Impact Evaluation of Remittances for Pakistan: Propensity Score Matching Approach

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This study attempts to uncover the biases in the impact evaluation of remittances when the problems relating to selection bias and counter factual are not taken into account. Taking migration as an intervention and foreign remittances as an input, the study measures the socioeconomic impact using an approach which yields more accurate non-experimental estimates in self-select cases through multiple output and outcome indicators such as income, expenditure, saving, and capital accumulation which, directly and indirectly, affect households' welfare, poverty incidence and growth prospects of a country. Using PIHS data, the study first calculates the difference in socioeconomic characteristics of treated or remittances beneficiary households (RBH) and control or remittances non-beneficiary households (NRBH) ignoring endogeneity and observable differences. Second, it calculates the propensity score and evaluates the impact using data from common support area for both RBH and NRBH households. Third, it evaluates the impact using the propensity score matching approach which replicates the experimental benchmark. The difference in the first and the third estimates reveals the bias originating from the issues of selection and difference in observable characteristics. The results show that after controlling for observable characteristics of households, regional difference, networking and applying the selection correction technique, the average impact of remittances is significantly reduced. A disaggregated analysis shows that the socioeconomic impact of remittances differs by the level of skills. The impact is significant for relatively low skilled poor households but for high skilled households it remains significant only in case of bank deposits. The paper concludes that estimates are biased upward if the selectivity issue and endogeniety problems are ignored which may lead to wrong policy implications.

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1. INTRODUCTION

The extent to which foreign remittances affect welfare, poverty and growth has been a matter of considerable debate.[1] Pakistan is among the top five countries whose

foreign exchange earnings comprise a significant amount of foreign remittances. Growing by about 20 percent annually the foreign remittances now form 5 percent of Pakistan's GDP in 2010-11.[2] Their importance can be viewed from the fact that remittances do not have to be paid back like other foreign exchange receipts such as official development assistance. Therefore, its integration into overall development planning is essential to maximise its benefits. A comprehensive analysis using the most appropriate technique is needed to form appropriate policies [White (2005)].

Foreign remittances play an important role at the macro as well as micro levels. They are a major source of income of the recipient households in Pakistan and help mitigate the financial hardships of the households. The recipient households put them to various uses that have welfare, poverty, and growth implications. The existing literature[3] measures the impact of the remittances using methodologies that vary from the most complicated ones such as the economy wide computable general equilibrium (CGE) model [Siddiqui and Kemal (2006) and Siddiqui (2009)] to the simplest as descriptive statistics.[4] The CGE method is most demanding not only in overcoming the problem of data scarcity and capturing multi-round effects[5] but also in finding appropriate elasticities and skills for programming [Knerr (1992)]. Some studies explore just one dimension or the other in the partial equilibrium framework.[6] However, the majority of these studies do not account for selection to migration[7] and ignore the counterfactual or differences in the observable characteristics, hence they tend to overstate the impact. Therefore, it is

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[1]Remittances currently represent about one-third of total financial flows to developing countries, which are larger than official development assistance flows. In many countries, they are also larger than foreign direct investment. Therefore, the interest in the impact of remittances is growing to better understand how remittances resulting from migration contribute to poverty reduction [Fajnzylber and Lopez (2007)].

[2]In absolute term, remittances have increased from $1087 million to $13186.58 over 2001-12 [Pakistan (2008-09, 2012-13)].

[3]Adams (1998), Aggarwal, *et al*. (2006); Amjad (1986); Amjad (1988); Arif (1999); Burney (1988); Gilani, *et al*. (1981); Hyun (1988); Iqbal and Sattar (2005); Jongwanich (2007); Kazi (1988); Mahmud (1988); Malik and Sarwar (1993); Maqsood and Sirajeldin (1994); Nayar (1988); Quisumbing and McNiven (2007); Rodrigo and Jayatissa (1988); Siddiqui and Kemal (2006); Tan and Canlas (1988); Tingsabad (1988).

[4]Amjad (1986, 1988); Burney (1987, 1988), Gilani, *et al*. (1981); Kazi (1988) for Pakistan, Oh-Seok (1988) for Korea, Mahmud (1988) for Bangladesh, Nayar (1988) for India, Rodrigo and Jayatissa (1988) for Sri Lanka, Tan and Canlas (1988) for Philippines, Tingsabad (1988) for Thailand.

[5]An inflow of remittances increases household income and expenditure, which may, in turn, generate new income and employment opportunities—multiplier effect [Adams (1998)].

[6]For instance, Iqbal and Sattar (2005) estimate the relationship between growth and remittances. Arif (1999) investigates investment behaviour of remittances beneficiary households (RBH) and Malik and Sarwar (1993) compare the consumption pattern of RBH and NRBH [non-remittance beneficiary households]. Adam (1998) has conducted a Tobit analysis to explore remittances impact on rural asset accumulation-land, livestock and non-farm assets. All these studies ignore the problem of selection to migration. Though Maqsood and Sirajeldin (1994) account for selection correction terms and focus on one aspect, wage earnings and used explanatory variables which are correlated with migration such as wealth.

[7]Gilani, *et al*. (1981); Amjad (1986); Irfan (1986); Various studies in Amjad (1988); Burney (1987); Malik and Sarwar (1993); Arif (1999); Iqbal and Sattar (2005); Siddiqui and Kemal (2006); Jongwanich (2007); Some of them have analysed the impact of remittances on macro and micro aggregates quantitatively using regression analysis. For instance Maqsood and Sirajeldin (1994) consider migration as endogenously determined, therefore made corrections in their earnings function. However, all these studies overstate the impact because they ignore the differences in observable characteristics i.e., measure the impact of remittances on consumption without taking into account the impact of income what they have earned in the domestic economy before migration.

obligatory to take into account the selectivity issue and the difference in observable characteristics that measure the actual impact of treatment. Any ambiguity in the impact raises need for empirical research. To correctly measure the socio economic impact of remittances, one must compare the socio-economic indicators such as income, expenditure, saving and capital accumulation (human, financial and physical) of the migrant-households[8] to what they have if they are not migrated. The latter has not been observed. Recognising this difficulty, Rosenbaum and Rubin (1983) were the first to propose the propensity score matching (PSM) approach for more accurate non-experimental estimates in self-select cases. In the following years, the method was also recommended by Heckman, *et al.* (1997); Dehejia and Wehba (2002); White (2006); and McKenzie and Gibson (2006); Deininger and Liu (2008) for this type of analysis.

Considering migration as an intervention—a case of non-random selection of remittance beneficiary households [individual self-select to migrate]—this author adopted the PSM approach to evaluate the impact of remittances on the socio economic condition of households which, directly and indirectly, affect welfare, poverty, and growth prospects of the country. For this purpose data from the Pakistan Integrated Households Survey (PIHS) [Pakistan (2002)] on income, consumption, saving, asset holdings, indebtedness, capital accumulation—human, physical and financial, and domestic economic activity for both groups i.e. [RBH and NRBH] was used employing the same methodology. This study assumes that households which receive foreign remittance are treated or remittance beneficiary households (RBH) and the control group which does not receive remittance income are called non-treated or remittance non-beneficiary households (NRBH).

Here three approaches are used to calculate bias in attribution of remittances. First, the naive approach to calculate the mean difference in socio-economic indicators using full sample of all RBH and NRBH ignoring selection bias and counter factual. Second, the difference in the indicators is calculated using data from common support area after allowing for the propensity score. Third, after pairing observation from RBH and NRBH groups based on PSM to balance treatment and control group on observable characteristics, the difference in the mean value of socio-economic indicators is calculated. The difference in the three estimates reveals the bias that originates due to selection bias and the difference in observable characteristics.

The rest of the paper has been organised as follows. The next section presents impact evaluation methodology, selection variables and multiple socio-economic indicators. Data used for the analysis are discussed in Section 3. Section 4 discusses distribution of beneficiary and control group. The results are discussed in Section 5. Sections 6 and 7, respectively, discuss heterogeneity in the impact by skill level and compare the results of this study with earlier ones. Section 8 concludes the paper.

2. METHODOLOGY

In impact evaluation studies, bias originates from three sources; (i) selection bias, (ii) self-selection, and (iii) difference in observable characteristics.

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[8]Migrant households are those who receive remittance income from abroad and non-migrants are those who do not receive income from abroad.

First, the naive approach is used to measure the difference in socio-economic impact of remittances. In this approach, the impact is measured using all households—RBH and NRBH ignoring selection bias and counter factual.[9]

Second, the conceptual framework from Rosenbaum and Rubin (1983) and Heckman, *et al.* (1997, 1998); which has been widely used in this type of analysis [Dehejia and Wehba (2002); McKenzie and Gibson (2006); Deininger and Liu (2008) etc.] is used to reveal the bias (if any) in the estimates. The framework consists of PSM and difference methods. The PSM approach has many advantages over the other methods:

(1) It overcomes the problem of multi dimensionalities and develops an index of propensity score P(X) for the treated (RBH) and control (NRBH) groups to match. In the presence of a large number of explanatory variables, matching all variables becomes difficult. The PSM method renders the multidimensional matching problem to one-dimensional i.e. instead of matching on a vector X of variables.

(2) It gives more accurate non-experimental estimates, where households self-select into the programme [Dehejia and Wehba (2002); McKenzie and Gibson (2006); Deininger and Yanyan (2008); White (2006)].

(3) It replicates the experimental benchmark if the outcome from the treatment and control groups is (i) compared over a common support area (the distribution of households likely to receive the treatment is similar in both groups). (ii) Data is collected from both groups in a similar fashion [Dehejia and Wehba (2002)].

(4) The method does not require a parametric model and allows the estimation of mean impacts without arbitrary assumptions about functional forms and error distribution [Jalan and Ravallion (2001)].

In this study the remittance-response function or selection equation is estimated first. The major concern in the PSM approach concerns which explanatory variables should be included in remittance response function to estimate the probability of a household receiving remittances or not. The probability depends on households and community based characteristics of RBH and NRBH. The dependent variable represents the status of households receiving remittance income (decision to migrate) or not i.e., a dichotomous variable taking the value '1' when household receive remittances and '0' when it does not.

$$D_{REM} = b_i x_i + g_j z_j \qquad \ldots \qquad \ldots \qquad \ldots \qquad \ldots \qquad \ldots \qquad \ldots \qquad (1)$$

D_{REM} is a dichotomous variable where $D_{REM} = 1$ if a household receive remittances, otherwise 0.

x_i is a vector of individual or household level characteristics
z_j is a vector of community characteristics

In the absence of information about migrated labour, it is worthwhile to examine family characteristics that motivate the migrated worker's decision to remit income.

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[9]Malik and Sarwar (1993) have compared consumption of RBH and NRBH using this method. The results show that total consumption and recurrent consumption of RBH are higher by 0.05 points, whereas expenditure on durable goods is higher for NRBH.

These variables are chosen in such a way that they affect remittance income (migration decision) but not the outcome variables.

The most important variable that determines remittance from migrated labour is their education [Nishat and Bilgrami (1993); Adams (2008).[10] This information is not available from the existing data. However, the correlation between the education of the head of the households and average education of the earners is 0.75. Therefore, here the education of the head of household has been used as a determinant of the remittance income. Five categories of education [(1-5), (6-9), (10-13), (14-15), and 16 and above including all professional categories] are defined with base category of education of less than one year.

The principal migration motivation comes from household size, which determines the need for migration. If a household has a large family size, labour is expected to migrate to earn more owing to the fact that labour receives higher wages abroad. The age of the head of the household is included in the equation as an explanatory variable.

People living in the same community are more likely to have many characteristics (Z_j) in common including community norms, infrastructure, leadership, physical environment, social structure, household strategies. Therefore, they behave in similar fashion. The existence of migratory network affects migration from that community. In this study community remittance income per household has been used to indicate the existence of migratory network.[11] It indicates that the larger the value of remittances per household, the stronger is the migratory network and more people are expected to migrate abroad from that community.[12]

Region also reflects a certain skill level. For instance, labour from rural area belongs to lower education level and more likely to send a higher proportion of low skill (low educated or unskilled) labour compared to urban labour. Language is also an important factor in determining the type of labour migrating to different parts of the world. In this case, workers from more developed provinces with high literacy rate are more likely to send skilled labour.[13] In this study one dummy variable has been employed for region –D_{Region} with rural as base category and three dummy variables (D_i) for three provinces, Punjab, Sindh, Khyber Pakhtunkhwa (KP) with rest of Pakistan (ROP)[14] as the base category to control for regional differences, assuming that characteristics mentioned above are region specific and vary across the regions [Nishat and Bilgrami (1993)].

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[10]Education may also be an important variable to determine, whether migrant send money through formal or informal channel. The highly educated are expected to send remittances through formal channels-using financial institution. Whereas illiterate or low educated labour send remittance through informal channels such as 'hundi'. Education and occupation are highly correlated.

[11]This indicates migration prevalence rate and is used as an instrument for the opportunity to migrate [Mansuri (2007)]. Migratory network increase migration opportunities by providing information to potential migrants and existing migrant worker relax financial constraints [Mansuri (2007)].

[12]Remittance income per households along with education level will also determine how these remittances are sent and from where. However, all these are assumptions, for real analysis there is a need to collect data on these issues.

[13]Education may also be important determinant of labour migrated to specific region. For instance, labour with high education level may migrate to English speaking countries, whereas labour with lower education level may migrate to Middle East countries.

[14]ROP includes Balochistan, Federal Administered Tribal Areas and Azad Kashmir.

The likelihood of being a recipient family is presented by reduced form equation which includes above mentioned households level and community level characteristics.

The model is defined as follows:

$$D_{REM} = \alpha + \beta_2 Y_{REMH}^{com} + \beta_3 Age_{HH} + \beta_4 Hsize + \sum_{EDU=1}^{5} \beta_{EDU} D_{EDU} + \sum_i \gamma_i D_i + \phi D_{region} \quad \dots \quad (2)$$

$D_i = 1$ for ith province and 0 otherwise,

where

$\quad i = $ P(Punjab), Sindh (S), Khyber Pakhtunkhwa (KP)
$\quad\quad = 0$ otherwise
$\quad D_{EDU} = 1$ for kth education level of head of the household and 0 otherwise,

where

$\quad EDU = $ primary (1-4), Middle (5-9), FA(10-13), BA (14-15), 16 and above with base category of less than one year of education.
$\quad D_{region} = 1$ for urban and 0 otherwise, base category rural
$\quad Hsize = $ Household size—total members present in a household
$\quad Y_{REMH}^{com} = $ Community remittance income per household
$\quad Age_{HH} = $ Age of the head of household

In this study the SPSS programme has been used to estimate the logistic function defined in Equation 2.

The second concern in this approach is to choose treatment (RBH) and comparison or control group (NRBH). The SPSS-PSM–macros developed by Levesque to match PSM of the treated (RBH) with control group (NRBH) are employed and the common support area (S) is defined selecting the observation following Heckman, *et al.* (1998).

$$S = Supp(X \vert D_{rem} = 1) \cap Supp(X \vert D_{rem} = 0) \quad \dots \quad \dots \quad \dots \quad \dots \quad (3)$$

It defines the area with the common range dropping all observations from RBH and NRBH whose P values are beyond the range defined in Equation 3.

Third, the exact matching approach in which each RBH is paired with NRBH has been used which minimises the difference of their PSM within the common support area and drops the rest of the households.

The next goal is to calculate the attribution of remittances to socio-economic outcome. Classic evaluations focus on two parameters: average impact on the units that are given the opportunity to take it up (non-participant-NRBH) and the average impact on those who receive it (participants-RBH) [Ravallion (2009)].

Let *Y* be the vector of socio-economic variables that are defined as output and outcome variables. The outcomes corresponding to $D_{REM}=1$ and $D_{REM}= 0$ are denoted by (*Y*1, *Y*0), respectively, and *X* is the vector of variables that are time invariant characteristics of the treated unit RBH. The assumption underlying the matching estimator is that all relevant differences between the two groups are captured by their observables *X*. The treatment assignment D_{REM} (household receiving remittance income) is independent of *Y* (*Y*0 and *Y*1) given *X* (observable characteristics). It can be written as

$$(Y_0, Y_1) \amalg D_{REM} \mid X \qquad \ldots \qquad \ldots \qquad \ldots \qquad \ldots \qquad \ldots \qquad \ldots \qquad (4)$$

This implies that

$$(Y_0) \amalg D_{REM} \mid P(X) \qquad \ldots \qquad \ldots \qquad \ldots \qquad \ldots \qquad \ldots \qquad \ldots \qquad (5)$$

Where $P(X)$ is propensity score, and defined as $P(X) = Pr \ (D_{REM}=1 \mid X)$ which by definition lies between 0 and 1. Another implicit assumption required by the matching estimator is the stable unit treatment value assumption (*SUTVA*), which states that the outcome of *i*th unit given treatment is independent of the outcome of unit *j*th unit given treatment. To satisfy this assumption we have to ignore the general equilibrium effects [Ham, *et al*. (2005)]. In the absence of baseline data, the remittance impact (*REMI*) is measured as follows:

$$REMI = E(Y1/D_{REM} = 1) - E(Yo/D_{REM}= 0)$$

This expression measures mean difference in the impact of remittance income on RBH over the control group NRBH.

The effects of remittances vary with the education of head of the households.[15] This study tests the hypotheses: Does the effect of the treatment vary by education level? Let *Edu* denote schooling and *s* denote the different levels of schooling. The effect of remittances income on different educational groups is estimated for each education level in the following way:

$$\Delta_s = E(Y1-Y0) \parallel D_{REM}=1, Edu=s) = E(Y1 \parallel D_{REM}=1, Edu=s) - E(Yo \parallel D_{REM}=0, Edu =s) \quad (6)$$

We define $s = 0, 1, 2, 3, 4, 5$

> S=0 if education is less than one year
> S=1 if education is below primary, (1-4) year
> S=2 if education is between (5-9) year
> S=3 if education is between (10-13) year
> S=4 if education is between (14-15) year

S=5 if education is 16 years and above including professionals such as doctors, engineers etc.

This study measures the attribution of remittances to socioeconomic aspects of households such as income, expenditure, saving, investment, welfare, and poverty. These indicators are discussed in detail in the next section.

Third, the bias in the impact of remittances is calculated ignoring the differences in observable characteristics. It is calculated as difference in difference.

Let D1, D2, and D3 be the differences measured using full sample, data from common support area, and using PS matching of RBH and NRBH, respectively. The difference between D1 and D3 reveals the bias in the estimates if one ignores the issues of endogeniety and differences in the observable characteristics.

Bias = D1 − D3

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[15]Quisumbing and McNiven (2007) show that countries exporting unskilled labour receive more remittances per capita than the remittances per capita received by the countries exporting skilled labour.

2.1. Socio-economic Indicators

In this study multiple socio-economic indicators (including basic need indicators (BNIs such as calorie intake, housing, safe drinking water, sanitation facilities, education) have been used to measure attribution of remittances. Satisfaction of basic needs determines a country's capability development [Siddiqui (2006)] and poverty reduction.

(a) *Income Effects*

Migrants are expected to receive higher income as workers leave their home country to take the advantage of higher wages [Farchy (2009)] and remit a significant amount of their earnings; about 78 percent of their total earnings [Siddiqui and Kemal (2006)]. Remittances are not exogenous transfers but a substitute for the domestic earnings that migrants had earned if they had not migrated. Income per adult equivalent has been used here to measure the income effect of migration.[16]

The RBH group has three choices to use these receipts: consume, save or invest, which directly and indirectly affect poverty and growth prospects of a country.

(b) *Consumption*

Earlier literature on socio-economic impact of remittances [Gillani, *et al.* (1981) and Amjad (1988)] show that remittances (57 to 62 percent) are generally, used for consumption purposes.[17] The expenditure pattern of households is central to any meaningful discussion on welfare and poverty. If households increase the demand for food and non-food items, remittances are more likely to improve the welfare of households and reduce poverty. Here food and non-food expenditure in rupees per adult equivalent term and calorie intake (BN) per adult equivalent have been used which directly determine the welfare and poverty effects and indirectly determine the growth effects as increase in expenditures boosts the economy through multiplier effects. Similarly, higher expenditure on consumer durables [households' equipment] such as washing machine, TV, oven, refrigerator, automobiles also indicates higher standard of living. Ownership of households' equipment is measured in rupee value at the household level.

(c) *Investment*

If remittances ease working capital constraint, it is expected to improve capability and growth prospects of a country by increasing human and physical capital.

Investment in Human Capital: Remittances are expected to improve the capability of a household if migrant households spend more on children's education to improve the quantity and quality of their education. It compensates for loss in human capital due to migration of labour in the long run and improves literacy rate (as indicator used to measure capability of a country). In this study 'average class of school-going children in

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[16]According to the theory of migration, migration itself is nothing but investment in human capital, which contributes to growth on their return. But that analysis is beyond the scope of this paper.

[17]57 percent of total remittances (through official and unofficial channels) are allocated to recurrent consumption and 62 percent of remittances through official channels only.

a household' and expenditure on education per class have been used to measure quantity and quality of human capital formation, respectively i.e., the key outcome from the perspective of economic growth in the long run.

Investment in Physical Capital: Empirical studies show that migrant households largely invest in housing. Housing is one of the basic needs. This effect has been captured in terms of adults/room. In addition, existence of facilities like availability of clean water (BN), sanitation, electricity, gas, and telephone indicates higher standard of living. These facilities are partially dependent on infrastructure development by the government.[18]

Investment in productive capital is captured through agriculture farming/land holding, livestock holdings, and entrepreneurial activity etc. If remittance income increases accumulation of productive capital, it is expected to have a growth promoting impact.

(d) Saving

Households save by buying jewellery, keep cash at home or save in bank schemes. (i) Jewellery is one form of investment in unproductive capital though it indicates leakage from the economy but can be used in growth enhancing activities. For instance, It may be used for investment purposes on the return of migrant labour. However, for the year under analysis, this is idle money and indicates households' financial condition. This indicator is measured at the household level in terms of rupees. (ii) Households cash holdings at home are measured in rupees. (iii) Households' bank profit receipts measuring the size of the bank deposits[19] are used as outcome indicators of financial saving that determine financial development—financial resources available for credit distribution. Remittances via financial development can also positively affect poverty and growth [Aggarwal, *et al.* (2006)]. If the deposit level is higher for RBH, it may also have growth-enhancing effect through the banks' intermediation process—credit expansion. It can be indirectly inferred that higher bank deposits have a growth promoting impact.

(e) Poverty

Poverty is measured by head count ratio i.e. the percentage of population below the poverty line which is officially prescribed poverty line for rural and urban areas.

(f) Growth

The growth impact is deduced indirectly from growth oriented activities such as increased demand for goods and services, entrepreneurial activity, livestock activities, land farming etc. Entrepreneurial activities alone are considered as a driver of growth. If these activities increase, one may expect to have growth promoting effects of remittances. These channels of remittances' impact on outcome indicators are comprehensively presented in log Frame in Appendix I Table 1.

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[18]Multiplier effects of remittances also generate growth-enhancing impact. Through back ward and forward linkages—investment of one household could generate an increase in income of the other, for example, investment in housing generates employment for construction workers and income. Existing literature show that this sector boost at the macro level.

[19]Aggarwal, *et al.* (2006) use level of deposits to measure financial development that affect poverty and growth via credit expansion.

3. DATA

This study relies on data from Pakistan Integrated Household Survey (PIHS) for the year 2001-02 conducted by Federal Bureau of Statistics (FBS) [Pakistan (2002)]. The data provides detailed information on household size, income, consumption (food, non-food, and durable commodities), asset endowment (land, buildings, livestock), loans, education status and expenditure on education, work status by gender, and small scale entrepreneurial activities. The sample consists of 16182 randomly selected households. The sample is restricted to households whose income is greater than Rs 1000 per month. Households whose consumption data is missing have been dropped. Out of this sample of 15924, 802 households (5 percent of the total) are remittance beneficiary households (RBH) and 15122 are non-remittance beneficiary households (NRBH). Table 2 in Appendix I presents the set of variables along with their definition that have been included in the analysis.

The major characteristics of households have been presented in Tables 3–5 in Appendix I. The geographic distribution of the RBH show that majority of migrated households are located in two provinces of Pakistan, Punjab and Khyber Pakhtunkhwa, 33.2 and 30.7 percent, respectively (Table 3 in Appendix I). However, RBH are largely from rural areas −56.1 percent of the total (Table 4). This implies that migrated labour can largely be categorised as unskilled or low skilled labour. The majority of migrants consist of unskilled and semiskilled workers, i.e., 52.24 percent, while highly qualified migrants are only 2.52 percent in 2007 [Siddiqui (2011)].

The average size of the households is 7.2 individuals with average age of head of the household being 45.7 years having education of 4.2 years (Table 5 in Appendix I). The income per adult equivalent per year is Rs 28063.7. Food expenditure is high relative to non-food expenditure consuming 3732 calories per day per adult. Households own household equipment worth Rs 19851.5. The human capital accumulation indicated by the education level of currently school going children is 7.2 years with very low average for the household education level of 2.7 years. Average expenditure on education of children currently going to school is Rs 3807.9 per year.

The living condition is not good −2.5 adults / room. On average, 76.8 percent of households have tap water and 35.6 percent have access to sanitation facilities, 69.9 percent have electricity. Average gas and telephone facilities are very low as a whole—21.3 and 12.1 percent—respectively. Households, on average, own assets including residential and commercial buildings, and land worth Rs 0.35 million. They own 1.4 acres of land per household. Household save on jewellery purchases and cash worth Rs 16619.6 and Rs 10355.5 respectively and they owe money amounting to Rs 29814.9 and receive profit on bank deposits of Rs 332. Entrepreneurial activity is low as households, on average, hold 0.2 enterprises. Two employed persons per household indicate a dependency ratio of 3.6 per earner. With poverty line for rural and urban areas at Rs 705 and Rs 850 expenditure per adult per month, respectively, the poor households are 39.1 percent and 29.8 percent of the total in rural and urban areas in 2001-02.

**4. DISTRIBUTION OF THE TREATMENT AND
COMPARISON SAMPLES**

First, a binary logistic function [Equation 2] is tested to calculate the probability that a household receives remittances. The results are reported in Table 1. The results show that a majority of variables are significant at the 5 percent level.

Table 1

Results from Estimated Logistic Function

	Coefficients	T-Statistics
Community Characteristics		
D_P	0.32	3.1
D_S	0.49	2.3
D_N	0.15	1.5
D_UR	0.10	1.2
LY^{com}_{REMH} *	0.89	21.8
Households Characteristics		
D_EDU1	0.16	1.0
D_EDU2	0.18	1.7
D_EDU3	0.03	0.3
D_EDU4	0.40	1.8
D_EDU5	0.39	1.8
LHSIZ*	0.18	2.3
LAGE*	0.01	0.1
Constant	−12.35	−17.0

*–Variables are in log form.

Second, the paired t-test is employed to examine whether the mean of each element of X vector for the treatment is equal to that of the matched sample. The results show that prior to matching, the difference between the mean values of explanatory variables of the two groups was very significant, but the difference becomes insignificant for all variables after PSM (see Table 2). This indicates that the distribution of the covariates is approximately the same across the RBH and NRBH.

Table 2

Mean of the Covariates of Remittances Income

	T- Test for Equality of Means			
	Before PSM		After PSM	
Covariates (X-Vector)	Mean Difference	T	Mean Difference	T
Age	3.1	5.2	1.0	1.3
Education of Head of the Household	0.3	1.6	-0.1	–0.4
Province	0.7	10.6	0.0	0.5
Region	–0.1	–4.3	0.0	–0.6
Household Size	0.5	3.2	0.2	0.8
Remittance per Household by District	8439.8	28.0	785.0	1.8

***The range of estimated probability that a household receives remittance income is between 0.0002 – 0.35476. The distribution of propensity scores (PS0 for the treated and control groups before and after PSM are presented in Figures 1 to 4 in Appendix I. The common support area is defined by dropping observation from the RBH group whose P-values are larger than that of NRBH and the non treated observation of which P-values are smaller than that of treated i.e.; unmatched PS. In other words we select a common field for both players, which is with PS in the range of 0.00035 – 0.35187. I drop the cases that have probability less than 0.00035 and larger than 0.35187 from both groups. Prior to matching, the mean of estimated PS for migrant and non-migrant households were, respectively, 0.14867 and 0.045161. In the trimmed sample the mean of PS for control is 0.06342, the gap between the two reduces. But after the matching there is negligible difference in the mean values of propensity scores of the two groups—0.14867 for the control and 0.13853 for the RBH.

Prior to matching, the comparison of the mean values of the indicators across the treated (RBH) and control group (NRBH) reveal a crude difference (that includes difference due to observed characteristics) in living standards. The results show that household size is larger for RBH i.e., 7.7 compared to 7.2 of the NRBH, the larger family size indicates the need for migration (Table 5 in Appendix I). On average, the head of the households is older with higher education level in the RBH. Treated units receiving remittance income have higher expenditure per adult per year compared to NRBH. Their expenditure on food is lower than expenditure on non-food item in contrast to the expenditure pattern of NRBH. The human capital indicators support the positive relationship of remittance income and human capital formation [see calorie intake, average class of school going children at present, and expenditure on education per year]. On average, RBH households own equipment that 2.7 times higher in worth than NRBH. RBH have 3.4 rooms per household compared to 2.4 rooms for NRBH. RBH own houses with more facilities such as electricity, safe drinking water, and sanitation. The higher percentage of RBH also has gas and telephone facilities. All these indicators show higher standard of living of treated units compared to non-treated ones. The RBH hold larger assets which include residential buildings, non-residential buildings and livestock, have more cash and jewellery and are less indebted. The profit on bank deposits of RBH is about three times higher than that of NRBH. On average, they hold fewer acres of land holdings. The results support the view that remittances have positive impact on housing and consumer durables and non-land assets [Quisumbing and McNiven (2007)]. Low entrepreneurial activities among RBH do not support the growth impact of remittances. It may affect growth through credit expansion. However, the poverty impact of remittances is very strong with only 5 percent of RBH being below the poverty line compared to 23.9 percent of NRBH. This is a naïve valuation approach that overstates the remittances impact as the difference in mean value which includes the impact of the difference in observables characteristics.

5. RESULTS

Table 3 reports the difference in the mean value of socio-economic indicators of the treated and control groups of households under three definitions. First, the differences in the mean values of socio-economic indicators of the treated and control groups are calculated using all observations. Second, these differences are calculated based on a set of observations from common support area. Third, households that minimise the difference between PS of the two groups—treated (RBH) and control (NRBH)—are matched. The differences are tested statistically using t-ratios. These results are compared by taking the difference in difference of mean of first and third exercise to find the bias in the estimated values if the endogeneity problem and difference in observable characteristics are ignored.

In Table 3, Column 1 and 2, respectively, the mean differences in socio-economic indicators are reported which are based on the whole sample of the treated or remittances receiving households (802) and the control group consists of all households who do not receive remittances (15924) and their t-values. Column 3 and 4 present the results for the trimmed sample (common support area) with the sample of 802 and 15122, respectively, for beneficiary and non-beneficiary households. Finally, the 5th and 6th columns present

the average treatment (remittances) effect on the treated (RBH) after exact matching of propensity score with control group (NRBH) which minimises the difference between treated and control groups of households after controlling for observables' characteristics along with their t-ratio to measure significance.

Table 3

Comparison of Differences in Means for Households—
Treated (TRH) Vs Control (NRBH)

Outcome and Output Indicators	Full Samples		Trimmed Sample-Common Sport Area		After Propensity Score Matching		Bias
	Mean Difference	t-statistics	Mean Difference	t-statistics	Mean Differences	t-statistics	
(1) Income per adult equivalent	−368.0	−0.1	−6889.4	−0.8	9948.1	5.9	−2803.5
(2) Expenditure per adult equivalent	11483.5	9.1	10433.9	8.2	8619.3	5.6	−24.9
(3) Expenditure on food per adult per year	3663.9	11.4	3280.2	10.1	2788.3	7.4	−23.9
(4) Non-food consumption (durables) per adult per year	7819.6	7.8	7153.7	7.1	5831.0	4.7	−25.4
(5) Calorie intake per adult per day	1063.1	4.0	868.4	3.2	695.5	1.9	−34.6
(6) Expenditure on education	5753.7	7.7	5152.9	6.8	4094.9	4.7	−28.8
(7) Average class	1.2	8.6	1.0	6.9	0.7	3.5	−43.4
(8) Average class of currently going to school children	4.4	9.4	3.7	7.8	2.4	3.7	−45.9
(9) Household equipment	31602.3	5.8	28515.4	5.2	20046.5	3.1	−36.6
(10) Room occupy	1.1	17.0	1.0	15.5	0.7	7.3	−39.3
(11) Electricity	0.2	16.7	0.1	11.3	0.1	4.6	−55.5
(12) Gas	0.0	0.5	0.0	−1.3	0.0	0.0	−114.1
(13) Telephone	0.3	16.0	0.3	14.5	0.2	10.1	−19.2
(14) Safe drinking water	0.0	−2.9	0.0	−3.0	0.0	1.1	−156.8
(15) Sanitation facilities	0.2	13.7	0.2	10.3	0.1	5.2	−45.0
(16) Asset	559293.9	5.7	519566.9	5.3	336624.2	2.9	−39.8
(17) Livestock	0.1	0.8	−0.1	−1.0	0.1	1.5	172.2
(18) Land holdings (acres)	−0.7	−4.8	−0.4	−2.5	−0.3	−1.0	−53.1
(19) Jewelry (Rs)	140415.7	1.2	139428.0	1.2	137027.2	1.2	−2.4
(20) Saving in cash (Rupees)	19384.1	4.2	17449.0	3.7	15671.4	2.4	−19.2
(21) Loan	−1096.2	−0.1	11115.0	1.6	9212.7	1.2	−940.4
(22) Profit on bank deposits	745.3	2.5	651.1	2.2	645.1	1.9	−13.4
(23) Men employed	−0.8	−19.7	−0.7	−16.6	−0.5	−8.7	−34.2
(24) Women employed	−0.3	−14.8	−0.2	−10.4	−0.1	−3.8	−58.6
(25) Employed total	−1.1	−22.9	−0.9	−18.4	−0.6	−8.7	−40.8
(26) Enterprises	−0.1	−4.3	−0.1	−5.9	−0.1	−4.3	60.4
(27) Poverty (Head Count Ratio)	−0.2	−22.4	−0.2	−19.9	−0.1	−7.7	−33.1
Number of Observation	802 vs 15122		802 vs 10756		802 vs 685		

The results of this impact evaluation reveal that RBHs are in better position than NRBH. The results show that difference in the mean income per adult equivalent is negative but not significant in the first two exercises. After exact matching, this difference in mean values becomes positive and significant (Col. 5 and 6). This proves the theory that workers migrate to take the advantage of higher wages. The results show that households with same qualification and social background earn higher income abroad than in the domestic country. In all the three exercises, the RBH have higher expenditure per adult equivalent but the difference is minimum when the PS, i.e. the exact matched samples have been used. This result also holds for food expenditure,

calorie intake and non-food expenditure. After exact matching of RBH and NRBH, the difference in expenditure per adult equivalent reduces to Rs 8619.3–24 percent.

With reference to human capital indicators, RBH appear to be better educated. The difference in education level of children currently going to school reduces from 4.4 classes to 2.4 classes. This is also reflected in average expenditure per class. Like previous studies, the results support the hypotheses that remittances have positive impact on human capital accumulation. However, results also show that if differences in the observable characteristics are not controlled, the impact would be 43 percent and 45.9 per cent larger over the actual impact on human capital accumulation. The results may misguide policy makers if issues of endogeneity and counterfactual are ignored.

Other differences are associated with ownership of durable goods and other amenities of life. On average, RBH households own more equipment than the NRBH. A higher proportion of the RBH has access to electricity, telephone facilities and room per adult equivalent than the NRBH. However, gas and tap water facilities are not significantly different in both groups may be because of lack of public infrastructure.

In case of different types of physical capital accumulation, the results suggest that remittances do not have a statistically significant impact on the accumulation of livestock, land holdings, jewellery, and loans (Table 3) but have higher assets of residential buildings, cash holdings (significant at 5 percent) and profit receipts from banks (significant at 10 percent level).[20] These results make the role of remittances in generating economic growth doubtful. Some of these results confirm the earlier findings of Amjad (1988); Gilani (1981) and Arif (1999) that migrant households invest in housing but reject that they are used for land, jewellery, and repayment of loans. However, the results are not comparable as earlier studies did not take into account counterfactual.

The level of female and male economic activity in RBH is significantly lower than in the NRBH. This suggests that both men and women in the households are less likely to work if they receive remittances. This may also imply that the control group of households are relatively poor and women are forced to work to meet their basic needs. Men's lower economic activity in RBH is self-evident since it is they who are working abroad. The lower participation of both men and women also indicates the loss of production due to migration. Non-agriculture establishments (enterprises) are largely owned by non-migrant households or NRBH. The difference between the two groups is significant. This indicates that remittances are not invested in productive enterprises and the hypotheses that remittances influence growth is not correct. The results of earlier studies by Gilani, *et al.* (1981), Tinsabad (1988) for Thailand, and Rodrigo and Jayatissa (1988) for Sri Lanka show that remittances are used for non-agriculture investment by 8.2 percent, 29.5 percent, and 3.6 percent, respectively. Therefore, government should promote local businesses so that households predominantly engaged in consumption or unproductive investment have the option to engage in productive activities.

These results show that the living standard of remittance receiving households is higher than that of the non-treated group. But, if we ignore the difference in observable

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[20]The reason can be that majority of RBH belong to rural area, and they may be receiving remittances through informal channels. Even if the migrant send through formal channels (Banks), household may not report.

characteristics, we overstate the impact extensively. This leads us to conclude that remittances raise the standard of living. The results associated with basic needs such as calorie intake, housing, sanitation facilities etc. also have a role in poverty reduction. Poverty, measured by head count ratio, shows that among the RBH would be, on average, 0.1 points lower than among the NRBH i.e., a difference of 0.1 point (p.d) between the two groups. This finding is supports the earlier finding by Siddiqui and Kemal (2006), which shows that remittances reduce poverty by 0.1 percent over the base year with one percent increase in remittances. The difference in poverty is of 0.2 points when we compare poverty of two groups—all treated and all non-treated. This method overstates the impact of remittance on poverty. PSM overcomes the bias problem cutting the impact down to 0.1 p.d—a reduction of 33 percent. The bias in other estimates can be observed from the last column of Table 3 which shows that the estimates are biased upward. If one ignores the issues of selection and differences in observable characteristics, remittances would look like having a greater than actual impact (see Table 3) which is likely to result in wrong policies. The last column of Table 3 shows that the existing literature measuring the impact of remittances belongs to the first group. This study for Pakistan is the first which evaluates the impact of remittances overcoming the problem of endogeniety and counterfactuals and provides an experimental benchmark. Therefore, the results of earlier studies need careful consideration if used for policy formulation.

6. HETEROGENEITY IN IMPACT OF REMITTANCES BY EDUCATION LEVEL

It is important to examine heterogeneity in treatment effect on socioeconomic aspects of households grouped by education level using a methodology that renders an experimental benchmark. Here households are defined in two strata on the basis of education of the head of the household—low skill (less than 10 years) and high skill (10 years and above). In each group, households are further classified into three sub groups. In the lower strata of education (below matriculation) three skill levels are classified as: L-LS (less than one year of education), L-MS (1-4 years of education) and L-HS (5-9 years of education). In the upper strata of education [matriculation and above] three groups are classified as: H-LS (10-13), H-MS (14-15), H-HS (16 years and above).[21]

The overall results show that the relatively poorer group of households (first four groups) register larger gain from foreign remittances in terms of income and expenditure per adult equivalent which increases with the education level except for L-MS. In this group (L-MS) the difference in the income is significant at 10 percent level. Poverty reduces the most among household groups in lower strata where education of the head of the household is below matriculation. In the upper strata, income expenditure and poverty impact are observed in households classified as low skill (10-13 years of education). The other two groups do not register any significant impact of remittances. These groups belong to the richest group of households.

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[21]Where in the lower strata, L-LS =Low-Low skill,, L-MS=Low medium skill, L-HS= Low-high skill, In the upper strata H-LS=High- low-skill, H-MS=High-medium-skill, and H-HS=High-high-skill.

Table 4

Impact Evaluation of Remittances by Education Level

Outcome Indicators	Education less than 1 year		Education below Primary (1-4 years)		Education Primary but below Matric (5-9 years)	
	Difference in Means	T-Statistics	Difference in Means	T-Statistics	Difference in Means	T-Statistics
Number of Observation	403		44.0		156.0	
Income per Adult Equivalent	6374.36	7.99	4725.54	1.73	8011.45	2.48
Expenditure per Adult Equivalent	5396.05	7.94	637.83	0.23	9212.72	4.95
Poverty (Head Count Ratio)	−0.2	−5.84	−0.1	−1.12	−0.2	−4.39
	*Education Matric to below BA (10-13 years)_*		*Education BA to below MA (14 to 15 years)*		*Education MA and above including Professionals (16 years and above)*	
Number of Observation	146.0		27.0		28.0	
Income per Adult Equivalent	21040.96	3.51	13569.31	1.01	22259.93	0.98
Expenditure per Adult Equivalent	18456.22	3.57	11935.50	0.77	13012.64	0.56
Poverty (Head Count Ratio)	−0.1	−2.93	0.00	−0.05	0.00	0.00

The poverty effect of remittance is estimated to be 0.1-point difference (p.d) for the whole group in the aggregate analysis. The poverty reduction effect is estimated to be −0.2 p.d for L-LS and L-HS, and larger than average effect for the whole group (−0.1 p.d.). The poverty impact decreases (in absolute term) from −0.2 p.d. to −0.1 p.d. for below matriculation to above matriculation group. This finding is consistent with the findings of Siddiqui and Kemal (2006), which show that poverty impact is larger among relatively poor households and has a smaller impact on relatively rich households. There is no poverty impact for the richest group of households. This does not imply that migration is an irrational decision for these groups of households. Some earlier studies show that the positive effect of migration is not realised until five or six years after the original migration Ham, *et al.* (2005). The initial returns are not significant. Siddiqui (2011) shows that migration of skilled labour has increased in recent years. So the benefits have not been significantly realised yet, or the sample of these households is very small.

The detailed results for these households are presented in Table 6 in Appendix I. The results show that the impact of remittances is still positive in terms of income, expenditure and all types of capital accumulation for the households with less than one year of education. In the upper strata, households with education of matriculation and above, i.e., with 10-13 years of education benefit. The other two groups show significant positive impact only on [profit from bank at 10 percent level of significance] and [expenditure on education, room occupancy], respectively [see Table 6 in Appendix I]. From this it can be concluded that two households in the upper strata belong to richer group of households and do not register the impact in the basic needs' variable. But the impact is significant in bank accounts. However, insufficient data for these groups may be the major reason for the insignificant results. The overall results show that aggregate analysis hides the variation in impact by education level.

7. COMPARISON WITH EARLIER STUDIES

The main difference between the results of this study and the earlier studies is that the change in outcome indicators in this study is unlikely to be correlated with the migration decision, while in the earlier studies it is correlated. The characteristics that influence the migration decision are likely to influence the decision of other households. The majority of earlier works do not take into account the issues of selection and differences in observable characteristics. Therefore they are likely to overestimate the impact.

Empirical estimates from earlier studies are compiled in Table 7 in Appendix I. The table reports major results along with data and methodology used in the analysis. It shows that disparities in estimation techniques and data affect the conclusion. It also shows that more than 90 percent labour migrated from Pakistan, India, Sri Lanka, and Bangladesh to Middle East in the 1980s.

Income and Consumption: Many studies conducted in the 1980s, especially in South Asian countries, have focused on the use of remittances based on existing migration data collected at the household level. Amjad (1988), Kazi (1988) and Gilani, *et al.* (1981), for Pakistan have found that migrant households allocate about 63 percent of resources to total consumption expenditure and 56.8 percent when remittances through unofficial channels are also included. While the results of the present study show that RBH spend 44 percent on food measured in per adult equivalent term, which is lower than the food expenditure of NRBH at 53 percent. Similarly, Gilani, *et al.* (1981) show that RBH allocate 62 percent of their remittances to recurrent consumption (57 percent), durable goods (2.8 percent) and other expenditure (2.3).   The results of these studies do not compare the expenditure pattern with counterfactual or control group expenditure. Hence their findings cannot be used to conclude that remittances contribute to higher consumption or lower consumption. Malik and Sarwar (1993) overcome this problem and estimate demand functions for three types of consumption expenditure—total consumption expenditure, recurrent consumption and expenditure on durable goods for RBH and NRBH for various regions of Pakistan. The study concludes that the expenditure pattern is different for migrant and non-migrant households. But the study ignores the differences in observable characteristics and estimate the function by using the whole sample. The result of the present study shows that estimates are biased if the difference is measured using all migrant and non-migrant households. The difference in consumption of RBH and NRBH decreases by 25 percent in total consumption and in expenditure on durables, while the expenditure on food decreases by 24 percent. Therefore it is necessary to use a methodology which at least minimises if not eliminates the bias.

Empirical evidence shows that more than 50 percent of the migrated labour to Middle East were unskilled labour. Mahmood (1988), Hyun (1988), and Tan and Canlas (1988) show that migrated labour from Bangladesh, Korea and Philippines are earning three to six times higher than wages in their country of origin. If we control for the selection bias and the observable characteristics, the difference in income[22] becomes significant and positive (see Table 3).

[22]This difference is in total earned income.

Welfare, Poverty and Inequality: Higher income and consumption are expected to reduce poverty and inequality. Siddiqui and Kemal (2006) show that remittances reduce poverty and improve welfare by 0.01 percent and 0.06 percent, respectively. Rodrigo and Jayatissa (1988) show that inequality increases with remittance inflow. The study by Jongwanich (2007) using cross country data shows that remittances through direct and indirect channels reduce poverty by 0.03 percent. The results of the present study—reduction in poverty by 0.01 percent—match with the results of Siddiqui and Kemal (2006) who show that the poverty impact varies by type of household, rich and poor. These results are confirmed by the results of this study as the impact varies by type of households i.e., the poor register larger impact. However, the results are not exactly comparable as the base year is different. This study shows that bias reduces poverty estimates by 33 percent, when we correct for the selection bias and observable characteristics.

Investment: The studies show that investment in real estate, land, and housing are higher for RBH and ranges between 20.7 and 35.4 percent for Pakistan. Another study for Thailand shows that 33 percent migrant households own houses compared to 20 percent non migrant households. Overall, 75 percent migrant households own assets compared to 39 percent non migrant households. The studies also measure the impact of remittances or their allocation to different types of assets, physical, financial, and human (see Table 7) but the fact remains that they over-estimate the impact due to uncontrolled difference in observable characteristics or counterfactuals. This type of analysis does not measure the sole benefits of migration or remittances, but also include the effects of uncontrolled differences in socio economic characteristics of households.

Growth: Burney (1987) using demand composition and Iqbal and Sattar (2005) using the Chami, Fullenkamp, Jahjah model show positive relationship between growth and remittances. Burney (1987) shows that the contribution of official remittances from Middle East to GNP growth was 13.6 percent during 1973-4 to 1976-7. This contribution increased to 24 percent when remittances through unofficial channels were also taken into account. Iqbal and Sattar (2005) show that increase in remittances by one percentage point increase growth by 0.44 percentage point. Jongwanich (2007) estimates the neoclassical model of Barro using cross country data. The study could not find any direct and significant impact on growth, but indirect effect of remittances on growth works through human capital investment (0.02 percent) and physical capital (0.01 percent). The growth impact remains inconclusive in the present study. The results show that remittances affect human capital accumulation positively, which have a growth promoting impact [Jongwanich (2007)]. In addition higher bank deposits also point to growth promoting effects through the banks' intermediary role i.e. credit expansion. But low entrepreneurial activity and less land holding shows the opposite.

This writer constructed a table of expected outcome indicator of remittances impact giving value of '1' if a study includes the indicator and zero if it ignores, measuring data quality with 1=secondary, 2=primary, 3=data on both treated and control groups. Similarly the methodology is ranked as 1 if data uses only descriptive statistics, and 2 if both descriptive and statistical estimation analysis are used, while 3 means rigorous. An index based on the information has been developed. An ideal situation (hypothetical) is when comprehensive data with treated and control groups is used, for

rigorous impact evaluation to measure the impact on all expected outcome indicators. A comparison of the ideal study with the previous empirical studies shows deviation from the optimal analysis (see Figure 1). The figure shows that majority of studies divert from optimum evaluation level. There is a need to motivate researchers to conduct impact evaluation using method which reduces biases if not eliminate them in the impact and renders an experimental benchmark.

Figure 1: A Comparison of Empirical Studies
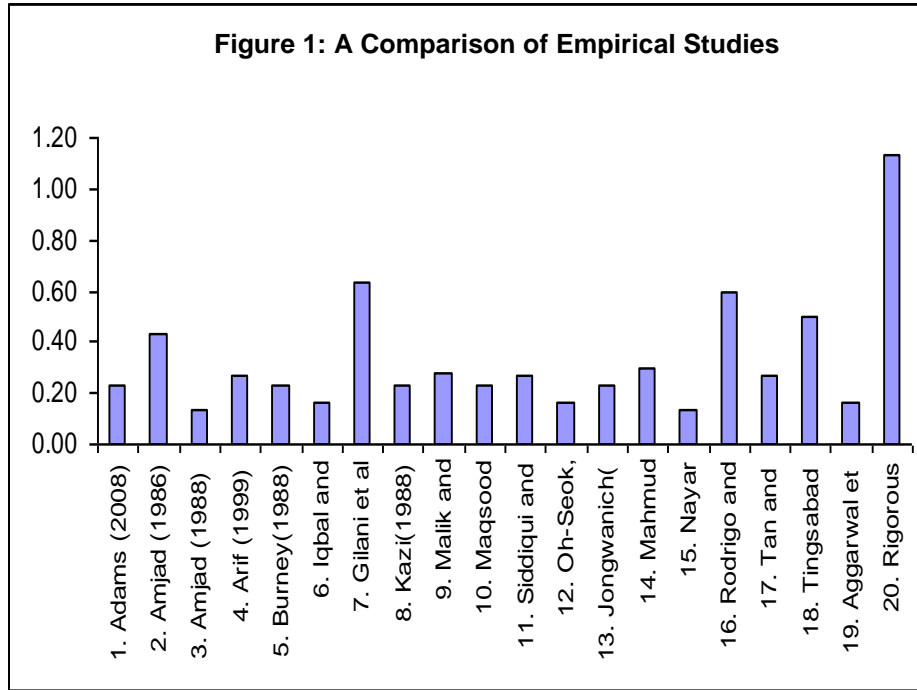
8. CONCLUSION

Given the multi dimension impact of remittances, its integration into overall development planning is essential. For that purpose, it is required to conduct a comprehensive analysis using the most appropriate techniques to draw lessons for suitable policies. Rosenbaum and Rubin (1983) indicate that robust estimates can be obtained by overcoming the problem of selection bias and difference in observable characteristics using PSM and difference method which replicates experimental bench mark in self-select cases.

This paper contributes to the literature of remittance in Pakistan by analysing the impact of remittances using the propensity score matching and difference method. The major finding of the study is that robust estimates that take into account both selection and endogeniety problems in estimating the average impact of remittances are substantially different from the estimates which disregard these issues and so overstate the actual impact. A comparison of impact corrected for selection with those where it is not shows a very large and significant bias. In policy-making it is the unbiased results that are needed.

The paper quantifies the benefits of migration (remittance), in terms of income, expenditure, savings, human capital and physical capital accumulation, poverty, and growth. After balancing for the differences in observable characteristics, migration is found to be beneficial. The number of migrant households with income levels below poverty line reduces by 0.1 points over non-migrants in the aggregate. Their higher human and physical capital ownership, savings in cash and profit from bank point to the growth promoting impact of remittances, whereas lower entrepreneurial activity and low men and women participation in economic activities in the RBH group illustrate the opposite. The growth impact of remittances therefore remains inconclusive.

Aggregate analysis hides heterogeneity in impact by education level and underestimates/over-estimate the effect for poor/rich households. The results show remittances have significant impact on poor households (with less than one year of education) but have no impact on highly educated households. Therefore, matching is a useful way to control for observable heterogeneity too.

The pattern of use of remittances determines the impact on poverty and growth. Therefore, if the objective is to achieve higher growth, the remittances can be redirected from current consumption towards productive investment by offering higher interest rate on deposits or subsidies for productive investment. However, further analysis requires more demographic and economic information on migrants and return migrants, their stay abroad, how they send money back home, over what period of time and from where. That analysis would be helpful to devise migration policies for poverty reduction and growth enhancing strategies.

APPENDIX I

Table 1

Impact in the Log Frame: Remittances Inflow from Abroad

Level	Indicators
Activities	Migration
Input	Remittances
Outputs	1. Accumulation of Capital Stock: Human, Physical and Financial.
Intermediate Outcomes	1. Better nutrition
	2. Higher enrolment
	3. Higher physical capital stock
	4. Higher Bank Deposits
Final Outcomes	Improved Social and Economic Indicators: literacy rate and health status and growth
Short Run Impact	1. Reduce poverty
	2. Improve welfare of households
Long Run Impact	Higher Productivity and Earnings

Table 2

Detail of Variables Used in the Analysis

Variable Name	Definition
1. Remittances	Households' remittance income from abroad in (Rs).
2. Income per Adult	Household income from all sources–domestic and foreign, divided by number of adult equivalent (Rs).
3. Total Expenditure per Adult	Total households expenditure divided by number of adult equivalent (Rs).
4. Expenditure on Food per Adult	Food expenditure per adult equivalent in Rs.
5. Calorie Intake	Calculated by multiplying quantity of good consumed with calorie per unit.
6. Expenditure on Non-food Items per Adult	Non Food Expenditure in Rs per year per adult equivalent
7. Expenditure on Durables such as Clothing and Footwear	Expenditure on durables per adult equivalent per year
8. Expenditure of Education per Class	Households Expenditure on Education divided by level (classes) of school going individuals
9. Average Class of School Going Children	Total number years of schooling of currently going to school children divided by number of school going children
10. Household Size	Number of households members
11. Females Economic Activity	Female Employment
12. Education of the Head of the Household	Highest level of Education of head of the household
13. Capital Stock Accumulation	
13a. Human Capital	Measured by education of currently going to school (years of schooling), average level of education of households and expenditure on Education per class.
13b. Physical Capital	Asset: Buildings (completed or under construction),– land, residential buildings, commercial buildings
13c. Equipment	Durable goods: Tangible asset accumulation such as refrigerator, TV, automobile and other durables.
13d. Financial Capital	Profit on Bank Deposits measure size of deposits
13e. Savings	Jewellery and Cash
14. Poverty	Head Count Ratio, Percentage of population below poverty line
14.a Poverty Line	Rural and urban poverty line are calculated based on the assumption that the gap between rural and urban poverty line is same as in 1990 Official national poverty line is used to calculate poverty line for rural and urban areas. Poverty lines are Rs 748, Rs 850 and Rs 705 for Pakistan, Urban and Rural areas, respectively
15. Household Condition (measured by amenities)	
15a. Electricity	Electricity direct connection
15b. Gas	Gas direct connection
15c. Tap Water	Piped, Hand Pump, Tube well direct
15d. Sanitation Facilities	Flush connected to public sewerage, Flush connected to pit
15e. Telephone	Telephone direct connection
15f. Occupancy	Room per adult

Table 3

Geographic Distribution (%)

	Control(NRBH)	Treated(RBH)	Total
Punjab	39.8	33.2	39.4
Sindh	24.2	4.0	23.2
KP	15.9	30.7	16.6
ROP	20.1	32.2	20.8
Total	100	100	100

Source: Author's Calculations.

Table 4

Distribution of RBH and NRBH by Region

Urban	Control	Treated	Total
Punjab	39.5	57.9	40.3
Sindh	40.8	41.0	41.3
KP	31.3	32.9	31.4
ROP	28.0	32.9	28.4
Total Urban	36.2	43.9	36.6
Rural			
Punjab	60.5	42.1	59.7
Sindh	59.2	0.0	58.7
KPK	68.7	67.1	68.6
ROP	72.0	67.1	71.6
Total Rural	63.8	56.1	63.4
Pakistan	100.0	100.0	100.0

Source: Author's Calculations.

Table 5

Mean Values of Output and Outcome Variables

Variables	Full Sample	Treated	Control
No. of Observation	15924.0	802.0	15122.0
H-size	7.2	7.7	7.2
Age	45.7	48.6	45.5
Education of Head of the Household	4.2	4.5	4.2
Remittances per adult per year	778.1	15450.0	0.0
Households in a district	155.4	175.0	154.4
Income per Adult	28063.7	27714.3	28082.2
Expenditure per Adult	16053.0	26958.1	15474.6
Food intake per adult per year	8865.5	12344.9	8681.0
Non-food consumption (durables) per adult per year	7187.4	14613.2	6793.6
Calorie intake per adult per day	3732.2	4741.7	3678.7
Average class of currently going to School	7.2	11.4	7.0
Expenditure on education per year	3807.9	9271.8	3518.1
Average class of households	2.7	3.9	2.7

Continued—

Table 5—(*Continued*)

Household Equipment	19851.5	49862.1	18259.9
Room per households	2.4	3.4	2.4
Electricity	69.9	88.7	68.9
Gas	21.3	22.0	21.3
Telephone	12.1	38.5	10.7
Tap water	76.8	72.3	77.1
Toilet	35.6	58.9	34.4
Asset	351314.6	882440.2	323146.2
Livestock	0.2	0.2	0.2
Land Ownership	1.4	0.8	1.5
Jewelry	16619.6	149963.3	9547.6
Cash	10355.5	28763.3	9379.3
Loan	29814.9	28774.0	29870.2
Bank Deposit profit	332.0	1039.8	294.5
Employment	1.9	0.9	1.9
Enterprises	0.2	0.2	0.2
Poverty based on expenditure per adult equivalent	23.0	4.99	23.9

Source: Author's Calculations.

Table 6

Impact Evaluation of Remittances by Education Level

Education level Outcome/Output Indicators	Less than one Year		1–4 year		5–9 years		10–13		14–15		16 and above	
	Difference in mean	T-Statistics	Difference in mean	T-Statistics	Difference in mean	T-Statistics	Difference in mean	T-Statistics	Difference in mean	T-Statistics	Difference in mean	T-Statistics
1. Income per adult equivalent	6374.36	7.99	4725.54	1.73	8011.45	2.48	21040.96	3.51	13569.31	1.01	22259.93	0.98
2. Expenditure per adult equivalent	5396.05	7.94	637.83	0.23	9212.72	4.95	18456.22	3.57	11935.50	0.77	13012.64	0.56
3. Expenditure on Food per Adult per Year	1685.03	5.64	664.59	0.60	2476.38	3.52	5719.69	4.77	5642.87	1.51	6204.74	1.63
4. Calorie intake per adult per year	770.47	1.96	−140.26	−0.08	87.90	0.10	948.61	0.96	665.87	0.23	2930.88	0.83
5. Non food consumption (durables)per adult per year	3711.02	7.54	−26.77	−0.01	6736.34	4.85	12736.53	3.00	6292.63	0.51	6807.90	0.34
6. Expenditure on education	3311.67	6.09	3333.83	1.98	5507.90	2.89	2179.34	1.49	12313.57	0.72	13585.78	1.98
7. Average class of Households	1.02	4.55	0.37	0.65	0.59	1.44	0.25	0.45	0.54	0.42	−0.29	−0.24
8. Average class of currently going to School children	4.34	6.10	1.86	0.83	2.92	1.75	−1.42	−0.84	−1.49	−0.32	−1.62	−0.37
9. Household Equipment	13742.28	5.97	7194.39	1.25	51042.25	2.11	28240.48	2.01	54.49	0.00	−54404.74	−0.77
10 Room Occupy	0.86	7.61	0.52	1.54	0.73	3.68	0.11	0.44	0.34	0.75	0.70	1.69
11 Electricity	0.16	4.94	−0.12	−1.68	0.08	2.55	0.01	0.40	−0.04	−1.00	0.05	1.00
12 Gas	−0.01	−0.58	0.02	0.20	0.04	0.73	0.02	0.36	0.00	0.00	−0.06	−0.46
13 Telephone	0.21	8.61	0.09	0.95	0.35	7.16	0.25	4.41	0.02	0.17	0.14	1.11
14. Safe Drinking Water	0.05	1.39	0.00	0.00	0.10	1.98	−0.08	−1.78	0.05	0.50	−0.04	−0.40
15. Sanitation facilities	0.18	5.43	−0.02	−0.20	0.15	2.68	0.08	1.62	0.01	0.08	0.15	1.60
16. Asset	246351.34	5.79	237325.76	0.97	646653.19	1.45	268842.66	0.84	979637.04	1.11	11444.81	0.02
17. Livestock	0.21	1.50	−0.36	−0.80	0.43	1.97	0.01	0.05	0.02	0.08	−0.57	−2.12
18. Land holdings (acres)	0.00	0.03	−4.85	−0.80	0.02	0.06	−0.36	−0.77	−0.68	−0.89	−0.36	−0.47
19. Jewelry (RS)	251106.20	1.06	5470.45	0.46	21636.55	4.39	26957.60	1.92	7958.52	0.83	27948.05	1.45
20. Saving in Cash (Rupees)	13687.21	3.84	37196.97	1.30	24624.74	1.65	33712.75	2.55	−118451.85	−0.97	6919.16	0.15
21. Loan	23780.64	1.77	43602.41	1.54	−14039.49	−0.76	−8412.13	−1.26	−16068.15	−1.38	−15250.00	−0.82
22. Profit on bank deposits	−76.19	−0.79	795.45	1.16	530.70	1.32	1822.15	1.42	1814.81	1.68	4175.32	0.68
23. Men employed	−0.51	−6.06	−0.28	−0.88	−0.43	−3.20	−0.65	−5.06	−0.30	−1.29	−0.69	−2.58
24. Women employed	−0.14	−2.96	0.00	0.00	−0.10	−1.77	−0.15	−2.00	−0.17	−1.64	0.10	0.79
25. Employed total	−0.65	−6.21	−0.28	−0.68	−0.53	−3.49	−0.80	−4.90	−0.47	−1.87	−0.58	−1.95
26. Enterprises	−0.08	−2.37	−0.20	−1.75	−0.10	−1.59	−0.19	−3.12	−0.01	−0.08	−0.04	−0.36
27. Poverty (Head Count Ratio)	−0.15	−5.84	−0.09	−1.12	−0.16	−4.39	−0.09	−2.93	0.00	−0.05	0.00	0.00

Source: Author's Calculations.

Table 7

Empirical Estimates from Existing Literature

Focus on	Data	Results					
		official(unofficial)= 1.49 (2.89)to 6.59(11.01) in1970 and 1980s	0.44 to one percentage point of remittances	Human capital= 0.02 Physical Investment =0.01			
Growth (5,6,21)	TS						
Earning Estimate of non Migrant Per Capita Remittances(1)	469 HH survey	223.6					
Earnings(remittances)r(8)	ARTEP	4908Rs/Month					
Remittances(2,4)	ARTEP/ILO	2589 Rs /m	27083 (20416)	5909.00			
Wage ratio after migration /Domestic(13,15,19)		2.65,	Bangladesh=5.77	Philippines= 6.35			
Variation in Remittances income =ratio of poorest/richest 20 %,(1)	469 HH survey	1–13.8%					
Consumption out of remit/ Share of consumption (2,7,9,8,18,20, 99)	Total	63.3% – 56.8%	62.19	0.57m 0.52nm	52.1	6.99/(0.55)	57%(99)
	recurrent	53.50%	57.00	0.53m 0.48nm			
	marriages	9.80%	2.35		2.9		
	Consumer Durables	included in recurrent	2.84	0.026m 0.03 nm	5.9	11.04	
Real Estate	Total	35.40%	21.68				
	Construction /Purchase of Residential House		12.14				
	Improvement in House & Construction		2.27		14.2	33.13/20.73	
	Commercial Real Estate		5.72				
	AgricultureLand		1.55		15.6	6.12/225.24	
Investment/Saving, after/Before(2)	Total	24.2% saving	12.95		35.1	M/NM=75/39 Asset Ownership	
	Agricultural Investment		3.3				
	Industrial/commercial Investment		8.21		29.5	Year= 1981 5.41(6.65)=transport equipment, total invest=3.61	
	Financial Investment/Saving=foreign currency account				14.2	13.42/2.20	
Residual		8.5	318	0.003	loan=4.3%, Jewellery =5.1 Education = 2.4, Health=5.9	loan=23.54, Jewellery=0.26	Loan=2.6%(99), Jewellary=26.8(99) Other saving = 5.1%
	Human Capital		0				
	Poverty(12, 22)	0.01, 0.03	2275752.63				
	Welfare(12)	-0.06	0				
	average cost of migrant(15,20)	1534 in $ 1983	38979 to 43518 baht				

Sources: 1. Adams (1998), 2. Amjad (1986), 3. Amjad (1988), 4. Arif (1999), 5. Burney (1988) 6. Iqbal and Sattar (2005), 7. Gilani, *et al*. (1981), 8. Kazi (1988), 9. Malik and Sarwar (1993), 10. Maqsood and Sirajeldin (1994), 11. Nishat and Bilgrami (1993), 12. Siddiqui and Kemal (2006), 13. Hyun (1988), 14. Jongwanich (2007), 15. Mahmud (1988), 16. Nayar (1988) 17. Quisumbing and McNiven (2007), 18. Rodrigo and Jayatissa (1988), 19. Tan and Canlas (1988), 20. Tingsabad (1988), 21. Aggarwal, *et al.* (2006), Jongwanich (2007).

Note: Number in parentheses in the first and second column indicates reference study described below.

Table 6

Table 7

APPENDIX II
Histograms Before and After Propensity Score Matching
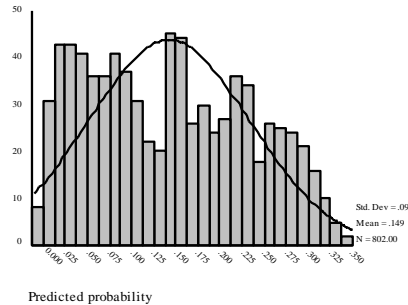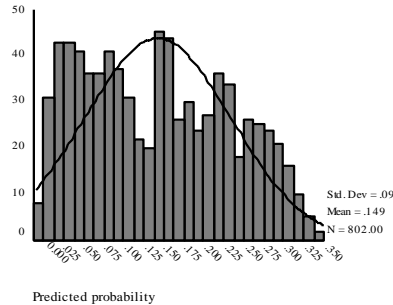
Figure 1: Histogram of RTH before PSM

Std. Dev = .09
Mean = .149
N = 802.00

Predicted probability

Figure 3: Histogram of TRH after PSM

Std. Dev = .09
Mean = .149
N = 802.00

Predicted probability

Figure 2: Histogram of NRCH before PSM

Std. Dev = .06
Mean = .045
N = 15122.00

Predicted probability
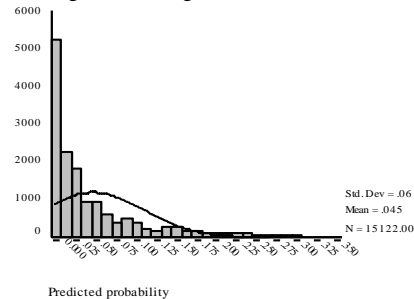
Figure 4: Histogram of NRCH After PSM

Std. Dev = .09
Mean = .139
N = 685.00

Predicted probability
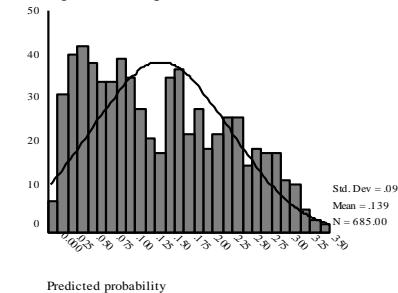
Note: Author's Construction.

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