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## **Remittances, Moral Hazard and Monitoring: A Study on the Effects of Microfinance Institutions' Monitoring on Opportunistic Remittance Receivers**

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**Abstract:** The canonical tradeoff between risks and incentives is in this study applied in a new setting: between a migrant and her relatives remaining at home. Receiving monetary remittances (private cash or in kind transfers) from the migrant reduces the risk of income shortfalls, which simultaneously creates disincentives for the receivers at home to work. Traditionally, studies have used only the labor-leisure model to explain why remittances make recipients reduce their labor supply, whereas the problem of moral hazard has been accounted for by few. Therefore, the purpose of this thesis is to provide further research on the moral hazard explanation for the negative relationship between the remittance receipt and labor supply. Furthermore, since many remittance receivers are also microfinance borrowers, we recognize the coexistence of these capital flows and try to find out whether the remittance receivers' opportunistic behavior is affected by the monitoring associated with microfinance program participation. Using a household survey conducted in rural Bangladesh, we find support for the moral hazard hypothesis and that microfinance monitoring alleviates the problem among men. However, our tests do not generate significant results for women, which raises a need of further research and additional data capturing the characteristics of female labor supply.

**Keywords:** remittances, moral hazard, asymmetric information, labor supply, microfinance, monitoring

**JEL:** D82, F22, F24, G21, J22

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## 1. Purpose

Migration is a phenomenon that affects all of us in one way or another—and it has its benefits as well as its costs, which are continuously subject to lively debates. A feature of migration that has interested economists and other researchers for decades is private transfers that are sent from migrants to the relatives at home. As a matter of fact, a negative relationship between receiving *remittances*, as these transfers are called, and labor supply has been observed in various countries. In order to explain this relationship, studies (see e.g. Amuedo-Dorantes & Pozo 2006; Cox-Edwards & Rodriguez-Oreggia 2009; Drinkwater et al. 2006 and Rodriguez & Tiongson 2001) have traditionally turned to the neoclassical labor-leisure model where nonlabor income such as remittance lifts the receiving individual's budget constraint and allows her to spend more time on leisure. In other words, there is an *income effect* through which the receiver can reduce her labor supply. Furthermore, with a higher nonlabor income such as remittance, the receiver's reservation wage increases (Killingsworth 1983).

However, what has not been paid much attention in previous research is the presence of moral hazard arising from asymmetric information regarding the needs and conditions at home for the receivers. The migrant's relatives may realize the benefits of an income effect, i.e., they may desire to work less for the same income. It is, obviously, not the easiest task for a migrant living away from home to determine whether the family is being dishonest about their economic situation so as to get more transfers than they would necessarily need, which would allow them to work less than they are actually able.

Remittance flows have increased in recent years and on the aggregate level, the consequences could be grave since it implies that total output in the receiving country falls. In 2013 the officially recorded global remittance flows were estimated to be \$550 billion worldwide, whereof \$414 billion were flows to developing countries alone. The top receiving countries were India (\$71 billion) and China (\$60 billion). Other countries receiving large amounts of remittances include Nigeria, Egypt and Bangladesh. Relating remittance flows as a share of GDP, the top receiving countries were Tajikistan (48%), Kyrgyz Republic (31%), Nepal (25%), Lesotho (25%) and Moldova (24%) (World Bank 2014). Nevertheless, one needs to bear in mind the informal nature of private transfers such as remittances, since recorded flows make out a mere fraction of the true amount for each country. In addition to monetary remittances, cultural remittances also occur. The latter form is received either by means of telecommunication or when the migrant visits or returns home and brings new ideas, cultural norms and values.

Even though access to other sources of financing in addition to monetary remittances is limited in developing countries, one source of capital which is rather common in the developing world and which coexists with remittances is microfinance. Unlike that of remittance receivers, the monitoring of microfinance borrowers is highly formalized and borrowers are usually enrolled in a program that entails rigorous group-based monitoring. Logically, this monitoring could be expected to have an effect on those individuals who behave opportunistically due to remittances, which is, indeed, the scope of our study. Therefore, the purpose of this thesis is to provide further research on the moral hazard explanation to the negative relationship between labor supply and the remittance receipt, and to see how opportunistic behavior may be affected by a type of monitoring many remittance receivers are subject to, namely that of microfinance institutions.

The birthplace of microcredit in its current form is Bangladesh where the pioneering microfinance institution *Grameen Bank* was founded in 1983 by Prof. Muhammad Yunus. To analyze the effects of microfinance monitoring, we use data from a household survey jointly conducted by The Bangladesh Institute of Development Studies and the World Bank in 1991–1992. In addition to the prevalence of microfinance, Bangladesh is of particular interest because it is unique in its three cropping seasons per year, during all of which rice is cultivated. Since access to technology was very limited in a poor country such as Bangladesh in the early 1990s and rice production was highly labor intensive, the incentives to reduce labor supply were low. Furthermore, the issue of moral hazard may have been even more serious back then, since migrant's possibilities of monitoring the relatives were limited given the lack of telecommunications and similar monitoring devices.

Based on the Bangladeshi data, we perform Fixed Effects (FE) estimations where we examine the number of hours worked per month for individuals of three different groups: a combined group for both microfinance program participants and nonparticipants, a second group with nonmembers only and, lastly, a third group consisting of program members only, controlling for remittances in each group. This approach enables us to draw conclusions on whether remittance receivers behave opportunistically and if being part of a microfinance program has any impact on this behavior. To our knowledge, no researchers have previously taken the coexistence of microfinance and remittances into account when studying various effects of remittances, and certainly not when studying the negative effect of remittances on labor supply.

The remainder of the thesis is organized as follows: Section 2 reviews previous research and establishes the current state of knowledge. The theoretical framework used for achieving our purpose is provided by section 3. In the following section, section 4, we develop our research

question and hypotheses. In section 5, we present our data and econometric approach, including a discussion on endogeneity issues. Finally, the results of our study are presented in section 6 and concluded in section 7.

## 2. Previous Research

The income of rural households in developing countries dependent on agricultural production is quite volatile due to unpredictability regarding weather outcomes and the immobility of land—the two major production inputs. A way of insuring against this risk is to send a family member to another country or to an urban area where risks are uncorrelated with those at home, as recognized by the New Economics of Labor Migration (NELM). In addition to the so called *insurance motive*, a wide range of motivations to remit that are by no means mutually exclusive have been established by researchers, including pure altruism, ensuring rights to inheritance, exchange of a variety of services (e.g. that the migrant's assets at home are taken care of) and repayment of loans (Rapoport & Docquier 2006). Nevertheless, this thesis is not concerned with the reasons for why transfers arise, but its focus remains on one of the identified effects of remittances: the occurrence of opportunistic behavior on the part of the receivers.

The physical distance that is created between the migrant and the household members remaining in the home country can give rise to two kinds of moral hazard. The asymmetric information lies in the resources of the migrant on the one hand and in the needs of the family on the other. Ways of preventing a migrant from behaving opportunistically, i.e., refraining from remitting, could be loss of prestige and denying the migrant's right to inheritance or right to return home (Rapoport & Docquier 2006). However, unlike the family, the migrant cannot use credible threats to tackle opportunistic behavior. Azam and Gubert (2004) point out that the migrant is not able to verify the effort level of the family and that only the output level could be observed by a witness. Moreover, comparing the family's output with that of other families in the same area might not be sufficient since other families may exhibit opportunistic behavior as well. In addition, honest families may be forced by shirking families to reduce their effort too.

Azam and Gubert (2006) further elaborate on the insurance mechanism of migration and the effects of remittances on productivity. First, they highlight that the insurance effect is contingent on the access to a reliable network in the region that the migrant migrates to. Second, they emphasize that the opportunistic behavior of the family at home depends on the strength of the insurance effect.

According to Azam and Gubert (2006), there are two ways for a household to protect itself against an income shock, e.g. one caused by a drought. It can either work harder and produce more output so as to avoid falling below its consumption norm, or it can send a member abroad. Therefore, they “[...] predict that there is some possibility of substituting at the margin migration for effort for any given desired level of protection.” (Azam & Gubert 2006, p. 441) The opportunity cost of migration is obviously the lost labor at home; hence, the decision greatly depends on the network that the household has access to. If there is not a long tradition of migration for a certain group, there might not be an extensive network of relatives in locations offering the desired incomes with risks uncorrelated with those at home, which makes migration too costly. In that case, Azam and Gubert (2006) predict the household to invest in their own production effort rather than migration. The theoretical predictions are tested using a production function on households in the Kayes area in Mali and it is concluded that the insurance mechanism has a negative and significant effect on agricultural productivity in the region (Azam & Gubert 2004). It is also shown that households with a migrant produce further away from the efficiency frontier than nonmigrant households, which supports the moral hazard hypothesis. Thus, the popular discussion of the tradeoff between risks and incentives is applied in a new setting: between a migrant and their family.

A model with very similar predictions to those of Azam and Gubert (2004; 2006) is developed by Chami and others (2005). In their model, the migrant is altruistic and moral hazard arises when the receivers substitute remittances for labor effort and thereby take advantage of the migrant who cannot observe the effort of the receivers. The rationale is that the moral hazard problem is not an opposing explanation to the income effect, but rather a consequence of it. Furthermore, Naiditch and Vranceanu (2009) develop a game theoretic model with asymmetric information where the remittance receiver works less to signal to the migrant their need of financial support, the implications being that labor supply in the receiving country falls. In a second step, the migrant in the model is aware of the risk of opportunism and, therefore, reduces the remitted amount. Nevertheless, due to limitations of scope the focus of this thesis remains on the first step which is equivalent to the case developed by Azam and Gubert (2004) and Chami and others (2005).<sup>1</sup>

In addition to reduced labor supply, there may be further consequences of moral hazard on the aggregate level. Ebeke (2012) concludes that remittances reduce public spending in countries with

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<sup>1</sup> Note that the study by Azam and Gubert (2004) is the only one of the three which both models and explicitly tests for moral hazard empirically. Naiditch and Vranceanu (2009), on the other hand, start from the already observed relationships between remittances and labor supply and remittances and migrants’ wages and develop their model accordingly, without empirical testing. Chami and others (2005) use their model for a related, but different purpose than that of Azam and Gubert (2004): they test whether remittances behave like other capital flows triggering growth. Due to the insurance effect, they conclude that remittances flow counter cyclically and are not a catalyst for growth. Hence, they do not focus on the issue of moral hazard on the micro level.

governance issues. He finds two reasons for this: Firstly, the government realizes that remittances can work to compensate for reduced public spending. In other words, public subsidies can be replaced by remittances that will work like private subsidies. Secondly, households will not have the incentive to monitor the government and exert pressure on it for change when they are insured through remittances. The second reason is referred to as household moral hazard that translates into public moral hazard. Relating to this is a study by Arnott and Stiglitz (1991) which also discusses the harms of the insurance effect. First, they show that nonmarket insurance given by family and friends will always be provided and that moral hazard causes the fully insured to reduce their effort. Second, they show that nonmarket insurance may crowd out market insurance. An individual insured by family and friends will be less cautious and, hence, the response of market insurers is to provide less insurance. Nonmarket insurance is not as efficient as market insurance since it involves less risk pooling and, thus, welfare is reduced. However, if the nonmarket insurers monitor each other, i.e., if there is perfect monitoring within the family, welfare increases since the insured will be more cautious than without peer monitoring.

The plentiful studies focusing solely on the income effect of remittances do not entirely point in the same direction. Amuedo-Dorantes and Pozo (2006) find support for the income effect only amongst women in their Mexican sample, whereas the men exhibited a behavior in line with the opposing *disruptive effect*—that the migrant is most often of working age and, hence, other family members might start working more to compensate for the income lost or to pay for the costs of migration. Based on the same data, Airola (2008) concludes that the negative effect of remittances on hours worked by household heads is small but significant. However, he does not clearly link his results to theory and, thus, there is no discussion on whether the results support the income effect.

In contrast to the Mexican studies, Rodriguez and Tiongson (2001) find that the income effect is larger for men in their Pilipino sample, which is discussed to be due to the fact that men's labor supply is more responsive to changes in income than to changes in wages (for women, it is the other way around) since men are traditionally more involved in paid work than women. It is, however, important to note that the study focuses on temporary migrants only. Knowing that the migrant will return within some time may give rise to other decisions made by the nonmigrant household members than knowing that they will not. Also important to note is Amuedo-Dorantes and Pozo's (2006) critique of the method used. They argue that remittances may change hours worked and/or the type of work of the recipients, without altering the employment rates. Furthermore, they point out that the endogeneity of remittances with respect to labor supply has not been accounted for.



Unlike the other Mexican studies mentioned above, Cox-Edwards and Rodriguez-Oreggia (2009) find no support of the income hypothesis. They only focus on persistent remittances and exclude temporary remittances sent as a response to sudden negative income shocks. However, the latter form of remittance captures the insurance effect, which is our main interest since insurance and moral hazard are closely connected. Similarly, Drinkwater and others (2006) also fail to detect an income effect when using panel data from 19 developing countries. They do, however, find evidence of an *investment effect*, which implies that firms will afford to invest more since remittances loosen credit constraints and, hence, unemployment decreases.

### **3. A Framework for Analyzing Remittances, Monitoring and Moral Hazard**

Moral hazard is a problem that has proven to occur when individuals engage in activities that entail some form of risk sharing and when the outcomes of these activities are affected by the individuals' actions. An important condition for moral hazard to exist is asymmetric information since it enables hiding of actions and dishonesty (Holmström 1979). This issue is common in insurance situations, corporate governance, labor contracts, etc. The situation that is of special interest in this study is moral hazard arising from the insurance effect of remittances.

#### **3.1 Moral Hazard in a Remittance Context**

A way of diversifying the risk of income shortfalls for a family is to send one of its family members away to live in an area with less or uncorrelated volatility in income compared to that at home. Then, the migrant can send remittances home in order to reduce risks and to secure a certain level of consumption and living standards for the relatives. However, the distance created between the two parties gives rise to informational asymmetries. These conditions are what creates the moral hazard problem in the setting of remittances: individuals engaging in risk sharing activities where information is imperfect.

We base this section on a traditional moral hazard situation between a principal and an agent within a firm and on studies that have specifically modeled moral hazard of remittance receivers before (see Azam & Gubert 2004; Chami et al. 2005 and Naiditch & Vranceanu 2009). However, we choose not to present any of the three models for the remittance situation in their complete form for a number of reasons. Azam and Gubert (2004) have developed a very technical and extensive model with features beyond the scope of this study, some of which are specific to the area in Mali which they are studying, e.g. the shame associated with consumption shortfalls for higher social classes in that particular society. Although closely related to the focus of our study, the model by

Chami and others (2005) is not presented in a way that enables us to verify its accuracy. Specifically, not all variables are defined and all steps in the solution are not clearly derived. Lastly, as already mentioned, Naiditch & Vranceanu (2009) model aspects in subsequent time periods with a wider range of consequences that remittances can have, whereas this study is only concerned with the consequences on the receivers' labor supply. This implies that we, due to limitations of scope, primarily focus on the opportunistic behavior exhibited by the receiver.

Recognizing the dependency on agricultural production in developing countries, the volatility of a family's income from such production is captured by Azam and Gubert (2004) with the following production function:

$$y = \alpha e, \quad (1)$$

where  $y$  is the output from agricultural production,  $e$  is the effort of the family member remaining at home and  $\alpha$  is their productivity. The domain of  $\alpha$  is  $\alpha \in [0, \bar{\alpha}]$  and its cumulative distribution function  $F(\alpha)$ , density function  $f(\alpha)$  and the expected value  $E\alpha$ . When modelling moral hazard in the setting where firm ownership and management are separated, Mas-Colell and others (1995) assume that profits in a firm are not solely determined by the manager's effort level. Adjusting this to a situation of agricultural production, we assume that output can take on the values  $y \in [\underline{y}, \bar{y}]$  and that it is randomly related to the level of effort in a way that is described by the conditional density function  $f(y|e)$ , with  $f(y|e) > 0$  for all  $y \in [\underline{y}, \bar{y}]$  and all  $e \in E$ , where  $E$  is the set of possible actions in terms of effort. Mas-Colell and others (1995) thereby illustrate that output can be low in spite of high effort. Nevertheless, output is expected to be higher when the effort level is high. Assuming that there are only two different levels of effort, high effort ( $e_H$ ) or low effort ( $e_L$ ), the distribution of  $y$  conditional on  $e_H$ , therefore, first-order stochastically dominates the distribution conditional on  $e_L$ :  $F(y|e_H) \leq F(y|e_L)$  at all  $y \in [\underline{y}, \bar{y}]$ .

Moreover, Mas-Colell and others (1995) expect the agent to maximize her own utility,  $u(y, e)$ . The utility function satisfies  $u_y'(y, e) > 0$  and  $u_y''(y, e) \leq 0$  at all  $(y, e)$  and  $u(y, e_H) < u(y, e_L)$  at all  $y$ . These conditions capture that the family member at home prefers high income to less and dislikes effort. More specifically,  $u(y, e) = v(y) - g(e)$ , where the first term captures the utility of higher income and the second term the disutility of effort. Therefore,  $v'(y) > 0$ ,  $v''(y) \leq 0$  and  $g(e_H) > g(e_L)$ .

The next step is to introduce remittances ( $R$ ) into the model. Imagine a family consisting of two individuals where one is a remittance receiver and the other is an altruistic migrant who sends

remittances home when needed, due to e.g. less income because of seasonality in the home country. Henceforth, the family member remaining at home will be referred to as the receiver. The parties are separated by geographical distance which implies that there is asymmetric information between the two.

Assuming that the remittance receiver in addition to her output,  $y$ , also receives remittance transfers, based on the realizations of  $y$  that the remittance receiver reports to the migrant, the receiver's total income is:

$$I = y + R(y). \quad (2)$$

As equation (2) shows, the budget constraint for the receiver lifts with remittances. If the receiver is affected by a negative income shock that decreases  $y$ , the remittance,  $R(y)$ , serves as insurance so that the receiver can sustain the same level of total income,  $I$ . Furthermore, as captured by the traditional labor-leisure model, an individual's labor supply decision is also affected by the disutility of effort. Therefore, there are incentives for the receiver to behave opportunistically to get more remittances than necessarily needed. The stronger the insurance mechanism, the stronger are the receiver's incentives to shirk (Azam and Gubert 2004). Azam and Gubert (2004) observed in the Kayes area an act of collusion where families grouped and lied about natural disasters hitting the area in order to obtain remittance transfers from migrants.

It is further supported by Chami and others (2005) that from the migrant's point of view, the remittance transfer is not intended to make the recipient work less, but to insure the recipient against negative income shocks and to compensate for bad realizations of output. In their model, an important assumption is that the migrant is altruistic in her sending of remittances. Due to asymmetric information and the related possibility of hidden actions, the receiver seizes the opportunity to reduce her effort as she knows that at the margin, the migrant will behave altruistically. Therefore, Chami and others (2005) predict the moral hazard problem to persist.

One may wonder whether the migrant realizes that the receiver is tempted to work less due to remittances. Naiditch and Vranceanu (2009) also assume that the migrant is altruistic. Furthermore, they include in their model that the migrant realizes that there may be an issue of moral hazard on the part of the receiver. However, the migrant also realizes that the receiver may really be in need. As a result, the migrant reduces the remitted amount, but she does not cease to remit entirely due to her altruism. Therefore, also in this model, the problem of moral hazard persists.

Azam and Gubert (2004) dig even deeper into the issue and stress the fact that the migrant is unable to use credible threats to punish moral hazard since the receiver's effort level cannot be verified and thereby the remittance transfer cannot be based upon it. In contrast, there are ways for the receiver to force the migrant to keep remitting, even though the family is not able to verify whether the excuses are made up or valid. Azam and Gubert (2004) argue that several factors exist that make the migrant continue sending remittances in spite of the possibility to lie about her ability to remit. Guilt, the desire to be considered generous and a way of reinforcing the position in the clan are factors observed from their field research in the Kayes area. We argue that such factors can also lead to that the migrant keeps sending remittances although being aware of moral hazard on the recipient's side. Further ways for a family to prevent moral hazard on the migrant's side are summarized by Rapoport and Docquier (2006) and include loss of prestige, denying the migrant's right to inheritance, family solidarity or return home, that the migrant's assets at home are taken care of, and repayment of loans.

Evidently, there is an implicit insurance contract between the migrant and the receiver. Rapoport and Docquier (2006) further argue that this kind of arrangement will be self-enforcing if a sufficient degree of altruism is prevailing in the family, equivalent to the predictions of Chami and others (2005). When deciding which family member to send to another area the choice is, therefore, based on the earnings potential and the level of loyalty of that particular member (Rapoport & Docquier 2006).

In contrast to Chami and others' (2005) prediction of the moral hazard problem to persist, Holmström (1979) argues that any additional information to a principal about the agent's actions, even when imperfect, could be used to mitigate the moral hazard problem. Given that moral hazard exists in a remittance context, this implies that under certain circumstances the problem of moral hazard may, in fact, not persist.

### **3.2 Monitoring Difficulties for the Migrant and Potential Benefits of Microfinance Program Participation**

Given the geographical distance, it is typically quite difficult for a migrant to monitor the actions of the remittance receiver at home due to high monitoring costs and limited resources. Therefore, migrants could benefit if someone with better tools and resources could monitor the receivers on their behalf and thereby decrease the incentives for the receivers to shirk. In this section, we present one successful example of centralized monitoring and how it can be applied in the context of our study.

### ***3.2.1 An Example of Centralized Monitoring***

From the mid-1950s to the mid-1970s, the banking system in Japan was highly centralized, especially with regard to the monitoring of borrowers. A Japanese main bank, described by Aoki (1994) as the bank with the largest fraction of short-term loans lent to a firm, other than the role of a lender, also had the monitoring and evaluation responsibilities of the borrowing firm.

To explain the Japanese main bank system, Aoki (1994) distinguishes between three stages of monitoring that are all taken over by the main bank: (I) *ex ante* monitoring, where the bank has the responsibility to perform credit evaluation before lending money to a firm, (II) *interim* monitoring where the ongoing performance of a firm should be monitored and intervened in if necessary and (III) *ex post* monitoring where the financial outcome of a firm's performance is verified, evaluated, and necessary actions are taken. This type of monitoring on borrowing firms proved to be a very effective system for the Japanese economy during its high growth period in the early 1950s through the early 1970s. However, since then, Japan has been moving towards a more Anglo-American type of securities-based financial system, where separate securities market institutions have responsibility for different kinds of monitoring. Aoki (1994) concludes that the main bank system is more appropriate for economies in their early developing stages when loan financing is high and the main bank can work to avoid duplication of the monitoring. However, when economies gain further developments in the financial sector and infrastructure, the Anglo-American system may be preferable since, typically, equity and bond financing will increase and create a need for additional types of monitoring adapted to the different forms of the firms.

The primary reasons for why the main bank takes on the responsibility of monitoring firms are that the main bank has better resources to perform monitoring than other banks and investors and because the main bank, as the largest lender, will incur great losses if the firm defaults on its loan. In this setting, it is resource-optimizing to have one monitoring institution only that has a comparative advantage in monitoring a firm and its behavior, rather than having many institutions engaging in the monitoring, incurring greater costs than the main bank and perhaps not yielding the same quality of the monitoring.

### ***3.2.2 The Monitoring Practices of Microfinance Institutions***

Microfinance institutions are known for targeting individuals that live under poor conditions with no or little collateral to offer. This implies greater risk of loan defaults and, hence, a well working monitoring system and incentives for the borrowing individuals to fulfill their obligations is needed.

Different methods of monitoring are used by microfinance institutions depending on the type of loan and the borrower. Most microfinance institutions rely on group based monitoring, meaning that a group of program participants is created to link the borrowers to each other. By using peer pressure mechanisms and other moral obligations, it is ensured that the group members repay their loans and participate in the microfinance programs. In addition, the frequent group meetings should also educate and build awareness (Pitt & Khandker 1998).

Clearly, an analogy can be drawn between the main bank and the microfinance institution. Microfinance institutions monitor, educate and evaluate the performance of their borrowers and this should have effects on the members' behavior, toward willingness to work harder and produce yields above the loan rate. Therefore, the main implication of centralized monitoring for this study is that its benefits could be transferrable to a remittance context. Instead of having several monitoring institutions (or migrants in the remittance case) that do not have the same resources and informational power, the main bank (microfinance institution) deals with the monitoring on behalf of all lenders (migrants). This implies that the moral hazard problem associated with the remittance receipt may be mitigated by the monitoring of microfinance institutions.

#### **4. Research Question**

In parallel with remittances, many households in developing countries have microfinance available as an additional capital source and, just as remittances, it lifts the budget constraint of the receiver. However, microfinance has other features different to those of remittances, including other monitoring possibilities. Given the coexistence of microfinance and remittances, it is important to consider the impact of the monitoring practices of microfinance institutions on the remittance receivers. Therefore, we want to see if a microfinance institution can assist the sender of remittances in monitoring the receiver so as to reduce moral hazard. However, as a first step, it is important to establish whether moral hazard is actually present.

This leads us to the following research question:

- *Is there a problem of moral hazard associated with the remittance receipt and, if so, will this problem be mitigated by the monitoring conducted by microfinance institutions?*

This research question stems from the notion that the insurance mechanism of remittances will induce receivers to behave opportunistically, i.e., be dishonest about their need of remittances, in order to acquire the desired income effect. Accordingly, we develop our first hypothesis:

**Hypothesis 1:** *There is a negative relationship between remittances and total hours worked due to moral hazard.*

This hypothesis is consistent with the predictions of Azam and Gubert (2004), Chami and others (2005) and Naiditch and Vranceanu (2009). In a second step, it is important to determine if the moral hazard problem will be mitigated by the monitoring of microfinance institutions. Therefore, the second hypothesis is as follows:

**Hypothesis 2:** *A remittance receiver who is also a participant of a microfinance program will behave less opportunistically due to the monitoring conducted by the microfinance institution.*

If moral hazard in the setting of remittance transfers is consistent with general theories of moral hazard, then, monitoring the group of individuals who behave opportunistically due to these transfers should induce them to exert more effort. However, it could also be the case that a remittance receiver who is also in a microfinance program will not be noticeably affected by the monitoring of microfinance institutions due to the insurance effect of remittances. If the receiver of remittances is on the verge of defaulting, she may have remittances sent to her from the migrant to pay off the loan. In other words, the opportunistic behavior may still remain in spite of a membership in a microfinance program; hence, the monitoring conducted by the microfinance institution will be insufficient. It is, therefore, a priori ambiguous how microfinance will affect a person that is both a member of a microfinance program and a receiver of remittances.

## **5. The Case of Bangladesh**

### **5.1 The Data**

In order to test our research question we use a quasi-experimental household survey jointly conducted by The Bangladesh Institute of Development Studies and the World Bank during 1991–1992 on individual households in rural Bangladesh. The survey aims to provide data for an analysis of the three major credit programs in Bangladesh: Grameen Bank (GB), Bangladesh Rural Advancement (BRA) and the Rural Development-12 Program of the Bangladesh Rural Development Board (RD-12). All three of the programs work exclusively with offering production credit to the poor and landless in rural communities using peer monitoring as collateral. In addition, all programs also provide noncredit services such as skill training, teaching of investment strategies, literacy and health, and alteration of the attitude towards women (Pitt & Khandker 1998). Moreover, some programs target women specifically in order to improve female empowerment and to strengthen women's bargaining power. However, Khandker (2008) states that this has led

to men being more reliant on their wives obtaining loans and because of cultural norms in Bangladesh, many of these women give up the loans to their husbands.

The survey includes 1,798 households randomly drawn from 87 villages in rural Bangladesh. These 87 villages belong to 29 different *thanas*, an administrative unit that consists of a number of villages, which are also randomly selected from the 391 thanas in Bangladesh. 24 of these thanas have at least one of the three credit programs and five of them are nonprogram thanas. A household census was conducted to classify households as targets or nontargets, where a target household qualifies to join a program. In order to be eligible to join a program one has to own less or equal to half an acre of cultivated land. Among the target households, the census also aims to identify participating and nonparticipating households. 1,538 of the 1,798 sampled households are target households, whereof 905 households are credit program participants, i.e., 59% of those who could join a program did. The same individuals were revisited and answered the same survey three times during the years 1991–1992. The recurring visits were based on the three cropping seasons in Bangladesh: wave 1 occurs during November–February and is called the *Aman rice season*; wave 2, the *Boro rice season*, occurs during March–June; and wave 3, which is during July–October, is called the *Aus rice season* (Pitt & Khandker 1998).

This dataset is of interest because it contains information about remittance transfers, microfinance program participation, number of hours worked, consumption, etc. at the household and individual level. Using this dataset, we are able to test the effect of remittances on incentives to work and whether this effect changes if an individual, in addition to receiving remittances, also is a microfinance program participant. In other words, this dataset contains a sufficient set of variables that enables us to test our research question. As far as we know, other studies that have used this dataset do not focus on the remittance transfers in the data, and, therefore, neither the relationship between remittances and microfinance nor its impact on labor supply has been previously studied.

The question of whether this dataset is reliable is appropriate to discuss in this section. Considering that two well-known and professional organizations gathered the data, their approach when obtaining the data and the interview methods are most likely valid. Furthermore, the survey was conducted for academic reasons. Therefore, we do not believe that the data are manipulated to benefit the different credit programs in the survey. A further question to be raised is the age of the survey. There are several reasons for why we choose to use these data in spite of their age. First, it is the only dataset available to us with a panel structure that provides information about microfinance as well as remittances. We have not found any other data as sophisticated and of as good quality on a disaggregated level. Second, Bangladesh is unique in the sense that there are three



cropping seasons yearly, and rice is being cultivated during all three of them. This reduces the risk of omitted variable bias since all three waves have characteristics that are quite similar and do not differ much in terms of production inputs, justifying the use of the same control variables for all waves. Third, there are, in fact, certain benefits associated with using data from this particular time period. In the early 1990s the uses of and improvements in technology were limited in a country like Bangladesh, implying that agricultural production in general and rice production in particular was still dominating and labor intensive. In addition, in a poor country, other types of employment may be hard to find, implying that the incentives to reduce labor supply were low. The limited access to technology and the low development in the area at the time also imply that the migrants had difficulties in communicating with their families and monitoring them, even more so than today when telecommunications can be used to a greater extent. Hence, there are clear benefits of using this dataset; not only does it enable us to study three different waves, but it also enables us to observe individuals in a context where moral hazard may have thrived.

## 5.2 The Relationship between Remittances, Microfinance Monitoring and Labor Supply

### 5.2.1 Econometric Specification

With our research question and our theoretical framework in mind, we develop the following econometric regression:<sup>2</sup>

$$THM_{it} = \delta_t + \beta_0 + \beta_1 \text{remittance}_{it} + \beta_2 X_{it} + u_{it} + a_i,$$

where  $THM_{it}$  is the total number of monthly hours worked for each individual. Since many individuals work in more than one sector at the same time,  $THM_{it}$  is the sum of total hours worked for each individual in the following four sectors: agricultural, nonagricultural, self-employment and own enterprise. The difference between self-employment and own enterprise is that self-employment comprises production activities more closely related to household production and livestock such as fishing, cropping, nursing, etc., while enterprises are self-owned businesses.

$\delta_t$  is used to control for the different waves (seasons) to account for any potential differences in e.g. labor inputs and production levels of the individuals.

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<sup>2</sup> The regression is similar to that of Airola (2008). Note that Cox-Edwards and Rodriguez-Oreggia (2009) criticize Airola's (2008) findings since he estimates the regression for household heads only. This may generate biased estimates if one does not consider the fact that who was household head at the time of the survey might not have been so prior to the migration. Indeed, Airola (2008) has not commented on whether headship is endogenous to migration in his dataset. However, since we are estimating the regression for all survey takers in our sample, we do not experience the same problem and we, therefore, choose to use the specification in its current form.

$\text{remittance}_{it}$  is the total average amount of remittances received per month during each wave by each household in the local currency, *taka*. Note that only in kind and cash remittances are included in the dataset. Hence, our analysis concerns monetary remittances only, not cultural remittances. The transaction variables are presented at a household level, which means that we do not have data on who in the household is in fact using the remitted transfers and how much of the share each member obtains. Therefore, we keep transfers and loans received from microfinance and other organizations on a household level as they are presented and assume that they are fungible within households, which Pitt and Khandker (1998) also have assumed. We do not believe this will cause a bias because there should be spillover effects from members that are receiving transfers and loans on other household members. In other words, the identifying assumption is that credit and remittance receipt are fungible within the household.

$X_{it}$  is a vector that captures individual specific characteristics which may differ across individuals in the sample and it has four different components:

1. Characteristics that influence an individual's productivity and are captured in the following variables: *age*, which is the individual's age in years at the time of the survey. *numberofchildren*, a variable that counts the number of children in the household. To capture the number of days during the last month that the respondent was injured the variable *daysinjured* is used. *mpregnant* describes if a woman is currently pregnant and how far along in her pregnancy she is. The variable *tsavings* is the individual's personal wealth and denotes the amount of monetary savings in bank accounts and forced savings by microfinance institutions. Lastly, *areacultivated* is the total area of land in acres that an individual cultivates.
2. *Asset wealth*: an aggregated variable that consists of the total value of land, buildings, equipment and processing tools in taka, to control for enterprises' sizes, wealth and modernization of the production in agriculture for every individual.
3. *Household wealth*: a variable that contains factors that measure household wealth, such as the value of furniture, electronic appliances and household and kitchen utilities. This variable is important in order to control for how much work has to be put into household chores on a daily basis and to control for differences in wealth.
4. *Sectors and income*: finally, we control for the three different sectors: enterprise, agriculture and nonagriculture and the revenue and wages from these three sectors. The sectors are dummy variables and need to be controlled for since different sectors require different amounts of labor input. The sector self-employment is not specified in wages and revenues

as the other three, perhaps because it is difficult to measure how much this type of activities are worth. Therefore, we add a variable called *selfemploymentvalue*, which is the value of the livestock owned. We also include hourly wage variables for agricultural and nonagricultural occupation and revenues last month from the respondents' own enterprises. There is an importance of controlling for income because the wages are contingent on labor inputs.

In addition to total remittance flows, we also have access to the variable *rmemberHH* that describes if the sender of remittances is a member of the household who lives elsewhere. It is used to control for the fact that losing one member of the household could have major effects on other members' labor supply in order to compensate for an income and labor input source being lost. If not controlling for this variable, our results would be biased where remittances sent from this member may show that it leads to other members working more when it is in fact a rise in number of hours worked in order to compensate for the sender's absence; hence, we would not be examining what we aim for. Furthermore, there is no issue of estimating the regressions for current migrants since there are no such respondents in the survey.

Lastly, we have the error terms  $u_{it}$  and  $a_i$  where  $u_{it}$  is the individual unobserved error for individual  $i$  at time  $t$  and  $a_i$  the individual specific time independent error. We limit our sample to the ages 10–80. When examining the data, one can see a big trend of individuals starting to work at the age of 10 and working fairly little or nothing at all after the age of 80. For a graph over the distribution of working hours per month on age, please refer to Appendix Graph 1a.

Important to note is that optimally, we would in our regression like to include a dummy for microfinance program participation and an interaction term between remittances and microfinance. However, since we use FE methods, a variable must vary between different time periods in order for it to not be omitted from the regressions. The reasons for why we choose the FE method follow in section 5.3.2 *The Choice of an Appropriate Estimator*. In our sample, the state of membership in microfinance programs is constant and does not change during the survey period for most individuals. Therefore, one cannot include microfinance and the interaction term as control variables in the regression and instead, we separate the sample into two different groups: microfinance program members and nonmembers respectively, controlling for remittances. Furthermore, it is not possible to control for the number of household members when using FE since this variable is also not time-variant during our short time span.

Ultimately, we estimate two completely different groups and we do not observe the effect of introducing the microfinance monitoring to the individual. However, we are not interested in the

treatment effect of microfinance program participation as such since it is not realistic to introduce a policy forcing all remittance receivers to become members of a microfinance program in order to cope with the moral hazard problem. First, this is not the purpose of a microfinance institution. Second, due to the informal characteristics of remittances, it is impossible to identify all remittance receivers. Therefore, instead of estimating a treatment effect of microfinance program participation on remittance receivers, we focus on the differences in hours worked between members and nonmembers of microfinance programs, who are all remittance receivers, to uncover the occurrence of moral hazard and the potential benefits of formalized monitoring. In other words, what is of interest is whether the two groups (program members and nonprogram members) respond differently to remittances in terms of labor supply.

### 5.2.2 Dividing the Sample into Four Groups

Given the differences between men and women and their activities in our studied population it is crucial to account for this in the regressions. At the time the survey was carried through, Bangladesh was a conservative Islamic society that encouraged *purdah*, the seclusion of women. Therefore, very few women in the sample work in the wage paying labor market and the dominating occupation consists of self-employment activities such as producing goods at home for market sale, which is culturally less frowned upon (Pitt & Khandker 1998). Bearing the differing employment patterns between men and women in mind, it is appropriate to hold the sexes separate when estimating the effect of remittances and microfinance monitoring on total hours worked per month.

Ultimately, we study four different groups:

**Table 1:** Descriptive Statistics on the Monthly Remittance Inflow for the Four Different Groups

		observations	min	mean	max	sum
<i>Men</i> Remittances Received	Nonmember	697	2	736.1725	8,750	513,112.30
	Member	58	5	723.5560	8,750	41,966.25
<i>Women</i> Remittances Received	Nonmember	682	2	689.1439	8,750	469,996.10
	Member	68	7.5	576.3346	8,250	39,190.75

These four groups are of interest to study since it is our aim to determine how the effect of the remittance receipt on labor supply changes if the remittance receiver is also subject to microfinance monitoring. Therefore, as an initial stage, we run the regression on all the males and females in the sample, respectively, to see how remittances affect the different sexes and their total hours worked per month. Thereafter, we run the same regressions, however, separating the respondents

according to microfinance program membership, in order to reveal any potential differences due to program membership. Below, descriptive statistics on these four groups are presented to provide an overview of some of their differences.

**Table 2:** Descriptive Statistics on Control Variables for Men

Variables	Nonmicrofinance				Microfinance			
	Observations	min	mean	max	Observations	min	mean	max
thm	12,636	0	92.62195	660	1,179	0	195.9924	538
remittance	12,636	0	40.60717	8,750	1,179	0	35.59478	8,750
age	12,636	0	21.28063	98	1,179	16	34.78117	75
numberofchildren	12,636	0	.0001583	1	1,179	0	.0008482	1
daysinjured	2,885	1	10.0617	30	315	0	8.860317	30
tsavings	12,636	0	371.0649	320,000	1,179	0	1,814.159	41,014
assetvalue	12,636	0	21,442.36	3,290,000	1,176	0	11,842.28	417,100
householdwealth	12,636	0	982.0632	100,100	1,179	0	737.1891	40,100
areacultivated	6,172	0	94.89913	4,000	569	1.1	76.59069	945
agricultursector	8,532	0	.2286685	1	1,179	0	.2629347	1
nonagriculsector	8,532	0	.1847164	1	1,179	0	.1806616	1
ownenterprise	12,636	0	.4587686	1	1,176	0	.5722789	1
selfemployvalue	12,618	0	3,829.928	65,000	1,176	0	3,275.825	40,500
revenueastmonth	12,636	0	7,756.696	655,000	1,176	0	8,174.639	500,000
wageagricuculture	12,636	0	.2485272	80	1,179	0	.0907549	40
wagenonagriculture	12,636	0	6.844982	300	1,179	0	8.242578	200

**Table 3:** Descriptive Statistics on Control Variables for Women

Variables	Nonmicrofinance				Microfinance			
	Observations	min	mean	max	Obsevation	min	mean	max
thm	11,148	0	10.55221	420	1,830	0	40.55956	390
remittance	11,148	0	42.15968	8,750	1,830	0	21.41571	8,250
age	11,148	0	19.93595	90	1,830	15	35.09454	66
mpregnant	11,148	0	.0988518	10	1,830	0	.1546448	9
numberofchildren	11,148	0	.8883208	12	1,830	0	2.24153	10
daysinjured	2,630	0	10.03726	31	501	1	11.32335	30
tsavings	11,148	0	36.75879	20,000	1,830	0	1,214.009	20,000
assetvalue	11,139	0	22,023.13	3,290,000	1,830	0	8,944.058	750,000
householdwealth	11,148	0	981.9068	100,100	1,830	0	621.4809	40,100
areacultivated	5,438	0	93.92976	4,000	721	.01	65.06282	560
agriculturesector	7,125	0	.0113684	1	1,830	0	.0273224	1
nonagriculsector	7,125	0	.0477193	1	1,830	0	.0808743	1
ownenterprise	11,139	0	.4460903	1	1,830	0	.5153005	1
selfemployvalue	11,133	0	3,658.412	65,000	1,830	0	2,268.517	27,000
revenueastmonth	11,139	0	8,272.324	655,000	1,830	0	4,977.317	360,000
wageagricuculture	11,148	0	.006638	22	1,830	0	.010929	20
wagenonagriculture	11,148	0	.5022722	95	1,830	0	1.458153	100

Note that the members of a microfinance program are less wealthy than nonmembers, which is reasonable since the programs target the poor in rural areas. The size of the remittance receipt is similar across groups; however, both male and female program members seem to be working more than nonmembers. Women in general work much less than men in the sample. Furthermore, the distributions between the sectors of work in the groups are quite similar, which is, nevertheless, controlled for in our regressions.

### 5.3 Endogeneity and Other Data Issues

#### 5.3.1 Self-Selection and Reverse Causality

As with every estimation model, one has to be aware of potential endogeneity problems and correct for these. Previous studies using the same dataset (see e.g. Pitt & Khandker 1998; Morduch 1998; Pitt 1999 and Khandker 2005) have noted an important endogeneity problem that needs to be taken into account when using the data:

1. The placement of the credit programs is not random. Since the programs target poor individuals in rural areas in Bangladesh, program availability cannot be random. Furthermore, there may be unmeasured individual attributes that affect the demand for program participation. In addition, the impact of program participation on the individual

is also based on observed and unobserved abilities of the participants. In other words, if not accounted for, an endogeneity problem arises as a result of the possible correlation between the error terms and program participation.

Pitt and Khandker (1998) have shown that sources of intrafamily transfers were not significant determinants of credit demand and, therefore, they concluded that receiving remittances will not lead to self-selection bias on program participation. Furthermore, targeted individuals must have, as already mentioned, at most 0.5 acres of cultivated land in order to be eligible to join a program. Pitt and Khandker (1998) argue that the selection problem should be mitigated because the determining factor is landownership. However, using the same dataset, Morduch (1998) finds in his study on the impact of microfinance on the poor that individuals with more than 0.5 acres of land are, indeed, able to join a program. This implies that the 0.5 eligibility rule is not rigidly followed. Pitt, one of the researchers who conducted the survey, answered this criticism by explaining that the eligibility rule of 0.5 acres only concerns cultivated land. Some program participants may be owners of larger areas of land that are wastelands. Therefore, Pitt claims that the 0.5 acres eligibility rule actually was followed, unlike stated by Morduch (Pitt 1999). It is not possible for us to check the validity of Pitt's statement because landownership variables in the dataset are not separated into cultivated land and other types of land. Pitt's words may weigh more since being one of the researchers who designed and conducted the survey should make him better informed. Therefore, we assume that every program follows the 0.5 acre rule strictly when screening for new members. Nevertheless, we are skeptical of the view that landownership mitigates the self-selection issue to a major extent since the selection problem is likely to remain within the group that has less than 0.5 acres of land.

Problem 1 applies to remittance as well since it is an independent variable included in our regression, unlike in previous studies using the same dataset. Therefore, we have a further estimation issue to take into consideration:

2. Receiving remittances is not randomly assigned. Individuals receiving remittances may differ from those who do not in observable and unobservable ways.

Some of these differences are easy to control for, such as injury, gender, number of children and so forth (see section 5.2.1 *Econometric Specification*). Nevertheless, one cannot be certain that all individual characteristics influencing the sending of remittances have been controlled for. Indeed,

it is likely that a correlation between the error terms and the remittance receipt remains. This could exaggerate the effect of remittances on hours worked when the effect is in reality due to the fact that remittance receivers systematically exhibit other characteristics than nonreceivers.

Furthermore, both Airola (2008) and Amuedo-Dorantes and Pozo (2006) raise the concern that hours worked may influence the amount of remittances that is sent:

3. There might be reverse causality where the dependent variable of number of hours a remittance receiver works affects the independent variable remittances received.<sup>3</sup>

Amuedo-Dorantes & Pozo (2006) have dealt with the reverse causality problem by instrumenting remittances with the number of Western Union offices per capita in their region of interest. Airola (2008), on the other hand, argues that this problem does not matter for determining the consequences of remittances on total output in the economy: “[...] the total impact of remittance income on the output of the Mexican economy in any given year is the total observed output less the (counterfactual) output in the absence of remittance income. The predicted counterfactual labor supply is robust to these selection concerns.” (Airola 2008, p. 9) Nevertheless, in our regressions, an upward bias in the coefficient estimate for remittances would be the consequence of this problem since some of the effect is actually reverse, which means that we might be overstating the true causal effect of remittances on hours worked.

### ***5.3.2 The Choice of an Appropriate Estimator***

If the self-selection problems are not accounted for when using the data, our results on the effect of the credit program membership on the individuals receiving remittances will be biased due to unobserved differences in abilities, current living conditions, etc. of participants. Assuming that the eligibility rule is not a good method to control for program selection, a common approach to the problem of estimating equations with endogenous regressors is to use an instrument. However, finding an instrument that is both relevant and exogenous is impossible with the variables at hand. Therefore, we cannot use an instrument in the same manner as Amuedo-Dorantes and Pozo (2006).

Another approach is to use panel data methods such as Fixed Effects (FE) and First Difference (FD) estimations where one can control for individual and household specific fixed effects and, thus, deal with the selection issues by estimating only the variation within the unit of observation. Note that in our particular dataset, using FE estimations is more appropriate than FD estimations

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<sup>3</sup> Note that this scenario is explicitly modeled by Naididch and Vranceanu (2009).



because of missing values in the data. When a value from a certain wave is missing, it is not possible to calculate a first difference and, hence, this will yield a lower number of observations compared to time-demeaning the data with FE estimations. In our case, the FD regression is based on only 25 observations for men and 24 for women in the nonprogram group, whereas the FE approach gives 115 observations for men and 152 for women.

A competing panel data method is Random Effects (RE) where a weighted average of within and between variation is used. The determining factor of which approach to use is how the error term is correlated with the independent variables. If the fixed effect  $a_i$  is correlated with the regressors, then RE will yield biased and inconsistent estimates. Khandker (2005) confirms that households that are resource poor demand more loans from microfinance programs, especially households with low land ownership. He shows that the error terms in the credit demand equations for men and women are correlated with unobserved variables in the error terms from estimating current effects of borrowing on e.g. consumption. Hence, the assumption that  $Cov(\text{remittance}, a_i) = 0$  is not likely to hold in our case. Therefore, we must use FE in order to control for the unobserved fixed effects.

The reason for why we estimate our regression on the individual and not the household level is that we find it desirable to estimate the impact of remittances and monitoring on a level that is as disaggregated as possible. Estimating on the household level and controlling for household fixed effects would be much less precise since most of our variables of interest are measured at the individual level, e.g. our dependent variable hours worked and various control variables such as gender, age, injury, etc. Nonetheless, remittances are often sent for the whole household's benefit and, thus, it is one of the few variables that is not measured at the individual level in our particular survey. As already mentioned, we choose to deal with this by imposing the assumption that remittances are fungible within the household and that they have an impact on all household members.

Furthermore, one may wonder why we do not use OLS estimations, since it would enable us to include variables that are not varying over time and thereby use interaction terms between remittances and microfinance participation, which we cannot when using FE estimations. The benefit of such an approach is that we would not have to run three different regressions for each gender, but we could include all groups into one regression. This would yield a larger sample and would, hence, be more efficient. However, in order for OLS to produce unbiased estimates, there

must not be any correlation between the independent variable (remittances in this case) and the fixed effect  $\alpha_i$ , which is unlikely due to the above mentioned reasons. Biased estimates are not desirable and, therefore, we conclusively rule out the use of OLS.

However, also FE estimations come at a price. In order for FE to produce unbiased estimates, strict exogeneity must hold. This implies that the idiosyncratic errors must be uncorrelated with all independent variables at all points in time. This is unlikely to hold given that we do not have a perfect set of control variables. A further discussion on this is provided in section 6.4 *Robustness Testing*. Finally, using only within-variation in the data will increase standard errors and decrease efficiency. A second issue decreasing efficiency is when the idiosyncratic errors are not serially uncorrelated. It is, perhaps, more likely to assume that the *changes* in the idiosyncratic errors are uncorrelated over time, i.e., that a random walk is followed (receiving remittances in one period implies that you will get it in future periods as well), which implies that using FE makes us lose even more efficiency.

Moreover, in spite of using FE, there is one selection problem remaining in our regressions: the individuals are not randomly assigned between the group of microfinance program members and the group of nonmembers. With access to data ranging over a longer period of time, it would be possible to identify remittance receivers who are at first nonmembers but later become members, and thereby completely avoid the potential bias arising from self-selection. Given our very narrow time span, we have to settle with the current approach. It should be noted that we have controlled for all differences between the two groups that are known, such as the level of savings and wealth, and own enterprise. It cannot be ruled out that an important unknown variable is omitted. Nevertheless, we argue that this potential bias must be small since the sample is very homogenous in the first place—all are citizens of rural Bangladesh and live under similar conditions—and since we control for each known difference. Hence, the potentially omitted variable is not available in our sample and we cannot think of a variable that would bias the results extensively and which, therefore, would have been included in the survey had we designed it ourselves. Not knowing whether this potential variable has a positive or negative effect on labor supply, it is difficult to say in which direction our potential bias would point due to the self-selection problem.

Before conducting our tests, we examine the data in order to see whether the sample is normally distributed or not. Several variables are skewed to the right and zero-inflated, such as the variables for income and number of hours worked. One of the reasons for this in the case of the income variable is that many women in the sample work fairly little in a wage paying sector. Having zero-inflated variables implies that we cannot use natural logarithms to achieve more normal

distributions. If we would use logarithms for, say, total hours worked, the zero-observations would lead to that most variation in that variable is due to whether someone works in a wage paying sector or not, which is not the focus of our study. Hence, we must rely on the asymptotic properties of our FE estimator. Since the sample size is quite large, our estimates should be consistent.

### ***5.3.3 Measurement Errors***

What may be an issue for the reliability of the data is measurement errors. We view the Classical Errors in Variables (CEV) assumption to be the most likely assumption in this case since there is no reason to believe that any individual is more or less likely to over- or underreport the values of our independent variables than anyone else.<sup>4</sup> The measurement error is especially likely to be present in the remittance variable since it involves the respondents' own approximations of their monetary and in kind remittances received. This implies that our coefficient estimates may suffer from attenuation bias, understating the true effect of remittances on hours worked. Unfortunately, the attenuation bias is exacerbated when we use FE since the signal-to-noise ratio decreases when the between-variation in the data is taken out.

For the same reasons as above, it is likely that our dependent variable of total hours worked also suffers from measurement error, which decreases efficiency. Moreover, if the measurement error in our dependent variable is correlated with our independent variables, our estimates are biased. Perhaps shirking remittance receivers over-report how much they have worked, not only to the migrant but also in the survey. This would bias the coefficient for remittances upward, extenuating the true effect of remittances on labor supply.

## **6. Results**

### **6.1 The Insurance Effect of Migration**

As concluded by studies looking at the classic cases of moral hazard, there needs to be some sort of insurance that gives one party of a contract incentives to behave opportunistically in order for moral hazard to exist. Therefore, we need to study the patterns of remittance sending in our data to see if they are actually sent as insurance.

Looking at the relationship between remittances and days injured by running an OLS estimation, one can see that injury affects the amount of remittances positively. Note that this regression is

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<sup>4</sup> Note that Khandker (2005) has assumed the same.

very simple and may be subject to omitted variable bias. However, the essential result here is that the relationship between remittances and days injured during the last month is positive which implies that remittances do have an insurance effect.

**Table 4:** OLS Estimation of Remittances on Days Injured During the Last Month

<b>Variables</b>	<b>OLS remittance</b>
daysinjured	0.669* (0.390)
Constant	24.51*** (5.087)
Observations	8,762
R-squared	0.000
Standard errors in parentheses *** p<0.01, ** p<0.05, * p<0.1	

Testing for the remittance inflows during the different crop seasons (waves) in the same manner shows that in the first wave, the highest amount of remittances is typically received, since the coefficient estimates for the other two waves on remittances are negative. This may be explained by the fact that during the pre-harvest period *Monga*, which occurs before the Aman rice crop season (wave one), families often suffer due to famine (Khandker 2012). Many households experience a decrease in income of 50-60% and household expenditure typically decreases by approximately 10-25% (Bryan et al. 2013).

**Table 5:** OLS Estimation of Remittances on Waves

<b>Variables</b>	<b>OLS remittance</b>
2.wave	-26.62*** (4.464)
3.wave	-39.08*** (4.614)
Constant	61.35*** (3.167)
Observations	36,454
R-squared	0.002
Standard errors in parentheses *** p<0.01, ** p<0.05, * p<0.1	

These results suggest that an insurance effect which depends on individual living conditions is indeed present. Note that this analysis could be much more formalized and extensive—Gubert (2002) devoted an entire paper to study the prevalence of the insurance effect in the Kayes area

and it would certainly be favorable for us to do the same in Bangladesh. As for now, due to limitations of scope, we have to settle with the above clear indications of the existence of an insurance effect, nonetheless aware of the risk of omitted variable bias and overestimation.

Since we establish that remittance transfers in our sample do increase in injury and depending on season, the insurance reason for remitting cannot be rejected. Even so, additional reasons for why our particular individuals of observation receive remittance transfers are likely to exist. We cannot, however, exclude the remittances which are sent for other reasons than insuring from our analysis. First, it is not possible since the different reasons for remitting are closely related and intertwined. Second, no questions regarding the reason for the remittance transfers are included in the survey used to collect our data. Nevertheless, given that the decision to remit can rely on more than one motivation simultaneously, including all remittance transfers into our analysis may be beneficial. If our results support the moral hazard hypothesis, then this implies that the insurance motivation behind remitting is strong enough to induce moral hazard. In other words, we do not by any means dismiss the possibility of additional motivations to remit. On the contrary, we believe that the additional motivations are very likely and that they can, in line with the discussion in section 3.1 *Moral Hazard in a Remittance Context*, reinforce the insurance contract.

## 6.2 Remittances and the Impact of Microfinance Institutions' Monitoring

Recall our econometric regression from section 5.2 *The Relationship between Remittances, Microfinance Monitoring and Labor Supply*:

$$THM_{it} = \delta_t + \beta_0 + \beta_1 \text{remittance}_{it} + \beta_2 X_{it} + u_{it} + a_i$$

Estimating the effect of remittances on hours worked and the impact of microfinance monitoring using FE shows the following results for men:

**Table 6:** Fixed Effect Estimation of Total Hours  
Worked per Month (thm) for Men on Remittances and Control Variables

Variables	(R, combined) thm	(R & Nonprogram) thm	(R & Program) thm
remittance	<b>-0.0715***</b> (0.0179)	<b>-0.0655***</b> (0.0206)	<b>1.433*</b> (0.828)
rmemberHH	121.7*** (38.32)	128.7*** (35.70)	
age	-2.964 (27.30)	10.59 (21.24)	-91.05 (81.74)
daysinjured	-1.627*** (0.536)	-1.810*** (0.536)	-5.816** (2.330)
tsavings	-0.00110 (0.000854)	-0.00135 (0.000836)	-0.00354 (0.0123)
assetvalue	2.61e-05 (4.92e-05)	4.38e-05 (4.44e-05)	-0.000747 (0.000504)
householdwealth	-0.000797 (0.00273)	-0.00104 (0.00244)	0.0174 (0.0252)
areacultivated	0.0671 (0.0664)	0.116* (0.0655)	-1.215*** (0.413)
agriculturesector	80.95*** (15.77)	78.79*** (16.37)	85.43 (72.86)
nonagriculturesector	83.06*** (28.67)	102.1*** (29.83)	-940.3** (445.7)
ownenterprise	29.31* (17.17)	51.76*** (14.95)	-60.21 (42.38)
selfemploymentvalue	-0.00257** (0.00124)	-0.00301** (0.00122)	-0.00241 (0.00535)
revenueastmonth	0.000492*** (0.000187)	0.000388* (0.000200)	0.00693*** (0.00228)
wageagriculture	1.927 (1.447)	2.122 (1.342)	
wagenonagriculture	0.103 (0.561)	-0.194 (0.583)	21.15** (10.04)
2.wave	8.943 (9.257)	17.60** (8.945)	-65.75 (46.15)
3.wave	12.37 (10.48)	24.24** (9.869)	-88.22* (52.04)
Constant	203.7 (947.3)	-281.7 (732.1)	3,546 (2,926)
Observations	1,024	876	148
R-squared	0.239	0.351	0.467
Number of id	814	699	115
Using fixed effects on individual level	Yes	Yes	Yes

Robust standard errors in parentheses

\*\*\* p<0.01, \*\* p<0.05, \* p<0.1.

The first two regressions, the combined group and the group of nonmembers of a microfinance program, show a negative effect on total hours worked per month when receiving remittances, but when the remittance receivers are subject to the monitoring by a microfinance institution, this relationship cannot be observed. All results for the men in our sample are significant and support Hypothesis 1, that remittance receivers behave opportunistically and decrease their labor supply due to the transfers. The results also support Azam and Gubert's (2004) predictions that migration

is substituted for effort if there is access to a consistent network in another country or area. Therefore, it is likely that the households in our survey have access to such networks. Furthermore, the results also support Hypothesis 2, which says that a remittance receiver will behave less opportunistically due to the monitoring of a microfinance institution.

The economic implications of the results for the Bangladeshi men are quite noteworthy. For instance, for a nonmember who receives remittances the expected decrease in labor supply is -0.0655 hours per taka received, holding all other factors fixed. The mean amount of remittances received per month is 93 taka in the entire sample; however, one should bear in mind that only 1,505 individuals actually receive remittances and, hence, the mean value within the remittance receiving group is much larger: 736 taka. This implies that a remittance receiving male works on average -48.21 hours less per month due to remittances, but that a man who is in a microfinance program does not exhibit this kind of behavior. On the contrary, he works additional hours.

The results for women are shown in the table below:

**Table 7:** Fixed Effect Estimation of Total Hours  
Worked per Month (thm) for Women on Remittances and Control Variables

Variables	(R, combined) thm	(R & Nonprogram) thm	(R & Program) thm
<b>remittance</b>	<b>0.00164</b> <b>(0.00238)</b>	<b>0.00264</b> <b>(0.00257)</b>	<b>-0.341</b> <b>(0.280)</b>
rmemberHH	-12.50 (7.821)	-9.931** (4.493)	12.43 (15.79)
age	8.765** (4.319)	7.167** (3.387)	-1.441 (8.274)
mpregnant	0.640 (0.467)	0.272 (0.359)	0.504 (1.770)
numberofchildren	-0.0448 (0.398)	-0.171 (0.300)	-2.134 (1.687)
daysinjured	-0.0149 (0.165)	-0.0410 (0.185)	-0.0466 (0.378)
tsavings	0.00268* (0.00159)	0.00207* (0.00113)	-0.00326 (0.00393)
assetvalue	3.70e-05** (1.87e-05)	3.20e-05 (2.02e-05)	3.60e-05 (5.51e-05)
householdwealth	0.000107 (0.000223)	-3.04e-05 (0.000274)	0.00715* (0.00365)
areacultivated	-0.0138 (0.0114)	-0.0130 (0.0123)	-0.0183 (0.0516)
agriculturesector	15.61 (9.833)	12.82 (10.10)	
nonagriculturesector	-181.3* (98.14)	-425.0*** (53.09)	378.0*** (30.43)
ownenterprise	2.882 (6.159)	9.123 (5.934)	7.058 (5.470)
selfemploymentvalue	0.000260 (0.000271)	1.11e-05 (0.000297)	0.00211 (0.00158)
revenueastmonth	-7.81e-06 (2.31e-05)	-2.80e-06 (2.31e-05)	-7.10e-05 (0.000247)
wagenonagriculture	18.09*** (4.502)	30.58*** (3.078)	-2.759*** (1.039)
2.wave	-1.374 (2.735)	-3.725 (2.844)	-1.668 (6.501)
3.wave	-0.267 (3.115)	-3.196 (3.060)	-11.01 (7.408)
Constant	-289.8* (150.8)	-230.3** (116.4)	78.78 (305.8)
Observations	957	766	191
R-squared	0.700	0.513	0.961
Number of id	743	591	152
Using fixed effects on individual level	Yes	Yes	Yes

Robust standard errors in parentheses

\*\*\* p<0.01, \*\* p<0.05, \* p<0.1

The first thing to note is that the regressions for women do not produce any significant results for the variable of interest, *remittance*. Although insignificant, the results for women do not support any of our hypotheses. The estimates show that women increase their number of hours worked per



month when receiving remittance transfers and work less when they are both receiving remittances and are under the monitoring by microfinance institutions. However, due to the insignificance, no definite conclusions can be drawn. Further discussion on why there is no clear pattern among the women is appropriate.

### **6.3 Discussion Relating to the Diverse Results between Men and Women**

Interpreting the results requires consideration for the social context in which our study is based. As mentioned earlier, Bangladesh was at the time the survey was conducted a country with large gender inequality and gender discrimination. The insignificant results for the female survey participants imply that there is no clear trend or pattern in the data for how women behave when receiving remittances and microfinance loans. Perhaps the level of female empowerment varies between families and individuals, leading to varied outcomes on total hours worked for women. In some families women may be encouraged to work, whereas in others purdah, the marginalization of women, may be practiced. This could lead to diffused and diverse results for the female group. Clearly, we would need further information on the independence and empowerment of the actual women in our rural population to be able to support this discussion—general knowledge about the overall situation of Bangladeshi women is not enough. Specific survey questions on who controls and spends remittances and microcredit are of particular interest. 23 of 73 household heads in our sample are female, which does indeed imply that in 32% of the households, a woman makes important decisions. One way to verify if this is the case is to run the same regressions as above but only for the female household heads. However, since the number of female household heads is rather small, regressions cannot be run due to an insufficient number of observations. Furthermore, dropping the female household heads from the regressions does not change the results noticeably compared to the main regressions, in which they are included.

There is yet another possible explanation for the diverse results which is also related to cultural and socio-economic factors. Recall that the signs of the estimates on the impact of remittances on total hours worked per month for men and women are the exact opposite. One explanation for this might be related to that remittances are fungible within the household. I.e., the remittance transfers are mostly not sent for the benefit of one single individual but for whole families. Based on this and the limited empowerment of women, it is perhaps not surprising that our results show that the women work more when receiving remittances and not participating in a program since it may be due to compensation for the lesser hours worked per month by the men in the same groups. When

women are microfinance participants the coefficient estimate of remittance shows a negative impact on total hours worked per month. This may be related to the fact that borrowings from the programs and remittances are in fact taken over by men. Nevertheless, these are pure speculations that are not supported by the data, since the results for women are not significant.

## 6.4 Robustness Testing

### 6.4.1 Disaggregating Variables

To test the robustness of our results, we first run the same econometric specification as above, however, using the same control variables at a more disaggregated level. In our main regressions in section 5.2 *The Relationship between Remittances, Microfinance Monitoring and Labor Supply*, we aggregate e.g. household wealth into one variable, consisting of the value of furniture, household-, kitchen- and electronic appliances. Instead of grouping these variables into one, we below run regressions where these variables are included one by one.

Running the regressions with more disaggregated control variables, we get the following results for the effect of remittances on total hours worked per month for men in the three different groups.

**Table 8:** Fixed Effect Estimation of Total Hours Worked per Month (thm) on Remittances for Men Using Disaggregated and Aggregated Control Variables

	(R, combined)	(R & Nonprogram)	(R & Program)
Variables	thm	thm	thm
<b>Robustness Check</b> (disaggregated controls)			
<b>remittance</b>	<b>-0.0716***</b>	<b>-0.0637***</b>	<b>2.973*</b>
	(0.0177)	(0.0199)	(1.607)
Observations	1,024	876	148
R-squared	0.258	0.370	0.527
Number of id	814	699	115
Using fixed effects on individual level	Yes	Yes	Yes
<b>Main Regression</b> (aggregated controls)			
<b>remittance</b>	<b>-0.0715***</b>	<b>-0.0655***</b>	<b>1.433*</b>
	(0.0179)	(0.0206)	(0.828)
Observations	1,024	876	148
R-squared	0.239	0.351	0.467
Number of id	814	699	115
Using fixed effects on individual level	Yes	Yes	Yes

Robust standard errors in parentheses

\*\*\* p<0.01, \*\* p<0.05, \* p<0.1

For the complete table with all variables, please see Appendix Table 1a.

Comparing the new results to the main regressions, we note that the estimates have the same signs and significance levels. Hence, our hypotheses still have support. However, the sizes of the estimates in these regressions differ from the main regression, but only a little for the general group and for nonmicrofinance members. For the third group, microfinance program members, the coefficient estimate is larger and has almost doubled in size compared to the initial regression. This implies that we had negative bias in the estimates in our main regression due to grouping the control variables.

For women, the results are shown in the table below.

<b>Table 9:</b> Fixed Effect Estimation of Total Hours Worked per Month (thm) on Remittances for Women Using Disaggregated and Aggregated Control Variables			
	(R, combined)	(R & Nonprogram)	(R & Program)
<b>Variables</b>	<b>thm</b>	<b>thm</b>	<b>thm</b>
<b>Robustness Check</b> (disaggregated controls)			
<b>remittance</b>	<b>0.000647</b>	<b>0.00219</b>	<b>-0.274</b>
	(0.00236)	(0.00242)	(0.233)
Observations	957	766	191
R-squared	0.706	0.523	0.977
Number of id	957	766	191
Using fixed effects on individual level	Yes	Yes	Yes
<b>Main Regression</b> (aggregated controls)			
<b>remittance</b>	<b>0.00164</b>	<b>0.00264</b>	<b>-0.341</b>
	(0.00238)	(0.00257)	(0.280)
Observations	957	766	191
R-squared	0.700	0.513	0.961
Number of id	957	766	191
Using fixed effects on individual level	Yes	Yes	Yes

Robust standard errors in parentheses

\*\*\* p<0.01, \*\* p<0.05, \* p<0.1

For the complete table with all variables, please see Appendix Table 2a.

The coefficient estimates are still not significant on conventional levels and, hence, causal effects remain unidentified for the female groups. For the women who are not members of microfinance programs, the coefficient estimate for remittance is very similar to that of our main regression. In the combined group and the last group, remittances and microfinance participants, the estimates are larger than in the main regression, where women in this group will on average work 0.274 hours less per month for each additional taka received, holding all other factors fixed. The difference implies that we may have a negative bias in our main regression, where we overstate the negative

impact of remittances for the third group. Nevertheless, due to the insignificance of all results for women, this should, again, be considered speculation only as the true effect might be zero. It further confirms that there is a need of better controls for the female group, such as the degree of empowerment mentioned above.

#### ***6.4.2 Estimating for Different Age Groups***

The results above show that the findings for men are quite robust and significant. However, for women, running the regressions on a more disaggregated level, the estimates were neither consistent with the main regression, nor did it improve the significance levels of the estimates. Therefore, for further robustness checks, we divide the sample into different age groups. It may be the case that our chosen age span, 10–80 years, is too wide. The results of these regressions for women can be found in Appendix Table 3a and, indeed, they vary greatly across the different age groups. First, for women that are between the ages of 10–18, who can be considered children living at home since the legal marriage age in Bangladesh is 18 (although child marriages do occur), receiving remittances has a very small impact on the number of hours worked. Note that these results are insignificant. Nevertheless, the results are not surprising since this age group does not work as much as older women. The average number of hours worked is 12 per month for this particular age group, for the 19–49 year-group, the mean value is 28 hours and for the group that is 50 and older, the mean value is 14 hours. Also, the standard deviations of all groups are very large, which further indicates that some women work very little, whereas others are more empowered and work more. One may also assume that the youngest women have no or very little bargaining power in the household and that they are not as affected by remittance transfers. Furthermore, running the regression for the third group, remittance receivers and microfinance members, yields an insufficient number of observations for this particular age span.

When running the regressions on women between the ages of 19–49, the estimates are quite similar to our main regressions; however, still not significant. The similar results are expected because this is the most well represented age group in our main regressions. What may be most interesting with dividing the women into different age groups is that the women aged 50 and above have a negative sign on the coefficient estimate of remittances. This result is significant and, therefore, supports that women older than 50 will work less when receiving remittances when program members and nonmembers are combined. Conducting robustness checks thus suggests that for women, the effect of remittances differs depending on age, which is a potential measure of bargaining power in the household and, therefore, may affect the significance in our results. Note that we also run similar regressions for men and that the results in all age groups, except for the group of men

between the ages of 10–18, are equivalent to our initial findings. Naturally, the significance levels of the estimates decrease as the sample sizes decrease. The divergent group of men shows an increasing number of hours worked when receiving remittances. However, this estimate is not significant and perhaps not of great concern since it is the group of children. For full detail of our regressions for men, please see Appendix Table 4a. Note that we cannot divide the sample into even smaller age spans than these three due to an insufficient number of observations for some of the variables of interest.

### ***6.4.3 Further Discussion***

With even more sophisticated data with an even richer set of variables, further robustness testing could be conducted. For instance, we would benefit from more variables measuring labor supply in addition to the one we have access to (number of hours worked). For example, if a variable capturing unemployment were available, we could regress the same independent variables on the unemployment rate instead and compare the results to those of our main regression. This would provide further evidence for or against causal effects.

Furthermore, additional time periods over a larger time span would allow us to investigate whether the effects of remittances on labor supply are lagged. Few studies that we know of have factored in the lagged effect of remittances in their analyses. One exception is Kim (2007) who states in his study on remittances and reservation wages in Jamaica that remittances in a previous period can affect the decision making in a latter period, where remittances received in the past are commonly a reference point when making household and individual decisions. Therefore, in our case, maybe the recipient's behavior in the first wave was affected by remittance transfers in preceding periods, for which we have no data. If this is the case, strict exogeneity is violated in our main regressions, leading to bias and exaggeration of the effect of the remittances in the current period. Nevertheless, we have been able to account for a certain degree of lagged effect in our main regression already, since the remittance variable captures the average amount of monthly remittances in the last four months, i.e., average remittances during each wave. It would have been desirable to account for the lagged effect also between waves and over even longer time periods. However, given the short time span of our survey, it is not possible to run this regression.

## 7. Conclusions

This study aims to provide further research on one of the downsides of remittances, namely that they induce receivers to work less and, thus, create a problem of moral hazard. The canonical tradeoff between risks and incentives is, therefore, applied in a new setting: that between a migrant and the family remaining at home. Using panel data from a household survey conducted in 1991–1992 in Bangladesh, we perform Fixed Effects estimations to see whether the moral hazard problem is present and, if so, whether it is reduced by the monitoring conducted by microfinance institutions. The results for men are significant and confirm that remittances make the receiver work less, more specifically, on average 48 hours less each month. However, in the female groups, our estimations yield no significant results. With our research, we add further support and weight to the few studies focusing on this rather new explanation for the negative relationship between remittances and labor supply, which was one of the purposes of this thesis.

The second purpose was to find out whether microfinance monitoring is of importance for the moral hazard problem. Our findings for men confirm that it is. If the recipients of remittances are also under microfinance program monitoring, our results show that the negative relationship between remittances and labor supply no longer exists for men, which implies that for the many individuals receiving microfinance and remittances concurrently, there is no problem of moral hazard. In this way, the microfinance institutions indirectly work to centralize the monitoring on behalf of the migrants who cannot themselves monitor the recipients as efficiently due to resource constraints. In addition, microfinance institutions are not only banks, but they also educate and make sure that the loans are used for their intended purpose. Therefore, the microfinance institutions could also develop practices where they work to improve the use of remittances.

It is important to remember that our conclusions are based on data from the early 1990s, and that they are valid in the historical context only. The same results may very well not be generated today given the rapid developments in Bangladesh since then. One important change that could render differing results is the improvements in telecommunications infrastructure that may have increased the possibilities for the migrant to conduct the monitoring in an efficient way herself. It would be of interest to conduct a study similar to ours with recent data to see whether moral hazard is an issue also today. Such a study could be used by policy makers seeking to increase remittance flows or regulate the uses of remittances.

As of now, we have only studied moral hazard in Bangladesh in the early 1990s and, therefore, it would be of great interest to perform similar tests in other countries based on recent data to see if

our results are robust and applicable in a wider setting. If possible, the tests should be performed on longitude panel data where more time periods may increase significance for the groups where it was missing. Estimating female labor supply is quite a complex issue, which our insignificant results for the female groups confirm. Some of the characteristics specific of women we are able to control for, such as pregnancy and the sector in which they are employed, whereas other characteristics remain unobserved. One such characteristic is the degree of emancipation. Further research may focus on these issues in order to unravel how women respond to remittances and microfinance monitoring. Pursuing this further, it may be of interest to consider also cultural remittances. If the migrants bring with them new values that, for example, strengthen the position of women in the home society, a country can gain a lot in terms of aggregate output.

## 8. References

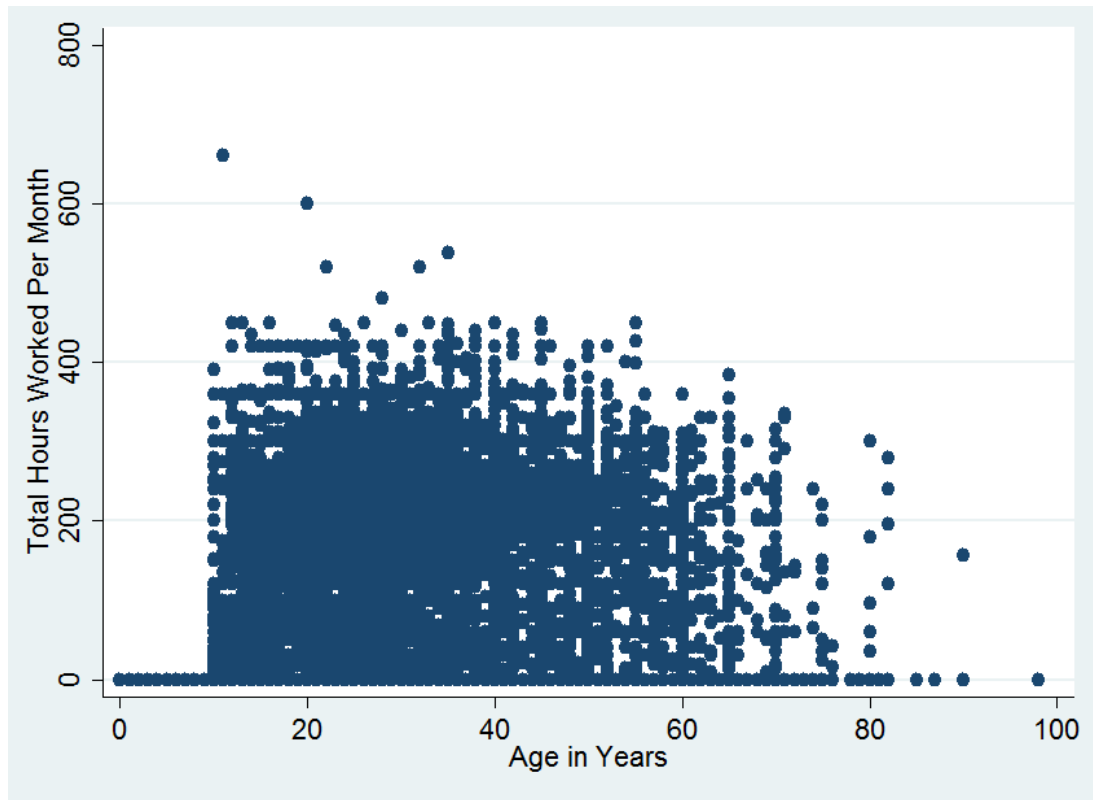
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## Appendix

**Graph 1a:** Distribution of Total Hours Worked Per Month on Age



**Table 1a:** Fixed Effect Estimation of Total Hours Worked per Month (thm)  
on Remittances and Control Variables for Men

Variables	(R, combined) thm	(R & Nonprogram) thm	(R & Program) thm
<b>remittance</b>	<b>-0.0716*** (0.0177)</b>	<b>-0.0637*** (0.0199)</b>	<b>2.973* (1.607)</b>
rmemberHH	123.4*** (36.96)	129.5*** (34.98)	
age	-18.78 (36.63)	4.463 (29.27)	-297.1 (210.9)
agesqr	0.217 (0.444)	0.0766 (0.472)	3.244 (2.661)
daysinjured	-1.748*** (0.503)	-1.973*** (0.490)	-5.549** (2.456)
tsavings	-0.00109 (0.000918)	-0.00135 (0.000891)	-0.00898 (0.0142)
areacultivated	0.0566 (0.0656)	0.1000 (0.0646)	-1.030*** (0.390)
tlandvalue	2.19e-05 (5.25e-05)	3.92e-05 (4.93e-05)	-0.000833 (0.000695)
tbuildingvalue	0.00252 (0.00230)	-0.000453 (0.00139)	0.0170 (0.0576)
tequipvalue	0.00219*** (0.000635)	0.00214*** (0.000593)	0.185 (0.314)
processtools	0.00150** (0.000759)	0.00133* (0.000783)	-0.187 (0.211)
furniture	-0.000512 (0.00352)	-0.000661 (0.00314)	-0.0315 (0.0367)
HHKitchen	0.00237 (0.00899)	0.00251 (0.00802)	0.0609 (0.0796)
electronics	0.00618 (0.00771)	0.0111 (0.00734)	2.365 (2.960)
agriculturesector	79.28*** (16.12)	78.58*** (16.71)	91.04 (76.74)
nonagriculturesector	82.89*** (28.20)	102.5*** (29.74)	-1,212* (643.4)
ownenterprise	25.73 (17.98)	52.34*** (16.07)	-92.89* (51.38)
wageagriculture	1.916 (1.386)	2.101 (1.308)	
wagenonagriculture	0.0635 (0.552)	-0.233 (0.586)	28.43* (15.32)
selfemploymentvalue	-0.00230* (0.00118)	-0.00268** (0.00117)	-0.0105 (0.0118)
revenuemarket	0.000700*** (9.55e-05)	0.000545*** (5.40e-05)	0.00801*** (0.00268)
2.wave	9.324 (9.413)	16.87* (9.135)	-48.19 (50.61)
3.wave	13.88 (10.89)	23.87** (10.38)	-63.39 (51.91)
Constant	420.5 (965.7)	-190.8 (708.6)	6,266 (4,368)
Observations	1,024	876	148
R-squared	0.258	0.370	0.527
Number of id	814	699	115
Using fixed effects on individual levels	Yes	Yes	Yes

Robust standard errors in parentheses

\*\*\* p<0.01, \*\* p<0.05, \* p<0.1

**Table 2a:** Fixed Effect Estimation of Total Hours Worked per Month (thm)  
on Remittances and Control Variables for Women

Variables	(R, combined) thm	(R & Nonprogram) thm	(R & Program) thm
<b>remittance</b>	<b>0.000647</b> <b>(0.00236)</b>	<b>0.00219</b> <b>(0.00242)</b>	<b>-0.274</b> <b>(0.233)</b>
rmemberHH	-10.02 (6.515)	-10.75** (5.279)	-3.298 (14.87)
age	30.90* (17.45)	14.63 (8.985)	
agesqr	-0.254 (0.162)	-0.0812 (0.0776)	-0.0737 (0.0630)
mpregnant	0.531 (0.479)	0.274 (0.388)	-0.369 (1.658)
numberofchildren	-0.252 (0.348)	-0.138 (0.328)	-5.024*** (1.891)
daysinjured	-0.0260 (0.167)	-0.0694 (0.189)	0.262 (0.353)
tsavings	0.00282* (0.00162)	0.00217* (0.00112)	-0.00537 (0.00341)
areacultivated	-0.0157 (0.0127)	-0.0170 (0.0139)	-0.0661 (0.0570)
tlandvalue	3.94e-05** (1.84e-05)	3.47e-05* (2.00e-05)	0.000131* (6.97e-05)
tbuildingvalue	-0.000191 (0.000169)	-0.000215 (0.000210)	-0.00154*** (0.000500)
tequipvalue	-0.000127 (0.000139)	-0.000219 (0.000139)	0.0106** (0.00451)
processtools	0.00118 (0.000877)	0.00164* (0.000966)	-0.203*** (0.0618)
furniture	0.000165 (0.000524)	3.48e-05 (0.000592)	0.00260 (0.00245)
HHKitchen	0.00181 (0.00187)	0.00214 (0.00181)	0.0206* (0.0118)
electronics	0.000328* (0.000168)	0.000260 (0.000206)	0.0208** (0.0104)
agriculturesector	15.44 (10.36)	12.67 (10.89)	
nonagriculturesector	-171.0* (95.20)	-412.0*** (54.08)	377.6*** (29.38)
ownenterprise	3.051 (6.126)	9.400 (5.860)	5.380 (5.401)
wagenonagriculture	17.61*** (4.262)	29.82*** (3.167)	-3.094*** (1.041)
selfemploymentvalue	0.000263 (0.000279)	7.78e-06 (0.000314)	0.00239* (0.00126)
revenueastmonth	7.45e-06 (2.71e-05)	1.84e-05 (2.76e-05)	-0.000104 (0.000362)
2.wave	-1.653 (2.846)	-4.457 (3.030)	7.808 (6.336)
3.wave	-1.728 (3.019)	-4.268 (3.150)	-16.17** (6.857)
Constant	-688.1* (374.6)	-367.6* (204.5)	135.6 (95.05)
Observations	957	766	191
R-squared	0.706	0.523	0.977
Number of id	743	591	152
Using fixed effects on individual level	Yes	Yes	Yes

Robust standard errors in parentheses

\*\*\* p<0.01, \*\* p<0.05, \* p<0.1

**Table 3a:** Fixed Effect Estimation of Total Hours Worked per Month (thm)  
on Remittances and Control Variables for Different Age Groups for Women

	Ages 10–18		Ages 19–49			Ages 50 and above	
Variables	R thm	R & nonMF thm	R thm	R&nonMF thm	R&MF thm	R thm	R&nonMF thm
remittance	-0 (0)	-0 (0)	0.00143 (0.00197)	0.00166 (0.00212)	-0.208 (0.289)	-0.00340** (0.00167)	-0.00304* (0.00172)
rmemberHH	0 (0)	-0 (0)	-9 (4.994)	-17.01*** (6.201)	5.761 (15.89)	3.375* (1.998)	3.383 (2.052)
age			13.98** (6.624)	15.88** (6.646)		-1.032 (1.218)	-0.962 (1.251)
mpregnant	-0 (0)	-0 (0)	0.891 (0.652)	0.523 (0.616)	5.079 (3.078)		
numberofchildren			-0.687 (0.686)	-0.000788 (0.818)	-2.375 (1.614)	-0.0623 (0.170)	0.0115 (0.158)
daysinjured	-0 (0)	-0* (0)	-0.156 (0.254)	-0.230 (0.307)	0.0298 (0.391)	0.0470 (0.0656)	0.0735 (0.0642)
tsavings	-0 (0)	0 (0)	0.00267* (0.00152)	0.00322** (0.00146)	0.00624 (0.00975)	-0.00326 (0.00236)	
assetvalue	-0* (0)	0 (0)	3.29e-05* (1.92e-05)	3.50e-05* (1.81e-05)	1.45e-06 (6.18e-05)	1.98e-05 (1.35e-05)	2.03e-05 (1.37e-05)
householdwealth	-0 (0)	-0 (0)	-1.34e-05 (0.00113)	-0.000773 (0.00127)	0.00679* (0.00351)	0.000151 (9.99e-05)	0.000178* (0.000100)
areacultivated	0 (0)	-0* (0)	-0.00243 (0.0166)	-0.00124 (0.0200)	0.00767 (0.0481)	-0.0104 (0.00885)	-0.0117 (0.00905)
agriculturesector			29.90*** (3.648)	30.26*** (4.618)		6.213*** (2.212)	5.839** (2.265)
nonagriculturesector			-192.5*** (7.802)	-227.4*** (42.87)			
ownenterprise	0 (0)	0 (0)	13.03* (6.632)	12.79 (8.782)	12.79* (7.018)	-3.825** (1.661)	-3.133** (1.582)
selfemploymentvalue	-0 (0)	-0 (0)	0.000125 (0.000404)	-8.09e-05 (0.000558)	0.00151 (0.00166)	-5.50e-05 (9.48e-05)	-8.73e-05 (9.28e-05)
revenueastmonth	0 (0)	0 (0)	-5.97e-06 (2.88e-05)	9.35e-06 (2.90e-05)	-7.63e-05 (0.000265)	-2.36e-05** (1.05e-05)	-2.20e-05* (1.11e-05)
wagenonagriculture	36*** (0)	36*** (0)	16.49*** (0.342)	18.55*** (2.611)	9.975*** (0.219)	15.34*** (0.176)	
2.wave	-0 (0)	-0 (0)	-6.923** (3.034)	-8.250** (3.933)	-5.070 (6.231)	3.733** (1.788)	3.357* (1.826)
3.wave	-0 (0)	-0 (0)	-6.916* (3.955)	-5.748 (4.897)	-13.72* (7.582)	2.244 (2.052)	2.700 (2.033)
Constant	-2.959*** (0)	-3.012*** (0)	-434.8** (217.8)	-492.1** (215.5)	19.57 (13.68)	65.70 (71.07)	61.77 (73.92)
Observations	172	169	582	420	162	208	182
R-squared	1.000	1.000	0.691	0.395	0.935	0.993	0.300
Number of id	145	143	449	320	129	154	133
Using fixed effects on individual levels	Yes	Yes	Yes	Yes	Yes	Yes	Yes

Robust standard errors in parentheses  
\*\*\* p<0.01, \*\* p<0.05, \* p<0.1

**Table 4a:** Fixed Effect Estimation of Total Hours Worked per Month (thm)  
on Remittances and Control Variables for Different Age Groups for Men

Variables	Ages 10–18		Ages 19–49			Ages 50 and above	
	R thm	R & nonMF thm	R thm	R&nonMF thm	R&MF thm	R thm	R&nonMF thm
remittance	0.0728 (0.242)	0.0728 (0.242)	-0.0710*** (0.0226)	-0.0595*** (0.0187)	1.436 (0.921)	-0.208 (0.143)	-0.240* (0.132)
rmemberHH			147.2** (57.32)	151.4*** (46.13)			
age	-25.04 (36.50)	-25.04 (36.50)	-32.06 (60.51)	4.559 (42.93)	-148.9*** (55.97)	112.8*** (39.74)	192.2*** (53.93)
daysinjured	-1.699 (1.599)	-1.699 (1.599)	-2.338** (0.954)	-2.981*** (1.001)	-5.140** (2.209)	-0.317 (0.783)	-0.123 (0.661)
tsavings	0.0246*** (0.00775)	0.0246*** (0.00775)	-0.00176* (0.000923)	-0.00248*** (0.000908)	-0.00534 (0.0102)	0.00550 (0.00392)	0.00883** (0.00413)
assetvalue	9.30e-05 (9.62e-05)	9.30e-05 (9.62e-05)	-7.44e-05 (0.000127)	-6.59e-05 (0.000112)	-0.00141*** (0.000486)	0.000161** (7.11e-05)	0.000223*** (7.33e-05)
householdwealth	0.00535 (0.00486)	0.00535 (0.00486)	-0.00289 (0.00595)	-0.00543 (0.00572)	0.0124 (0.0279)	0.00242 (0.00598)	4.76e-05 (0.00585)
areacultivated	-0.213 (0.169)	-0.213 (0.169)	0.177 (0.123)	0.289** (0.118)	-1.611*** (0.439)	0.0166 (0.0612)	0.0415 (0.0577)
agriculturesector	115.5*** (16.41)	115.5*** (16.41)	76.73*** (23.50)	78.98*** (23.51)	170.5** (69.29)	93.85*** (18.25)	103.1*** (18.99)
nonagriculturesector			112.1* (57.95)	108.7* (55.35)		53.50*** (19.48)	67.31*** (13.87)
ownenterprise	-55.15 (51.87)	-55.15 (51.88)	31.01 (26.83)	70.67*** (22.53)	-68.87 (46.55)	31.86 (27.81)	60.93*** (20.86)
selfemploymentvalue	0.00323 (0.00350)	0.00323 (0.00350)	-0.00587* (0.00320)	-0.00491 (0.00329)	-0.00987 (0.00739)	-0.00158 (0.00129)	-0.00177 (0.00122)
revenuemarket	0.00283 (0.00221)	0.00283 (0.00221)	0.000455** (0.000195)	0.000313 (0.000221)	0.00929*** (0.00192)	0.00219* (0.00127)	0.00160 (0.00117)
wageagriculture			2.677 (2.112)	2.716* (1.637)			
wagenonagriculture			0.231 (1.091)	0.0967 (1.078)	2.820** (1.300)	-1.153** (0.499)	-1.511*** (0.456)
2.wave	20.06 (26.85)	20.06 (26.85)	-2.891 (16.49)	13.65 (15.13)	-99.32* (58.92)	19.18 (13.27)	23.23* (13.75)
3.wave	-1.723 (20.14)	-1.723 (20.14)	9.156 (17.50)	28.16 (17.20)	-118.7* (60.07)	25.00* (14.67)	32.16** (16.22)
Constant	365.1 (497.4)	364.2 (496.8)	1,182 (1,955)	-28.19 (1,389)	5,028*** (1,780)	-6,728*** (2,394)	-11,609*** (3,274)
Observations	225	224	555	433	122	249	224
R-squared	0.426	0.426	0.284	0.452	0.635	0.422	0.500
Number of id	194	193	451	354	97	173	156
Using fixed effects on individual levels	Yes	Yes	Yes	Yes	Yes	Yes	Yes

Robust standard errors in parentheses

\*\*\* p<0.01, \*\* p<0.05, \* p<0.1