Remittances and Household Dependence: Evidence from Bangladesh

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Abstract

Economic theory predicts that an unexpected windfall should reduce the labour supply of an adult through the income effect. This underscores the notion that cash transfers (both public and private) create work disincentives and can make the recipients lazy. This study investigates whether remittances – a private cash transfer – leads to dependence at the receiving household level. The main hypothesis is that remittances reduce the likelihood and amount of non-remittance income generated by households. We use data from the Bangladesh Survey on the Use of Remittance 2013 and instrumental variables approach to account for endogeneity concerns. Our results show that remittances do not lead to dependence at both the extensive and intensive margins. The results are robust to different model specifications, different definitions of the treatment and outcome variables and violations of the exclusion restriction. We also present important channels through which remittances affects households' dependence other than the income effect.

Keywords: Remittances, remittance dependence, dependency culture, imperfect instrumental variable, Bangladesh.
JEL Codes: F22, F24.

1 Introduction

Economic theory predicts that when an adult receives an unexpected windfall, they supply less labour and earn less income. This notion underscore fears that public or private transfers such as conditional cash transfers, unconditional cash transfers or migrant remittances create work disincentives and make the recipients lazy. Public cash transfers in terms of social protection are gaining popularity in low and middle income countries and are an important lifeline for poor and vulnerable households in these countries (Banerjee et al., 2017; Beegle et al., 2018; Gentilini et al., 2014). Public cash transfers have been shown to have positive effects on health (Marinescu, 2018), nutrition (Manley et al., 2013), and poverty (Agostini and Brown, 2011; Aizer et al., 2016) outcomes of recipients. Despite these positive effects, there are concerns in the public policy circles that these transfers could discourage work and lead to dependence[1]. However, there is little rigorous evidence to support this claim. Banerjee et al. (2017) using data from 7 randomised controlled trials (RCTs) in 6 countries found no observable evidence that public cash transfers lead to lower labour supply both at the extensive margin and the intensive margin. Similarly, Baird et al. (2018) conducted a "narrative review" of the existing evidence and concluded that public transfers have little to no effect on adults labour supply.

Remittances are private transfers and a form of non-labour income. They have been shown to reduce poverty (Adams and Cuecuecha, 2013; Adams and Page, 2005), increase investment in health (Amuedo-Dorantes and Pozo, 2011; Antman, 2010) and human capital (Acharya and Leon-Gonzalez, 2014). Remittances have also been shown to increase entrepreneurship (Acosta, 2007; Woodruff and Zenteno, 2007). The effect of non-labour income on a household's labour supply has received much attention in labour economics. Perhaps, the most popular example is the response of wives' labour supply to their husband's income (i.e., a form of non-labour income for the wife) (see Bredtmann et al., 2018; Halla et al., 2020; Kohara, 2010). Similarly, migration economics studies the labour supply response of left behind household members to remittance receipt from a migrant. This question emerges from a broader concern – whether remittances lead to remittance dependence. If it does, this unintended consequence of remittances can reduce economic activities in remittance-receiving communities and undermine local economic development efforts.

Existing studies on the effect of remittances on remittance dependence use indirect measures such as labour supply. The preponderance of evidence in this literature points to lower labour supply in response to remittance inflows. Some authors have argued that this is evidence of remittance dependence (Amuedo-Dorantes and Pozo, 2014; Démurger, 2015). However, we argue that this measure does not fully capture remittance dependence for the following reasons. First, migration from developing countries is typically a male phenomenon (BBS, 2016; Ratha et al., 2011), and left behind adult family members are usually female members (i.e., wife) and elderly parents (Démurger, 2015). Gender norms in many developing countries

discourage women from engaging in paid employment. Consequently, they are more likely to stay at home and engage in home production rather than participate in the labour market. Second, remittances may facilitate asset accumulation such as acquiring agricultural land which generates non-labour income from land rents and crop sharing agreements that might not be captured by earning measures. Furthermore, remittances increase the reservation wage of recipient household members which could lead to longer search for good jobs or inspire recipient household members to quit low-paying jobs. Consequently, labour supply does not capture the extent of remittance dependence. A better approach to investigate remittance dependence is to use direct measures of a household's non-remittance income.

In this study, we examine the effect of remittances on household remittance dependence by asking whether remittances reduce the likelihood and extent of non-remittance income generated by households. Essentially, we want to check whether remittance receipt leads to remittance dependence at both the intensive and extensive margins in Bangladesh. Bangladesh is a suitable context to study this question because it is a major labour exporting country and ranks among the top ten international remittance receiving countries in the world (World Bank, 2020). Furthermore, there is a sizeable incidence of remittance dependence amongst households in Bangladesh (IOM, 2019).

We use data from the Bangladesh Survey on the Use of Remittance 2013 – a cross-sectional, nationally representative household survey of international migrant households. It provides comprehensive information about migration patterns, remittances received, and their uses. It also provides rich information on migrant characteristics, socio-economic and demographic characteristics of the left behind household members. Our key explanatory variable is the cash amount of remittances received in the previous 12 months before the survey. At the extensive margin, remittance dependence is a binary indicator that equals one if the household declare to rely solely on remittances and zero otherwise. At the intensive margin, it is the amount of non-remittance income. The rationale is that the larger non-remittance income is, the less dependent the household is on remittances. Non-remittance income comprises income from all other sources except remittances. These sources include income from agriculture, income from business, wage income and rents.

A simple regression of remittances on dependence is likely to lead to biased results due to potential confounding effects. We therefore use instrumental variables (IV) approach to address the potential endogeneity of remittances. A credible instrument must be correlated with the endogenous variable of interest but uncorrelated with the error term. We exploit changes in the economic conditions at destination as a source of exogenous variation. Specifically, our instrument – economic fitness shocks – is a measure of the destination country's diversification and ability to produce complex goods on a globally competitive basis. Higher economic fitness (EF) shows relatively greater capabilities, higher value additions, greater ease in diversifying products, and more predictable growth (World Bank, 2021). We argue that economic fitness is relatively better than simpler measures such as unemployment

rate as an IV in that it provides a more comprehensive picture of a country's competitiveness on the global stage and the overall attractiveness of the country. It is also a better proxy of migrants' potential income and employment. We define economic fitness shocks as changes in economic fitness at the migrants' destination in the year preceding the survey. We expect that improvements (worsening) in economic fitness at destination increase (decrease) remittance flows but are uncorrelated with household level outcomes in Bangladesh except through remittances. Destination-level instrumental variables are popular in the remittance literature because they are plausibly exogenous (Amuedo-Dorantes, 2014; Cuadros-Menaca and Gaduh, 2020; Yang, 2008).

Although our instrument is plausibly exogenous, there are potential threats to identification. For example, the choice of destination countries for Bangladeshi migrants are not exogenous as they are driven, for example, by migration networks. Another potential threat is through international trade. If the destination countries are key trading partners with Bangladesh, then it is possible that economic fitness shocks at the destination country can also affect households in Bangladesh through other channels, thus violating the exclusion restriction. We test the sensitivity of our results to violations of the exclusion restriction using Nevo and Rosen (2012)'s imperfect instrumental variables (IIV) approach. The IIV approach substitutes the strong and untestable exogeneity assumption with two weaker assumptions – one, the IIV is correlated with the error term but the direction of the correlation is the same as that of the correlation between the endogenous regressor and the error term. The second assumption is that the IIV is less endogenous than the endogenous regressor of interest. In this way, we can obtain bounds on the endogenous variable of interest rather than point estimates.

At the extensive margin, we find that remittance receiving households are more likely to engage in income generating activities; implying that they are not dependent on remittances. More precisely, a 10 percent rise in remittances increase the probability of engaging in income generating activities by 1.5 percentage points. At the intensive margin, our results show that remittance receipt increases a household's non-remittance income. Specifically, we find that a 10 percent increase in remittances boost households' non-remittance income by 2.6 percentage points. Taken together, the results suggest that remittance receipt does not lead to remittance dependence, as suggested by the migration and remittance literature (Amuedo-Dorantes and Pozo, 2006; Binzel and Assaad, 2011; Mendola and Carletto, 2012). Instead, remittances ease households' liquidity constraints and facilitates investment in capital (Adams and Cuecuecha, 2013; Hossain and Sunmoni, 2022; Yang, 2008) and other income generating activities that increase households' non-remittance income. These results are robust to different model specifications, different definitions of our treatment and outcome variables and violations of the exclusion restriction of the instrumental variables approach.

We test for possible channels through which remittances affect household dependence other than the conventional income effect. Precisely, we explore the health productivity and

liquidity mechanisms. Our results show that these are important mechanisms through which remittances affects households. Using five different measures of health productivity, we find that remittances ease liquidity constraints thus allowing individuals to purchase better quality food, live in a more sanitary environment, and invest in their health. These factors contribute to the worker's health and productivity, thus increasing their participation in the labour market and income generating activities. Secondly, we find evidence for the liquidity effect mechanism. Our results show that remittances ease households' liquidity constraints and facilitate participation in income generating activities such as investment in physical or financial capital, which boosts households' non-remittance income and reduces remittance dependence. Overall, we provide new and rigorous evidence that remittances do not lead to household dependence but rather ease households' liquidity constraints and facilitates in-vestment in health and income generating activities which can boost household income and reduce dependence.

We make three important contributions to the migration and remittance literature. First, we use a novel approach to explicitly study remittance dependence. To our knowledge, we are the first to explicitly study the effect of remittances on receiving households' dependence. The closest studies to ours are those that study the effect of remittances on the labour supply of left-behind household members (Amuedo-Dorantes and Pozo, 2006; Binzel and Assaad, 2011; Mendola and Carletto, 2012). We argue that labour supply decisions of household members do not fully capture remittance dependence in developing countries. Second, we highlight important channels through which remittances affect households other than the income effect. In the context of low- and middle-income countries where missing credit and insurance markets are prevalent, the income effect may not be enough to fully capture the effect of remittances on households. We thus, explore two other mechanisms – health-productivity and liquidity effect – which better capture the effect of remittances on households. Third, we used a novel method to check the sensitivity of our results to violations of the exclusion restriction. Past studies that used instrumental variables to address endogeneity sometimes adopt instruments that do not satisfy the exclusion restriction condition.

The rest of the paper is structured as follows: Section 2 covers the institutional context, Section 3 covers the conceptual framework, Section 4 covers the data sources, Section 5 covers the empirical methodology, Section 6 covers the main results, Section 7 covers robustness checks, Section 8 covers heterogeneity of effect, Section 9 covers mechanisms and Section 10 concludes the paper.

2 Institutional Context

International migration is an integral part of the Bangladeshi economy. With about 7.4 million migrants abroad, Bangladesh is the sixth largest labour exporting country in the world (IOM, 2022). Furthermore, the International Organisation for Migration (IOM) estimates that over 2 million young adults join the labour market yearly (IOM, 2017). However, the demand for labour in the domestic economy significantly under performs the supply of labour. Many workers who are unable to find jobs in the domestic market migrate internationally in search of better opportunities. According to the IOM, about 0.7 million Bangladeshi workers migrate to the Middle East and Arab countries each year (IOM, 2019).

Given the importance of international migration in Bangladesh, the government has prioritised migration in its development policy. In addition, there are government departments and agencies such as the Ministry of Expatriates' Welfare and Overseas Employment and Bureau of Manpower Employment and Training (BMET) which facilitate international migration (IOM, 2020). Figure 1 shows that the absolute number of migrants from Bangladesh has increased steadily in the past two decades, however, the ratio to population has remained relatively stable at about 5%.

Migration is typically a male phenomenon in Bangladesh with more than 90% of the mi-grants being men (BBS, 2016). These migrants typically migrate to the Middle East, they have low levels of education and are usually in their thirties. Prior to 2004, there were some government restrictions which disincentivised female migration. However, since 2004, the restrictions decreased and female migration increased (IOM, 2017). Female migrants from Bangladesh typically migrate to the Middle East and are employed as domestic workers (IOM, 2020).

The importance of remittances on origin households and communities is well established in the literature (Adams, 2011; Amuedo-Dorantes and Pozo, 2014; Antman, 2014; Démurger, 2015). Remittances is the second-largest foreign exchange earner in Bangladesh after garment exports. Given the sheer magnitude of international migration in Bangladesh, remittances from migrant workers plays an important role in the economy. According to the World Bank, Bangladesh is the 7th largest recipient of remittances in the World as of 2021 (World Bank, 2022).

Remittance flows to Bangladesh stood at $13.87bn in 2013 but has grown by an average of 7% over the last decade and is expected to reach $22.4bn in 2022 (World Bank, 2022). Figure 2 shows the trends in remittance flows over the past 4 decades. The figure shows a steady upward trend in remittance flows to Bangladesh. This underscores the large-scale labour exports and the consequent inflow of remittances. Furthermore, about 90% of migrants send remittances to their families back home, and these remittances account for approximately 78% of total household income in remittance-receiving households (BBS, 2016). These

Figure 1: Emigration and emigrants as a share of total population
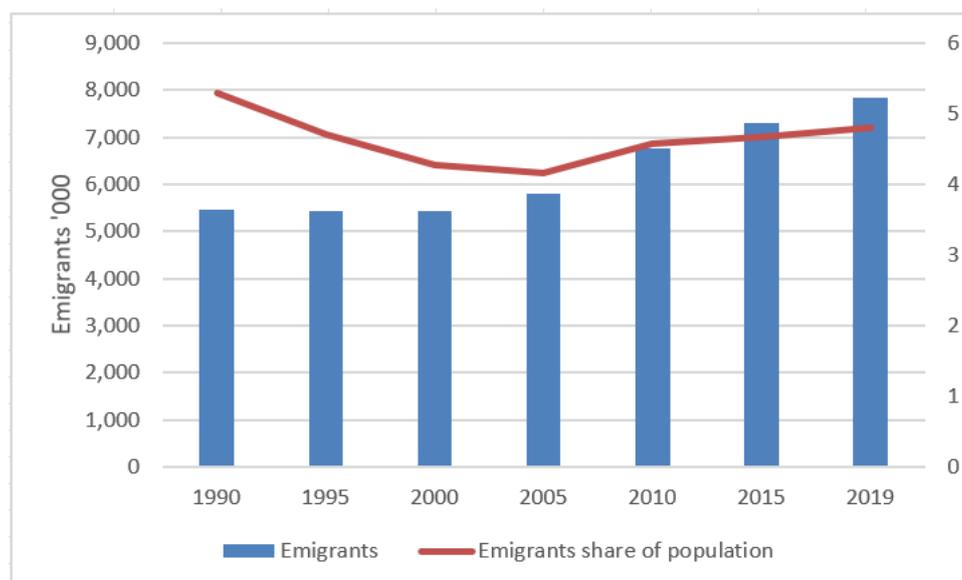
Notes. This figure was created by the author using Migrants stock data was from UNDESA (accessed 30 May 2022). Population data was from World Bank (accessed 1 June 2022). UNDESA means United Nations Department of Economic and Social Affairs.

private transfers increase the total household income of remittance receiving households and puts them in the top 10% of Bangladesh's income ladder (IOM, 2019). The remittance to Gross Domestic Product (GDP) ratio was about 7 percent in 2020, which is 13th largest in Asia (IOM, 2022). Given the importance of international migration and remittances in Bangladesh, it is not surprising that there is a large literature that analyse the effect of remittances on origin households. However, to our knowledge, this is the first study to analyse the effect of remittances on households' dependence.

Figure 2: Inward remittance flows to Bangladesh 1980 – 2020
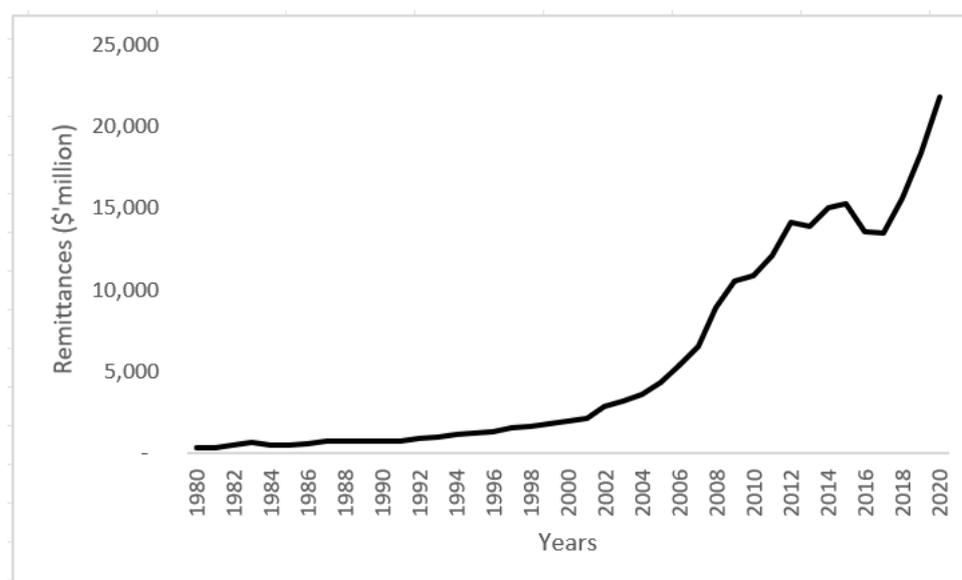
Source: World Bank Remittances Database (Extracted May 29, 2022).

3 Conceptual Framework

The neoclassical model of labour-leisure choice predicts that an increase in non-labour income of a working age person leads a parallel, outward shift in their budget constraint. If we assume that leisure is a normal good, then an increase in non-labour income raises the demand for leisure and reduces hours of work. The income effect of an increase in non-labour income, holding wage rate constant is a reduction in labour supply (Borjas, 2016). On the decision to work, agents maximise their utility (i.e. they allocate their time working for pay or enjoying pleasurable leisure activities) subject to a budget constraint. The agent's budget constraint comprises of labour income and non-labour income. Labour income is determined by the market wage rate and the agent's time budget, while non-labour income refers to income from other sources such as, inheritance, investment income and remittances (Borjas, 2016).

Many researchers have argued that remittances can be considered as non-labour income in remittance-receiving households (Cox-Edwards and Rodríguez-Oreggia, 2009; Killingsworth, 1983). The decision to participate in the labour market is driven mainly by the reservation wage which is defined as the minimum wage rate that would make the agent indifferent between working or not working (Cahuc et al., 2014). Therefore, an agent will only work if the market wage rate is higher than his/her reservation wage. In the same vein, if the reservation wage increases, an agent is less likely to join the labour force and vice versa. A key determinant of the reservation wage is non-labour income which is comprised of individual or household assets/wealth, income of other household members and remittances, etc. As a result, receiving remittances can increase an agent's non-labour income which can reduce the likelihood of participation in the labour market.

Overall, the theory predicts that an increase in non-labour income leads to a reduction in the labour supply of adults both at the extensive (whether to work or not) and intensive (hours worked) margins. Several studies have investigated the effect of remittances on labour supply and the preponderance of evidence suggest that remittances reduce labour supply (Binzel and Assaad, 2011; López-Feldman and Escalona, 2016; Mendola and Carletto, 2012). Some authors explain these results through the income effect of remittances. Others suggest that remittances leads to dependency by providing work disincentives (Amuedo-Dorantes and Pozo, 2014). This paper follows the argument of Baird et al. (2018) which suggests that the simple neoclassical labour-leisure model may be too simple to explain the labour supply response of individuals to transfers such as remittances, particularly in the context of low- and middle-income countries. They suggest additional channels (health-productivity and liquidity effect) through which transfers can affect the recipients labour supply.

In this paper, we will focus on two channels which can be grouped together as missing markets. Missing or incomplete credit and insurance markets can prevent individuals from participating in economic activities that could increase their income and labour supply (Chiodi et al., 2012).

For example, credit constraints can hinder people from partaking in certain investments that can boost their earnings capacity. Similarly, missing or incomplete insurance markets can make individuals reluctant to engage in high risk, high reward activities. Private transfers such as remittances can help recipients overcome liquidity and, risk constraints and thus increase their labour earnings and potentially labour supply through channels other than the income effect. One of such channels is the health productivity and another is the liquidity effect.

Health and Productivity channel: Unhealthy workers are not very productive at work (Baird et al., 2018; Dasgupta and Ray, 1986). Health has been linked with labour supply and productivity in the literature - good health with more labour supply and vice versa (Goryakin et al., 2014; Blundell et al., 2021; Cai, 2010). Remittances can ease liquidity constraints, thus allowing individuals to purchase better quality food, live in more sanitary environments, and invest in their health. These factors contribute to the worker's health, thus increasing their productivity and participation in the labour market and other income generating activities. Several studies in the literature show that remittances improve households' health and sanitation facilities, which improves labour productivity and engagement in income generating activities (Amuedo-Dorantes and Pozo, 2011; Lu, 2013; Mergo, 2016).

Liquidity Effect: It is well established in the literature that remittances relax households' budget constraints, which can improve consumption and facilitate investment in physical or financial capital (Adams, 2011; Hossain and Sunmoni, 2022; Jena, 2018). In addition, it can provide much-needed liquidity for household members to start businesses. For example, for individuals who have viable business ideas but lack the funds to execute it, remittances can enable them start businesses or expand current business. Studies have shown a positive effect of remittances on entrepreneurship (Giulietti et al., 2013; Kakhkharov, 2019; Woodruff and Zenteno, 2007).

4 Data Source

This study uses the Bangladesh Survey on the Use of Remittance 2013. This is a nationally representative cross-sectional household survey of international remittance-receiving households carried out by the Bangladesh Bureau of Statistics (BBS) in 2013. It contains comprehensive information about the characteristics of the migrants, the socioeconomic conditions of the remittance-receiving households, and detailed information on remittance use. The survey also provides detailed information on migrant characteristics as well as the destination country of the migrant. Retrospective household income and expenditure data were collected for the last 12 months before the survey. Households also reported the total remittance received in the past 12 months. One unique feature of the survey is that it provides data on household income sources and specifically whether the household received income from any sources other than remittances.

Our key explanatory variable is the cash amount of remittances received in the previous 12 months before the survey. Our outcome variable is household's dependence on remittances. We explore remittance dependence at both the extensive and intensive margins. At the extensive margin, remittance dependence is a binary indicator variable that equals one if the household declares to have no other income source but remittances and zero otherwise. This variable was created from the question "does the household have any other source of income other than remittances?" in the survey. At the intensive margin, we define remittance dependence as the amount of income from non-remittance sources. In particular, we used the question, "how much income did your household earn from other sources (excluding remittances) in the last 12 months?", from the survey to capture this variable. The rationale is that the larger the non-remittance income, the less dependent the household is on remittances. It is important to note that this variable is conditional on households having other sources of income other than remittances i.e. answering yes to the above question.

Our sample includes households with temporary economic migrants[2] who will return to their home country after living in the destination country for a period. We keep households with male migrants as migration is predominantly a male phenomenon in Bangladesh. Finally, we keep households with a migration duration of at least 18 months because households' reports of total remittances in the last 12 months will be incomplete if migration happened within the last year. In addition, migrants do not start sending remittances immediately after arriving at their destination. Finally, about 26.5% (with a standard deviation of 0.44) of our sample are fully dependent on remittances (i.e. income from other sources is zero). Our final sample consists of 9,238 remittance receiving households with temporary male migrants who migrated at least 18 months before the survey.

Table 1 presents the distributional characteristics of the sample[3]. The full sample is in column 1, non-remittance dependent households in column 2, and remittance dependent households in column 3. About a quarter (26%) of our sample are remittance dependent. Almost half (48%) of the remittance receiving households in Bangladesh are female headed. About a third (32%) of household heads in remittance receiving household have secondary education and a little above a quarter (28%) have primary education. The typical household head in remittance receiving households is 49 years old. The typical remittance receiving household in Bangladesh is made up of 4.7 members on average. They have about 21% of working age male household members and about 40% of working age female household members. About 42% of remittances are received by the wife of the migrant, 40% are received by the migrant's parent and only 12% is received by the migrant's siblings. Migrants sends money 5.2 times on average per year, which corresponds to almost every other month.

Most migrants from Bangladesh are young men with an average age of 33. They are typically uneducated or have very low levels of education as only 12% have secondary education. It is therefore not surprising that about 64% of them work as labourers in the Middle East. The Middle East is the main destination for Bangladeshi migrant as it accounts for 70% of the

migrants in our sample[4]. More than half (53%) of the migrants are sons of the household head and only 34% are the husband of the household head. Bangladeshi migrants sent a total of $2849.76[5] in the 12 months preceding the survey which amounts to an average of $237.48 per month. This is four times larger than average household income of $693.

Table 1: Summary Statistics

	Full Sample	Remittance Dependent	
		No	Yes
	(1)	(2)	(3)
Household Head's Characteristics			
Household head is female (=1 if yes)	0.476	0.386	0.730
	(0.499)	(0.487)	(0.444)
Head has primary education (=1 if yes)	0.282	0.281	0.282
	(0.450)	(0.450)	(0.450)
Head has secondary education (=1 if yes)	0.324	0.309	0.368
	(0.468)	(0.462)	(0.482)
Head's age	48.68	51.00	42.14
	(16.47)	(16.01)	(15.95)
Household Characteristics			
Household size	4.688	4.981	3.864
	(2.322)	(2.428)	(1.75)
Proportion of male members aged 16-60 years	0.210	0.235	0.139
	(0.204)	(0.201)	(0.195)
Proportion of female members aged 16-60 years	0.402	0.397	0.413
	(0.398)	(0.175)	(0.194)
Remittance receipt by migrant's brother/sister (=1 if yes)	0.124	0.140	0.078
	(0.048)	(0.347)	(0.267)
Remittance receipt by migrant's parents (=1 if yes)	0.400	0.448	0.262
	(0.490)	(0.497)	(0.440)
Remittance receipt by migrant's wife (=1 if yes)	0.417	0.353	0.596
	(0.493)	(0.478)	(0.491)
Frequency of remittance received	5.234	5.036	5.792
	(3.154)	(3.079)	(3.293)
Migrant's Characteristics			
Migrant's age	33.24	32.41	35.59
	(9.14)	(9.07)	(8.90)
Migrant has above secondary education (=1 if yes)	0.122	0.133	0.090
	(0.328)	(0.340)	(0.286)
Migrant is a husband (=1 if yes)	0.339	0.251	0.583
	(0.473)	(0.434)	(0.493)
Migrant is a son (=1 if yes)	0.528	0.596	0.337
	(0.499)	(0.491)	(0.473)
Migrant is a labourer (=1 if yes)	0.639	0.638	0.641
	(0.480)	(0.480)	(0.480)
Migrant is in the Gulf countries (=1 if yes)	0.704	0.682	0.763
	(0.457)	(0.466)	(0.466)
Remittance Information			
Total remittances in past 12 months (USD)	2849.76	2944.62	2583.26
	(2917.13)	(3010.26)	(2620.22)
Outcome Variables			
Household is remittance dependent (=1 if yes)	0.263	0.000	1.000
	(0.440)	(0.000)	(0.000)
Total non-remittance income in past 12 months(USD)	693.736	939.74	0.000
	(1222.31)	(939.74)	(0.000)
Instrument			
Change in economic fitness of the destination country	0.121	0.120	0.123
	(0.131)	(0.132)	(0.131)
Observations	9,238	6,813	2,425

Note: (a) This table shows the mean and standard deviation of the key variables. Standard deviation is reported in parenthesis. (b) Remittance dependence is an indicator variable equals one if household has no other income except remittances, and zero otherwise. (c) The means of the variables are calculated separately for not remittance dependent and remittance dependent groups in columns 2 and 3.

5 Empirical Methodology

The main objective of this study is to examine the hypothesis that remittances lead to dependence – reduce the likelihood and extent of non-remittance income generated by the household. Essentially, we want to check whether remittance receipt leads to remittance dependence at both the intensive and extensive margins. We start our analysis by estimating a linear regression model using the ordinary least squares (OLS) estimator. The baseline model is given below:

$$Y_i = \beta_0 + \beta_1 R_i + X_i \Pi + \varepsilon_i \tag{1}$$

Where Y_i captures household i's remittance dependence at both the extensive and intensive margins. At the extensive margin Y_i is dummy variable that equals 1 if the household has no other income but remittances i.e., they are remittance dependent and zero otherwise. The function $Y_i = 1(Y_i^* > 0)$ is an indicator function that takes the value of 1 if $Y_i^* > 0$ and zero otherwise. Y_i^* is an unobserved or latent variable that captures the probability that household i is remittance dependent. At the intensive margin, Y_i is the natural logarithm of household i's total non-remittance income. The larger this amount is, the less remittance dependent the household is and vice versa. R_i is the natural log transformation of total remittances received by the household in the last 12 months before the survey. X_i is a vector of individual and household level characteristics. The controls include household head, household, and migrant characteristics presented in Table 1. β_1 is the parameter of interest and ϵ_i is the error term. $\epsilon_i \sim N(0, \sigma^2)$.

An OLS estimation of remittance receipt on a household's remittance dependence will likely yield biased estimates. This is due to the endogeneity of remittances. For example, sending remittances is not random; migrants must choose whether to send remittances, how much to send, and the frequency. It is possible that these factors are correlated with some unobserved variables that also affect remittance dependence at the household level. This is the classic omitted variables bias. Another potential source of endogeneity is reverse causality. Though we expect that remittance receipt may lead to a household's dependence on remittances, it is also possible that a household's dependence on remittances may induce the migrant to send money. For example, gender norms in rural Bangladesh indicate that men are the family's breadwinners and women should only engage in home production (Asadullah and Wahhaj, 2021; de Brauw et al., 2021). Since women typically do not participate in the labour market and their husbands or sons migrate, their dependence is expected to lead to remittance flows.

We address the endogeneity of remittance using an instrumental variable (IV) approach. We use economic fitness shocks at the destination countries as an instrument for remittances. According to the World Bank, economic fitness is a measure of a country's level of diversification and capability to produce complex goods on a globally competitive basis

(World Bank, 2021). Countries with higher levels of economic fitness can produce a more diverse set of goods and services, they are able to quickly upgrade into more complex goods, they are likely to have more predictable long-term growth and to attain globally competitive positions, compared to other countries. Conversely, countries with lower economic fitness tend to suffer from poverty traps, have lower capabilities and less predictable growth (Roster et al., 2018). Comparing economic fitness to GDP reveals previously unknown information about the level of growth and development of countries (World Bank, 2021).

We argue that economic fitness is a more comprehensive and refined measure of the level of economic prosperity in migrant destination countries compared to crude measures such as level of unemployment. This is because economic fitness can be used to predict economic growth, competitiveness, and level of attractiveness of destination countries to migrants. It also signposts potential income and employment opportunities for migrants. For example, since economic fitness is a predictor of economic growth, countries with higher economic fitness are more likely to grow faster and have more income and employment opportunities than similar countries with lower economic fitness. We define economic fitness shocks as a change in the economic fitness of the migrants' destination country from 2011 to 2012. A positive change in economic fitness (EF) shows relatively greater capabilities, higher value additions, greater ease in diversifying products, and more predictable growth (World Bank, 2021). The top 5 destinations for Bangladesh Migrants in the data are Saudi Arabia, United Arab Emirates, Malaysia, Kuwait, and Oman.

The Linear IV model is expressed as follows:

$$Y_i = \beta_0 + \beta_1 \widehat{R_i} + X_i \Pi + \varepsilon_i \tag{2}$$

$$R_i = \delta_0 + \delta_1 \Delta EF_d + X_i \Pi + \varepsilon_i \tag{3}$$

Where ΔEF_d is the change in economic fitness in the destination country, δ_0 and δ_1 are parameters to be estimated. The other variables and parameters are as before. The rationale for using economic fitness shocks as an instrument for remittances is that exogenous changes in economic conditions in migrant's destination countries affect the incomes and employment of migrants which in turn affect the level of remittances sent. However, these exogenous changes are not expected to affect households' remittance dependence through any other observed or unobserved channels except remittances. This instrument is relevant because it predicts the probability, amount, and frequency of remittances sent to the households. Due to the validity and relevance of destination-level characteristics, many studies in the migration and remittance literature used them as instruments (Amuedo-Dorantes, 2014; Cuadros-Menaca and Gaduh, 2020; Yang, 2008). The first stage regression shows that our instrument (i.e., economic fitness shocks) predicts remittance flows (see Table 2). The F-statistics are greater

than the conventionally accepted value of 10, which provides some assurance of the quality of the instrument. We check for under-identification and weak identification using the Sanderson-Windmeijer (SW) and Cragg-Donald tests. The null hypotheses are that the endogenous regressor is weakly identified, and the model is under-identified. We reject the null hypotheses since the associated F statistics are greater than the critical values (see Table 2). This provides further assurance about the credibility of our instrument. However, we are not out of the woods yet. Column (1) of Table 2 provides the first stage for remittance dependence at the extensive margin, while column (2) provides the first stage at the intensive margin.

5.1 Threats to Identification

Although our instrument is plausibly exogenous, there could be violations of the validity assumption. For example, the choice of destination countries for Bangladeshi Migrants is not exogenous as it is driven by migration networks and other factors. Another potential threat is through international trade. If the destination countries are key trading partners with Bangladesh, then it is possible that economic fitness shocks at the destination country can also affect households in Bangladesh through other channels, thus violating the exclusion restriction.

We check for the sensitivity of our results to violations of the exclusion restriction using Nevo and Rosen (2012)'s imperfect instrumental variables (IIV) approach. Rather than imposing the zero-correlation (exogeneity) assumption between the error term and the instrument i.e., $Corr(Z, u) = 0$, they relax this strong assumption and allow the error term to be correlated with the instrument. The exogeneity assumption is replaced with two weaker assumptions that allow the parameter of interest to be partially identified. First, they assume a non-zero correlation between the IIV and the error term. Then, they assume that the sign of the correlation between the IIV and the error term is the same direction as the sign of the correlation between the endogenous regressor and the error term. This assumption is presented formally in equation 4 below.

$$\rho_{X\epsilon}\rho_{Z\epsilon} \geq 0 \qquad (4)$$

Since this assumption uses weak inequality, it directly relaxes the validity assumption of the standard IV method i.e. $\rho_{Z\varepsilon} = 0$. Where $\rho_{X\varepsilon}$ signifies the correlation between the endogenous regressor, X and the error term, ε and $\rho_{Z\varepsilon}$ is the correlation between the IIV and the error term.

$$|\rho_{X\epsilon}| \geq |\rho_{Z\epsilon}| \qquad (5)$$

Table 2: First Stage Regression

	Log (Remittances)	Log (Remittances)
	(1)	(2)
Change in the economic fitness	-0.732***	-0.828***
	(0.071)	(0.089)
Household head is female (=1 if yes)	0.003	-0.018
	(0.030)	(0.036)
Head has primary education (=1 if yes)	0.033	0.029
	(0.024)	(0.028)
Head has secondary education (=1 if yes)	0.025	-0.006
	(0.024)	(0.029)
Head's age	0.001	-0.001
	(0.001)	(0.001)
Household size	0.053***	0.046***
	(0.005)	(0.006)
Proportion of male members aged 16-60 years	0.029	-0.077
	(0.052)	(0.063)
Proportion of female members aged 16-60 years	0.273***	0.260***
	(0.057)	(0.071)
Remittance receipt by migrant's parents (=1 if yes)	0.012	0.032
	(0.025)	(0.030)
Remittance receipt by migrant's brother/sister (=1 if yes)	-0.041	0.006
	(0.034)	(0.039)
Frequency of remittance received	0.073***	0.086***
	(0.003)	(0.004)
Migrant's age	0.001	0.001
	(0.001)	(0.002)
Migrant has above secondary education (=1 if yes)	0.139***	0.128***
	(0.028)	(0.032)
Migrant is a husband (=1 if yes)	-0.083**	0.016
	(0.041)	(0.048)
Migrant is a son (=1 if yes)	0.008	0.073
	(0.042)	(0.033)
Migrant is a labourer (=1 if yes)	-0.127***	-0.118***
	(0.021)	(0.026)
Migrant is in the gulf countries (=1 if yes)	-0.086***	-0.094***
	(0.021)	(0.025)
District fixed effects	Yes	Yes
First-stage F-statistics	105.00	102.86
SW Chi-sq statistics (under-identification test)	105.93	108.01
SW F-statistics (weak identification test)	105.00	102.86
Cragg-Donald Wald F statistic (weak identification test)	135.05	128.03
Observations	8,995	6,518

Note: (a) This table present the first stage regression coefficients of the two stage least squares (2SLS) estimation. (b) Outcome variable in columns 1-2 is log(remittances). Column 1 is the first stage for the extensive margin indicator of remittance dependence and column 2 is the first stage for intensive margin indicator of remittance dependence. (c) Standard errors are clustered at the household level and appear in parentheses. (d) All columns include district fixed effects. (e) The list of controls are household head's characteristics, household characteristics, and migrant's characteristics included in Table 1. (f) The Sanderson-Windmeijer (SW) F-statistics is a test of weak identification with a null hypothesis that the endogenous regressor is weakly identified. (g) ***Significant at the 1 percent level, **Significant at the 5 percent level, and *Significant at the 10 percent level.

The second assumption is that the IIV is less correlated with the error term than the endogenous regressor. This assumption is quite intuitive since we may believe that the IIV is not exogenous, but it is less endogenous than the endogenous regressor of interest. This assumption, in addition to the first assumption, helps tighten the bounds on the parameter

of interest. The combination of assumptions 1 and 2 gives rise to the definition of "imperfect instrumental variable" – an IV that has the same direction of correlation with the error term as the endogenous regressor, but the IV is less correlated with the error term than the endogenous regressor. These two weaker assumptions in place of the traditional validity assumption generate bounds on the parameter of interest.

6 Main Results

In this section, we present the results of our main estimations. Table 3[6] presents the ordinary least squares (OLS) and instrumental variable (IV) estimates. The outcome variable in columns (1-2) of Table 3 is a binary indicator that equals one if the household has no other income except remittances (i.e., they are remittance dependent) and zero otherwise. Meanwhile, the outcome variable for columns (3-4) of Table 3 is the natural logarithm of non-remittance household income. This variable captures remittance dependence at the intensive margin. The treatment variable is the natural logarithm of the cash amount of remittances received in the last 12 months before the interview. Full set of controls and district fixed effects are included in all regressions. Furthermore, we present robust standard errors in parenthesis.

Column (1), Table 3 presents the naive OLS estimate of the effect of remittances on remittance dependence at the extensive margin. The results show that remittance receipt has no significant effect on remittance dependence. However, this estimate is likely biased downwards due to reverse causality. The instrumental variables result presented in column (2) of Table 3 shows that remittance receipt reduces the probability of remittance dependence in a household. More precisely, a 10 percent increase in remittances reduce the probability of remittance dependence by 1.5 percentage points[7].

Next, we estimate the intensive margin of remittance dependence: the effect of remittances on households' non-remittance income. The result of this analysis is presented in columns (2) and (3) of Table 3. The OLS result in column (3) shows that remittance receipt increases the household's non-remittance income. The IV result in column (4) corroborates the OLS results. We find that a 10 percent increase in remittances boosts households' non-remittance income by 2.6 percentage points. Taken together, the results suggest that remittance receipt does not lead to remittance dependence, as suggested by the migration and remittance literature (Amuedo-Dorantes and Pozo, 2006; Binzel and Assaad, 2011; Mendola and Carletto, 2012). Our results also corroborate new evidence that debunks the myth that transfers – both private and public – make the recipients lazy and disincentivise work or engagement in income generating activities (Baird et al., 2018; Banerjee et al., 2017; Vadean et al., 2017). The prevalent view in the migration and remittance literature is that the lower labour supply response of households to remittances is due to dependence. Using a more direct measure of remittance dependence, our results challenge this view and suggest that perhaps there are

other mechanisms at work rather than the moral hazard or laziness effect which leads to dependence.

Table 3: Effect of Remittances on Households' Dependence

	Remittance Dependence (=1 if Yes)		Log (Non-remittance Income)	
	OLS	IV	OLS	IV
	(1)	(2)	(3)	(4)
Log(remittances)	-0.004	-0.152***	0.061***	0.266**
	(0.006)	(0.053)	(0.020)	(0.133)
Controls	Yes	Yes	Yes	Yes
District fixed effects	Yes	Yes	Yes	Yes
First-stage F-statistics	-	105.00	-	102.86
Mean of outcome		0.263		10.538
Observations	9,214	8,995	6,691	6,518

Note: (a) This table present the effect of remittances on household dependence on remittance income. (b) The treatment variable is log(remittances). (c) Outcome variable in columns 1-2 is an extensive margin indicator of remittance dependence that equals one if household has no other income except remittances, and zero otherwise. (d) Outcome variable in columns 3-4 is an intensive margin indicator of remittance dependence (i.e., log(non-remittance income)). (e) Columns 1 and 3 show ordinary least square (OLS) estimates and columns 2 and 4 show two-stage instrumental variable estimates. (f) Standard errors are clustered at the household level and appear in parentheses. (g) All columns include district fixed effects. (i) The list of controls are household head's characteristics, household characteristics, and migrant's characteristics included in Table 1. (j) ***Significant at the 1 percent level, **Significant at the 5 percent level, and *Significant at the 10 percent level.

7 Robustness Checks

7.1 Nevo & Rosen (2012) Bounds

In this section, we present evidence on the effect of remittance on household dependence using economic fitness shocks as an imperfect instrumental variable. Recall that, in the methodology section, we mentioned that the exclusion restriction of our instrument may be violated in two main ways. First, though economic fitness shocks in destination countries are random and plausibly exogenous, the choice of the country to migrate to is endogenous. Secondly, international trade is another channel through which the exclusion restriction may be violated. If the destination countries are key trading partners with Bangladesh, then it is possible that shocks in the destination country can also affect households in Bangladesh.

We implement Nevo and Rosen (2012)'s imperfect instrumental variables approach to check for the sensitivity of our main results to violations of the exclusion restriction. The result of this exercise is presented in Table 4. Column (1) presents the results for remittance dependence at the extensive margin, i.e., the outcome variable is a binary indicator variable that equals one if the household has no other income but remittances and zero otherwise.

Meanwhile, column (2) presents the results at the intensive margin. The outcome variable is the natural logarithm of households' non-remittance income.

Table 4: Imperfect IV Estimation of Remittances on Households' Dependence

	Remittance Dependence (=1 if Yes)	Log (Non-remittance Income)
	(1)	(2)
Log(remittances)	[-0.094, -0.021]	[0.092, 0.141]
	(-0.184, -0.005)	(0.040, 0.386)
Controls	Yes	Yes
District fixed effects	Yes	Yes
Observations	8,995	6,518

Note: (a) This table present the effect of remittances on household dependence. (b) The treatment variable is log(remittances). (c) Outcome variable in columns 1 is an extensive margin indicator of dependence that equals one if household has no other income except remittances, and zero otherwise. (d) Outcome variable in columns 2 is an intensive margin indicators of dependence (i.e., log(non-remittance income)). (e) Columns 1 and 2 show imperfect instrumental variable (IIV) estimates. (f) Standard errors are clustered at the household level and appear in parentheses. (g) IIV estimation bounds are reported in square brackets and corresponding confidence intervals are reported in parentheses in columns 1 and 2. (h) All columns include district fixed effects. (i) The list of controls are household head's characteristics, household characteristics, and migrant's characteristics included in Table 1. (j) ***Significant at the 1 percent level, **Significant at the 5 percent level, and *Significant at the 10 percent level.

The results in column (1) of Table 4 yield a fairly consistent result. We still find a negative effect of remittance receipt on households' remittance dependence at the extensive margin. The coefficient of remittances is bounded between – 0.094 and – 0.021 (with a 95 percent confidence interval of – 0.184 and – 0.005). The coefficients are statistically significant as the 95 percent confidence interval does not contain zero. Column (2) of Table 4 shows the IIV results at the intensive margin. The results support our main finding that remittances increase households' non-remittance income. The coefficient of remittances is positive and bounded between 0.092 and 0.141 (with a 95 percent confidence interval of 0.040 and 0.386). The result is also statistically significant as the 95% confidence interval does not contain zero.

7.2 Alternative Definition of Treatment

In our main estimation, the treatment variable is a continuous variable, i.e., a natural log transformation of the cash amount of remittance received. Here, we test whether the size of remittances has any effect on remittance dependence. We check whether a high cash amount of remittances affect households' remittance dependence differently compared to a relatively low cash amount of remittances. We define our treatment as an indicator variable that equals one if the remittance received is in the top quartile of the remittance distribution and zero in the bottom three[8] . The result of this exercise is presented in Panel A of Table 5. We also define our treatment as a binary indicator variable that equals one if remittance received is in the top tercile of remittance received and zero if it is in the bottom two terciles. The result of this analysis is presented in Panel B of Table 5. The outcome variables are remittance dependence at both the extensive and intensive margins.

We focus on the IV estimation results because the OLS results are biased downwards due to reverse causality. The IV estimates in Panel A show that households that receive remittances in the top quintile of the remittance distribution are on average 0.355 points less likely to be remittance dependent compared to households that receive remittances in the lower quintiles of the remittance distribution. The coefficients are statistically significant at the 1% level. Similarly, at the intensive margin, households that receive remittances in the top quintile are 0.663 points more likely to earn non-remittance income, compared to their counterparts. This is also statistically significant at the 1% level. The IV estimates in Panel B paints the same picture as above with slightly smaller magnitudes. The result of this exercise supports our main findings in Table 3. More precisely, our results are robust to an alternative definition of our treatment variable. We still find that remittances reduce the likelihood of remittance dependence and increase the households' non-remittance income[9] .

Table 5: Effect of Remittances on Households' Dependence: Alternative Definitions

	Remittance Dependence (=1 if Yes)		Log (Non-remittance Income)	
	OLS	IV	OLS	IV
	(1)	(2)	(3)	(4)
Panel A				
Top quintile remittances (=1 if Yes)	-0.032***	-0.355***	0.201***	0.633**
	(0.012)	(0.123)	(0.038)	(0.320)
Controls	Yes	Yes	Yes	Yes
District fixed effects	Yes	Yes	Yes	Yes
First-stage F-statistics	-	71.35	-	59.91
Observations	9,205	8,985	6,682	6,509
Panel B				
Top tercile remittances (=1 if Yes)	-0.022**	-0.316***	0.164***	0.575**
	(0.011)	(0.110)	(0.035)	(0.289)
Controls	Yes	Yes	Yes	Yes
District fixed effects	Yes	Yes	Yes	Yes
First-stage F-statistics	-	78.39	-	66.47
Observations	9,205	8,985	6,682	6,509

Note: (a) This table present the effect of high level of remittances on household dependence on remittance income. (b) The treatment variable in Panel A is an indicator of high level of remittances equals 1 if received remittances is in the top quartile of remittance distribution, and zero if received remittances is in the bottom three quartile of remittance distribution. The treatment variable in Panel B is an indicator of high level of remittances equals 1 if received remittances is in the top tercile of remittance distribution, and zero if received remittances is in the bottom two tercile of remittance distribution. (c) Outcome variable in columns 1-2 is an extensive margin indicator of remittance dependence that equals one if household has no other income except remittances, and zero otherwise. (d) Outcome variable in columns 3-4 is an intensive margin indicator of remittance dependence (i.e., log(non-remittance income)). (e) Columns 1 and 3 show ordinary least square (OLS) estimates and columns 2 and 4 show two-stage instrumental variable estimates. (f) Standard errors are clustered at the household level and appear in parentheses. (g) All columns include district fixed effects. (i) The list of controls are household head's characteristics, household characteristics, and migrant's characteristics included in Table 1. (j) ***Significant at the 1 percent level, **Significant at the 5 percent level, and *Significant at the 10 percent level.

Furthermore, we check whether remittances have a nonlinear effect on households' dependence. We use a quadratic term which we expect to capture non-linearity in the effect of remittance on households' dependence. This exercise will highlight whether a low level of remittances have a differential effect on household dependence compared to high levels of remittances. The result of this exercise is presented in Table 6. The outcome variable in columns (1-2) of Table 6 is a binary indicator that equals one if the household has no other income except remittances (i.e., they are remittance dependent) and zero otherwise. Meanwhile, the outcome variable for columns (3-4) of Table 6 is the natural logarithm of non-remittance household income. The naïve OLS estimates in Columns (1) and (3), show some non-linearity. However, these estimates are likely to be biased due to reverse causality. The IV[10] estimates in columns (2) and (4) do not show any non-linearity. Hossain and Sunmoni (2022) also do not find any non-linear effect of remittances on households' investment decisions. This analysis lends some credibility to our linear estimation.

Table 6: Non-linear Effect of Remittances on Households' Remittance Dependence

	Remittance Dependence (=1 if Yes)		Log(Non-remittance Income)	
	OLS	IV	OLS	IV
	(1)	(2)	(3)	(4)
Log(Remittances)	0.169***	-0.103	-1.288***	-9.882
	(0.060)	(2.775)	(0.203)	(11.156)
Log(remittances) squared	-0.012***	-0.003	0.091***	0.660
	(0.004)	(0.183)	(0.014)	(0.730)
Controls	Yes	Yes	Yes	Yes
District fixed effects	Yes	Yes	Yes	Yes
First-stage F-statistics	-	77.72	-	65.69
Observations	9,205	8,995	6,682	6,509

Note: (a) This table present the nonlinear effect of remittances on household dependence on remittance income. (b) The treatment variables are log(remittances) and log(remittances) squared. (c) Outcome variable in columns 1-2 is an extensive margin indicator of remittance dependence that equals one if household has no other income except remittances, and zero otherwise. (d) Outcome variable in columns 3-4 is an intensive margin indicator of remittance dependence (i.e., log(non-remittance income)). (e) Columns 1 and 3 show ordinary least square (OLS) estimates and columns 2 and 4 show two-stage instrumental variable estimates. (f) Standard errors are clustered at the household level and appear in parentheses. (g) All columns include district fixed effects. (i) The list of controls are household head's characteristics, household characteristics, and migrant's characteristics included in Table 1 (j) ***Significant at the 1 percent level, **Significant at the 5 percent level, and *Significant at the 10 percent level.

7.3 Alternative Definition of Outcome Variable

In this section, we check for sensitivity of our outcome variables to changes in definition. Up till now, we have defined remittance dependence at the extensive margin as a binary indicator that equals one if the household has no other income except remittances (i.e., they are remittance dependent) and zero otherwise. Meanwhile, at the intensive margin, we defined remittance dependence as the natural logarithm of non-remittance household income. In this section, we define remittance dependence as the share of remittances in total household income. The rationale is that the bigger the share, the more dependent the household is and vice versa. We estimate four different empirical models to check this robustness. The result of this exercise is presented in Table 7. Column (1) presents the results for OLS, Column (2) presents the results for instrumental variables (IV) estimation, Column (3) presents the results for the Tobit estimation and Column (4) presents the results for the IV-Tobit estimations. We use a Tobit model because we have censoring both left and right censoring. We have censoring on the left for households who receive very small amounts of remittances and on the right for households who do not have any other income except remittances. We thus estimate a Tobit model using maximum likelihood estimators (MLE) to circumvent this issue.

Table 7: Effect of Remittances on Households' Dependence Alternative Outcome

	Remittance Share of Household's Total Income			
	OLS	IV	Tobit	IVTobit
	(1)	(2)	(3)	(4)
Log(remittances)	0.114***	0.070***	0.119***	0.047*
	(0.003)	(0.022)	(0.004)	(0.027)
Marginal effect	-	-	[0.156]	[0.061]
Controls	Yes	Yes	Yes	Yes
District fixed effects	Yes	Yes	Yes	Yes
First-stage F-statistics	-	105.00	-	105.00
Mean of outcome			0.815	
Observations	9,214	8,995	9,214	8,995

Note: (a) This table present the effect of remittances on households' remittances share of total income. Total income includes both remittances and non-remittance income. (b) The treatment variable is log(remittances). (c) Outcome variable in columns 1-4 is remittances share of households' total income. The share varies between zero and 1. (d) Column 1 show ordinary least square (OLS) estimates, column 2 show two-stage instrumental variable estimates, column 3 show Tobit estimates with lower bound at zero and upper bound at one, and finally column 4 show IVTobit estimates. (e) Standard errors are clustered at the household level and appear in parentheses. (f) All columns include district fixed effects. (g) The list of controls are household head's characteristics, household characteristics, and migrant's characteristics included in Table 1. (h) ***Significant at the 1 percent level, **Significant at the 5 percent level, and *Significant at the 10 percent level.

The results are consistent with our main findings in Table 3. Across all model specifications, we find that remittances have a positive effect on the share of remittances in household income. The naïve OLS estimates show that a 1% rise in remittance receipts increases the share of remittances in household total income by 0.00114. While the naïve Tobit estimates and marginal effect also show positive effects. However, these coefficients are likely to be biased due to reverse causality. The IV and IV-Tobit also show a positive and significant effect of remittances on the share of remittances in household income. Specifically, the IV estimates show that a 1% rise in remittance receipts increases the share of remittances in household total income by 0.0007. Similarly, the marginal effects of the IV-Tobit shows that a 1% rise in remittance receipts increases the share of remittances in household total income by 0.00061.

In this robustness section, we checked the sensitivity of our main results to violations of the exclusion restriction, different definition of our treatment and outcome variables and different model specifications. We also checked for non-linearity in the effect of remittances on household dependence. Overall, this exercise shows that our results are robust to relaxing the exclusion of the traditional instrumental variables approach, alternative definition of our treatment and outcome variable, and alternative model specifications. However, we do not find any evidence of non-linearity in the effect of remittances on remittance dependence.

8 Heterogeneity

8.1 Household Head's Characteristics

In this section, we explore the heterogeneity of the effect of remittances on households' remittance dependence. In the first heterogeneity analysis, we study how the characteristics of the household head, such as gender, level of education, and age, might affect the household's dependence on remittance. Exploring heterogeneity by the characteristics of the household head is important for a number of reasons. First, gender norms in rural Bangladesh indicate that women should not engage in non-farm paid employment but should take care of the home. These norms affect women's participation in the labour market or income generating activities which are different for men. Furthermore, studies have shown that the gender of the remittance receiver can affect the utilisation of remittances. Studies have shown that on average, remittances received by women are typically spent on education, health and nutrition (Guzmán et al., 2008), meanwhile, remittances received by men are more likely to be invested in small businesses and physical capital (Lopez-Ekra et al., 2011). Secondly, the level of education of the household head can determine the type of economic activity they can partake in. For example, more educated household heads are more likely to engage in high-wage jobs than less educated ones. Thirdly, the age of the household head also determines the level of dependence. Too young or too old household heads are more likely to be dependent than working-age household heads.

The result of this exercise is presented in Table 8. The treatment variable is the natural logarithm of remittances. The outcome variable in column (1) is remittance dependence at the extensive margin, while the outcome variable in column (2) is remittance dependence at the intensive margin. Panel A presents the result for household heads' gender, Panel B presents the results by the Household heads' level of education, and Panel C presents the results by household heads' age. We do not find significant heterogeneity by heads' characteristics, except for heads' gender at the extensive margin. The result suggests that female-headed households are less likely to be remittance dependent than male-headed households. This finding suggests that female heads have access to non-labour earning opportunities such as land rent or crop sharing in Bangladesh.

Table 8: Heterogeneous Effect of Remittances on Households' Dependence by Head's Characteristics

	Remittance Dependence (=1 if Yes)	Log (Non-remittance Income)
	(1)	(2)
Panel A: Head's Sex		
Log(remittances) x Female (=1 if yes)	-0.194*	0.129
	(0.101)	(0.281)
Log(remittances)	-0.077	0.228
	(0.053)	(0.150)
Panel B: Head's Education		
Log(remittances) x Primary education (=1 if yes)	-0.106	-0.259
	(0.117)	(0.330)
Log(remittances) x Secondary education (=1 if yes)	-0.114	-0.078
	(0.124)	(0.322)
Log(remittances)	-0.087	0.351*
	(0.068)	(0.185)
Panel C: Head's Age		
Log(remittances) x Age	0.003	0.001
	(0.004)	(0.010)
Log(remittances)	-0.278	0.243
	(0.193)	(0.494)
Controls	Yes	Yes
District fixed effects	Yes	Yes
Observations	8,985	6,509

Note: (a) This table present the heterogeneous effect of remittances on households' dependence on remittance income. (b) The treatment variable is log(remittances) and interaction of log(remittances) with household head's characteristics. (c) Outcome variable in column 1 is an indicator of remittance dependence that equals one if household has no other income except remittances, and zero otherwise. (d) Outcome variable in columns 2 is an intensive margin indicators of dependence (i.e., log(non-remittance income)). (e) Columns 1 and 2 show two-stage instrumental variable estimates. (f) Standard errors are clustered at the household level and appear in parentheses. (f) All columns include district fixed effects. (g) The list of controls are household head's characteristics, household characteristics, and migrant's characteristics included in Table **??**. (h) ***Significant at the 1 percent level, **Significant at the 5 percent level, and *Significant at the 10 percent level.

8.2 Household Characteristics

In this section, we explore heterogeneity by household characteristics. We expect that household characteristics can affect the participation of household members in the labour market or income generating activities and thus dependence. For example, we expect larger household sizes to reduce women's labour supply but increase men's (Cools et al., 2017). Also, we expect households with more working-age male members to supply more labour and engage in more income generating activities compared to households with more working-age female members. Furthermore, studies show that the relationship between the remitter and recipient may affect utilisation of remittances. For example, female migrants with children typically send remittances to their children's carer (usually another woman) (Pérez Orozco and Paiewonsky, 2007). In our sample, about 60 percent of remittance recipients in dependent households are wives of the migrant compared to about 45 percent of parents in non-dependent households. Finally, as Amuedo-Dorantes (2014) suggest, the frequency of remittances affects its usage at the household level. We thus hypothesise that households that receive more frequent remittances are more likely to be dependent than those that do not. We test these hypotheses using our data and present our results in Table

9. Panel A shows the heterogeneity by household size, Panel B and C show heterogeneity by the proportion of working-age male and female household members respectively, Panel D shows heterogeneity by the recipient of remittances, and Panel E shows heterogeneity by the frequency of remittances.

We do not find any significant heterogeneity by household characteristics, except for the proportion of working-age female members and remittance frequency. Our results show that households with a higher proportion of working-age female members have less non-remittance income. This result is likely driven by the gender norms in rural Bangladesh, which limits women's labour market activities. Next, we find that more frequent remittances reduce the likelihood of remittance dependence. This result is most likely driven by the financial security of frequent remittance flow that helps households engage in income generating activities.

Table 9: Heterogeneous Effect of Remittances on Households' Dependence by Household Characteristics

	Remittance Dependence (=1 if Yes)	Log (Non-remittance Income)
	(1)	(2)
Panel A: Household Size		
Log(remittances) x Household size	0.016	-0.008
	(0.017)	(0.045)
Log(remittances)	-0.227**	0.307
	(0.098)	(0.257)
Panel B: Proportion of Male Members Aged 16-60		
Log(remittances) x Proportion of male members aged 16-60	0.169	-0.876
	(0.234)	(0.677)
Log(remittances)	-0.190**	0.489**
	(0.081)	(0.220)
Panel C: Proportion of Female Members Aged 16-60		
Log(remittances) x Proportion of female members aged 16-60	-0.063	-1.181**
	(0.205)	(0.592)
Log(remittances)	-0.123	0.775**
	(0.107)	(0.310)
Panel D: Recipient of Remittances		
Log(remittances) x Receipt by migrant's parents (=1 if yes)	0.034	-0.057
	(0.110)	(0.295)
Log(remittances) x Receipt by migrant's sibling (=1 if yes)	0.151	-0.064
	(0.137)	(0.356)
Log(remittances)	-0.192*	0.308
	(0.098)	(0.257)
Panel E: Frequency of Remittance Received		
Log(remittances) x Frequency	-0.066**	-0.042
	(0.028)	(0.065)
Log(remittances)	0.138	0.441
	(0.111)	(0.270)
Controls	Yes	Yes
District fixed effects	Yes	Yes
Observations	8,985	6,509

Note: (a) This table present the heterogeneous effect of remittances on households' dependence on remittance income. (b) The treatment variable is log(remittances) and interaction of log(remittances) with household characteristics. (c) Outcome variable in column 1 is an indicator of remittance dependence that equals one if household has no other income except remittances, and zero otherwise. (d) Outcome variable in columns 2 is an intensive margin indicators of dependence (i.e., log(non-remittance income)). (e) Columns 1 and 2 show two-stage instrumental variable estimates. (f) Standard errors are clustered at the household level and appear in parentheses. (f) All columns include district fixed effects. (g) The list of controls are household head's characteristics, household characteristics, and migrant's characteristics included in Table 1. (h) ***Significant at the 1 percent level, **Significant at the 5 percent level, and *Significant at the 10 percent level.

8.3 Migrant's Characteristics

In this section, we present heterogeneity analysis based on the characteristics of the migrant. We expect that the characteristics of the migrant will affect the motivation, amount, and frequency of remittances sent home. For example, we expect that more educated migrants are more likely to get lucrative jobs in the destination countries and thus send more money back home. Furthermore, studies have shown that migrants' altruism is one of the drivers of sending remittance members (Lucas and Stark, 1985; Stark, 2009); thus, the relationship of the migrant to the household head affect the amount and frequency of remittances. Furthermore, we expect migrants in more lucrative destinations to send more money than migrants in less lucrative destinations. Finally, migrants with white-collar or professional jobs are more likely to send more remittances than migrants who are labourers, for example. We test these conjectures and present our results in Table 10. Panel A presents the results for heterogeneity by migrants' age, Panel B presents the results by migrants' level of education, Panel C presents the results by the relationship of the migrant to the household head, Panel D presents the results by the occupation of the migrant and Panel E presents the results by the destination of the migrants.

Our result show that households with older migrants earn more non-remittance income and are less dependent. We find that households where the husband is the migrant are less likely to be remittance dependent at the extensive margin. We also find that migrants' destinations matter. For example, households with migrants in the Gulf countries are less likely to be remittance dependent at the extensive margin but earn less non-remittance income. We do not find any significant results for the other hypotheses examined.

To sum up this section, we find that female headed households are less likely to be remittance dependent. However, households with a high proportion of working age women are more likely to be dependent. Also, more predictable, or more frequent remittances reduce remittance dependence. Furthermore, households where the husband of the household head is the migrant and households with older migrants are less likely to be remittance dependent. Finally, households with migrants in Gulf countries are less likely to be remittance dependent.

Table 10: Heterogeneous Effect of Remittances on Households' Dependence by Migrant's Characteristics

	Remittance Dependence (=1 if Yes)	Log (Non-remittance Income)
	(1)	(2)
Panel A: Migrant's Age		
Log(Remittances) x Age	-0.002	0.029*
	(0.005)	(0.017)
Log(Remittances)	-0.086	-0.615
	(0.173)	(0.534)
Panel B: Migrant's Education		
Log(Remittances) x Above secondary education (=1 if yes)	-0.001	0.504
	(0.222)	(0.637)
Log(Remittances)	-0.149***	0.226*
	(0.051)	(0.134)
Panel C: Migrant's Relationship to Household Head		
Log(Remittances) x Husband (=1 if yes)	-0.265*	0.685
	(0.139)	(0.461)
Log(Remittances) x Son (=1 if yes)	-0.152	-0.077
	(0.104)	(0.272)
Log(Remittances)	-0.007	0.218
	(0.083)	(0.211)
Panel D: Migrant's Occupation		
Log(Remittances) x Labourer (=1 if yes)	-0.120	0.187
	(0.105)	(0.283)
Log(Remittances)	-0.075	0.144
	(0.083)	(0.240)
Panel E: Migrant's Destination		
Log(Remittances) x Gulf countries (=1 if yes)	-0.270***	-0.510**
	(0.098)	(0.257)
Log(Remittances)	-0.003	0.527***
	(0.068)	(0.187)
Controls	Yes	Yes
District Fixed Effects	Yes	Yes
Observations	9,214	8,995

Note: (a) This table present the heterogeneous effect of remittances on households' dependence on remittance income. (b) The treatment variable is log(remittances) and interaction of log(remittances) with household head's characteristics. (c) Outcome variable in column 1 is an indicator of remittance dependence that equals one if household has no other income except remittances, and zero otherwise. (d) Outcome variable in columns 2 is an intensive margin indicators of dependence (i.e., log(non-remittance income)). (e) Columns 1 and 2 show two-stage instrumental variable estimates. (f) Standard errors are clustered at the household level and appear in parentheses. (f) All columns include district fixed effects. (g) The list of controls are household head's characteristics, household characteristics, and migrant's characteristics included in Table 1. (h) ***Significant at the 1 percent level, **Significant at the 5 percent level, and *Significant at the 10 percent level.

9 Mechanisms

9.1 Health and Productivity

This section explores the potential mechanism through which remittances affect a household's remittance dependence. The first mechanism we study is the "health and productivity effect." Unhealthy workers are not very productive at work (Baird et al., 2018; Dasgupta and Ray, 1986). Remittances can ease liquidity constraints, allowing individuals to purchase better quality food, live in a more sanitary environment, and invest in their health. These factors contribute to improve a worker's health, thus increasing their productivity and participation in the labour market and other income generating activities such as farm and non-farm enterprise development.

We use five different measures to capture the health-productivity effect. The measures are health care expenditure, healthy sanitation facility, healthy cooking facility, healthy lighting facility, healthy water facility, and healthy lifestyle index. Healthy sanitation facility is a binary indicator variable that equals one if the household uses sanitary toilet facilities and zero otherwise. Healthy cooking facility is a binary indicator variable that equals one if the household uses clean cooking options such as natural gas or Liquefied petroleum gas and zero if the household uses kerosene or wood[11] . Healthy lighting facility is a binary indicator variable that equals one if the household uses clean lighting options such as electricity or solar and zero if the household uses kerosene[12]. Healthy water facility is a binary indicator variable that equals one if the household uses healthy water sources such as piped water or deep well and zero if the household uses pond or river water. Finally, the healthy lifestyle index is the first principal component[13] of the four variables (i.e., healthy sanitation facility, healthy cooking facility, healthy lighting facility, and healthy water facility) and is normalised to have zero mean and standard deviation one.

The result of this exercise is presented in Table 11. We find strong evidence of the health-productivity effect. Our results show a statistically significant, and positive effect of remittances on investment in a healthy lifestyle. This finding supports other findings in the literature that remittances improve households' health and sanitation facilities, which improves labour productivity and engagement in income generating activities (Amuedo-Dorantes and Pozo, 2011; Lu, 2013; Mergo, 2016).

Table 11: Health-Productivity Effect Mechanism

	Log(Health Care Expenditure)	Healthy Sanitation Facility (=1 if yes)	Healthy Cooking Facility (=1 if yes)	Healthy Lighting Facility (=1 if yes)	Healthy Water Facility (=1 if yes)	Healthy Lifestyle Index
	(1)	(2)	(3)	(4)	(5)	(6)
Log(Remittances)	0.651***	0.330***	0.075***	0.147***	0.021	0.749***
	(0.134)	(0.059)	(0.027)	(0.041)	(0.015)	(0.122)
Mean outcome	4.273	0.486	0.051	0.857	0.987	0.000
Controls	Yes	Yes	Yes	Yes	Yes	Yes
District Fixed Effects	Yes	Yes	Yes	Yes	Yes	Yes
Observations	8,646	8,985	8,985	8,985	8,985	8,985

Note: (a) This table present the effect of remittances on households' investment in healthy lifestyle. (b) The treatment variable is log(remittances). (c) Healthy lifestyle index is the first principal component of four variables (i.e., healthy sanitation facility, healthy cooking facility, healthy lighting facility, and healthy water facility) and normalised it to have zero mean and 1 standard deviation. (d) All columns show two-stage instrumental variable estimates. (e) Standard errors are clustered at the household level and appear in parentheses. (f) All columns include district fixed effects. (g) The list of controls are household head's characteristics, household characteristics, and migrant's characteristics included in Table 1. (h) ***Significant at the 1 percent level, **Significant at the 5 percent level, and *Significant at the 10 percent level.

9.2 Liquidity Effect

The second mechanism we explore is the liquidity effect mechanism. It is well established in the literature that remittances relax households' budget constraints, which can improve consumption and facilitate investment in physical or financial capital (Adams, 2011; Hossain and Sunmoni, 2022; Jena, 2018). In addition, it can provide much-needed liquidity for household members to start businesses. Therefore, we check whether remittances through the liquidity effect can facilitate households' engagement in the labour market or income generating activities which can increase their non-remittance income and reduce dependence on remittances. The result of this analysis is presented in Table 12. The outcome variables in columns 1 – 5 are dummy for above-district average consumption, dummy for physical capital investment, log physical capital investment, dummy for financial capital investment and log financial capital investment respectively. We find strong evidence for the liquidity effect mechanism. Our results show that remittances ease households' liquidity constraints and facilitate participation in income generating activities such as investment in physical or financial capital, which boosts households' non-remittance income and reduces remittance dependence. Overall, we find that the effect of remittances on households' remittance dependence is transmitted through two main mechanisms – the health-productivity effect and the liquidity effect.

Table 12: Liquidity Effect Mechanism

	Above Average Consumption (=1 if yes)	Physical Capital Investment (=1 if yes)	Log(Physical Capital Expenditure)	Financial Capital Investment (=1 if yes)	Log(Financial Capital Expenditure)
	(1)	(2)	(3)	(4)	(5)
Log(Remittances)	0.312***	0.135***	0.647*	0.187***	0.711**
	(0.056)	(0.050)	(0.334)	(0.055)	(0.285)
Mean outcome	0.511	0.265	7.027	0.481	5.733
Controls	Yes	Yes	Yes	Yes	Yes
District Fixed Effects	Yes	Yes	Yes	Yes	Yes
Observations	8,984	8,985	2,304	8,985	4,644

Note: (a) This table present the effect of remittances on households' investment in high consumption, physical, and financial investment. (b) The treatment variable is log(remittances). (c) All columns show two-stage instrumental variable estimates. (d) Standard errors are clustered at the household level and appear in parentheses. (e) All columns include district fixed effects. (f) The list of controls are household head's characteristics, household characteristics, and migrant's characteristics included in Table 1. (g) ***Significant at the 1 percent level, **Significant at the 5 percent level, and *Significant at the 10 percent level.

10 Conclusion

The neoclassical model of labour-leisure posits that the income effect of a public or private transfer is a reduction in labour supply and higher demand for leisure. This intuition propagates the notion that cash transfers undermine the work ethics of the recipients, reduces their labour supply and makes them lazy or dependent. Recent studies have shown that there is no compelling evidence to support the notion that public cash transfers make the recipients lazy and leads to dependence. This study investigates whether private cash transfers such as remittances lead to dependence. In particular, this study explores the effect of remittances on households' remittance dependence. We used data from the Bangladesh Survey on the Use of Remittance 2013. Identification relies on instrumental variables. In particular, we exploited changes in economic situation at the migrants destination country as an instrument for remittances. Overall, we do not find any evidence that remittances leads to household dependence. As a matter of fact, we find that remittances reduces the probability of being dependent and increases households non-remittance income. Our results show that health-productivity and liquidity effects are two important channels through which remittances affects households' dependence. Precisely, our results show that remittances enable households to improve their health and sanitation outcomes thus improving their health-productivity and labour supply. Furthermore, remittances ease liquidity constraints which improves self-employment and investment in financial capital, which boosts household non-remittance income and reduces dependence. Our results are robust to different model specifications, different definitions of treatment and outcome variables and violations of the exclusion restriction. Overall, we provide new and rigorous evidence that remittances do not lead to household dependence but rather ease households' liquidity constraints and facilitates investment in health and income generating activities which can boost household income and reduce dependence.

Notes

[1]See Banerjee and Duflo (2019) for a review.

[2]Labour migration in Bangladesh is typically of a temporary nature with workers returning in some future period. Every year, thousands of Bangladeshi workers migrate to Gulf countries to work on short-term visas and short term contracts (Bossavie et al., 2021). Furthermore, permanent migrants are less likely to send remittances as their ties with Bangladesh weakens over time.

[3]We do not present statistical differences between remittance dependent and non-remittance dependent households because remittance dependence is our outcome variable and by definition, we expect statistically significant differences.

[4]Table A1 in the appendix provides descriptive statistics by migrants' destination

[5]The cash amount of remittances was converted from Bangladesh Taka (BDT) to USD using the average exchange rate in 2013 which was BDT78/$1

[6]Table A2 in the appendix show the full model with all the controls

[7]We also check the robustness of our main results to a different model specification. Precisely, we estimated a probit and IV probit model. The result of this exercise in presented in appendix Table A3. We find that our main result is not sensitive to different model specifications

[8]We do not use more than one quartile or tercile because that would require more than one instrument

[9]We also check the robustness of our main results to a different model specification. Precisely, we estimated a probit and IV probit model. The result of this exercise in presented in appendix Table A3. We find that our main result is not sensitive to different model specifications

[10]We use the squared term of the IV to instrument remittance squared

[11]There is evidence to show that indoor air pollution has negative consequences for the health outcomes of household members. See (Ezzati, 2005). Also, the government in Bangladesh provides energy subsidies.

[12]According to the World Bank, the electrification rate in Bangladesh is 96.2% as at 2020 (World Bank, 2022)

[13]The principal components is shown in Table A4 in the appendix

References

Acharya, C. P. and Leon-Gonzalez, R. (2014). How do Migration and Remittances Affect Human Capital Investment? The Effects of Relaxing Information and Liquidity Constraints. *Journal of Development Studies*, 50(3):444–460.

Acosta, P. (2007). Entrepreneurship, Labor Markets, and International Remittances: Evidence from El Salvador.

Adams, R. H. (2011). Evaluating the economic impact of international remittances on developing countries using household surveys: A literature review. *Journal of Development Studies*, 47(6):809–828.

Adams, R. H. and Cuecuecha, A. (2013). The Impact of Remittances on Investment and Poverty in Ghana. *World Development*, 50:24–40.

Adams, R. H. and Page, J. (2005). Do international migration and remittances reduce poverty in developing countries? *World Development.*

Agostini, C. A. and Brown, P. H. (2011). CASH TRANSFERS AND POVERTY REDUCTION IN CHILE*. *Journal of Regional Science*, 51(3):604–625.

Aizer, A., Eli, S., Ferrie, J., and Muney, A. L. (2016). The Long-Run Impact of Cash Transfers to Poor Families. *American Economic Review*, 106(4):935–71.

Amuedo-Dorantes, C. (2014). The good and the bad in remittance flows. *IZA World of Labor*, 97:15185.

Amuedo-Dorantes, C. and Pozo, S. (2006). Migration, Remittances and Male and Female Employment Patterns. *American Economic Review*, 96(2):222–226.

Amuedo-Dorantes, C. and Pozo, S. (2011). New evidence on the role of remittances on healthcare expenditures by Mexican households. *Review of Economics of the Household*, pages 69–98.

Amuedo-Dorantes, C. and Pozo, S. (2014). Remittance income uncertainty and asset accumulation. *IZA Journal of Labor and Development*, 3(1):1–24.

Antman, F. M. (2010). Adult Child Migration and the Health of Elderly Parents Left Behind in Mexico. *American Economic Review Papers and Proceedings*, 100(2):5–9.

Antman, F. M. (2014). The impact of migration on family left behind. In *International Handbook on the Economics of Migration*, number 6374, pages 293–308.

Asadullah, M. N. and Wahhaj, Z. (2021). Missing from the Market: Purdah Norm and Women's Paid Work Participation in Bangladesh. *SSRN Electronic Journal.*

Baird, S., McKenzie, D., and Özler, B. (2018). The effects of cash transfers on adult labor market outcomes. *IZA Journal of Development and Migration*, 8(1):1–20.

Banerjee, A. V. and Duflo, E. (2019). *Good economics for hard times.* PublicAffairs.

Banerjee, A. V., Hanna, R., Kreindler, G. E., and Olken, B. A. (2017). Debunking the stereotype of the lazy Welfare recipient: Evidence from cash transfer programs. *World Bank Research Observer*, 32(2):155–184.

BBS (2016). The Survey on Investment from Remittance 2016. Technical report, Bangladesh Bureau of Statistics (BBS).

Beegle, K., Honorati, M., and Monsalve, E. (2018). *Reaching the Poor and Vulnerable in Africa through Social Safety Nets*. The World Bank, Washington DC.

Binzel, C. and Assaad, R. (2011). Egyptian men working abroad: Labour supply responses by the women left behind. *Labour Economics*, 18(SUPPL. 1):S98–S114.

Blundell, R., Britton, J., Dias, M. C., and French, E. (2021). The impact of health on labor supply near retirement. *Journal of Human Resources*, pages 1217–9240R4.

Borjas, G. (2016). *Labor Economics*. McGraw-Hill, New York, seventh ed edition.

Bossavie, L., Gorlach, J.-S., Ozden, C., and Wang, H. (2021). Temporary migration for long-term investment.

Bredtmann, J., Martínez Flores, F., and Otten, S. (2018). Remittances and the Brain Drain: Evidence from Microdata for Sub-Saharan Africa. *Journal of Development Studies*, 00(00):1–22.

Cahuc, P., Carcillo, S., and Zylberberg, A. (2014). *Labour Economics*, volume 53. The MIT Press, Cambridge, second edi edition.

Cai, L. (2010). The relationship between health and labour force participation: Evidence from a panel data simultaneous equation model. *Labour Economics*, 17(1):77–90.

Chiodi, V., Jaimovich, E., and Montes-rojas, G. (2012). Migration , Remittances and Capital Accumulation : Evidence from Rural Mexico. *Journal of Development Studies*, 0388.

Cools, S., Markussen, S., and Strøm, M. (2017). Children and Careers: How Family Size Affects Parents' Labor Market Outcomes in the Long Run. *Demography*, 54(5):1773–1793.

Cox-Edwards, A. and Rodríguez-Oreggia, E. (2009). Remittances and Labor Force Participation in Mexico: An Analysis Using Propensity Score Matching. *World Development*, 37(5):1004–1014.

Cuadros-Menaca, A. and Gaduh, A. (2020). Remittances, child labor, and schooling: Evidence from colombia. *Economic Development and Cultural Change*, 68(4):1258–1293.

Dasgupta, P. and Ray, D. (1986). Inequality as a Determinant of Malnutrition and Unemployment: Theory. *The Economic Journal*, 96(384):1011.

de Brauw, A., Kramer, B., and Murphy, M. (2021). Migration, labor and women's empowerment: Evidence from an agricultural value chain in Bangladesh. *World Development*, 142:105445.

Démurger, S. (2015). Migration and families left behind. *IZA World of Labor*, 144.

Ezzati, M. (2005). Indoor air pollution and health in developing countries. *The Lancet*, 366(9480):104–106.

Gentilini, U., Honorati, M., and Yemtsov, R. (2014). The State of Social Safety Nets 2014. Technical report, World Bank Group, Washington DC.

Giulietti, C., Wahba, J., and Zimmermann, K. F. (2013). Entrepreneurship of the left-behind. In *Labor Market Issues in China*. Emerald Group Publishing Limited.

Goryakin, Y., Rocco, L., Suhrcke, M., Roberts, B., and McKee, M. (2014). The effect of health on labour supply in nine former soviet union countries. *The European journal of health economics*, 15(1):57–68.

Guzmán, J. C., Morrison, A. R., and Sjöblom, M. (2008). The impact of remittances and gender on household expenditure patterns: evidence from ghana. *The international migration of women*, pages 125–152.

Halla, M., Schmieder, J., and Weber, A. (2020). Job displacement, family dynamics, and spousal labor supply. *American Economic Journal: Applied Economics*, 12(4):253–87.

Hossain, M. S. and Sunmoni, A. (2022). Remittances and Household Investment Decisions: Evidence from sub-Saharan Africa. *IZA Journal of Development and Migration*, 13(1).

IOM (2017). Bangladesh Annual Migration Report 2017: Ministry of expatriates' welfare and overseas employment | IOM Publications Platform. Technical report, International Organisation for Migration.

IOM (2019). Migration, Family Remittances, Assets and Skills Categories in Bangladesh. Technical report, International Organization for Migration.

IOM (2020). Bangladesh: Survey on drivers of migration and migrants' profile - Bangladesh. Technical report, International Organisation for Migration (IOM).

IOM (2022). World Migration Report 2022 | IOM Publications Platform. Technical report, International Organisation for Migration.

Jena, F. (2018). Migrant Remittances and Physical Investment Purchases: Evidence from Kenyan Households. *Journal of Development Studies*, 54(2):312–326.

Kakhkharov, J. (2019). Migrant Remittances as a Source of Financing for Entrepreneurship. *International Migration*, 57(5):37–55.

Killingsworth, R. M. (1983). *Labor Supply*. Cambridge University Press.

Kohara, M. (2010). The response of japanese wives' labor supply to husbands' job loss. *Journal of Population Economics*, 23(4):1133–1149.

Lopez-Ekra, S., Aghazarm, C., Kötter, H., and Mollard, B. (2011). The impact of remittances on gender roles and opportunities for children in recipient families: Research from the international organization for migration. *Gender & Development*, 19(1):69–80.

López-Feldman, A. and Escalona, D. (2016). Remittances and labour allocation decisions at communities of origin: the case of rural Mexico. *https://doi.org/10.1080/13504851.2016.1181702*, 24(4):238–242.

Lu, Y. (2013). Household Migration, Remittances and Their Impact on Health in Indonesia. *International Migration*, 51(SUPPL.1):e202–e215.

Lucas, R. E. B. and Stark, O. (1985). Motivations to Remit: Evidence from Botswana. *https://doi.org/10.1086/261341*, 93(5):901–918.

Manley, J., Gitter, S., and Slavchevska, V. (2013). How Effective are Cash Transfers at Improving Nutritional Status? *World Development*, 48:133–155.

Marinescu, I. (2018). No Strings Attached: The Behavioral Effects of U.S. Unconditional Cash Transfer Programs.

Mendola, M. and Carletto, C. (2012). Migration and gender differences in the home labour market: Evidence from Albania. *Labour Economics*, 19(6):870–880.

Mergo, T. (2016). The Effects of International Migration on Migrant-Source Households: Evidence from Ethiopian Diversity-Visa Lottery Migrants. *World Development*, 84:69–81.

Nevo, A. and Rosen, A. (2012). Identification with imperfect instruments. *Review of Economics and Statistics*, 94(3):659–671.

Pérez Orozco, A. and Paiewonsky, D. (2007). Remittances. Technical report, Working Paper INSTRAW.

Ratha, D., Mohapatra, S., Ozden, C., Plaza, S., Shaw, W., and Shimeles, A. (2011). *Leveraging Migration for Africa.* The World Bank.

Roster, K., Harrington, L., and Cader, M. (2018). Country case studies in economic fitness: Mexico and brazil. *Entropy*, 20(10):753.

Stark, O. (2009). Reasons for Remitting.

Vadean, F., Randazzo, T., and Piracha, M. (2017). Remittances, Labour Supply and Activity of Household Members Left-Behind. *Journal of Development Studies*, 55(2):278–293.

Woodruff, C. and Zenteno, R. (2007). Migration networks and microenterprises in Mexico. *Journal of Development Economics*, 82(2):509–528.

World Bank (2020). Phase II: COVID-19 Crisis through a Migration Lens Migration and Development Brief 33. Technical report.

World Bank (2021). Vulnerable employment, total (estimate) | Data.

World Bank (2022). GDP per capita growth (annual

Yang, D. (2008). International migration, remittances and household investment: Evidence from Philippine migrants' exchange rate shocks. *Economic Journal*, 118(528):591–630.

Remittances and Household Dependence: Evidence from Bangladesh
Appendix

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Appendix A. Additional Tables

Table A1: Remittance Dependence by Migrant Destination

Destination	Remittance Dependence (=1 if Yes)			Log (Non-remittance Income)			Change in Economic Fitness
	N	Mean	Std. Dev.	N	Mean	Std. Dev.	
Bahrain	202	0.287	0.454	144	10.459	1.214	0.024
Brunei	15	0.200	0.414	12	11.315	1.212	0.027
Greece	33	0.333	0.479	20	10.745	0.951	-
Iraq	14	0.286	0.469	10	11.079	1.182	0
Italy	128	0.234	0.425	95	10.911	1.085	-0.131
Jordan	13	0.462	0.519	7	10.041	1.234	0
kuwait	489	0.217	0.412	379	10.433	1.266	0
Lebanon	17	0.353	0.493	11	10.251	1.22	0
Libya	39	0.154	0.366	32	10.414	1.109	-
Malaysia	1,323	0.222	0.416	1,013	10.505	1.188	0.277
Maldives	85	0.200	0.402	66	10.616	1.079	-0.047
Oman	586	0.358	0.480	363	10.447	1.11	0.013
Qatar	145	0.310	0.464	98	10.601	1.243	0
Saudi Arabia	3,002	0.267	0.443	2,177	10.427	1.254	0.036
Singapore	381	0.192	0.394	306	10.828	1.233	-
South Afr	50	0.100	0.303	45	11.193	1.183	0.103
Spain	12	0.167	0.389	10	11.285	1.345	0.018
Syria	56	0.214	0.414	43	10.974	1.066	0.28
United Arab Emirates	2,061	0.304	0.460	1,410	10.536	1.19	0.071
United Kingdom	94	0.160	0.368	79	11.088	1.183	-0.145
United States	48	0.083	0.279	43	11.285	1.082	-

Table A2: Effect of Remittances on Households' Dependence (model with full set of controls)

	Remittance Dependence(=1 if Yes)		Log (Non-remittance Income)	
	OLS	IV	OLS	IV
	(1)	(2)	(3)	(4)
Log(remittances)	-0.005	-0.152***	0.073***	0.231*
	(0.006)	(0.053)	(0.021)	(0.136)
Household head is female (=1 if yes)	0.089***	0.090***	-0.135***	-0.130***
	(0.015)	(0.016)	(0.048)	(0.049)
Head has primary education (=1 if yes)	-0.002	0.004	0.033	0.028
	(0.012)	(0.013)	(0.038)	(0.039)
Head has secondary education (=1 if yes)	-0.018	-0.014	0.189***	0.202***
	(0.012)	(0.013)	(0.038)	(0.039)
Head's age	-0.002***	-0.002***	0.007***	0.007***
	(0.000)	(0.001)	(0.002)	(0.002)
Household size	-0.025***	-0.017***	0.111***	0.103***
	(0.002)	(0.004)	(0.008)	(0.010)
Proportion of male members aged 16-60 years	-0.217***	-0.213***	0.796***	0.827***
	(0.028)	(0.030)	(0.085)	(0.087)
Proportion of female members aged 16-60 years	-0.087***	-0.047	0.477***	0.443***
	(0.030)	(0.035)	(0.095)	(0.104)
Remittance receipt by migrant's parents (=1 if yes)	-0.043***	-0.039***	0.086**	0.079*
	(0.012)	(0.013)	(0.039)	(0.040)
Remittance receipt by migrant's brother/sister (=1 if yes)	-0.035**	-0.041**	0.143***	0.140***
	(0.016)	(0.017)	(0.049)	(0.050)
Migrant's age	-0.001	-0.001	0.002	0.002
	(0.001)	(0.001)	(0.002)	(0.002)
Migrant has above secondary education (=1 if yes)	-0.043***	-0.017	0.292***	0.242***
	(0.013)	(0.016)	(0.041)	(0.046)
Migrant is a husband (=1 if yes)	0.126***	0.108***	-0.496***	-0.499***
	(0.021)	(0.023)	(0.066)	(0.068)
Migrant is a son (=1 if yes)	0.044**	0.045**	-0.336***	-0.349***
	(0.020)	(0.022)	(0.062)	(0.064)
Migrant is a labourer (=1 if yes)	0.035***	0.013	-0.112***	-0.093**
	(0.011)	(0.014)	(0.035)	(0.039)
Migrant is in the Gulf countries (=1 if yes)	0.020**	0.012	-0.105***	-0.090***
	(0.010)	(0.011)	(0.032)	(0.033)
Frequency of remittance received	0.005***	0.015***	-0.020***	-0.035***
	(0.002)	(0.004)	(0.005)	(0.013)
	Yes	Yes	Yes	Yes
District fixed effects	Yes	Yes	Yes	Yes
First-stage F-statistics	-	105.00	-	102.86
Mean of outcome	0.263		10.538	
Observations	9,214	8,995	6,691	6,518

Note: (a) This table present the effect of remittances on household dependence on remittance income. (b) The treatment variable is log(remittances). (c) Outcome variable in columns 1-2 is an extensive margin indicator of remittance dependence that equals one if household has no other income except remittances, and zero otherwise. (d) Outcome variable in columns 3-4 is an intensive margin indicator of remittance dependence (i.e., log(non-remittance income)). (e) Columns 1 and 3 show ordinary least square (OLS) estimates and columns 2 and 4 show two-stage instrumental variable estimates. (f) Standard errors are clustered at the household level and appear in parentheses. (g) All columns include district fixed effects. (i) The list of controls are household head's characteristics, household characteristics, and migrant's characteristics included in Table 1. (j) ***Significant at the 1 percent level, **Significant at the 5 percent level, and *Significant at the 10 percent level.

Table A3: Effect of Remittances on Households' Dependence using Alternative Definitions

	Remittance Dependence (=1 if Yes)	
	Probit	IV-Probit
	(1)	(2)
Panel A		
Top Quintile Remittances (=1 if Yes)	-0.113**	-1.244***
	(0.047)	(0.322)
Marginal effect	[-0.030]	[-1.244]
Controls	Yes	Yes
District fixed effects	Yes	Yes
First-stage F-statistics	-	71.35
Observations	9,205	8,985
Panel B		
Top Tercile Remittances (=1 if Yes)	-0.070*	-1.116***
	(0.041)	(0.295)
Marginal effect	[-0.019]	[-1.116]
Controls	Yes	Yes
District fixed effects	Yes	Yes
First-stage F-statistics	-	78.39
Observations	9,205	8,985

Note: (a) This table present the effect of remittances on household dependence on remittance income. (b) The treatment variable is log(remittances). (c) Outcome variable in columns 1-2 is an extensive margin indicator of remittance dependence that equals one if household has no other income except remittances, and zero otherwise. (d) Outcome variable in columns 3-4 is an intensive margin indicator of remittance dependence (i.e., log(non-remittance income)). (e) Columns 1 and 3 show ordinary least square (OLS) estimates and columns 2 and 4 show two-stage instrumental variable estimates. (f) Standard errors are clustered at the household level and appear in parentheses. (g) All columns include district fixed effects. (i) The list of controls are household head's characteristics, household characteristics, and migrant's characteristics included in Table 1. (j) ***Significant at the 1 percent level, **Significant at the 5 percent level, and *Significant at the 10 percent level.

Table A4: Principal Components

Factors	Component	Unexplained
Healthy Sanitation Facility (=1 if yes)	0.617	0.532
Healthy Cooking Facility (=1 if yes)	0.532	0.653
Healthy Lighting Facility (=1 if yes)	0.580	0.587
Healthy Water Facility (=1 if yes)	-0.015	1.000