

Can international migration reduce poverty and inequality?  
Evidences from rural Bangladesh

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## Abstract

The economic wellbeing of a large number of Bangladeshi families depends heavily on migrants' remittances. This study aims at analyzing the impact of international migration on rural poverty and inequality in Bangladesh. It draws on a true-panel dataset collected in 2004 and 2014 from sampled households of 62 villages in Bangladesh. Analyses are based on a comparison with counterfactual migrant households incomes derived from difference-in-difference (DiD) with propensity score matching (PSM) technique. Study finds that international migration significantly reduces poverty incidences by around 23 percent. Study also finds that international migration significantly increases household income and improves housing condition. Moreover, when differential impact of migration duration is analyzed findings suggest that households with relatively longer-term migration do even better in improving their housing condition. However, findings do not suggest any significant impact of longer-term migration in reducing rural poverty and changing inequality status.

**JEL classification:** O15, R23, I32.

**Keywords:** International migration, remittances, poverty, inequality, impact evaluation, difference-in-differences, propensity score matching, Bangladesh.

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# 1 Introduction

Migration is potentially important strategy to improve household welfare, fight poverty and decrease inequality (Nguyen, et al., 2011). Remittances sent by migrants are a remarkably high component of international capital flows. In recent years, the amount of international remittances to developing countries has been much higher than foreign assistance (DeWind & Holdaway, 2005). In 2008, the total flow of international remittances to developing countries amounted to \$US 328 billion. For some countries, remittances were more than 20 percent of total GDP (Gross Domestic Product) (Acharya & Leon-Gonzalez, 2012).

Around 10.07 million Bangladeshi workers are currently working in 160 countries, which comprise more than 10 percent of country's total labor force (GoB, 2016). Since independence in 1971, the number of migrant workers from Bangladesh has been increasing rapidly (Bangladesh Bank, 2016). Every year, around 225,000 workers migrate from Bangladesh (Arifeen, 2013). In successive 5-year national development plans, migration has been considered as a potential strategy (Islam, 2011) to create employment opportunities for many of the 2 million workers which are being added every year in country's labor force (GoB, 2016).

Bangladesh is now the 10<sup>th</sup> migrant remittances earning country in the world and 3<sup>rd</sup> in South Asia (World Bank, 2015). In 2015, about 555,881 international migrants sent about USD 15,270 million remittances in Bangladesh (Bangladesh Bank, 2016) that shared around 8 percent of total GDP. Compared to 2010, when country's remittance earning was about USD 11,650 million sent by about 390,702 international migrants, Bangladesh experienced about 8.4 percentage growths in remittance earning in last 5 years (Islam, 2011).

Despite its economic importance for the country, relatively little is known about migration and remittances in Bangladesh, which have been widely underrepresented in the migration and development literature (Bauer & Zimmermann, 1998). Although a number of studies have been published on Bangladesh, most of the analyses are descriptive in nature. These studies primarily investigate the trends and patterns of migration and remittances, use of remittances, and countries migration policies (see Arifeen, 2013; Bangladesh Bank, 2016; BBS, 2013; Islam, 2009; Siddiqui, 2003). When the impact of

remittances on households in Bangladesh is analysed, this is done based on a simple comparison of recipients and non-recipients using cross-sectional data: for instance (Arifeen, 2013); (Hossain & Bayes, 2009); (Raihan, et al., 2009). However, (Sharma & Zaman, 2009) and (Hossain, et al., 2016) investigate based on counterfactual estimation but do not analyze impact of migration on poverty and inequality. Again, none of the available studies provide differential impact of migration duration on income-related outcomes of migration on (migrant sending) rural households, and poverty and inequality.

In this contribution this study highlights the impact of remittances on the welfare and income distribution of the rural population in Bangladesh. This study adds to the debate on the linkages between migration and poverty and inequality (see, for instance, Taylor & Lopez-Feldman, 2007; Adams, et al., 2008). Unlike earlier studies on Bangladesh, this study analyzes the impact using representative household level true-panel data based on robust counterfactual estimates and tries to answer the following questions:

- a) whether migration reduces household poverty and inequality?
- b) whether duration of migration has differential impact on poverty and inequality?

To answer the above questions, this study is aimed to investigate-

1. how migration affects household per capita income?
2. is there any effect of migration on agricultural and non-agricultural income?
3. does migration affects household productive capital accumulation?
4. what is the impact of migration on housing condition?
5. does migration impact household poverty and inequality status?
6. whether migration duration has differential impact on poverty and inequality?

The remaining of this study is structured as follows: chapter 2 presents an overview on migration and remittances in Bangladesh, chapter 3 presents a brief review on migration literature, chapter 4 discusses about the methodology, chapter 5 includes sampling design and data collection procedure, chapter 6 presents and discusses the main results, and chapter 7 concludes the paper.

## 2 International migration and remittances in Bangladesh

The history of international migration is believed to be a century-old in the Indian sub-continent. At the earlier times people migrated primarily due to non-economic reasons; however, passing times, after colonization took place and era of globalization has been started people found international migrations as new economic opportunities (Hossain & Bayes, 2009). In Bangladesh, after independence in 1971, flow of international migration observed a large momentum when Middle Eastern countries, with rising oil prices, went through a phase of major infrastructural development for which they needed large number of expatriate workers (Hossain & Bayes, 2009). Later on, due to significant development in bilateral diplomatic and economic relationships with Southeast Asian and other countries across the globe, Bangladeshis has been spread out in different countries around the world and (GoB, 2016). In this chapter the trends and patterns of outflow of international migration and the inflow of international remittances, its' contribution to national economy and use of remittances at household level are presented in brief based on the latest national statistics.

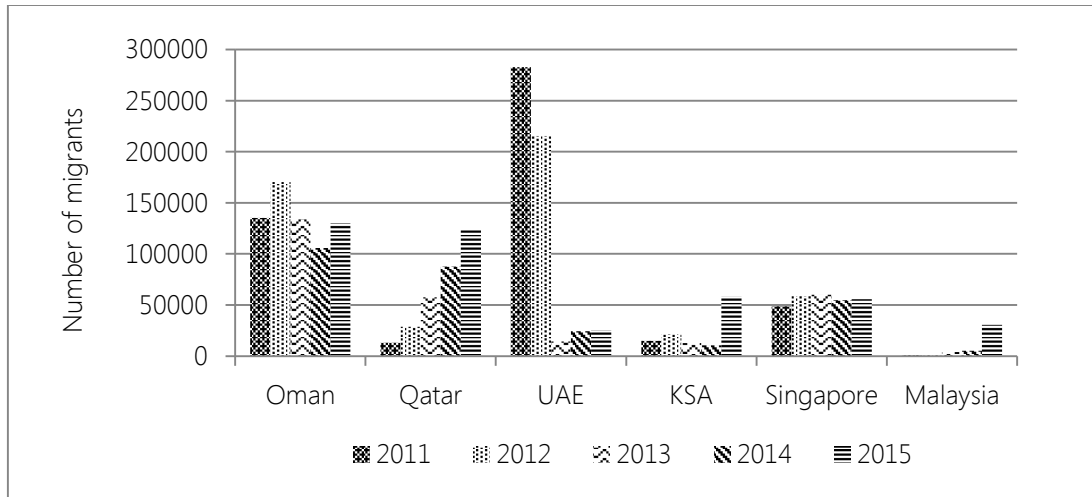
### 2.1 Outflow of international migrants

According to latest Bangladesh Bank statistics, since 1976 around 10.071 million workers have been migrated from Bangladesh (see **Table A 1**). In 1976, total number of international migrant was 6,087 which have gradually increased in the successive years. During 1990s number of migrants reached around 10,0000. A greater surge of international migration is observed during 2007-08 fiscal year when number of migrants dramatically increased to around 1 million. Another substantial upward trend is observed in 2015. In 2014, 425,684 workers were employed in the overseas job market while in 2015 it was 555,881 which is 30.58 percent more than that of the previous year (GoB, 2016).

Bangladeshis have been migrated in 160 countries located in different regions of the world (GoB, 2016). According to the latest report published by Ministry of Expatriates' Welfare and Overseas Employment (MoEWOE) in 2015, Oman receives the highest number of Bangladeshi workers followed by Qatar and Kingdom of Saudi Arabia (see **Figure 2.1**). However, during 1990s and early

2000s, United States of Arab Emirates, Kingdom of Saudi Arabia and Kuwait were the top Bangladeshi migrant receiving countries (see table). Among Southeast Asian countries Singapore is the highest Bangladeshi migrant receiving country followed by Malaysia.

Figure 2.1: Major destination countries of Bangladeshi migrants

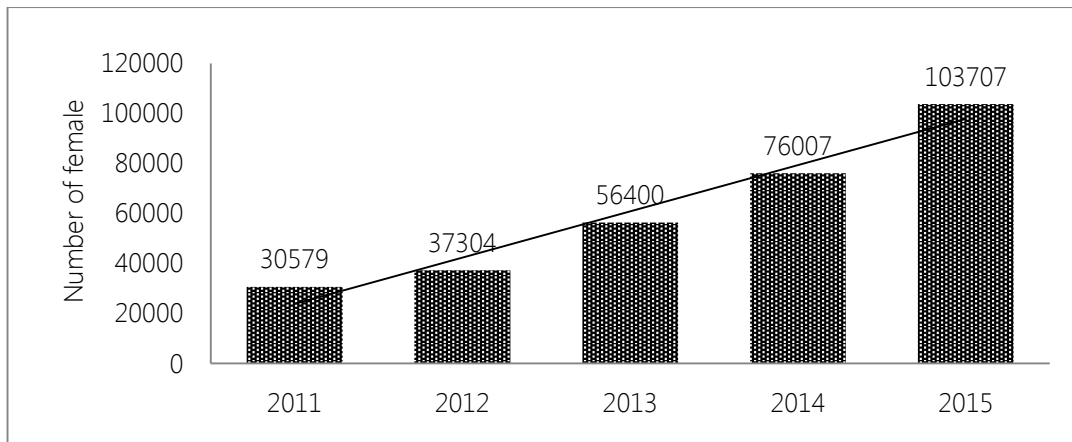


Source: Author's drawing based on (Bangladesh Bank, 2016)

### 2.1.1 Female migrants

According to MoEWOE, 2015 report, the number of female migrant workers has been increasing at an optimistic pace for the last 5 years (see **Figure 2.2**). In 2011, total number of female workers was 30,579 which rose to 103,707 in 2015; the growth is 239.14 percent. In comparison to the number of female workers in 2014 (76,007), the percentage of increase in 2015 is 36.44. Out of 103,707 female workers in 2015, 61,864 were domestic workers. Among the destination countries, United Arab Emirates (UAE) was the most popular one for Bangladeshi female workers in 2015. UAE was followed by Jordan. In 2015, 24,304 and 21,773 women were employed in UAE and Jordan respectively. The other top destinations for Bangladeshi women migrants in 2015 were Saudi Arabia, Oman, Lebanon and Qatar.

Figure 2.2: Migration of female workers from 2011-2015

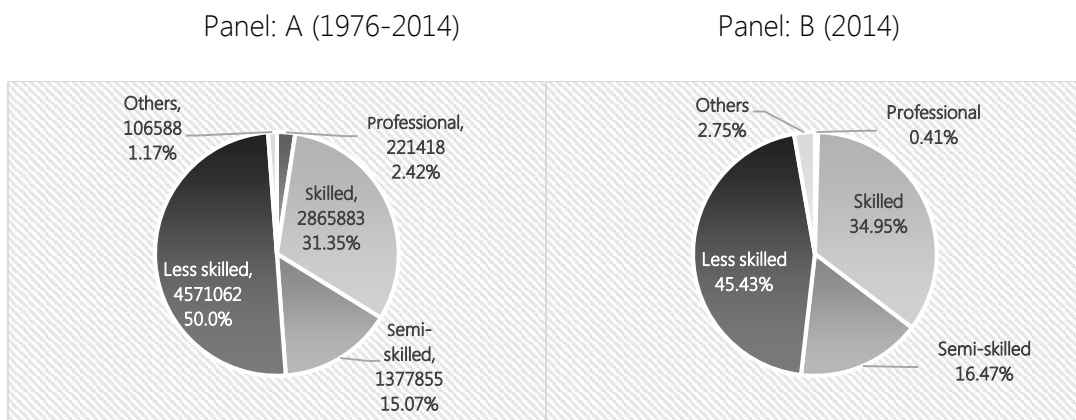


Source: Author's drawing based on (GoB, 2016).

### 2.1.2 Skill composition of international migrants

Between 1976 and 2014, (GoB, 2016) finds that among the skill composition of the expatriates workers during this period 31.35% were skilled, 15.07% semi-skilled, 50% were less-skilled (see **Figure 2.3 (Panel: A)**). On the contrary only in 2014, the percentage of skilled and semi-skilled manpower were 34.95 and 16.47 respectively which clearly indicates that in the recent trend the number of skilled and semi-skilled overseas Bangladeshi workers are increasing (see **Figure 2.3 (Panel: B)**). At the same time the percentage of less-skilled workers is decreasing over the time.

Figure 2.3: Skill compositions of migrant workers

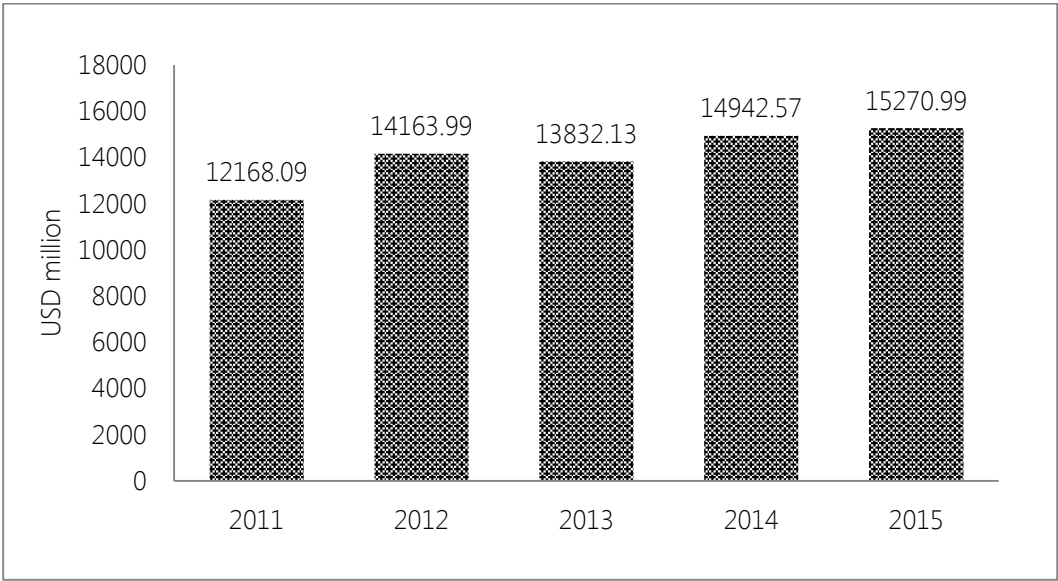


Source: Author's drawing based on (GoB, 2016).

## 2.2 Inflow of international remittances

Between 1976 and 2015 Bangladesh receives around 15641.8 billion USD as remittances (Bangladesh Bank, 2016). According to (GoB, 2016), Bangladesh has been ranked 10th on the list of the highest remittance receiving country in 2015. In the 2014-15 financial year Bangladesh received 15.31 billion USD as remittance from expatriates.

Figure 2.4: Remittances inflows from 2011-2015

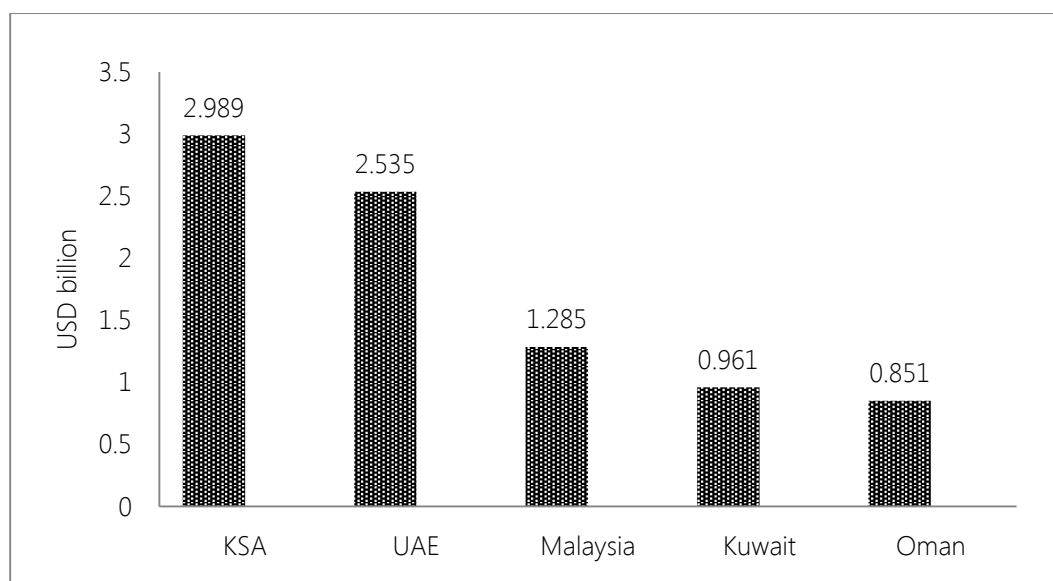


Source: Author’s drawing based on (GoB, 2016).

From the **Figure 2.4** we can see that the growth of international remittances for Bangladesh was almost stable during last five years although the world economy has experienced a lot of turmoil and recession during this period.

Although Bangladeshi workers are spread over around 160 destination countries around the world, there are certain countries from where Bangladesh receives a major portion of its remittances. For instance, in 2015, Bangladesh received highest amount of remittances from KSA which is 2.989 billion USD, followed by UAE 2.535 billion USD. Other three top source countries of remittances for Bangladesh are Malaysia, Kuwait and Oman (see **Figure 2.5**).

Figure 2.5: Inflow of remittances from top 5 countries



Source: Author's drawing based on (GoB, 2016).

### 2.3 Contribution of migrants' remittances in national economy

In every year around 2 million workers are being added into the national workforce (GoB, 2016) among them rural poor households share the major portion. International migration is considered as one of the pivotal tools to employ them as the domestic demand is insufficient (Arifeen, 2013). Bangladesh as a labor surplus country, on average, it exports about 225,000 migrant labors annually (Arifeen, 2013). Currently, international migrants consist of around 12 percent of total labor force in Bangladesh [ (Bangladesh Bank, 2016); (GoB, 2016)].

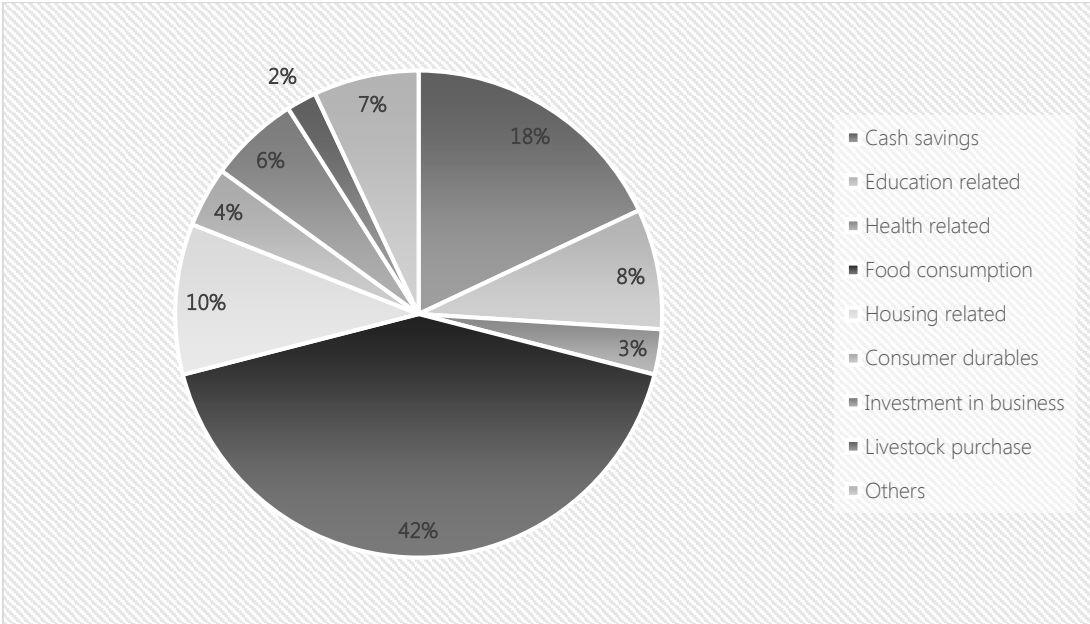
Remittance is considered as the single most important source of foreign exchange for Bangladesh to ease the balance of payment and alleviate pressures on external borrowing with an implication to poverty alleviation (Arifeen, 2013). It also provides a solid basis to this economy. It is contributing around 8 percent to our GDP (GoB, 2016). Two-three decades back, country's national budget was heavily dependent on foreign aids. Scenarios have changed with time as remittance inflow has been increased.

Along with GDP, inflows of remittances have a positive impact on poverty and total fertility rate (TFR) in Bangladesh (Arifeen, 2013). An UNFPA study suggests that remittance inflows in last decade contributed to reduce severity of poverty by 1 percent and TFR by more than 3 percent.

### 2.4 Use of remittances by households

According to a World Bank Policy Research Working Paper-5018, (Arifeen, 2013) show that remittances sent by migrants play an important role in increasing household investments in education, entrepreneurship, and health – all of which have a high social return in most circumstances. In poorer households, remittance may finance the purchase of basic consumption goods, housing, and children’s education and health care. A total of 43 per cent of remittance receipt is spent on food consumption nationally while only 19.2 per cent is spent on cash savings, 6.4 per cent on investment in business (see **Figure 2.6**). The percentage share of expenditure on consumption goods is higher than that of capital goods.

Figure 2.6: Use of remittances by households



Source: Author’s drawing based on (Arifeen, 2013).

In IOM remittance use survey report published in 2009, household remittance data were broken down into two categories: disposable goods and services and

durable goods and services. An average household was found to have spent TK. 109,130 of remittance money towards 63 per cent of its total household expenses (durable and disposable) in the year before the survey. There were little variations in the proportion of household expenses met with remittances money, by level of household expenses. Data showed that remittances have led to improvements in the consumption of food among the majority of migrant households. There were clear indications of remittances having a positive impact on the level of surveyed households mentioned using remittances to buy books, papers, and other learning materials for their children. Most migrant households used some portion of their remittances towards procuring medical treatment, and medicines. About 72 per cent used it to obtain treatment and another 60 per cent used it to purchase medicines.

Overall, over the period rate of international migration has been increased and emerged as a major economic development tool for economic development. It absorbs surplus labor and reduces unemployment. Inflows of remittances has been sourced a major share of national balance of payment and country's GDP growth. Not only the national economy, migration and remittances have far reaching positive impact on household consumption and investments in enterprise development and human capital. If it could be increased their skills before migration they might be able to get secure job in host countries and send more remittances to their households in Bangladesh.

### 3 Literature review

In economic literature, the empirical analysis of international migration is a black hole (Bauer & Zimmermann, 1998). However, the increasing importance of international migration and remittance in households' welfare and overall country's social, political and economic development attracted many researchers who further investigated its impact empirically in many developing countries located in different regions of the world to understand the complex relationship between migration and development. The available studies look into the changes of different macroeconomic and microeconomic level outcomes including per capita income and expenditure, land productivity, work effort, enterprise investment, human capital development, food and nutrition, health, poverty and inequality and so on in migrant sending households and overall country's economy.

All the available studies suggest significant positive impact of international migration on household income though temporary migration results shortage of household labor supply. Using farm household survey data collected in 1995 (Taylor, et al., 2003) estimate impact of migration on Chinese rural households following three-stage least squares technique. This paper provides evidence that rural farm households with migrant members increase their per capita household income between 16 percent and 43 percent compare to the households without migrant member though their crop income reduced significantly. Another study done by (De & Ratha, 2012) using Sri Lanka Integrated Survey 1999-2000 data also find significant positive relationship between international migration and household income increase. In line with the New Economic of Labor Migration (NELM) framework (Atamanov & Berg, 2012) analyse heterogeneous impact of migration on crop income in Kyrgyz Republic based on a nationally representative household survey data collected in 2007. The study uses instrumental variable technique and provides evidence that remittances lead to an increase in crop income for most farmers, but not those in the highest land ownership quartile. However, for permanent migration the overall impact is negative but seasonal migration has a significant positive impact on crop income for smaller farms. Another study is conducted by Nguyen, et al. (2011) in Vietnam that uses panel data of Vietnam Household Living Standard Surveys 2004 and 2006 to evaluate the long-term impact of work and non-work

migration on household welfare, and national poverty and inequality status. To estimate the impact they use matched DiD technique, a robust estimation technique for analysing non-experimental and/or quasi-experimental studies. According to their study, work migration significantly increases household per capita income by 19 percent but, non-work migration does not. However, non-remittance household income and work efforts of remaining household members of migrant households are not changes significantly. International migration in U.S. had significant impact on increasing land productivity and hence household income in rural Mexico (Taylor & Lopez-Feldman, 2007). They find that households with migrant members gain about 1069 pesos for having an additional hectare of land compared to the households who do not have migrant members. The effect of land in crop income is also significantly higher for migrant households than the non-migrants.

The impact of migration on household consumption and expenditure is found positive by all the available empirical studies. In Vietnam, per capita consumption is increased significantly by 8 percent and 12 percent, respectively, for work and non-work related migration cases (Nguyen, et al., 2011). Descriptive statistics of a mixed-methods based study, conducted in Zimbabwe using urban household data collected in 2005, suggests that migrant remittances receiving households mostly use their remittances for buying foods and paying utility bills (Bracking & Sachikonye, 2010). In Mexico, a developing country located in Latin America, international migration allows migrant households to have the ability to spend for purchasing more food compare to the non-migrant households. In Bangladesh, migration improves household total expenditure slightly (Sharma & Zaman, 2009). Using PSM technique based on household survey data this study estimates this impact. Raihan, et al. (2009) also suggest similar impact of migration on food, housing and education related expenditure in Bangladesh.

Zosa & Orbeta Jr (2009) suggest in their study that there is no significant impact on savings and investment in Philippines. However, Bracking & Sachikonye (2010) show that comparatively richer households use remittances for productive accumulation and/or acquisition but, poorer households use remittances for buying foods and durable goods. In Ghana, rural households with migrant remittances have access to more plots of land and higher land size compare to that of households without migrant remittances (Aguilar-Stoen, et al., 2016). The

descriptive statistics of this study that uses rural household survey data collected between 2010 and 2012 show that on average migrant households have 7.3 hectare more land than non-migrant households. Using four year panel data collected in 1996, 1998, 2000 and 2002 in El Salvador, Damon (2010) estimates impact of international migration and remittance which suggests that migration reduces value of agricultural asset holding. Sharma & Zaman (2009) also suggest a significant positive impact on savings and investments in Bangladesh.

The impact of migration on agriculture is mixed. Miluka, et al. (2010) suggest in their study that international migration is considered as a strategy to move out of agriculture. It reduces household labor effort in agricultural activities, less investment in productivity-enhancing and time saving farm technologies and shift on-farm investment from crop to livestock production. In El Salvador, Damon (2010) estimates two-stage instrumental variable technique and suggests that having a migrant increases the cultivation land area for basic grains by 2.489 hectares; however, reduces land for cash crop cultivation by 3.119 hectares compare to that of households without migrant. This paper also suggests that low input use for comparatively risky agricultural production which results lower returns to land and family labor among migrant having households. Brauw (2010) in Vietnam also finds that seasonal migration reduced input use in crop cultivation. In addition to that, the Vietnam study results suggest that due to migration land use transfers from rice production to other crops i.e. shift from labor-intensive to land-intensive crop cultivation. Using a three round true-panel dataset Hossain, et al. (2016) suggest that receiving migration decreases household own cultivation land in Bangladesh.

The impact of migration and remittances on human capital and health is complex. Among the very few studies, McKenzie (2006) suggests that in Mexico, migration and remittances lower educational attainment of children. However, income elasticity of education expenditure is higher among household with migrants compared to those without migrants in Philippines (Zosa & Orbeta Jr, 2009). On the other hand, Bargain & Boutin (2015) show in Burkina-Faso using IV estimators that average remittance levels reduce household proportion of working children ages between 5 and 14 by 5-11 percent, however not vary across gender. Following the similar estimation technique Antón (2010) suggests that receiving remittances on an average increase child's WAZ by 0.60 point,

however, on HAZ no significant impact in Ecuador. Zosa & Orbeta Jr (2009) provide information by review other studies that international migration causes shortage of in health sector in Philippines and slow down household fertility.

A good number of studies are available that investigate impact of international migration on poverty and inequality. The impact on poverty is mixed. A cross-country study conducted by United Nations (2011) that uses a panel data for 77 developing countries for the period 1980-2008 suggests in 21 Asian countries, on average, with the given levels of countries' GDP, a 10 percent rise in remittance reduces poverty headcount ration by 3.9 percent and around 3.5 percent in poverty gap at \$ 2 a day (PPP). Majeed (2015) suggest that countries with comparatively higher level of financial development enjoy positive effects of remittances on poverty. The study uses a panel data of 65 countries collected over the period of 1970-2008 to investigate the impact. A positive impact is observed in Ghana where international migrant remittance receiving households experience a significant fall of poverty incidence by 88.1 percent (Adams, et al., 2008). However, in Vietnam, Nguyen, et al. (2011) suggest that work migration does not reduce expenditure-based poverty incidence but significantly reduces poverty gap and severity of poverty of migrant households compare to non-migrants over time. Non-work migration reduces poverty incidence by 9 percent and poverty gap and squared poverty gap by 57 and 67 percent respectively. Applying computational general equilibrium modelling in Bangladesh, Raihan, et al. (2009) suggest that 1.7 out of the 9 percentage point reduction in the headcount ratio during 2000-2005 was due to the growth in remittances. But, Nepal simulation study done by Acharya & Leon-Gonzalez (2012) provides evidences of increasing poverty incidence, gap and severity in short-term. More poor households send their household members in abroad in Nepal whereas, from other countries the comparatively well-off households send their members in abroad. This fact might lead to a different experience in Nepal. Based on a longitudinal panel dataset, the descriptive statistics suggest that the share of extreme poor declined in foreign migrant villages in Bangladesh from 9 percent in 1988 to 1 percent in 2000, but the proportion of moderate poor increased over time in the same villages (Hossain & Bayes, 2009).

The impact of inequality of migration is also mixed. McKenzie (2006) in Mexico, Nguyen, et al. (2011) in Vietnam and Acharya & Leon-Gonzalez (2012) in Nepal

suggest reduction of (expenditure) inequality due to migration and remittances. Majeed (2015) also suggests that a country enjoys a positive effect of remittances on inequality if it has higher level of financial development. Using Heckman specification technique based on household survey data collected in 1991 Barham & Boucher (1998) show that potential home earnings of Migrants have a more equalizing effect that do remittance on income distribution in Nicaragua. However, International migrant remittance receiving households in Ghana experience an increase inequality, measured by Gini coefficient, by 17.4 percent (Adams, et al., 2008). This study applies Lee method, a multinomial logit model and generalization of Heckman two-stage, to analyze the impact of international migrant remittance on inequality on households. Hossain & Bayes (2009) find similar results which suggest that migration increases Gini concentration ratio from 0.39 to 0.53 in Bangladesh.

## 4 Methodology

This chapter portrays a detail discussion on the impact estimation methodology which this study follows. The discussion includes why and how this study use difference-in-difference (DiD) with propensity score matching (PSM) technique for identifying robust counterfactuals and unbiased impact estimates of migration. In the first section, this study presents the theoretical intuitions and mathematical foundations of DiD and PSM. Second, the steps on how the combined methods are used to estimate impact of migration on relevant outcomes are discussed. Last, how and why this study calculated (a) Foster-Greer-Thorbecke (FGT) indexes of poverty and, (b) Theil's L index and Theil's T indexes of inequality.

Number of the studies reviewed in this study use IV as empirical technique (see Atamanov & Berg, 2012; Bargain & Boutin, 2015; Brauw, 2010; McKenzie, 2006; Taylor & Lopez-Feldman, 2007) to estimate the impact of migration and remittances on poverty and inequality. IV method is rigorous enough to estimate impact of an intervention however, finding a good IV is difficult and a weaker IV produces biased estimates (Bound, et al., 1995). They use migration network as the IV and estimate the impact of migration and remittances based on single cross-sectional data which include post-migration information only. This study could use IV however; information on migration network is not available in the using dataset. Another good IV is not also available in the dataset that may confirm robust impact estimates.

Another study done by Nguyen, et al. (2011) use difference-in-difference (DiD) with propensity score matching (PSM) to estimate the impact of international work and non-work migration on household welfare, poverty and inequality. They suggest that this combined method produces unbiased impact estimates but, requires panel data where pre and post-migration information is available. However, recent literatures argue that experimental method, interchangeably, provides the most efficient way of constructing counterfactual and producing unbiased impact estimates (Gertler, et al., 2011). But, when Randomized controlled Trial (RCT) is not feasible like migration case, either DiD or PSM could be the best alternatives if pre and post-migration data is available for the same sample households (Khandker, et al., 2010). However, instead of using either only

PSM or DiD, the combination of those brings together the two sets of technical advantages attributed to DiD and PSM, which improves the impact estimates considerably (Cattaneo, et al., 2009). The DiD with PSM can estimates robust impact by constructing a valid counterfactual and controlling observed and time-invariant unobserved heterogeneity of the sample households. Asadullah & Ara (2015) confirm this argument in favour of using DiD with PSM by applying this combined method to estimate the long-term impact of an anti-poverty development programme in Bangladesh.

As long as, a nationally representative panel dataset for rural Bangladesh is available for this research, which includes pre and post migration related data, this study choose DiD with PSM as impact estimation technique.

#### 4.1 Difference-in-difference (DiD)

DiD method compares the changes in outcomes over time between migrant and non-migrant households (Gertler, et al., 2011). Mathematically,

$$DiD = E(Y_1^T - Y_0^T | T_1 = 1) - E(Y_1^C - Y_0^C | T_1 = 0) \quad [4.1]$$

Here, for a two-period setting,  $Y_0^T$  represents pre-migration outcome of migrant household.  $Y_1^T$  represents post-migration outcome of migrant household. Thus,  $E(Y_1^T - Y_0^T | T_1 = 1)$  measures the difference in outcome between pre and post-migration periods among migrant households. In a similar way,  $E(Y_1^C - Y_0^C | T_1 = 0)$  measures the difference in outcome between pre and post-migration periods among non-migrant households. Thus, DiD calculates the difference in the differences in outcome between migrant and non-migrant households over time i.e. pre and post-migration periods. This difference is the impact estimate of migration on an outcome. (Khandker, et al., 2010) point out a set of assumptions, which must hold while estimating the DiD:

1. Outcome is correctly specified in the DiD equation.
2. Covariance between the error term ( $\epsilon$ ) and other variables used in equation are zero.

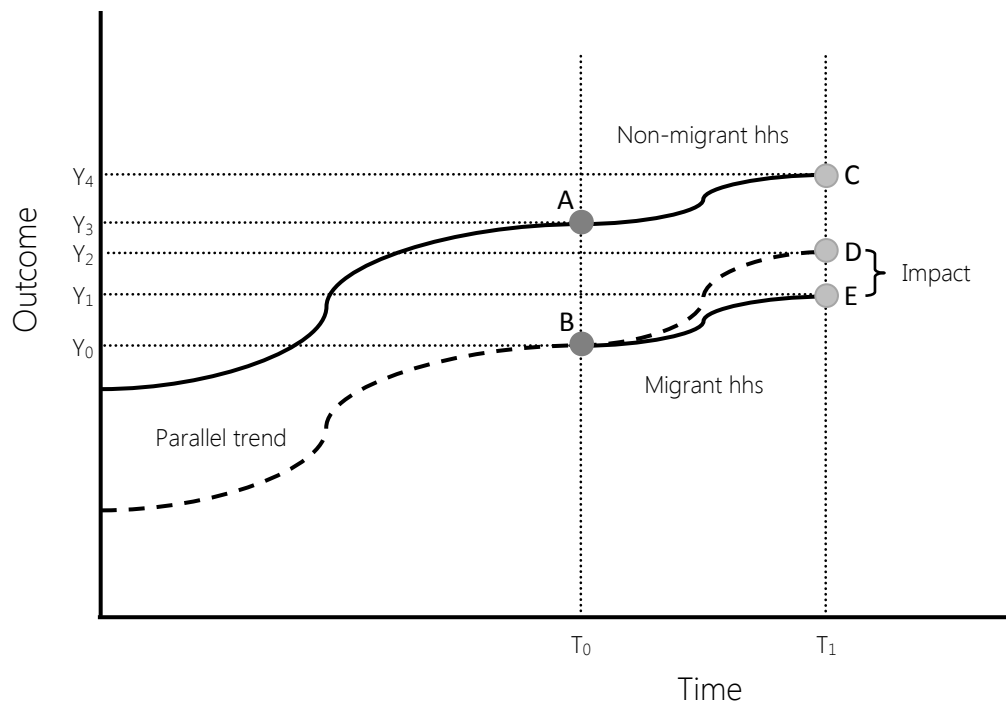
$$Cov(\epsilon_{it}, T_{it}) = 0$$

$$Cov(\varepsilon_{it}, t) = 0$$

$$Cov(\varepsilon_{it}, T_{it}) = 0$$

The last of the expression is known as parallel-trend assumption. It means that unobserved characteristics might affect migration decision; however, they do not vary over time. The intuition of DiD may become more understandable by the Figure 4.1.

Figure 4.1: DiD estimation technique (holding parallel trend assumption)



Source: Author's drawing based on Khandker, et al. (2010) and Gertler, et al. (2011).

In the Figure 4.1, time and level of mean outcome are shown by horizontal and vertical axis respectively. The solid line shows the trend of non-migrant households' outcome and dotted line shows the trend of households with migrant member' outcome over time.  $T_0$  and year  $T_1$  represents before and after migration periods. It can be seen that up to  $T_0$  both migrant and non-migrant households follow the same trend though their level of outcome differs. At,  $T_0$ , migrants' outcome is  $Y_0$  corresponding to point B and non-migrants' outcome is

$Y_3$  corresponding to point  $A$ . However, after  $T_0$  households with migrant member reach point  $D$  at  $T_1$  by following an upward pathway, which is different from the non-migrants. At  $T_1$ , migrants' outcome is  $Y_2$  and non-migrants' outcome is  $Y_4$  corresponding to point  $D$  and  $C$  respectively. Nevertheless, it is observed from the figure that, if households with migrant member would not have migrant members their after-migration trend does not differ from the non-migrants. They reach point  $E$  at  $T_1$  from point  $B$  at  $T_0$  and the level of outcome is  $Y_1$ . Therefore, the trend of households with migrant member,  $BD$ , and trend of non-migrant households,  $AC$ , both are tandem in absence of migration. The DiD method assumes that in the absence of migration both the migrant and non-migrant households follow the same trend before and after migration. There may be some unobserved differences between the two groups however, the differences are time-invariant i.e. the level of difference does not change over time. Therefore, the unobserved difference does not bias the DiD estimate.

Now, the impact of migration can be estimated from the **Figure 4.1**. First, it is important to calculate the difference in outcome between migrant and non-migrant households before migration i.e. at  $T_0$ . From the figure, the difference is:

$$(C-A) = (Y_4 - Y_3) \quad [4.2]$$

Now, after migration, at  $T_1$ , the difference in outcome is:

$$(D - B) = (Y_2 - Y_0) \quad [4.3]$$

So, the DiD is:

$$DiD = (D - B) - (C - A) \quad [4.4]$$

$$DiD = (Y_2 - Y_0) - (Y_4 - Y_3) \quad [4.5]$$

It is clear from the figure that, if the migrants do not have migrant members then,

$$(A - B) = (C - E)$$

$$\text{or, } (Y_3 - Y_0) = (Y_4 - Y_1)$$

$$\text{or, } (Y_4 - Y_3) = (Y_1 - Y_0) \quad [4.6]$$

Putting this equality in DiD equation [4.5], results:

$$DiD = (Y_2 - Y_0) - (Y_1 - Y_0)$$

$$DiD = (Y_2 - Y_1) \quad [4.7]$$

$(Y_4 - Y_3)$  in the DiD equation [4.5] estimates the counterfactual.

But, estimating a valid counterfactual is challenging, because it is not possible to observe same households with and without migrant members in the same time. It is possible to observe the households either a condition at any point of time. So, to make an inference is necessary to estimate the counterfactual i.e. what would have been the changes in any outcome variables (e.g. per capita income) if migrant household does not have migrant members. The inference would be the closest approximation if migrant and non-migrant households are as much as similar in-terms of different observable and unobservable characteristics before migration. That is, migrant households are matched (and hence statistically comparable) to the non-migrant households. By using the techniques of PSM it is possible to identify matched comparison group of non-migrant households to the migrants. PSM holds an assumption that if migrant and non-migrant households are statistically matched there would be no difference in terms of unobserved characteristics.

## 4.2 Propensity Score Matching (PSM)

PSM offers a unique way to construct a statistical comparison group based on a model of estimating the probability of having migrant member by a household conditional on its' own observed characteristics  $X$  (Rosenbaum & Rubin, 1983). The estimated probability is termed as 'propensity score', which is a single composite score, ranging from 0 to 1, enables us to identify the group of households without migrant member that looks observably most similar to the households with migrant member(s). It removes the 'curse of dimensionality' i.e. finds matched comparison households of treatment households in terms of a single propensity score instead of number of  $X$  is much more convenient (Gertler, et al., 2011). PSM uses pre-migration or baseline information of  $X$  to estimate the propensity score by following a logit model:

$$P(X) = \Pr(T = 1|X) \quad [4.8]$$

Rosenbaum & Rubin (1983) show that holding two certain assumptions-conditional independence and presence of common support, matching on propensity score,  $P(X)$  is a good matching on  $X$ .

Conditional independence' implies whether or not households have migrant members (conditional on a set of covariates,  $X$ ) are independent of the outcomes that they have. Mathematically, conditional independence is

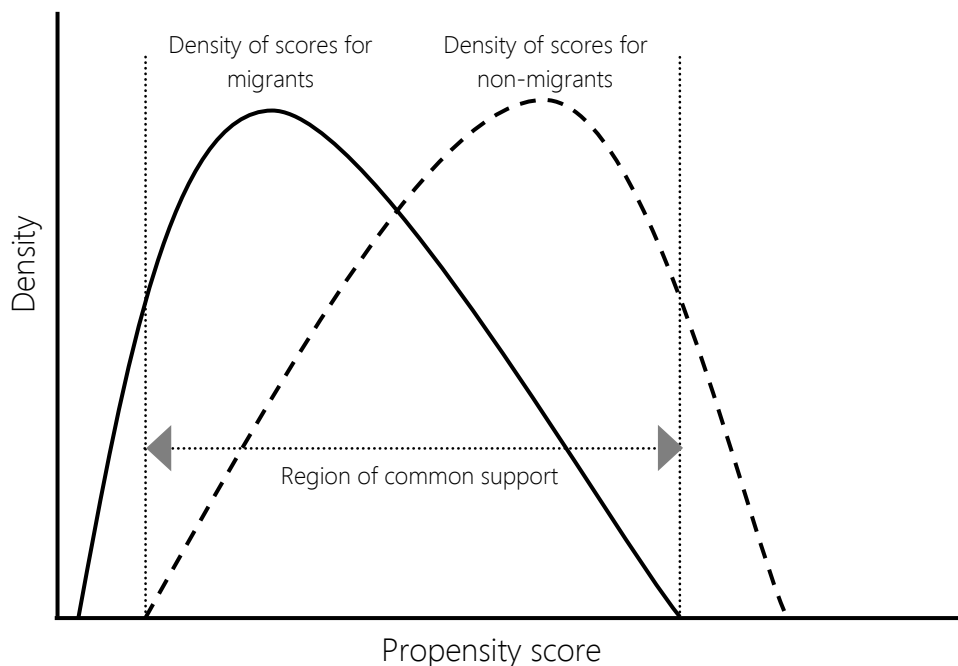
$$(Y_i^T, Y_i^C) \perp T_i | X_i \quad [4.9]$$

The common support or overlap condition refers to a situation where enough number of migrant and non-migrant households fall under a common region of their propensity score distribution plot (Gertler, et al., 2011). Mathematically,

$$0 < P(T_i = 1) | X < 1 \quad [4.10]$$

Common support or overlap condition is shown by the **Figure 4.2**, where horizontal axis represents the estimated propensity scores and vertical axis represents the density. The solid and dotted curves show the propensity score distribution of households with migrant member and households without migrant member respectively. The length of the arrow represents common support region. Under the common support region migrant and non-migrant households' propensity scores are closer or matched. Thus, the matched non-migrant households serve as a valid comparison group.

Figure 4.2: Propensity score distribution and common support



Source: Author's drawing based on Khandker, et al. (2010) and Gertler, et al. (2011).

### 4.3 Impact estimation under combined method

In order to estimate impact of migration this study first uses PSM to identify the matched comparison group i.e. finding the closest non-migrant households from the sample of non-migrant households to the sample of households with migrant member based on observed covariates  $X$  that jointly affects migration decision and outcome of interest. A logit regression model is used to estimate the joint probability or propensity score of having migrant member for each of the households. Then, common support region is defined and identified the households which overlap the common support region. These households are selected for impact analysis. Second, DiD technique is used to estimate the impact of migration. All the steps are described in detail in the following sub-sections.

#### 4.3.1 *Estimating a model of migration decision*

To estimate the propensity score or predicted probability the following logit regression is used where the dependent variable is  $T_i$  that equals to 1 when household  $i$  has migrant member(s), otherwise  $T_i$  equals to 0.

$$T_i = \alpha + \sum_{k=1}^K \beta_k X_{ik} + \varepsilon_i \quad [4.11]$$

Here,  $X_{ik}$  is pre-migration individual, household and community level characteristics of household  $i$ .

After estimating the migration equation, the predicted values of  $T$  from the above equation can be derived. The predicted value represents the estimated probability or propensity score of migration. Every sampled migrant and non-migrant will have an estimated propensity score is  $\hat{P}(X|T = 1) = \hat{P}(X)$ .

According to (Heckman, et al., 1998), the logit regression produces lower biased predicted probability or propensity score because

1. we use data which collected by the same survey questionnaire by the same source
2. our data is well representative of rural Bangladesh due to robust sampling strategy, and

3. the migrant and non-migrant households come from the same socio-economic conditions

#### 4.3.2 *Defining the region of common support or overlap and balancing tests*

The region of common support is defined where estimated propensity score distribution for migrant and non-migrant households overlap. Unmatched households are dropped from the analysis to improve the precision by reducing biases.

This study also checks the balancing property to test whether within each quintiles of the propensity score distribution, the mean propensity score and mean of covariates  $X$  are the same. Mathematically, the balancing property is:

$$\hat{P}(X|T = 1) = \hat{P}(X|T = 0) \quad [4.12]$$

## 4.4 Calculating indexes

Two indexes are calculated in this study. To estimate impact on poverty this study uses FGT indexes as outcome variables. Theil's T and L indexes are used as outcome variable as well to see how migration affects inequality status.

### 4.4.1 *Poverty measurement using FGT indexes*

To see the impact of migration on poverty eradication FGT indexes are calculated. FGT indexes are used as outcome indicators in fixed-effect regression function. FGT indexes are thought of as one of a family of measures proposed by Foster, et al. (1984), which may be written generally as

$$P_{\alpha} = \frac{1}{N} \sum_{i=1}^N \left( \frac{G_i}{z} \right)^{\alpha}, \quad (\alpha \geq 0) \quad [4.13]$$

where,  $\alpha$  = measure of the sensitivity of the index to poverty

$z$  = income poverty line

$G_i$  = poverty gap for individual  $i$  is  $G_i = z - x_i$  (with  $G_i = 0$  when  $x_i > z$ ), where,  $x_i$  = per capita income for the  $i$ th person's household

When  $\alpha = 0$ ,  $P_0$  is simply the headcount index, which simply measures the proportion of the sample is counted as poor. When  $\alpha = 1$ , the index is the poverty gap index  $P_1$ , which measures the extent to which individuals on an average fall below the poverty line ( $z$ ). Again, when  $\alpha = 2$ ,  $P_2$  is the severity index where inequality among the poor is taken into account.

#### 4.4.2 Inequality measurement: Theil's L and Theil's T indexes

There are number of inequality measures used by practitioners. Among them Gini coefficient and Generalized Entropy (GE) measures are widely accepted due their interpretational conventionality and statistical rigor. According to (Haughton & Khandker, 2009), to become a good measure of inequality any measure should satisfy the following criteria:

- (1) Mean independence
- (2) Population size independence
- (3) Symmetry
- (4) Pigou-Dalton transfer sensitivity
- (5) Decomposability
- (6) Statistical testability

Gini coefficient, which measures inequality based on the Lorenz curve, satisfies first four criteria; however, these measures are not easily decomposable or break down by population groups or income source or in other dimensions. To have better measure of inequality we opt for Theil's T and Theil's L indexes. Both indexes belong to the family of GE inequality measures. Theil's T and Theil's L indexes satisfy all of the six criteria noted above. It allows decomposing the inequality measure and checking statistical robustness. Mathematically, the GE formula is:

$$GE(\alpha) = \frac{1}{\alpha(\alpha-1)} \left[ \frac{1}{N} \sum_{i=1}^N \left( \frac{y_i}{\bar{y}} \right)^\alpha - 1 \right] \quad [4.14]$$

where,  $\bar{y}$  = per capita income

GE measures vary between zero and infinity. Zero represents an equal distribution and higher value represents higher levels of inequality.  $\alpha$  represents

the weight given to distances between incomes at different strata of the income distribution. It can take any real value. GE is more sensitive to the changes in the lower tail of the distribution when  $\alpha$  takes lower value and vice versa. The most common values used for  $\alpha$  are 0, 1, and 2. When  $\alpha = 0$ , we call it Theil's T index. Mathematically, Theil's T index is:

$$GE(1) = \frac{1}{N} \sum_{i=1}^N \frac{y_i}{\bar{y}} \ln \left( \frac{y_i}{\bar{y}} \right) \quad [4.15]$$

Again,  $\alpha = 1$  is Theil's L index, which is mathematically as follows:

$$GE(0) = \frac{1}{N} \sum_{i=1}^N \ln \left( \frac{\bar{y}}{y_i} \right) \quad [4.16]$$

In concluding the methodology chapter, this study follows DiD with PSM to estimate impact of migration and remittances on household welfare, poverty and inequality because this combined method provides comparable statistical rigour estimates over other methods. To estimate valid inference of counterfactual, which requires estimating impact under DiD, a matched comparison group is constructed using PSM. PSM technique uses a logit regression model to estimate conditional probability of having migrant member of every household based on observable household and regional characteristics and define a common support region which identifies the matched migrant and non-migrant households for impact analysis. The theoretical intuitions and mathematical procedure of DiD and PSM, and the steps of impact estimation under the combined method are presented in this chapter. In addition to that, calculation and use of income diversity index, FGT index and Theil's indexes are discussed as well. The next chapter will focus on the data which are used for this study.

## 5 Sampling design and data collection

This chapter focuses on the sampling and data collection procedure. In addition to that, how a true panel dataset is constructed for impact analysis is described here.

### 5.1 Sampling design

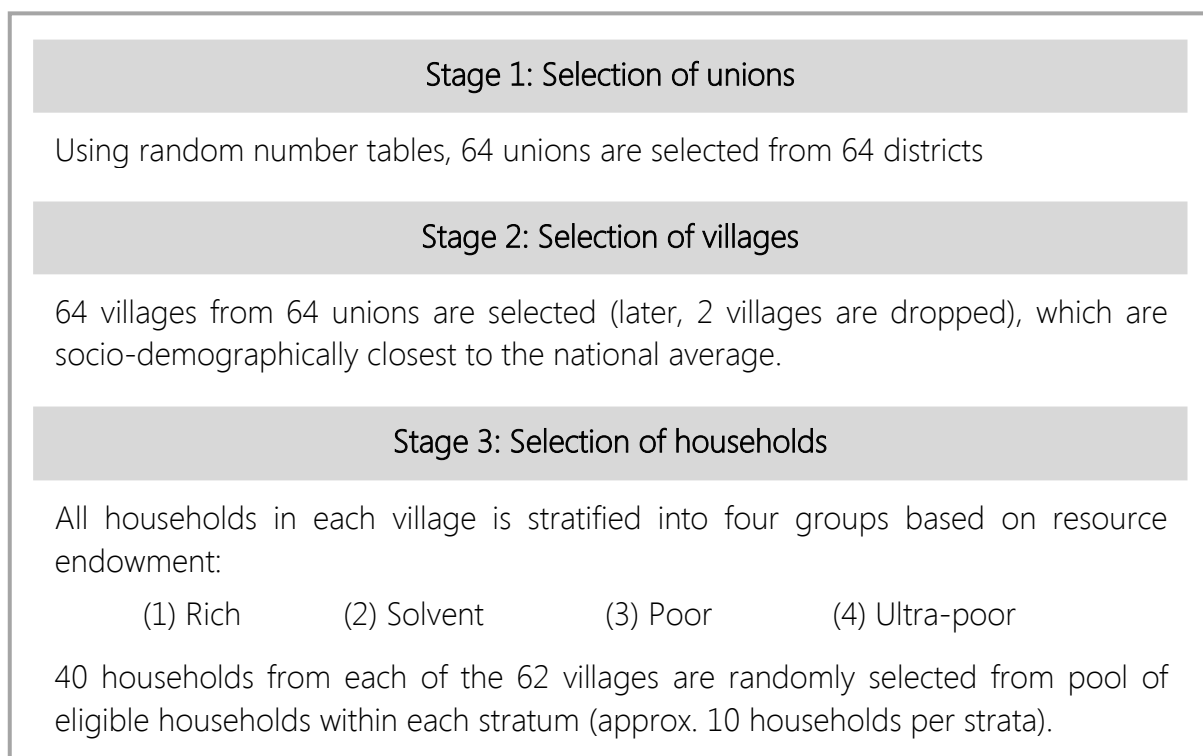
For this study, five rounds of panel datasets are collected from 2480 households from 62 villages of 57 districts in Bangladesh in 1988, 2000, 2004, 2008 and 2014. However, this study uses only two rounds of them- 2004 and 2014 for estimating the impact of migration and remittances. A multi-stage stratified cluster random sampling technique was followed to select the sample villages and households. Structured questionnaires were administered to collect primary data from sample villages and households. In each of the rounds, more or less similar village and household questionnaires were used. In the

Figure 5.1, the author illustrates the sampling design in brief, later on details out the procedures.

In **1988**, at the **first stage** of sampling design, 64 unions were selected from 64 districts using random number tables. At the **second stage**, based on 1981 census data, 64 villages were selected from 64 unions, which were lying close to the national average in terms of population density and literacy rate. Then, household census was conducted in every selected village and data was collected on various socio-economic and demographic variables from every household. During the census, two villages were dropped due to administrative difficulties. Therefore, data were collected from 9,474 households in the census, on an average 153 households from each of the 62 villages. Later on, at the **third stage**, all the households in a village were stratified into four groups based on their resource endowment following Participatory Rural Appraisal (PRA) approach. The groups were:

- 1) Rich
- 2) Solvent
- 3) Poor
- 4) Ultra poor

Figure 5.1: Sampling design



Source: Author's compilation

After that, following proportionate random sampling technique, 20 households were selected so that out of four strata, every household was represented on the basis of respective importance. Thus, from all of the 62 villages data were collected from 1,246 households. It is worth mentioning that in the sampling design villages were treated as cluster.

In **2000**, villages and households surveyed in 1988 were revisited. The migrated households, which were surveyed in 1988, were excluded in this year. But, to keep the sample size adequate and serve the purpose on an average 12 new households per villages were surveyed in 2000. Thus, a total of 1,888 households were surveyed in this round.

In **2004**, households, which were surveyed in 1988 and 2000 were revisited again. In this year again the migrated households were excluded and numbers of new

households were included during the survey. The number of sample household stand at 1,927.

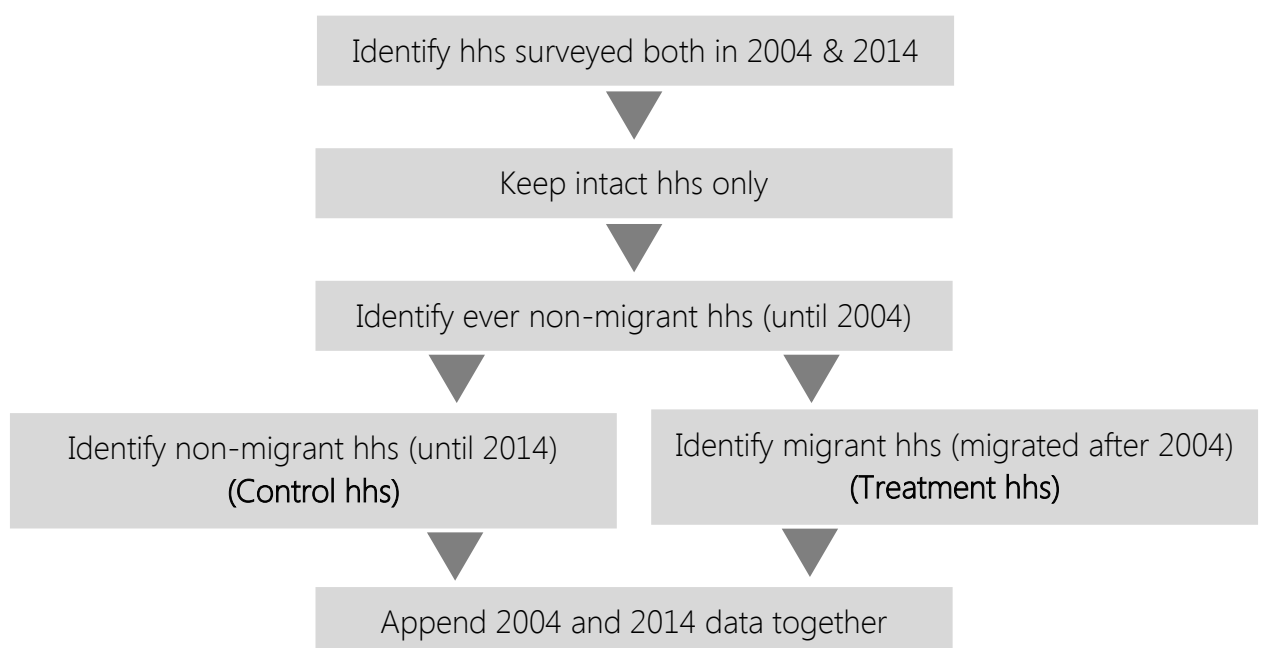
In **2008**, all the households, which were surveyed in 1988, 2000, and 2004, were revisited except the migrated ones. Again adding up the number of new households surveyed in 2008, the sample size becomes 2010.

Finally, in **2014**, on an average 40 households per village were surveyed. Along with the older households surveyed in all the previous rounds in 1988, 2000, 2004, and 2008, the latest sample size is 2,480 households.

## 5.2 Construction of panel dataset for impact evaluation

A balanced panel dataset is constructed from two rounds of surveys i.e. 2004 and 2014 to evaluate the impact. 2004 is considered as the baseline and 2014 as the end line. The following steps are applied (illustrated in **Figure 5.2**) in order to prepare the balanced panel dataset.

Figure 5.2: Steps followed to construct the balanced panel dataset



Source: Author's compilation

*Step 1: Identify households surveyed in all five rounds*

In the first step, using unique household identification numbers (IDs) those households are identified which are surveyed in all five rounds. It ensures the most important steps of construction of the balanced panel dataset.

*Step 2: Keep intact households only*

Then, in the second step, only the intact households are kept from the dataset available after step 1. It is observed that passing times households in rural areas become parted. A newer household is formed where one or few members of the original household belong to. The most common reasons of household split are marriage of a son and dying of the father who braced number of married sons with their wives and children together in a single household. Choosing intact households helps to minimize statistical noises like-reducing number of members in the original households might overestimate per capita income.

*Step 3: Identify ever non-migrant households (until 2004)*

The paper follows quasi-experimental methods (detail discussion is available in chapter 4) to estimate the impact of migration. In order to do so the method requires of having data for statistically sufficient number of migrant and non-migrant households for baseline and end-line. In this case, baseline refers to the situation when the sample households have no migrant members ever. However, end-line is the situation when there are some of the sample households have migrant members who have migrated after the baseline. Rests of the sample households don't have any migrant member yet. For this study, 2004 is selected as baseline and 2014 as end-line.

There are some potential reasons behind choosing 2004 as baseline. First, before 2004, heterogeneity in natural disasters and different national programmes placements were observed in different regions of Bangladesh. These facts may result measurement errors while estimating the impact of migration. Second, from 2004 more uniform and comprehensive household questionnaire was administered to collect data. Finally, choosing 2004 as baseline provides

statistically sufficient number of migrant and non-migrant sample households till end-line to get statistically robust estimates of the impact of migration.

In this step, study drops the households who have migrant members before 2004 from the available dataset after step 2.

*Step 4: Identify migrant (treatment) and non-migrant (control) households*

It is described in step 3 that the impact evaluation method requires data on migrant and non-migrant households. So, in this step, from the available dataset after step 3, this study identifies the households who have sent their members to abroad as migrant. These households with migrant member can be termed as treatment households. The term 'treatment' is widely used in available literature which refers to an individual or a household or any other unit who is exposed to any intervention- having migrant member in this case. The households who have no migrant member are also identified. This group of households are termed as control or comparison households. Iteratively, it is worthy to note that this treatment and control households never exposed to migration event before 2004 (baseline), but the treatment got exposed after 2004.

*Step 5: Append 2004 and 2014 data together*

2014 is treated as the end-line when data is available on both migrant and non-migrant sample households. This study simply appends two years' (baseline and end-line) data together and constructs a balanced panel dataset. So, finally this balanced panel dataset consists of data on treatment (migrant) and control (non-migrant) households for baseline (2004) and end-line (2014). This study estimates impact of migration based on this balanced panel dataset.

In conclusion, following a multistage clustered random sampling technique five rounds panel data on households and villages are collected from 62 villages of Bangladesh in 1988, 2000, 2004, 2008 and 2014. However, for this study, two rounds panel dataset of 2004 and 2014 are used. 2004 considered as the baseline and 2014 as endline. The steps, which are followed to construct a true panel dataset, are described here. The next chapter provides the results based on the true panel dataset.

## 6 Empirical strategy, results and discussions

This chapter provides an overview about sample households and their migrant members, empirical strategy and results of impact of international migration on household welfare, poverty and inequality. The chapter consists of three sections. The first section of this chapter presents information about migrant members of sample households and a comparative outlook of treatment and comparison households. The second section provides the detail procedure and results of propensity score matching estimation and identification of matched non-migrant households of migrant households to estimate the impact of migration. The last section discusses empirical strategy of impact estimation following fixed-effects DiD and the results of impact of international migration on different household welfare indicators, poverty and inequality.

### 6.1 Profile of migrant members and sample households

This section provides information about migrant members of sample households, and a comparative status regarding household characteristics and welfare indicators of migrant households and non-migrant households.

#### *6.1.1 Migrant members' profile*

According to the panel data, total number of sample household is 1,268 where 123 (9.7 percent) households had international migrant member and rest 1,145 households didn't have during 2004-2014. One hundred and forty three (143) members from 123 sample households i.e., more than one member per household, migrated in different countries of the world for different purposes. About 96 percent of total migrant members were male. Migrant members were on an average 29 years old ( $SD=7.07$ ) in 2014 and their mean schooling years was 7 ( $SD = 3.42$ ). Around 96 percent of migrant members went abroad for getting jobs and around 2 percent went for doing business. Rest 2 percent went for perusing other purposes. When they migrated only 20 percent of them had trainings. However, data shows that all the migrant members sent remittance to their households in Bangladesh during 2004-2014. Almost every migrant member reported that s/he migrated for comparatively higher wages or better salaries.

The destinations countries of the migrant members are given in **Table 6.1**. Data shows that Malaysia was the most preferred country for migration. Around 22.5 percent of migrant members went Malaysia during 2004-2014. As a region, Middle East was the most preferred location for migration where more than 66 percent of total migrant members went.

Every migrant member did not migrate at the same time. They had been staying in their host countries for different time durations and no migrant members of sample households returned back permanently in Bangladesh during 2004-2014. Available data shows that on an average the migrant members had been staying in their host countries for around 5 years. About 53 percent of total migrant members had been staying in their host countries for 5 years or less and rest 47 percent had been staying for more than 5 years (see Table 6.2).

**Table 6.1: Destinations of international migrant members of sample households**

Region/ Country	Number of migrants	Percent
<i>Middle East</i>	<i>94</i>	<i>66.4</i>
United Arab Emirates	28	19.6
Oman	27	19.0
Saudi Arabia	23	16.1
Qatar	8	5.6
Kuwait	3	2.1
Bahrain	3	2.2
Lebanon	1	0.7
Iraq	1	0.7
Egypt	1	0.7
<i>Asia</i>	<i>38</i>	<i>26.9</i>
Malaysia	32	22.5
Singapore	6	4.2
<i>Europe</i>	<i>3</i>	<i>2.3</i>
Italy	2	1.6
England	1	0.7
<i>North America</i>	<i>1</i>	<i>0.7</i>
USA	1	0.7

Region/ Country	Number of migrants	Percent
<i>others</i>	6	4.3
<b>Total</b>	<b>143</b>	<b>100</b>

Source: Author's calculation based on 2004 and 2014 household survey.

**Table 6.2: Time duration of international migration by migrant members**

Time duration (year)	Number of migrants	Percent
0.5	13	9.1
1	11	9.7
2	20	14.0
3	11	7.7
4	10	7.0
5	11	7.7
6	16	11.2
7	23	16.1
8	11	7.7
9	8	5.6
10	9	6.3
<b>Total</b>	<b>143</b>	<b>100</b>

Source: Author's calculation based on 2014 household survey.

### *6.1.2 Characteristics of sample households*

In order to present a comparative outlook of migrant and non-migrant households all the household characteristics are grouped into two broad categories: socio-demographic and economic. In addition to that, village level comparative statistics are also given in this section to provide some useful information on infrastructure that were available during 2004-2014 to the households located in different villages. The comparative status based on the household characteristics is shown in **Table 6.3**.

#### *6.1.2.1 Socio-demographic characteristics*

##### Household size

Available data show that the average household size decreased between 2004 and 2014 in both group of households. In 2004, average household size was 5.7 and 4.7 respectively of migrant and non-migrant households which declined to

4.9 and 4.6 respectively in 2014. In passing, it is important to note that according to our study definition the migrant members are not considered as household member.

#### Sex of household head

Number of female-headed household is increased over the years among both groups of households. There were only 0.08 percent female-headed households in migrant group in 2004, which increased to 17.1 percent in 2014. In the same way, number of female headed household is increased from 4.6 percent in 2004 to 12.8 percent in 2014 in non-migrant group. Number of many factors like death of male household heads and internal and/or international migration might be crucial behind this temporal change. But, the change is comparatively higher for treatment group.

#### Age of household head

In 2004, average age of household head of migrant household was 48 years whereas non-migrant household heads were on an average 44 years old. Average age of household head becomes 54 years and around 50 years respectively for migrant and non-migrant groups in 2014. Again, mostly death of male household heads and migration resulted to the observed changes.

#### Schooling years of household, household head and spouse

Average schooling years of migrant and non-migrant households were increased between 2004 and 2014. On an average, migrant household members had 4.3 years of schooling and non-migrant household members had 3.2 years of schooling according to 2004 data. In 2014, average schooling years became 4.8 and 4.1 respectively for migrant and non-migrant households. Average schooling years of non-migrant household heads and their spouses was declined during the years; however, households with migrant member experienced the opposite trends.

#### Child education at secondary level

In 2004, about 54 percent of migrant households reported that at least one of their children still read at secondary level which stood at around 24 percent in

2014. On the other hand, about 31 percent of non-migrant households reported that at least one of their children still read at secondary level in 2004 and about 26 percent in 2014.

#### *6.1.2.2 Economic characteristics*

##### Male and female worker

Number of male worker per household decreased during 2004-2014. Households with migrant member had 1.7 male workers and non-migrant had 1.3 male workers in 2004 which reduced to 1.2 in 2014. On the other hand, average number of female worker was around very low in both the years. It was around 0.1 in 2004 in both groups of households however, slightly increased in migrant households in 2014 and became 0.2.

##### Young and old dependency

Young dependant ratio, the ratio of younger people who were less than 15 years old to the working age population who were aged between 15 years to 64 years, also decreased during the years. In 2004, young dependant ratios were 0.9 and 0.8 respectively in migrant and non-migrant households. In 2014, the ratios became 0.5 and 0.6 respectively. It is easy to realize the reason behind the lower magnitude of young dependant ratio that most of the younger people became more than 15 years old in 2014 who were less than 15 years old in 2004. On the contrary, old dependant ratios, the ratio of older people who were more than 64 years old to the working age population who were aged between 15 years to 64 years, were stagnant at 0.1 during the years in both migrant and non-migrant households except in migrant households in 2014 which was 0.3.

##### Household occupation

Some interesting aspects were observed while analysing occupation related data of the sample households. In 2004, around 17 percent households of migrant group had agriculture as the only source of income which became zero in 2014. On the other hand, around 26 percent non-migrant households had agriculture as the only source of income in 2004 that reduced to half in number in 2014. Comparatively lower return of agricultural produces and lower access to necessary inputs might result this downward trend. Very few percentages of

migrant and non-migrant households had only non-agricultural income sources during 2004-2014. Majority of the households had mixed- both agriculture and non-agriculture income sources and it followed an increasing trend over the years. In 2004, around 82 percent of households with migrant member had mixed income sources which increased to about 98 percent in 2014. In the same way, about 72 percent and about 85 percent of non-migrant households had mixed income sources in 2004 and 2014 respectively. The fact showed that on an average sample households had access to more diversified income sources in 2014 compare to 2004. There might be several reasons to this move notably access to infrastructure and energy, increasing educational qualifications of household members, and higher rate of financial inclusion played important but need further study to explore more.

#### Domestic migrant member

Number of sample households who had domestic migrant members was increased during 2004-2014. Compare to the migrant households more non-migrant households had domestic migrant members in 2014 than 2004. In 2004, around 18 percent migrant households had domestic migrant members but in 2014 it became around 19 percent only. On the other hand, about 14 percent non-migrant households had domestic migrant members in 2004 which increased to about 28 percent in 2014.

#### NGO membership

Non-migrant households experienced an increase to have had NGO membership of household members whereas migrant group experienced the opposite trend. About 32 percent of households with migrant member had NGO membership in 2004 which decreased to about 14 percent in 2014. On the contrary, in 2004 about 31 percent of non-migrant households had NGO membership that increased to about 33 percent in 2014.

#### *6.1.2.3 Village characteristics*

During 2004-2014, the villages become more developed in terms of paved road connectivity. In 2004, around 27 percent of 62 villages had access to paved road which became around 57 percent in 2014. However, in terms of electricity connectivity and telephone connection (T&T) data does not show any change.

On an average 56 percent of households in the villages had electricity connection in 2004 which remained same in 2014 as well. In the same way, telephone connection was in the same rate (around 8 percent of village) over the years. One thing need to note that, going through other sources of secondary data, it was observed that over times mobile network connection has been increased rapidly in Bangladesh and people has been moved to that. In our village data set there is no information on mobile network use. If there were so it might be observed that people had more access to telephone in 2014.

Table 6.3: Profile of households (unmatched sample)

Sl.	Characteristics	2004		2014	
		Migrant HH (N=123)	Non-migrant HH (N=1145)	Migrant HH (N=123)	Non-migrant HH (N=1145)
<b>Household characteristics</b>					
<b>Socio-demographic</b>					
1	Average household size (persons)	5.7 (1.7)	4.7 (1.9)	4.9 (2.0)	4.6 (2.1)
2	Female headed household (percent)	0.08 (9.0)	4.6 (21.0)	17.1 (37.8)	12.8 (33.5)
3	Average age (years) of household head	48.0 (10.5)	44.1 (12.8)	54.0 (13.5)	49.6 (12.2)
4	Average years of schooling (household)	4.3 (2.4)	3.2 (2.7)	4.8 (2.5)	4.1 (2.7)
5	Average years of schooling (household head)	4.1 (4.1)	3.8 (4.4)	4.1 (3.9)	4.2 (4.5)
6	Average years of schooling (spouse of household head)	3.0 (3.2)	2.7 (3.5)	2.7 (3.2)	3.2 (3.8)
7	Child still read at secondary level (% of hh)	53.7 (50.0)	30.7 (46.2)	23.6 (41.5)	26.1 (43.9)
8	Average number of under five (05) children	0.5 (0.7)	0.6 (0.8)	0.4 (0.7)	0.4 (0.6)
<b>Economic</b>					
9	Average number of male worker (person)	1.7 (0.9)	1.3 (0.7)	1.2 (0.8)	1.2 (0.8)
10	Average number of female worker (person)	0.1 (0.3)	0.1 (0.3)	0.2 (0.4)	0.1 (0.3)
11	Young dependant ratio	0.9 (0.7)	0.8 (0.7)	0.5 (0.6)	0.6 (0.6)
12	Old dependant ratio	0.1 (0.2)	0.1 (0.4)	0.3 (0.3)	0.1 (0.3)
13	Income source (% of hh)				

Sl.	Characteristics	2004		2014	
		Migrant HH (N=123)	Non-migrant HH (N=1145)	Migrant HH (N=123)	Non-migrant HH (N=1145)
	Only agriculture	17.1 (37.8)	26.2 (44.0)	0.0 (0.0)	13.0 (33.7)
	Only non-agriculture	0.8 (0.9)	1.91 (13.7)	1.6 (12.7)	2.5 (15.7)
	Mixed	82.1 (39.0)	71.8 (45.0)	98.4 (12.7)	84.5 (36.3)
14	Have domestic migrant member (% of hh)	17.9 (38.5)	13.9 (34.6)	18.7 (39.2)	27.6 (44.7)
15	Household NGO membership (% of hh)	31.7 (46.7)	30.7 (46.1)	13.8 (34.7)	33.3 (47.1)
<b>Village characteristics</b>					
16	Access to paved road (% of village)	27.4 (45.0)		56.5 (50.0)	
17	Access to electricity (% of hh in a village)	56.3 (33.4)		56.7 (34.3)	
18	Access to telephone (% of village)	8.1 (2.8)		8.1 (2.8)	

Value in the parentheses indicates standard deviation (SD).

Source: Author's calculation based on 2004 and 2014 household and village survey.

### 6.1.3 Household welfare indicators

In this sub-section, several welfare indicators associated with international migration are presented. **Table 6.4** shows the comparative statistics of the indicators between migrant and non-migrant sample households during 2004-2014. It is important to note that, in survey dataset there is no information on household consumption; therefore, household income, capital, housing, and income poverty and income inequality related indicators are analysed here. Again, income and values of different capital are not CPI adjusted as this study is aimed to compare the relative changes between two time periods among households with migrant member and households without migrant member.

#### Per capita income

In both groups of households per capita income, measured in Bangladeshi currency (taka), was increased significantly during 2004-2014. In 2004, per capita income of migrant and non-migrant households was 12,336 taka and 12,222 taka, respectively. During 2004-2014, per capita income increased by around 531

percent among migrant households and became 77,841 taka in 2014. During the same time period, non-migrant households experienced around 221 percent increase in per capita income which became 39,233 taka in 2014. If international remittance was excluded from per capita income then it was observed that households with migrant member experienced comparatively lower increase in per capita income than non-migrant households. Households with and without international migrants respectively gained around 176 and 221 percent increase in per capita income excluding international remittance during 2004-2014.

#### Per capita agro and non-agro income

Households with migrant member had comparatively lower per capita agro income than that of households without migrant member in 2004, however, in 2014, the status became reversed. Non-agro per capita income was bit higher among migrant households than for non-migrant households in 2004. But, in 2014, migrant households had much higher non-agro per capita income than the non-migrant households. Migrant households gained 231 and 808 percent increase respectively in per capita agro and non-agro income during 2004-2014. On the other hand, non-migrant households gained 186 and 259 percent increase in per capita agro and non-agro income, respectively, during the same course of time. In passing, it is important to note that, during 2004-2014, 75 percent of per capita income came from non-agricultural sources in migrant households. On the other hand, in non-migrant households, 54 percent of per capita income came from non-agricultural sources during the mentioned time period.

#### Per capita domestic remittance

In 2004, per capita domestic remittance income was 700 taka and 460 taka, respectively, in migrant and non-migrant households. This income was increased over time in both household groups but change was higher for non-migrant households. In 2014, per capita domestic remittance income was 2,860 taka for households with migrant member and 4,907 taka for that of households without migrant member.

### Per capita land ownership

In 2004, migrant households owned on an average 0.097 ha land per capita, which was comparatively lower than non-migrant households (0.098 ha). However, passing times, migrant households gained 16.5 percent increase in per capita owned land that was higher than non-migrant households who gained 11.2 percent increase during 2004-2014.

### Household capital

Both agricultural and non-agricultural capital was increased during 2004-2014 among both groups of households; however, changes in both types of capital were higher among non-migrant households. In 2004, migrant households' agricultural capital was 11,963 taka that became 32,430 taka in 2014. Non-agricultural capital was increased from 22,746 taka in 2004 to 89,965 taka in 2014. In non-migrant households agricultural and non-agricultural capital was 8,805 taka and 12,243 taka respectively in 2004, which increased to 30,333 taka and 83,883 taka respectively in 2014.

### Housing condition

Significant positive changes were observed in improving housing condition among sample households during 2004-2014. Both household groups improved their housing condition, but the change was bigger among migrant households. In 2004, respectively, only 0.81 and 2.62 percent migrant and non-migrant households lived in the houses that made of permanent materials. But, in 2014, around 15 percent of migrant and around 5 percent of non-migrant households lived in houses that made of permanent materials i.e. roof, wall, and floor are made of concrete.

Table 6.4: Welfare indicators of (unmatched) sample households

Sl.	Welfare indicators	2004		2014	
		Migrant HH (N=123)	Non-migrant HH (N=1145)	Migrant HH (N=123)	Non-migrant HH (N=1145)
1	Per capita income (taka)	12,336 (9,602)	12,222 (13,634)	77,841 (71,144)	39,233 (46,021)
2	Per capita income excluding international remittances (taka)	12,336 (9,602)	12,222 (13,634)	34,013 (49,380)	39,232 (46,021)

Sl.	Welfare indicators	2004		2014	
		Migrant HH (N=123)	Non-migrant HH (N=1145)	Migrant HH (N=123)	Non-migrant HH (N=1145)
3	Per capita agro income (taka)	5,919 (5,737)	6,369 (8,696)	19,579 (42,861)	18,215 (23,135)
4	Per capita non-agro income (taka)	6,417 (8,420)	5,854 (9,846)	58,261 (48,992)	21,018 (39,978)
6	Per capita owned land size (ha)	0.097 (0.208)	0.098 (0.268)	0.113 (0.201)	0.109 (0.218)
7	Agro capital (taka)	11,963 (11,514)	8805 (12,394)	32,430 (68,576)	30,333 (40,765)
8	Non-agro capital (taka)	22,746 (87,362)	12,243 (66,208)	89,965 (3,47,899)	83,883 (5,34,460)
9	House made of permanent materials (% of household)	0.81 (9.1)	2.62 (16.0)	14.63 (35.49)	5.1 (22.0)

Value in the parentheses indicates standard deviation (SD).

Source: Author's calculation based on 2004 and 2014 household survey.

#### 6.1.4 Household poverty and inequality status

During 2004-2014 International migration improved poverty incidence, poverty gap and severity of poverty of sample households; however, the improvement was comparatively higher for migrant households (see **Table 6.5**). The head-count ratio [p0], calculated using estimated poverty lines,<sup>1</sup> shows that in 2004, around 40 percent of migrant households lived under the poverty line. But, in 2014, only 13 percent households were found to be lived under the poverty line. Thus, migrant group of households experienced around 67 percent reduction in poverty incidence during 2004-2014. Among non-migrant households, around 46 percent was found to live under poverty line in 2004. The figure became around 42 percent in 2014 with a reduction of around 10 percent. The poverty gap index [p1] reduced from 0.15 to 0.04 and poverty severity index [p2] reduced from 0.08 to 0.02 during 2004-2014 among migrant households. Among non-migrant households, p1 reduced from 0.18 to 0.14 and p2 reduced from 0.09 to 0.07 during 2004-2014.

<sup>1</sup> Poverty lines were estimated for both the years-2004 and 2014 following FAO norms of cost-of-basic-needs methods. The estimated poverty lines for 2004 and 2014 were 8,292 taka and 24,522 taka, respectively. The estimated poverty lines identified moderate poverty.

Theil's indexes show a little bit deterioration in inequality status of sample households during 2004-2014 (see **Table 6.5**). According to Theil's L index, inequality increased among migrant group only during 2004-2014. Again, the other inequality measure, Theil's T, shows that among both household groups inequality increased during the study period and the magnitude was comparatively higher for migrant group. The value of Theil's L and T indexes were respectively 0.26 and 0.24 in 2004 for migrant group which became 0.30 and 0.31, respectively, in 2014. On the other hand, for non-migrant group Theil's L and T indexes were respectively 0.31 and 0.34 in 2004 and 0.31 and 0.35, respectively, in 2014.

**Table 6.5: Poverty and inequality measures of (unmatched) sample households**

Sl.	Poverty and inequality measures	2004		2014	
		Migrant HH (N=123)	Non-migrant HH (N=1145)	Migrant HH (N=123)	Non-migrant HH (N=1145)
Poverty status (All poverty)					
1	Poverty incidence [P0 (%)]	39.8 (49.2)	46.2 (49.9)	13.0 (33.8)	41.7 (49.3)
2	Poverty gap index [P1]	0.15 (0.25)	0.18 (0.25)	0.04 (0.12)	0.14 (0.22)
3	Poverty severity index [P2]	0.08 (0.17)	0.09 (0.17)	0.02 (0.08)	0.07 (0.15)
Inequality status (All inequality)					
4	Theil's L	0.26 (0.76)	0.31 (0.78)	0.30 (0.78)	0.31 (0.77)
5	Theil's T	0.24 (1.19)	0.34 (2.56)	0.31 (1.52)	0.35 (2.90)

Value in the parentheses indicates standard deviation (SD).

Source: Author's calculation based on 2004 and 2014 household survey.

## 6.2 Propensity score estimation and determinants of migration

To identify matched non-migrant households of migrant households' propensity score matching technique is used. It is earlier noted (see 0 for details) that estimated propensity score predicts the probability that a household had at least one international migrant member during 2004-2014 using pre-migration information collected in 2004. As migration decision is a binary dependent variable, which takes value either '0' or '1', a logit regression is appropriate to

estimate the propensity score. A STATA command 'pscore', written by (Becker & Ichino, 2002), is used to estimate the propensity score of households.

Economic theories of migration suggest that people primarily migrate to improve income or to reduce risk [ (Harris & Todaro, 1970), (Katz & Stark, 1986), (Stark, 1980), (Stark, 1991)]. The new economics of labor migration assumes that migration decisions are determined both by individual and household characteristics, including human and physical assets of the households [ (Mora & Taylor, 2006). In line with the recent literature on determinants of migration [e.g. (Hoddinott, 1994), (Mora & Taylor, 2006), (Nguyen, et al., 2011)], the set of explanatory variables or migration decision determinants consist of individual, household, village and regional level characteristics. Individual level characteristics include sex of household head, age of household head, and schooling of household head and spouse. Household level characteristics include household size, average schooling of household members, whether child still read at secondary level or not, number of children aged 0-5 years, number of economically active male and female member, young and old dependant ratio, household occupation, household income and capital, NGO membership and housing condition. Village and regional level characteristics include access to paved road, electricity and telephone. In addition to that, whether village located in agro-favourable geo-graphic region or not a region dummy variable is included. Several control variables such as household income and remittances are also outcome variables.

Logit regression and determination of common support region Table 6.6 represents the logit regression results regarding the determinants of migration. There are 123 treatment households and 1,145 comparison households i.e. a total of 1,268 sample households which predicted propensity scores are estimated by performing this logit regression. STATA's 'pscore' command defined a common support region based on the estimated propensity score which is [.00584579, .66921061] (see **Table 6.7** for detail STATA results of common support region). The households which estimated propensity score is beyond this range are excluded from the sample for further impact analysis (see **Figure A 1** for graph of matched and unmatched migrant and non-migrant household based on estimated propensity distribution). The defined common support region excluded 35 households from the non-migrant group. Thus, the number

of matched sample households becomes 1,233 which consist of 123 migrant and 1,110 non-migrant households.

### 6.2.1 *Balancing tests*

To see whether the households under the common support region are well balanced across the estimated propensity score and different characteristics STATA performed a series of balancing tests. To do so, migrant and non-migrant households were grouped into 5 blocks based on the estimated propensity score. Two sample t-tests with equal variances were performed within each block first, to see whether migrant and non-migrant households are different in terms of estimated mean propensity score and second, to see whether migrant and non-migrant households are different in terms of all explanatory variables included in the logit regression. In this case, the balancing property is satisfied which implies that matched migrant and non-migrant households are statistically similar prior to had international migrant member.

**Table 6.6: Logit regression of migration probability**

Sl.	Explanatory variables	Households with international migration (1 = yes) (N = 1268)
1	Household size	-0.004 (0.088)
2	Sex of household head (1 = male)	1.02 (1.17)
3	Age of household head (years)	0.013 (0.011)
4	Schooling years of household head	-0.082* (0.043)
6	Schooling years of household head's spouse	-0.02 (0.53)
7	Schooling years of household	0.21** (0.09)
9	Child still reading at secondary level (%)	0.39 (0.25)
10	Number of children (age 0-5)	-0.16 (0.19)
11	Number of economically active male member	0.43** (0.17)
12	Number of economically active female member	-0.28

Sl.	Explanatory variables	Households with international migration (1 = yes) (N = 1268)
		(0.48)
13	Young dependents ratio	0.34 (0.21)
14	Old dependents ratio	-1.11 (0.63)*
15	Household income source is only agriculture	-0.072 (1.08)
16	Household income source are both agro and non-agro	0.12 (1.06)
17	Household has domestic migrant (1 = yes)	-0.13 (0.28)
18	Per capita household income (taka)	-0.00001 (0.00001)
19	Per capita household owned land (ha)	0.25 (0.51)
20	Household agro capital (taka)	-0.00001 (0.0000)
21	Household non-agro capital (taka)	0.0000 (0.0000)
22	Household has NGO membership (1 = yes)	0.024 (0.22)
23	House made of permanent materials (1 = yes)	-1.52 (1.05)
24	Village access to paved road (1 =yes)	-0.47* (0.28)
25	Village access to electricity (1 = yes)	0.005 (0.004)
26	Village access to telephone (1 =yes)	-0.13 (0.38)
27	Village located in flood-prone region	1.49*** (0.47)
28	Village located in coastal region	1.85*** (0.38)
29	Village located in agro-favorable region	1.60*** (0.47)
30	_cons	-6.79*** (1.68)
	Pseudo R <sup>2</sup>	0.134

\*  $p < 0.05$ ; \*\*  $p < 0.01$

Value in the parentheses indicates standard error (se).  
Source: Author's calculation based on 2004 household survey.

Table 6.7: Estimated propensity score in common support region

	Percentiles	Smallest		
1 %	0.0070786	0.0058458		
5 %	0.0108167	0.005956		
10 %	0.0148987	0.0060134	Observations	1233
25 %	0.0328394	0.0060977	Sum of Weight	1233
50 %	0.0701421		Mean	0.0996448
			Std. Dev.	0.0917645
		<b>Largest</b>		
75 %	0.1353297	0.4781469		
90 %	0.2253626	0.4832262	Variance	0.0084207
95 %	0.2877223	0.4887102	Skewness	1.689577
99 %	0.4211048	0.6692106	Kurtosis	6.453847

Source: Author's calculation based on 2004 household survey.

### 6.3 The empirical strategy and impact estimation of international migration

In this section, the impact of international migration on different household welfare indicators, household income diversification, and poverty and inequality were presented. Using the panel data of 2004 and 2014 of matched sample households the impact of migration is estimated by applying household level fixed effect regression technique under difference-in-difference (DiD) method. These DiD estimates with fixed effects ultimately represent the impact of remittance on different household welfare indicators and poverty index.

#### 6.3.1 Estimating the impact of migration using DiD following fixed effect (FE) method

Following Khandker & Samad (2013), assuming the following reduced-form equation of migration of the  $i$ -th household living in  $j$ -th village in period,  $t$  as

$$M_{ijt} = \lambda X_{ijt} + \eta_{ij}^m + \mu_j^m + \varepsilon_{ijt}^b \quad [6.1]$$

where,  $M_{ijt}$  represents migration status of household  $i$  in village  $j$  during a period  $t$ ,  $X_{ijt}$  is a vector of household and village level characteristics,  $\lambda$  is a vector of unknown parameters to be estimated,  $\eta_{ij}^m$  is an unmeasured determinant of

migration decision that is time-invariant within a household,  $\mu_j^m$  is an unmeasured determinant of migration decision that is time-invariant within a village, and  $\varepsilon_{ijt}^b$  is a non-systematic error.

Household-level outcome  $Y_{ijt}$  in period  $t$ , conditional on migration, is defined as below:

$$Y_{ijt} = \alpha X_{ijt} + \beta M_{ijt} + \eta_{ij}^y + \mu_j^y + \varepsilon_{ijt}^y \quad [6.2]$$

where,  $\beta$  measures the effects of programme participation on the outcome of interest.

Applying a deviation from the mean version of the DiD to equation (4.14) above:

$$(Y_{ijt} - \bar{Y}_{ij}) = \alpha(X_{ijt} - \bar{X}_{ij}) + \beta(M_{ijt} - \bar{M}_{ij}) + (\varepsilon_{ijt}^y - \bar{\varepsilon}_{ij}^y) \quad [6.3]$$

$$\Rightarrow \Delta Y_{ijt} = \alpha \Delta X_{ijt} + \beta \Delta M_{ijt} + \Delta \varepsilon_{ijt}^y$$

$$\text{where} \quad \Delta M_{ijt} = \lambda \Delta X_{ijt} + \Delta \varepsilon_{ijt}^m \quad [6.4]$$

Since the terms  $\eta_{ij}^y$ ,  $\mu_j^y$  and  $\varepsilon_{ijt}^y$  are uncorrelated across equation [4.15] and [4.16], consisting of unobserved village and household heterogeneity, and are differenced out over time, it follows that the simple OLS estimation of equation [4.15] will be consistent. In other words, a household-level fixed effect (FE) method is applied to estimate the migration impact.

Besides estimating the impacts of migration in general, this study would also like to examine if relatively longer-term migration makes a difference. Over the period of 10 years that the panel surveys span, some households were found to have migrant member for more than 3 years. This study sets a hypothesis that is relatively longer-term migration might have impacts that are different from the impacts of having migrant member for relatively shorter-term. To address this issue, equation [4.14] is modified by incorporating a dummy for longer-term migration (which has a value 1 if member of the household migrated for 3 years or more, and 0 otherwise). But such variable, being time-invariant, is wiped out in fixed-effects implementation, and as such, before including in the model it is interacted with time, resulting in the following equation:

$$Y_{ijt} = \alpha X_{ijt} + \beta M_{ijt} + \gamma P_{ij} * T_t + \eta_{ij}^y + \mu_j^y + \varepsilon_{ijt}^y \quad [6.5]$$

Where  $P_{ij}$  is a dummy variable that indicates of having migrant household member for 3 years or more,  $T$  is a vector of time dummy, and  $\gamma$  measures the effect of longer-term migration.

Two different fixed-effects regression models are estimated to analyse the impact of international remittance on households. In model-1, the impact of having a migrant member are estimated irrespective of their migration tenure i.e. not considering for how long a household had its' migrant member. In model-2, the differential duration of migration is considered to estimate the impact of migration. Under this model, long-term impact of international migration was analysed. To identify the households who had migrant member for longer time this study looked at the years left by the migrant members of households. If any member migrated before 2011 i.e. at least three (03) years ago of 2014 is considered as a long-term migrant. Thus, model-2 helps to decompose the impacts of international migration in time horizons. For analysing the impact of migration and remittances on poverty and inequality another fixed effect model (model-3) is estimated where more than 5 years of migration considered as long-term.

### *6.3.2 The impact on household welfare*

To analyze the impact of international migration on household welfare this study looked into the changes on household per capita income, per capita income excluding international remittance, per capita agricultural and non-agricultural income, per capita owned land size, agricultural and non-agricultural capital and housing condition. **Table 6.8** presents the fixed-effects DiD estimates to show the impacts on these welfare indicators, and poverty and inequality.

#### *6.3.2.1 The impact on per capita income per year*

According to model-1, when migration duration is not considered, per capita income of migrant households is increased significantly compared to the matched non-migrant households (see **Table 6.8**). On an average, migrant households earned 33,994 taka more per capita per year during 2004-2014 than their counterparts. Model-2, also suggests that the households who had migrant

member for long time (more than 3 years) could increase per capita income per year. However, if remittance income is excluded then both models suggest significant reduction in per capita income per year of migrant households compared to non-migrant households. There might be two reasons behind these findings: either existing household members do not work much or they highly rely on migrant members' income.

#### *6.3.2.2 The impact on per capita agro and non-agro income per year*

Both regression models suggest that migration did not significantly change per capita agricultural income of migrant households compared to the non-migrants, however, significantly increased non-agricultural income (see **Table 6.8**). Following model-1, when household's migration duration is not considered, it is found that migration increases per capita non-agro income per year by 33,079 taka. Model-2 suggests that in case of long-term migration (more than 3 years), households with migrant member gained on an average 26,225 taka more per capita non-agro income per year than their matched counterparts.

#### *6.3.2.3 The impact on land ownership*

No significant impact is observed on land ownership due to international migration using either of the regression models (see **Table 6.8**). But, the point estimates suggest that migration had a negative impact on land owning. This might be because of the fact that most of the migrant members collected migration costs either by selling or rented-out of their land which usually seems very difficult to get those land back again, even after such long-period.

#### *6.3.2.4 The impact on productive capital accumulation*

Estimates show that migration has no significant impact on either agricultural or non-agricultural capital of migrant households compared to non-migrant households (see **Table 6.8**). It might be that migrant sending households are too poor to accumulate capital within this study period. If more data were available additional analysis could provide some information regarding this.

Table 6.8: The impact of international migration on household welfare

International migration variable	Per capita income including remittances (Tk.)	Per capita income excluding international remittance (Tk.)	Per capita agro income (Tk.)	Per capita non-agro income including remittances (Tk.)	Per capita owned land size (ha)	Agricultural capital (Tk.)	Non-agricultural capital (Tk.)	Housing condition (1 = made of permanent materials) (%)
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
<b>Model-1</b>								
HH had migrant member	33,994*** (4,431)	-9,395** (4,184)	915 (2,335)	33,079*** (3,738)	-0.024 (0.021)	2,349 (4,002)	12,457 (50,752)	11.1*** 2.25
<b>Model-2</b>								
HH had migrant member	12,481 (7,240)	-18,440*** (6,868)	-3,149 (3,834)	15,630** (6,111)	-0.015 (0.034)	-3,109 (6,575)	-42,162 (83,382)	1.61 (3.68)
HH had long term migrant member	32,333*** (8,632)	13,593* (8,189)	6,107 (4,571)	26,225*** (7,287)	-0.013 (0.040)	-8,202 (7,839)	82,088 (99,422)	14.22*** (4.39)

Value in the parentheses indicates standard error (se).  
Source: Author's calculation based on 2004 and 2014 household survey.

### *6.3.2.5 The impact on housing*

International migration had significant positive impact on improving housing condition during 2004-2014 (see **Table 6.8**). According to model-1, when migration duration is not considered, compared to the matched non-migrant households around 11 percent more migrant households reported that they lived in the houses which are made of permanent materials. On the other hand, having long-term migrant member (more than 3 years) increased the number of households lived in permanent material made houses to around 14 percent (model-2).

### *6.3.3 The impact on poverty*

The DiD estimate with fixed effects suggests that when migration duration is not considered (model-1) international migration significantly reduced poverty incidence, poverty gap and severity of poverty among migrant households in rural Bangladesh compared to the matched non-migrant households (see **Table 6.9**). Using the estimated poverty line<sup>2</sup> following costs of basic needs (CBN) approach advocated by FAO, model-1 estimates that international migration reduced poverty incidence (P0) by around 23 percent among migrant households compared to the non-migrants between 2004 and 2014. Findings also suggest that migration reduces poverty gap (P1) and severity of poverty (P2) by 0.077 point and 0.039 point, respectively.

However, if long-term migration is considered (model-2 and model-3) then no significant impact on poverty status is observed (see **Table 6.9**). This study cannot draw more to interpret this interesting trend due to unavailability of necessary data. But, it is observed from the available data that the migrant members, who left households at least for 3 years or even 5 years, sent comparatively less amount of remittances than those of migrants who left households less than 3 years. Another concern may be important that the estimates have low statistical power to detect the impact in long-run as the number of migrant household is small; however, further research is necessary to get conclusive findings.

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<sup>2</sup> Poverty lines were estimated for both the years-2004 and 2014 following FAO norms of cost-of-basic-needs methods. The estimated poverty lines for 2004 and 2014 were 8,292 taka and 24,522 taka, respectively. The estimated poverty lines identified moderate poverty.

### 6.3.4 The impact on inequality

This study does not suggest conclusive findings on impact of migration on inequality. Due to limited information on migration households this study does not interpret the fact properly rather suggests further research on this issue based on required data.

Table 6.9: The impact of international migration on poverty and inequality

International migration variable	Poverty status (All poverty)			Inequality status (All inequality)	
	Poverty head count ratio [P0 (%)]	Poverty gap index [P1]	Poverty severity index [P2]	Theil's L	Theil's T
	(1)	(2)	(3)	(4)	(5)
<b>Model-1</b>					
HH had migrant member	-22.76*** (5.77)	-0.077*** (0.028)	-0.039** (0.019)	0.099 (0.082)	-0.283 (0.317)
<b>Model-2</b>					
HH had migrant member	-21.67** (0.095)	-0.084** (0.045)	-0.054** (0.032)	0.268** (0.134)	-0.601 (0.521)
HH had long term migrant member (more than 3 years)	-1.65 (11.30)	0.011 (0.054)	0.023 (0.038)	-0.255 (0.160)	0.478 (0.621)
<b>Model-3</b>					
HH had migrant member	-21.34** (8.01)	-0.10* (0.04)	-0.061** (0.031)	0.165 (0.113)	-0.441 (0.439)
HH had long term migrant member (more than 5 years)	-2.71 (1.07)	0.04 (0.05)	0.041 (0.041)	-0.127 (0.151)	0.303 (0.585)

Value in the parentheses indicates standard error (se).

Source: Author's calculation based on 2004 and 2014 household survey.

## 7 Conclusions

International migration is an increasingly important phenomenon in Bangladesh and considered as a potential livelihood strategy for rural households. Successive governments of Bangladesh have been patronizing international migration as one of the most promising development tools for improving household welfare and reducing poverty. However, there are few studies analysing the impact of migration and remittances empirically and most of them use cross-sectional dataset and suffer from weaker methodology. While most of the studies provide information on trend and patterns of migration and remittances and household remittance use, only three studies suggest results on household consumption, land cultivation, savings and investments and poverty incidence. But, none of the available studies provide information on household income, capital accumulation, domestic remittance, income diversification and housing. In addition, no study provides differential impact of migration duration on poverty and inequality.

This study is aimed to investigate the impact of international migration on household income, capital, land, housing, income diversification, and poverty and inequality based on a true-panel rural household dataset collected in 2004 and 2014 by using DiD with PSM, a widely accepted robust estimation method for quasi-experimental studies like migration. This combined method offers a unique way of inferring counterfactual estimates by constructing matched non-migrant households to migrants and controlling the effects of time varying observed and time invariant unobserved heterogeneity of migrant and non-migrant households while estimating the impacts.

Between 2004 and 2014, international migration significantly increases per capita income of migrant households compare to their matched non-migrant households. Through remittances, migration significantly increases migrant households' per capita income by 33,994 taka. But, if remittance earning is excluded then the effect of migration is significantly negative on per capita income in general however, if household has migrant member for longer-term a significant positive impact is observed. Long-term migration increases remittance-excluded per capita income by 13,593 taka.

Migration does not have any significant impact on per capita agricultural income however, per capita non-agricultural income is increased significantly among migrant households compare to their matched counterparts as if non-agricultural income includes remittances. On the other hand, results do not provide any significant impact on household agro and non-agro productive capital though point estimates are positive.

A notable impact is observed on changing housing condition. Estimate show that between 2004 and 2014 migrant household improves their housing condition significantly than matched non-migrants. Compare to non-migrant households around 11 percent more migrant households is found to live in the houses that made of permanent materials. The estimate becomes bit higher when households have long-term migrant member.

The matched-DiD fixed effect estimates suggest significant favourable impact of migration and remittances on poverty status, however no significant impact on income inequality. Between 2004 and 2014, migration significantly reduces poverty incidence by 22.76 percent. It also reduces poverty gap by 0.077 and severity of poverty by 0.039 within the same period. However, interestingly, there is no significant impact on poverty if long-term migration is considered. Low statistical power or comparatively lower income from long-term migrant may lead to this finding.

The findings also suggests that in long-term migration does not make any difference in reducing inequality, however to have a conclusive evidence further rigorous study is necessary.

Overall, empirical estimates suggest that international migration is an effective development tool to increase household income and housing condition of rural households in Bangladesh. It is also an important development policy to reduce poverty but in long-term the impact is not evident. The impact on inequality is inconclusive and need further investigations. These micro-evidences may be useful not only for Bangladesh but also for other developing countries, especially some South Asian countries such as India, Nepal, Sri Lanka and some Asian countries like Philippines, Vietnam, Lao PDR and Cambodia to mainstream international migration as a tool for increasing household welfare and reducing poverty.

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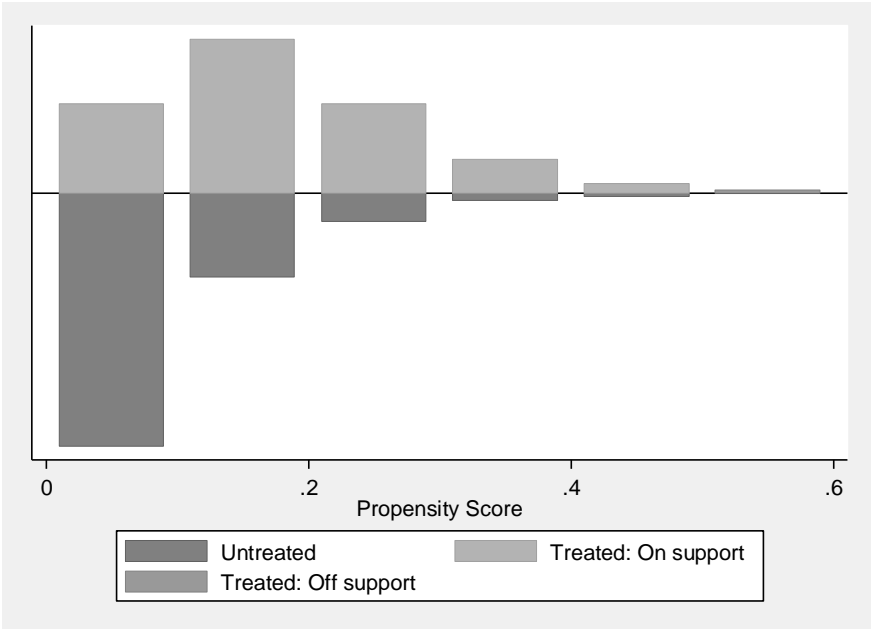
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Appendix

Figure A 1: Estimated propensity score of migrant and non-migrant households



Source: STATA output based on estimated propensity score

Table A 1: Overseas employment and remittances from 1976-2016

Year	Name of the Country																				Misc. Clearance	Total Employment	Remittances*				
	KSA	UAE	Kuwait	Oman	Qatar	Bahrain	Lebanon	Jordan	Libya	Sudan	Malaysia	Singapore	S. Korea	UK	Italy	Japan	Egypt	Brunei	Mauritius	Iraq			Others	Million USD	Crore Tk.		
1976	217	1,989	643	113	1,221	335	-	-	173	-	-	-	-	-	-	-	-	-	-	-	1,396	-	6,087	23.71	35.85		
1977	1,379	5,819	1,315	1,492	2,262	870	-	-	718	-	-	-	-	-	-	-	-	-	-	-	-	1,870	-	15,725	82.79	125.16	
1978	3,212	7,512	2,243	2,877	1,303	762	-	-	2,394	-	23	-	-	-	-	-	-	-	-	-	-	2,483	-	22,809	106.90	165.59	
1979	6,476	5,069	2,298	3,777	1,383	827	-	-	1,969	-	-	110	-	-	-	-	-	-	-	-	-	2,586	-	24,495	172.06	266.95	
1980	8,695	4,847	3,687	4,745	1,455	1,351	-	-	2,976	-	3	385	-	-	-	-	-	-	-	-	-	1,929	-	30,073	301.33	492.95	
1981	13,384	6,418	5,464	7,352	2,268	1,392	-	-	4,162	-	-	1,083	-	-	-	-	-	-	-	-	-	14,264	-	55,787	304.88	620.74	
1982	16,294	6,863	7,244	8,248	6,252	2,037	-	-	2,071	-	-	331	-	-	-	-	-	-	-	-	-	13,422	-	62,762	490.77	1,176.84	
1983	12,928	6,615	10,283	11,110	7,556	2,473	-	-	2,209	-	23	178	-	-	-	-	-	-	-	-	-	5,845	-	59,220	627.51	1,568.76	
1984	20,399	5,185	5,627	10,448	2,726	2,300	-	-	3,386	-	-	718	-	-	-	-	-	-	-	-	-	5,925	-	56,714	500.00	1,265.49	
1985	37,133	8,336	7,384	9,218	4,751	2,965	-	-	1,514	-	-	792	-	-	-	-	-	-	-	-	-	5,601	-	77,694	500.00	1,419.61	
1986	27,235	8,790	10,286	6,255	4,847	2,597	-	-	3,111	-	530	25	-	-	-	-	-	-	-	-	-	4,982	-	68,658	576.20	1,752.85	
1987	39,292	9,953	9,559	440	5,889	2,055	-	-	2,271	-	-	-	-	-	-	-	-	-	-	-	-	4,558	-	74,017	747.60	2,313.94	
1988	27,622	13,437	6,524	2,219	7,390	3,268	-	-	2,759	-	2	-	-	-	-	-	-	-	-	-	-	4,900	-	68,121	763.90	2,423.59	
1989	39,949	15,184	12,404	15,429	8,462	4,830	-	-	1,609	-	401	229	-	-	-	-	-	-	-	-	-	3,227	-	101,724	757.84	2,446.00	
1990	57,486	8,307	5,957	13,980	7,672	4,563	-	-	471	-	1,385	776	-	-	-	-	-	-	-	-	-	3,217	-	103,814	781.54	2,691.63	
1991	75,656	8,583	28,574	23,087	3,772	3,480	25	-	1,124	-	1,628	642	-	-	-	-	-	-	-	-	-	585	-	147,156	769.30	2,818.65	
1992	93,132	12,975	34,377	25,825	3,251	5,804	37	-	1,617	-	10,537	313	-	-	-	-	-	-	-	-	-	16	-	188,124	901.97	3,513.26	
1993	106,387	15,810	26,407	15,866	2,441	5,396	37	-	1,800	-	67,938	1,739	-	-	-	-	-	-	-	-	-	328	12	244,508	1,009.09	3,986.97	
1994	91,385	15,051	14,912	6,470	624	4,233	382	-	1,864	-	47,826	391	1,558	-	-	-	-	-	-	-	-	1,335	26	186,326	1,153.54	4,629.63	
1995	84,009	14,686	17,492	20,949	71	3,004	406	-	1,106	-	35,174	3,762	3,315	-	-	-	-	-	-	-	-	2,659	229	187,543	1,201.52	4,838.31	
1996	72,734	23,812	21,042	8,691	112	3,759	490	-	1,966	-	66,631	5,304	2,759	-	-	-	-	-	-	-	-	3,062	196	211,714	1,355.34	5,685.30	
1997	106,534	54,719	21,126	5,985	1,873	5,010	907	-	1,934	-	2,844	27,401	889	-	-	-	-	-	-	-	-	303	238	231,077	1,525.03	6,709.15	
1998	158,715	38,796	25,444	4,779	6,806	7,014	1,389	-	1,254	8	551	21,728	578	-	-	-	-	-	-	-	-	169	16	267,667	1,599.24	7,513.23	
1999	185,739	32,344	22,400	4,045	5,611	4,639	219	-	1,744	16	-	9,596	1,501	-	-	-	-	-	-	-	-	1	139	268,182	1,806.63	8,882.74	
2000	144,618	34,034	594	5,258	1,433	4,637	-	-	1,010	54	17,237	11,095	990	-	-	22	9	1,420	271	-	-	4	-	222,686	1,954.95	10,199.12	
2001	137,248	16,252	5,341	4,561	223	4,371	-	-	95	450	153	4,921	9,615	1,961	-	-	19	3	2,958	272	-	-	1,017	-	189,060	2,071.03	11,590.79
2002	163,269	25,462	15,769	3,854	552	5,421	2	1,829	1,574	136	85	6,856	28	-	-	19	37	17	154	59	-	-	133	-	225,256	2,847.79	16,484.53
2003	162,131	37,346	26,722	4,029	94	7,482	3	2,128	2,855	784	28	5,304	3,771	166	28	12	26	980	-	-	-	301	-	254,190	3,177.63	18,485.12	
2004	139,031	47,012	41,108	4,435	1,268	9,194	-	-	6,022	606	923	224	6,948	215	2,055	550	47	33	1,802	44	-	-	2,859	8,582	272,958	3,565.31	21,286.52
2005	80,425	61,978	47,029	4,827	2,114	10,716	14	9,101	972	885	2,911	6,651	223	2,793	950	79	207	191	1,381	-	-	4,015	12,240	252,702	4,249.87	27,304.34	
2006	109,513	130,204	35,775	8,082	7,691	16,355	821	2,822	104	2,380	20,469	20,139	992	1,625	1,428	174	639	496	2,090	-	-	8,995	10,722	381,516	5,484.08	38,366.56	
2007	204,112	226,392	4,212	17,478	15,130	16,433	3,541	494	1,480	1,726	273,201	38,324	39	972	10,950	164	1,068	1,186	3,658	-	-	1,827	10,222	832,609	6,562.71	45,337.35	
2008	132,124	419,355	319	52,896	25,548	13,182	8,444	682	5,067	170	131,762	56,581	1,521	952	6,928	133	1,891	1,054	3,071	-	-	2,461	10,914	875,055	8,979.00	61,587.83	
2009	14,666	258,348	10	41,704	11,672	28,426	13,941	1,691	22,742	514	12,402	39,581	1,474	1,253	5,339	39	3,018	2,699	1,826	412	5,036	8,485	475,278	10,717.73	73,981.46		
2010	7,069	203,308	48	42,641	12,085	21,824	17,268	2,235	12,132	14	919	39,053	2,699	173	6,726	17	2,730	2,191	3,705	2,288	4,017	7,560	390,702	11,004.73	76,639.97		
2011	15,039	282,739	29	135,265	13,111	13,996	19,169	4,387	89	79	742	48,667	2,021	30	7,624	20	3,312	5,150	5,353	234	3,566	7,440	568,062	12,168.09	90,260.85		
2012	21,232	215,452	2	170,326	28,801	21,777	14,864	11,726	14,975	23	804	58,657	1,447	17	9,280	420	7,478	5,038	5,421	359	10,190	9,509	607,798	14,163.99	115,816.93		
2013	12,654	14,241	6	134,028	57,584	25,155	15,098	21,383	7,175	211	3,853	60,057	2,121	14	4,792	41	949	5,971	5,961	7,456	21,279	9,224	409,253	13,832.13	108,066.93		
2014	10,657	24,232	3,094	105,748	87,575	23,378	16,640	20,338	4,461	86	5,134	54,750	1,748	16	856	55	266	6,633	5,938	13,627	28,762	11,690	425,684	14,942.57	115,969.62		
2015	58,270	25,271	17,472	129,859	123,965	20,720	19,113	22,093	231	350	30,483	55,523	2,359	4	44	99	601	6,354	4,753	13,982	19,638	4,697	555,881	15,270.99	119,363.62		
2016	57,279	4,236	10,852	102,320	67,705	27,486	7,944	12,572	-	202	25,284	29,610	1,072	9	1	84	541	2,565	2,634	2,895	10,906	6,698	372,895	7,440.78	58,559.52		
<b>Total</b>	<b>2,755,329</b>	<b>2,356,962</b>	<b>511,074</b>	<b>1,180,711</b>	<b>546,549</b>	<b>345,517</b>	<b>140,754</b>	<b>119,598</b>	<b>122,125</b>	<b>8,714</b>	<b>765,955</b>	<b>625,914</b>	<b>34,881</b>	<b>10,079</b>	<b>55,515</b>	<b>1,469</b>	<b>22,788</b>	<b>54,927</b>	<b>47,305</b>	<b>41,253</b>	<b>206,180</b>	<b>117,983</b>	<b>10,071,582</b>	<b>156,492.07</b>	<b>1,076,624.25</b>		
<b>z</b>	<b>27.36</b>	<b>23.40</b>	<b>5.07</b>	<b>11.72</b>	<b>5.43</b>	<b>3.43</b>	<b>1.40</b>	<b>1.19</b>	<b>1.21</b>	<b>0.09</b>	<b>7.61</b>	<b>6.21</b>	<b>0.35</b>	<b>0.10</b>	<b>0.55</b>	<b>0.01</b>	<b>0.23</b>	<b>0.55</b>	<b>0.47</b>	<b>0.41</b>	<b>2.05</b>	<b>1.17</b>	<b>Remittance Up to June, 2016</b>				

\*Remittance Source : Bangladesh Bank (www.bangladesh-bank.org/econdata/wagermidtl.php)

Source: (Bangladesh Bank, 2016)