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From Migration to Meals: How Remittances Improve Household Food Security in Rural Indonesia

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Abstract

In light of growing global concerns over rural poverty and food insecurity, this study addresses an urgent need to understand how remittances can contribute to improving household food security in developing economies. This research is the first to empirically examine the impact of remittances on food security outcomes using data from 600 rural households in Indonesia and employing a Conditional Mixed Process (CMP) model to ensure unbiased estimation. The results show that remittances significantly enhance household food security by increasing dietary diversity and reducing food insecurity. Additionally, household characteristics, such as dependency ratio, bank account ownership, gender of the household head, household size, and enterprise ownership—strongly influence the likelihood of receiving remittances. These findings emphasize that remittances can serve as a critical financial buffer for vulnerable households, particularly in rural areas with limited access to formal financial services or social protection mechanisms. While the data is drawn from Indonesia, the implications extend to other remittance-receiving countries facing similar socioeconomic challenges. Strengthening the infrastructure for remittance transfers, promoting financial inclusion, and ensuring that remittances are used for enhancing household resilience can amplify their developmental impact globally. Policymakers and development practitioners should recognize remittances not only as private flows but also as potential instruments for achieving food security and well-being, especially in the face of global shocks such as climate change, pandemics, and economic crises. This study provides timely and policy-relevant insights for leveraging migration-finance linkages to promote sustainable rural development worldwide.

1. Introduction

In today’s interconnected world, food security remains a critical concern, particularly for developing countries where economic instability often limits household access to adequate and nutritious food (Rahaman et al., 2021; Toiba et al., 2024). Food security, as defined by the Food and Agriculture Organization (FAO), refers to a situation in which "all people, at all times, have physical, social, and economic access to sufficient, safe, and nutritious food that meets their dietary needs and food preferences for an active and healthy life" (Ingram, 2020). Achieving this level of stability is challenging for many developing nations, where income disparities, employment instability, and poverty are prevalent (Workie et al., 2020; Pawlak et al., 2020). Indonesia, a major developing country in Southeast Asia, is no exception. As the country navigates the complexities of economic growth and poverty reduction, remittances from international migration have emerged as a pivotal factor influencing food security at the household level (Pratikto et al., 2020).

The disparities in job opportunities within developing economies create structural inequalities that hinder stable income generation for many families, exacerbating food insecurity (Singh et al., 2021). A substantial body of research highlights how limited job creation fails to match the growing labor force, leading to high unemployment rates (Diyantoro & Alie, 2014; Raza et al., 2023). In this context, migration has become a common strategy for individuals seeking better livelihood prospects outside their home countries (Sunam et al., 2021). International migration, particularly in countries with high unemployment rates like Indonesia, offers a potential escape from poverty, allowing workers to send remittances back to their families (Sugiyarto et al., 2019). These remittances have grown significantly over the past few decades, with the World Bank (2022) estimating global remittance flows to have reached $630 billion in 2022 alone. Such substantial financial inflows serve as a lifeline for households in developing nations, including Indonesia, offering an alternative income source that can directly influence food security and overall welfare.

Indonesia is one of the largest sources of migrant workers in Southeast Asia, with an estimated 2.7 million Indonesian workers abroad as of 2022, primarily in countries like Malaysia, Saudi Arabia, and Hong Kong (Nopitasari et al., 2019). These migrant workers send home remittances that contribute substantially to their families' household incomes, often forming a significant part of local economies in rural and peri-urban areas (Hasibuan & Hartono, 2024). The reliance on remittances is particularly notable in communities where employment opportunities are scarce, agricultural productivity is low, and local economies are underdeveloped (Paudel et al., 2024). For many Indonesian households, remittances provide a safety net that can mitigate the effects of local economic downturns and support daily needs, including food (Parinduri & Thangavelu, 2008)). Studies show that remittances have contributed to poverty alleviation and income growth, indirectly improving food security by enhancing families' purchasing power (Adekunle et al., 2022; Ahmed, 2022; Alhassan, 2023; Aregbeshola, 2022; Azizi, 2021; Bang et al., 2022; Dash, 2022; Feng et al., 2018; Kratou & Khlass, 2022; Pal et al., 2021; Raza et al., 2023; Saptono et al., 2022; Seidu et al., 2022; Sevencan, 2023; Veljanoska, 2022). The relationship between remittances and food security operates through multiple channels. Firstly, remittances act as a direct cash transfer, giving households the flexibility to allocate funds toward basic needs, including food, healthcare, and education. This form of direct income can reduce food insecurity by enabling families to purchase more and higher-quality food items, thus ensuring a more diverse and nutritious diet. This is particularly relevant in rural Indonesia, where households often lack access to stable income sources, leaving them vulnerable to fluctuations in agricultural production and market prices (Feng et al., 2018;). By providing an additional income source, remittances can reduce the financial stress on these households, allowing them to maintain a more consistent and adequate food supply.

Secondly, remittances contribute to economic stability on a broader scale, indirectly enhancing food security by supporting national economic resilience. Remittances provide foreign exchange reserves, which help stabilize local currencies and mitigate inflation. By injecting foreign currency into the national economy, remittances reduce the country's dependence on other volatile income sources like exports and foreign investments, making the national economy more resilient to global economic shocks. In this way, remittances function as a macroeconomic stabilizer, reinforcing local economies and, by extension, supporting food security at a national level. For instance, previous studies note that remittances can stimulate economic growth and reduce unemployment by contributing to capital formation and supporting small businesses, which often serve as vital sources of income for local communities (Imran et al., 2020; Iqbal, 2013).

Despite the potential benefits of remittances for food security, existing studies have produced mixed results regarding their impact. Some research suggests that households receiving remittances are better equipped to achieve food security due to increased disposable income, which allows them to purchase food and other essentials (Abadi et al., 2018; Moniruzzaman, 2022; Sulemana et al., 2019). However, other studies argue that remittances do not always lead to productive investments or improved food security, as some households may allocate these funds toward non-essential or luxury goods (Kakhkharov & Ahunov, 2022). In Nepal, for instance, Mishra et al. (2022) observed that remittances were often used for investments in education and small enterprises, which can contribute to long-term economic stability and food security. Conversely, Abadi et al. (2018) found no significant difference in food security outcomes between households that received remittances and those that did not, suggesting that the impact of remittances on food security may vary significantly based on household priorities and financial management practices.

These varying outcomes could be influenced by several factors. One critical factor is household demographics and socioeconomic characteristics, which may create confounding variables in remittance studies. For example, households with higher levels of education or those in urban areas may manage remittances more effectively, using them for investments that lead to improved food security. In contrast, households in more rural or impoverished areas may use remittances to meet immediate needs without necessarily investing in long-term food security strategies (Adams Jr & Cuecuecha, 2010). Another factor is the methodology used in these studies. Many studies on remittances rely on average treatment effect (ATT) approaches, which address selection bias but often overlook endogeneity issues (Adams Jr & Cuecuecha, 2010; Feld, 2022; Mishra et al., 2022). Selection bias occurs when households that receive remittances differ systematically from those that do not, leading to skewed comparisons (Abadi et al., 2018). Additionally, endogeneity issues arise when unobserved factors, such as household financial literacy or cultural attitudes toward saving, influence both the receipt of

remittances and household food security, confounding the relationship between the two variables.

Considering these methodological challenges, there is a need for more robust research methodologies that account for both selection bias and endogeneity when studying the impact of remittances on food security. This study employs the conditional mixed process (CMP) approach, which can mitigate these issues by addressing observable and unobservable factors that may influence remittance outcomes. The CMP approach allows for more accurate estimation of the causal effects of remittances on food security by accounting for potential endogeneity in the data. By applying this advanced econometric method, the study aims to provide more reliable insights into the relationship between remittances and food security in Indonesia, thus contributing to a nuanced understanding of how remittances can serve as a tool for achieving food security among vulnerable households.

This study makes several significant contributions to the existing literature on remittances and food security in Indonesia. First, it addresses a critical gap in the literature by examining the impact of remittances on food security within the Indonesian context, where remittances play a substantial role in household income. By focusing on Indonesia, the study sheds light on the specific ways in which remittances influence food security in one of the world's largest remittance-receiving nations, where millions of migrant workers send money back home. Second, this research introduces the CMP approach as a methodological advancement in remittance studies, providing a solution to the endogeneity issues that have complicated previous studies. By using CMP, the study offers a more accurate assessment of remittances' impact on food security, setting a precedent for future research in this area. Third, the findings of this study have practical implications for policymakers. By understanding the pathways through which remittances contribute to food security, policymakers can design targeted interventions that support migrant households and optimize the use of remittances for food security enhancement. For instance, policies that encourage financial literacy and productive investment among remittance-receiving households could maximize the benefits of remittances for food security and economic resilience.

2. Conceptual Framework

Figure 1 ilustrates the potential links between remittances and food security. The relationship between remittances and household food security is intricate, acting both as a potential lifeline and a challenge. On one hand, remittances provide a critical income stream that directly enhances food security by enabling households to afford food, improve their diet, and access essential goods (Ofori et al., 2023; Szabo et al., 2022). For many low-income families, particularly in rural regions, this financial support can be

transformative, reducing their vulnerability to food insecurity and providing a buffer during economic hardships. Remittances serve as an immediate safety net, bolstering household resilience in times of crisis by ensuring basic needs are met (Galstyan & Galstyan, 2021; Obi et al., 2020). Beyond short-term relief, remittances can contribute to long-term financial resilience, especially when families invest them productively (Mallick, 2020). Households that channel remittances into income-generating activities, such as agricultural improvements, small businesses, or livestock, create additional income streams that strengthen their financial foundation (Shapiro & Mandelman, 2016; Sikder et al., 2017). For example, rural households may invest in farming equipment or livestock, which can increase productivity and offer a stable income. By diversifying their income sources, households reduce dependency on remittances and become more financially resilient, fostering sustainable food security. This productive use of remittances can establish a positive feedback loop, wherein additional income supports further investments, creating a robust economic base that withstands economic fluctuations.

However, remittances can also introduce potential drawbacks that may hinder long-term food security. A primary risk is financial mismanagement, where households may allocate remittances to non-essential or luxury items rather than to food or productive assets (Thapa & Acharya, 2017). This misallocation can yield short-term comfort but jeopardize long-term stability if remittance funds are not consistently directed toward necessities or investments that could sustain the household. Thus, financial mismanagement can undermine the potential of remittances to support food security, leading to periods of vulnerability when income is not wisely allocated. Additionally, the migration of family members, often heads of households, can impact family dynamics and labor roles, particularly in rural farming families (Wurtz & Castañeda, 2024). When a primary decision-maker migrates, the household may struggle to manage financial and agricultural responsibilities effectively (He-Schaefer & Fan, 2024). In these cases, a decline in agricultural productivity may result if other family members lack the time, skills, or motivation to maintain farming activities. For families that traditionally rely on home-grown food, this shift toward purchased food due to migration-induced labor shortages can reduce self-sufficiency and compromise food security, as households become more reliant on external sources of food. Furthermore, dependence on remittance income may foster economic dependency, reducing the motivation to pursue additional income sources or diversify economic activities (Le De et al., 2013)Households that receive consistent remittances might perceive less need to seek alternative income, creating a passive income structure. This reliance may reduce household adaptability to local economic conditions and inhibit sustainable livelihood development, making them vulnerable to external shocks, particularly if remittance flows decline unexpectedly. This single-source dependency poses a significant risk to food security, as households may struggle to meet their needs without alternative income options.

In rural areas, where agriculture is often the primary livelihood, the consequences of remittance dependency on food security are more pronounced. When a key family member engaged in farming migrates, agricultural activities may be neglected or even abandoned (He & Ye, 2014; Kaur, 2022) This transition from agricultural self-sufficiency to remittance dependency can be detrimental, reducing local food production and affecting the community's agricultural economy (Kapri & Ghimire 2020). As fewer people participate in farming, local food availability may decrease, potentially leading to higher food prices and shortages that affect both remittance-receiving and non-receiving families. Lastly, migration's psychological and social impacts, such as family strain and the absence of a key family member, may indirectly affect food security (Botezat & Pfeiffer, 2020). Emotional stress on remaining family members can impact their motivation to manage household needs, including food acquisition and preparation. This disruption in family cohesion may have long-term consequences on overall household well-being, which is crucial for maintaining stable food security. Thus, while remittances offer significant benefits, they must be managed thoughtfully to maximize their positive impact on household food security.

3. Research Method

3.1. Research Data

The determination of locations in this research uses a multistage sampling method. First, three provinces were selected—two on the island of Java, namely East Java Province, Central Java Province, and one province in West Sumatra. The selection was purposive by considering the highest number of migrant workers in Indonesia (National Agency for Placement and Protection of Indonesian Workers, 2022). Subsequently, regencies with the highest number of migrant workers were selected. In East Java, the two regencies selected were Malang Regency and Blitar Regency. In Central Java, one regency was selected, namely Cilacap Regency. Likewise, one regency in West Sumatra was selected, namely Padang Pariaman Regency. The selection of sub-district locations was purposive based on information from various agencies, such as the Department of Manpower and Statistics Indonesia (BPS). Two sub-districts were chosen based on the highest number of migrant workers from each regency. Finally, two villages were selected from each sub-district using the same method, resulting in a total of eight villages.

The respondents in each village were selected using a simple random sampling method. First, a list of migrant and non-migrant households in each selected village was surveyed to build a framework for the research sampling. The next step was selecting samples from the list of households in each village using the Yamane (1973). The results were oversampled to obtain 75 respondents from each village, resulting in a total of 600 respondents, including both remittance receiver and non-receiver households.

3.2. Measurement of key variables

The key variables in this study, remittance status and food security, are essential for analyzing the potential impacts of remittances on household food security outcomes. Remittance status, the primary independent variable, indicates whether a household receives remittances, and is measured using a binary dummy variable. A value of 1 is assigned if the household receives remittances and 0 if it does not. In this context, a remittance-receiving household is defined as one that has sent at least one family member to migrate—either domestically or internationally—who then sends financial support back to the household. This transfer of income may occur regularly or irregularly, but the critical aspect is that the household benefits financially from the income generated by a family member who works outside the household's typical geographic location. On the other hand, non-remittance households are those that do not send family members to migrate and, consequently, do not receive any form of remittance. These distinctions allow for a clear comparison between households with and without external financial support from migration.

The second key variable, food security, is measured through two indicators: the Food Consumption Score (FCS) and the Food Insecurity Experience Scale (FIES) (FAO, 2017; Rahman et al., 2022). The FCS is a widely used indicator developed by the World Food Programme (WFP) that evaluates household food security based on dietary diversity, food frequency, and nutrient intake. Households are scored according to the variety and frequency of different food groups consumed over a specified period, typically the past week. This score reflects the quality and diversity of the household's diet, with higher scores indicating better food security. The FCS is particularly valuable in contexts where food security may vary seasonally or due to economic conditions, as it provides a snapshot of dietary adequacy and resilience.

The second indicator, the Food Insecurity Experience Scale (FIES), complements the FCS by providing a subjective measure of food security based on direct experiences of food access challenges. Developed by the Food and Agriculture Organization (FAO) (FAO, 2017), the FIES assesses food security by asking respondents about their experiences with food insecurity over the past year, ranging from mild challenges (such as worry about accessing food) to more severe issues (such as skipping meals due to lack of resources). This measure captures a household's experience with food-related stress and the stability of their access to sufficient food, thus providing a nuanced view of food insecurity. By combining FCS and FIES, this study captures both the dietary and experiential aspects of food security, offering a comprehensive understanding of household food security status.

3.3. Data Analysis

In estimating the impact of remittances on household food security, this study employs a conditional mixed process. In the first stage, we modeled the household remittance receivers, assuming that a household's probability to receive remittance is associated with their characteristics, modeled as follows:

$$R_i^* = \partial Z_i + e_i, with\ S_i = \begin{cases} 1, if\ R_i > 0 \\ 0, if\ R_i \leq 0 \end{cases} \quad (1)$$

where R_i^* denotes a latent remittance variable, measured by a dummy variable (C_i= 1 for the remittance receiver; 0 otherwise). X_i represents the explanatory variables' vectors, including age, gender education, family size, dependency ratio, agriculture, asset, distance to public transportation, enterprises, salary income, and location; ∂ is a parameter to be calculated; and e_i refers to an error term.

Second, we built the outcome model by assuming that household food security is the functions of the remittance variable (R_i) and the explanatory variables (V_i). Therefore, to investigate the impact of remittance on household food security can be written by the following model:

$$E_i^* = aS_i + bV_i + u_i, \quad (2)$$

where E_i^* represents the household food security as indicated by a continuous value; a and b are parameters to be calculated. u_i is an error term.

We employed CMP to tackle the issue of endogeneity. This approach is suitable for dealing with endogeneity problems in models with diverse outcome variables, including dichotomous, continuous, or ordered dependent variables (Roodman, 2011). Our research focuses on a continuous outcome variable, i.e., food security, assessed through the food consumption score (FCS) and the food insecurity experience scale (FIES). Essentially, CMP simultaneously estimates different regression models, such as a probit model for Eq. 1 and a continuous regression for Eq. 2, effectively addressing the endogeneity concern (Asfaw et al., 2016).

4. Results and Discussion

4.1. Descriptive Statistics

Table 1 presents the variable information related to household life in a particular area. This data analysis provides an overview of the characteristics and conditions of households and the factors that can influence their happiness and life satisfaction. The first variable is

Remittances, which is a dummy variable with a value of 1 if the household receives remittances and 0 otherwise. From the data, it can be concluded that about 47.2% of households in the sample receive remittances. This indicates a financial contribution from family members outside the household, which can affect their economic conditions. Household demographics are also reflected in the data. The Age variable shows that the average age of the household head is 49.601 years. The Gender variable indicates that the majority of household heads are male, with a dummy value of approximately 0.853. The education of the household head is reflected in the Education variable, which shows that the education level of the household head is 8.712 years.

Table 1
Descriptive statistics of selected variables

Variable	Measurement	Mean	Std. Dev.
Remittances	Dummy, 1 if the household receives remittance; 0 otherwise	0.472	0.500
Age	Age of household head in a year	49.601	12.730
Gender	Dummy, 1 for male; 0 otherwise	0.853	0.354
Education	Education level of household head in a year	8.712	3.183
Family size	Number of family members	3.762	1.296
Depratio	The ratio of dependency family in percent	11.399	1.025
Agriculture	Dummy, 1 if the household's main income source is agriculture; 0 otherwise	0.259	0.439
Asset	Total land area owned by the household in m2	30.418	591.786
Distance to public transport	Distance to public transportation in km	4.103	3.623
Enterprises	Dummy, 1 if the household has enterprises; 0 otherwise	0.568	0.496
Salary	The number of family members contributing to household income	0.931	0.841
Income	Household income of million rupiah per year	35.900	162.000
Java	Dummy, 1 if the household lives in Java Island, 0 for Sumatera	0.788	0.409
Bank account	Dummy, 1 if the household has a bank account; 0 otherwise	0.732	0.443

The Family Size variable indicates that the average number of family members was 3.762. Meanwhile, the Depratio variable shows the family dependency ratio in percentage, with a value of around 11.399%. This indicates that most households in the sample have a relatively small number of family members and a low dependency rate. Table 1 also depicts the economic factors, such as the Agriculture variable, a dummy variable indicating whether the main source of household income comes from the agricultural sector, with a value of 25.9%. The Asset variable reflects the total land area owned by the household, with an average of around 30,418 m^2. The distance to public transportation is reflected in the Distance to Public variable, with an average of around 4.103 km. The Enterprises variable is a dummy variable indicating whether the household has a business, with a value of around 56.8%. The Salary and Income variables reflect the contribution of family members to household income, with an average of 0.931 family members contributing and a household income of around 35,900 million rupiahs per year. The last variable is Java, a dummy variable that indicates whether the household lives on the island of Java or Sumatra. Most households in the sample live on the island of Java, with a dummy value of around 78.8%. Finally, the Bank Account variable is a dummy variable indicating whether the household has a bank account, with a value of around 73.2%, which reflects the level of financial inclusion and household access to banking services.

Table 2 compares average household characteristics between those receiving remittances and those that do not. Notably, there are differences in various aspects. Remittance-receiving households show a slight age disparity, which could be contextually consequential. Gender disparity is significant, possibly reflecting remittance receipt patterns. Education among the remittance-receiving households tends to be higher, hinting at better access to education. Although differences in family size are not significant, there is a noticeable gap in deprivation rates, suggesting remittances may alleviate hardship. Most strikingly, remittance-receiving households exhibit substantially higher asset values, indicating the remittance’s role in increasing economic well-being. Disparities also extend to the distance to public transportation, number of enterprises, salary, and income variables.

Table 2. The mean difference in household characteristics

Variables	Mean		diff
	Remittance	Non-remittance	
Age	49.690	49.521	0.169
Gender	0.824	0.879	-0.055*
Education	8.824	8.611	0.213
Family size	3.773	3.752	0.021
Depratio	11.267	11.516	-0.249***
Agriculture	0.245	0.271	-0.026
Asset	9.328	49.234	-39.906
Distance to public	4.379	3.857	0.522*
Enterprises	0.484	0.644	-0.160***
Salary	1.139	0.745	0.394***
Income	31.100	40.100	-9.000

Note: ***=p< 0.01, **=p< 0.05, and *=p< 0.1

4.2. Factors Influencing Remittance

The remittance model in Table 3 provides a detailed overview of the factors influencing household remittance reception. The analysis results indicate that several variables significantly impact households receiving remittances, including gender, household size, non-productive household members (dependency ratio), enterprise ownership, salary, and income. One noteworthy factor is gender. The findings show that gender significantly negatively influences households receiving remittances. This suggests that male-headed households are less likely to receive remittances than female-headed households. This trend could be attributed to the traditional gender roles in Indonesian society, where females are often expected to handle domestic responsibilities rather than participate in the workforce (Setyonaluri et al., 2021). Consequently, male household heads are often responsible for fulfilling household financial needs, making them less likely to receive external financial support through remittances.

Table 3. The impact of remittance on food consumption score

Variables	Remittances		FCS	
	(Coefficient)		(Coefficient)	
Remittances			11.295	(2.918)***
Age	0.001	(0.004)	-0.055	(0.038)
Gender	-0.429	(0.155)***	1.582	(1.464)
Education	0.003	(0.016)	0.141	(0.148)
Family size	-0.119	(0.055)**	0.738	(0.494)
Depratio	0.179	(0.067)***	-0.895	(1.105)
Agriculture	0.103	(0.123)	-0.406	(0.137)***
Distance to public	0.019	(0.015)	1.083	(1.026)
Enterprises	-0.347	(0.107)***	0.011	(0.660)
Salary	0.224	(0.069)***	1.951	(0.628)***
Income	0.033	(0.032)	0.996	(0.302)***
Java	0.343	(0.142)**	5.019	(1.304) ***
Bank account	0.644	(0.113)***		
Cons	1.235	(1.116)	-17.281	(10.502)
ρ_{eu}	-3.600	(0.182)**		
Log likelihood	-2774.555			
LR chi2(31)	173.160			
Prob > chi2	0.000			
Sample size	632			

Note: Standard errors in parentheses. ***=p< 0.01, **=p< 0.05, and *=p< 0.1

In addition to gender, household size is also a critical factor in remittance probability. The findings indicate that the number of family members has a significant negative influence. In other words, the larger the household, the lower the possibility of receiving remittances, which may be because larger households have more working-age members who can contribute to household financial stability. This finding aligns with a previous study by Olowa and Olowa (2013) highlighting the negative impact of household size on the probability of receiving remittances. The dependency ratio, which measures the number of non-productive household members, also emerges as a significant variable. The negative coefficient indicates that the higher the dependency rate, the lower the tendency

to receive remittances. Entrepreneurship also proves to have a significant impact on the probability of households receiving remittances. Business ownership has a negative and significant coefficient, indicating that households with businesses are less likely to receive remittances. This suggests that entrepreneurship can stabilize households, reducing the need for external financial support and even migration patterns (Song et al., 2021). Finally, salary and income variables also determine remittance receipt. Higher salaries and incomes can provide incentives to stay in a hometown, especially if the local economic conditions are satisfactory. Conversely, households with lower salary and income levels may be more vulnerable to economic pressures, prompting them to seek opportunities elsewhere.

4.3. Impact of Remittances on Food Security

The impact of remittances on food security is the main focus of the research, especially in the rural context of Indonesia. Tables 5–6 provide a detailed overview of the relationship between remittances and food security proxied by the Food Consumption Score (FCS) and the Food Insecurity Experience Scale (FIES). The analysis results indicate that the remittance variable has a positive and significant impact on FCS, while it has a negative and significant impact on FIES. In the context of food security, FCS serves as a key indicator measuring the quality of household food consumption. The findings suggest that households receiving remittances have higher FCS values, which indicates the role of remittances in enhancing households' access to diverse and sufficient food consumption. Remittances can be used to diversify foods and reduce dependence on a single type of food, which positively impacts the quality of consumed food.

The research results also highlight the relationship between remittances and FIES, which measures the household's food insecurity level. The findings show that remittances have a negative impact on FIES. In other words, households receiving remittances tend to experience lower levels of food insecurity. Remittances can provide an additional source of income for food needs, reducing the risk of food insecurity. This finding is in line with a study by Moniruzzaman (2022) in various global contexts, which emphasizes the positive role of remittances in improving food access and reducing the risk of hunger. Additionally, research by Nugroho et al. (2022) underscores the importance of engaging communities in developing sustainable solutions for food security.

Meanwhile, Eq. 2 controls household characteristics in the estimation strategy. The results are presented in Table 3 for FCS and Table 4 for FIES. The findings indicate that the number of family members positively and significantly affects FIES—the larger the households, the greater the challenges in securing adequate food supplies. A similar finding was highlighted in a study by Awoke et al. (2022), which emphasized the negative influence of family size on household food security. Similar to household size, the dependency ratio shows a positive and significant coefficient for FIES, suggesting that

having more dependent members increases the risk of household food insecurity. Agricultural variables also significantly reduce household food security, suggesting that households with earnings from agriculture tend to be more food insecure. This is because farmers' livelihoods are more vulnerable than non-farmers (Rahman et al., 2022). Salaries and incomes positively and significantly affect household food security, which is not surprising as more income allows households to maintain their food needs better (Rahman & Mishra, 2020).

Table 4
The impact of remittance on food insecurity experience scale

Variables	Remittances		FCS	
	(Coefficient)		(Coefficient)	
Remittances			11.295	(2.918)***
Age	0.001	(0.004)	-0.055	(0.038)
Gender	-0.429	(0.155)***	1.582	(1.464)
Education	0.003	(0.016)	0.141	(0.148)
Family size	-0.119	(0.055)**	0.738	(0.494)
Depratio	0.179	(0.067)***	-0.895	(1.105)
Agriculture	0.103	(0.123)	-0.406	(0.137)***
Distance to public	0.019	(0.015)	1.083	(1.026)
Enterprises	-0.347	(0.107)***	0.011	(0.660)
Salary	0.224	(0.069)***	1.951	(0.628)***
Income	0.033	(0.032)	0.996	(0.302)***
Java	0.343	(0.142)**	5.019	(1.304) ***
Bank account	0.644	(0.113)***		
Cons	1.235	(1.116)	-17.281	(10.502)
ρ_{eu}		-3.600	(0.182)**	
Log likelihood	-2774.555			
LR chi2(31)	173.160			
Prob > chi2	0.000			
Sample size	632			
Note: Standard errors in parentheses. ***=p < 0.01, **=p < 0.05, and *=p < 0.1				

5. Conclusion

This study investigates the impact of remittances on household food security in the context of Indonesia using data from 600 households and analyzed using a Conditional Mixed Process (CMP) approach. The primary finding underscores the significant positive influence of remittances on enhancing household food security. Remittances ensure that households have access to an adequate and varied diet, hence diversifying food

consumption and mitigating the risk of food insecurity. The findings align with the existing literature, reaffirming the vital contribution of remittances to household welfare. The findings also shed light on the nuanced relationship between household characteristics and the likelihood of receiving remittances. The positive determinants include dependency ratio and bank account ownership. Households with higher dependency ratios or access to formal financial services are more likely to receive remittances. Conversely, gender, family size, and business ownership have negative associations with remittance receipt, suggesting that certain demographic and economic factors may hinder the flow of remittances to households in the home country.

Based on this study's findings, policymakers should consider implementing a program to encourage migrant workers to send their remittances back to their home country, such as by facilitating channels for remittance transfers. This program may include providing incentives or reducing transaction costs associated with sending remittances through formal channels. Additionally, financial literacy among migrant workers should be improved. They should be made aware of the benefits of sending remittances through formal channels and the potential benefits for household welfare.

Declarations

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Data Availability Statement

The data that support the findings of this study are available from Hery Toiba upon request.

Conflict of Interests

There is no conflict of interest.

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Figures

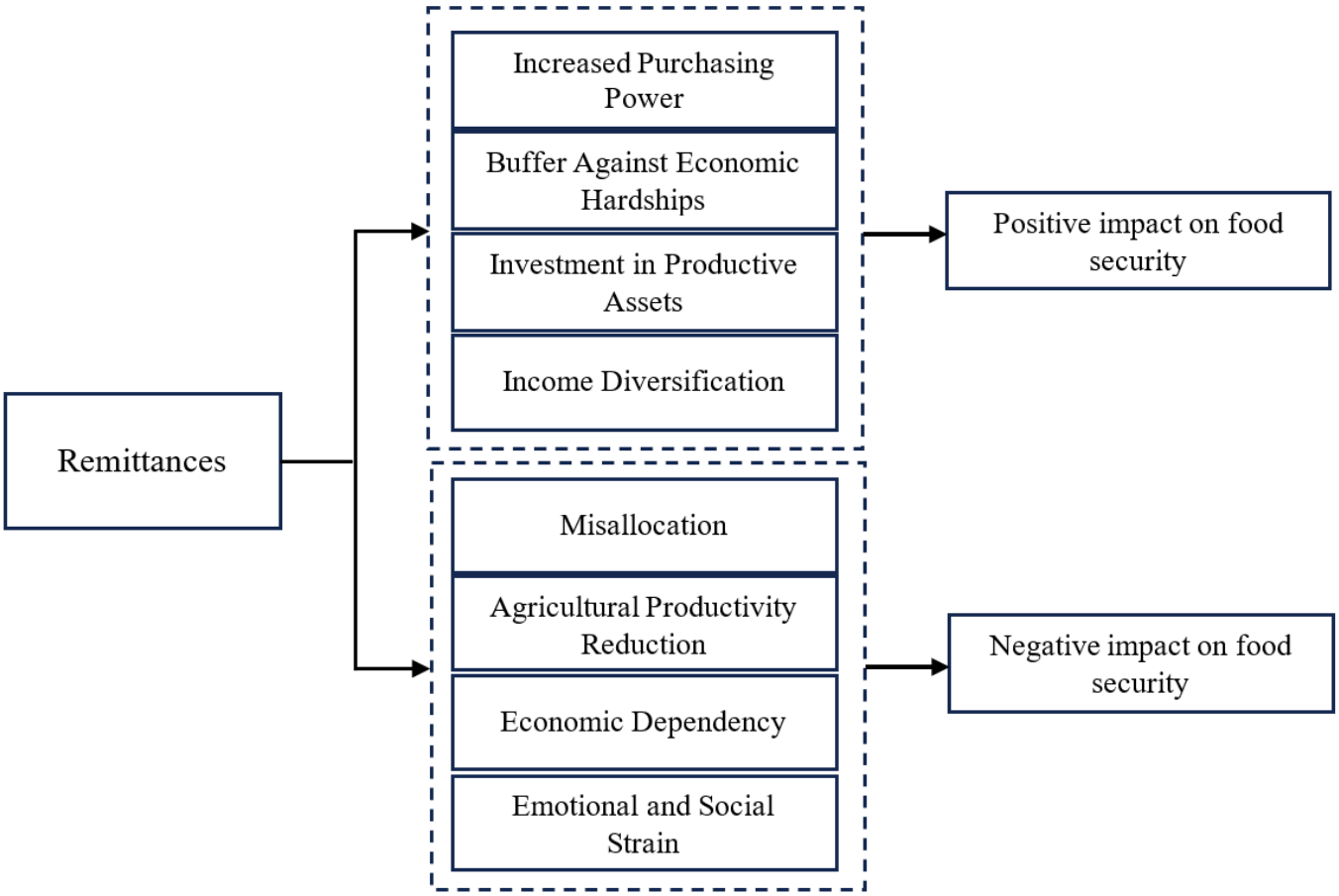


Figure 1

Conceptual framework illustrating the potential links between remittances and food security