Remittances and its impact on agricultural productivity of Pakistan

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Reg. No PIDE2016FMPHILDS20

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A dissertation submitted to the Pakistan Institute of Development Economics (PIDE) Islamabad, in partial fulfillment of the requirement for the degree of Master of Philosophy in Development studies

Department of development Studies

Pakistan Institute of Development Economics, Islamabad

(2016-2019)

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CERTIFICATE

This is to certify that this thesis entitled: *"Remittances and its Impact on Agriculture Productivity of Pakistan"* submitted by Mariam Afzal is accepted in its present form by the Department of Development Studies, Pakistan Institute of Development Economics (PIDE), Islamabad as satisfying the requirements for partial fulfillment of the degree in Master of Philosophy in Development Studies.

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Date of Examination: June 25, 2019

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III. Acknowledgement

First, I would like to thank my supervisor, Dr. Muhammad Jehangir of department of Development Studies at Pakistan Institute of Development Economics, Islamabad. His door was always open for me whenever I needed any guidance or had queries in my mind regarding my thesis. He helped me to be in the right direction throughout my thesis.

I would also like to thank the internal reviewer, Mr. Aqeel Chaudhary of department of Development Studies at Pakistan Institute of Development Economics, Islamabad, to give time and valuable comments on this thesis.

I would like to acknowledge Mr. Kamran Khan, senior analyst at Pakistan Institute of Development Economics, Islamabad, for helping me for my thesis.

Finally, I would like to express my gratitude to my parents who supporting and encouraging me throughout. The thesis would not have been completed without their prayers and support.
Thank you.

Mariam Afzal

IV. Abstract

Purpose of this research is to find a relationship between migration, remittances and agricultural productivity which is done by the application of New Economics of Labor Migration theory in context of Pakistan. The main objectives are to find out the effect of migration on agricultural productivity and weather the remittances received by the households are invested in agriculture or not. Cross- sectional household survey data from Pakistan Panel Household survey data (2010) has been analyzed by applying 3sls regression model. The results support New Economics of Labor Migration theory that explains that migration leads to labor shortage in agriculture, however, remittances compensate the loss occurred due to labor migration that improves productivity via investment in agriculture sector.

1. Introduction

Individuals cannot control the economic conditions, social environment and climatic conditions. Such social and natural constraints limit the choices of individuals over farm investments, land use and output mix (FAO, 1993). Migration of labor is considered as the most dominant strategy to improve their likelihood conditions and reduce financial constraints. It has been reported that a lot of countries have been facing decline in their rural population due to increased migration rates in rural areas. One of those countries is China, where rural migration has significantly increased over the decade as the country experiences economic and social reforms (Zhang, 2010). People tend to migrate to other areas or countries to send remittances to their home areas to cater their financial needs and investments, especially in agricultural sector as most of the rural households are involved in agriculture. This fact cannot be denied that Pakistan is an agricultural country and agriculture has failed to provide adequate and enough opportunities for full employment and has been unable to yield sufficient income for the households to have a satisfactory living standard (Chaudhry et al., 2006). Thus, the rural areas have surplus labor and face financial constraints which leads them to migrate to other areas. High level of migration reflects the inability of the rural sector to incorporate the excess labor.

In theories, the fallen product value of migrated individuals creates opportunity cost for rural economy of the country. Lewis model contribute in this regard by explaining the mechanisms through which surplus labor in traditional areas of developing countries can be utilized by expanding the modern sector of the country. The model has certain assumptions which are; surplus labor does exist, and the loss of labor which is occurred due to labor migration does not lead to the decline of production (Taylor and Martin, 2001). New Economics of Labor Migration theory (NELM) incorporates the analysis of

determinants of migration, and their impacts, and also focuses on the complexity of migration as economic institution (Rozelle et al., 1999). The purpose of this theory is to explore the migration determinants, which are; community level variables, impact of remittances on agriculture , financial constraints of households, risks and the potential effects of migration such as negative effect of migration due to labor loss and positive impact of remittances on productivity levels. The theory analyzes the decision of migration as a household decision instead of individual decision. The household take simultaneous decisions of remaining labor allocation and investment after taking the decision of migration in a household which affects the productivity levels (Taylor et al., 2003). New Economics of Labor Migration theory considers remittances as a basic element which represents an important mechanism by which consequences and determinants of migration are connected (Taylor and Martin, 2001).

Empirically a strong effect of migration and remittances on agricultural productivity will support the New Economics of Labor Migration theory. Negative effects will show that migration leads to labor shortage. On the other hand, positive effect will show that migration increases productivity by reducing risks and financial constraints (Sindi and Kirimi, 2006).

In South Africa, it is observed that productivity levels declined for short term in labor resource areas, however, in long run, the agricultural productivity level increased due to the investments made by using remittances (Lucas, 1987). On the other hand, a study reveals that people who are involved in migration do not have any significant impact on productive investment (De Brauw et al., 2002). Another study finds out the investment preferences of non- farm and farm remittances receiving households. Areas where heavy migration takes place, people tend to adopt urbanized consumption habits. On the contrary, remittances lead to more capital accumulation. According to a research, remittances doubles the consumption expenditure of farmers. Top spending priority of both non-farmers and farmers workers is

recreation, with increase in their expenditure by 225%. Whereas leading priority of other workers is transportation with an increase of 114% in expenditure. Education is second priority for nonfarm workers and is seventh for farm workers. Some evidences say that since remittance recipients are poor, they spend this income on basic goods and house maintenance, while some say that after receiving remittances, people refer more leisure which may have negative effects on agricultural production. For Greece,62.6%,22.3%,3.5%,4.0%,0.4% and 7.2% of remittances are spent on consumption, housing, machinery, investment in trade, on investment (non-machinery) in agriculture and purchase of agricultural land respectively. Not only the recipient households, but also whole economy gets benefited from remittances as we have an example like Florina, Greece. Employment rates were also increased (Glytsos, 1993).

The conflicting results and ideas reveal that the relationship among migration, remittances and agricultural productivity is very complex. The relationship can change with agricultural conditions, social circumstances and production conditions. The existing literature reveals that limited work has been done to calculate the impact of remittances on agricultural sector on micro level for Pakistan. This study will fill this literature gap, considering the fact that Pakistan is an agricultural country and it was among the top 5 emigration countries in 2013- 2014 and remittance recipient country in south Asia in the year 2014 and 2015. The purpose of this study is to test the New Economics of Labor Migration theory by using cross-sectional data from Pakistan Panel Household survey for Pakistan. The research also provides the empirical evidence for New Economics of Labor Migration theory.

1.1. Justification and Contribution of the study:

Motivation for this research comes from the fact that a country's development also includes its agricultural development specially for a country like Pakistan, which is an agricultural country and 60.3 % of population still lives in rural areas (2017) (Pakistan Demographics Profile 2018). Pakistan is amongst the 20 countries or areas of origin of international migrants in 2017. Pakistan's remittances averaged US$ 2658 Million from 2002 until 2017 reaching US $5529 million in 2016. The rates were US $4740 million and $5246 million in third quarter of 2017 and second quarter of 2017 respectively. It's very important to analyze how such increasing rates of migration and remittances are affecting the agricultural side of Pakistan.

It is intended that the results of this research will be used by the authorities to access and then evaluate the current agricultural development through the remittances received by the families of the migrants. These findings can also be used for the correction of the existing rural agricultural development of Pakistan.

1.2. Objectives of the study:

To determine the extent to which New Economics of Labor Migration (NELM) theory explains the role of remittances in agricultural productivity of Pakistan.

To find weather remittances received by the households are reinvested in agriculture

1.3. Research questions:

What is the extent to which the New Economics of Labor Migration (NELM) explains the role of remittances agricultural productivity of Pakistan?

What is the impact of remittances on wheat productivity of Pakistan?

2. Literature review

Below is an extensive literature review on the impact of remittances on agricultural productivity and if remittance receivers spend the remitted money on agriculture or not.

Adams (1991) have compared expenditure patterns in terms of consumption and investment of migrant households who receive international remittances with those who do not, in 3 villages of Minya, Cairo. The results are contrary to many other studies which say that most of the remitted income is spent on personal consumption , rather such income is spent much less on daily consumption and more on other items. Results suggest that 73% of total expenditure is used to buy building and agricultural land. They don't waste money on newly desired consumption goods as they perceive that remitted income is not permanent way of earning.

This explains that households tend to spend the remitted money on those areas which will provide them long term benefits. Agricultural land is a long term asset for the people living in rural areas, thus a major share of remittances is spent on agricultural land.

Wang et al. (2013) did research on three townships in Qingyang prefecture, Gansu province which is located in northwestern China, using Cross-sectional household survey data with 3SLS regression model. This research basically provides the empirical evidence for New Economics of Labor Migration theory. Their research expands Taylor et al.'s work and other related previous studies by showing that the relationship between agricultural investment and remittances depends on the farm's output and hence profitability. In the multi-cropping small farming system, the loss caused due to the removal of a member from farm on lower return crop is normally offset by the gain from investing in a higher return profitable crop. This normally happens in short run case. Jokisch's (2002) in his study also reveals that some farmers don't invest in agriculture because it is not a good investment for them. Non-farm income is

not invested in agriculture in China where farm activities seem risky and unattractive to farmers. So, it's not mandatory that remittances are meant to be spent in agriculture in rural areas; it rather depends on profitability and rationality.

Quinn (2009) in their paper, estimated the impact of remittances on agricultural technology using the cross sectional data from 1987 to 1997 Mexican migration project and concluded that remittances may increase high yield variety (HYV) seeds which increases agricultural production by reducing credit constraints and households risks.

Zahonogo (2011) employed cropping seasonal data from the year 2003-2004 collected in Sudanese area, Burkina. This paper also tracks down the impact of remittances on agriculture and the results reveal that people migrate to overcome the insufficiency of agricultural income by utilizing the remitted funds. Households with migrated family members have more important use of animal traction than the other households, in which remittances from the migrated family members can support in achieving access to agricultural technology.

Tshikala and Fonsah (2014) used 2SLS and 3SLS estimation techniques for the data taken from rural Senegal and finds that both international and internal migration of people are positively correlated with adoption of new and advanced farming technologies. However, families who receive remittances from international migrants are more likely to invest in advanced farming technology. The reason explained behind this is, the migrants from developing countries mostly migrate to developed countries, so the households expect more remittances from international migrants than internal migrants. Such households thus spend more on profitable activities

Mendola (2008) took cross sectional data from two cities of Bangladesh to test weather income from migration effects the risk taking behavior of farming families and to adopt new agricultural technology

or not. the data consists on survey of 5062 households which was collected by conducted by the Institute of Development Studies in 1994/95.This study has restricted the sample to 3404 households. The results reveal that mostly wealthier families indulge in more costly high return migration which means international migration. Such families are more likely to spend in more advance and modern farming technologies, and so they have higher productivity rates, whereas poor families cannot afford costly migration and thus spend very little on agricultural technology.

Singh et al. (2012) in their paper did empirical analysis on eight villages in Madhubani and east Champaran districts of Bihar, India, by doing survey of 400 families, half of them were migrant families. Both migrant and non- migrant households were taken in order to perform comparative analysis of differences in agricultural productivity parameters. The results show that migration did act as a risk coping strategy for the financially weaker group of the society. Investment of remitted income in agriculture could have increased if appropriate infrastructure facilities were there in such rural areas. Proper infrastructure system and facilities help in faster dissemination of advanced agricultural technology, in order to achieve higher agricultural productivity levels.

Batista et al. (n.d.) conducted semi random household surveys in 15 different neighborhoods throughout the Maputo to find ways on how to mobilize the remittances to achieve agricultural modernization in Mozambique and concludes that it's important to have full control of migrants on the money they send back home in order to achieve higher level of agricultural modernity in Mozambique, because without direct control on the use of remittances, migrants may keep the money and remit very less.

Iheke (2014) investigates the effect of remittances on the output of arable of remittances and non-recipient households residing in South Eastern Nigeria. By using cost route technique in data collection, data analysis shows that both receiving and non-receiving remittance households were different in terms

of farm size, age, income and output. Households recipient of remittances were older and produces more crop than the non- recipients of remittances. Major factors that influence the crop output of remittance receiving households were availability of farm inputs, capital and farm size. Regression analysis shows that remittances lead to increased agricultural output, because remittances alleviates capital constraints and develops commercial agriculture through introduction of new crops, techniques, modern equipment and purchase of land. Policies are needed to enhance remittance inflows. Remittances recipient countries have to provide friendly environment through stable exchange rates, infrastructure, transparent legal system and fair institutions and good governance to get benefited from remittances.

Khan et al. (2010) also find a positive relation between remittances and agricultural development. Research took place in rural areas of Toba Tek Singh using multistage sampling technique for data collection. Most of the migrant's incomes are spent on farm machinery, livestock and farmland which shows their preferred area is agriculture. Most important factor of investing migrant's income on agriculture is migrants being belonged to rural areas; other factors are mindset and lack of education. Those migrants who did not invest is because they had few years duration of migration and were less experienced. The evidence provided in the paper show that 30% of migrants had invested their remitted income in farming, 18.3% had invested income in livestock and 5% had invested in farm machinery, while 46.7 % had absolutely no investments.

The above literature by different researchers reveal that the impact of remittances on productivity and the extent of adaptation of higher agricultural technology depend on the availability of other factors also, such as amount of remittances received, level of education, economic condition of household, availability of facilities etc.

Wouterse (2010) took data from Burkina Faso and finds that only continental migration and farm technical efficiency had positive relation with each other in cereal production.

Imran et al. (2016) in their paper reveal that migration is performed to diversify income sources but it not only increases burden on urban resources of the country, but also have adverse effects on agricultural productivity. Research performed by taking cross sectional data from Southern Punjab shows that cotton production was negatively impacted because cotton production requires intense labor work, whereas wheat productivity was positively affected by rural urban migration because of the increased investment in pesticides, seeds and other inputs.

Findings by Imran et al. (2016) and Wouterse (2010) provide a deeper information that the impact of remittances depends on the nature of the crop.

Atamanov and Berg (2012) find the effect of international migration and remittances on crop productivity in Kyrgyz Republic by using household budget survey from Asian Development Bank. This research is unique and different from other work because this paper allows the effect of remittances on different farmers having different land size. The results reveal that permanent migration has negative impact on agricultural income. Remittances do act as compensation for this loss but the positive impact of remittances decrease with the farm size.

According to Jokisch (2002), there are two possibilities that happen after migration. Either the loss of labor leads to reduction in cultivation or the amount of remittances offsets the labor shortfalls and helps in providing agricultural capital to make improvements in agricultural sector (Black, 1993; Mines and de Janvry, 1982). Jokisch (2002) worked on Highland Ecuador by taking the base period December 1994-July 1995 to investigate the impact of migration on agricultural change on small farm holders and

concludes that agriculture which was once self-sufficient now depends on international economies. Remittances are mostly spent on education, land accumulation, health, increased consumption etc. In the case of south Ecuador, remittances have not changed the whole agricultural patterns and activities but have allowed the migrants to start their households. That's somehow a middle path between the two extremes i.e. (i) high agricultural improvements due to investment in agriculture or (ii) loss of labor in agriculture sector thereby declining the cultivation. Change in agricultural patterns by consuming remittances is highly dependent on the sending country's environment and political context and needs to be understood first. In south central Ecuador, due to the constraints like poor soil quality and lack of access to irrigation, spending in agriculture is not a wise decision as it's very risky so migrants are more likely to spend remittances in areas other than agriculture.

Konseiga (2004) have tried to provide a solution to food security issue that is common in developing countries using remittances and showed through a channel that how remittances can help in adopting agricultural technology and gaining high productivity rates. Authors have researched on Sahel, Tunisia using treatment effects model. According to Konseiga, A, households would invest more in agricultural technology if their primary activity is farming and migration is the best tool to be able to invest in farming technology. The survey shows that such households invest in consumption and agricultural activities; here they talked about investing in stone bund technology. This work supports the developing strategy in Sahel, where non local income is being used in investing in cost effective technologies and ultimately tackling with the prevailing food security issues.

Lambin and Meyfroidt (2011) claims that sustainability of agricultural land and forests is very important as they are continuously shrinking due to high food demand. In their paper they discussed how globalization can be used to increase land use efficiency instead of just uncontrolled land expansion. There are four mechanisms being discussed in the article that are intensified by economic globalization

which lead to land conversion. One of mechanisms mentioned is remittances. There are two possibilities that take place. Either remittances lead to the reconversion of households to nonfarm activities and diversify their earning options and occupations, or households invest in agricultural intensification. Migrants also buy land in their home areas for security. Migration interacts with other factors also, that are associated with globalization that generates structural transformation in rural areas through privatization of land, creation of infrastructural projects like dams, easy access to credit etc. which results into diversification of land use and new farm crops. Booth et al. (2007) determined how the agricultural land's use change among the non –migrant and migrant's families in El Salvador, Guatemala, Nicaragua and Costa Rica by using combination of beta regression techniques, poison and multivariate logistic technique because the data was longitudinal, cross-sectional and binary all. The data used was collected by LAMP between the years 2000-2007.They conclude that with increased remittances, small farm holders tend to invest in land purchasing, increase their pasture landholding and row crop. Remitted money does not translate into more farm sales, intensification and transition to cattle ranching, and this is opposite to what New Economics of Labor Migration theory says. So their main goal is to raise their investments in terms of achieving quantitative change instead of qualitative change. The existing expansive land demands that support low intensity cropping, land degradation and cattle precipitation are not doing well for the sustainability of rural landscapes. Increased migration rates did not lead to make huge changes in purchasing more mechanized and advanced agricultural equipment, more employment of labor and chemical soil amendments. Results showed that migration is positively related to no. cattle owned, but this livestock ownership weakened when employed robust standard error.

Ofuoku (2015) conducted research in Delta State, Nigeria to calculate the impact of rural-urban migration and remittances on arable agricultural production. Structured interview schedule and questionnaire were used for data collection. He concludes that remittances from rural- urban migration

are far less than rural farm households. As the remittances earned from rural-urban migration were not sufficient to make any meaningful contribution in agricultural production, this remitted money were added to rural farm household and farm input funds.

Glytsos (1993) use input output model to study direct and indirect effects of remittances in Greece in year 1971.in this paper, authors mention that some evidences show that since Remittance recipients are poor, they spend this income on basic goods and house maintenance, while some say that after receiving remittances, people prefer more leisure which may have negative effects on agricultural production. According to Nicholas, 0.4 % and 7.2 % of remittances are spent on (non-machinery) agriculture and purchase of land respectively in Greece. Florina is a farm country, with having 71.3% population living in rural areas and 64.4 % population is employed in agriculture. Not only the recipient households but whole population of Florina gets benefited from remittances.

Miluka et al. (2010) concludes in his study that Albanian families with migrant workers tend to work fewer hours in farms and agriculture production. Moreover, such families do not spend much on time saving and productivity enhancing farm technology.

Remittances are not always seen as a tool for development. Jahjah, Chami et al. (2003) has formulated a model of remittances showing that remittances are not meant for profit purposes. They are compensatory and thus have negative relation with GDP growth. Altruistically driven remittances are compensation for poor economic conditions and do not help in economic development.

This finding is questionable, because when a large number of households try to improve their poor economic conditions by using remitted money, this also contributes in economic development of the country overall.

Ang (2009) has done research in Albania and in his study he finds that remittances are capable of improving economic development at national level, but not at rural level. These findings are also questionable, because remittances are received at individual and household levels, which means that they will have immediate effect on the households and then they have overall impact on the national level. Remittance receiving households who reside in rural areas are supposed to be affected first which will contribute in rural development.

2.1. New Economics of Labor Migration theory (NELM):

According to Taylor (1999), the range of impacts of migration- remittances is between the two extremes. Each of these extremes have their own assumptions regarding what leads to migration and how remittances gained from the migration affect the migrant sending households. The first extreme is known as the developmentalist extremes, which is related to New Economics of labor Migration Theory. The theory argues that the decision of sending migrants is not an individual but a family strategy to raise their income, reduce financial constraints and to invest in productive activities. Remittances gained by the migration process leads to development by easing investment and production constraints which are faced by the poor families of developing countries.

Taylor et al. (1999) used 787 rural household survey data of 31 villages of north east china in the year 1995, which had detailed information of their agricultural production, non-farm income and wealth. Out of 787 Households, 134 HHs at least one family member is included in migrant labor force, and 97 such households receive remittances. Using NELM (New economics of labor migration) and then estimating effects of Migration and Remittances on Income Sources using Iterated 3SLS ,results reveal that overall migration has a slightly negative affect on maize yields in northeast china, as people move

out from agricultural sector, thereby reducing human capital from agriculture, which ultimately negatively affects self-employed agriculture, at least for short run, but such loss is compensated through the remittances received from the migrant labors as remittance is a positive function of migration. Econometric results reveal that 1 additional Yuan remitted leads to 2.02 Yuan increase in farm income. As people migrate, they change their crop mixes and activities. Migrated people act as financial intermediaries and help rural households to overcome their credit issues. They also help in making a transition from familial production to commercial production of yields.

Rozelle et al. (2003) derived similar results as Rozelle, Taylor et al. (1999) that migration reduces household's agricultural production and then remittances offset the negative impact to some extent. Remittances directly lead to increased income levels and indirectly stimulate agricultural productivity. Remittances remove constraints on agricultural production in imperfect markets in village areas.

The above literature review provides a deeper understanding of the impact of remittances on agricultural productivity. Most of the literature is in support of the idea that remittances have positive impact on agricultural productivity, in the presence of other factors as well such as level of education, facilities, legal system, economic status, amount of remittances received. One the other hand there are also some researches that claim the opposite.

2.2. Research gap:

As explained, previous researches have investigated the impact of remittances on poverty and consumption patterns of the migrant sending country. Very limited research has been done on the impact of remittances on the agricultural sector of the migrant sender country. Unfortunately, no research has been found on the capability of remittances and if they cater the agriculture needs of Pakistan. This research project therefore seeks to take the opportunity to test the applicability of New Economic Labor

Migration theory to remittance led agricultural change and to empirically investigate the impact of remittances on agricultural productivity of Pakistan.

3. Methodology

Quantitative analysis is performed to find the impact of remittances on agricultural productivity of Pakistan.

New Economics of Labor Migration theory is tested to find the linkages existing between migration, remittances and agricultural productivity.

3.1. Research Design:

The research design of this study is descriptive.

3.2. Research method:

The model is tested using three-stage least square regression model (3sls).

3.3. Data and Variables:

Data used in the research are taken from Pakistan Panel Household survey data (2010). New Economics of Labor Migration framework has been employed. For agricultural productivity, data of wheat crop has been taken which is grown seasonally. The number of observations selected for the research is 1009, which is taken according to the data availability from PPHS. The sample data includes all the migrants and non-migrants households cultivating wheat crop.

The independent variables for regression have been selected on the basis of data availability and previous tests of New Economics of Labor Migration hypothesis. The key independent variables selected for regression equations include number of migrants and remittances. Remittances are taken in Rupees received by each household. Number of migrants are the number of individuals who have migrated from

each household. According to Jockish (2002), farm productivity is directly proportional to the availability of household members. But, labor drain due to migration of household members can be compensated by remittances (Rozelle et al., 1999). So we expect positive sign on remittances ad negative sign on migrants.

Another set of independent variables include demographic characteristics and human capital of each household. Farm size and household size are chosen in order to control land availability per individual. Farm size is taken in hectares. For human capital characteristics, evidence shows that education of household head positively effects farm productivity (Jamison and Lau, 1986). Education of the household head also affects migration decision of the family. Age of the household head is another important factor in crop productivity. So, it can be expected that higher level of education and younger family heads leads to higher farm productivity.

A control variable is also included i.e. number of elderly people in a household. Number of elders in a household are also important as they look after the children at home and their decisions are preferred in a household. The age selected for elders is 60 and above. The dummies for Punjab, Sindh and Khyber Pakhtunkhwa are included in the model, whereas Balochistan is selected as reference base. Yield is taken as key dependent variable in the model reflects output per unit area of land. Yield is measured in kg per hectare.

3.4. Theoretical Framework:

New Economics of Labor Migration Theory

Porumbescu (2015) describes that, to induce remittance flows, migration has to be performed. De Haas (2010) explains that the New Economics of Labor Migration theory arose as a critical response to the concepts of neo- classical migration theory during the decades of 1980's and 90's, as neo- classical

models were too rigid to deal with complex development and migration linkages, and also ignore the constraints. Remittances, which is one of the key factors of migration was completely ignored in neo-classical models. According to Stark (1991), in order to explain the decision of becoming a migrant, wider social entities should be taken into account, instead of analyzing it on individual level. One of these social entities is labelled as Household. The too rigid to deal with complex development and migration linkages, and also ignore the constraints. Remittances, which is one of the key factors of migration was completely ignored in neo-classical models. According to Stark (1991), in order to explain the decision of becoming a migrant, wider social entities should be taken into account, instead of analyzing it on individual level. One of these social entities is labelled as Household. The New Economics of Labor Migration theory represents the idea that the decision of performing migration and immigration is not an individual but a household decision. According to Mendola (2008), the migrant belongs to a rural extended family, who sends its members to other places for employment purpose, in order to earn capital and find new investment opportunities for their family farm.

Their aim is to maximize their incomes and overcome risk and limitations thorough diversifying the resources. Thus, Mendola (2008) states that New Economics of Labor Migration stresses on the insurance purposes for migration. According to Taylor, Rozelle et al. (2003), New Economics of Labor Migration hypothesis states that remittances reduces the constraints on production in imperfect market conditions characterizing less developed countries rural areas. These markets in developing areas are either weakly developed or un-elite groups are unable to access them due to the constraints. Remittances received from migration helps such groups to overcome market constraints that they face, by enable these groups to make investments in productive activities. New Economics of Labor Migration theory also implies that contribution of migration in development is not connected to return migration, rather both permanent and temporary migrants contribute in the developing factor through the remittances they send. According

to Taylor (1996), previous theories failed to consider the indirect and complex linkages between migration and remittances, and the way they influence the economic conditions of household, which is why prior researchers were pessimistic about the power of migration and the development aspects attached to it.

This theory further explains how loss of labor due to migration, capital accumulation and potential adoption of different and new procedures of practicing agriculture may influence how farmers continue to manage their agricultural lands.

Thus framework has been employed as a theoretical framework, as it traces links among migration, remittances and agricultural productivity of Pakistan.

3.5. Empirical model:

According to New Economics of Labor Migration theory, the decision of migration is not taken individually but a household level, in order to achieve certain goals. Income Maximizing households allocate their resources in more productive activities. The allocations depend on some characteristics such as household size, farm size, and other related characteristics. Some families do face liquidity constraints on making investments in high productivity technology such as high quality fertilizers and seeds. These constraints are tackled can be tackled through remittances which are induced by migration, whose decision is taken by the family by considering multiple factors in account.

The major relationships that are estimated in this research project involve three equations.

Suppose a family's crop yield, labelled as Y, is a function of remittances (R), migration (M) and Household characteristics labeled as X_Y, then equation (1) would be

$$Y = \beta_\circ + \beta_1 M + \beta_2 R + \beta_3 X_Y + \varepsilon_Y \ldots\ldots\ldots (1)$$

According to New Economics of Labor Migration theory, constraint that limits the amount of fixed resource and can be allocated to any other higher return productive good, is a function of remittances and migration (Taylor, 2003). Migration decreases the number of labor indulged in farm activity, while remittances increases the amount of capital for production purpose. The null hypothesis states that migration and remittances, both do not affect productivity, that is β_1, β_2 =0 in each system.

Remittances are the function of migration (M), because remittances are produced by the migrated household members and farm size:

$$R = \delta_\circ + \delta_1 M + \delta_2 farmsize + \varepsilon_R \ldots\ldots\ldots\ldots\ldots (2)$$

As stated in New Economics of Labor Migration theory, Migration decision is a household decision which is taken by a household by considering different factors. So, the role of migration is very important here. Migration equation is analyzed separately by considering the factors inducing or affecting it. Migration equation is also estimated in order to remove the endogeneity problem.

Migration is a function of household size (HH size) and the individual level characteristic i.e. education level of household head (hedu) and age of head (headA). Migration in reduced form is represented as

$$M = \alpha_\circ + \alpha_1 HHsize + \alpha_2 hedu + \alpha_3 headA + \alpha_4 farmsize + \varepsilon_M \ldots\ldots\ldots\ldots (3)$$

Equations (1) - (3) have a recursive system. In all three equation mentioned above, both migration and remittances are analyzed endogenously. Due to the endogeneity problem, Remittances and Migration have separate equations. Three instrumental variables are used in the model. The variable, human capital of migrated workers is calculated by multiplying migrated worker's accumulative experience (measured

in years) with their experience wage. Migration networks are correlated to both experience and wage. In both theoretical and empirical model, migration networks is considered as one of the most important variables that drive migration (Taylor et al., 2003). Second instrument variable is the number of current students who need to be supported in a household. This instrument variable is used to identify remittance equation in the model. Average migrant's education is taken as third instrument variable which explains migration and remittances. Selection bias is a common problem in migration studies, as not every household's farmer participates in migration and not every household receives remittances from the migrant member.

ϵy, ϵR and ϵM are the stochastic terms. These terms are assumed to be independently and normally distributed. However, as the exogenous variables may affect remittances and yield, all three disturbances are more likely to be correlated with each other. That is why, three- stage least square (3SLS) has been employed for model estimation to solve contemporaneous correlation among equations. Another reason behind using 3sls is, it also obtains instrumental variable estimates by taking in account covariance's across the equation disturbances also.

$$Y = \beta_\circ + \beta_1 M + \beta_2 R + \beta_3 X_Y + \varepsilon_Y \ldots\ldots\ldots (1)$$

$$R = \delta_\circ + \delta_1 M + \delta_2 farmsize + \varepsilon_R \ldots\ldots\ldots\ldots\ldots (2)$$

$$M = \alpha_\circ + \alpha_1 HHsize + \alpha_2 hedu + \alpha_3 headA + \alpha_4 farmsize + \varepsilon_M \ldots\ldots\ldots\ldots (3)$$

3.6. Variables:

Variable abbreviation	Variable
Y	Yield
R	Remittances
M	No. of Migrants
X_Y HHsize hedu headA farmsize eld	Household characteristics Household size Education of head Age of head Total farm size Number of elders
Std	Number of students in a household
Avgedu	Average education of migrants
EW	Experience-wage
LocP	Dummy variable for location Punjab
LocS	Dummy variable for location Sindh
LocK	Dummy variable for location KPK

3.7. Descriptive statistics

Variable	Observation	Mean	Std. Dev	min	Max
Yield	1002	2710.17	7563.7	0	158144
No. of Migrants	1009	0.392	0.960	0	9
Remittances	1009	2227.9	21273.3	0	360000
Age of head	1008	51.3	14.8	15	96
Education of head	1008	3.37	4.43	0	16
Number of elderly people	1009	0.69	0.785	0	3
Planted area	1009	2.13	3.23	0.05	44.7
Experience-wage	1004	3423343	8091492	0	109560000
Total number of students	1009	1.982	2.337	0	13
Farm size	984	49.7	1451.3	0	80.94
Household size	1009	8.76	4.64	1	43

4. Estimation results and discussion

In this chapter, the results of the study are discussed. Below it is discussed how migration and remittances and other independent variables effect the wheat productivity of households.

Table 1: Variables in Equation (1)

Effect of independent variables on Yield

Variables	Coefficient	Std.Error	z-statistic	Prob.
Remittances	0.5790	0.2733	2.12	0.034
No. of migrants	-2323.095	1277.1	-1.82	0.07
Household size	77.835	104.30	0.75	0.45
Farm size	0.169	0.181	0.93	0.35
Number of elderly people	-72.36	342.64	-0.21	0.833
Age of head	-43.96	25.41	-1.73	0.084
education of head	-218.9	149.01	-1.47	0.142
Punjab	2275.09	1169.3	-1.95	0.052
Sindh	-1743.1	1149.5	-1.51	0.13
KPK	-213.3	1408.0	-0.15	0.88

Table 2: Variables in Equation (2)

Effect of independent variables on remittances

Variables	Coefficient	Std.Error	z-statistic	Prob.
No. of Migrants	2233.4	6400.4	0.35	0.72
Farm size	-0.275	0.513	-0.54	0.59
Punjab	2241.3	4137.5	0.54	0.58
Sindh	-296.6	3153.0	-0.09	0.78
KPK	-937.2	3455.7	-0.27	0.78
Experience - wage	2324.01	128.2	1.9	0.07
Average education of migrants	715.38	1316.5	0.54	0.58
Total number of students	248.9	329.3	0.76	0.45

Table 3: Variables in Equation (3)

Effect of independent variables on number of migrants

Variables	Coefficient	Std.Error	z-statistic	Prob.
Household size	0.01	0.007	1.48	0.09
Head education	0.014	0.0064	-2.29	0.02
Farm size	0.000	0.000	1.84	0.06
Age of head	-0.000	0.001	-0.44	0.660
Punjab	0.500	0.1200	4.17	0.000
Sindh	0.110	0.123	0.89	0.372
KPK	0.117	0.136	0.86	0.388
Experience - wage	-3.07	3.51	-0.87	0.38
Average education of migrants	0.207	0.014	14.74	0.000
Total number of students	0.013	0.014	0.95	0.342

	Dependent variables					
Independent variables	No. of migrants	Remittances	Yield	No. of migrants	Remittances	Yield
Migration effects						
Number of migrants		2233.4(6400.4)	-2323.0(1277.1) ***		-991.0(5313.2)	-4927.2(2189) **
Remittances			0.57(0.27) **			1.17(0.51) **
Human capital and household character tics						
Household size	0.01(0.007) ***		77.8(104.3)	0.013(0.008)		-74.1(207.8)
Farm size	0.000(0.000) ***	-0.27(0.51)	0.16(0.18)	0.000(0.000) ***	-0.17(0.54)	0.48(0.317)
Number of elderly people			-72.36(342.6)			-165.9(468.9)
Age of head	-0.014(0.001)		-43.96(25.4) ***	-0.002(0.002)		-88.0(49.7)
Education of head	0.00(0.006) **		-218.9(149.0)	-0.019(0.007)		-549.6(318.2)
Fertilizer						0.003(0.006)
Chemical						-0.04(0.052)
Labor						5.52(3.67)
Dummy variables and instrumental variables:						
Punjab	0.500(0.12) *	2241.3(4137.5)	2275.09(1169.3) ***	0.568(0.133) *	4355.9(5313.2)	-3142.8(1843.8) ***
Sindh	0.110(0.12)	-296.6(3153.0)	-17.43(1149.5)	0.076(0.140)	4355.9(4453.9)	-1642.8(1742.9)
KPK	0.117(0.13)	-937.2(3455.7)	-213.3(1408.0)	0.148(0.149)	-844.4(3985.2)	1125.7(2356.5)
Experience- Wage	-3.07(3.51)	2324(128.2) ***		-2.81(4.60)	2135(138.3) ***	
Avg education of migrants	0.207(0.01) *	715.3(1316.5)		0.206(0.016) *	1328.3(1120.5)	
Total number of students	0.013(0.14)	0.013(0.45)		0.008(0.016)	425.3(338.09)	

Significant at 1%*, 5% and 10%*****

Table 4: Estimation of migration and remittances on wheat productivity

4.1 Results interpretation

The results reveal that all estimators perform well. Most of the results, especially results of dependent variables came out as expected. Yield decreases as number of number of migrants in a household increases, while remittances are shown to have positive correlation with yield.

- **Yield and migration:**

Yield and migration are negatively correlated to each other. 1 person increase in migrants will decrease yield by 2323.09 kg/ha. In short run, loss of labor from agriculture intensifies labor shortage, which leads to have negative impact on the agriculture (Li et al., 2013).

- **Remittances and yield:**

Remittances have significant impact on yield of wheat production. Result reveal that 1 rupee increase in remittance would raise output by 0.579 units. Loss of agricultural productivity that can be caused due to the migration of labor in a household is offset by the amount of remittances received from the migrant members (Li et al., 2013). Remittances directly lead to increased income levels and indirectly stimulate agricultural productivity. Remittances remove constraints on agricultural production in imperfect markets in village areas (Quinn, 2009)

- **Head education and yield**:

Results show that household's head education and yield are insignificant to each other. According to a research conducted in Tamil Nadu rice farms, India, formal education is not a significant factor of agricultural productivity, rather informal education and experience are significant with productivity (Kalirajan and Shand, 1985)

• Elderly people and yield:

Results show that productivity and number of elders present in a household are insignificant to each other. Better technology and skilled farmer positively impacts overall yield (Assuncao and Ghatak, 2003). Thus, number of elderly people in a household does not matter, number of skilled farmers in a household matter, who re able to work in farms.

• Age of head and yield:

Age of head and yield in the results are significant. 1 year increase in age of head of household decreases yield by 43.96 units. Humans' makes mistakes, however, the chances of making errors by older elders are higher. Half of the population aged between 80 and 89 are diagnosed with cognitive impairment (Agarwal et al. 2009). Thus, due to the limited ability of making efficient decisions, and ineffective allocation of resources leads to reduction in productivity rates.

• Farm size and yield:

Results show that farm size and yield are insignificant to each other. The relationship between farm size and productivity (negative or positive) only occurs when the performance of hired labor is supervised by the family members, and the availability of loan is dependable on land owned, otherwise, under no supervision model, the relationship between farm size and productivity does not hold (Feder, 1985).

• **Household size and yield:**

Results reveal that household size and yield are insignificant to each other. Better technology and skilled farmer positively impacts overall yield (Assuncao and Ghatak, 2003). Thus, household size does not matter, number of skilled farmers in a household matter.

- **Number of migrants and remittances**:

Remittances and migrants are statistically insignificant in the results. Due to the high living cost and high expenditures, migrants usually do not remit. Also, when the large number of individuals from a household migrate, less number of individuals left behind, and thus there is less financial constraint (Cortina and Ochoa-Reza, 2008). There is a term called, ´lifestyle migration which is performed by the individuals who think that there are better life style opportunities available elsewhere. Thus, there motto is not to send remittances, but to have better life there. (Benson and O'reilly, 2009).

- **Total farm size and remittances:**

Results show that relationship between farm size and remittances is insignificant. In China, examining the surplus labors shows, that there are a lot of labors who are unemployed. So, it is suggested by the government to move out from crop farming to non- agricultural work. Many of the rural areas are poorly endowed with occupation other than agricultural, so the surplus migrate, which provides benefits to both host and sender areas (Banister et al.,1989). Poverty has been reduced significantly in Sub-Sahara Africa and Latin America through remittances with heterogeneous effects (Ratha, 2007). So, migration is done for other purposes, major one is to gain remittances and reduce financial constraints and has nothing to do with the farm size of the household.

- **Total number of students and remittances:**

The result reveal that remittances and number of students present in a household are insignificant to each other. Research conducted in Tajikistan shows that there are no evidences found that the remittances are used for productive purposes. Remittances are just considered as a short term coping strategy for the poor households which helps in attaining basic level of consumption (Clément,

2011). Thus, for poor households, the main purpose of migration and remittances is to decrease poverty and increase poverty level, and have no relation with the number of students in a household. Also, according to Mendola (2008), the migrant belongs to a rural extended family, who sends its members to other places for employment purpose, in order to earn capital and find new investment opportunities for their family farm. So, this can be interpreted that students are not able to earn or migrate so this variable has no relation with remittances.

- **Experience- wage and remittances:**

According to the results, experience wage and remittances are positively correlated with each other. 1 unit increase in experience wage leads to 2324 rupees increase in remittances. Education and experience has positive influence on entrepreneurship (Robinson and Sexton, 1994). There is a strong relationship between experience and relative salaries (Medoff and Abraham, 1980). Higher wages leads to higher remittances (Stark, 1991).

- **Migrant's education and remittances:**

Education and experience has positive influence on entrepreneurship (Robinson and Sexton, 1994). Due to the development of industrial sector and technological advancements, the importance of education has increased as a determinant of productivity of labor, and thus , of wage determination (Meng, X., 1995)and higher wages leads to higher remittances (Stark,1991).On the other hand, due to brain drain caused by migration, flow of remittances can also become low (Faini, 2006). These counter arguments show that flow of remittances can depend on other factors and does not have strong relationship between education of migrants and remittances. Another study proves that skilled labor remit less (Niimi at al. 2010). This points to the fact skilled and unskilled are more prominent in affecting remittances, rather than education level of migrants.

- **Household size and migration:**

Result shows that household size and migration are significant to each other. One individual increase in Household size will increase migration by 0.01 units. Migration decision is not an individual but an overall family decision. According to Mendola (2008), the migrant belongs to a rural extended family, who sends its members to other places for employment purpose, in order to earn capital and find new investment opportunities for their family farm. Their aim is to maximize their incomes and overcome risk and limitations thorough diversifying the resources. Thus, Mendola (2008) states that New Economics of Labor Migration stresses on the insurance purposes for migration. This shows that migration is done considering the financial constraint, and increase in household size will put more pressure on financial constraint, so there will be more migration

- **Age of head and migrants:**

Results show that the relation between age of head and migration is insignificant. Most of the major decisions such as migration and financial decisions are taken by the household heads. (Kim et al., 2017). This is irrespective of age of the head, which is why no correlation exists between age of head and number of migrants

- **Head education and migrants:**

The results show that education of head and migration are positively correlated with each other. 1 level increase in household head education increases number of migrants by 0.014 person. Education of households' head is one of the important household characteristic. Migration is not an individual decision but a household decision. It is basically about making a strategic choice of sending best member appropriate for the migration purpose (Azam et al., 2006). Most of the major decisions such as migration and financial decisions are taken by the household heads (Kim

et al., 2017). Education enhances decision making abilities and leads to making more effective decisions (Huffman and W.E., 1974). Thus, the important decision of sending migrants is positively related to the education level of the head of the household (Rozelle et al., 1999).

• Farm size and migration:

The relationship between farm size and number of migrants is significant. 1 hectare increase in farm size will increase migration by 0.00003 units. According to Mendola (2008), the migrant belongs to a rural extended family, who sends its members to other places for employment purpose, in order to earn capital and find new investment opportunities for their family farm. One of the factors influencing decision of migration is the opportunity cost. If the need is to invest in more agricultural technology than labor work, the members are sent to other areas for earning. As the farm size increases, demand for resources such as agricultural machinery and fertilizers will increase, so more migration will take place.

• **Migrants education and migration:**

Results reveal that education of migrants and migration are highly significant to each other. 1 level increase in education, increases migration by 0.20 units. Job search by an individual and the search of workers by employers are affected by education and age of the worker (Schwartz,1976).

• Number of students and migration:

According to the results, number of students in a family and migration are insignificant to each other. According to Mendola (2008), the migrant belongs to a rural extended family, who sends its members to other places for employment purpose, in order to earn capital and find new investment opportunities for their family farm. Their aim is to maximize their incomes and

overcome risk and limitations thorough diversifying the resources. Thus, the decision of migration is irrelevant to the number of students present in a family, and is dependent on number of available people for migration.

• Dummy variables and dependent variables:

Punjab, Sindh and KPK are taken as dummy variables while Balochistan is considered as reference base. The results show that only Punjab is significant with number of migration and yield. Punjab experience higher migration rates than Balochistan, which is set as a reference base. In the case of wheat yield, Punjab performs better in terms of productivity than Balochistan.

• Control variables:

Another regression was run by adding three control variables in the model.

$$Y = \beta_\circ + \beta_1 M + \beta_2 R + \beta_3 X_Y + \beta_4 chem + \beta_5 lab + \beta_6 fer + \varepsilon_Y \ldots\ldots\ldots (1)$$

$$R = \delta_\circ + \delta_1 M + \delta_2 farmsize + \varepsilon_R \ldots\ldots\ldots\ldots\ldots (2)$$

$$M = \alpha_\circ + \alpha_1 HHsize + \alpha_2 hedu + \alpha_3 headA + \alpha_4 farmsize + \varepsilon_M \ldots\ldots\ldots (3)$$

'Lab' represents total number of labor employed for various agricultural activities. Labor is expressed in person-day worked. Fertilizer and chemical are measured by cost of total fertilizers and chemicals used in the production of crop. The results show, that the overall results of the model remains the same with slight change in values, however, these variables are insignificant to migration and remittances.

5. Conclusion

It is a challenging task to understand the source of farm productivity in developing countries. This study takes data of Pakistan from PPHS 2010 to understand the impact of migration and remittances on agricultural productivity. The study has focused on the relationship among labor withdrawal from agriculture, remittances and farm productivity to understand the impact of migration on wheat yield. Thus the main objectives of the study were to determine the extent to which New Economics of Labor Migration theory explains the role of remittances on agricultural productivity of Pakistan and weather the remittances received are reinvested in agriculture or not. New Economics of Labor Migration theory is taken as analytical framework. The model is tested by using three-stage least square regression model (3sls). The results derived supports New Economics of Labor Migration theory and consistent with the findings of Taylor et al.(1999, 2003), which explains that migration leads to labor shortage in agriculture , however, remittances compensate the loss occurred due to labor migration that improves productivity, which means that the remittances are reinvested in agriculture.

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