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Impact of Migration and Remittances on Livelihood Security: Insights from the Estate Sector of Sri Lanka

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ABSTRACT

The purpose of this study was to find out the effect of migration on the livelihood security of the estate sector in Sri Lanka as none of the other reported studies covered livelihood security issues with respect to whole country. Data for the study come from the Household Income and Expenditure Survey (2016) conducted by the Department of Census and Statistics of Sri Lanka. A composite index approach was applied to construct the livelihood security index which was formulated based on economic security, food security, education security, health security, and habitat security. The propensity score matching (PSM) method was employed to illustrate the impact of migration and remittances on livelihood security and its outcomes, while addressing the self-selection problem. Average treatment effect (ATT) results showed significant differences in ATT effect of remittances on economic security, food security, and education security, and no significant difference in ATT of receiving remittances with health security and habitat security. Remittance receiving households consisted of high education security and health security than the non-remittance-receiving households with low economic security, food security, and habitat security. The study concludes that migration and remittances affect livelihood security of estate sector households positively.

Keywords: Migration, remittances, livelihood security index, household livelihood security, Propensity Score Matching technique, Average treatment effect

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Introduction

Although the estate sector provides a great contribution to economic growth of Sri Lanka in terms of production and export earnings, it is still physically as well as politically deprived in Sri Lanka (Vijayakumar and Olga, 2012). Low productivity, high cost of production, lack of quality improvement and marketing facilities, low profitability and inability to generate sufficient surpluses for long term sustainability are among the major problems faced by estate sector as a whole (IPS, 2009). It is also observed that shortfalls in access to productive assets like land and water, gap in product and input markets and inadequate technological progress and weak institutional arrangements are also problems faced by estate and rural sector together (Vijayakumar and Olga, 2012). Households of estate sector are considered to be the poorest households in Sri Lanka. Apart from these, labor migration also has become a major issue. The sector is now experiencing labor shortages due to labor outmigration, absenteeism of registered workers, especially the better educated younger generation and therefore shortage of skilled labor. Migration of labor from estate sector has become a major threat to the future of estates (Illukpitiya et al., 2004). If more and more skilled laborers migrate, it may badly affect the productivity of the estate sector (Nonthakot and Villano, 2008). However, positive impacts suggest that remittances lead to increase income of the households, whereby the poverty is reduced since the remittances, in most cases, are monetary transfers. Remittances also change the household investment, asset accumulation, children's education and health (De Silva, 2013 and De and Ratha, 2012).

Estate people are considered to be one of the most marginalized groups and most vulnerable people of Sri Lanka. Livelihood is the flow of food and cash to meet basic needs. However, security is ownership of or access to resources and assets to offset risks, ease shocks and meet contingencies. High poverty levels and low earning potential of estate households change their livelihood security status.

Estate workers' livelihood security basically depends on their ability to gain an adequate income through their work in estates and managing their cultivations, income and resources for that. However, there are large inequalities in access to and the utilization of services (mainly health, and education) between the estate sector and the rest of the country (Jayawardena, 2014). Less market access, poor infrastructure and low levels of education are few major barriers that directly influence the adaptation of

migration strategy of the estate workers' from the estates to urban areas or to foreign countries to meet their basic needs such as food, shelter, healthcare, and fulfillment of children's needs (Dharmadasa and Polkotuwa, 2016). Household and individual wellbeing is also indirectly affected by migration and remittances sent by migrants. This occurs through the form of increased wages with the depletion of the local labor force, or through remittances from migrant employment, which are invested in local production (de Brauw and Giles, 2018). However, most of the migrants tend to spend their money and transfer only a limited amount (remittances) to their households situated in estates. Therefore, remittances may supplement income earned locally and directly reduce exposure to poor living standard. Migration and remittances interlink with poverty, inequality, household welfare, expenditure pattern of households and livelihood security. Remittances from migration reduce the poverty with a mixed effect on income inequality while household welfare and expenditure pattern changes significantly

Migration from estate is considered to be a strategy to diversify livelihood portfolio beyond estate employment and World Bank (2007) further reveals that, if they are able to diversify income sources it would be associated with welfare gains and lower poverty for households. As migration has become a livelihood strategy among estate communities and it is a new source of employment, the remittances from migration can play a major role in shaping up livelihood security of estate population. However, a relatively little attention has been paid to studying the effect of migration and remittances on livelihood security of estate households in Sri Lanka. In particular, De and Ratha (2012) highlighted the lacuna of researches on the developmental consequences of this essential transfer income at the household level and they further stressed that developmental impacts are mixed. The magnitude of the impact depends on household characteristics, amount of remittances received and frequency of remittances received by the households. World Bank (2007) highlights the fact that opportunities through internal migration are limited and earnings from internal migration are found to be sufficient only for day to expenses of migrants. The very reason for this issue is that the estate households are unable to find better paying jobs outside the estate due to their low education status. As a result, working outside the estate does not necessarily imply higher earnings. Moreover, international migrants send substantial amount of remittances in comparison to internal migrants. Thus, the main impact of migration

depends on the receipt of remittances and how much remittances are received by the estate households.

Therefore, the main objective of this study is to determine the effect of migration and remittances on the household livelihood security of estate sector of Sri Lanka by estimating the impact of migration and remittances on income security, food security, education security, health security and habitat security which are the outcomes in measuring the livelihood security.

Literature Review

Livelihood Security and Outcomes

Livelihood security has been expressed in different ways by various scholars. If households have sustainable, socio-economic-cultural and political systems, they are more secured in terms of livelihoods. Livelihood security can also be defined as adequate and sustainable access to income and resources to fulfill basic needs (including adequate access to food, potable water, educational opportunities, health facilities, housing, and time for community participation and social integration (Chambers and Conway, 1992; Giris *et al.*, 2020). Household livelihood security is further defined as a family's or community's ability to maintain and improve its income, assets, and social well-being from year to year the relief to rehabilitation to development continuum (Frankenberger, 1996). Component or the outcomes of the livelihood security are very important to identify the success of the people's livelihoods or the quality of the population. Thereby, to measure the livelihood security of the estate sector, five livelihood security outcomes; economic security, food security, health security, education security, and habitat security were used.

Impact of Migration and Remittances on Livelihood Security

Migration is a decision that impacts the well-being of the household, the home community, and the entire economy in different ways (Azam and Gubert, 2006). Migrants send remittances because households benefit from increased household consumption in their home country. In other words, migrants send remittances because they are concerned about family members who have been left behind. Therefore, remittances are considered an important source of income for origin households who are poor and have fewer options to meet basic requirements and achieve livelihood security.

Remittances have specific characteristics that make them more effective than other financial sources. As a result, they have the potential to lift poor households out of poor living status by increasing household income and consumption. Furthermore, they can relax credit constraints, allowing households to invest in human capital such as education and health, better shelter to protect against natural calamities, and other vital components of livelihood. This, in turn, can improve the livelihood security of poor rural households by making them less susceptible to trends, seasonality, and shocks.

In the case of livelihood security, migration and remittances have positive outcomes. For example, Abadi *et al.* (2018) find that remittances are important components in food security and they assist in procuring sufficient food and securing adequate quality food. Eze, (2017) concludes that rural out-migration and remittances improve the livelihood security by exerting a strong effect on improvement in purchasing power thereby reducing poverty. Moniruzzaman (2020) reveals that remittances influence the food security conditions significantly. Dodd *et al.*, (2020) also highlight that migration contribute to enhanced economic and emotional security among family members left behind in Honduras. Maphosa (2007) discusses the growing importance of food remittances as a strategy for improving livelihood security in Ghana. Crush and Caesar (2018) also reveal that both poor and better off households in many rural areas remit food; a practice that enhances the food security. McKay (2005) is on the opinion that livelihood security increases as a result of migration and non-migrant households who are unable to find waged work are lacking livelihood security. Furthermore, Nilsen (2014) indicate that remittances reduce household inequality and improve food security thereby contributing to increased livelihood security. On the contrary to this, however, Atuoye *et al.*, (2017) find that the households that receive remittances in the urban sector and the households that receive remittances and do not receive remittances in the rural sector are more like to be more food insecure in Ghana. To our knowledge, literature related to migration remittances and livelihood security with respect to the estate sector of Sri Lanka could hardly be found. However, Wijerathne *et al.*, (2014) have conducted a study on livelihood security in the estate sector in Nuwara-Eliya and find that education and health security are in a better condition while habitat security, economic security and food security are at a moderate level. However, they have not considered the effect of remittances on those outcomes. They further find that overall livelihood security is at a moderate level. In a study conducted to assess the livelihood

security of women in hills, Shyamalie and Saini (2010) concludes that women in study areas are relatively better food secure while habitat security is also higher. Most of the reviewed literature suggests that migration and remittances affect positively on the livelihood security of households. Some studies argue that there can be negative outcomes also. Therefore, to which extent the remittances contribute to livelihood security is of great importance for households of the estate sector of Sri Lanka, as it is the poorest sector in Sri Lanka.

Methodology

Data

The Household Income and Expenditure Survey (HIES) 2016 data of the Department of Census and Statistics in Sri Lanka (DCS) was used for this study. HIES is generally conducted over 12 consecutive months to capture seasonal variations of income and expenditure patterns in Sri Lanka. The HIES 2016 is the latest available and the ninth in its series. This survey consisted of a wide range of topics that include information about demographic characteristics, income, education, health, expenditure, remittances and transfers, and assets, etc. Even though this survey was not designed as a migration or remittance survey, it contains data on current remittances and transfers from outside the country and from within the country other than the basic information on household socio-economic characteristics. The actual sample size is 21, 756 households representing urban, rural, and estate sectors in Sri Lanka. Out of the total sample households, 3, 429 households are from the urban sector, 17,394 households are from the rural sector and 933 households are from the estate sector. According to the migration status, the estate sector which is the focus of this study represents 230 migrant households (24.65%) and 703 non-migrant households (75.34%). Out of the migrant households in the estate sector, only 143 households (62.18%) have received remittances as opposed to the 87 households (37.82%) that haven't received remittances. Therefore, our study utilized subsample of these 230 migrant households to estimate the effect of migration and remittances on the livelihood security of the estate sector of Sri Lanka.

Model Specifications and Estimation

This study analyzed the impact of migration and remittances on household livelihood security of the estate sector of Sri Lanka. A composite index approach was used to construct the livelihood security index and the Propensity score matching method was used to evaluate the impact of migration and remittances on livelihood security and its outcomes while simultaneously addressing the self-selection problem.

Table 1. Indicators Used for Different Livelihood Security Outcomes

Livelihood Security outcomes	Indicators	Measurements
Economic security	Per capita income	Rs/month
	Proportion of employed members (age between 15-59)	Number
	Economically active household members	Scale developed based on ratio
	Dependents in the households	Scale developed based on ratio
Food security	Per capita expenditure	Rs/ month
	Food Expenditure Ratio	Scale developed based on food expenditure ratio
Education security	Accessibility to schools	Distance (Km) to primary and secondary school
	Number of members household members who educated 10 years or more	Number
	Literacy level of household	Scale developed
	School enrolment of children	Number
Health security	Accessibility to health services	Distance (Km) to primary health center or government hospitals

	Quality of sanitation facilities	Wealth ranking system developed
Habitat security	Quality of floor housing	Wealth ranking system developed
	Quality of wall	
	Quality of roof	
	Space of house	
	Accessibility to drinking water	

Construction of Livelihood Security Index: A Composite Index Approach

In constructing the livelihood security index, we follow the methodologies adopted by Shyamalie and Saini (2010), Shyamalie *et al* (2014) and Sarker *et al* (2019). Shyamalie and Saini (2010) use six livelihood security outcomes; food security, economic security, health security, education security, habitat security and social network security. However, Sarker *et al* (2019) use food security, health security education security and habitat security as the food security outcomes. In a study conducted by Shyamalie *et al* (2014) in estate sector in Nuwaraeliya district in Sri Lanka, they use five livelihood security outcomes. They are food security, economic security, health security, education security and habitat security. In our study also we use the same livelihood security outcomes as Shyamalie *et al* (2014). The difference between our study and study conducted by Shyamalie *et al* (2014) is that we use a nationally representative sample whereas they use only a sample from Nuwaraeliya district and our objective is to measure effect of remittances on livelihood security. Although it is evident from the literature that many authors and institutions (CARE, India, 1997; CARE, USA, 2002; Rahman and Alam, 2001; Christina *et al.*, 2001) have defined livelihood security in different manner, Centre for Agriculture and Extension (CARE), Kenya (1996) first use six livelihood security outcomes in empirically quantifying the various issues affecting livelihood security. Shyamalie and Saini (2010) use the same outcomes that were used by CARE, Kenya, (1996).

Economic security: according to Shyamalie and Saini, (2010) economic security is defined as the capacity to generate sufficient income to satisfy the

fundamental needs and maintain the stability of the family. Economic security was measured by per capita income, employee proportion, active population ratio, and using dependency ratio. Food security is the ability of households to command access to food (Choithani, 2017). However, World Food Summit (1997) states that “Food security exists when all people, at all times, have physical and economic access to sufficient, safe and nutritious food that meets their dietary needs and food preferences for an active and healthy life” and this definition includes the dimensions of food availability, access to food, food utilization and stability (FAO, 2006). In our study, food security has been captured only by, per capita expenditure and food expenditure ratio of the household (Rathnayake *et al*, 2019). Health security is defined as the capacity of individuals to identify, prevent and manage significant risks to their health (Jeyarajah, 2016). Health security of the estate sector was measured by accessibility to health services and the quality of the sanitation facilities (Shyamalie *et al.*, 2014).

Education security is defined as the capacity of the individual to obtain or benefit from basic education (Jeyarajah, 2016). Education security has been captured by the indicators like accessibility to school, ten years or more educated members, the literacy level of household, and school enrollment. Habitat security is defined as the access of individuals to an adequate shelter and its related resource to ensure that they have a healthy and sanitary environment, protection from detrimental elements to enable safe and secure livelihoods (Shyamalie and Saini, 2010).

A weighted average approach with several indicators (please see the Table 01) that measure economic security, food security, health security, education security, and habitat security was used to construct the Household livelihood security (HLS) index according to Akter (2012); Shyamalie and Saini, (2010) and Jeyarajah, (2016). Indicators were standardized using different scales to measure them.

Standardized indicators were calculated by;

$$\mathbf{zind}_j = \frac{\mathbf{Indicator}_j - \mathbf{Min}_j}{\mathbf{Max}_j - \mathbf{Min}_j}$$

\mathbf{zind}_j = standardized indicator j

\mathbf{Max}_j and \mathbf{Min}_j = maximum and minimum value of indicator j

The household livelihood security index for the particular indicator constructed by,

$$HLS_i = \frac{\sum_{j=1}^j zind_j}{j}$$

HLS_i = Household Livelihood Security for one indicator

$\sum_{j=1}^j zind_j$ = summated standardized score of all households for of an indicator

j = Number of households cover in the study

Overall Livelihood Security (LS) index for the household calculated by;

$$LS_i = \frac{\sum_{i=1}^n W_i HLS_i}{\sum_{i=1}^n W_i}$$

LS_i = Livelihood Security

HLS_i = Household Livelihood Security

$\sum_{i=1}^n W_i$ = summated value of weightage of all indicators

Each indicator was ranked on a five - point ordinal scale where 5 indicates highest livelihood security and 1 indicates the least livelihood security. Those livelihood security outcomes were measured based on accessibility / availability, quality and status. Livelihood security indices such as food, economic, health, education, habitat security were computed by aggregating all the scores of the selected indicators.

Having the livelihood security index been calculated, we regressed the livelihood security index by taking the receipt of remittances as one indicator variable.

$$Y = \alpha + \beta_1 X_1 + \beta_2 X_2 + \beta_3 X_3 + \beta_4 X_4 + \beta_5 X_5 + \beta_6 X_6 + \beta_7 X_7 + \beta_8 X_8 + \varepsilon$$

Where;

Y = Household livelihood security (index value)

X_1 = Gender of household head

(dummy where 1 = male, 0 = otherwise)

X_2 = Household size (number)

X_3 = Number of dependents (number)

X_4 = Number of current employees (number)

X_5 = **School enrollment of children (number)**
 X_6 = **Ownership of livestock**
 (dummy where 1=owned, 0=otherwise)
 X_7 = **Ownership of agricultural lands**
 (dummy where 1 = owned, 0 = otherwise)
 X_8 = **Remittance receipt**
 (dummy where 1 = receive, 0 = otherwise)
 $\alpha, \beta_1 \dots \beta_8$ = **coefficients to estimated**
 ε = **error term**

Although the effect of receipt of remittances can be seen by regressing the variable related to remittance receipt with the livelihood security index, the results may be biased due the non-randomness of the sub sample of remittance receiving households. To address the bias arising from non-randomness we use Propensity Score Matching (PSM) technique.

Propensity Score Matching Method

Remittance receiving status was used to examine the effect of migration on livelihood security. Thereby both remittance recipient households and non-remittance recipient households were used. Comparisons of these two groups of households directly produce bias results due to non-randomness arising from self-selection and it is the most difficult issue when estimating the effect of migration and remittances on household livelihood security. According to literature, migration is not a random decision, and therefore remittances are not randomly assigned, Remittance receiving households and non-receiving households are systematically different. There could be confounding factors that influence both the probability of receiving remittances and the outcome of interest. Here the argument is that if receivers of remittances systematically differ from households that do not receive remittances along observable and unobservable dimensions (Acosta 2006; Adams 2006; De and Ratha 2005; Yang and Martinez 2005 cited by Guzman et al. (2008), we cannot simply compare remittance receiving and non-receiving households due to the fact that it generates bias results. In controlling the issue of non-randomness, we adopt propensity score matching technique. In this type of method each treated observation (remittance-receiving household) is matched to a fixed number of control observations (non-remittance-receiving household) based on a propensity score.

The causal treatment effect (τ_i) is estimated as follows.

$$\tau_i = Y_{i1} - Y_{i0}$$

Where Y_{i1} and Y_{i0} are the outcomes respectively for a household with and without treatment. Considering $D = \{0, 1\}$ to be a binary indicator where $D = 1$ if a household receives remittances and $D = 0$ otherwise, the Average Treatment Effect (ATE) between the treated households (remittance received households) and the non-treated households (non-remittance received households) can be estimated through:

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

But, ATE measures do not reflect the true impact of treatment, if the selection into treatment and other factors are related to both treatment and certain omitted variables that affect the outcome variable. However, the problem is that we can observe the outcome variable under either treatment or control for each household, but never both at the same time. Therefore, instead of ATE, Average Treatment Effect on the Treated (ATT) was used and it can be defined by:

$$ATT = E[Y^1 | D = 1] - E[Y^0 | D = 1]$$

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

$$[E[Y^0 | D = 1] - E[Y^0 | D = 0]] = 0$$

In order to eliminate the bias from self-selection, we employed a matching approach to construct a counterfactual that allows us to match treated households with non-treated households that have as many similar traits as feasible. The matching is based on an index, the propensity score, which summarizes each household's pre-treatment characteristics. The propensity score is the probability of assignment into treatment, $p(X)$, conditional on a set of pre-treatment characteristics, X , so that:

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

It is difficult to find matches with the same propensity score in both treated (remittance receive households) and control (non- remittance receives households) samples. For that, matching algorithms are used to match treated and control groups of similar propensity scores. Under the matching algorithms, the nearest neighbor matching method and kernel matching method were used in this study. Under these methods, treated (remittance-receiving households) and control (non- remittance-receiving households) groups were compared. In nearest neighbor matching, controlled households are matched with treated households based on the closest propensity score (Kakhkharov and Ahunov, 2021). However, most of the time, every treated observation may not match with every single control, because nearest neighbor matching chooses to do the best matching for a control household for more than a treated household. In kernel matching method all treated observations are matched with all controls with a weighted average. Then the average treatment effect was obtained and finally, the difference in household livelihood security indicators between the matched treated and control groups were calculated (Abadi et al., 2018).

Results and Discussion

Descriptive Analysis

Overall Household Livelihood Securities of the Sector

The Figure 1 shows the comparison of the livelihood securities among three sectors; the estate sector, rural sector, and urban sector. As shown in this figure, there is a considerable gap in the livelihood status among the three sectors with the urban sector showing the highest livelihood security with a value of 3.31 followed by the rural sector (3.14). The estate sector which is the main focus of this study has shown the lowest livelihood security with a mere 3.01 index value. This depicts the real picture of the estates and reveals the need for increased attention on the living standards of the estate sector than the other two sectors.

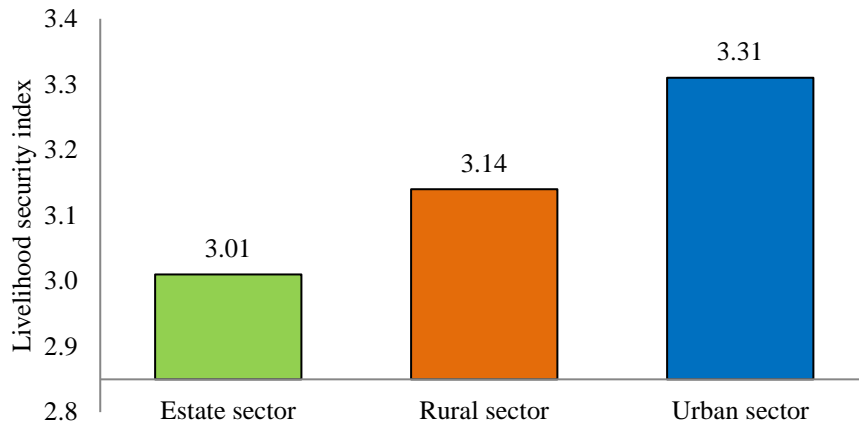


Figure 1. Overall Livelihood Securities of Rural Urban and Estate Sectors

Household Livelihood Security and Household Livelihood Security Outcomes of the Estate Sector

Overall livelihood security index value of the estate sector is estimated to be 3.01. Health security indicators have recorded the highest value with 4.32 while the education security indicator is the lowest with a value of 2.06. Economic security (2.99), food security (2.92) and habitat security (2.78) have shown relatively closer value to each other and to the overall livelihood index.

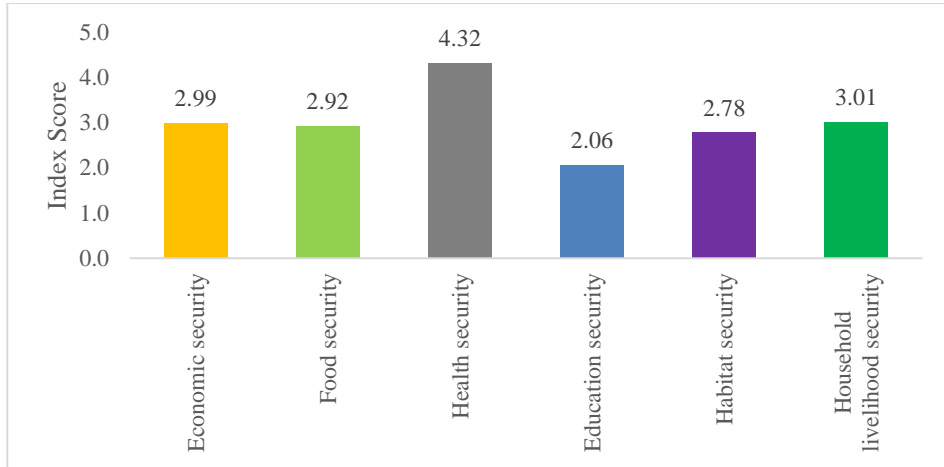


Figure 2. Overall Household Livelihood Security and Outcomes of Estate Sector

Results of Descriptive Statistics

As we have sub-categories of selected subsample of 230 migrant households, using two sample t-test, we compare the means of selected variables and outcomes between remittance receiving households and the household that do not receive remittances. Table 2 shows the results of the analysis.

Table 2. Descriptive Statistics by Remittance Status

Livelihood Security Outcomes /Variables	Total Households (230)		Remittance Receiving Households (143)		Non-remittance Receiving Households (87)		t Value	p Value
	Mean	SD	Mean	SD	Mean	SD		
Outcome indices								
Economic Security	2.54	1.00	2.28	0.96	2.96	0.91	5.30***	0.000
Food security	2.73	0.49	2.67	0.44	2.82	0.56	2.28**	0.023
Education security	2.35	0.87	2.48	0.86	2.15	0.86	-2.83**	0.005
Health security	4.24	0.78	4.26	0.81	4.19	0.72	-0.69	0.489
Habitat security	2.91	0.61	2.88	0.59	2.95	0.66	0.89	0.373
Independent variables								
Gender of household head	0.50	0.50	0.39	0.49	0.66	0.47	4.06***	0.000
Household size	3.55	1.50	3.64	1.52	3.41	1.47	-1.12	0.263
Number of dependents	3.17	1.41	3.37	1.46	2.85	1.27	-2.78**	0.005
Number of current employees	1.25	0.83	1.07	0.78	1.54	0.83	3.83***	0.000
School enrollment	0.98	1.04	1.15	1.07	0.71	0.92	-3.17**	0.001
Ownership of the livestock	0.19	0.39	0.18	0.38	0.20	0.40	0.46	0.640
Ownership of the agricultural lands	0.30	0.46	0.25	0.43	0.40	0.49	2.41**	0.016

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

The significance level reveals that there are some differences between treated (remittance receive) and control (non- remittance receive) households. When considering the outcome variables, there can be seen statistically significant difference in economic security, food security and education security.

When considering the household characteristics, there are also significant differences in gender of household head, number of dependents, number of current employees, school enrollment, and ownership of the agricultural lands between treated (remittance-receiving) and control (non- remittance-receiving) households.

OLS Regression Analysis of the Effect of Remittances on Household Livelihood Security

To assess the effect of migration and receipt of remittances (dummy variable indicating 1=household receive remittances and 0=otherwise) on household livelihood security (dependent variable), we first estimated an OLS regression. Here we have not considered whether they receive internal or international remittances separately. Table 03 shows the results of the regression analysis with nine parameters. The overall model is highly significant with a probability value of 0.00 with 49.09% R^2 value. Out of the total variables, three variables are statistically significant at 1 percent and three variables are statistically significant at 5 percent.

Table 3. Results of the Regression Analysis for Livelihood Security

Household Livelihood Security	Coefficient	Standard Error	p> t
Gender of household head	0.492**	0.019	0.011
Household size	-0.042***	0.006	0.000
Number of dependents	-0.022**	0.007	0.002
Number of current employees	0.178***	0.011	0.000
School enrollment	0.147***	0.007	0.000
Ownership of the livestock	0.031	0.021	0.133
Ownership of agricultural lands	0.033**	0.016	0.048
Receipt of remittances	0.043**	0.019	0.028
Constant	2.727***	0.026	0.000

Number of observations	230
Prob> F	0.000
R ²	0.491
Adj R ²	0.472
Root MSE	0.267

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

According to the results, receiving remittances has a significant and positive effect on household livelihood security in the estate sector at a 5 percent significant level. Higher number of dependents and higher household size reduce the household livelihood security. It may cause due to the increase in the expenditures within the household. Currently working employees have a positive effect on the household livelihood security as they are the persons who are highly involved in the improvement of the living status of the households by covering the households' expenditures. Male household head gives major contribution to the livelihood security of the household. Higher school enrollment has a positive impact on household livelihood security. This is due to the fact that human capital improves the earning potential of the household by leading obtain higher income and increase in their living standards. Ownership agricultural lands also has a positive effect on livelihood security. Agricultural lands act as additional income gaining resource to the households and sometimes household heads tend to allocate some amount of the remittances to the improvement of the agricultural lands. Thereby they can earn benefits in better terms than earlier.

Results of the Propensity Score Estimation

Although the results of the OLS regression reveal that remittances affect the livelihood security positively, simple analysis as such will yield biased outcomes due to the endogeneity arising from self-selection. Therefore, we use propensity score matching technique to address the issue. The probability of a household that is receiving remittance from migrants was estimated using probit regressions and the results are presented in Table 4. The P-value of the overall model (Prob > chi²= 0.0000) showed that the independent variables reliably predict the dependent variable. Relative to not receiving remittances, gender of household head, household size, number of current employees, and school enrollment are statistically significant in receiving remittances.

Table 4. Results of Probit Regression for Remittances Receiving Sample

Dependent Variable: Remittance (1/ 0)			
Variable Name	Coefficient	Standard Error	P Value
Gender of household head	-0.484**	0.190	0.011
Household size	0.175*	0.092	0.057
Number of dependents	-0.009	0.089	0.914
Number of current employees	-0.513**	0.148	0.001
School enrollment	0.294**	0.094	0.002
Ownership of the livestock	0.062	0.237	0.791
Ownership of the agricultural lands	-0.312	0.195	0.110
Number of observations	230		
LR chi ²	47.26		
Prob > chi ²	0.000		
Pseudo R ²	0.155		
Log likelihood	-128.905		

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

According to the results, household size, school enrollment, and ownership of the livestock positively affect the probability of receiving remittances and gender of household head, number of dependents, number of current employees, and ownership of agricultural lands negatively affect the probability of receiving remittances to households.

Table 5 shows the balancing information for the propensity scores and for each character before and after matching. Before matching there are statistically significant biases in several variables that include gender of household head, number of dependents, number of current employees, school enrollment, and ownership of the agricultural lands. However after the matching, bias has reduced significantly and there are no significant differences in these variables between treated and control samples.

Table 5. Propensity Score and Covariate Balance

Variable	Sample	Mean		% Reduction		t- test	
		Treated	Control	% Bias	bias	t	p> t
Propensity score	Unmatched	0.694	0.503	99.6		7.42***	0.000
	Matched	0.694	0.693	0.6	99.4	0.06	0.956
Gender of household head	Unmatched	0.398	0.666	-		-	0.000
	Matched	0.398	0.405	55.5	97.4	4.07***	0.904
Household size	Unmatched	3.643	3.413	15.3		1.12	0.264
	Matched	3.643	3.671	-1.9	87.8	-0.15	0.879
Number of dependents	Unmatched	3.377	2.850	38.5		2.78**	0.006
	Matched	3.377	3.314	4.6	88.1	0.35	0.724
Number of current employees	Unmatched	1.076	1.540	-		-	0.000
	Matched	1.076	1.049	57.2	94.0	4.23***	0.759
School enrollment	Unmatched	1.153	0.712	43.9		3.17***	0.002
	Matched	1.153	1.069	8.4	81.0	0.71	0.478
Ownership of the livestock	Unmatched	0.181	0.206	-6.3		-0.47	0.641
	Matched	0.181	0.181	0.0	100.0	0.00	1.000
Ownership of the agricultural lands	Unmatched	0.251	0.402	-		-	0.016
	Matched	0.251	0.237	32.4	90.7	2.42***	0.784

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

According to the results of the table, the propensity score showed 99.6 percent imbalances between the treatment and control samples before matching, and this bias was significantly reduced to a level of 0.6 percent after matching.

As Table 6 shows, during the matching process, pseudo R^2 has reduced and also likelihood ratio chi-square test result has reduced significantly. Then the

low pseudo R^2 and the likelihood ratio tests reveal that, both treated group (remittance-receiving households) and control group (non- remittance-receiving households) have the same distribution in covariates (the household characteristics) after matching.

Table 6. Other Covariate Balance Indicators before and after Matching

Indicator	Sample	
Pseudo R^2	Unmatched	0.156
	Matched	0.004
LR X^2 (P- value)	Unmatched	47.68 ***
	Matched	1.56

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

The Average Treatment Effect on Household Livelihood Security

Table 7 shows that there is a positive and significant effect of receipt of remittances on overall household livelihood security of estate sector.

Table 7. Results of the Average Treatment Effect on Household Livelihood Security

Household Livelihood Security	Coefficient	Standard Error	Z	P > z
Average treatment effect				
Remittance received (1 vs 0)	0.058**	0.025	2.24	0.025

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

The Average Treatment Effect (ATT) on Household Livelihood Security Outcomes

The ATT results from Table 08 below indicated that the differences in economic security between treated and control households are (0.302) and (0.432) for nearest neighbor and kernel matching respectively. Households with access to remittances have on average lower economic security than their non-remittance counterparts with statistical significance (at the 5 percent significant level). ATT differences in food security between treated

and control households are (0.138) and (0.134) for nearest neighbor and kernel matching respectively and households with access to remittances have on average lower food security than their non-remittance counterparts are statistically significant (at 10 percent significant level).

Table 8. Differences in ATT for Treated and Control Groups

Outcome	Matching Algorithm	Treated Group	Control Group	Differences in Average Outcome (ATT)	t-value
Economic security	Nearest neighbor matching	2.63	2.94	-0.302	- 3.98**
	Kernel matching	2.63	3.07	-0.432	- 3.95**
Food security	Nearest neighbor matching	2.67	2.81	-0.138	-1.84
	Kernel matching	2.67	2.81	-0.134	-1.77
Education security	Nearest neighbor matching	2.53	2.80	0.250	2.48**
	Kernel matching	2.53	2.22	0.305	2.43**
Health security	Nearest neighbor matching	4.24	4.24	0.004	0.04
	Kernel matching	4.24	4.23	0.007	0.07
Habitat security	Nearest neighbor matching	2.83	2.95	-0.121	-1.24
	Kernel matching	2.83	2.95	-0.121	-1.30

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

The ATT difference in education security between remittance and non-remittance receive households were (0.250) and (0.305) for nearest neighbor

and kernel matching respectively and statistically significant (at 5 percent significant level). ATT differences between treated (remittance receive) and control (non- remittance receive) households of health security were 0.04 and 0.07 for nearest neighbor and kernel matching respectively and ATT differences of 0.121 for both nearest neighbor and kernel matching for habitat security. And these differences in health security and habitat security between treated and control groups are not statistically significant.

Conclusions

This paper has examined the impact of migration on the households' livelihood security of the estate sector in Sri Lanka according to remittance-receiving by using a nationally representative data set collected by the Department of Census and Statistics of Sri Lanka 2016 period. Household livelihood security of the estate sector was measured using a composite index approach and data were analyzed by using a propensity score matching technique with probit, average treatment effect, and OLS analytical techniques. PSM was used to avoid selectivity or associate bias because migration and receiving remittances are considered as a self-selection process.

Results indicate that lowest household livelihood security exists in the estate sector followed by rural and urban sectors. 25% estate households have at least one migrant and 62% of migrant households received remittances from migrants.

The study further finds that receipt of remittances by estate households depends on several factors. For example, propensity to receive remittances when the estate household head is a male. With the increase in number of employed people within the households, propensity to receive remittances reduce. Larger households receive more remittances and the households having school children receive more remittances.

Results of OLS regression and PSM suggest that the estate households that receive remittances enjoy higher livelihood security. Although the case is such with overall livelihood security the results further indicate that economic security reduces with the receipt of remittances while education security increases.

In maintaining the overall livelihood security of estate households, male headed households, employed household members and ownership of

agricultural lands play a significant role while household size and dependents in the households negatively affect the household livelihood security. As the livelihood security is the lowest among the three sectors, it is important for policymakers to create new policies or to revise the existing policies to enhance the household livelihood security and the household livelihood security outcomes.

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