *et al.*, 2011), on household investment (Xu *et al.*, 2017; Monnet and Wolf, 2017), on food security (Abebew *et al.*, 2020; Hasanah *et al.*, 2017), division of labor (Xu *et al.*, 2018; Zhang *et al.*, 2017), psychological health (Agadjanian *et al.*, 2020; Zhang *et al.*, 2017), household budget (Acharya and Leon-Gonzalez, 2019). Unfortunately, the number of studies focusing on the impact of migration on healthcare expenditure is rare (Nguyen *et al.*, 2017). Thus, the study attempts to investigate on this issue from Bangladesh, a South Asian country perspective.

Bangladesh has experienced increasing economic growth in recent years. The economy grew by 7.28% in fiscal year 2017, up from 7.1% in fiscal year 2016. Over the past ten years from 2008 to 2017, the average annual gross domestic product (GDP) growth rate was 6.28%, calculated from Bangladesh Bank Annual Report 2016–2017 (Bangladesh Bank, 2017). International remittance is the second largest source of foreign exchange income after exports, and it accounted for 10% of the GDP in 2008, sent by 5.8 million migrant workers from abroad (Raihan *et al.*, 2009). In 2016, the World Bank ranked Bangladesh fifth as a stock of migrants and eighth among remittance earnings country worldwide. Thus, the country is constantly achieving stable growth performance and remittance income.

In relation to economic growth and remittance income, the rate of migration in Bangladesh has increased over the years, with the rate of international migration higher than domestic migration. In our current dataset, more than 66% of the cases involve international migrants. This high rate of international migration is not surprising since returns from overseas employment are relatively high due to wage differentials, even after adjusting for differences in cost of living (Sharma and Zaman, 2009). Overall, both internal migration and international migration are rapidly increasing. A time-series analysis of lifetime internal migrants showed that migrants numbered 0.95 million, accounted for 2.31% of the total population in 1951. It rose to 6.56 million migrants in 1982, accounted for 7.39% of total population. The proportion of lifetime migrants found in the 1991 population census was 10.44%. However, the estimated lifetime migration rate for the period of 1982–1991 was 10.44, and for the period of 1991–2004, it was 9.34%. In 1984, the in-migration rate in rural areas was 5.8 per thousand populations, and in 2010, it was 22.2 per thousand populations. In urban areas in 1984, in-migration was 14.5 per thousand populations, and in 2010, this rate was 73.4 per thousand populations (Bangladesh Bureau of Statistics, 2011). By contrast, international migration trends show three phases. The first phase was during the period of 1978–1989, during which migration was characterized by workers going to Middle East countries. This phase included approximately 724,000 workers or a flow of 52,000 workers per year. The second phase was marked by the opening of Malaysia and Singapore markets for Bangladesh workers from

1990 to 2000. This opening caused out-migration to quadruple to approximately 205,000 workers per year, and roughly 2.3 million workers moved from Bangladesh. The third phase started in 2001, characterized by the opening of markets for Bangladeshis in East European countries, Italy, the Republic of Korea and again Malaysia after a three-year embargo. Subsequently, the yearly migration rate doubled from the previous decade to 410,000 workers per year (Raihan *et al.*, 2009). These migration trends show that the rate of migration in Bangladesh has continuously increased since the liberation war in 1971, in the form of both internal and external migration.

Although the growth performance, the rate of migration and the stock of remittance earnings have simultaneously increased, the microeconomic impact of migration on household welfare remains obscure (Nguyen *et al.*, 2017). The few studies conducted in Bangladesh in this context have shown contradictory findings, especially the impact of migration on household healthcare expenditures. These studies have also been limited in methodological approaches and have had insufficient sample sizes.

To overcome these limitations and fill the research gap, our study intends to examine the effects of migration on household consumption expenditures using a nationally representative sample and modern methodological approaches. More specifically, we aim to investigate the impact of migration on household welfare by examining household expenditure patterns. Our fundamental research questions are quite simple. (1) How does household consumption expenditure vary across households sending migrants and household without migrants in the context of Bangladesh? (2) Are these monies from migration merely exhausted for consumption, instead of being investing in human and physical capital development? The first question focuses explicitly on household food and non-food expenditures. The second question focuses on whether remittance income from migration contributes to increase spending on education and health care.

This study is different in its methodological approach. We use coarsened exact matching (CEM) methods, which exactly match the unit of observations from treated and control groups with similar characteristics, to investigate the impact of migration on household consumption expenditures. We estimate the sample average treatment effect on the treated (SATT) to measure the causal impact of migration on household welfare.

The remainder of the paper is structured as follows. Section 2 provides a brief literature review. Section 3 describes the data source and the methodology. Section 4 presents the results and discussion. Section 5 summarizes and concludes the study.

2. Literature review

2.1 Theoretical links between migration and household welfare

The researchers have widely studied causal connections between migration and different household related issues (Tang, 2020; Abebaw *et al.*, 2020; Xu *et al.*, 2017, 2018; Agadjanian *et al.*, 2020). Various theories and modeling techniques have been developed to explain such causal relationships. For the study of migration, the economic theory of migration is widely used (Collins, 2018). The economic theory of migration assumes that decision makers or individuals consider a set of locations and rationally choose one place that maximizes their expected return from migration (Czaika, 2015).

According to Lewis (1954), the economy consists of two sectors: a subsistence agricultural sector and an urban-based manufacturing sector. The subsistence agricultural sector, in which the marginal product of labor is close to zero, possesses an abundant supply of workers (Varga, 2019; Saqib *et al.*, 2018). Therefore, people move from surplus labor areas to deficit labor areas to improve their living conditions (Yuan *et al.*, 2018). The theory of Lewis (1954) is consistent with the theory of “pull” and “push” factors developed by Ravenstein (1885) in his “Laws of Migration.” This theory of “push” and “pull” factors explains the factors that cause

migration (Hoffmann *et al.*, 2019; Kanayo *et al.*, 2019). Pull factors include economic, social, political, cultural or environmental benefits that attract people to migrate to the place of destinations, for example, places where better job opportunities, better education, rich culture or social values, and better living environments are available (Klaus and Pachocka, 2019; Hoffmann *et al.*, 2019). Push factors include the forces that cause people to migrate from the place of origin, for example, fewer employment opportunities and lower wages, political turmoil, social degradation, a fragile economy and loss of assets or lives due to natural disasters (Hoffmann *et al.*, 2019). Therefore, migration occurs due to the existence of differential benefits at the place of origin and destination regarding wages, education, social values or living environment (Crawley and Skleparis, 2018). A similar argument is also found in the migration model developed by Harris and Todaro (1970) and in the work of Sjaastad (1962), which explained that migration decisions are made based on the expected income differentials between the places of origin and destination, rather than wage differentials only. This theoretical background suggests that location- or region-specific benefits and forces generate differentials in expected returns and therefore cause migration. The existence of such differentials is also found between domestic migration and international migration. Adams (2006) argued that households with international remittances are more capable of reducing poverty than households with domestic remittances.

However, the economic theories show both optimistic and pessimistic views of migration (Franceschelli and Keating, 2018). The optimistic view describes migration as a form of optimal decision-making for expected gains or outcomes perceived after migration. Such decision-making includes optimal allocation of production factors, sharing benefits for both the origin and destination countries through capital and knowledge transfer (Ali *et al.*, 2019). Conversely, the pessimistic view focuses on the negative impact of migration (Steenvoorden and Hartevelt, 2018). It describes the migration of skilled and educated individuals as hindering the development of an economy. Therefore, their migration causes efficient outcome loss in production sectors. It is commonly known as “brain drain” in the migration literature. It also argues that remittances are consumed rather than invested in productive sectors (Durand and Massey, 1992). However, recent studies have countered the pessimistic view of migration. For example, Yaméogo (2014) argued that migration contributes to gaining knowledge and achieving technological advances through reverse engineering. In another study, Stark and Bloom (1985) reported that migration allows households to transfer surplus labor to labor shortage areas.

Finally, the role of remittances that migrants send to family members in the country of origin is diverse and vague. The permanent income hypothesis assumes that, since remittances are a transitory type of income, households tend to spend them more at the margin on human and physical capital investment (Aguayo-Téllez *et al.*, 2021; Randazzo and Piracha, 2019); therefore, income from remittances exerts a widening impact on the growth and development of migrant-sending countries (Pan *et al.*, 2020).

2.2 Empirical evidence

These theoretical issues have been evaluated and supported in much of the empirical research. Households receiving remittances allocate more money to education, housing, health and durable goods (Tabuga, 2007). Russell *et al.* (1990), in a World Bank discussion paper, showed that migrants tend to use remittance money for investments in education, farming, livestock and small-scale enterprises after satisfying household subsistence needs. Households receiving remittances improve their living conditions, reduce poverty status and therefore contribute to economic growth (Adams and Cuecuecha, 2010). A study in Turkey by Koc and Onan (2001) on the impact of remittances on families’ well-being showed that receipt of remittances has a positive impact on household welfare with both direct and indirect

income effects. This finding suggests that migrants grasp the benefits of wage differentials, consistent with the arguments of [Lewis \(1954\)](#), [Sjaastad \(1962\)](#), [Ravenstein \(1885\)](#) and [Harris and Todaro \(1970\)](#).

The theoretical argument over the expected return differentials between domestic and international migration was supported in the study of [Adams and Cuecuecha \(2010\)](#). Using household survey data from Guatemala in 2002 and applying a two-stage multinomial selection model, they found that households receiving international remittances spend less at the margin on food expenditures, and households receiving either internal or international remittances spend more at the margin on education and housing than what they would have spent without the receipt of remittances. Similar evidence was also found in the study of [Taylor and Mora \(2006\)](#). Using data from the Mexico National Rural Household Survey 2003, they showed that households with international migrants have large marginal budget shares for health and small marginal budget shares for food and housing. They also showed that households with internal migrants have relatively large marginal budget shares for health, housing and education. In a study in Burkina Faso, [Wouterse \(2008\)](#) found that remittances help to reduce the poverty headcount ratio for households with international migrants.

Empirical research has supported both the optimistic and pessimistic views of the impact of migration on household welfare. The most critical finding regarding the pessimistic view of migration is the curse of “brain drain.” For example, [Snarr *et al.* \(2011\)](#) reported that educated and young migrants are considered talented people who mostly contribute to production sectors, including agriculture. Therefore, their migration causes efficient outcome loss in production sectors. In a study in Cameroon, [Djiofacka *et al.* \(2013\)](#) found a negative effect of skilled migration on productivity. Additionally, they found an increase in the rate of poverty. Several other studies have shown that remittances are consumed instead of invested and thus are not devoted to productive use in migrant-sending areas ([Randazzo and Piracha, 2019](#); [Taylor *et al.*, 1996](#); [Durand and Massey, 1992](#)). However, the pessimistic views of “brain drain” have been countered in some studies. For example, [Yaméogo \(2014\)](#) showed that migration contributes to gaining knowledge and technological advances through reverse engineering, demonstrating the diaspora effect of migration, which suggests that migrants gain knowledge through experiences and can contribute to technological advances and knowledge transfer in their countries of origin when they return.

The permanent income hypothesis has also been supported in several studies. [Yaméogo \(2014\)](#) found that in Burkina Faso, poorer households receiving remittances spend more money on food, whereas wealthier households allocate more money to durable goods, education, housing and transportation. It is important to clarify that wealthier households treat remittances as a transitory type of income. As we mentioned earlier in the theoretical section, the permanent income hypothesis assumes that remittances are a transitory type of income and therefore tend to spend them more at the margin on human and physical capital development. For example, in a study in the Philippines, [Yang \(2008\)](#) found that receipt of remittances drives more spending on education and increases the rate of school attendance (see [Adams, 2006](#)).

Several studies conducted in Bangladesh have shown that migration is regarded as a means of household welfare improvement and poverty reduction ([Raihan *et al.*, 2009](#); [Sharma and Zaman, 2009](#); [Wadood and Hossain, 2017](#)). However, these studies were limited in methodological approaches and had insufficient sample sizes. Using the Household Income and Expenditure Survey (HIES) 2005 data, [Raihan *et al.* \(2009\)](#) estimated the association between remittances and household welfare. They used ordinary least squares (OLS) regression and found that there are positive associations of remittances with food, housing, education and medical expenditures. However, OLS regression does not guarantee mitigation of self-selection bias. [Sharma and Zaman \(2009\)](#) used a sample of 500 households from ten randomly selected districts in Bangladesh and applied propensity score matching (PSM) to

check the causality between migration and household welfare. They found that monthly per capita total expenditures are significantly higher for migrant households, compared to non-migrant households. However, their sample size was not sufficiently large to draw general conclusions. More recently, [Wadood and Hossain \(2017\)](#) conducted a study to reveal the microeconomic impact of remittances on household welfare in Bangladesh using PSM methods. They also found that both internal and external remittance-receiving households experience significant reductions in poverty and increases in consumption expenditures. However, their study did not report the balancing property of PSM, which is crucial for the determination of selection bias.

The impact of migration on household welfare has not been studied well in the context of Bangladesh, which is the area of research to which the current study contemplates contributing. Our study differs from others in its methodological approach. We use the CEM method to examine the impact of migration on household consumption expenditures. The advantage of the CEM approach is that it exactly matches the units of observation from the treated and control groups with similar characteristics. Therefore, expenditure patterns in households with migration status must be compared with those in otherwise similar households without migration status while controlling for endogeneity and selection bias. We attempt to provide evidence for the impact of migration on household welfare, including per capita expenditures, providing a more realistic scenario of individual welfare improvement.

3. Study design

3.1 Data source

The data utilized for this study come from Bangladesh [HIES 2010](#), a nationally representative survey conduct by the Bangladesh Bureau of Statistics (BBS). This survey was administered from February 2010 to January 2011. The survey covers 12,240 households drawn from 612 primary sampling units (PSUs), from 16 strata: six rural areas, six urban areas and four statistical metropolitan areas. This survey contains detailed information about income, expenditure, consumption and poverty situation. As part of this survey, a supplemental migration and remittance module was administered in a nationally representative sub-sample of 1,539 households. The module was designed to gather nationally representative information about migration and remittances for the first time in Bangladesh.

The current study considers the data of 12,240 households. We omitted 27 households considering the age of the household head was younger than 20 years old or/and older than 99 years old, resulting in a sample size of 12,213 households. This consideration includes the following. First, the legitimate age of marriage is 18 years old for woman and 21 years for men. Thus, a newly married couple can live separately from their parents, and either of them can play the role of household head, depending on their economic influence. It suggests that someone younger than 18 or 20 years old cannot be a household head. Second, the oldest member of the household, older than 90 or 100 years of age, might have exercised decision-making at one time; however, he or she is no longer regarded as the main household head because of his or her non-earning status. Therefore, we omitted those younger than 20 years old or and older than 99 years from the dataset. Since our focus is on migration and its impact on household expenditures, we grouped the data into households with migration status and households without migration status, numbering 1,535 (12.57%) and 10,678 (87.43%), respectively.

3.2 Methodology

We begin our data analysis by defining migration, which is household migration status in our study. The migration status of a household is defined as any member (at least one) of the household having migrated, either within the country or abroad, over the past previous years since the year in which the survey was conducted ([2010](#)). We divide the households into two

groups: households with migration status (treatment group) and households without migration status (control group). To measure the household consumption expenditures, we estimate both monthly aggregate and monthly per capita expenditures. We first estimate the total monthly consumption expenditure and decompose the total expenditure into monthly food expenditures, monthly non-food expenditures, monthly medical expenditures and monthly education expenditures. Then, we estimate per capita total monthly consumption expenditures and also decompose into per capita monthly food expenditures, per capita monthly non-food expenditures, per capita monthly medical expenditures and per capita monthly education expenditures. The monthly consumption expenditure is the sum of goods and services that households consume per month. Food expenditures include purchased and non-purchased food items, such as rice, fish, meat, vegetables, eggs, pulses, oil, spices, milk, fruit, drinks and tobacco, including food eaten outside the home. Non-food expenditures include fuel, cosmetics, cleaning products, transport, clothing, housing, durable goods, taxes, insurance and recreation expenditures. Medical expenditures include expenditures such as doctor's fees, medicines, medical tests, hospitalization and health-related travel expenses. Expenditures on education include money spent on books, stationery, registration fees, examination fees, annual fees, home tutor expenses, hostel or boarding expenses and other related expenses.

Econometric approach considers household remittance status as an explanatory variable (Taylor and Mora, 2006). In our study, we consider household migration status to be an explanatory variable. The advantage of this consideration is that household budget constraints are constructed as a function of not only income, prices and socio-demographic variables but also the amount of remittance income that households receive or household migration status. Therefore, we assume that income from different sources is pooled into a general household budget constraint. Thus,

$$C_{ij} = f(I_{ij}M_i, X_i) + e_i \quad (1)$$

where, C_{ij} denotes the consumption expenditures of household i for expenditures on j . I_{ij} denotes the income of household i from source j . M_i denotes a dummy for household migration status, indicating that a household receives migration status if at least one member of the household migrates compared to a household without migration status. X_i denotes the observed characteristics of a household, and e_i denotes an error term.

Several matching methods are applied to evaluate the impact of migration on household consumption expenditures, such as PSM, Mahalanobis matching and other matching methods. The key objective of the matching method is to prune observations from the dataset to have a comparable balance between the treated and control groups in the remaining data such that the observational distributions of the covariates (X) between the two groups are more similar after matching. Therefore, calculating a simple difference of means estimates the causal effect. Unfortunately, PSM, which is commonly applied in many existing studies, is limited to its balancing property criterion. Finding a matching solution that improves the balance between the treated and control groups is easy for some covariates, but the results often leave the balance worse for some other variables at the same time (Iacus *et al.*, 2012; King and Nielsen, 2016). It produces the risk of bias and model dependence if the balancing property is not satisfied. Checking the balance continuously, rematch and repeating this procedure until the balance improves is tiresome work (King *et al.*, 2010).

To avoid such balancing property problems and other problems in matching methods, Iacus *et al.* (2012) introduced a new class of matching method known as "Coarsened Exact Matching" (CEM). CEM works in samples and guarantees that the imbalance between the matched treated and control groups will not be greater than the *ex ante* user choice. With CEM, it is easier for the analyst to choose levels and coarsen each covariate on the basis of

observational information. CEM is superior to commonly used matching methods in its ability to reduce imbalances, model dependence, estimate error, bias, variance, mean square error and other criteria (Iacus *et al.*, 2012). Therefore, CEM is considered a defense protecting the analyst from threats to validity in drawing causal inferences.

CEM holds two simplifying assumptions. First, it holds the standard ignorability assumption. That is, conditional on observed characteristics X , the treatment variable is independent of the potential outcomes:

$$T_i \perp\!\!\!\perp \{Y_i(0), Y_i(1)\} | X \quad (2)$$

where T_i denotes the treatment status of observation i , $Y_i(0)$ denotes the potential outcome for observation i if the unit does not receive treatment and $Y_i(1)$ denotes the potential outcome if the unit receives treatment. X denotes the vector of observed covariates. Second, it assumes that matching-based estimators tend to focus on SATT to retain all treated units, and it prunes only control units. That is, for each observation, $Y_i(1)$ is always observed, whereas $Y_i(0)$ is estimated from control units through matching algorithms. It is worth noting that the number of treated units can decrease, depending on the coarsening and binning strategies chosen by the analyst.

In this study, we apply the CEM method developed by Iacus *et al.* (2012) to check the causality with less selection bias and fewer endogeneity problems. We estimate the SATT, defined as the impact of household migration status on household consumption expenditures. The SATT is described as follows:

$$\text{SATT} = \frac{1}{n_T} \sum_{i \in T} TE_i \quad (3)$$

where T in $\sum_{i \in T}$ is the set of indices of treated units in the sample. n_T denotes the total number of elements of the set. TE_i is the treatment effect for the unit i .

Prior to SATT estimation, we check for measures of imbalance. The benefit of measuring imbalance is to summarize the multivariate distance between the pretreatment covariates for the treated and matched control groups. It is good practice to fix the bin size of the covariates to measure the multivariate distances. If prior information indicates that some variables are more important than others in predicting the outcome, the analyst can choose to use more bins for this variable. The multivariate imbalance measure is described as follows:

$$\mathcal{L}_1(f, g) = \frac{1}{2} \sum_{\ell_1, \dots, \ell_k \in H(X)} |f_{\ell_1, \dots, \ell_k} - g_{\ell_1, \dots, \ell_k}| \quad (4)$$

where f and g denote the relative frequency distributions for the treated and control groups, respectively. $f_{\ell_1, \dots, \ell_k}$ is the relative frequency for observations belonging to the cell with coordinates $\ell_1, \dots, \ell_k$ of multivariate cross-tabulation of the treated units, and $g_{\ell_1, \dots, \ell_k}$ for the control units. $H(X)$ is the set of distinct values generated by binning on variable X . Good matching will satisfy $\mathcal{L}_1(f^m, g^m) \leq \mathcal{L}_1(f, g)$. Here, f^m and g^m are the frequencies for the matched treated and control groups, respectively, corresponding to the unmatched f and g frequencies. $\mathcal{L}_1(f^m, g^m) \leq \mathcal{L}_1(f, g)$ indicates that CEM reduces the amount of imbalance through the binning and coarsening of the covariates.

In our study, we coarsen each variable by recoding so that substantively indistinguishable values are grouped and assigned the same numerical value. Then, we apply the exact matching algorithm to the coarsened data to determine the matches and to prune unmatched units. In other words, after coarsening, the CEM algorithm generates a set of strata each with same coarsened values of covariates X , and the units in the strata that contain at least one treated and one control unit are retained; units in the remaining strata are removed from this

sample. For each matched unit i in the strata, CEM assigns the following weights:

$$w_i = \begin{cases} 1, & i \in T^s \\ \frac{m_C}{m_T} \frac{m_T^s}{m_C^s}, & i \in C^s \end{cases} \quad (5)$$

CEM assigns weight $w_i = 0$ if units are unmatched and $w_i = 1$ for the treated units. CEM, therefore, eliminates the differences between the treated and control groups (i.e. eliminating imbalances beyond some chosen level defined by the coarsening strategies). The remaining differences are greatly amenable to being spanned by a statistical model without risk of much model dependence. After coarsening, the CEM algorithm creates a set of strata $s \in S$, each with same coarsened values of covariates X . In the above equation, T^s is the treated units in stratum s , and $m_T^s = \#T^s$ is the number of treated units in the stratum. Similarly, for the control units C^s , the number of units in stratum $m_C^s = \#C^s$. The number of matched units for the treated and controls groups are $m_T = \sum_{s \in S} m_T^s$ and $m_C = \sum_{s \in S} m_C^s$ respectively.

To move into the SATT estimation, we begin by coarsening the continuous covariates that we use in our study, namely, household head's age, household head's educational level (years of schooling), household size and acres of cultivable land that each household occupies. We denote the range of continuous covariates X_j as $Z_j = \max_{i=1, \dots, n} X_{ij} - \min_{i=1, \dots, n} X_{ij}$. Thus, coarsening is equivalent to the value ε_j for each variable such that $0 < \varepsilon_j \leq Z_j$, where $\varepsilon_j = Z_j$ corresponds to the all of observations grouped in a single interval, and $\varepsilon_j = 0$ corresponds to no coarsening. Following these coarsening strategies and considering the histogram distributions of household information, we assign 13 bins for the variable household head's age, seven bins for the household head's education, seven bins for the household size and 12 bins for the acres of cultivable land that each household occupies. We leave the bin settings for dummy variables by default. Table 1 shows details about the coarsening choices of the covariates used for the SATT estimation.

4. Results and discussion

4.1 Descriptive statistics

Table 2 presents descriptive statistics for household head characteristics. It shows that households with migration status have seeming differences in household head characteristics from households without migration status. Most of these differences are statistically significant with higher confidence intervals ($\alpha \leq 1\%$). The age of the household head for the migrant household is higher than that for households without migration status. A household head is the member of the household who makes decision regarding the different activities of the household. The household head sex ratio shows that more than 45% of household heads with migration status are female. This result could be confusing unless we consider that most of these female-headed households had male migrants who used to be the household head, and their wives act as household heads in the absence of their husbands. Among the female-headed households, more than 10% are widowed. Considering that Islam is the majority-practicing religion, we examined the migration status of households of other religions. We find that only 5% of Hindu households have migration status in our dataset. More than 40% of heads of the households with migration status are an earning member, 10% possess a bank account, 9% are members of a credit union, 10% receive social safety net (SSN) benefits and 24% are heads of households with migration status receiving medical treatment.

Table 3 presents descriptive statistics for household characteristics. It shows that more than 73% of households with migration status are in rural areas. Households with migration status possess seemingly more living rooms, usable spaces (in sq ft.), brick wall houses, separate dining rooms, sanitary latrines, electricity access, mobile phones, internet access and

Table 1.
Coarsening choices of
the covariates

Group	Covariates	Coarsening strategy	Notes
By household (HH) head characteristics	HH head age (years)	20, 24, 28, 32, 36, 40, 44, 48, 54, 59, 64, 69, 80	13 bins: 20–23 = 0, 24–27 = 1, 28–31 = 2, 32–35 = 3, 36–39 = 4, 40–43 = 5, 44–47 = 6, 48–53 = 7, 54–58 = 8, 59–63 = 9, 64–68 = 10, 69–79 = 11, 80–99 = 12
	HH head education (years)	0, 2, 5, 6, 10, 11, 13	7 bins: 0 = 0, 2–4 = 1, 5 = 2, 6–9 = 3, 10 = 4, 11–12 = 5, 13–19 = 6
	HH head sex (dummy)	0, 1	1 = male, 0 = female
	HH head separated (dummy)	0, 1	1 = yes, 0 = other
By household characteristics	Cultivable land (acres)	0, 1, 11, 21, 31, 41, 51, 61, 81, 101, 201, 501	12 bins: 0 = 0, 1–10 = 1, 11–20 = 2, 21–30 = 3, 31–40 = 4, 41–50 = 5, 51–60 = 6, 61–80 = 7, 81–100 = 8, 101–200 = 9, 201–500 = 10, 501–3,960 = 11
	HH size	1, 2, 3, 4, 5, 6, 7	7 bins: 1–2 = 0, 2 = 1, 3 = 2, 4 = 3, 5 = 4, 6 = 5, 7–17 = 6
	Medical status (dummy)	0, 1	1 = suffered, 0 = other
	Earning status (dummy)	0, 1	1 = earns, 0 = other
	SSN status (dummy)	0, 1	1 = receives, 0 = no
	Current residential location (dummy)	0, 1	1 = urban, 0 = rural
	Fishing (dummy)	0, 1	1 = yes, 0 = no
	Forestry (dummy)	0, 1	1 = yes, 0 = no
	Religion (dummy)	0, 1	1 = yes, 0 = other
	[1 = Hindu, 0 = other]		

cultivable land (in acres). Additionally, these households are engaged more in livestock, forestry and fishing activities than households without migration status.

Table 4 presents descriptive statistics for the outcome variables. It shows the seeming differences in household consumption expenditure patterns between households with migration status and those without migration status. The results show that household consumption expenditures in all categories are higher for households with migration status than for households without migration status. Households with migration status spend on average 3,539 tk. more than households without migration status for total monthly consumption (tk. is short for taka).

Decomposition of total monthly consumption expenditures shows that households with migration status spend 1,331 tk. monthly on food, 1,884 tk. on non-food and 255 tk. on medical

Table 2.
Descriptive statistics
for household head
characteristics

Potential covariates	Treatment group (HH with migration status = 1)			Control group (HH without migration status = 0)			Difference	
	<i>n</i>	Mean	SD	<i>n</i>	Mean	SD	Diff.	SE
<i>Household head characteristics</i>								
HH age (years) (99 ≥ age ≥ 20)	1,535	49.635	15.544	10,678	45.532	13.459	4.103***	0.375
HH sex (dummy)	1,535	0.541	0.498	10,678	0.903	0.297	-0.361***	0.009
HH education (years) (0 ≤ educ ≤ 19)	1,535	4.081	4.497	10,678	4.130	5.124	-0.049	0.138
HH married (dummy)	1,535	0.870	0.336	10,678	0.900	0.300	-0.030***	0.008
HH never married (dummy)	1,535	0.008	0.088	10,678	0.012	0.108	-0.004	0.003
HH widowed (dummy)	1,535	0.116	0.320	10,678	0.078	0.269	0.037***	0.008
HH separated (dummy)	1,535	0.006	0.076	10,678	0.006	0.077	-0.000	0.002
Religion(dummy) [1 = Hindu, 0 other]	1,535	0.050	0.217	10,678	0.119	0.324	-0.070***	0.009
Religion (dummy) [1 = Buddhist, 0 other]	1,535	0.006	0.076	10,678	0.007	0.085	0.001	0.002
Religion (dummy) [1 = Christian, 0 other]	1,535	0.001	0.026	10,678	0.004	0.064	-0.003	0.002
HH earning status (dummy)	1,535	0.443	0.497	10,678	0.876	0.330	-0.433***	0.010
Bank account (dummy)	1,535	0.101	0.301	10,678	0.062	0.242	0.039***	0.007
Credit union member (dummy)	1,535	0.087	0.282	10,678	0.164	0.370	-0.076***	0.010
HH SSN status (dummy)	1,535	0.102	0.303	10,678	0.157	0.373	-0.055***	0.010
HH medical status (dummy)	1,535	0.243	0.429	10,678	0.207	0.407	0.036***	0.011
Note(s): *Level of significance 10%, **level of significance 5%, ***level of significance < 1%								

expenditures higher than households without migration status. We also express differences in household consumption in per capita terms, showing that per capita total monthly consumption for households with migration status is 888 tk. higher than that for households without migration status. Decomposition shows that the per capita food expenditure is 343 tk., the per capita non-food expenditure is 462 tk. and the per capita medical expenditure is 60 tk. higher than in households without migration status. However, we do not find any significant difference in their spending on education, either in monthly aggregate or in per capita terms.

We also check for the existence of Engle’s law on household food expenditures for households with migration status. Engle’s law states that as household income increases, the percentage of that income spent on food declines on a relative basis (Houthakker, 1957). The negative mean difference value of -0.046 indicates that households with migration status spend less on food than households without migration status. Thus, Engle’s law applies for the households with migration status. The descriptive indicates that there are seeming differences between households with migration status and those without migration status. Households with migration status seem to achieve improvement in living standard than those without migration status.

4.2 Econometric results and discussion

The findings from the econometric analysis reveal that household expenditure patterns differ significantly between households with migration status and those without migration status. The SATT estimation results are presented in Tables 5–7. Covariate determination for the model specification is presented in Table 8. The CEM summary with measures of imbalances is presented in Table 9. Finally, Engle’s index ratio for food expenditures is presented in Table 10.

Potential covariates	Treatment group (HH with migration status = 1)			Control group (HH without migration status = 0)			Difference Diff.	S.E
	<i>N</i>	Mean	S.D	<i>n</i>	Mean	S.D		
<i>Household characteristics</i>								
Residential location (urban = 1, rural = 0)	1,535	0.277	0.448	10,678	0.372	0.483	<i>−0.095***</i>	0.013
HH size	1,535	4.585	2.178	10,678	4.538	1.842	0.047	0.052
No. of rooms	1,535	3.066	1.596	10,678	2.196	1.228	<i>0.870***</i>	0.035
Useable space (SQFT)	1,535	537.642	647.913	10,678	383.048	371.916	<i>0.154593***</i>	11.376
Walls brick (dummy)	1,535	0.285	0.452	10,678	0.254	0.435	<i>0.032**</i>	0.012
Separate dining room (dummy)	1,535	0.204	0.403	10,678	0.121	0.326	<i>0.083***</i>	0.009
Sanitary latrine (dummy)	1,535	0.266	0.442	10,678	0.188	0.391	<i>0.078***</i>	0.011
Electricity (dummy)	1,535	0.689	0.463	10,678	0.561	0.496	<i>0.128***</i>	0.013
Mobile phone (dummy)	1,535	0.870	0.337	10,678	0.619	0.486	<i>0.250***</i>	0.013
Computer (dummy)	1,535	0.031	0.174	10,678	0.026	0.160	0.005	0.004
Internet (dummy)	1,535	0.016	0.127	10,678	0.011	0.104	<i>0.005*</i>	0.003
Cultivable land (acres)	1,535	81.109	171.546	10,678	52.245	145.437	<i>28.864***</i>	4.066
Livestock (dummy)	1,535	0.671	0.470	10,678	0.603	0.489	<i>0.068***</i>	0.013
Fishing (dummy)	1,535	0.146	0.353	10,678	0.129	0.335	<i>0.017*</i>	0.009
Forestry (dummy)	1,535	0.412	0.492	10,678	0.301	0.459	<i>0.111***</i>	0.013

Note(s): *Level of significance 10%, **level of significance 5%, ***level of significance < 1%
Expenditure expressed in Bangladeshi taka (BDT)

Table 3.
Descriptive statistics
for household
characteristics

In Tables 5–7, we estimate a total of nine different models. For Model 1, we use the covariates of household head age and educational level, household size, cultivable land and household head sex, medical status, earning status and SSN status. In Model 2, we add current residential location. For the next couple of models, we increase the number of covariates to determine the variation in the sizes of coefficients. In Model 5, we use all coarsened covariates.

Models 1 to 5 provide consistent results, which show that households with migration status can increase their expenditures due to additional sources of remittance income. From several previous studies, we have found the similar result with Quisumbing and McNiven (2010), Taylor and Mora (2006), and Koc and Onan (2004). The total monthly consumption expenditure of households with migration status is approximately 2,500 tk. higher than that of households without migration status. These findings are consistent with Nguyen *et al.* (2017) and Nguyen *et al.* (2011). In Bangladesh, total monthly food expenditures and non-food expenditures are approximately 1,100 and 1,300 tk., respectively. We have found the similar result from the study of Thapa and Acharya (2017), Raihan *et al.* (2009), Taylor and Mora (2006), Nguyen *et al.* (2017). The study finds that total monthly medical expenditure is 130 tk. higher than those of households without migration status. From the previous studies conducted by Wadood and Hossain (2017), Nguyen *et al.* (2017), Thapa and Acharya (2017), and Taylor and Mora (2006), we have also found the similar result. The per capita total monthly consumption expenditure is roughly 600 tk. Higher than that of households without migration status, which is congruent with the studies of Wadood and Hossain (2017) and Sharma and Zaman (2009). The per capita monthly food expenditures and per capita non-food

Outcome variables	Treatment group			<i>n</i>	Control group (HH without migration status = 0)		Difference	
	(HH with migration status = 1)				Mean	SD	Diff.	SE
	<i>N</i>	Mean	SD					
Total month. cons. exp. (TMCE)	1,535	14,248.320	11,888.260	10,678	10,709.200	8,984.003	3,539.124***	256.543
Monthly food exp. (MFE)	1,535	7,134.972	4,489.889	10,667	5,803.498	3,457.735	1,331.473***	98.379
Monthly non-food exp. (MNFE)	1,531	5,824.581	8,719.410	10,593	3,940.325	5,373.308	1,884.256***	161.349
Monthly medical exp. (MHE)	1,452	670.007	1,846.246	10,124	414.927	1,517.989	255.081***	43.859
Monthly educational (MEE)	1,282	799.841	1,210.205	8,699	735.454	1,968.021	64.387	56.477
Per cap. month. cons. exp. (PMCE)	1,535	3,358.148	2,708.506	10,678	2,469.264	2,052.804	888.884***	58.585
Per cap. month. food exp. (PMFE)	1,535	1,671.773	1,006.645	10,667	1,328.096	676.122	343.677***	19.819
Per cap. non-food exp. (MNFE)	1,531	1,388.848	1,978.469	10,593	927.273	1326.161	461.576***	38.963
Per cap. month. medi. exp. (PMHE)	1,452	157.671	434.582	10,124	97.422	3.657	60.249***	10.578
Per cap. month. educ. exp. (PMEE)	1,052	553.348	708.422	6,892	525.204	1,400.981	28.144	44.031
Engel index ratio								
Monthly food exp. (MFE)	1,535	0.553	0.143	10,667	0.600	0.140	-0.046***	0.004

Table 4.
Descriptive statistics
for the outcome
variable

Note(s): *Level of significance 10%, **level of significance 5%, ***level of significance <1%
Expenditure expressed in Bangladeshi taka (BDT)

expenditures are approximately 250 and 300 tk., respectively. A similar result was also found from [Wadood and Hossain \(2017\)](#), [Sharma and Zaman \(2009\)](#) for per capita food expenditures, and [Nguyen *et al.* \(2017\)](#) and [Wadood and Hossain \(2017\)](#) for per capita non-food expenditure. The per capita monthly medical expenditure is 30 tk. higher than those of households without migration status, suggesting that migration has positive impacts on household total consumption expenditures, food expenditures, non-food expenditures and medical

Outcome variables	N	Model 1 Coef.	SE	n	Model 2 Coef.	SE	N	Model 3 Coef.	SE
Total month. cons. exp. (TME)	4,020	2,647.444***	464.119	2,945	2,501.842***	496.885	2,510	2,783.134***	480.859
Monthly food exp. (MFE)	4,018	1,206.563***	227.118	2,943	1,163.993***	257.579	2,508	1,230.265***	227.901
Monthly non-food exp. (MNFE)	3,987	1,325.365***	271.808	2,916	1,218.725***	262.799	2,483	1,362.407***	271.339
Monthly medical exp. (MHE)	3,783	83.581	50.752	2,785	57.174	57.807	2,362	134.566**	58.629
Monthly educational exp. (MEE)	3,332	-21.005	62.973	2,457	14.245	62.227	2,091	2.968	67.071
Per cap. month. cons. exp. (PTME)	4,020	627.471***	96.238	2,945	591.524***	98.479	2,510	664.362***	103.086
Per cap. month. food exp. (PMFE)	4,018	292.937***	43.540	2,943	286.535***	47.220	2,508	309.635***	46.970
Per cap. month. non-food exp. (PMFE)	3,987	293.682***	57.718	2,916	270.139***	53.994	2,483	307.882***	57.534
Per cap. month. medical exp. (PMHE)	3,783	29.165**	13.776	2,785	25.955*	15.5726	2,362	41.350	16.919
Per cap. month. educ. exp. (PMEE)	2,710	-12.38847	43.427	1,983	-5.460	43.101	1,669	-7.993	45.504

Note(s): *Level of significance 10 %, **level of significance 5 %, ***level of significance < 1 %
Expenditure expressed in Bangladeshi taka (BDT)

Table 5.
SATT estimation
results for the impact of
migration on
household
consumption
expenditures

Table 6.
SATT estimation
results for the impact of
migration on
household
consumption
expenditures

Outcome variables	N	Model 4 Coef.	SE	n	Model 5 Coef.	SE	N	Model 6 Coef.	SE
Total month. cons. exp. (TME)	1,886	2,537.552***	553.294	1,578	2,265.918***	558.977	4,722	3,010.250***	444.846
Monthly food exp. (MFE)	1,884	942.358***	278.108	1,576	838.739***	286.305	4,716	1,342.222***	213.099
Monthly non-food exp. (MNFE)	1,866	1,413.658***	304.892	1,563	1,271.227***	310.389	4,682	1,492.519***	263.432
Monthly medical exp. (MHE)	1,768	139.713**	54.243	1,480	125.544**	54.007	4,455	106.703**	47.283
Monthly educational (MEE)	1,556	-21.903	77.017	1,315	-24.547	77.903	3,879	29.742	58.479
Per cap. month. cons. exp. (PTME)	1,886	611.078***	115.122	1,578	595.448***	123.277	4,722	687.087***	89.453
Per cap. month. food exp. (PMFE)	1,884	254.294***	53.897	1,576	254.541***	57.620	4,716	321.242***	40.703
Per cap. month. non-food exp. (PMNFE)	1,866	311.879***	62.939	1,563	294.867***	67.078	4,682	316.931***	53.579
Per cap. month. medical exp. (PMHE)	1,768	42.235**	19.669	1,480	42.100**	21.404	4,455	31.972**	12.559
Per cap. month. educ. exp. (PMEE)	1,239	-31.514	53.370	1,048	-11.523	51.907	3,123	17.130	39.830

Note(s): *Level of significance, 10% **level of significance 5%, ***level of significance < 1%
Expenditure expressed in Bangladeshi taka (BDT)

Outcome variables	<i>n</i>	Model 7 Coef.	SE	<i>n</i>	Model 8 Coef.	SE	<i>n</i>	Model 9 Coef.	SE
Total month. cons. exp. (TME)	5,412	3,278.324***	430.167	10,454	3,280.209***	372.719	5,337	3,065.105***	433.960
Monthly food exp. (MFE)	5,405	1,336.178***	191.963	10,444	1,299.016***	148.948	5,335	1,340.572***	199.937
Monthly non-food exp. (MNFE)	5,362	1,643.019***	260.344	10,376	1,748.184***	255.488	5,293	1,632.264***	256.676
Monthly medical exp. (MHE)	5,099	228.106**	75.351	9,885	209.543***	57.546	5,020	133.936***	46.369
Monthly educational (MEE)	4,406	67.603	55.543	8,552	-27.916	59.867	4,481	-93.594	98.535
Per cap. month. cons. exp. (PTME)	5,412	750.603***	89.046	10,454	799.233***	84.195	5,337	748.870***	90.240
Per cap. month. food exp. (PMFE)	5,405	323.240***	37.531	10,444	329.088***	31.291	5,335	330.254***	39.310
Per cap. month. non-food exp. (PMFE)	5,362	355.816***	49.835	10,376	412.471***	59.180	5,293	385.954***	56.224
Per cap. month. medical exp. (PMHE)	5,099	53.941***	15.874	9,885	47.633***	13.255	5,020	38.439***	12.142
Per cap. month. educ. exp. (PMEE)	3,470	36.637	39.440	6,843	-21.805	44.659	3,700	-41.933	58.436

Note(s): *Level of significance 10 %, **level of significance 5 %, ***level of significance < 1 %
Expenditure expressed in Bangladeshi taka (BD T)

Table 7.
SATT estimation
results for the impact of
migration on
household
consumption
expenditures

Table 8.
Covariate
determination for
model specification

Covariates	Model 1	Model 2	Model 3	Model 4	Model 5	Model 6	Model 7	Model 8	Model 9
HH age (years) (99 ≥ age ≥20)	✓	✓	✓	✓	✓	✓	✓		✓
HH education (years) (0 ≤ educ ≤19)	✓	✓	✓	✓	✓	✓	✓		
HH size	✓	✓	✓	✓	✓	✓	✓	✓	✓
Cultivable land (acres)	✓	✓	✓	✓	✓	✓	✓	✓	✓
HH head sex (dummy)	✓	✓	✓	✓	✓	✓	✓	✓	✓
medical status (dummy)	✓	✓	✓	✓	✓	✓	✓	✓	✓
Earning status (dummy)	✓	✓	✓	✓	✓	✓		✓	✓
SSN status (dummy)	✓	✓	✓	✓	✓			✓	✓
Current residential location (dummy)		✓	✓	✓	✓			✓	✓
Fishing (dummy)			✓	✓	✓				
Forestry (dummy)				✓	✓				
HH head separated (dummy)					✓			✓	✓
Religion (dummy) [1 = Hindu, 0 = other]					✓				

expenditures, both in the aggregate and per capita. However, we do not find any significant impact of migration on household education expenditures either in the aggregate or per capita terms. These findings are also consistent with [Raihan *et al.* \(2009\)](#) and [Sharma and Zaman \(2009\)](#).

Therefore, our overall findings suggest that households with migration status mainly allocate their budget shares to food, non-food and medical expenditures. Furthermore, it indicates that the flow of income from remittances is supposed not devoted to education, which is vital from a long-term development perspective.

To check the sensitivity of our model analysis, we omit several covariates from Models 6 to 9 ([Tables 6 and 7](#)). Omitting several covariates, we find that the size of coefficients changes largely, which suggests that we have removed crucial information about migrant household, which explains household welfare more. Having included those covariates in the previous models, we get outcome variables, which provides consistencies in the size of coefficients. Surprisingly, we find that the size of the coefficients for each outcome variable increases largely. Total monthly consumption expenditures increase from 2,500 tk. to approximately 3,200 tk. The coefficients for food, non-food and medical expenditures also increase greatly, suggesting that we drop crucial information from these models that likely explains household migration status more, and in the absence of this information, Models 6, 7, 8 and 9 produce sensitivity in the size of coefficients. In [Table 8](#), we have given a summary of the covariate

CEM index	Model 1	Model 2	Model 3	Model 4	Model 5	Model 6	Model 7	Model 8	Model 9
Multivariate L1 distance before CEM	0.849	0.883	0.902	0.925	0.936	0.816	0.778	0.579	0.783
Multivariate L1 distance after CEM	0.192	0.196	0.204	0.216	0.219	0.180	0.159	0.038	0.094
Number of strata	4,698	5,626	6,198	7,109	7,661	4,042	1,066	1,528	3,648
Matched strata	482	440	398	346	311	491	405	462	559
Matched treated	732	619	547	445	398	805	631	1,377	937
Unmatched treated	803	916	988	1,090	1,137	730	904	158	598
Matched control	3,288	2,326	1,963	1,441	1,180	3,917	3,153	9,077	4,400
Unmatched control	7,390	8,352	8,715	9,237	9,498	6,761	7,525	1,601	6,278
Total treated	1,535	1,535	1,535	1,535	1,535	1,535	1,535	1,535	1,535
Total control	10,678	10,678	10,678	10,678	10,678	10,678	10,678	10,678	10,678

Table 9.
CEM summary

Table 10.
Engle index ratios for
food expenditure

	Outcome variables	<i>n</i>	Coef.	SE
Model 1	Monthly food exp. (MFE)	4,716	−0.0245***	0.0007
Model 2	Monthly food exp. (MFE)	4,018	−0.026**	0.008
Model 3	Monthly food exp. (MFE)	2,943	−0.026***	0.008
Model 4	Monthly food exp. (MFE)	2,508	−0.028***	0.008
Model 5	Monthly food exp. (MFE)	1,884	−0.030***	0.009
Model 6	Monthly food exp. (MFE)	1,576	−0.024**	0.010
Model 7	Monthly food exp. (MFE)	5,405	−0.029***	0.006
Model 8	Monthly food exp. (MFE)	10,444	−0.033***	0.005
Model 9	Monthly food exp. (MFE)	5,335	−0.027***	0.007

Note(s): *Level of significance 10%, **level of significance 5%, ***level of significance < 1%

determination for the different model specification. It is just a summary of the variables what we have presented from Models 1 to 9. In Table 9, we have presented a CEM summary of different models. Based on the different models, we have applied coarsening techniques.

Finally, the Engle index ratio in Table 10 shows that households with migration status tend to spend less on food than households without migration status. Engle’s law states that households tend to spend less on food as their level of income increases (Houthakker, 1957). The smaller values for the Engle index ratio indicate that households with migration status spend less on food expenditures. Thus, Engle’s law is applicable for households with migration status. In our current study, we have found that households with migration status have a positive welfare impact on food, non-food and medical care increment, and this is in line with the research questions we have set. Though the previous studies conducted in Bangladesh and other Asian countries found a positive association between migration and education expenditure, we do not find such a positive impact of household migration status on its expenditure on education.

5. Conclusions and future research agenda

This study investigates the impact of migration on household consumption expenditures in Bangladesh. We seek evidence for whether households with migration status attain increases in household welfare as a causal impact of migration. This study uses data from Bangladesh HIES 2010, which is a nationally representative dataset compiled routinely in every five years. To control for endogeneity problems and sample selection bias, we use CEM methods in estimating the SATT (Iacus *et al.*, 2012). We also check for the existence of Engle’s law regarding household expenditures on food.

The descriptive statistics show that rural households tend to be the sources of more migrants than urban households. Rural household members have a tendency to migrate to urban areas within the country for better employment opportunities or abroad as labor-migrant (Sikder and Higgins, 2017). Both monthly aggregate and per capita monthly expenditures on total consumption, food items, non-food items and medical expenditures have significant, positive differences between households with migration status and households without migration status. The econometric analysis shows that households with migration status can significantly raise their consumption expenditures, compared to households without migration status (Raihan *et al.*, 2009). Specifically, households with migration status can spend more on total consumption, including food, non-food and medical expenditures, due to additional sources of income from remittances. It is important to remember that household non-food expenditures include expenditures on housing, durable goods, taxes, fuel, cosmetics, cleaning products, transportation, clothing, insurance and recreation. These results imply that households with migration status are likely to spend

more money on food, non-food and medical than households without migration status. Therefore, migration has a positive impact on household welfare increases. However, the results do not provide evidence about their spending on education expenses.

It is necessary to be cautious in interpreting our findings for several reasons. First is the fungible nature of household expenditure. That is, remittances are spent at the margin like income from any other source, causing difficulty in separating the part of the remittance used for various expenditure categories because the data for remittance used are not available in our dataset. The availability of such information could provide more comprehensive results. Second, the dataset does not provide specific information about household investment expenditures, which would allow, if available, for investigating whether and to what extent households allocate their spending for investments in firm and non-firm activities to raise household income. Furthermore, it might reveal to what extent households allocate their budgets to productive and non-productive activities. Third, our study does not include household budget allocation for agricultural input expenses. The necessity and estimation of such expenses are relevant since most of the households with migration status are rural households. These points can be addressed in future studies. Moreover, future researchers could use panel data, to have something more on both theoretical and econometric ground. This study contributes to its methodological approach and estimates causal impacts in per capita terms, providing a more realistic scenario of household welfare.

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