The Impact of Remittances on Household Food Security: A Micro Perspective from Tigray, Ethiopia

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Abstract

While the volume of remittances to developing countries has been growing significantly over the years, the impact of remittances on food security has not received much attention. To bridge the gap this paper has examined the impact of remittances on farm household's food security status, using a sample of 301 farm households from two livelihood zones of the Tigray Regional State of Ethiopia. The average treatment effect (ATT) results show that households with access to remittance have significantly lower Coping Strategy index (CSI), Reduced Coping Strategy index (rCSI) and Household Food Insecurity Access Scale (HFIAS) on average as compared to households without remittance income. However, there is no significant difference in the ATT effect of remittances on Food Consumption Score (FCS) between treated and control households. These findings suggest that remittances lower the frequency and the severity of coping strategies and households with remittances have lower anxiety about not being able to procure sufficient food, higher ability to secure adequate quality food, and lower experience of insufficient quantity of food intake than those without remittance. Thus it is imperative to include migration and remittances as important components of food security programs and food security policies in Ethiopia and should go beyond just food production measures, and include measures that help in generating adequate levels of effective demand via income growth or transfers policies

Key Words: **Remittance, Coping Strategy, Food Insecurity Access Scale, PSM, Ethiopia**

1. INTRODUCTION

The inflow of remittances in developing countries (DCs) has increased dramatically since 1990s, increasing from US$ 325 billion in 2010, and has emerged as a most important source of private capital flows for dozens of these countries(World Bank, 2011). Ethiopia has experienced a similar trend. For example the World Bank ranks Ethiopia to be the 8th largest remittance receiver in sub-Saharan Africa in 2010, with an inflow of remittances reaching 387 million USD, to be compared with net Foreign Direct Investment inflows of 100 million USD and net Overseas Development Assistance (ODI) at 3.3 billion USD (World Bank, 2011). Not surprisingly, the potential impact of those flows on economic development has also generated considerable interest, both among academics and policy makers.

At the academic level, a number of recent works have explored the impact of remittances on poverty utilizing household consumption and expenditure surveys (HCES) for tracking the impact of remittances on poverty in developing countries (Adams and Page, 2005; Paga and Plaza, 2005; Gupta et al., 2009), but this kind of measure is not typically used for rapid assessments in a dynamic contexts as the data are only updated every few years (Maxwell et al., 2013). For example , if remittances help to temporarily smooth consumption and incomes , their poverty impacts may be better captured through an explicit focus on this temporarily as part of poverty or food security measure, instead of restricting to annualized income or consumption (in which case temporary contributions do not always feature as significant). This suggests that there is still a need to increase

our understanding about the specific roles of remittances for different strategies in different contexts. Interestingly, with the exception of Babtunde & Martinetti, (2010); Jimenez, (2009); INSTRAW, (2008); Quartey and Blankson, (2004); and Durand et al., (1996) there is no study to our knowledge that subjects to critical empirical scrutiny. Moreover, with the exception of Babtunde & Martinetti, (2010) all of them are confined to issues of household food expenditure or calorie availability. This relative importance of rapid, accurate and cross-contextual indicators of food security and the relative dearth of attention given to it by researchers and policy makers alike raise the possibility of significant untapped potential for improved role of remittances in developing countries, and a significant impact for high quality research that tackles the topic. Many critical questions remain: For example, what connection, if any, is there between remittances and food security indicators? Do remittances improve household food security? What are the characteristics of households receiving remittances?   Answering these and other questions can enable us to develop recommendations that maximize the potential role of remittances in countries where there is pervasive poverty and food insecurity.

In fact, Babatunde and Martinetti (2010) in their study of Nigeria used an instrumental variables (IV) approach to investigate the impact of remittances on food security. Their results show that that remittance income has a positive and significant effect on calorie, but has no effect on dietary quality, micro nutrient and child nutritional status. However, a major limitation of the IV approach is the difficulty in defining instruments in the estimation. In addition the IV procedure tend impose a linear functional form assumption, implying that the coefficients on the control variables are similar for treated (remittance

households) and control (non-remittance) groups. However, this assumption may not hold, since the coefficients could differ (Jalan and Ravallion, 2003)

Thus by explicitly focusing on food security indicators , this study contributes to the existing literature by empirically examining whether remittances are really contributing to different measures of food security such as (1) Coping Strategy Index (CSI); (2) Reduced Coping Strategies index (rCSI); (3) Household Food insecurity and Access Scale (HFIAS); and (4) Food Consumption Score(FCS) in two livelihood zones of Tigray regional state of Ethiopia based on household survey data collected by the authors as part of a SIDA funded project , livelihood changes overtime during 2011-2013

We employ the propensity score matching (PSM) method to control for self − selection that normally arises when remittance –recipient households are not randomly assigned. By explicitly considering the causal relationship between remittances and cross-contextual indicators of food security, this paper seeks to address counterfactual questions that may be significant in predicting the impacts of policy changes and framing our understanding of the potential for remittances to offer potential pathways out of food insecurity.

The remainder of the paper is organized as follows: Section 2 provides review of related literature on remittances, poverty and food security. Section 3 discusses an over-view of remittances in Ethiopia. Section 4 presents the data used in the empirical analysis. Section 5 outlines the empirical procedure. Section 6 discusses the empirical results, while the final section provides concluding remarks

2. Review of Literature on Remittances, Poverty and Food Security

The impact of remittances on poverty and income distribution is developing countries has been extensively investigated since (see Adams, 1991; Stark et al., 1988) with mixed findings. While, it is agreed that migration and remittances reduce poverty the magnitude of poverty reduction varies on whether remittance is treated as "potential substitute" or "exogenous transfer". Considering remittance as "potential substitute", Brown and Jimenz (2008) for Tonga and Fiji argued that remittances had large impact in reducing poverty. However, the impact was smaller when they considered remittance as an "exogenous transfer". In the same way Zhu and Luo (2010) for Hubei province of China and Barham and Boucher (1998) for Nicaragua use remittance as a potential substitute to assess the impact of remittance on poverty and income distribution.

With regard, to the impact of remittance on food security, a few empirical studies have looked into related linkages, but all of them are confined to issues of household food expenditure or calorie availability (Jimenez, 2009; INSTRAW, 2008; Quartey and Blankson, 2004; and Durand et al, 1996) and dietary quality, micronutrient consumption, and nutritional outcomes (Babatunde and Martinetti, 2010).

INSTRAW (2008) , in a study on gender , remittances and development in the Philippines found that remittances contribute to the improvement in the food security of receiving households in addition to a significant change in food consumption patterns. Jimenez (2009) conducted a comparative analysis between remittance-receiving households and non-receiving households in Tlapanala village of Mexico. Results of his analysis show that the consumption patterns do not differ significantly, but food consumption expenditures were higher in remittance –receiving households. In the same

way Quartey and Blankson (2004) in their study of Ghana found evidence of increased food consumption among remittance – receiving households.

3. Overview of Migration and Remittances in Ethiopia

A noticeable degree of out-migration in Ethiopia started since in the 1970s following the revolution and political unrests afterwards. During the early days, migration was limited to the urban elite, especially the young and educated, who for political reasons sought refuge in Western countries. Gradually, however, migration has become an aspiration of most urban people, mainly for economic reasons. After the mid 1980s, even rural peasants began flocking to the Middle East and the Gulf region in search of jobs and better pay. Currently, over two million Ethiopian's are believed to reside abroad (Aredo, 2005). According to the World Bank's Migration and Remittances Fact book (2011), the top emigration destination countries for Ethiopians are Sudan, USA, Israel, Djibouti, Kenya, Saudi Arabia, Canada, Germany, Italy, and Sweden(World Bank, 2011).

Despite its large migrant population, Ethiopia has not fully tapped its potential and data on remittance flows is highly problematic (Geda et al., 2011). However, the World Bank ranks Ethiopia to be the 8th largest remittance receiver in Sub-Saharan Africa in 2010, with an inflow of remittances reaching 387 million USD, to be compared with net Foreign Direct Investment inflows of 100 million USD (World Bank, 2011).

In addition to international migration, Ethiopia also experiences one of the highest levels of internal migration and population distribution in Africa (RESAL, 1999) which is also a big source of remittance. Ethiopia's internal migration is largely an individual or family response to adverse socio-economic, physical and political environment as well as direct

government policy. In this context, the character, direction and volume of migration in Ethiopia in the last three decades have been shaped by political instability, decline or stagnation in the growth of the agricultural sector and government resettlement programs of the 1980s to tackle famine and attain food security (Mebru , 2006). An important aspect of Ethiopian internal migration is its association with urbanization and shortage of land especially for newly married young people as there was no land re-distribution since 1991.

Despite the large and increasing flow remittances internal and international , very little is known about the impact that these remittances might have on the households and the country's economy as a whole (Andersson, 2011). In fact few case studies such as Anderson (2011) and Aredo (2005) examined the impact of remittances on poverty , but to our knowledge there is no study that tries to investigate the impact of remittances on food security.

4. DATA DESCRIPTION

The data for this paper come from the Livelihoods Change Over Time (LCOT) four-round panel survey conducted in two districts (woredas) of northern Ethiopia between August 2011 and February 2013 in collaboration with World Vision, a research partnership (funded by the Swedish International Development Agency (SIDA) between the Feinstein International Center and researchers at the College of Dryland Agriculture and Natural Resources, Mekelle University in Tigray). The overall objective of the LCOT panel survey is to assess household resilience in the face of an annually recurring shock: the "hunger season."(for the details see Maxwell et al., 2013 and Vatila et al., 2012)

The survey sample was stratified to represent the livelihood- and food-security related variables of two woredas: Tsaeda Amba (Eastern Tigray) and Seharti Samre (Southern Tigray). In each woreda, 150 households were selected, 75 from each of two kebeles (sub-district units). The sub-kebele (i.e., village- or kushet-level) sampling units were obtained by systematic selection with a random start. The probability of each sampling unit being selected was proportional to the village's size. Within the village, sampling of households was done by random selection of transects.

<<INSERT MAP OF THE STUDY AREA>>

Each survey round not only gathers information on the situation prevailing at the time, but also asks retrospective questions about household decisions and experiences over the six-month period to the survey (i.e., since the last survey round) and , in the case of the food security measures, over the one month preceding the survey.

5. Empirical Procedure

One of the main challenges when estimating the causal effects of remittances on household food security measures is self-selection. There might be unobservable characteristics that affect both the probability that the household receives remittances (and migrates) and the outcome of interest. If selection into sending remittances is not a random decision, analysis of the effect of remittances on household food security will give biased estimates unless the problem of self selection is addressed.

Previous studies has used a number of approaches to address selectivity into migration and remittance sending, including assuming selection on observables (e.g.Admas, 1989), parametric selection correction models (e.g. Barham and Butcher, 1998), instrumental variables (e.g.Mansuri, 2006; McKenzie and Rapport, 2010), and propensity score

matching (Esquivel and Huuerta, 2007; Cox-Edwards et al., 2009). In this paper the last method is applied.

Propensity score matching is often used in a program evaluation setting, where the objective is to compare participant outcome with and without treatment. The method was first proposed as away to reduce bias in estimation of treatment effects with observational data in the seminal work by Rosenbaum and Rubin (1983), and has become popular method to measure the impact of economic policy interventions (Becker and Ichino, 2002). The idea is to first create an index that summarizes observable characteristics of the household into a propensity score index. The households are then divided into two groups, those who receive remittances and those who don't, and ranked according to their propensity score. Finally the households are matched with similar households from the other group. In this way households in the treatment group can be matched and compared with households from control group who have similar characteristics in every aspect except that they don't receive remittances.

In equation form, our goal is to estimate the causal treatment effect

$$\tau_i = Y_{i1} - Y_{i0} \qquad (1)$$

Where Y_{i1} and Y_{i0} is the outcome with and without treatment respectively for household i. Consider $D= \{0,1\}$ to be a binary indicator where 1 equals being assigned into treatment and 0 means not being assigned treatment. The *Average Treatment Effects* (ATE) can be estimated through:

$$\tau_{ATE} = E[Y_i|D_i = 1] - E[Y_i|D_i = 0] \qquad (2)$$

ATE is hence the average difference between the treated households (in our context treated households are households who receives remittances) and the non- treated

households. However, such comparison might not capture the true impact of the treatment if we have selection into treatment and there are other factors that are correlated with both treatment and some omitted variable that is affecting the outcome variable. A fundamental problem is that we can observe the outcome variable under either treatment or control for each household, but never both at the same time.

In this context, a preferred parameter to use instead of ATE is the *Average Treatment Effect on the Treated* (ATT), defined by:

$$ATT = E[Y^1|D = 1] - E[Y^0|D = 1] \qquad (3)$$

Where $E[Y^1|D = 1]$ is never observed. Replacing $E[Y^0|D = 1]$ by the expected value of $[Y^0|D = 0]$, which is observable in ATE, would not give an accurate estimate as long as Y^0 for the treated and comparison group systematically differs. The true parameter is only identified if:

$$E[Y^0|D = 1] - E[Y^0|D = 0] = 0 \qquad (4)$$

As discussed above, this is not very likely to hold in non-experimental studies. Instead we rely on a matching approach in order to derive a counterfactual that enables us to match treated households with non-treated households with similar characteristics as possible in order to reduce the bias from self-selection. The matching is made based on an index, *the propensity score,* summarizing the pre-treatment characteristics of each household. The propensity score is the probability of assignment into treatment,$p(x)$, conditional on a set of pre-treatment characteristics, X, so that

$$p(x) = \Pr[D = 1|X] = E[D|X] \qquad (5)$$

There are a few restrictions that should be fulfilled when implementing the propensity score procedure. The conditional independence assumption (CIA) requires that the outcome variable is independent of treatment conditional on the propensity score. The balancing property theorem tells us that two households with the same predicted probability of being treated (i.e. receive remittances in this case) and belonging to two different groups (treated and non-treated) differ when it comes to the error term in the propensity score equation. The error term is furthermore, approximately independent of the observed covariates. In other words, for balancing property to be satisfied households with the same propensity score must have the same distribution of observable and unobservable characterstics irrespective of treatment status. The balancing property can be tested using a covariate imbalance test. Common support implies that analysis is only carried out when there are sufficient data. Hence, there is no extrapolation outside the range of the observed data points. It is therefore advisable to impose a common support restriction when estimating the propensity score in order to improve the quality of matches.

The propensity score can be estimated using any discrete choice model using observable characteristics to reduce the bias that is attributable to unobservable factors. The extent to which the bias is reduced depends on the quality of the conditioning variables (Becker and Ichino, 2002). In addition previous studies have shown that matching methods provide reliable estimate of impact provided that (1) the same data source is used for participants and non-participants (in this case households that receive remittances and that did not), (2) treated and controls have access to the same markets, and (3) the data include meaningful variables capable of identifying program participation and outcomes

(Heckman et al., 1997).We believe that each of these criteria is satisfied in this study. All data come from 2011 household survey, with the samples of treated and controls drawn from the same tabia to assure comparability of markets and local context. In addition the diversity of variables we have chosen accomplishes this objective. Our observable characteristics include a rich set of household, community and village level characteristics. Household characteristics control for differences in endowments such as productive assets and serve as a proxy for household wealth, which is likely to influence household's receipt of remittance. We also include community level variables to take account of differences in economic opportunities available to households living in different communities. We add village level dummies to control for natural, political, and economic differences across villages. This specification is consistent with previous empirical literature on the determinants of remittance (see for example Aredo, 2005; Andersson, 2012; Bohra-Mishra, 2011)

Our interest is to in the causal average effect of migrant remittance on some outcome (food security indicators). Accordingly we calculate propensity scores using a standard probit (similar to the one described above) where the binary dependent variable represents the two alternatives that we want to compare i.e. households' receiving remittance and that did not. Next we match treated and controls with the same or similar propensity score (see Becker and Ichino (2002) for more details on the assumption behind estimation.

A number of matching algorithms have been suggested in the literature to match treated and control groups of similar propensity scores. The most widely employed algorithms include the nearest neighbors matching, calliper matching, and the kernel matching

methods. In the first, the nearest matching estimators with replacement, we compare a treated (households with remittance) and controls (non-remittance households) whose propensity scores are sufficiently close, by recognizing that it is impossible to obtain exact propensity scores for all pairings of treated and control households, and that a control household can be a best match for more than one treated household. In the second, we try Kernel matching. Rather than much one treated with one control, we can use several control, to act as the matches for a treated. The idea is to calculate the average propensity score from a neighborhood of propensity of several comparison members (non- remittance households), match this average propensity score to the propensity score of a treated (remittance households) and then proceed to obtain the average treatment effect in equation (3). We use kernel to test the robustness of the results. Finally, we take the difference in food security indicators between the matched treated and control groups and sum over all the differences between them.

5.1.Outcome Variables

Given the multidimensional nature of food security, practitioners and policy makers have long recognized the need a variety of means for measurement (Kennedy, 2002) Although there are different indicators of food security (food insecurity) which are well correlated , they tend to capture different elements of food insecurity. For example the coping strategy index (CSI) and the reduced coping strategy index (rCSI) tend to capture the element of quantity or sufficiency , the household food security access scale (HFIAS) captures a mix of sufficiency and physiological factors , while the food consumption score (FCS) capture quality , diversity and quantity as well (Vatilla et al., 2013).

Accordingly we used these different indicators as outcome variables to investigate the impact of remittances defined by the authors as follows.

Coping Strategies Index (CSI). The Coping Strategies Index, developed by Maxwell (1996), looks at the behaviors exercised by households in order to cope with a food deficit. Questions about eleven types of behaviors—ranging from changes in dietary patterns to alternative strategies for obtaining food—and their frequency are asked of households, and the resulting score ranges from 0 to 108. The index combines the frequency and severity of coping strategies, so the higher the index score, the more food insecure the household is.

Reduced Coping Strategies Index (rCSI). Like the CSI , the reduced coping strategy (rCSI) index also combines the frequency and severity of coping strategies , so the higher the index score, the more food insecure the household is

Household Food Insecurity and Access Scale (HFIAS). The HFIAS, developed by Coates et al (2007), focuses on three dimensions of food access: anxiety about not being able to procure sufficient food, the inability to secure adequate quality of food, and the experience of insufficient quantity of food intake. Nine questions about these topics are used to calculate a score ranging from 0 to 27, with higher scores indicating greater food insecurity.

Food Consumption Score (FCS). The Food Consumption Score is a measure of dietary diversity developed by the World Food Programme (Wiessman et al. 2008, WFP 2009). It asks about frequency of consumption over the past month for cereals and tubers, pulses, vegetables, fruit, meat and fish, milk, sugar, and oil. The scale ranges from 0 to 64, with 0–12 considered poor food consumption, 12.5–20 considered borderline food consumption, and scores above 20 considered adequate food consumption. (Note that, unlike HFIAS and CSI, higher FCS indicates improved food security.)

5.2. Independent Variables

The first step in the analysis is to estimate the probability of receiving remittances a function of individual and household characteristics. Table 2 presents the probit regression to determine which variables predict the probability of receiving remittances. The household level variables include literacy, dependency ratio family size, support network score, social participation score, aggregate impact of shocks, number of migrant household members, and value of productive asset owned, TLU and total planted land. Individual level variables include whether age and gender of the household head.

The probability of receiving remittances is expected to be positively correlated with the number of migrant households, since ability to send a remittance increases if there are more household members migrating to other area. Receiving remittance is also expected to increase with household size, since it means more members to support. Dependency ratio is expected to influence the probability of access to remittances in one or the other way. Households with relatively large number of dependents are often poor and resort to transfers. In this paper dependency ratio is arrived by taking the ratio of all household

members under the age of 15 and above the age of 64 (considered dependents) to all household members between ages 15 and 64.

Household head ship can influence the flows of remittance. Given the feminization of poverty has been taking place over years in Ethiopia, the probability of getting access to remittances is expected to be higher with female headed households as compared to conjugal households. The effect of age on access to remittance is accommodated by incorporating age of the household head. Although it is difficult to predict the effects of age on remittance transfers on apriori grounds, it may possible to expect that remittances are more accessible to elderly than young.

6. RESULT AND DISCUSSIONS

6.1. Descriptive Statistics Results

A table 1 presents the definitions and sample statistics of the variables used in the analysis. Also presented in the tables are differences in means of the variables used in the matching analyses along with their significance levels. The significance levels suggest that there are some differences between treated and controls with respect to household and outcome variables. With regards to the outcome variables, there appear to be statistically significant differences in household coping strategy index (CSI), reduced coping strategy index (rCSI), and household food insecurity access scale (HFIAS). There are also significant differences in family size, total planted land, and TLU between treated and control households.

<< INSERT TABLE 1 ABOUT HERE >>

The findings from this section that simply compare mean differences in the outcome variables and other household variables between treated (household that receive

remittance) and control groups (non-receivers of remittance) suggest that treated households are generally better off than control groups. Given that the comparisons of mean differences do not account for the effect of other characteristics of farm households, they may confound the impact of migrant remittances on food security status with the influence of other household characteristics. Multivariate approaches that account for selection bias arising from the fact that treated and control groups may be systematically different are essential in providing sound estimates of the impact of migrant remittance on food security indicators. The independent variables used in the probit regression models to predict the propensity scores were based on past research on determinants remittance transfers (Aredo, 2005; Andersson, 2012 ; Bohra-Mishra,2011)

6.2.The Propensity Score Estimation results

The propensity scores which were estimated with a probit model are reported in table 2. Propensity scores help as a device to balance observed distribution of covariates across the treated and untreated groups (Lee, 2008). A detailed interpretation of the propensity score estimates is not undertaken in this study. However, the results shown in table 2 indicate that most of the variables included in the estimators have the expected signs.

<< INSERT TABLE 2 ABOUT HERE >>

The density distribution of the propensity score for treated and control variables show a good overlap (see figure 1) suggesting that the common support condition is satisfied. The bottom half of the graph shows the propensity score distribution for the control (non-remittance households) , while the upper half refers to the treated (remittance households).

<< INSERT FIGURE 1 ABOUT HERE >>

Table 3 demonstrate how matching restricts the control sample in order to increase the similarity of the sub-sample of control cases that are directly compared with treated cases, in order to estimate the consequences of treatment. The same table also presents the balancing information for the propensity scores and for each covariate before and after matching. We used the standardized bias differences between treatment and control samples as a convenient way to quantify the bias between the treatment and control samples. In many cases we found that sample differences in the unmatched data significantly exceed those in the samples of the matched cases. The process of matching thus creates a high degree of covariate balance between the treatment (remittance households) and control groups (non-remittance households) that are used in the estimation procedure.

<< INSERT TABLE 3 ABOUT HERE >>

The imbalances between the treatment and control samples in terms of the propensity score had been more than 100% before matching as shown in table 3. This bias was significantly reduced to a level of 3.1% after matching. The same table also shows that before matching, several variables exhibit statistically significant differences, while after matching the covariates are balanced. The low pseudo R^2 and the insignificance likelihood ratio tests also support the hypothesis that both groups have the same distribution in covariates X after matching (see table 4). These results clearly show that the matching procedure is able to balance the characteristics in the treated (remittance households) and the matched comparison groups (non-remittance households). We therefore used these results to evaluate the impact of remittances among groups of households having similar observed characteristics. This allows us to compare food

security outcomes for treated (remittance households) with those a comparison group (non-remittance households) showing a common support.

6.3. The Average Treatment Effect (ATT)

The ATT results from table 4 below indicated that the differences in coping strategy index (CSI) between treated and control households is substantial, which is (5.79) and (5.35) for nearest neighbor and kernel matching respectively. Households with access to remittances have on average lower coping strategy index (CSI) than their non-remittance counterparts at 1% significance level. This suggests that households who have access to remittances are more food secure as shown by lower CSI than their non-remittance comparison group. In the same way, the differences in rCSI between remittance and non-remittance households was (2.23) and (1.89) for the nearest and kernel matching respectively and this differences is statistically significant at 5%. In general the frequency and the severity of coping strategies is high among non- remittance households

<< INSERT TABLE 4 ABOUT HERE >>

The ATT result for the outcome variable household food insecurity and access scale (HFIAS), a similar trend is reflected. Treated households (households with access to remittance) in the matched sample have lower HFIAS than their comparison (non-remittance) households. The difference between the two groups is (2.30) and (2.24) for nearest neighbor and kernel matching respectively. This again suggests that households with access remittance are better in terms of food access than non remittance households i.e.

households with remittance have lower anxiety about not being able to procure sufficient food, higher ability to secure adequate quality food, and lower experience of insufficient quantity of food intake than those without remittance. Again this difference in HFIAS between households with remittance and non-remittance households is significant at 5 % for both matching algorithms.

Finally, the ATT difference in FCS revealed that households with remittance have higher FCS than their non –remittance households. The difference in FCS between remittance households and non-remittance households was 5.76 and 4.44 for nearest and kernel matching methods respectively. However, this differences in FCS between treated and control groups are not statistically significant.

7. Conclusions and policy implications

This paper has examined the impact of remittances on farm household's food security status, using a sample of 301 farm households from two livelihood zones of the Tigray Regional State of Ethiopia. A propensity score matching model was employed to account for selection bias that normally occurs when unobservable factors influence both treatment and outcome variables such as the food security indicators.

Descriptive analysis of the sample data indicates that, compared to non-receiving households, remittances receiving households are better off in terms of mean total CIS, rCSI as well as HFIAS. Results of the propensity score matching also show that remittances exert a positive and statistically significant effect on household food security indicators i.e. households with access to remittance has lower CSI, rCSI and HFIAS as compared to households without remittance income. These findings are generally consistent with the widely held view remittance provides food security and poverty alleviation in rural areas of developing countries.

Our findings point to two policy recommendations. First, the positive impact of remittances on CSI, rCSI as well as HFIAS makes it imperative to include migration and remittances as important components of food security programmes in developing countries such as Ethiopia. Food security policies should go beyond just food production measures, and include measures that help in generating adequate levels of effective demand via income growth or transfers policies. In particular, in designing social security policies governments of developing countries such as Ethiopia should take into account the role played by remittance transfers in addressing food insecurity. It is also high time for governments to seriously consider the need for providing incentives to promote the flows of transfers among families. In particular poverty reduction strategy

papers such those Growth and Transformation Plan of the Ethiopian government should incorporate migration-cum-remittances into their program.

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Table1: Descriptive statistics for outcome variables, all samples and by remittance status

Variable definition	All Households (n= 300)	Remittance households (n= 53)	Non-Remittance households (n= 247)	T-value
Outcome Variables				
Coping Strategies index (CSI)	15.1(0.75)	11.6(1.32)	15.8(0.86)	0.033**
Reduced Coping Strategies index (rCSI)	8.10(0.39)	6.58(0.78)	8.42(0.44)	0.072*
Household Food Insecurity and Access Scale (HFIAS)	7.91(0.30)	6.57(0.67)	8.19(0.33)	0.038**
Food Consumption Score (FCS)	27.7(0.59)	28.9(1.19)	27.4(0.66)	0.325
Independent Variables				
Age of Household head in years	42.8(0.90)	45.1(2.50)	42.7(0.95)	0.229
Sex of Household Heads (=1 if male , 0, otherwise)	0.76(0.02)	0.69(0.06)	0.77(0.03)	0.167
Family size of the household	5.73(0.14)	4.80(0.33)	5.94(0.15)	0.002***
Dependency ratio	1.17(0.54)	1.10(0.14)	1.18(0.06)	0.541
Education of the household head in years	1.60 (0.07)	1.50(0.20)	1.60(0.08)	0.511
Total planted land in Tsimdi (equals 0.25 hectare)	4.58(0.30)	3.29(0.66)	4.85(0.34)	0.048**
Support network score (Suppnet)^^^^	4.38(0.25)	3.94(0.54)	4.47(0.29)	0.424
Social Participation score (Socpart)^^^^	5.65(0.22)	5.13(0.55)	5.76(0.24)	0.279
Ownership of livestock in TLU	1.77(0.09)	1.40(0.18)	1.87(0.11)	0.067*
Value of Productive asset (prodasb)	1074.9(136)	749.7(134)	1145.7(163.1)	0.268
Number of migrant households	0.42(0.03)	1.00(0)	0.29(0.03)	0.000***
Aggregate Shock impact (disimpct)^^^^	20.2(0.31)	20.1(0.78)	20.2(0.78)	0.840

Significant level: * = 1%; ** = 5% and * = 10%.**

^^^^ for details of measuring suppnet , socpart and disimpct refer to Vatila et al., 2012)

Table2. Estimation of Propensity Score: Probit Model

Variable name	Coefficient	Standard Error	P-Value
Dependent Variable : Remittance (1/0)			
Age of Household head in years	-0.002	0.006	0.744
Sex of Household Heads (=1 if male , 0, otherwise)	0.259	0.247	0.295
Family size of the household	-0.093	0.049	0.057**
Dependency ratio	-0.006	0.110	0.958
Education of the household head in years	0.124	0.119	0.297
Total planted land in Tsimdi (equals 0.25 hectare)	-0.027	0.027	0.312
Support network score (Suppnet)^^^^	0.007	0.025	0.773
Social Participation score (Socpart)^^^^	0.005	0.028	0.851
Ownership of livestock in TLU	0.025	0.093	0.784
Number of migrant households	0.763	0.109	0.000***
Aggregate Shcok impact (disimpct)^^^^	-0.018	0.019	0.355
Value of productive Asset(prodasb)	-0.000	0.000	0.587
Constant	-0.093	0.049	0.154
Number of observations	299		
Pseudo R^2	0.24		
LR-chi-square	67.99***		
Log likelihood	-150.69993		

* significant at 10%; ** significant at 5%, *** significant at 1 %

Table 3. *Propensity Score and Covariate Balances (Note: Figures in bold are significant)*

Variable	Sample	Mean		% reduction		t- test	
		Treated	Control	% bias	|bias|	t	p>|t|
Propensity Score	Unmatched	0.3581	0.1279	129.4		9.31	**0.000**
	Matched	0.7353	0.7287	3.1	97.8	0.13	0.897
Hhh_sex	Unmatched	0.6793	0.7724	-20.1		-1.43	0.153
	Matched	0.6793	0.6345	10.0	51.9	0.48	0.631
Age_hh_1	Unmatched	45.094	42.285	16.6		1.18	0.238
	Matched	45.094	44.817	1.6	90.1	0.08	0.936
Family_size	Unmatched	4.7547	5.9187	-48.2		1.45	**0.002**
	Matched	4.7547	4.8566	- 4.2	91.2	-3.19	0.827
Dep_ratio	Unmatched	1.0961	1.1881	-9.7		-0.22	0.310
	Matched	1.0961	0.8503	25.8	-167.1	- 0.66	0.511
P_size _tsimdi	Unmatched	3.3462	4.8684	-29.8		-1.91	**0.057**
	Matched	3.3462	3.9131	-11.1	62.8	-0.66	0.509
Tlu	Unmatched	1.4151	1.8618	-28.5		-1.72	**0.086**
	Matched	1.4151	1.3914	1.5	94.7	0.10	0.922
prodasb	Unmatched	760.19	1138.1	-19.3		-1.05	0.296
	Matched	760.19	589.33	8.7	54.8	0.84	0.403
suppnet	Unmatched	4	4.4553	-10.7		-0.68	0.495
	Matched	4	4.6677	-15.7	-46.7	-0.85	0.395
socpart	Unmatched	5.1132	5.7561	-16.2		-1.09	0.278
	Matched	5.1132	5.4012	-7.2	55.2	- 0.37	0.711
disimpact	Unmatched	20.057	20.203	-2.7		-0.18	0.458
	Matched	20.057	20.122	-1.2	55.1	-0.06	0.951
Outhh761	Unmatched	1.4528	0.4106	140.6		9.13	**0.000**
	Matched	1.4528	1.4676	-2.0	98.6	-0.10	0.924

Table 4. *Other covariate Balance Indicators Before and After Matching*

Indicator	Sample	
Pseudo R2	Unmatched	0.27
	Matched	0.03
LR X2 (p-value)	Unmatched	75.42(0.000)***
	Matched	4.08 (0.982)

* significant at 10%; ** significant at 5%, *** significant at 1 %

Table 5. Differences in ATT for treated and control groups

| Outcome	Matching Algorism	E(Y) Treated	E(Y) Control	Differences in Average outcome (ATT)	P –Value
PANEL A: Coping strategy index (CSI)					
Treatment : Dummy =1 if the household receives remittance , 0 otherwise					
Impact : Mean Impact					
CSI	N-neighbor	11.25	17.04	-5.79	0.006***
	K-matching	11.25	16.60	-5.35	0.006***
PANEL B: Reduced Coping strategy index (rCSI)					
Treatment : Dummy =1 if the household receives remittance , 0 otherwise					
Impact : Mean Impact					
rCSI	N-neighbor	6.44	8.67	-2.23	0.029**
	K-matching	6.44	8.33	-1.89	0.029**
PANEL C: Household Food Insecurity Access Scale (HFIAS					
Treatment : Dummy =1 if the household receives remittance , 0 otherwise					
Impact : Mean Impact					
HFIAS	N-neighbor	6.37	8.67	-2.30	0.007***
	K-matching	6.37	8.61	-2.24	0.007***
PANEL D Food Consumption Score (FCS)					
Treatment : Dummy =1 if the household receives remittance , 0 otherwise					
Impact : Mean impact					
FCS	N-neighbor	29.04	23.28	5.76	0.236
	K-matching	29.04	24.60	4.44	0.314

* significant at 10%; ** significant at 5%,   *** significant at 1 %
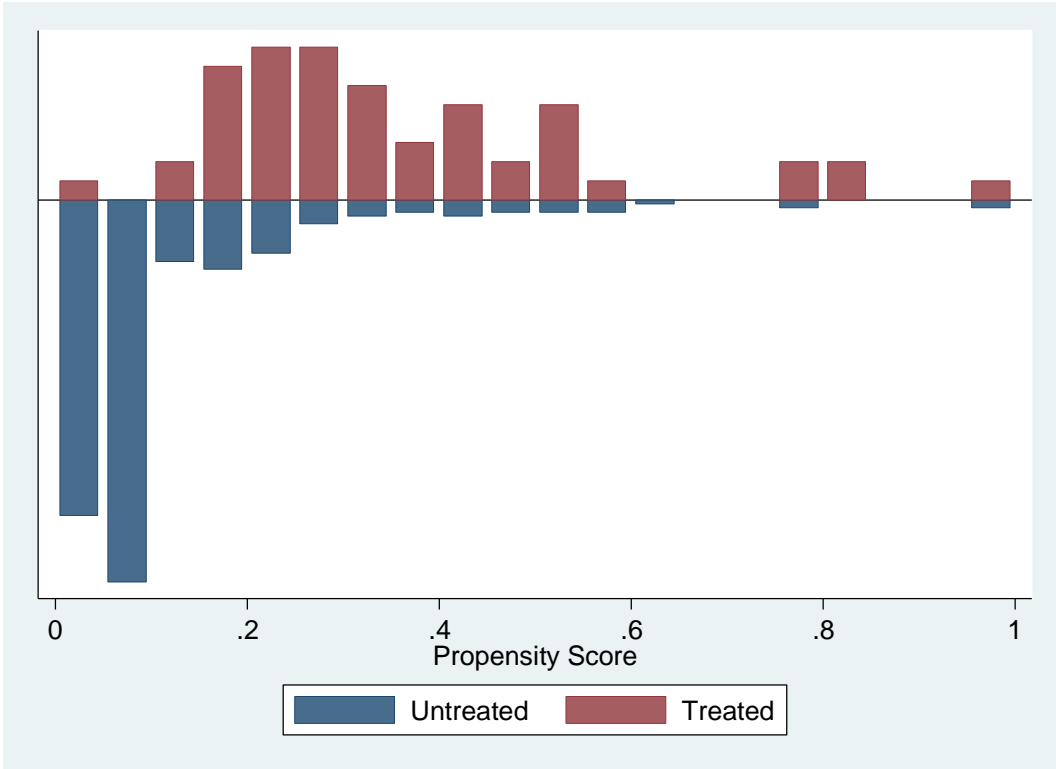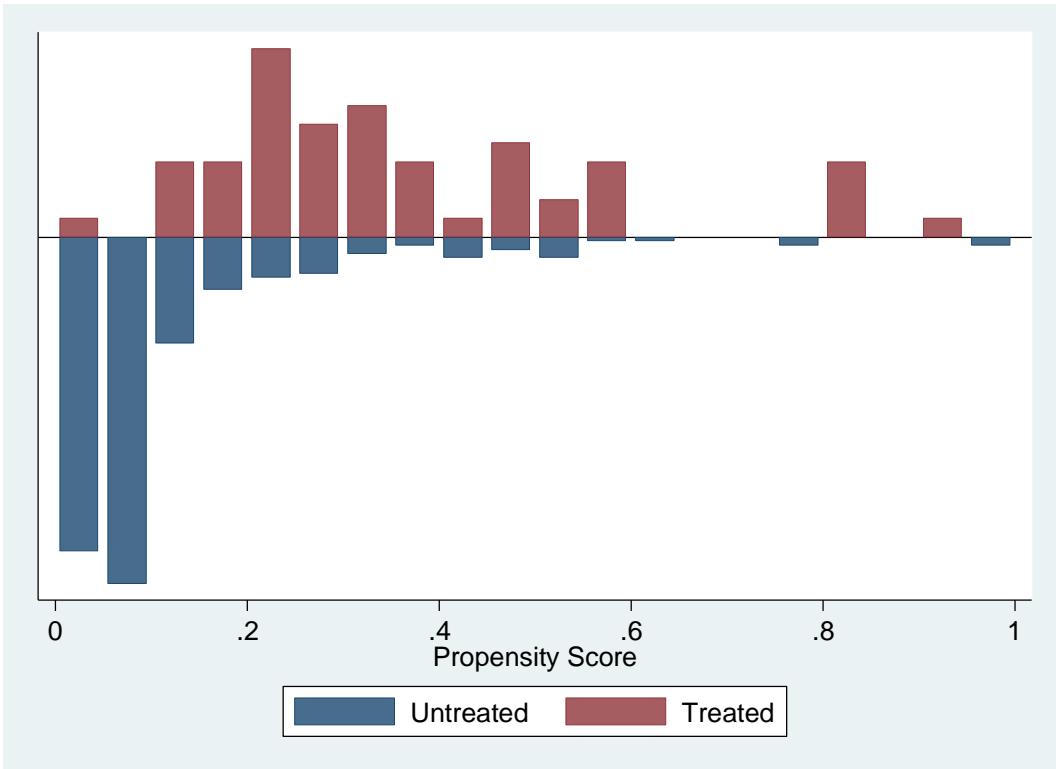
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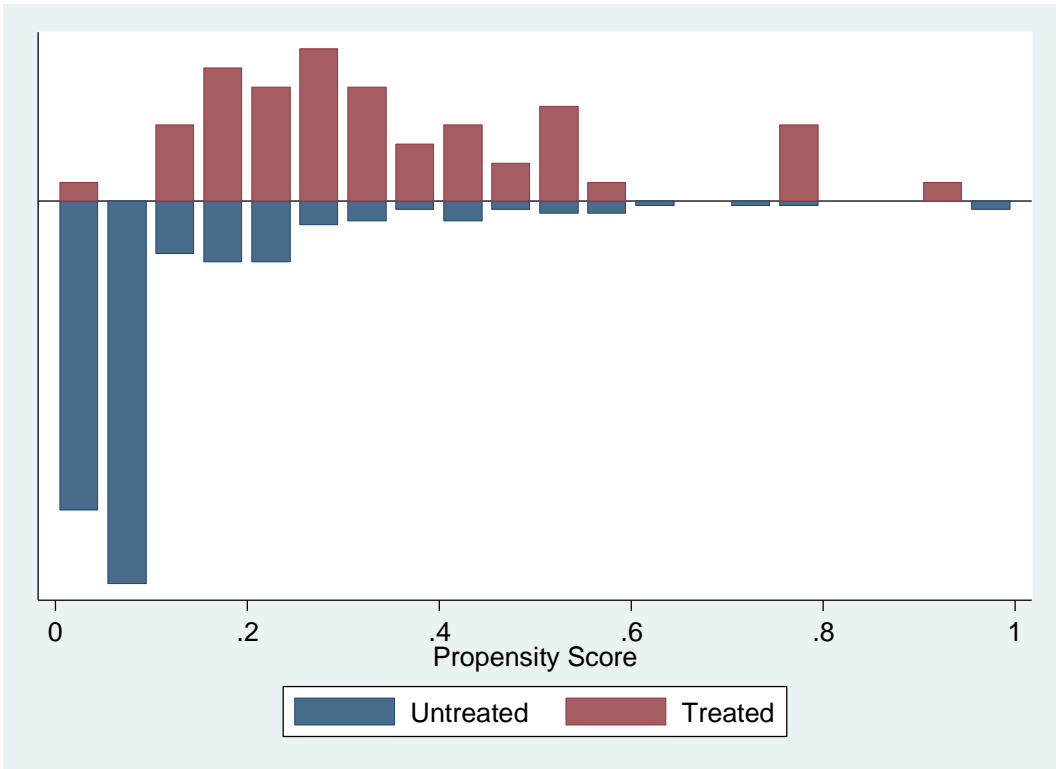
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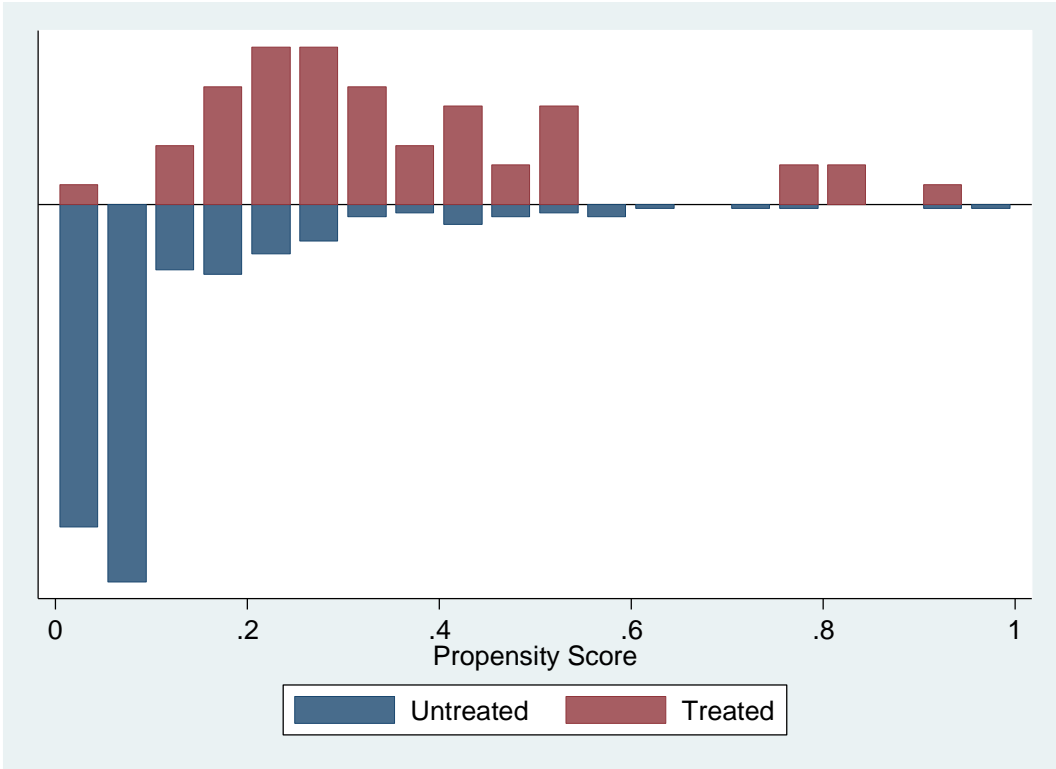
Household Food Insecurity Access Scale (HFIAS)

Food Consumption Score (FCS)