The Use of M-bank in Rural Areas of Northern Bangladesh: A Focus on Gender Differences within the Households

(バングラデシュ北部農村におけるモバイルバンキング利用に関する実証研究

－世帯内の男女格差に着目して－)

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Abstract

Financial inclusion is crucial to increase the livelihood of the poor by reducing poverty and achieving sustainable development goals (e.g., Demirguc and Klapper, 2012; World Bank, 2018). In recent years, mobile banking (M-bank) has emerged as one of the latest technologies (Aker and Mbiti, 2010; Yu, 2012). It brings more low-income people into the use of formal financial services with a very low transaction cost using a mobile phone (Baabdullah et al., 2019). However, a question arises: is the increasing rate of inclusion really changing the lives of the poor and especially the female? Previous studies address that M-bank can increase savings and transfers, enhance income generating activities, and further to increase expenditure on food and education in rural areas of developing countries (e.g., Aker et al., 2016; Azad, 2016). However, in Bangladesh, such evidence, especially for the rural female remains insufficient. Indeed, no empirical study on financial inclusion in northern Bangladesh is available.

This present research aims to examine the effects of household characteristics, especially, gender difference within a household on the likelihood of M-bank use as well as the relationship of M-bank use and household wellbeing in the rural areas of northern Bangladesh. To achieve this purpose, the 3 studies were specified: i) analysis of the determinants of M-bank use (Chapter 4), ii) analysis of the effect of gender difference on M-Bank use (Chapter 5), and iii) inquiry into the relationship between M-bank use and wife's socio-economic status (Chapter 6). These studies are based on the household-level data which were collected through the household survey in two villages: Gilabari, Akhanagar, and one urban ward: Collegepara of Thakurgaon District located in the northern region. The face-to-face survey based on questionnaires prepared was conducted for 153 households during the period from December 2016 to January 2017.

It was found that about 50% of the households surveyed had M-bank accounts at the time of the survey. Then, studies i) to iii) were subsequently carried out. Study i) relied mainly on the data of household characteristics. It was assumed that household characteristics as of 2010 such as mobile phone use, household head's education and occupation, age, and others are possible determinants of M-bank use, because the Bank of Bangladesh introduced the M-bank service operation in 2011. Multiple ordered logit models were employed, specifying 3 user categories: early-user (2011-2013), late-user (2014-2016/17), and no user. The estimation results revealed that mobile phone users and female-headed households were more likely to adopt M-bank regardless of adoption periods. It was also found that the size of household significantly affected M-bank use during the later period, while the occupation

types had no significant effect on M-bank use for either the early or the later period. An effect of educational attainment on M-bank was found mixed: a negative effect of secondary education on early users but a positive effect on late users. This result is inconsistent with the previous finding; i.e., a positive effect of education on M-bank use.

Study ii) relied on the restricted data which contain 129 male-headed couple households. Among this dataset, a remarkable difference was found in ratio of wife to husband in M-bank use, which is equal to 4:15. In addition to household characteristics, individual characteristics of husbands and of wives were considered as possible determinants of M-bank use. Individual characteristics were specified in both level and relative difference between husband and wife, with the latter variables applied to age and education between couples. Households were categorized into 3 subgroups: wife user, husband user, and non-user. The estimation results revealed that higher educated husband and having self-business or migrant family member within a household have a significantly positive effect on the likelihood of M-bank use among husbands. However, this result is not applied to the case of wives. However, a wife's educational attainment higher than her husband measured in difference was found to have a significantly positive effect on the likelihood of M-bank use in rural Bangladesh.

Study iii) relied on the same restricted data as for study ii). Descriptive statistics followed by Kruskal-Wallis tests suggested that across 3 subgroups (wife user, husband user, and non-user), significant differences exist in wife's socio-economic conditions such as savings for buying assets and current expenditure on education and self-consumption of luxury products. If a wife's M-bank user had her own income, she would be more likely to save and buy assets from her long-run point of view. On the contrary, without her own income, a wife user would prefer to spend on education and luxury items in the short-run perspective.

In general, a husband controls family finance in Bangladesh, which is a patriarchal society under the Islamic tradition. However, this research provided some interesting results. That is, female-headed households were more likely to use M-bank than male-headed households, and higher educated wives have an influence on M-bank use among male-headed households. It should be noted, however, that female-headed households whose income are lower on average, tend to use M-bank to receive social welfare benefits from the government and that a pronounced gender gap exists in M-bank use in favor of husbands among the majority of male-headed households in which husbands have more education than their wives. Finally, it is emphasized that although M-bank has facilitated personal money transactions, its impact on financial inclusion for rural people in northern Bangladesh has been still limited because currently M-bank has not been effectively used for business activities to increase household income.

Introduction

Background and Motivation of the Study

Financial inclusion expands access to financial services to the poor people, increasing their economic opportunities and improving their lives (Demirguc-kunt and Klapper, 2012; Inoue and Hamori, 2012; Odhiambo, 2009; World Bank, 2017). An inclusive financial system is an important tool of economic development as well as of economic goals under sustainable development goals (SDGs) (Afzal, 2016; Demirguc-kunt et al., 2013). According to the World Bank (2017), more than half of the total adult population worldwide, lack access to basic financial services. Even in some developed countries, almost one in five adults have no bank account or other form of access to the formal financial sector (Demirguc-kunt and Klapper, 2012). In many developing countries, however, nine out of ten people have no bank account or access to basic financial services (Bangladesh Bank, 2017; Beck et al., 2007; Demirguc-kunt et al., 2013; World Bank, 2017). Sustainable economic development is not made possible by socially excluding several populations (Afzal, 2016). To expand the access and usage of financial services to disadvantage groups, recently, many developing economies have encouraged a variety of programs, services and branchless banking activities ranging from Automated Teller Machines (ATMs) to mobile phones (M-phones) especially for the rural areas (Sousa, 2015). The maintenance and opportunity cost of formal banking services is higher relative to the number of users in rural remote areas than in urban areas (Johnson and Nino-Zarazua, 2011). Johnson and Nino-Zarazua (2011) also found that financial exclusion is associated with sociocultural characteristics of the region rather than with the mere urban-rural status in developing countries such as Kenya. The village poor often use informal ineffective alternatives such as selling livestock or borrowing money from traditional money lenders which are both risky and costly. No access to such alternatives makes the matter worse. When the poor must pay more for goods and services subject to the limited budget,

they must reduce their consumption. Also, higher cost and longer time for money transaction is one of the causes which often restricts the use of formal banking systems. This situation is more severe among small farmers who are unlikely to visit urban areas where formal financial organizations are located. Their limited opportunities in engaging in market-based activities also constraints their access to formal financial services. Furthermore, social and cultural constraints such as traditional customs impede certain segment of populations to use formal financial services. For example, because in Islamic society, where women's access to outside is restricted, it is difficult for them to have their own bank accounts for financial purposes. In fact, more accessible, cost-effective ways to use financial services is required for the unbanked poor to be financially included.

Financial inclusion has achieved phenomenal success and shows an 18 percent increase around the world from 2011 to 2017 (World Bank, 2017). Meanwhile, advanced information technology has extended to rural areas at a rapid pace in developing countries (International Telecommunication Union, 2017). One such technology is mobile banking (M-bank). M-bank, a new way of banking services allows users to deposit, withdraw and transfer funds as well as purchase goods and services using M-phone without using internet (Asongu, 2015; Baabdullah et al., 2019; Bhavnani et al., 2008; Morawczynski, 2011; Shaikh and Karjaluoto, 2015; Shareef et al., 2018; Sindhu and Srivastava, 2018). It brings more low-income people into the use formal financial services. However, if most of transactions are for personal transfer, purchase airtime, pay bills, deposit and withdrawal (Aker and Mbiti, 2010; Bangladesh Bank, 2017; Munyegera and Matsumoto, 2016; Yu, 2012), it remains unclear whether the growing rate of inclusion is really changing the lives of the poor and especially the female.

Previous studies address that M-bank can reduce the costs and time for financial transaction, increase savings and transfers, and enhance income generating activities to wealthier households in rural areas of developing countries (Aker et al., 2016; Azad, 2016; Blumenstock et al., 2016; Jack

and Suri, 2014). However, most of these studies on M-bank have focused on problems and prospects, and services and strategies on customer behavior (Ahad et al., 2012; Azad, 2016; Laukkanen and Cruz, 2012). Some studies have investigated socioeconomic determinants of the use of M-bank such as mobile phone use, age, gender and education level (Ahad et al., 2012; Azad, 2016; Munyegera and Matsumoto, 2016; Laukkanen and Cruz, 2012). However, if this banking services only increase the income of the rich or the male, it may have an adverse effect on society. In Bangladesh, such evidence especially for the rural females and poor is still lagging.

Despite the recent economic development, Bangladesh is still classified as one of the least developed countries. About 24% of the nation's population live below the poverty line (Bangladesh Bureau of Statistics (BBS), 2016). Financial exclusion among the poor and the female populations has long prevailed. Only 34% of the total population (about 160 million) have bank accounts (including 13% registered M-bank accounts). However, thanks to the development of information technology, presently 99% (159 million) are mobile phone subscribers (Bangladesh Bank, 2017; World Bank, 2017).

In this context, the central bank of Bangladesh decided to strategically promote M-bank in January 2011 to include the rural people under financial services. At present, 18 commercial banks have operated M-bank services such as purchasing airtime, transferring money, and paying bills through about 723,000 agents and about 3,900 ATMs. The number of M-bank subscribers has steadily increased and recently reached 57 million (Bangladesh Bank, 2017).

Although there are some studies on the factors of the diffusion of M-bank in Bangladesh (Ahad et al., 2012; Azad, 2016), no study has empirically analyzed the contributing factors, especially the effects of gender differences within households to the use of M-bank in Bangladesh using sophisticated econometric methods. Moreover, no information on financial inclusion is available in the northern part of Bangladesh (BBS, 2016). The northern region has the highest incidence of

poverty due to frequent droughts and floods causing lack of income generating activities (BBS, 2016; Shonchoy, 2011).

Purpose of the Study

The above-mentioned research works suggest that the determinants of the use of M-bank and the effect of gender differences in those determinants are not understood in rural Bangladesh. Then, the following questions arise:

1) What are the determinants of the use of M-bank at a household level?

2) Who are using M-bank in the male-headed households?

3) What is the relationship between the use of M-bank and the socio-economic status of wife's in the context of rural Bangladesh?

Therefore, the purpose of the present research is established to examine the effects of household characteristics, especially, gender difference within a household on the likelihood of M-bank use as well as the relationship of M-bank use and household wellbeing in the rural areas of northern Bangladesh. To achieve this purpose, the 3 studies were specified:

i) Analysis of the determinants of M-bank use (**Chapter 4**),

ii) Analysis of the effect of gender difference on M-Bank use (**Chapter 5**), and

iii) Inquiry into the relationship between M-bank use and wife's socio-economic status (**Chapter 6**).

Significance of the Study

This research focused on Bangladesh is expected to add evidence to the literature on the current situations as for financial inclusion and the effects of socio-economic factors on it in developing economies. Especially, empirical estimation relying on sophisticated econometric methods would

provide rigouts evidence which may be useful to consider development strategies to improve the livelihood of the poor and the female as well through the introduction of appropriate technology such as M-bank. For example, designing an effective policy to improve on the state of economic and financial development through the diffusion of M-bank requires the prediction of the behavior of target beneficiaries such as the rural poor. In such a case, the empirical findings from this study are expected to useful information.

Organization of the Thesis

This thesis is organized as follows. Chapter 1 describes the background of the study including the challenges faced presently with formal banking services and the trend of M-bank use in developing countries as well as the current situation with respect to the financial system and M-bank use in Bangladesh. Chapter 2 provides the literature review which provides a conceptual framework of the present research. Chapter 3 is devoted to the analytical approach which explains the detail procedure of methods employed in the subsequent chapters. Further, the dataset used for the empirical studies therein are explained. The dataset is constructed, based on the face-to-face household survey which was conducted for 153 households in two villages: Gilabari, Akhanagar, and one urban ward: Collegepara of Thakurgaon district located in the northern region during the period from December 2016 to January 2017. The results for study i) to iii) are presented in Chapter 4, Chapter 5 and Chapter 6, restrictively. Chapter 4 provides the results and discussions regarding the determinants of the use of M-bank in rural northern Bangladesh. The estimation results and discussions regarding gender differences are presented in Chapter 5, while those for the relationship between M-bank use and wife's socio-economic status are provided in Chapter 6. Chapter 7 presents the summary and conclusions of the present research, followed by policy implication.

Chapter 1

Background of the Study

1.1 Challenges Faced with Formal Banking Services in Developing Countries

It is well known that in the rural areas of developing countries, infrastructure and communication are insufficient in both availability and access and that access to the formal banking services is very low (Johnson and Nino-Zarazua, 2011; World bank, 2017). The poor, especially small farmers need to sell their livestock, asset, and take loan from the local money lender during production periods. Although sometimes harvest was good, the profit was too low to manage lender, and household expenditures. This may lead to negative effect on both physical and mental health. So, for the rural poor, it is a need to have easy and proper channel to pay and receive, borrow and repay, and save money to safe their families from emergencies. Financial exclusion is most likely to be associated with food poverty, hunger, and malnutrition. Most rural people generally depend on local hats/bazars (markets/stores) for buying and selling of products and services. No access to internets nor bank accounts tend to constraint villagers' market activities. Also, higher cost and longer time in money transaction is one of the causes which often restricts the use of formal banking services. The other factor for financial exclusion among the poor is the small size of transaction because it causes higher proportional costs to the poor (Ashta, 2009; Shankar, 2007). Furthermore, social and cultural constraints impede certain segment of populations to use formal financial services. For example, in Islamic society, where women's access to outside is restricted, so it is difficult for them to have their own bank accounts.

To support rural people, presently various wellbeing inputs are provided through microfinance institutions (MFIs) like microfinance for health, nutrition and education, etc. (Deloach and Lamanna, 2011). Despite that, it is reported that the poor rural households had to reduce the consumption

expenditure due to higher interest rates (28% in 2006) (Rosenberg et al., 2009). Also, it is reported that the behavior for use of microfinance differs by gender. A wife often collects loans for their husbands and children. A husband is likely to spend the borrowed money for their own purposes or household expenditures rather long-run capital investment. In general, microfinance institutions put higher priority on microcredit/loans than on savings, payments system, etc. (Imai et al., 2010; Morduch, 1999; Rutherford, 2003). Due to service fees, limited collateral and lack of financial literacy, formal banking services are not easily accessible by the poor. Although microfinance has expanded both in rural and urban areas, such a diffusion has not uniformly proceeded across areas or segments of population. Access of non-poor to microfinance has increased more than access of poor (Rutherford, 2003; Weiss and Montgomery, 2005). It is hoped that technology (online payments, mobile payment, and payment through card, etc.) will help to reach to the poor as well as reduce operating costs (Ashta, 2009).

1.2 Financial System and Banking Services in Bangladesh

At present the financial system in Bangladesh is mainly composed of three broad fragmented sectors: the formal sector, the semi-formal sector and the informal sector (Akter, 2016; Bangladesh Bank, 2017). The formal sector includes all regulated institutions like banks, non-banks, insurance companies, capital market intermediaries and micro finance institutions (MFIs). The semi-formal sector includes institutions which have not been regulated by the Central Bank of Bangladesh, insurance authority, securities and exchange commission, and other enacted financial regulators. This sector is mainly represented by specialized financial institutions; i.e., House Building Finance Corporation (HBFC), Palli Karma Sahayak Foundation (PKSF), Samabay Bank, Grameen Bank, and other non-governmental organizations (NGOs and discrete government programs). The informal sector includes private intermediaries which have been completely unregulated.

Various types of financial institutions provide financial service in Bangladesh. Along with the formal banking sector, there are non-banking financial institutions, cooperatives, microfinance institutions and other government or non-government financial institutions (e.g. BARD, BRAC, Grameen bank, etc.). These organizations likely to target the poor population. Overall, the current state of financial inclusion remains insufficient, despite the significant progress in the recent years.

1.3 M-bank Use in Bangladesh

Currently, 99 percent of the people of Bangladesh are under the mobile phone network. In the wake of the diffusion of mobile phone use, financial inclusion has increased; however, the M-bank users are still comparatively lower in number **(Table 1.1)**.

M-bank provides various banking services including financial and non-financial transactions, as summarized in **Table 1.2**. In a very short period, users of M-bank have drastically increased in developing countries because of convenience, cheapness, usability at the house with lower cost.

Table 1.1 M-bank users in Bangladesh

Total population	160 million	100%
Mobile phone subscriber	159 million	99%
M-bank access to users	64 million	40%

Source: International Telecommunication Union, 2017; Bangladesh Bank, 2017.

As mentioned above, in Bangladesh, both M-phone and M-bank have been diffused to a large extent. One of main reasons is its cost. The use of M-phone and M-bank are very cheap, compared with other services. Getting a mobile phone connection is almost free; the user needs to buy a mobile phone subscriber identity module (SIM) card (100 and 500 takas in BDT. around 130 to 650 yen). There is no monthly connection charge and only the user needs to pay for his/her mobile usage by purchasing talk time or airtime as a prepaid basis. They can buy a card or pay different amount of

money (e.g. 10tk., 20tk., 50 tk., etc.) (1taka=.75 yen) to use it for outcoming call in their mobile phone via recharging by themselves or nearby agents. No charges are needed for an incoming call. The usual phrase used for recharging the phone in Bangladesh is 'flexi-load' or 'top-up'. Also, people can recharge the mobile phone SIM card to almost any phone shop or street vendor to prepaid credit. They don't have to go to the provider whose network they're using. Some corner shops also do top-ups. Alternatively, people may visit any top-up or service center of mobile operators. Wherever they go, they will find within 100 meters some mobile SIM card and top-up vendors.

Also, the cost to open an M-bank account is only 30 yen in Bangladesh (registration, deposit, and withdrawal process in M-bank are shown in **Appendix I**). M-bank services are facilitated for various kinds of financial transactions via M-phone within very cheap charges such as transferring money, paying bills, etc.

Table 1.2 Services provided via M-bank

Financial services	Non-financial services
Bill payments	Balance enquiry
Peer-to-peer payments	Mini-bank statement
Fund transfers	PIN change
Remittance	Checkbook request
Shopping and donations	Due alerts for payments
Mobile balance recharge	Locate ATMs

Source: Shaikh and Karjaluoto, 2015

Chapter 2

Literature Review

This present chapter provides an overview of the literature on financial inclusion and poverty reduction. The previous findings related to the use of financial services by using M-bank, especially the gender differences, the relationship between female socio-economic status and the use of M-bank are presented, focusing on a least developing country, Bangladesh. Finally, a conceptual framework of the research is presented.

2.1 Financial Inclusion for Household Wellbeing and Poverty Reduction

2.1.1 Present Status and Scope of Financial Inclusion

Financial development can contribute to poverty reduction. Odhiambo (2009) examined the causal relationship between financial development, economic growth, and poverty reduction based on a trivariate framework in South Africa. In the past, researchers identified the indicators of financial inclusion in both suppliers' and demanders' perspectives: the providers of financial services like financial institutions and the users such as households and individuals (Zins and Weill, 2016). Inoue and Hamori (2012) estimated the generalized method of moment model (GMM) in 28 states using unbalanced panel data from 1974 to 2003 in India. The results show that financial development and economic growth reduce poverty in rural, urban, and the whole economy.

In spite of this fact, at present only half (50%) of the total population have a formal bank account in worldwide. In particular, the female (37% of females and 46% of males have formal bank account) and the rural underprivileged poor people are excluded from the financial institution in developing countries (Bangladesh Bank, 2017; Beck et al., 2007; Demirguc-Kunt and Klapper, 2013; World Bank, 2017). In rural areas, formal banks are not frequently available due to higher maintenance cost

associated with the smaller number of possible users. Also, the barriers to the lack of bank access are lack of electricity and internet access, less availability of automated teller machine (ATM) booth or internet banking, etc. In addition, due to the high illiteracy rate, accessing the formal bank account is difficult for the poor living in rural areas, especially in developing countries (Johnson and Nino-Zarazua, 2011) investigated the geographic, demographic, and socio-economic factors that influence the likelihood of access and using financial service employing a logistic regression model for Kenya and Uganda. The characteristics such as location (rural or urban and the province or region of the country), gender, age, education, main income sources, assets, and basic need (e.g., shelter, fuel, water, and food) as a proxy for poverty were included to identify the indicators of financial inclusion. The results suggest that financial exclusion is associated with socio-cultural characteristics of the region rather than with the urban-rural status.

Demirguc-Kunt and Klapper (2012) indicated that an account is an individual or a joint account at a formal financial institution, e.g. bank, credit union, cooperative, post office, or microfinance institution. The formal account can be used to save money, to make or receive payments, or to receive wages and remittances. This study was conducted based on the survey for respondents aged 15 or to investigate the use of financial services, especially for youth and women. It found that the use of formal accounts varies widely across regions, economies, and income groups with individual characteristics.

In recent years, banking through electronic channels has gained increasing popularity. This system provides alternatives for faster delivery of banking services to a wide range of customers. It is evident that online banking can act as complimentary towards e-business and create opportunities for both producers and customers (Nyangosi et al., 2009). However, Rahman (2001, 2002) observed that issues relating to electronic fund transfer require higher security and privacy. Further, the development of information and communication technology such as e-commerce, mobile commerce,

and mobile banking can mitigate these constraints. Mobile commerce is an upgraded version of e-commerce where the use of the internet is not mandatory.

2.1.2 The Use of M-bank and Its Determinants

Identifying the determinants of using M-bank is an important approach to increase the inclusion of financially excluded population. However, a few studies examined the variables that might have an impact on the use of M-bank in various countries using different methods (Ahad et al., 2012; Aker, 2010; Aker et al., 2016; Asongu, 2015; Azad, 2016; Baabdullah et al., 2019; Bhavnani et al., 2008; Blumenstock et al., 2016; Budree and Williams, 2013; Laukkanen and Cruz, 2012; Morawczynski, 2011; Munyegera and Matsumoto, 2016; Shareef et al., 2018; Shaikh and Karjaluoto, 2015; Singh and Srivastava, 2018). Furthermore, most of the studies in the context of different countries have focused on the problems and prospects, and services and strategies of M-bank (Ahad et al., 2012; Azad, 2016; Laukkanen and Cruz, 2012).

The past research focused on various topics related to M-bank such as M-bank adoption, M-bank acceptance, M-bank adoption intention, M-bank adoption attitude, M-bank usage behavior, M-bank utilization, etc, (Yang et al., 2012; Yu, 2012). Munyegera and Matsumoto (2016) found that M-phone, education of the head of the household, receipt of remittances have positive and significant impacts on the use of M-bank. This suggests a significant increase in per capita consumption through the facilitation of remittance in M-bank in Uganda. They used household fixed effects models, instrumental variable, and propensity score matching methods relying on 846 rural households panel data. The other studies found that M-bank users are wealthier, better educated, urban, and having a migrant family member in Africa (Aker and Mbiti, 2010; Blumenstock et al., 2016). By logistic regression, Laukkanen and Cruz (2012) found that M-bank adoption is related to an individual's demographic status, such as gender, age and education, and other socioeconomic factors in Finland and Portugal. The results showed gender, and region have significant effects on the adoption of M-

bank. Also, Ahad et al. (2012) found that gender and education are the main factors that significantly influence the adoption and acceptance of the M-bank by small and medium entrepreneurs (SME) in rural Bangladesh. However, Azad (2016) found no significant difference by gender on M-bank adoption in Bangladesh. In summary, some previously reported determinants of the use of M-bank in developing countries (e.g. Uganda, Kenya, Rwanda, Finland, Bangladesh, etc.) are M-phone, education level, age, gender, small and medium enterpreneur business, socio-economic characteristics in rural-urban status (Ahad et al., 2012; Aker et al., 2010; Azad, 2016; Laukkanen and Cruz, 2012; Munyegera and Matsumoto, 2016).

Therefore, studies were carried out in both developing and developed countries; however, a limited number have been conducted in Bangladesh using rigid econometric tools, specifically, in rural areas (Singh and Srivastava, 2018). The census data is not enough for explaining household characteristics and/or everyone in the households in a specific region. Micro-level studies based on the sample surveys are important to focus on. In fact, the existing studies in Bangladesh have ignored the causes of the effect on the use of M-bank at the individual and/or household level of a particular region. Thus, the rationale in this research for explanatory variables (household/individual characteristics) that are expected to influence the use of M-bank relies on the empirical evidence reported by the previous relevant studies. This means that these variables have not been derived from the structural micro model such as the consumer utility maximization problem from which the demand equation for M-bank could be obtained.

2.2 Financial Inclusion and Gender Difference

2.2.1 Financial Inclusion and Gender Difference in Developing Countries

Gender is a powerful determinant of economic and financial opportunities. Even though financial inclusion is progressing around the world, but females are still lag behind than males. More than 1

billion females are still excluded from formal financial services in a total of 1.7 billion excluded population. The gender gap has remained unchanged since 2011. This difference is not the same for all economies. For example, males and females are equally likely to have an account in developing countries such as Cambodia, Indonesia, Myanmar, and Vietnam. Although the more males and females are being financially included, still significant gender difference persists in other developing countries such as Afghanistan, Bangladesh, India, Pakistan, etc.

Demirguc-Kunt and Klapper (2013) observed legal discrimination against females in their ability to work outside, become a head of the household, to own an asset or property which in turn, affect the use of financial services. They are less likely to own accounts and to save and borrow. Even after controlling the income and education in econometric analysis, the significant gender difference remains in the use of financial services.

2.2.2 Financial Inclusion and Gender Difference in Bangladesh

In Bangladesh, only 29% of the female have registered financial accounts among the total financially included individuals (34%, financial inclusion insights, 2017). In the context of Bangladesh, Ahad et al. (2012) observed gender, education and small and medium entrepreneur (SME) business were the main factors for the use of M-bank. Another study in Kenya showed that male is more likely to use M-bank than female (Aker and Mbiti, 2010). In contrast, Azad (2016) found no gender difference in the use of M-bank in Bangladesh. On the other hands, micro-finance institutions (MFIs) have a positive significant effect on the rural poor and female but the effect is larger on non-poor measured on the multidimensional welfare indicator based on the Index Based Ranking (IBR) indicator (Imai et al., 2010; Sinha, 2009). However, some studies have also shown that MFIs have not reached the poorest of the poor in Asian countries like Bangladesh (Rutherford, 2003; Weiss and Montgomery, 2005). Higher rates of interest and strict repayment conditions reduce the relatively poor borrowers. In Bangladesh, most of the MFIs focus only on microcredit with less emphasis on other components

of microfinance such as payments, savings, insurance, and money transfer. Even many specialists and researchers consider microfinance and microcredit interchangeable (Chowdhury, 2009). It is important to emphasize the other components of microfinance. Financial services such as remittances and savings through M-bank are now the leading concern.

Although, Bangladeshi female is making progress but still face gender gap in terms of higher education, earnings, property right, etc. presented by the World Economic Forum (WEF). It is expected that if educational levels are enhanced, the female will have increased negotiating powers both at home and at the society. In Bangladesh, half of the population constitute the female, but job involvement is half than those of a male. If the female remains economically and financially unproductive, they cannot contribute to countries GDP. There are several studies analyze M-bank and associated factors that influence individual use of it, using both qualitative and quantitative methods in developing countries. Despite considerable researches on M-bank adoption that have appeared in journals, a review for relative power status between husband and wife within a household on M-bank use in northern Bangladesh remains missing. Thus, it is important to study the characteristics of couple households to get an idea about the target beneficiaries of the use of M-bank within a family. The aim of the present research is to focus on the differentials and determinants of M-bank use by couple in rural Bangladesh.

2.3 Financial Inclusion, Decision-making, and Marriage in Developing Countries

2.3.1 Decision-making Behavior in Financial Activities

In patriarchal societies in developing countries (like Bangladesh, India, Nigeria, South Africa, etc.), head of households is a major household decision-maker. Nowadays, wife's economic contribution to family resources through change in household's decision-making has remarkably increased. This also shows a joint household decision by couples in financial matters. Despite this situation, that a

family member already has an account is one of the major reasons for not having an account, resulting in financial exclusion in developing countries (Safavian and Haq, 2013). Several factors such as couple's characteristics and relative differences in characteristics (e.g. age, education, job status, family structure, place of residence, and mate selection, etc.) have influence on their intra-households' decision-making power (Dunhum and Flores-Yefal, 2018; Meekers and Oladosu, 1996; Oyediran, 1998). On the other hands, a wife's age and education are also related to her partner's.

2.3.2 Decision-making Behavior and Marriage

In Bangladesh, higher educated females are likely to marry similar partners with similar age, education, and outlook through positive mating (Hahn et al., 2015). In recent years, a positive correlation in marriage can reduce the early marriage in rural areas. It ultimately has a contribution to increase the educational attainment level, females' decision making. Previous literature exists based on the role of marriage and improving socioeconomic positions of women in developed countries (Aguero and Bharadwaj, 2014; Bharadwaj, 2015; Goldin and Katz, 2002). Dunhum and Flores-Yefal (2018) estimated a logistic regression and found that larger household size and having a partner have significantly positive effects on sharing minor and major decisions for females. On the contrary, the female who is self-employed makes a major decision on her own issues although her power of decision is less than the male's. The female having a savings account is more likely to make a decision jointly with her husband than alone in South Africa. Miyazaki et al. (2018) examined the effect of woman's land share as a proxy to capture an effect of women's intra-household bargaining power on their non-farm work participation in Ghana applying household fixed effect models. World Development (2012) reported that variables used to proxy for women's bargaining power are education, income, employment, asset ownership, etc. between spouses, or adult children and parents. Women's bargaining power can improve the wellbeing by increasing the health and education of the children. Several factors, for example, wife's education, employment status, religion, and husband's

educational attainment are used to identify the effect and extent of poverty on wives' contribution in the household decision-making by using a non-income poverty measurement in Nigeria (Oyediran and Odusol, 2004). Other researchers have focused on the relationships underlying marriage behavior, intra-household bargaining power and wife's wellbeing (Goldin and Katz, 2002; Ma and Piao, 2018).

2.3.3 The Use of M-bank, Wife's Socio-economic Status, and Household Wellbeing

The quantitative household analysis was conducted for measuring the wellbeing of the poor (Haughton and Khandker, 2009). According to Littlefield et al. (2003), access to financial services is an important direct or indirect contributor to improving the wellbeing through improving the education and health services of females in a family. Direct access to financial services for the female in a household will enhance income, self-dependence, job activities, and family decision-making. Suri and Jack (2016) provides evidence of a gender effect on M-bank thereby reducing poverty in Kenya. They said that households with access to M-bank improved the allocation of labor and consumption efficiently, especially for the female through changing their financial and occupational behavior. The female as such is more likely to sift a job from agriculture to businesses and increase savings comparable to the male. Despite that, little is known about how such technological services on improvement in female socio-economic status explicitly in developing countries (Efobi et al., 2018; Majlesi, 2016; Kaziangaa and Wahhaj, 2017).

On the other hand, Bangladesh is a Muslim patriarchal society. Freedom of movement outside the homestead area for the female is often restricted due to social customs and values. Therefore, their activities are confined to child care, household management, kitchen gardening, processing of rice and maize, service, etc. However, their attainment of education, autonomy in decision making, movement outside the homestead can increase their financial inclusion e.g. the use of M-bank. Socio-economic status, regional variations, religious affiliation may also have a relationship on the decision-

making status for using of M-bank. It might be happening that although female have higher education, and empowerment in decision-making but due to socio-cultural customs existed in the society, they are excluding financially. However, there has not been any study which looks at the relation between female's socio-economic conditions on her use of M-bank. This research examines socio-economic variables which could determine the relation of female's financial inclusion in Bangladesh.

2.4 Conceptual Framework of the Research

The literature review in this chapter illustrates that the use of M-bank has gained much popularity in facilitating a variety of financial transactions via mobile phone, such as purchasing talk time, recharging SIM, paying bills, and transferring money between individuals in many developing countries. However, most of researchers on the M-bank focused on assessing if mobile phone can contribute to economic benefits by reducing the communication costs and improving agricultural and labor market efficiency and producer and consumer welfare in specific circumstances and countries (Aker, 2008; Aker, 2010; Klonner and Nolen, 2008; Jensen, 2007). Although the target of introducing M-bank is "banking the unbanked," but recently it was found that M-bank users were wealthier, better educated, urban, and migrant households at the time of introduction of using M-bank.

Overall, the past literature tends to emphasize the positive role of financial inclusion in poverty reduction and improvement in wellbeing in various developed and developing countries. This evidence seems to apply to any developing country like Bangladesh. Keeping previous evidence of the use of M-bank in the context of financial inclusion in mind, a basic conceptual framework for the present research has been established, as shown in **Figure 2.1**. Within this conceptual framework, in attempt to identify the determinants of the use of M-bank, separately for husbands and wives and their interrelationships with poverty reduction and improvements in wellbeing in rural Bangladesh, the following studies are specified:

i) Analysis of the determinants of M-bank use **(Chapter 3)**,

ii) Analysis of the effect of gender difference on M-Bank use **(Chapter 5)**, and

iii) Inquiry into the relationship between M-bank use and wife's socio-economic status **(Chapter 6)**.
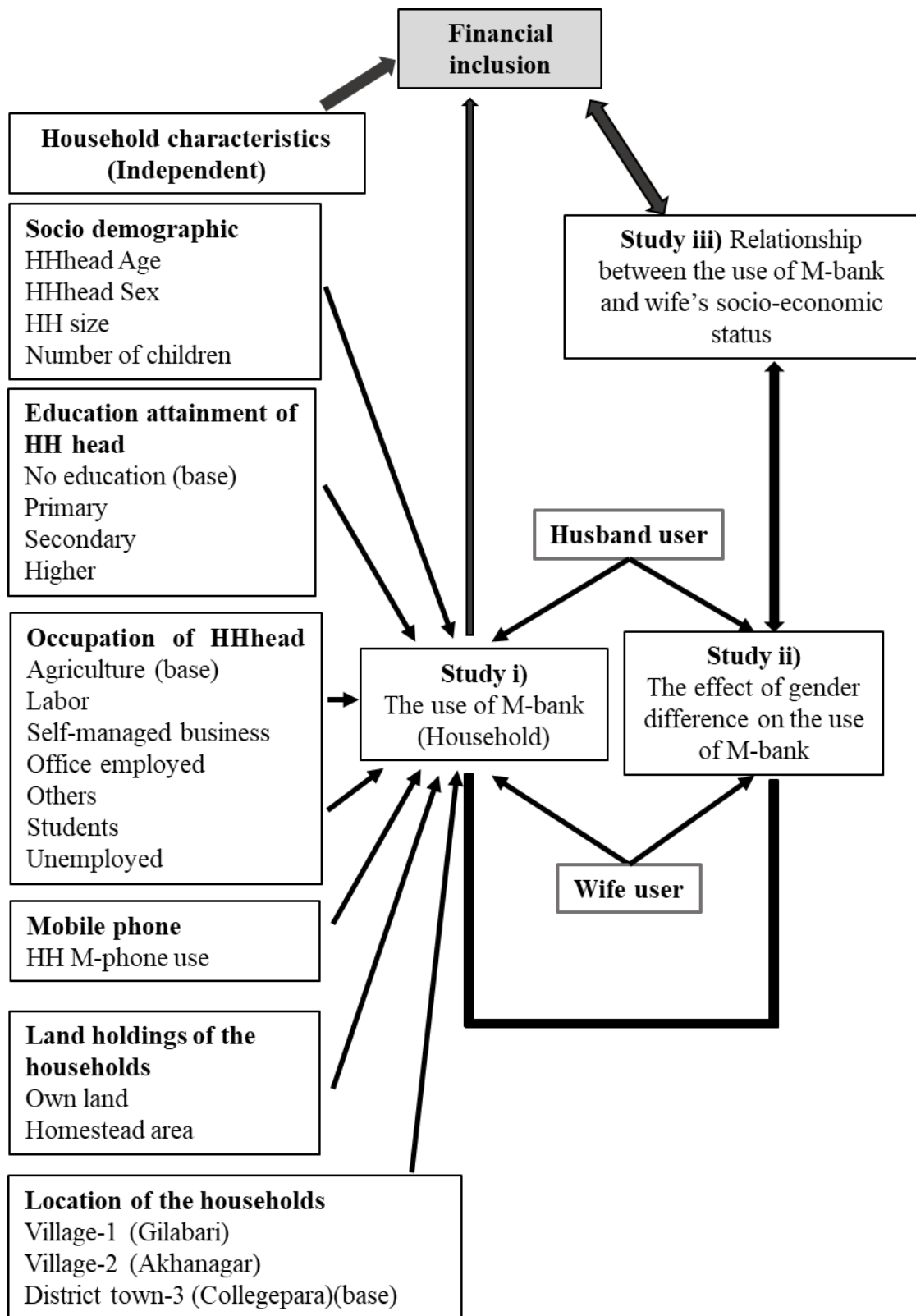
Figure 2.1 Conceptual framework of the research

Chapter 3

Analytical Approach

The purpose of this chapter is to describe the study area, research design, sampling procedures, and analytical methods fit the empirical research for studies i) to iii) specified in Introduction.

3.1 Study Area

Bangladesh is a South Asian low-middle income country **(Figure 3.1)** (BBS, 2016), and is one of the most densely populated countries, with a total population of 162 million within total area of 147,600 km². The country is low-lying so that is highly vulnerable to flooding and cyclones and expected to have a high impact of global warming.

About 24% of the population lives below the poverty line (BBS, 2016). Especially, the incidence of poverty is high (36%) in rural areas. Although more than half of GDP is generated through the service sector, almost half of Bangladeshis are employed in the agriculture sector, with rice as the single-most-important product. Farmers mainly live in rural areas (Mendola, 2007; Shonchoy, 2011). The focus on rural areas is quite important because they are the most often excluded from opportunities in modern society. Financial issues are no exception.

Bangladeshi society is highly stratified, services and opportunities are determined by gender, class and location. Bangladesh has, according to BBS, 2016, an adult literacy rate of 72%, while the male literacy rate is 75%, for females is 70%. Females constitute nearly half of the total population. So, they should be utilized for socio-economic development of the country. However, their job involvement is about half of those of male and often temporary. Female are mostly contributing in agriculture, readymade garments, small business enterprises sectors and non-paid housework and child care.

On the other hand, progress in reducing poverty was also uneven across divisions. During the last five years, vulnerability (including river erosion) and poverty have risen and highest in the north-west Rangpur (47%); stagnated in Rajshahi and Khulna in the west; fallen moderately in Chittagong; and fallen rapidly in Barisal, Dhaka and Sylhet divisions according to the country's 2015-16 Household Income Expenditure Survey (HIES). Problems of ethnic minority particularly in southeast Chittagong hill tracts, and adverse climate in coastal areas of the southwest part are often major concern. Southern region is the least densely populated regions. The people of these regions are involved in fishing, weaving, tourism activities besides agriculture. But north-west region remains unfocused. **Table 3.1** shows the socio-economic indicators disaggregated by eight divisions. I found that Bangladesh is more or less homogeneous based on average of unemployment rate, average household size, and population density per square kilometer. But the BBS (2011) reported that the national average was lower for literacy rate (who can read and write), similarly lower for male and female literacy, the use of M-phone by households, consuming iodized salt, received remittance from migrant who living abroad, in Rangpur division by comparing to other seven divisions and Bangladesh. On the other hand, Rangpur division had the highest poverty rate, male headed households, received higher safety net and loan from any sources than other divisions and Bangladesh average. In summary, the findings suggest the need to focus on the most underperforming division, the north-west region, Rangpur.

The north-west, Rangpur region frequently suffers from damages due to natural disasters such as droughts and floods, resulting in insufficient income generating activities (**Figure 3.1**; BBS, 2016; Shonchoy, 2011). The northern region is well known for acute seasonality which is locally called "Monga." Most vulnerable groups are agricultural wage laborer's, landless and marginal farmers, female headed households, children, pregnant women and aged people. Monga affected households adopt various coping strategy e.g. reducing consumption, selling of labor with advance payment at

cheap rate, borrowing of money, selling of assets, looking for work in other areas, dependency on relief, selling of field crops in advance at cheap rate etc. Illiteracy, and received loan is higher show that Rangpur division is more vulnerable than other divisions of Bangladesh. Because the northern region is the poorest in the nation, it would be legitimate that priority is given to this region in the development policy of Bangladesh. Furthermore, the understanding of the current status of M-bank use and its determinants in the nation's poorest region would provide interesting clues for exploring effective ways to reduce poverty and improve people's wellbeing through M-bank. It should be also noted that no information regarding financial inclusion in the northern region is available. These are main reasons that we decided the northern region as the case of our study.

Thakurgaon district, which is situated in the northern region has been chosen as the study area. It is one of the most far and remote districts from Dhaka-the capital. Several researches show that scope of services and opportunities is lower in far districts (Zahir, 2011). The census data of Bangladesh is not sufficient to study consequences of socio-demographic factors because only some information about poverty level is available in the census schedule. **Table 3.2** represents Thakurgaon district and Rangpur division-level averages of some socio-demographic indicators. The characteristics are showing similarities between Thakurgaon district and Rangpur division national averages. However, micro-level studies based on sample surveys are important to focus in this district to identify regional disparity. The most recent study of Raheem et al. (2019) examined the disparities among districts on various socio-demographic indicators in Bangladesh. Using two cluster averages of districts-level of two separate sets of indicators–"demographic indicators" and "literacy and educational indicators", Thakurgaon district was in cluster which had lower averages of education and demographic position comparing to national level. Thus, it suggests the need to focus on this district.

The district is composed of 5 Upazilas (sub-districts) with 641 villages. The district's population is 1,390,000 with about 321,000 households for an average of 4.3 persons per household. About 23% of the population live below the poverty line, the literacy rate is 48%, and the male-headed households account for 91% of the total households (BBS, 2016).

Our study area lies in Thakurgaon Sadar Upazila and Pirganj Upazila within Thakurgaon district. Specifically, 2 villages and 1 district city town (urban ward or ward of town) from Thakurgaon district were selected to collect the information and data through the household field survey. The study areas are presented in **Figure 3.1**. According to the BBS (2011) report and the administrative office of Thakurgaon district, Collegepara is categorized as city town (urban ward); it is in the urban ward. Two villages are Akhanagar, a union (sub-upazila) of Sadar upazila, and Gilabari, which is located at Bairchuna union of Pirganj Upazila. The people in the study area **(Figure 3.2)** have been directly or indirectly involved in agriculture and agriculture-related activities. Population for the study areas (Gilabary, Akhanagar and Collegepara) are presented in **Table 3.3** below.

3.2 Household Survey: Sample Size and Sampling Procedure

The face-to-face household survey was conducted in the study area (Gilabari, Akhanagar, and Collegepara of Thakurgaon) during the period from December 2016 to January 2017. A total of 153 households were surveyed with two sets of questionnaries. Since a list of villagers was not available, for the convenience of the survey, we arbitrarily selected certain numbers (an initially target sample size equal to at least, 50 for each area) of respondents/households as a representative of the whole population **(Table 3.3)**. The sample size was in 153 households (50, 52 and 51 for Gilabary, Akhanagar and Collegepara, respectively) from 2,816 households.

In the household study, two structured interviews were conducted using two sets of questionnaires. The first questionnaire was prepared to collect data from households for getting demographic, household asset and income, M-phone, M-bank, Migration related information (M-phone and M-bank user information are presented in **Figure 3.3**). The second questionnaire was designed to obtain the female information about decision making in the household. Female respondents are those who were considered to the second most important person beside the head of the household.

The questionnaires originally were designed in English and were translated into Bengali (local language) to help respondents understand questions easily and clearly. The English version of the questionnaire has been shown in **Appendix II, and III**. The data were collected mainly from the head of the households. When the head was absent at the time of the survey, the other member in the households was chosen to answer the questions. When any respondent failed to understand a question, the issue was explained as much as possible. After completion of the interview, the questionnaire sheet was carefully rechecked and corrected when necesarily before leaving the household surveyed.

After the field survey 153 households with questionnaires, the supplemental survey was conducted for several selected households to obtain qualitative information which would help interpret the results from the econometric estimation relying on quatitative data.

3.3 Basic Features of the Dataset

Our dataset composed of 153 observations are based on the household survey mentioned above. From this dataset, it was found the average household size, sex ratio (male/female*100), and rate of mobile phone users are 4.5, 105, and 93% respectively. According to the report of BBS (2011), the first two figures are almost equivalent to the district average: 4.4 for household size and 102 for sex ratio. This suggests that our sample can be regarded as the approximate representation of the total

households in Thakurgaon district. Note that no statistics on M-phone users are available in this district.

Our dataset include various socio-demographic variables; i.e., household head age, whether the head is male or female, number of a household member, number of children, asset, income, educational attainment of household individual, occupation/job type, the land size. These variables are categorized into "households characteristics", and "individual characteristics (separately specified for husband and wife)", and "wife's socio-economic characteristics". Variables categorized by type of characteristics are used for a study of interest; that is, "households characteristics" for study i): Analysis of the determinants of M-bank use (Chapter 4); "individual characteristics" for study ii): Analysis of the effect of gender difference on M-Bank use (Chapter 5); and "wife's socio-economic characteristics" for study iii): Inquiry into the relationship between M-bank use and wife's socio-economic status (Chapter 6).

Descriptive statistics for a set of variables categorized by type of characteristics are presented in the subsequent chapters in which such variables are used for study of interest.

3.4 Quantitaive Methods

We proceed with our analysis for studies i) to iii) in the following two steps. First, relatively simple statistical techniques such as percentage, mean and standard deviation were taken to describe basic features of socio-demographic characteristics of households and those of individuals. This applies to all 3 studies. Second, the more sophisticated quantitative method specific for the analysis of interest was employed in each study. Studies i) and ii) rely on the econometric models where the dependent variable is categorical with a few possible outcomes. In such cases (Chapters 4 and 5), various econometric models such as binary probit, multinomial logit, ordered probit and two-equation probit were employed. The basic models are explained in the next section. When causal relationships

were not specified, such statistical methods as t-test, chi-square test, and Kruskal-Wallis test were used (Chapter 6).

3.5 Econometric Models

A binary probit is applied to the case where the dependent variable (Y_i) has two values; that is, in the case of M-bank use, $Y_i = 0$ for no user and $Y_i = 1$ for user. Assuming that the plausible determinants of M-bank use are household characteristics (X_i), they are included as explanatory variables with the error term u_i, which is independently and identically distributed, the following model is specified:

$$Y_i^* = \beta X_i + u_i \qquad (1)$$

$$\text{if } Y_i^* > 0 \implies Y_i = 1$$

$$\text{if } Y_i^* \leq 0 \implies Y_i = 0$$

Maintaining the condition that the determinants of M-bank use are specified as X_i, multinomial logit model can apply to the case where the dependent variable (Y_i) has more than two values; that is, in the case of M-bank use, early-user (2011-2013), late-user (2014-2016/17), and no user. Furthermore, if such more than two values have some meanings in order, an ordered probit is the appropriate model to estimate.

When the decision of an indivisual may be related to the decision of the other indivisual, a two equation probit is employed. Suppose that both a husband and a wife are considered to decide the use of M-bank separately on the indivisual basis. Given this condition, if a husband uses M-bank, then let $Y_{1i}=1$, while if a wife use M-bank, then let $Y_{2i}=1$. Letting the characterisitcs of the husband and the wife be X_i and Z_i, respectively, with errors ϵ_{1i} and ϵ_{2i} which may be correlated with each other, a two eaquation probit model is written as:

$$Y_{1i}^* = \beta_1 X_i + \epsilon_{1i} \qquad (2)$$

$$Y_{2i}^* = \beta_2 Z_i + \epsilon_{2i}$$

27

Moreover, if a decision is assumed to be made by a household as a whole, a two equation probit may be merged into the following single equation:

$$Y_{ij}^* = \beta_0 + \beta_{1j} X_i + \beta_{2j} Z_i + u_{ij} \tag{3}$$

Alternatively, if a decision is assumed to be made on the indivisual basis, but not separately so that one's decision may be affected by the other's characteristics, a two equation probit may be specified as the following equations:

$$Y_{1i}^* = \beta_1 X_i + \gamma_1 Z_i + u_{1i} \tag{4}$$

$$Y_{2i}^* = \beta_2 X_i + \gamma_2 Z_i + u_{2i}$$

Alternatively, if a decision may be affected by barganing power between two indivisuals (husband vs wife), the relative difference in variables such as age and educational attainment between them needs to be considered, as specified by the following model:

$$Y_{1i}^* = \beta_1 (X_i - Z_i) + u_{1i} \tag{5}$$

$$Y_{2i}^* = \beta_2 (X_i - Z_i) + u_{2i}$$

The estimation of the probit model provides the likelihood of a particular outcome of the dependent variable due to a change in an explanatory variable of interest in terms of a marginal effect, which would help us understand an effect of each characteristic of interest more intuitively.

Table 3.1 National averages of the divisions and Bangladesh based on socio-economic indicators

Divisions Indicators	BAR	CTG	DHK	KHL	Average MMS	RAJ	RNG	SYL	BD
HH size, 2016	4.17	4.47	3.87	3.74	3.85	3.76	3.87	4.94	4.06
Literacy rate, 2011	62.9	57.0	54.7	57.3	-	55.8	52.5	54.1	56.2
Male literacy rate, 2011	64.4	59.8	57.2	60.2	-	58.3	56.5	56.6	58.9
Female literacy rate, 2011	61.5	54.3	52.2	54.3	-	53.3	48.3	51.6	53.6
Unemployment rate, 2011	9.9	12.2	9.8	6.7		6.9	7.2	21.5	9.8
Poverty rate (HCR), 2016	26.5	18.4	16.0	27.5	32.8	28.9	47.2	16.2	24.3
Population density per square km, 2011	655	990	1720	803	-	1007	958	775	1108
Male/female ratio, 2011	96.5	96.2	104.0	100	-	100.3	99.7	99.1	100.2
Male-headed HH,2011	90.8	82.9	87.8	91	-	90.8	91.1	86.7	88.5
Food (iodized salt consumption), 2011	62.4	59.3	64.6	60.1	-	36.3	33.8	50.7	54.3
M-phone use by HH, 2011	85.4	90.8	91.3	87.1	-	81.9	82.2	86.7	87.7
Migrants working Abroad who sent Remittance to HHs during Last 12 Months ('000'), 2016	110.77	128.96	158.46	92.91	146.57	125.09	72.87	134.58	133.78
Received benefits from SSNP (Beneficiaries), 2016	59.9	18.0	12.8	42.8	27.7	37.7	45.2	27.9	28.7
Received loan from any source during last 12 month (HHs), 2016	32.1	30.5	19.2	38.1	18.3	41.4	42.1	22.0	29.7

Sources: Bangladesh Bureau of Statistics, 2011, 2016; Raheem et al., 2019.
Notes: BAR, Barisal; CTG, Chittagong; DHK, Dhaka; KHL, Khulna; Mymensingh, MMS; RAJ, Rajshahi; RNG, Rangpur; SYL, Sylhet; BD, Bangladesh; SSNP, Social Safety Net Program; HCR, Head Count Rate; HH, Households. MMS was included in the Dhaka division in 2011.

Table 3.2 National averages of the Thakurgaon district and Rangpur division based on socio-demographic indicators

Indicators	Average	
	Thakurgaon district	Rangpur division
Population ('000'), 2011	1300	15700
Households ('000'), 2011	320	3800
Household size, 2016	4.3	3.87
Sex ratio (male/female), 2011	102	99.7
Male-headed household, 2011	91	91.1
Literacy rate (7 years +), 2011	48.7	47.2
Male literacy rate, 2011	53.0	50.6
Female literacy rate, 2011	44.4	43.8
Poverty rate (HCR), 2016	23	47.2
Population density per square km, 2011	780	958

Sources: Bangladesh Bureau of Statistics, 2011 and 2016.

Table 3.3 Distribution of households based on their location

Study Area	Total households Source: BBS, 2016	Total surveyed households
Village-1: Gilabary	116	50
Village-2: Akhanagar	1,616	52
Town village: Collegepara	1,084	51
Total	2,816	153

Figure 3.1 Map showing the location of Bangladesh, location of Thakurgaon district in Bangladesh, and location of the study areas (red stars) in Thakurgaon District.

Figure 3.2 Photographs of villagers in the study areas during survey.

(a) Growth of mobile phone user

61

31.3

8

0.4

1996-2000   2001-2005   2006-2010   2011-2017

(b) Growth of M-bank user

21.6

6.6

2011-2013   2014-2017
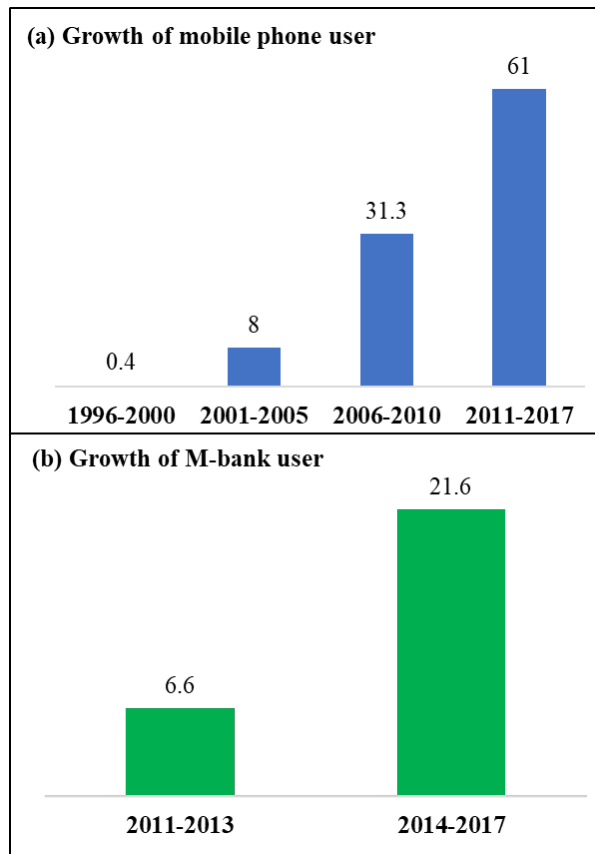
Figure 3.3 Growth of mobile phone and M-bank user in percentages (%) in the study areas (Source: Households survey 2016/2017).

Chapter 4

Determinants of the Use of M-bank at the Household Level

4.1 Background

In several developing countries such as Kenya, Uganda, Nigeria, India, Bangladesh, etc., it was observed that the use of M-bank is influenced by the characteristics of household/household individual (Ahad et al., 2012; Azad, 2016; Laukkanen and Cruz, 2012; Munyegera and Matsumoto, 2016). For example, males are more likely to use M-bank in Kenya (Aker and Mbiti, 2010). Also, the more educated or the more affluent a person is, the more likely she/he is to use M-bank in Uganda (Munyegera and Matsumoto, 2016). Thus, we hypothesize that the same behavioral patterns underlying the use of M-bank at the introduction could apply to the case of rural Bangladesh.

Some studies focus on the factors of the diffusion of M-bank in Bangladesh (Ahad et al., 2012; Azad, 2016); however, no study has empirically analyzed the contributing factors to the use of M-bank in Bangladesh using rigid econometric tools. Moreover, we found no information on financial inclusion available in the northern part of Bangladesh (BBS, 2016). Recent Bangladesh Bureau of Statistics (BBS), (2016) reported that poverty has increased in the northern region. The main reason for this high incidence of poverty is due to frequent droughts and floods causing lack of income generating activities (Shonchoy, 2011).

4.2 Purpose of the Study

The purpose of this study -- study i) is to empirically investigate the determinants at the introduction of the use of M-bank at household level in rural areas of northern Bangladesh.

4.3 Data

The dataset is composed of 153 households in 2 villages (Gilabari and Akhanagar) and 1 district town/urban ward (Collegepara) as mentioned in Chater 3. There are two remarks for this study. First, because M-bank was initiated in Bangladesh in January 2011, household characteristics as of the end of 2010 are considered initial conditions at the introduction of M-bank. Educational attainment and occupation of the household head and use of M-phone data were obtained as for such characteristics as the status at the end of 2010. However, some variables (e.g., number of a family member and number of children, land holdings and location of the households) were obtained only at the time of the survey period. We treated these variables as a proxy for the status as of the end of 2010. This is because such variables, especially, the status of land holdings and location of the households have been infrequently changed over the period 2011-2016/17 in the survey area. It was confirmed through our interview that migration is very rare in the study villages. No villagers have moved in from different places in recent years. On the other side, moving out from the study area to other districts, mainly to towns/cities is likely to take place. Note that according to Household Income and

Expenditure Survey (HIES) 2016, 11.2% of households reported any kind of migration from their household either within the country (from one district to another district) or abroad in 2016, and this rate was 12.3% in 2010.

The second remark is that M-bank users are defined as those who started to use M-bank at some point in time during the period 2011-2016/2017 and since then have continued to use M-bank. Consider the following two households who adopted M-bank. The first household used to use M-bank in 2011 but has not used it since then. The second household started to use M-bank in 2011 and have continued to use it every year until 2016/17. Obviously, these two households greatly differ in M-bank use although they started to use M-bank in the same year. In addition to continuity in M-bank use, the time of adoption of M-bank may be also important to characterize the household in use of M-bank. Indeed, the usage history of M-bank matters: both the continuity in use and time of adoption are important. Thus, in our study, we categorized the respondents into "early user", "late user", and "no user". Early users are defined as households that started to use M-bank during the period 2011-2013 and have continued their usage until our survey period 2016/17. Late users are defined as households that started to use M-bank during the period 2014-2016/17 and have continued to use it. It was confirmed that since its introduction, all users (77 households) in our sample have been using M-bank until the time of our survey, while all non-users (76 households) have never used M-bank. Note that some villagers were found to temporarily use M-bank mainly for transfer and paying bills

though they don't have any M-bank account. This type of households were excluded from our survey.

We collected data from the users who have been continuously using after opening the M-bank account.

4.4 Methods

The analysis in this chapter is performed in the following two steps. First, we explore a difference in

each household characteristic by M-bank users' status to capture a rough picture of the characteristics

for users and non-users in the study area. Second, we estimate the econometric model specified by

the multinomial logit as a base model to identify the determinants of the use of M-bank in a more

rigid manner. The determinants may depend on the start time of usage because 6 years have passed

since the introduction of M-bank. Marginal effects are obtained for three categories by using status:

early-users (2011-2013), late-users (2014-2016/17) and non-users. In addition, alternative models

such as binary probit and order probit are estimated to examine the robustness of the results from the

base model.

A brief definitions of the explanatory variables in our econometric analyses are described in

Appendix I. As shown in this table, the value of M-phone use represents the situation (use or no use)

as of 2010; it can be considered as a predetermined, explanatory variable in the estimation model in

which M-bank use is specified as a dependent variable. However, M-phone use might be an

endogenous variable. This is because its value is determined by the same factors for M-bank use

although having M-phone could be a prerequisite for using M-bank. Thus, we alternatively estimate a reduced form model in which M-phone use is excluded because of difficulty in finding adequate instrumental variables. Neverethless, we also estimate the model separately for users and non-users of M-phone as of 2010 to examine the possible different effects of explanatory variables between these two groups.

In addition to household characteristics, 2 village dummies are specified for 3 sub-samples: village-1 (Gilabari), village-2 (Akhanagar), and district town/ward of a town (Collegepara) to capture the possible existence of regional disparities in M-bank use which cannot be captured by the differences in characteristics across households. The reason that we included the regional dummies as explainable variables is that we assume there are village-specific characteristics that would induce the households to introduce M-bank. Such characteristics may not be captured by household characteristics that may also vary across villages. In our analysis, we put the importance on spillover effects (or external effects) within a village rather than on the household internal characteristics related to the place of residence.

4.5 Results and Discussion

Table 4.1 summarizes the data for the status of M-bank usage by 153 households in the study area. About 50% of households are found to have M-bank accounts in 2016/2017. Almost 60% of

households in a district town/city village (Collegepara) used M-bank. The rates in 2 villages are lower than this, especially in village 1 (Akhanagar) (40%), suggesting regional disparities in the use of M-bank across 3 locations. Differences in villages in households' characteristics on the use of M-bank is shown in detail in **Table 4.11**. In three villages, M-bank user is older, having a larger number of household member, highly educated household head. In the urban ward, M-bank users tended to office employed, female-headed, smaller owned and homestead land. On the other hand, villagers tended to engage in self-business activities, male-headed, owned larger land size, homestead area.

4.5.1 Comparison of Household Characteristics by M-bank User Status

Table 4.2a and Table 4.2b provide a comparison of household characteristics by M-bank user status between users and non-users. We tested the hypothesis of no difference between users and non-users. A χ^2 test was applied to categorical variables, and a 2-sample t-test was employed to quantitative variables such as age and owned land size. M-bank users are found to significantly differ in the following characteristics from non-users. First, users tend to be older, more educated, mobile phone user with larger household size and greater size of the homestead area. Second, as for the main occupation, users are more likely to be involved in self-employed business and office employee, while non-users tend to be engaged in farming.

It is interesting to note that the proportion of male-headed households in total households is found to be greater for non-users than users of M-bank, though the difference is statistically

insignificant. The result seems inconsistent with the finding available in the previous studies which found that males are more likely to use M-bank than females (Aker and Mbiti, 2010). This issue will be examined in a more rigid setting relying on the estimation of econometric models.

4.5.2 Econometric Estimation results

Table 4.3 shows the estimation results of the base model that includes the M-phone use as the explanatory variable. The marginal effects are obtained from the multinomial logit model with the base category set to M-bank non-users. It is found that M-phone use, secondary educational attainment, homeland holdings have significant effects on the use of M-bank for both early and late users of M-bank.

The estimation results from the reduced form model are presented in **Table 4.4**. Recall that the use of M-phone is excluded from this model. The results are quite similar to those for the base model. Although the absolute values of marginal effects are likely to be greater for the reduced form model, the importance of the variables remains almost unchanged. The variables which are significant in both models have at least indirect effects on the use of M-bank. The estimation with the sub-sample of M-phone users showed similar results with our base model (**Table 4.5)**. This suggests that the use of the mobile phone has a positive effect on the introduction of M-bank in both early and late stages of M-bank. We also tried to estimate the model for the non-users of M-phone; however, the maximum likelihood estimate did not converge, probably because of the small sample size. In what follows,

further discussions are presented on the main estimation results in details.

(a) Effect of the Use of M-phone

The results from the estimation of the base model in **Table 4.3** suggest that the use of the mobile phone has a positive effect on the introduction of M-bank in both early and late stages. The use of M-phone increases the probability of using M-bank by about 14% in the early stage and by about 12% in the late stage, with all other things held constant. In contrast, the use of M-phone reduces the probability of no use of M-bank by 27%, *ceteris paribus*. The use of M-phone in the household in 2010 is crucial even for the use of M-bank in the late stage. This result is consistent with the previous literature which found that M-phone has a significantly positive effect on the use of M-bank (Aker and Mbiti, 2010; Munyegera and Matsumoto, 2016).

(b) Effect of the Sex of Household Head

Male headed-households are less likely to become early users and more likely to become non-users of M-bank. This suggests that the female-headed household is more likely to use M-bank. As mentioned before, this finding is inconsistent with the previous studies. For example, the World Bank (2014) reported that rural females are the most often excluded from the formal financial sector in developing countries. Moreover, Azad (2016) found no gender difference in the use of M-bank in Bangladesh at the individual level. This inconsistency may be attributed to the nature of our sample in which female household heads account for only 5.9%. The difference within the female-headed

household based on the use of M-bank was also presented in **Table 4.6**. The comparison in the characteristics showed most of the female-heads were older, engaged in labor, and office employed activities with less educational attainment, mostly live in the district town areas. Another plausible explanation is that currently, households headed by females in Bangladesh may use M-bank to receive public welfare benefits (Parvez et al., 2015) the effect of which cannot be captured by variables in our models. Although we could not interview the all respondents in the sample, our follow-up survey conducted in February 2018 confirmed that some female-household heads started to use M-bank because government or NGO provided a stipend for child/female education and allowance for old-age directly via M-bank account.

(c) Effect of the Household Size

The size of the household is one of the important factors for the use of M-bank for late users. One household member increase would raise the probability of being a late-users by 7% in the survey area. This result implies that extended household members might have more social networks which can have an effect on the use of technology like M-bank. This seems inconsistent with the previous finding. Munyegera and Matsumoto (2016) found no significant effect of household size on M-bank use in Uganda. This dissimilarity may happen due to the difference in analytical tools. It should be noted that the size of the household does not matter in the case of early users. It matters only for late users. This may be because as M-bank is diffused and known to rural households at a late stage. A family

member establishes new linkages via other family members' outside contacts. An individual's social

networks include various types of contacts such as friends, neighbors, relatives, and workmates. It

can play a critical role in obtaining information and sharing experiences. On the contrary, whether the

household decides to use M-bank would rely on expected benefits from the use of M-bank rather than

household characteristics including wellbeing conditions. The larger households would be more

likely to enjoy benefits from the use of M-bank such as a reduction in transaction costs for purchasing

goods and services and financial transfers that increase with the household size with all other things

held constant.

(d) Effect of the Educational Attainment of Household Head

An effect of educational attainment on M-bank is found to be rather mixed: a negative effect of

secondary education on early users but a positive effect on late users. Therefore, the marginal effect

on current non-users is not significant. One of the plausible reasons for this may be that the household

head with secondary education is more cautious to use M-bank, taking possible risks into account

than the one with no education. In contrast, higher education would reduce the probability of not

using M-bank, suggesting a positive impact on the use of M-bank.

(e) Effect of Occupation of Household Head

The occupation types are found to have no significant effect on the use of M-bank in the base model.

The households may tend to use M-bank as a tool for non-business purposes such as money

transactions including the receipt of remittances from family members working in urban areas. This leads to the presumption that having migrant family members might have a positive effect on M-bank use. We have data for the households having family members who work away from homes as a migration based on our survey period in 2016/17. Because receiving remittance from migrant members might be one of the major reasons why people use M-bank. To address this possibility, we estimated the multinomial logit model with migrant family members as one of the explanatory variables and found that it has a positive effect on M-bank use, has shown in **Table 4.7**. The household having migrant family members is 11.7% (the value of standard error equal to 0.061) more likely to be early-users of M-bank, with other conditions held constant. Although the estimation result supported this presumption, we decided to treat this result only as a reference because of possible endogeneity bias, a serious problem inherent in the model. Thus, we did not include this variable with the base model. Also, migration was found to affect the household decision to adopt M-bank in the early stage, it did not affect it in the late stage. It should be noted, however, that the estimated coefficients of other variables for this model do not change much from the base model and shows the robustness of the estimation result of the base model.

(e) Effect of Homestead Area of the Household

The household wellbeing conditions represented by the size of the homestead has a significantly positive effect on the use of M-bank in all stages although their marginal effects are not large in value.

This expected result is consistent with the previous finding (Aker and Mbiti, 2010). According to Munyegera and Matsumoto (2016), they found that land size has no significant effect on the use of M-bank. This result may reflect the fact that those engaged in agriculture and living the villages more tend to own larger land while those engaged in self-managed business or services or living in the town area are less likely to do so.

This study also estimated determinants of the use of M-phone using a binary probit model (**Table 4.8)**. The estimation result showed that almost no significant effect in characteristics on the use of M-phone except homestead land size, and secondary educational attainment of the household head. However, the variables showed a very weak statistically significant positive effect on the use of M-phone. The use of M-phone may not depend on the characteristics of the household rather their main purposes is to enjoy the benefits of such a device to talk with family, and friends, etc. Moreover, alternative models such as binary probit and order probit are presented in **Table 4.9**, and **Table 4.10** respectively, shows the robustness of the results from the base model.

4.5.3 Summary and Discussions

This study has investigated the determinants of M-bank use in 153 households in Thakurgaon districts in rural northern parts of Bangladesh. There are some interesting results that are inconsistent with the previous literature with respect to i) an effect of the sex of household head, ii) an effect of the

household size, and iii) an effect of occupation on the use of M-bank. Among the possible reasons for

them, are briefly described as follows. As for i), female-headed households are more likely to adopt

M-bank to receive some government income transfer targeted at single-mother families. As for ii),

the larger households are more likely to use M-bank because they can enjoy greater benefits from the

use of M-bank. When the use of M-bank is diffused to some extent, external factors such as increases

in the expected occurrence of use of M-bank may be more important than household internal factors

such as wellbeing conditions for the household to decide to introduce M-bank. As for iii), the

households in the survey area may not use M-bank for their businesses; rather their main purposes

might be to exchange remittance with migrant family members. While the use of M-bank has

facilitated personal money transactions, it may not play a crucial role in generating household income

through enhancing business activities. In other words, currently, M-bank has not been effectively used

for business activities to increase household income. It may be concluded that the extent that the use

of M-bank has contributed to financial inclusion among rural households in the study area is limited.

Nevertheless, further research is required to investigate the mechanism on the individual use of

M-bank may help to understand the gender differences underlying the use of M-bank in rural

Bangladesh. In our next study, we will empirically explore this issue based on the use of M-bank

within the male-headed households in rural areas of Northern Bangladesh.

Table 4.1 No of households M-bank user in three study areas

Location	Users			Non-users	Total
	Early	**Late**	**Total**		
Village-1: Gilabary	13	12	25	25	50
	(26.0)	(24.0)	(50.0)	(50.0)	
Village-2: Akhanagar	4	17	21	31	52
	(7.7)	(32.7)	(40.4)	(59.6)	
District town: Collegepara	8	22	30	21	51
	(15.7)	(43.1)	(58.8)	(41.2)	
Total	25	51	76	77	153
	(16.3)	(33.3)	(49.7)	(50.3)	

Source: Household survey in 2016/2017.

Notes: Percentages (%) are shown in parenthesis

Table 4.2a Comparison of household characteristics by M-bank user status

	Users		Non-users		p-val[1]	Total	
Observation no	**76**		**77**			**153**	
Variable	**Mean**	**SD**	**Mean**	**SD**		**Mean**	**SD**
Socio-demographic variables of household (HH) in 2010							
HHhead age	38.37	11.92	35.13	12.28	0.10	36.74	12.17
HHhead sex	0.92	0.27	0.96	0.20	0.29	0.94	0.24
Household size	4.47	1.94	3.58	1.26	<0.001	4.03	1.69
No. of children	1.45	1.18	1.30	1.11	0.42	1.37	1.15
Educational attainment of household head in 2010 (dummy variables)							
No	0.26	0.44	0.33	0.47	0.40	0.29	0.46
Primary	0.15	0.35	0.22	0.42	0.22	0.18	0.39
Secondary	0.32	0.47	0.36	0.48	0.53	0.34	0.48
Higher	0.28	0.45	0.09	0.29	0.00	0.18	0.39
Main occupation of household head in 2010 (dummy variables)							
Agriculture	0.29	0.46	0.42	0.50	0.10	0.35	0.48
Labor	0.07	0.25	0.17	0.38	0.05	0.12	0.32
Self-employed	0.22	0.42	0.09	0.29	0.02	0.16	0.37
Office employee	0.37	0.49	0.22	0.42	0.05	0.29	0.46
Others	0.01	0.12	0.03	0.16	0.57	0.02	0.14
Students	0.01	0.12	0.03	0.16	0.57	0.02	0.14
Unemployed	0.03	0.16	0.05	0.22	0.41	0.04	0.20

Source: Household survey in 2016/2017.

Notes: 1) Column p-val reports the results for testing the hypothesis of no difference between users and non-users where chi-square tests were applied to categorical variable and 2-sample t-tests to quantitative variables.

Table 4.2b Comparison of household characteristics by M-bank user status

Variable	Users		Non-users		p-val[1]	Total	
Observation no	**76**		**77**			**153**	
Variable	**Mean**	**SD**	**Mean**	**SD**		**Mean**	**SD**
Mobile phone use in the household in 2010 (dummy variables)							
HH M-phone use	0.78	0.42	0.42	0.50	<0.001	0.60	0.49
Land holdings of household in 2016							
Owned land (ha)	0.68	2.02	0.41	1.39	0.34	0.55	1.73
Homestead (a)	0.08	0.28	0.02	0.03	0.07	0.05	0.20
Location of household in 2016 (dummy variables)							
Village-1	0.33	0.47	0.33	0.47	0.96	0.33	0.47
Village-2	0.28	0.45	0.40	0.49	0.10	0.34	0.48
District town	0.40	0.49	0.27	0.45	0.11	0.33	0.47

Source: Household survey in 2016/2017.
Notes: 1) Column p-val reports the results for testing the hypothesis of no difference between users and non-users where chi-square tests were applied to categorical variable and 2-sample t-tests to quantitative variables.

Table 4.3 Estimated marginal effects of a set of variables on the use of M-bank (base model)

Variables	Early-users[1]		Late-users[1]		Non-users[1]	
Socio-demographic variables of household (HH) in 2010						
HHhead age	0.00 (0.00)		-0.00 (0.00)		0.00 (0.00)	
HHhead sex	-0.19 (0.11)	*	-0.25 (0.18)		0.44 (0.18)	***
Household size	0.02 (0.02)		0.07 (0.03)	***	-0.09 (0.03)	***
No. of children	-0.02 (0.03)		-0.01 (0.04)		0.03 (0.04)	
Educational attainment of household head in 2010 (dummy variables)						
Primary	-0.06 (0.08)		0.09 (0.11)		-0.04 (0.10)	
Secondary	-0.19 (0.08)	***	0.19 (0.09)	**	0.00 (0.09)	
Higher	0.07 (0.08)		0.21 (0.12)	*	-0.28 (0.12)	**
Main occupation of household head in 2010 (dummy variables)						
Labor	-0.14 (0.12)		-0.05 (0.17)		0.19 (0.14)	
Self-employed	-0.01 (0.08)		0.16 (0.11)		-0.15 (0.11)	
Office employee	-0.06 (0.09)		0.16 (0.12)		-0.10 (0.11)	
Others	-1.65 (147.50)		0.27 (86.52)		1.39 (60.98)	
Students	-1.27 (154.97)		0.78 (90.91)		0.49 (64.06)	
Unemployed	-1.49 (102.88)		0.81 (60.35)		0.68 (42.53)	
Mobile phone use in the household in 2010 (dummy variable)						
HH M-phone use	0.14 (0.06)	**	0.12 (0.08)	*	-0.27 (0.06)	***
Land holdings of household in 2016						
Owned land (ha)	-0.00 (0.01)		-0.04 (0.030)		0.04 (0.03)	*
Homestead (a)	0.01 (0.00)	**	0.02 (0.009)	**	-0.03 (0.01)	**
Location of household in 2016						
Village-1	-0.00 (0.09)		-0.15 (0.13)		0.16 (0.12)	
Village-2	-0.14 (0.09)	*	-0.05 (0.10)		0.187 (0.10)	**
No. of observation			**153**			

Source: Household survey in 2016/2017.
Notes: Standard errors are reported in parenthesis. Asterisks *, ** and *** represent significance at 10%, 5% and 1%, respectively. 1) The dependent variable is M-bank user status that classifies the household as follows: early user who started to use M-Bank between 2011 and 2013 (y = 2), late user who started to use it between 2014 and 2016/17 (y = 1), and non-user (y = 0).

Table 4.4 Estimated marginal effects of a set of variables on the use of M-bank (reduced form model)

Variables	Early-users[1]		Late-users[1]		Non-users[1]	
Socio-demographic variables of household (HH) in 2010						
HHhead age	0.00 (0.00)		-0.00 (0.00)		0.00 (0.00)	
HHhead sex	-0.20 (0.11)	*	-0.23 (0.19)		0.42 (0.18)	**
Household size	0.02 (0.02)		0.07 (0.03)	***	-0.09 (0.03)	***
No. of children	-0.03 (0.03)		-0.01 (0.04)		0.04 (0.04)	
Educational attainment of household head in 2010 (dummy variables)						
Primary	-0.05 (0.08)		0.09 (0.12)		-0.04 (0.11)	
Secondary	-0.17 (0.08)	**	0.21 (0.09)	**	-0.04 (0.09)	
Higher	0.10 (0.08)		0.20 (0.12)	*	-0.30 (0.12)	**
Main occupation of household head in 2010 (dummy variables)						
Labor	-0.15 (0.13)		-0.04 (0.17)		0.19 (0.15)	
Self-employed	-0.01 (0.08)		0.20 (0.11)	*	-0.19 (0.11)	*
Office employee	-0.06 (0.09)		0.17 (0.12)		-0.11 (0.11)	
Others	-1.78 (129.71)		0.19 (67.84)		1.59 (61.87)	
Students	-1.40 (129.23)		0.78 (67.59)		0.62 (61.64)	
Unemployed	-1.51 (95.67)		0.82 (50.04)		0.69 (45.63)	
Land holdings of household in 2016						
Owned land (ha)	-0.01 (0.01)		-0.03 (0.03)		0.04 (0.03)	
Homestead (a)	0.01 (0.00)	***	0.03 (0.01)	***	-0.04 (0.01)	***
Location of household in 2016						
Village-1	0.01 (0.09)		-0.14 (0.13)		0.13 (0.13)	
Village-2	-0.13 (0.09)		-0.07 (0.10)		0.20 (0.10)	**
No. of observation			**153**			

Source: Household survey in 2016/2017.
Notes: Standard errors are reported in parenthesis. Asterisks *, ** and *** represent significance at 10%, 5% and 1%, respectively. 1) Refer to Notes 1) in Table 4.3.

Table 4.5 Estimated marginal effects of a set of variables on the use of M-bank (base model,

restricted to the data of M-phone users)

Variables	Early-users[1]		Late-users[1]		Non-users[1]	
Socio-demographic variables of household (HH) in 2010						
HHhead age	0.00 (0.00)		-0.00 (0.01)		0.00 (0.01)	
HHhead sex	-1.27 (177.31)		2.67 (408.03)		-1.39 (230.72)	
Household size	0.01 (0.03)		0.04 (0.04)		-0.05 (0.04)	
No. of children	0.00 (0.05)		-0.01 (0.06)		0.01 (0.05)	
Educational attainment of household head in 2010 (dummy variables)						
Primary	-0.09 (0.12)		0.19 (0.16)		-0.09 (0.14)	
Secondary	-0.36 (0.11)	***	0.29 (0.12)	**	0.07 (0.10)	
Higher	0.01 (0.11)		0.20 (0.15)		-0.212 (0.15)	
Main occupation of household head in 2010 (dummy variables)						
Labor	-0.25 (0.18)		0.22 (0.21)		0.03 (0.16)	
Self-employed	0.07 (0.12)		0.27 (0.14)	**	-0.34 (0.14)	***
Office employee	-0.04 (0.14)		0.22 (0.15)		-0.18 (0.14)	
Others	-1.05 (835.29)		-2.34 (932.95)		3.40 (538.65)	
Students	-0.80 (643.12)		2.66 (554.52)		-1.87 (635.46)	
Unemployed	-1.84 (156.71)		1.15 (97.28)		0.69 (59.43)	
Land holdings of household in 2016						
Owned land (ha)	0.00 (0.02)		-0.01 (0.04)		0.01 (0.04)	
Homestead (a)	0.01 (0.01)	**	0.03 (0.01)	***	-0.04 (0.02)	***
Location of household in 2016						
Village-1	0.03 (0.14)		-0.29 (0.16)	*	0.26 (0.17)	
Village-2	-0.25 (0.12)	**	-0.04 (0.13)		0.29 (0.13)	**
No. of observation			**91**			

Source: Household survey in 2016/2017.
Notes: Standard errors are reported in parenthesis. Asterisks *, ** and *** represent significance at 10%, 5% and 1%, respectively. Refer Notes 1) in Table 4.3.

Table 4.6 Comparison of female-headed household characteristics of using M-bank

Variable	Female-headed household					
	Users		Non-users		Total	
Observation	6		3		9	
Variable	Mean	SD	Mean	SD	Mean	SD
Socio-demographic variables of household (HH) in 2010						
HHhead age	38.83	7.60	28.33	5.51	35.33	8.44
Household size	4.83	3.31	4.33	0.58	4.67	2.65
No. of children	2.00	1.55	2.33	1.15	2.11	1.36
Educational attainment of household head in 2010 (dummy variables)						
No	0.50	0.55	0.67	0.58	0.56	0.53
Primary	0.50	0.55	0.00	0.00	0.33	0.50
Secondary	0.00	0.00	0.33	0.58	0.11	0.33
Higher	0.00	0.00	0.00	0.00	0.00	0.00
Occupation of household head in 2010 (dummy variables)						
Agriculture	0.17	0.41	0.00	0.00	0.11	0.33
Labor	0.33	0.52	0.67	0.58	0.44	0.53
Self-managed business	0.00	0.00	0.00	0.00	0.00	0.00
Office employed	0.33	0.52	0.00	0.00	0.22	0.44
Others	0.17	0.41	0.33	0.58	0.22	0.44
Student	0.00	0.00	0.00	0.00	0.00	0.00
Unemployed	0.00	0.00	0.00	0.00	0.00	0.00
Mobile phone use in the household in 2010 (dummy variables)						
HH M-phone use	0.33	0.52	0.33	0.58	0.33	0.50
Land holdings of household in 2016 (decimal)						
Owned land	115.50	267.08	0.00	0.00	77.00	218.90
Homestead	5.25	5.38	5.32	3.51	5.27	4.60
Location of household in 2016 (dummy variables)						
Village-1	0.33	0.52	0.33	0.58	0.33	0.50
Village-2	0.00	0.00	0.00	0.00	0.00	0.00
District town	0.67	0.52	0.67	0.58	0.67	0.50

Source: Household survey in 2016/2017.

Table 4.7 Estimated marginal effects of a set of variables on the use of M-bank (Base model,

including M-phone and migration)

Variables	Early-users[1]		Late-users[1]		Non-users[1]	
Socio-demographic variables of household (HH) in 2010						
HHhead age	-0.00 (0.00)		-0.00 (0.00)		0.00 (0.00)	
HHhead sex	-0.18 (0.11)	*	-0.29 (0.18)	*	0.47 (0.18)	***
Household size	0.02 (0.02)		0.07 (0.03)	***	-0.09 (0.03)	***
No. of children	-0.02 (0.03)		-0.01 (0.04)		0.04 (0.04)	
Educational attainment of household head in 2010 (dummy variables)						
Primary	-0.07 (0.08)		0.10 (0.11)		-0.03 (0.10)	
Secondary	-0.18 (0.08)	**	0.19 (0.09)	**	-0.01 (0.09)	
Higher	0.08 (0.08)		0.20 (0.12)	*	-0.28 (0.13)	**
Main occupation of household head in 2010 (dummy variables)						
Labor	-0.15 (0.13)		-0.06 (0.17)		0.21 (0.15)	
Self-employed	0.04 (0.08)		0.11 (0.12)		-0.15 (0.11)	
Office employee	-0.04 (0.09)		0.14 (0.11)		-0.10 (0.11)	
Others	-1.64 (206.66)		0.19 (119.96)		1.45 (86.70)	
Students	-1.20 (240.56)		0.70 (139.64)		0.50 (100.92)	
Unemployed	-1.47 (157.10)		0.79 (91.19)		0.68 (65.90)	
Mobile phone use in the household in 2010 (dummy variables)						
HH M-phone use	0.14 (0.06)	**	0.12 (0.07)	*	-0.27 (0.06)	***
Land holdings of household in 2016						
Owned land (ha)	-0.00 (0.01)		-0.04 (0.03)		0.043 (0.02)	*
Homestead (a)	0.01 (0.00)	**	0.02 (0.01)	***	-0.03 (0.01)	***
Location of household in 2016						
Village-1	-0.02 (0.09)		-0.18 (0.13)		0.20 (0.13)	
Village-2	-0.13 (0.08)		-0.07 (0.10)		0.20 (0.10)	**
Presence of migrant family members in 2016						
Migrants family	0.12 (0.06)	*	0.00 (0.10)		-0.12 (0.09)	
No. of observation			**153**			

Source: Household survey in 2016/2017.
Notes: Standard errors are reported in parenthesis. Asterisks *, ** and *** represent significance at 10%, 5% and 1%, respectively. 1) Refer to note 1) in Table 4.3.

Table 4.8 Estimated coefficients of a set of variables on the use of M-phone (probit model)

Variables	M-phone users[1]	
Socio-demographic variables of household (HH) in 2010		
HHhead age	0.00 (0.01)	
HHhead sex	0.08 (0.54)	
Household size	0.03 (0.09)	
No. of children	-0.02 (0.12)	
Educational attainment of household head in 2010 (dummy variable		
Primary	0.18 (0.33)	
Secondary	0.53 (0.29)	*
Higher	0.55 (0.40)	
Occupation of household head in 2010 (dummy variables)		
Labor	-0.29 (0.39)	
Self-managed business	0.43 (0.38)	
Service	0.04 (0.36)	
Others	-1.81 (1.29)	
Students	-0.38 (0.84)	
Unemployed	0.92 (0.70)	
Land holdings of household in 2016 (Hectare)		
Owned land	-0.03 (0.08)	
Homestead	10.50 (4.70)	**
Location of household in 2016		
Village-1	0.09 (0.39)	
Village-2	-0.26 (0.32)	
No. of observation	**153**	

Source: Household survey in 2016/2017.

Notes: Standard errors are reported in parenthesis. Asterisks *, ** and *** represent significant at 10%, 5% and 1%, respectively. 1) The dependent variable is a dummy variable for the use of M-phone in 2010 by the household (yes = 1 and no =0).

Table 4.9 Estimated coefficients of a set of variables on the use of M-bank (probit model)

Variables	M-bank users[1]	
Socio-demographic variables of household (HH) in 2010		
HHhead age	-0.01 (0.01)	
HHhead sex	-1.65 (0.65)	***
Household size	0.33 (0.11)	***
No. of children	-0.12 (0.14)	
Educational attainment of household head in 2010 (dummy variables)		
Primary	0.06 (0.38)	
Secondary	0.02 (0.31)	
Higher	1.03 (0.48)	**
Occupation of household head in 2010 (dummy variables)		
Labor	-0.74 (0.51)	
Self-managed business	0.54 (0.41)	
Service	0.36 (0.40)	
Others	-3.16 (1.22)	***
Students	-0.04 (0.95)	
Unemployed	-0.64 (0.70)	
Mobile phone use in the household in 2010 (dummy variables)		
HH M-phone use	0.98 (0.26)	***
Land holdings of household in 2016 (Hectare)		
Owned land	-0.12 (0.08)	
Homestead	10.16 (4.68)	**
Location of household in 2016		
Village-1	-0.55 (0.45)	
Village-2	-0.68 (0.37)	*
No of observation	**153**	

Source: Household survey in 2016/2017.

Notes: Standard errors are reported in parenthesis. Asterisks *, ** and *** represent significant at 10%, 5% and 1%, respectively. 1) The dependent variable is a dummy variable for the use of M-bank by the household (yes = 1 and no =0).

Table 4.10 Estimated coefficients of a set of variables on the use of M-bank (ordered probit models)

Variables	M-bank users[1a)]		M-bank users[1b)]	
Socio-demographic variables of household (HH) in 2010				
HHhead age	-0.00 (0.01)		-0.01 (0.01)	
HHhead sex	-1.50 (0.52)	***	-1.57 (0.52)	***
Household size	0.16 (0.07)	**	0.17 (0.07)	**
No. of children	-0.08 (0.11)		-0.09 (0.11)	
Educational attainment of household head in 2010 (dummy variables)				
Primary	-0.22 (0.33)		-0.26 (0.32)	
Secondary	-0.30 (0.27)		-0.29 (0.27)	
Higher	0.66 (0.34)	**	0.70 (0.34)	**
Occupation of household head in 2010 (dummy variables)				
Labor	-0.76 (0.43)	*	-0.80 (0.43)	*
Self-managed business	0.21 (0.33)		0.12 (0.32)	
Service	0.03 (0.34)		-0.10 (0.32)	
Others	-1.95 (1.01)	**	-2.15 (0.98)	**
Students	-0.19 (0.85)		-0.46 (0.82)	
Unemployed	-0.96 (0.64)		-1.14 (0.62)	*
Mobile phone use in the household in 2010 (dummy variables)				
HH M-phone use	0.966 (0.228)	***	0.974 (0.228)	***
Land holdings of household in 2016 (Hectare)				
Owned land	-0.02 (0.06)		-0.03 (0.06)	
Homestead	0.38 (0.54)		0.48 (0.54)	
Location of household in 2016				
Village-1	-.16 (0.36)			
Village-2	-0.51 (0.30)	*		
Village-town			-0.43 (0.29)	
No of observation		**153**		

Source: Household survey in 2016/2017.
Notes: Standard errors are reported in parenthesis. Asterisks *, ** and *** represent significant at 10%, 5% and 1%, respectively. 1) shows dependent variable for early user between 2011 and 2013 (y = 2), late user between 2014 and 2016/17 (y = 1), and no user (y = 0). Ordered probit models show the robustness and the time of use specified by two sets of village dummies: 1a) the former model uses two village dummy variables to control for the location and 1b) the latter uses the town dummy.

Table 4.11 Comparison in characteristics between user and non-user of M-bank by location

Variable	Village-1 (Gilabari=50)				Village-2 (Akhanagar=52)				District town-3			
	Non-users		users		Non-users		users		Non-users		users	
	Mean	SD	Mean	SD	Mean	SD	Mean	SD	Mean	SD	Mean	SD
Mobile phone in 2010												
HH M-phone use	0.60	0.50	0.72	0.46	0.39	0.50	0.81	0.40	0.24	0.44	0.80	0.41
Occupation of HHhead in 2010												
Agriculture	0.64	0.49	0.64	0.49	0.52	0.51	0.29	0.46	0.00	0.00	0.00	0.00
Labor	0.24	0.44	0.08	0.28	0.06	0.25	0.05	0.22	0.24	0.44	0.07	0.25
Self-managed	0.04	0.20	0.20	0.41	0.06	0.25	0.33	0.48	0.19	0.40	0.17	0.38
Service	0.08	0.28	0.08	0.28	0.19	0.40	0.29	0.46	0.43	0.51	0.67	0.48
Others	0.00	0.00	0.00	0.00	0.10	0.30	0.05	0.22	0.05	0.22	0.03	0.18
Unemployed	0.00	0.00	0.00	0.00	0.06	0.25	0.00	0.00	0.10	0.30	0.07	0.25
Other variables												
Age on 2016	37.52	11.60	40.60	9.19	43.48	12.72	44.43	13.30	41.95	11.97	47.47	12.38
Sex of the HHhead	0.96	0.20	0.92	0.28	1.00	0.00	1.00	0.00	0.90	0.30	0.87	0.35
HH size in 2016	4.20	0.91	4.72	1.67	4.03	1.54	5.33	1.83	3.90	1.22	5.13	2.40
Number of	1.20	1.12	1.12	1.13	1.10	0.94	1.57	0.93	1.71	1.27	1.63	1.35
Educational attainments of HHhead in 2016												
No	0.44	0.51	0.20	0.41	0.19	0.40	0.38	0.50	0.38	0.50	0.23	0.43
Primary	0.16	0.37	0.04	0.20	0.26	0.44	0.10	0.30	0.24	0.44	0.27	0.45
Secondary	0.36	0.49	0.36	0.49	0.35	0.49	0.29	0.46	0.38	0.50	0.23	0.43
Higher	0.04	0.20	0.40	0.50	0.19	0.40	0.24	0.44	0.00	0.00	0.27	0.45
Land size in 2016												
Owned land size	132.60	523.83	254.80	778.21	145.03	266.72	187.1	300.97	3.52	14.42	84.79	256.1
Homestead area	6.34	6.85	44.71	115.98	6.85	11.46	10.96	10.24	1.90	2.52	4.09	5.32

Source: Household survey in 2016/2017.

Chapter 5

The Effect of Gender Differences on the Use of M-bank at the Individual Level

5.1 Background

This chapter is aimed to examine individual characteristics that influence the decision of M-bank use, focusing on gender difference among the male-headed household in northern Bangladesh. In our sample, a remarkable difference was found in the use of M-bank between a husband and a wife among male-headed households **(Figure 5.1)**. Recall that estimation results in Chapter 4 show somewhat interesting features with respect to an effect of gender in M-bank use; that is, female-headed households are more likely to use M-bank than male-headed households.

The World Bank (2017) reported that although male and female are both being financially included, significant gender difference persists in access to technology for financial services in South Asian countries such as Bangladesh, Pakistan, Afghanistan, and Turkey, etc. In addition, Males are more likely to use M-bank in Kenya than females (Ahad et al., 2012; Aker and Mbiti, 2010). In contrast, Azad (2016) found no gender difference in the use of M-bank at the individual level in Bangladesh.

It is widely recognized that gender is a powerful determinant of economic and financial opportunities (Jack and Suri, 2014). Demirguc-Kunt and Klapper (2013) showed that in some

patriarchal societies, legal discrimination against females prevails in terms of abilities to work outside, head a household, and to own an asset or property which in turn, affect the use of financial services. Females are less likely to own bank accounts with which to save and borrow than males. The significant gender gap remains in access to financial services even after the effects of income and education are controlled, according to previous econometric studies. For example, a family member who already has an account may play a role as barriers to 26 % unbanked females in developing countries such as Bangladesh (Safavian and Haq, 2013). Within the household, together with family structure, place of residence and mate selection, such factors as couple's relative differences on age, education and job status, have influences on intra-households' decision-making power (Dunhum and Flores-Yefal, 2018; Meekers and Oladosu, 1996; Oyediran, 1998). Moreover, a wife's age and education are also related to her partner's. In Bangladesh, higher educated women would like to marry men with similarities in age, education, and outlook, through positive mating (Hahn et al., 2015). Further, positive mating can contribute to increase the educational attainment level and a wife's position in the household decision making (Aguero and Bharadwaj, 2014; Bharadwaj, 2015; Goldin and Katz, 2002; Ma and Piao, 2018).

Gender effect on M-bank use is still controversial. Indeed, empirical evidence regarding gender effect on M-bank use is lagging behind in Bangladesh, although the mobile phone itself is a cheap and affordable device so that it can be easily obtained by individual members of a family for M-bank

use.

5.2 Purpose of the Study

The main purpose of this study is to empirically estimate the effect of gender difference on the use of M-bank. It should be noted that gender difference in age or in education could function as a proxy to capture the status of wife's bargaining power in the process of the household's decision making.

Considering the presence of a possible effect of gender difference on intra-household decision-making power, it is hypothesized that gender difference has a significant effect on the decision on using M-bank within a male-headed household in rural Bangladesh. Under this hypothesis, the following questions arise:

1) Who is using M-bank within a male-headed household?

2) Who are making decisions on the use of M-bank within the household?

3) Do a husband and a wife jointly make a decision on M-bank use?

In what follows, a series of econometric estimations will be performed in an attempt to answer the questions above.

5.3 Data

The dataset used in this chapter is restricted to 129 male-headed couple households. Because our study is focused on the effect of gender difference on M-bank use in the couple household, 24 non-

couple households are dropped from the sample. The number of observations by region (village 1:

Gilabary, village 2: Akhanagar, and district town: Collegepara) is shown in **Table 5.1**.

To investigate the determinants of M-bank more explicitly with due attention to gender

difference, explanatory variables (which are assumed to be possible determinants) are categorized

into two types: level variables and relative variables **(Figure 5.2)**.

Level variables consist of the individual (both husband and wife) characteristics and

household's characteristics. Main individual's characteristics are M-phone use, age, educational

attainment and type of job. Household's characteristics include family size, children number, own

land size, and homestead area, household location, living condition, and presence of a migrant family

member in the household. Relative variables are specified as differences in characteristics between a

husband and a wife, and they include the age gap and educational gap.

To illustrate the status of M-bank on the individual basis, the data of the 129 households are

divided into the four sub-groups: 1) wife user and husband user, 2) wife user and husband non-user,

3) wife non-user and husband user, and 4) wife non-user and husband non-user. The distribution of

observations by sub-group is shown in **Table 5.2**.

However, because of the small number of observations for both sub-group 1) and sub-group 2),

which are 8 and 4, respectively, these two sub-groups are combined. This treatment may be legitimate

in the perspective of a wife's position in the household, because wives in both sub-groups, 1) and 2)

are presumed to have at least, equal bargaining power with their husbands in decision making on M-Bank use. Thus, three sub-groups are re-defined; namely, wife user, husband user, and non-user **(Figure 5.3)**. The comparison of individual characteristics and the estimation of econometric models are made, based on these three types of households.

5.4 Methods

Descriptive statistics are confirmed to identify differences in characteristics by type of households, followed by the estimation of econometric models.

The two equations probit models are employed to investigate the determinants of the use of M-bank by a couple on the individual basis, using both level and relative variables. The models can capture jointly separate decision outcomes for wife's use of M-bank and husband's use of M-bank and. The two equations probit is set as a base model. As are explained in Chapter 3, binary probit and multinomial logit models are alternatively estimated to check the robustness of the estimated results from the base model. Note that a binary probit model is estimated separately for either husband's M-bank use or wife's M-bank use by a single equation. In each equation, the characteristics of both a husband and a wife are specified to examine their effects on the individual use of M-bank. Multinomial logit models are based on the household unit, with the dependent variable whose values are specified as: y=1 for non-users, y=2 for husband users, and y = 3 for wife users.

5.5 Results and Discussion

5.5.1 Comparison of Level Variables between Husband and Wife Users

Table 5.3a, Table 5.3b, and Table 5.3c show the descriptive statistics of level variables for individual (husband's and wife's) characteristics and household's characteristics across three sub-groups. Because most characteristics are categorized variables, nonparametric Kruskal-Wallis test instead of ANOVA are employed to assess a difference in the center of the distribution for the level variable of interest across three sub-groups. Wife's characteristics for which the hypothesis of no difference in the center of the distribution is rejected at a 5% significant level are: the use of M-phone, having no, up to secondary, and above secondary to higher educational attainment level, involvement in office employed activities, and other occupation **(Table 5.3a).** Husband's characteristics as such are: the use of M-phone, having no and higher educational attainment, being a farmer, and having self-managed business **(Table 5.3b)**. Household's characteristics as such are: region (village 1-Gilabary, village 2-Akhanagar, and District town-Collegepara), and living condition that whether husband and wife are living together **(Table 5.3c).**

Descriptive statistics revealed several interesting features in our sample. First, wife users are likely to be highly educated and office employed. Second, all of wife user households live in the city town (Collegepara), and some couples in such households are living separately. Third, husband users are mainly involved in self-managed business activities. Forth, husband user households are likely to

have larger numbers of family members, land area, and some migrant family members. Fifth, in the non-user household, both a husband and a wife are less likely to use M-phone. Their educational level is low, and a husband is most likely to engage in farming while a wife is more likely to be a housewife and to live in village-2 (Akhanagar).

It is summarized that wife users have higher educational attainment, and wife user households are likely to have husbands with skilled jobs. On the contrary, husbands involved in self-business are more likely to belong to the husband user household. Educational attainment and type of job have a higher correlation while the wife's educational attainment is highly correlated with the husband's educational attainment. Thus, both a wife and a husband of a higher educated couple are more likely to have office jobs, thereby, more likely to use M-phone and M-bank individually. It may be considered that intra-household decision-making power functions in favor of wife in such households. As such, bivariate analysis can roughly provide features underlying relationships for results from some pairs of variables, but it does not allow us to assess the effect of gender difference on M-bank uses explicitly. Such deficiencies could be resolved by multivariate analysis built on econometric models.

5.5.2 Econometric Estimation Results

Estimation results from the base model (two equations probit, with level variables) are summarized in **Table 5.4.** It is found that such variables as husband self-business activity, wife higher education, region (village 1), living place and presence of migrant family members have significantly positive effects on husband's use of M-bank. Interestingly, no characteristic is found to have a significant effect on the wife's use of M-bank.

Table 5.5 provides the estimation results from the two equations probit model in which a set of level variables in the base model are replaced by relative variables for age and education. It is found that if the wife's educational level is higher than her husband's educational level, the likelihood of M-bank uses increases for wife's use of M-bank. This implies that the wife's educational status may reinforce the wife's bargaining power within the household, through which it may significantly influence individual use of M-bank in the husband-headed household. If this is true, a higher educated wife might have bargaining power in the process of decision making on using financial services like the case for M-bank use in rural Bangladesh.

Table 5.5 also shows that the difference in age between a husband and a wife has no significant effect on the individual use of M-bank regardless of gender. It is found that age has no effect on the individual use of M-bank at either level **(Table 5.4)** or the difference between a couple. Initially, it was presumed that the age gap may be reflected in bargaining power within the household through

which it may have an effect on the individual use of M-bank. However, this is not the case for our sample.

The other alternative models which are probit and multinomial logit models with level or relative variables are specified provided similar results. A probit model was estimated using only level variables separately for wife user and husband user are shown in **Table 5.6**, and **Table 5.7** respectively. It was found that variables that have significant positive effects on the husband's use of M-bank are: husband's higher educational attainment, self-managed business activity, and presence of a migrant family member. Also, the wife's higher educational attainment is found to have a significantly positive effect on the wife's use of M-bank. Further, the estimation results from the multinomial logit model in **Table 5.8** show the robustness of results from the preceding models. Husband involvement in the self-managed activities and presence of a migrant member have significant effects on the husband's use of M-bank. A higher educated wife is more likely to be an M-bank user. The estimation results from the multinomial logit model in which relative variables are specified are consistent with those from the two equations probit model with relative variables **(Table 5.5).** That is, a significant positive effect of the educational gap between a couple (the case where wife's educational level is higher than husband's level) is found for both wife's use and husband's use of M-bank.

These results suggest that gender difference exists in the use of M-bank within the male-headed

household. In general, husband users of M-bank are characterized by self-employed, having migrant member and living in a village. But these characteristics have no effect on the wife's use of M-bank. Wife users of M-bank are likely to be characterized by highly educated and living in the city town. In fact, among the male-headed household in which at least one person is using M-bank, if a wife has a higher education than her husband, she definitely is using M-bank, and so is her husband.

It is found that wife's educational attainment is a very important factor for individual use of M-bank in the male-headed household. Because highly educated wives are more likely to have office jobs in cities, they may need M-bank for business and urban daily life and also get her own salary that would financially facilitate M-bank use. In this respect, education functions as an instrument for getting good jobs and greater income. However, the wife's education status may also contribute to her bargaining power in the decision-making process within the household. If so, it is further assumed that the wife's bargaining power associated with education is affected by her education level and the difference in educational attainment between her husband and herself. The wife's education level is related to her social status (including jobs) and her income level, and both of them would influence her bargaining power within the household. However, this effect is limited to a segment of wives who are highly educated. On the contrary, the effect of the education gap in a couple on wife's bargaining power may arise for all wives regardless of their educational levels.

Paying attention to this point, two alternative models based on two equations probit are

estimated: 1) excluding the wife's educational level and 2) excluding the husband's educational level.

These results are presented in **Table 5.9** and **Table 5.10**, respectively. **Table 5.9** revealed that no level variable is found to have a significant effect on the wife's use of M-bank, but that education gap in favor of a wife (the case where the wife's education level is higher than her husband's level) is found to have a significantly positive effect on the wife's use of M-bank. These results are consistent with the preceding results shown in **Table 5.4 and Table 5.5.** It is found that education gap in favor of a wife also has a positive effect on husband's use of M-bank and that its effect is more pronounced when education gap is more than one school between a couple. It is also found that type of jobs and having migrants in the family is an important factor for the household's use, while wife's educational status is a very important factor for wife's use of M-bank. Finally, it is noted that when wife's education level variables are excluded and relative variables are included in the estimation model, husband's education level variables are found to have significant positive effects on husband's use of M-bank but have no effects on wife's use of M-bank. This implies a higher correlation between the wife's education level and husband's education level and that wife's use of M-bank is not affected by the husband's educational status.

5.5.3 Summary and Discussions

This study has investigated the determinants of the use of M-bank by husband and wife using the dataset composed of 129 male-headed households in 3 regions of Thakurgaon district. While there is

significant evidence for the use of M-bank, there is limited evidence for its use on the individual basis within the household. Especially, there is no evidence for the decision process underlying M-bank use in rural areas in developing countries. The main results from various analyses in this chapter are as follows. First of all, gender difference exists in the likelihood of individual use of M-bank. Wife's use of M-bank is quite limited compared with the husband's use of M-bank. Generally, husband users are characterized by self-employed, having a migrant family member and living in a village. On the other hand, wife users are more likely to be characterized by highly educated and living in the city town. These suggest that the determinants of the wife's use of M-bank differ from the determinants of the household's use of M-bank. Type of jobs and having migrants in the family are a very important factor for the household's use, while wife's educational status is a very important factor for wife's use of M-bank in the male-headed household. Interestingly, the relative educational attainment variable (the case where the wife's educational attainment is higher than the husband's educational attainment) has a significant positive effect on the wife's use of M-bank.

Some of these results are consistent with the previous findings. The previous evidence claims that the female is mostly financially excluded (World Bank 2017). Female M-phone and M-bank users are lower in numbers, compared with male users (Demirguc-kunt and Klapper, 2013). Also, the presence of migrant family members has a significant positive effect on the husband's use of M-bank. This is perhaps because M-bank is more likely to be used to send and receive money for remittance

of which incidence is higher for the households that have migrant family members (Ahad, 2012; Aker, 2010; Dunhum and Flores-Yefal, 2018; Hahn et al., 2015; Munyegera and Matsumoto, 2016; Meekers and Oladosu, 1996; Oyediran, 1998).

However, the results that are inconsistent with previous studies are also found in our analysis. It was reported that female-headed household has no significant effect on M-bank use (Munyegera and Matsumoto, 2016); however, our preceding analysis in Chapter 4 revealed that the female-headed household is more likely to use M-bank (Islam et al., 2018). The analysis in this chapter also revealed that gender difference in M-bank exists between husband and wife in male-headed households. Our estimation results suggest that the wife's educational level is a very important factor for the use of M-bank. Wives with higher educational attainment are more likely to use M-bank individually. If she is more educated than her husband, the likelihood of the wife's use of M-bank increases. In such a case, the husband also tends to use M-bank individually. One plausible reason for this is that highly educated wives are more likely to have bargaining power in the decision-making process within the household. This is because they have office jobs in cities and get her own salary that would facilitate her choice in financial issues including M-bank use. Moreover, such a wife would be likely to maintain an equal position in the household's decision even when her educational level is higher than her husband's level.

As confirmed in our sample, however, the segment of highly educated wives is small in population in the rural area. The majority of wives are lower-educated housewives. They do not use M-bank. Moreover, when a lower-educated wife uses M-bank, she tends to rely on her husband's bank account because a husband is a main income earner in the household. In a patriarchal society under Islamic customs, a husband is generally a major household's decision-maker and controls the family budget. The rural wife has less bargaining power in household decisions (Dunhum and Flores-Yefal 2018).

Equal and direct access to financial services is needed to reach lower educated wives who are most likely to be financially excluded. The use of M-bank that entails lower costs would be a possible powerful tool for compensating wife's lower bargaining power in the process of decision making on financial issues within the household. It could further change the household's livelihood strategies. In fact, government income transfer directly through M-bank can empower female's decision making at home in rural Bangladesh. Also, many researchers suggest that if a woman can make a decision freely on financial matters, an expected outcome would be increases of household's spending and investment on food, health, education of the children, buying asset and saving (Aker and Mbiti, 2010; Blumenstock and Eagle, 2010; Dunhum and Flores-Yefal, 2018). Thus, the use of M-bank would contribute to improve household wellbeing and reduce poverty in rural Bangladesh.
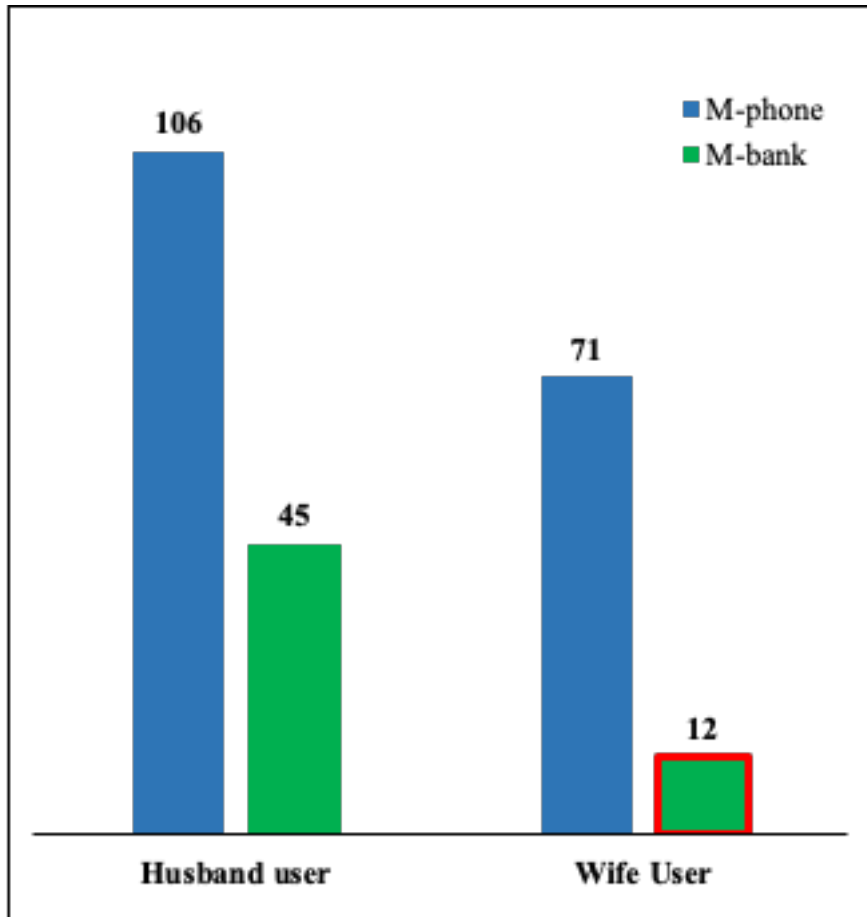
Figure 5.1 No of husband and wife user of M-phone and M-bank
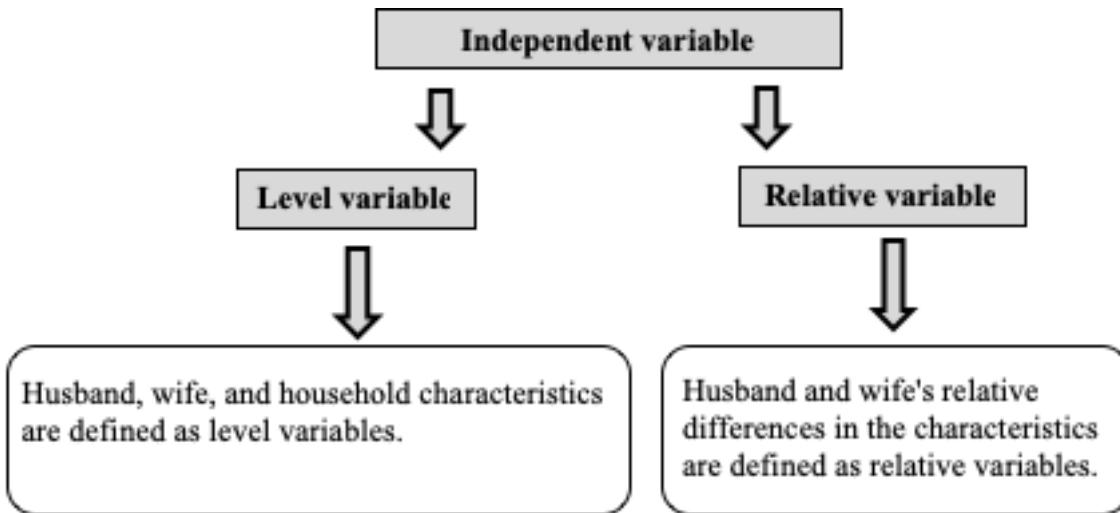
Figure 5.2 Definition of level and relative variables
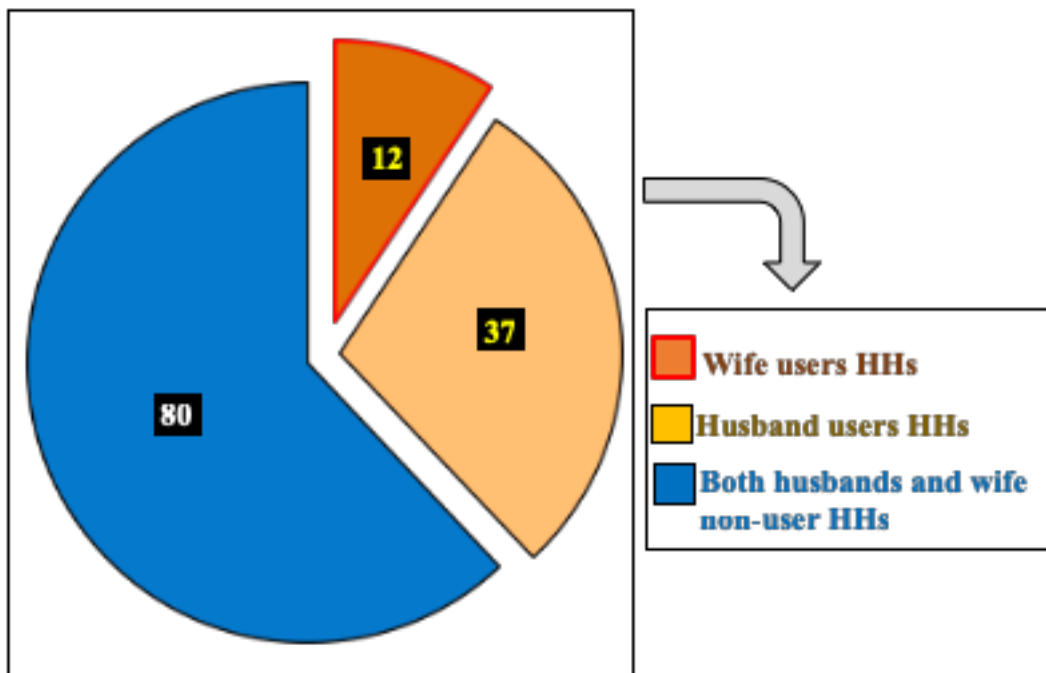
Figure 5.3 Sub-groups of 129 couple households based on the use of M-bank and gender

Table 5.1 Total no of the surveyed households in each region

Study Area	Total surveyed households
Village-1: Gilabary	44
Village-2: Akhanagar	48
District town: Collegepara	37
Total	129

Source: Household survey, 2016/2017.

Table 5.2 Tabulation of 129 households based on the couple and M-bank user

	Husband users	**Husband non-users**	**Total HH**
Wife users	Both husband and wife users (8)	Only wife users (4)	**12**
Wife non-users	Only husband user (37)	Both husband and wife non-users (80)	**117**
Total HH	**45**	**84**	**129**

Source: Household survey in 2016/2017.

Table 5.3a Comparisons in wife's characteristics across three 3 sub-groups of M-bank user

Sub-group	Wife users		Husband users		Both non-users			Total HHs	
Observation no	12		37		80			129	
Variable	Mean	SD	Mean	SD	Mean	SD	P-value	Mean	SD
Mobile phone use (dummy variables)									
M-phone use	1.00	0.00	0.65	0.48	0.44	0.50	<0.001	0.55	0.50
Age	36.00	11.34	32.68	8.90	34.88	10.39	0.30	34.35	10.06
Educational attainments in schooling (dummy variables)									
No education	0.17	0.39	0.14	0.35	0.34	0.48	0.05	0.26	0.44
Up to secondary	0.25	0.45	0.57	0.50	0.63	0.49	0.05	0.57	0.50
Above Secondary	0.58	0.51	0.30	0.46	0.04	0.19	<0.001	0.16	0.37
Main job (dummy variables)									
Agriculture	0.08	0.29	0.00	0.00	0.01	0.11	0.12	0.02	0.12
Non-agriculture									
Office employed	0.42	0.51	0.11	0.31	0.05	0.22	<0.001	0.10	0.30
Self-business	0.08	0.29	0.05	0.23	0.04	0.19	0.76	0.05	0.21
labor	0.00	0.00	0.03	0.16	0.09	0.28	0.29	0.06	0.24
Others	0.42	0.51	0.81	0.40	0.81	0.39	0.01	0.78	0.42
Religion	1.00	0.00	0.97	0.16	0.98	0.16	0.85	0.98	0.15

Source: Household survey in 2016/2017.

Notes: Column p-value reports the results for testing the hypothesis of no difference in the observation between wife users, husband users, and non-users subgroups where a Kruskal-Wallis (nonparametric hypothesis) test was applied to all independent level variables.

Table 5.3b Comparisons in husband's characteristics across three 3 sub-groups of M-bank user

Sub-group	Wife users		Husband users		Both non-users			Total HHs	
Observation no	12		37		80			129	
Variable	Mean	SD	Mean	SD	Mean	SD	P-value	Mean	SD
Mobile phone use (dummy variables)									
M-phone use	1.00	0.00	1.00	0.00	0.71	0.46	<0.001	0.82	0.38
Age	42.42	12.19	39.57	9.69	42.15	11.93	0.64	41.43	11.33
Educational attainments in schooling (dummy variables)									
No education	0.17	0.39	0.14	0.35	0.35	0.48	0.04	0.27	0.45
Up to secondary	0.33	0.49	0.51	0.51	0.55	0.50	0.38	0.52	0.50
Above higher	0.50	0.52	0.35	0.48	0.10	0.30	<0.001	0.21	0.41
Main job (dummy variables)									
Agriculture	0.17	0.39	0.24	0.43	0.44	0.50	0.05	0.36	0.48
Non-agriculture									
Office employed	0.50	0.52	0.32	0.47	0.26	0.44	0.24	0.30	0.46
Self-business	0.33	0.49	0.38	0.49	0.15	0.36	0.02	0.23	0.42
labor	0.00	0.00	0.05	0.23	0.13	0.33	0.24	0.09	0.29
Others	0.00	0.00	0.00	0.00	0.03	0.16	0.54	0.02	0.12
Religion	1.00	0.00	0.97	0.16	0.98	0.16	0.85	0.98	0.15

Source: Household survey in 2016/2017.

Notes: Column p-value reports the results for testing the hypothesis of no difference in the observation between wife users, husband users, and non-users subgroups where a Kruskal-Wallis (nonparametric hypothesis) test was applied to all independent level variables.

Table 5.3c Comparisons in household characteristics across three 3 sub-groups of M-bank user

Sub-group	Wife users		Husband users		Both non-users			Total HHs	
Observation no.	12		37		80			129	
Variable	Mean	SD	Mean	SD	Mean	SD	P-value	Mean	SD
Households size	4.17	1.27	4.57	1.48	4.25	1.43	0.53	4.33	1.43
No. of children	1.08	0.79	1.46	0.77	1.38	0.92	0.39	1.37	0.87
Land holdings of households									
Owned land (ha)	0.37	0.95	0.94	2.71	0.42	1.35	0.38	0.57	1.82
Homestead size (a)	3.30	3.23	12.61	39.18	2.33	3.68	0.14	5.37	21.50
Location of households									
Village-1	0.08	0.29	0.46	0.51	0.33	0.47	0.05	0.34	0.48
Village-2	0.33	0.49	0.27	0.45	0.43	0.50	0.26	0.37	0.49
District city	0.58	0.51	0.27	0.45	0.25	0.44	0.06	0.29	0.45
Living condition	0.83	0.39	1.00	0.00	0.94	0.24	0.08	0.95	0.23
Migrants in the HHs	0.25	0.45	0.22	0.42	0.11	0.32	0.23	0.16	0.36

Source: Household survey in 2016/2017.

Notes: Column p-value reports the results for testing the hypothesis of no difference in the observation between wife users, husband users, and non-users subgroups where a Kruskal-Wallis (nonparametric hypothesis) test was applied to all households level variables.

Table 5.4 Estimated coefficients of a set of level variables on the wife and husband use of M-bank

(base model)

Level variables	Wife users[1]	Husband user[1]	
Husband characteristics			
Age	-0.02 (0.06)	-0.01 (0.04)	
Up to secondary	-0.15 (0.68)	0.45 (0.40)	
Above secondary	0.25 (0.87)	0.33 (0.53)	
Office employed	-0.06 (0.73)	0.63 (0.39)	
Self-Business	0.36 (0.59)	1.11 (0.38)	***
Wife characteristics			
Age	0.02 (0.06)	-0.01 (0.04)	
Up to secondary	-0.02 (0.75)	-0.36 (0.44)	
Above secondary	0.97 (0.89)	1.08 (0.61)	*
Office employed	0.79 (1.01)	0.52 (0.74)	
Self-Business	-0.44 (1.33)	-0.52 (0.87)	
Others	-0.20 (0.89)	0.12 (0.53)	
Household characteristics			
Households size	0.16 (0.19)	0.06 (0.12)	
No. of children	-0.27 (0.32)	-0.04 (0.22)	
Owned land (ha)	-0.26 (0.37)	0.04 (0.07)	
Homestead size (a)	-0.01 (0.02)	0.01 (0.01)	
Village-1	-0.68 (0.73)	0.86 (0.44)	**
Village-2	-0.10 (0.51)	0.36 (0.41)	
Living place	-0.34 (0.79)	1.41 (0.85)	*
Migrants in the hhs	0.79 (0.59)	0.88 (0.40)	**
No of observation		**129**	

Source: Household survey in 2016/2017.

Notes: Standard errors are reported in parenthesis. Asterisks *, ** and *** represent significant at 10%, 5% and 1%, respectively. 1) The dependent variables are the wife users of M-bank, and husband users of M-bank that classifies the household as follows: wife/husband users (Y= 1), and wife/husband non users (Y=0).

Table 5.5 Estimated coefficients of a set of relative variables on the wife and husband use of M-bank

(base model)

Relative variables	Wife users[1]		Husband users[1]
Age gap 1 to 8 years	-0.43 (0.71)		-0.43 (0.71)
Age gap 9 to 16 years	-0.60 (0.75)		-0.60 (0.75)
Husband's education higher than wife	-0.04 (0.43)		-0.04 (0.43)
Wife's education higher than husbands	0.83 (0.37)	**	0.83 (0.37)
No of observation		**129**	

Source: Household survey in 2016/2017.

Notes: Standard errors are reported in parenthesis. Asterisks *, ** and *** represent significant at 10%, 5% and 1%, respectively. 1) Refers to Notes 1) in Table 5.4.

Table 5.6 Estimated coefficients of a set of level variables on the wife use of M-bank (probit model)

Level variables	Wife users[1]		
Wives characteristics			
Age	0.01	(0.05)	
Primary to secondary	-0.05	(1.09)	
Above secondary	2.08	(1.17)	*
Office employed	1.49	(1.71)	
Self-Business	-0.94	(2.24)	
Others	-0.62	(1.53)	
Households characteristics			
Households size	0.25	(0.34)	
No. of children	-0.63	(0.58)	
Owned land (ha)	-0.35	(0.59)	
Homestead size (a)	-0.03	(0.03)	
Village-1	-1.26	(1.36)	
Village-2	0.18	(0.89)	
Living place	-0.15	(1.20)	
Migrants in the HHs	1.74	(1.13)	
No of observation	**129**		

Source: Household survey in 2016/2017.

Notes: Standard errors are reported in parenthesis. Asterisks *, ** and *** represent significant at 10%, 5% and 1%, respectively. 1) The dependent variable is the wife users of M-bank that classifies the household as follows: wife users (Y=1), and wife non-users (Y=0).

Table 5.7 Estimated coefficients of a set of level variables on the husband use of M-bank (probit

model)

Level variables	Husband users[1]		
Husband characteristics			
Age	-0.02	(0.02)	
Primary to secondary	0.56	(0.56)	
Above secondary	1.42	(0.70)	**
Office employed	1.15	(0.62)	*
Self-Business	1.66	(0.61)	***
If Muslim	-0.24	(1.35)	
Household characteristics			
Households size	0.09	(0.20)	
No. of children	-0.17	(0.35)	
Owned land (ha)	0.02	(0.13)	
Homestead size (a)	0.03	(0.06)	
Village-1	0.45	(0.65)	
Village-2	-0.25	(0.59)	
Living place	1.82	(1.27)	
Migrants in the HHs	1.29	(0.64)	**
No of observation	**129**		

Source: Household survey in 2016/2017.

Notes: Standard errors are reported in parenthesis. Asterisks *, ** and *** represent significant at 10%, 5% and 1%, respectively. 1) The dependent variable is the husband users of M-bank that classifies the household as follows: husband users (Y=1), and husband non-users (Y=0).

Table 5.8 Estimated coefficients of a set of level and relative variables on the wife and husband use of M-bank (multinomial logit model)

Level and relative variables	Wife users[1]			Husband users[1]		
Husbands variables						
Age	-0.14	(0.21)		0.14	(0.14)	
Primary to secondary	-0.58	(1.95)		2.69	(1.40)	*
Above secondary	0.34	(3.79)		3.65	(2.09)	*
Office employed	0.82	(2.01)		1.09	(0.77)	
Self-Business	1.81	(1.67)		2.38	(0.80)	***
If Muslim	10.21	(5439.54)		1.62	(3.30)	
Wives variables						
Age	0.17	(0.22)		-0.18	(0.14)	
Primary to secondary	-2.42	(2.18)		-1.91	(1.27)	
Above secondary	1.69	(3.83)		-0.03	(2.08)	
Office employed	3.44	(2.24)		1.26	(1.80)	
Self-Business	-4.00	(3.74)		-1.53	(2.00)	
Others	-0.69	(2.01)		-0.03	(1.22)	
Households variables						
Households size	0.69	(0.56)		0.05	(0.26)	
No. of children	-1.37	(0.99)		0.09	(0.46)	
Owned land (ha)	0.00	(0.80)		0.03	(0.14)	
Homestead size (a)	-0.02	(0.07)		0.00	(0.03)	
Village-1	-3.51	(4.01)		1.37	(0.90)	
Village-2	1.21	(1.46)		0.23	(0.85)	
Living place	1.83	(2.37)		17.77	(2372.84)	
Migrants in the HHs	1.90	(1.56)		2.02	(0.86)	**
Age gap between husband and wife						
Age gap 1 to 8 years	0.45	(3.15)		1.58	(2.86)	
Age gap 9 to 16 years	0.79	(2.93)		0.09	(2.26)	
Husband education level higher than wife						
1 school gap	1.41	(1.85)		-0.56	(0.94)	
More than 1 school gap	-14.98	(3120.15)		-0.98	(1.68)	
Wife education level higher than husband						
1 school gap	5.40	(2.53)	**	0.12	(1.04)	
More than 1 school gap	-12.45	(2899.92)		3.17	(1.67)	*
No of observation	**129**					

Source: Household survey in 2016/2017.

Notes: Standard errors are reported in parenthesis. Asterisks *, ** and *** represent significant at 10%, 5% and 1%, respectively. 1) The dependent variable is the use of M-bank for non-user (y =1), husband user (y =2), and wife user (y =3).

Table 5.9 Estimated coefficients of a set of level and relative variables on the wife and husband use

of M-bank (Alternative model, by omitting wife's education level)

Level and relative variables	Wife user[1]			Husband user[1]		
Husband characteristics						
Primary to secondary	-0.49	(0.56)		0.71	(0.38)	*
Above secondary	0.59	(0.71)		1.17	(0.55)	**
Office employed	0.58	(0.71)		0.65	(0.39)	*
Self-Business	0.74	(0.57)		1.10	(0.38)	***
Wife characteristics						
Primary to secondary						
Above secondary						
Office employed	0.46	(0.82)		0.78	(0.72)	
Self-Business	-1.50	(1.14)		-0.45	(0.93)	
Others	-0.72	(0.65)		-0.15	(0.56)	
Household characteristics						
Households size	0.12	(0.17)		0.02	(0.12)	
No. of children	-0.43	(0.30)		0.03	(0.22)	
Owned land (ha)	-0.07	(0.29)		-0.01	(0.07)	
Homestead size (a)	0.00	(0.01)		0.00	(0.01)	
Village-1	-0.83	(0.77)		0.46	(0.40)	
Village-2	0.40	(0.55)		0.11	(0.40)	
Living place	-0.18	(0.82)		1.67	(1.06)	
Migrants in the hhs	0.01	(0.48)		1.21	(0.40)	***
Age gap between husband and wife						
Age gap 1 to 8 years	0.27	(0.90)		-1.46	(1.07)	
Age gap 9 to 16 years	0.39	(0.92)		-1.62	(1.07)	
Husband education level higher than wife						
1 school gap	0.07	(0.65)		-0.06	(0.41)	
More than 1 school	-5.07	(40364.62)		-0.53	(0.64)	
Wife education level higher than husband						
1 school gap	1.73	(0.62)	***	-0.70	(0.44)	
More than 1 school	-6.49	(53323.00)		1.34	(0.58)	**
No of observation			**129**			

Source: Household survey in 2016/2017.

Notes: Standard errors are reported in parenthesis. Asterisks *, ** and *** represent significant at 10%, 5% and 1%, respectively. 1) Refers to Notes 1) in **Table 5.4**.

Table 5.10 Estimated coefficients of a set of level and relative variables on the wife and husband use of M-bank (Alternative model, by omitting husband's education level)

Level and relative variables	Wife user[1]			Husband user[1]		
Husband characteristics						
Primary to secondary						
Above secondary						
Office employed	0.74	(0.68)		0.61	(0.39)	
Self-Business	0.97	(0.59)	*	1.17	(0.38)	***
Wife characteristics						
Primary to secondary	-1.75	(0.81)	**	-0.06	(0.38)	
Above secondary	-0.06	(0.78)		1.11	(0.53)	**
Office employed	0.57	(0.89)		0.85	(0.73)	
Self-Business	-2.17	(1.39)		-0.58	(0.99)	
Others	-0.69	(0.66)		0.05	(0.55)	
Household characteristics						
Households size	0.18	(0.19)		0.00	(0.12)	
No. of children	-0.43	(0.31)		0.11	(0.23)	
Owned land (ha)	0.07	(0.25)		0.00	(0.07)	
Homestead size (a)	0.00	(0.01)		0.00	(0.01)	
Village-1	-1.23	(1.20)		0.67	(0.42)	
Village-2	0.43	(0.49)		0.22	(0.39)	
Living place	0.01	(0.80)		1.55	(1.00)	
Migrants in the HHs	-0.12	(0.57)		1.05	(0.39)	***
Age gap between husband and wife						
Age gap 1 to 8 years	0.42	(1.07)		-1.03	(0.97)	
Age gap 9 to 16 years	0.14	(1.17)		-1.37	(0.98)	
Husband education level higher than wife						
1 school gap	0.39	(0.56)		0.45	(0.39)	
More than 1 school	-6.95	(1236407.00)		0.08	(0.60)	
Wife education level higher than husband						
1 school gap	2.44	(0.86)	***	-0.56	(0.45)	
More than 1 school	-6.37	(704533.60)		0.66	(0.59)	
No of observation			**129**			

Source: Household survey in 2016/2017.

Notes: Standard errors are reported in parenthesis. Asterisks *, ** and *** represent significant at 10%, 5% and 1%, respectively. 1) Refers to Notes 1) in **Table 5.4.**

Chapter 6

Relationship between the Use of M-bank and Wife's Socio-economic Status in the Male-headed Household

6.1 Background

M-bank facilitates a variety of financial transactions via mobile phone, including purchasing talk time, recharging SIM, paying bills, and transferring money between individuals. Although the target of introducing M-bank is "banking the unbanked", the evidence showed that M-bank users were wealthier, better educated and migrant households at the time of introduction of the use of M-bank (see in detail in Chapter 4). It is also found that the households are using M-bank mainly for personal money transactions in the survey area. The use of M-bank might have no contribution to generating household income through enhancing business activities. Interestingly, female-headed households are more likely to use M-bank. Regardless of that, a significant gender gap exists in individual use of M-bank within male-headed households (see in detail in Chapter 5). The empirical analysis for Chapter 5 suggested that a higher educated wife has an influence on the use of M-bank in male-headed households in rural areas of northern Bangladesh. Self-business managed by a husband, and presence of migrants have positive effects on the husband's use of M-bank. This is not the case for the wife's use of M-bank. In recent years, wife's economic contribution to family resources and her involvement in the household decision-making increased remarkably (Mahmud et al., 2012; Majlesi, 2016; Meekers and Oladosu, 1996; Oyediran, 1998); however, it is still unclear that M-bank has truly reached the poor, especially to wives in a household in such patriarchal society as Bangladesh.

There is vast research on the female financial inclusion and improvement in their socio-economic status in developing countries (Deloach and Lamanna, 2011; Imai et al., 2010; Morduch, 1999; Rutherford, 2000). According to Littlefield et al. (2003), direct access to financial services to

the wife can directly increase income and influence the decision making in the family, contributing indirectly to improving education and health. However, no empirical study is available about the relationship between the use of M-bank and the wife's socio-economic status in households in northern Bangladesh.

6.2 Purpose of the Study

This chapter aims to investigate the relationship between the use of M-bank and the wife's socio-economic status in the rural household. The analysis is based on the comparison of a set of relevant variables across the three sub-groups of households: a) wife users, b) husband users, and c) non-users.

6.3 Data

The cross-sectional dataset was constructed by the data collected from 129 male-headed households. Recall that the number of observations by sub-group is: 12 for wife users, 37 for husband users and 80 for non-users.

Most of the data for wife's socio-economic status in our data were obtained by asking each wife surveyed whether she agrees on the question provided; i.e., "Did you have business training?", or "Do you have your own income?", with 2 possible answers: "yes" or "no".

The data include the income-related decision, membership in a business association, freedom of decision on expenditures (i.e., savings/investment and consumption), mobility, and constraints for her decision. Savings and investment for more productive purposes are assumed to reflect the wife's behavior when she can afford to allocate income for purposes other than daily consumption items. The wife may spend part of earnings from any income source to save for future uses (e.g., children education and family members' diseases or injuries, repair of houses, marriages, and deaths) or to purchase assets for agriculture or in nonfarm business. Savings are expected to mitigate unexpected

events or loss (e.g., damages due to natural disasters). Spending on assets can lead to an increase in income and is viewed as an investment in the long run. On the other hands, expenditure (e.g., expenditure on daily necessities, education, health, and luxury items) is regarded as spending for comparatively less productive purposes in the short-run. Luxury items include cloth and other stuff for the festivals to maintain socio-cultural and personal interest. Both savings and investment and expenditure are made in the process of the household decision making in association with wife's economic status within the household. For example, a wife who earns money from her own income as a primary source and has money from a secondary source such as from parents or her husband could spend money not only for her family but also for herself. However, apparently, savings and investment, and expenditure are tradeoffs in family budget allocation, and both are associated with the wife's level of socio-economic status in the household and at the same time reflect household's wellbeing. Thus, caution is needed in interpreting the results.

6.4 Methods

Because most of the wife's socio-economic status variables are characterizes as categorical ("0" or "1"), a nonparametric, Kruskal-Wallis test is employed to investigate a statistically significant difference in wife's socioeconomic status across the three sub-groups. The null hypothesis is that there is no difference in the center of the distribution for the variable of interest.

6.5 Results and Discussion

Table 6.1a, **Table 6.1b**, **and Table 6.1c** summarize the results for wife's socio-economic characteristics across the three sub-groups: wife users, husband users, and non-users.

(a) Income-related Decision

Table 6.1a illustrates that the wife user households are found more likely to be involved in the

income-related decision; however, the hypothesis of no difference in response across sub-groups is not rejected for any other variables than having training. This suggests that while the wife's position in the income-related decision process may be related to the use of M-bank, such a relation is rarely significant. A large difference is found only for having training between the wife user sub-group and the other two sub-groups. Wives using M-bank are more likely to participate in training for handicrafts, cutting, knitting and microfinance-related activities than wives using no M-bank. Although not statistically supported, wife user households are found to prefer to use their income more in savings and investment on domestic animal, inputs for farmland and non-farm business activities in rural areas.

(b) Expenditure-related Decision

Table 6.1b shows that the wife user households are found more likely to be involved in the expenditure-related decision. The hypothesis of no difference in response across sub-groups is rejected for having a small expense, education, shopping luxury products and decision on spending jointly with a husband. Among the wife user households, 75 % of wives spend on household education and 42% spend on expensive items, while such figures are 43% and 19% for the husband user households and 31% and 8% for the non-user households. The same ordering, though not statistically supported, was found as for a personal decision on expenditure: 58%, 32%, and 34% for wife users, husband users and non-users, respectively. On the contrary, though not statistically supported either, the percentage of spending on daily necessities is the highest for the non-user households, 81%, followed by 70% for the husband user households and 58% for the wife user households. The same ordering with no statistical significance is also found for the husband's decision on expenditure: 17%, 22%, and 29% for wife users, husband users and non-users, respectively. These are expected results.

There are some noteworthy findings. First, regardless of M-bank use status, wives are less likely to spend on savings and investment; 8%, 3% and 5% for wife users, husband users, and non-users,

respectively. The majority of wives prefer to spend money on luxury items to saving and investing. Second, the mean value of decision on expenditure jointly with a husband is the highest, 41%, which is significantly higher than 17% for wife users and 16% for non-users. This implies that couples' joint decision is likely to take place in the household where only a husband uses M-bank. This further suggests that a wife using M-bank is more likely to make a decision independently while a wife in the household where neither a husband nor a wife uses M-bank is more likely obedient to her husband in the household decision process than a wife in the household where at least one person uses M-bank.

(c) Freedom of Mobility

Table 6.1c shows that the freedom to go outside is surprisingly low; 17%, 8% and 11% for wife users, husband users, and non-users, respectively, with evidence of no significant difference in response across these sub-groups. Most of the wives do not feel free to go outside. It is also found that the wife users of M-bank are more likely to have specific reasons or feel obstacles for her mobility; however, the hypothesis of no difference in response across sub-groups is rejected only for a financial problem. A financial problem for working outside is felt most likely among wives among the nonuser households than those among the other user households.

Religious factors are viewed as the main reason for no freedom to go outside by 58% of wives who use M-bank. This figure is higher than those for the wives who do not use M-bank (24% for husband users, and 30% for non-users), though the difference is not rejected across the three sub-groups at a 5% significant level. Almost the same pattern is seen for family and work pressure: 58%, 30% and 26% for wife users, husband users, and nonusers, respectively. Overall, wives who use M-bank are more likely to feel that social factors are obstacles to their mobility, while wives who do not use M-bank are more likely to feel that economic factors are obstacles to their mobility.

Nonetheless, evidence of no difference in response for all non-economic reasons or obstacles

for her mobility implies that regardless of her status in M-bank use, wife's behavior outside the home is restricted by social rules such as religious practice, customs, and norms. In fact, in Bangladesh, the practice of purdah/hijab (cover their bodies) confines a wife within the homestead. A wife generally needs permission from either her husband, parents-in-law, or her parents, and at least she is obliged to inform them of her going outside. It is often considered better not to move or go outside for women. An employed wife who needs to go to work outside may feel the barriers existing in society (Mahmud and Sultan, 2010). Furthermore, it is recognized that social status is also correlated with female freedom of mobility. Highly educated, wealthier women who belong to higher social status have greater autonomy. On the other hand, it is reported that the poorest wife, with lower social status, has relatively greater mobility outside the home, probably related to her greater participation in the workforce (Balk, 1997). Middle-class families who care more about socio-cultural, and religious norms and values often create restrictions on female freedom of mobility.

Overall, some of these previous findings may be marginally supported in our data, though are not statistically confirmed, if we can re-categorize the three sub-groups based on relative income levels: wife user households by wealthier families, husband user household by middle-class families and nonuser households by poor families.

(d) Purpose of the Use of M-phone

Table 6.2a summarizes the comparisons of the three sub-groups in mobile phone usages. It was confirmed through our interview that they bought and have been using M-phone mainly to communicate with their family members and friends. The results from the present comparison analysis reinforced this. All husbands in both sub-groups of wife users and household users use M-phone to call. Also, all wives in the wife user households use M-phone to call, too. But the percentage of M-phone use for calling is 65% for wives in the husband user households and 44% for wives in the nonuser households. Husbands are more likely to use M-phone for calling than wives. The next

frequent use occurs for purchase; 22% of the total of 129 husbands use M-phone for purchase while only 7 % of wives do so. All other purposes for M-phone use show less than 10 % for both husbands and wives in total households. In particular, fewer use M-phone for SMS; 4% for both husbands and wives in total.

The husbands are more likely to use M-phone than wives for any purpose. Among sub-groups, the wife user households are more likely to use M-phone than other two sub-group households for any other purposes than SMS. There is a larger difference in the wife's use of M-phone across the three sub-groups. While wives who use M-bank, have been using M-phone for various purposes, wives who do not use M-bank have been using M-phone mainly for calling. This is supported by that hypothesis test results such that the null hypothesis of no difference in response across sub-groups is rejected for all purposes.

Table 6.2b provides the summary of individual spending on mobile usage including both the M-phone and M-bank expenses across the three sub-groups. The husband's expense is greater in the wife user households than in other sub-groups, and the difference across sub-groups is statistically significant. The same pattern is seen for the wife's expense, though the difference across sub-groups is statistically insignificant. This result may reflect the higher economic status of wives who use M-bank.

A husband is more likely to spend money on mobile usage than a wife within the household. This may reflect the feature in a patriarchal society; a husband mainly controls the household budget. Sometimes a wife uses the husband's money to use and recharge their mobile phone or other expenses.

As seen in **Table 6.2c,** a significant difference is found for monthly surplus and shortage across the three sub-groups. It is found that the wife user households are more likely to have monthly surplus while the husband and non-user households are more likely to have more shortage. This implies that the categorization mentioned above is legitimate. That is, based on relative income levels, wife user

households, husband user households, and nonuser households, respectively, can be re-categorized by wealthier families, middle-class families, and poor families.

(e) Purpose of the Use of M-bank

Table 6.3a shows the comparisons of wife user households and husband user households in purposes of M-bank use. The chief purpose of the use M-bank is money transfer; 67% for husbands and 9% for wives. M-bank is less likely to be used for savings; 2% for husbands and 1% for wives. So is for other purposes. It is noteworthy that all wives who use M-bank use it for money transfer. It is confirmed through the interview that such a wife tends to save money by purchasing airtime in the SIM cards and prefer to use M-bank to buy for various purchases such as megabytes for internet, school fees, etc.

6.5.1 Summary and Discussions

The results from the comparison analysis of the three sub-groups (wife users, husband users, and nonusers) in wife's socio-economic factors suggest that wife's socio-economic status may be marginally related to the use of M-bank. This conclusion is drawn from the following findings. First, the wife's decision/choice on income and mobility is related to the use of M-bank, though not statically significant for most relevant variables. Wives using M-bank are more likely to participate in training for handicrafts, cutting, knitting and microfinance-related activities than wives using no M-bank. Although not statistically supported, wives using M-bank prefer to use their income more in savings and investment in farming and other business activities. Second, compared with wives who do not use M-bank, wives who use M-bank are more likely to have the small expense and to be involved in the decision on expenditure for education and purchasing luxury products; which is statistically confirmed. Third, wife users of M-bank are more likely to feel that social factors are obstacles to their mobility, while wives who do not use M-bank are more likely to feel that economic

factors are obstacles to their mobility. Forth, wife users of M-bank are more likely to use M-phone than wives who do not M-bank for any other purposes than SMS. Sixth, the wife user households are more likely to have monthly surplus while the husband and non-user households are more likely to have more shortage. This implies that based on relative income levels, wife user households, husband user households, and nonuser households could be viewed as wealthier families, middle-class families and poor families, respectively. Because all the wives who use M-bank belong to wife user households, they are regarded as part of wealthier families.

It should be also noted that evidence of no difference in response across the three sub-groups with respect to many wife's socio-economic status variables implies that regardless of her status in M-bank use, wife's behavior is restricted by social rules such as religious practice, customs, and norms. This result may reflect the Bangladeshi patriarchal society, where regardless of the wife's status, the household head or elder's head is the main decision-maker in the family.

All these findings can help understand the relationships between the wife's socio-economic position within the household and the use of M-bank more explicitly. However, the comparison analysis across sub-groups cannot provide any evidence of causal relations such as an effect of wife's M-bank use on her socio-economic position within the household, thereby on household's well-being. Further research is required to assess an effect of wife's M-bank use on her status within the household or household's well-being in a solid econometric manner relying on relevant data.

Table 6.1a Comparison in wife's socio-economic characteristics across the three sub-groups of M-bank

Sub-group	Wife users		Husband users		Non-users		Kwallis	Total HHs	
No of observations	12		37		80			129	
Variable	Mean	SD	Mean	SD	Mean	SD	P-value	Mean	SD
Income related variables									
Having training	0.83	0.39	0.38	0.49	0.18	0.38	<0.001	0.29	0.46
Having income	0.75	0.45	0.49	0.51	0.58	0.50	0.27	0.57	0.50
Having self-business	0.42	0.51	0.19	0.40	0.26	0.44	0.29	0.26	0.44
Contribute to household	0.67	0.49	0.54	0.51	0.58	0.50	0.75	0.57	0.50
Freedom to sell asset	0.58	0.51	0.54	0.51	0.54	0.50	0.96	0.54	0.50
Having membership	0.50	0.52	0.35	0.48	0.36	0.48	0.63	0.37	0.49
Membership in business association									
Micro-finance institution	0.33	0.49	0.32	0.47	0.33	0.47	1.00	0.33	0.47
Mutual business	0.33	0.49	0.32	0.47	0.33	0.47	1.00	0.33	0.47
Others	0.17	0.39	0.00	0.00	0.04	0.19	0.03	0.04	0.19

Source: Households survey 2016/17.
Notes: Column P-value reported Kruskal-Wallis test showing statistically significant difference between subgroups.

Table 6.1b Comparison in wife's socio-economic characteristics across the three sub-groups of

M-bank

Sub-group	Wife users		Husband users		Non-users			Total HHs	
No of observations	12		37		80		Kwallis	129	
Variable	Mean	SD	Mean	SD	Mean	SD	P-value	Mean	SD
Expenditure related variables									
Freedom to spend	0.58	0.51	0.57	0.50	0.54	0.50	0.93	0.55	0.50
Have small expense	0.33	0.49	0.41	0.50	0.14	0.35	<0.01	0.23	0.42
Decision on spend									
Personally	0.58	0.51	0.32	0.47	0.34	0.48	0.23	0.36	0.48
With husband	0.17	0.39	0.41	0.50	0.16	0.37	0.01	0.23	0.42
Husband	0.17	0.39	0.22	0.42	0.29	0.46	0.54	0.26	0.44
With other members	0.08	0.29	0.22	0.42	0.24	0.43	0.48	0.22	0.41
With outsiders	0.00	0.00	0.00	0.00	0.01	0.11	0.74	0.01	0.09
Reject to answer	0.00	0.00	0.05	0.23	0.06	0.24	0.67	0.05	0.23
Expenditure on self-consumption in less productive purposes*									
Daily expenses	0.58	0.51	0.70	0.46	0.81	0.39	0.14	0.76	0.43
Education	0.75	0.45	0.43	0.50	0.31	0.47	0.01	0.39	0.49
Health	0.25	0.45	0.19	0.40	0.29	0.46	0.53	0.26	0.44
Luxury product	0.42	0.51	0.19	0.40	0.08	0.27	<0.01	0.14	0.35
Save and buy asset	0.08	0.29	0.03	0.16	0.05	0.22	0.70	0.05	0.21

Source: Households survey 2016/17.
Notes: Column P-value reported Kruskal-Wallis test showing statistically significant difference between subgroups. *Expenditure on self-consumption in less productive purposes include wife who be involved in income activities and who do not have any incoming source. All variable are dummy variables, Yes=1, 0 otherwise.

Table 6.1c Comparison in wife socio-economic characteristics across the three sub-groups of M-bank

Sub-group	Wife users		Husband users		Non-users			Total HHs	
No of observations	12		37		80		Kwallis	129	
Variable	Mean	SD	Mean	SD	Mean	SD	P-value	Mean	SD
Freedom of Mobility									
Feel free to go outside	0.17	0.39	0.08	0.28	0.11	0.32	0.70	0.11	0.31
Reasons not feeling free to go outside									
Religious factor	0.58	0.51	0.24	0.43	0.30	0.46	0.08	0.31	0.46
Social barrier	0.33	0.49	0.30	0.46	0.31	0.47	0.97	0.31	0.46
Need permission	0.50	0.52	0.43	0.50	0.31	0.47	0.27	0.36	0.48
Insecurity	0.50	0.52	0.35	0.48	0.33	0.47	0.50	0.35	0.48
Obstacles faced to work/start work									
No obstacles	0.33	0.49	0.22	0.42	0.18	0.38	0.43	0.20	0.40
Financial problem	0.17	0.39	0.22	0.42	0.44	0.50	0.03	0.35	0.48
Lacks information	0.08	0.29	0.19	0.40	0.19	0.39	0.67	0.18	0.38
Family and work pressure	0.58	0.51	0.30	0.46	0.26	0.44	0.08	0.30	0.46
Lacks initial fund	0.08	0.29	0.05	0.23	0.13	0.33	0.49	0.10	0.30
Lacks cooperation	0.50	0.52	0.24	0.43	0.25	0.44	0.18	0.27	0.45
Others	0.08	0.29	0.22	0.42	0.19	0.39	0.59	0.19	0.39

Source: Households survey 2016/17.
Notes: Column P-value reported Kruskal-Wallis test showing statistically significant difference between subgroups. All variable are dummy variables, Yes=1, 0 otherwise.

Table 6.2a Comparisons of the purpose of using M-phone across the three sub-groups of M-bank

Sub-group	Wife users		Husband users		Non-users			Total HHs	
No of observations	12		37		80		Kwallis	129	
Variable	Mean	SD	Mean	SD	Mean	SD	P-value	Mean	SD
Husband's purpose of using M-phone									
Calling	1.00	0.00	1.00	0.00	0.70	0.46	<0.001	0.81	0.39
SMS	0.00	0.00	0.05	0.23	0.04	0.19	0.70	0.04	0.19
Purchase	0.67	0.49	0.57	0.50	0.00	0.00	<0.001	0.22	0.42
Information	0.25	0.45	0.03	0.16	0.09	0.28	0.06	0.09	0.28
Others	0.17	0.39	0.14	0.35	0.05	0.22	0.18	0.09	0.28
Wife's purpose of using M-phone									
Calling	1.00	0.00	0.65	0.48	0.44	0.50	<0.001	0.55	0.50
SMS	0.17	0.39	0.05	0.23	0.01	0.11	0.03	0.04	0.19
Purchase	0.58	0.51	0.00	0.00	0.03	0.16	<0.001	0.07	0.26
Information	0.25	0.45	0.00	0.00	0.03	0.16	<0.001	0.04	0.19
Others	0.25	0.45	0.00	0.00	0.03	0.16	<0.001	0.04	0.19

Source: Households survey 2016/17.
Notes: The variables are dummy variables, Yes=1, 0 otherwise.

Table 6.2b Comparisons of monthly mobile expenses across the 3 sub-group of M-bank

Sub-group	Wife users		Husband users		Non-users			Total HHs	
Observation	12		37		80		Kwallis	129	
Variable	Mean	SD	Mean	SD	Mean	SD	P-value	Mean	SD
Husband mobile	2113	3362.77	1043	1742.69	346	633.97	<0.001	710	1540.47
Wife mobile expense	383	562.15	143	135.74	231	251.60	0.26	226	300.68

Source: Households survey 2016/17.
Notes: Monthly mobile expense is a numerical variable included both the M-phone and M-bank expenses calculated in taka (1 taka= 0.73 yen).

Table 6.2c Comparisons in the M-phone usage characteristics across the 3 sub-group of M-bank

Sub-group	Wife users		Husband users		Non-users			Total HHs	
Observation	12		37		80		Kwallis	129	
Variable	Mean	SD	Mean	SD	Mean	SD	P-value	Mean	SD
Husband use of M-phone									
M-phone user	1.00	0.00	1.00	0.00	0.71	0.46	<0.001	0.82	0.38
One M-phone	0.75	0.45	0.89	0.31	0.71	0.46	0.10	0.77	0.42
More than one M-phone	0.25	0.45	0.11	0.31	0.00	0.00	<0.001	0.05	0.23
Wife use of M-phone									
M-phone user	1.00	0.00	0.65	0.48	0.44	0.50	<0.001	0.55	0.50
One M-phone	0.92	0.29	0.62	0.49	0.43	0.50	<0.003	0.53	0.50
More than one M-phone	0.08	0.29	0.03	0.16	0.01	0.11	0.31	0.02	0.15
Households variable									
Monthly surplus	0.83	0.39	0.57	0.50	0.45	0.50	0.04	0.52	0.50
Monthly shortage	0.17	0.39	0.43	0.50	0.55	0.50	0.04	0.48	0.50

Source: Households survey 2016/17.

Table 6.3a Comparisons of the purpose of the use M-bank within wife user and husband user households of M-bank

Sub-group	Wife users		Husband users		Total HHs	
Observation	12		37		129	
Variable	Mean	SD	Mean	SD	Mean	SD
Husband purpose of using M-bank						
Money transfer	0.67	0.49	0.92	0.28	0.33	0.47
Savings	0.08	0.29	0.03	0.16	0.02	0.12
Other	0.00	0.00	0.11	0.31	0.03	0.17
Wife purpose of using M-bank						
Money transfer	1.00	0.00	xx	xx	0.09	0.29
Savings	0.08	0.29	xx	xx	0.01	0.09
Other	0.08	0.29	xx	xx	0.01	0.09

Source: Households survey 2016/17
Notes: The variables are dummy variables, Yes=1, 0 otherwise. In husband user households, there is no wife user of M-bank. Wife user subgroup include both husband and wife M-bank user, and only wife user of M-bank. Both couples and only wife M-bank users' household are combined hypothesizing that these households' wife is respective, has equal decision-making power with their husbands in their households.

Table 6.3b Comparisons in the use of M-bank within wife user and husband user households of M-bank

Sub-group	Wife users		Husband users		Total HHs	
Observation	12		37		129	
Variable	Mean	SD	Mean	SD	Mean	SD
Husband use of M-bank						
M-bank user	0.67	0.49	1.00	0.00	0.35	0.48
One M-bank	0.50	0.52	0.89	0.31	0.30	0.46
More than one M-bank	0.17	0.39	0.08	0.28	0.04	0.19
Wife use of M-bank						
M-bank user	1.00	0.00	xx	xx	0.09	0.29
One M-bank	0.67	0.49	xx	xx	0.06	0.24
More than one M-bank	0.33	0.49	xx	xx	0.03	0.17

Source: Households survey 2016/17.

Chapter 7

Summary, Conclusions, and Recommendations

7.1 Summary

In 2011, Bangladesh central bank (Bangladesh Bank) introduced mobile-banking (M-bank) to provide banking services to larger populations by mobile phone (Aker and Mbiti, 2010; Yu, 2012). Previous studies showed that the use of M-bank can increase production, marketing, and small business directly or expenditure on food, health, and nutrition indirectly in rural areas of developing countries (Blumenstock, 2016; Munyegera and Matsumoto, 2016). In northern Bangladesh, such evidence, especially for the rural females, is still lagging. The main goal of this research is to find out whether household characteristics, especially, gender differences within households have crucial roles in the use of M-bank in the rural areas of northern Bangladesh. A face-to-face questionnaire survey was conducted for 153 households level data during the period from December 2016 to January 2017 in two villages: Gilabari, Akhanagar, and one urban ward: Collegepara of Thakurgaon District located in the northern region in Bangladesh. To achieve the purpose, the 3 studies were specified: i) analysis of the determinants of M-bank use, ii) analysis of the effect of gender difference on M-Bank use, and iii) inquiry into the relationship between M-bank use and wife's socio-economic status. A short summary of studies i) to iii) of the research is explained briefly in this section.

Study i) empirically investigated the determinants at the introduction of the use of M-bank by using household characteristics as of 2010 such as the use of mobile phone, household head's education, and occupation, age, etc. It was found that about 50% of the households surveyed had M-bank accounts at the time of the survey, the higher rate exists in the town than villages. The effects of the variables were investigated by econometric models considering three categories of using status: early-users (2011-2013), late-users (2014-2016/17), and non-users. Main results from the estimation

of several empirical models are as follows. The early-users are more likely to be characterized by mobile phone users and household head females which have both statistically significant effects in all stages on the use of M-bank. However, the household head's occupation has no significant effect. For example, household heads engaged in agriculture, self-managed business and services in 2010 are less likely to be M-bank users. The main purpose of the use of M-bank was found to be personal money transaction (e.g., to exchange remittance). Also, older or more educated household heads, with larger households are more likely to use M-bank during the later period. Female-headed households are more likely to use M-bank because of getting financial support from the government.

Because the individual use of M-bank was expected to help to understand the gender differences more explicitly, study ii) was designed to explore the issue of gender differences on the use of M-bank within 129 male-headed households. The study results found remarkable gender differences on the use of M-bank between the wife and the husband within the household; the M-bank rate of the wife to the husband was 4:15. Households' characteristics, in addition to individual characteristics of husbands and of wives, were considered as possible determinants of M-bank use. Households were categorized into 3 subgroups: wife user, husband user (no use by a wife), and non-user (no use by both a wife and a husband). The explanatory variables are also defined as level and relative variables. Level variables are the individual and household characteristics while relative variables are the husband and wife's relative differences in characteristics for age, education. Two equations probit models were applied as a base model to find out the effects of these characteristics on either husband's or wife's use of M-bank. Higher educated husband, doing self-business, having a migrant family member (the children or other members living outside who may contribute to improving the livelihood of the family through their remittance) are found to be major determinants of husband's M-bank use. On the other hand, living in urban areas and having higher education have significant positive effects on wife's use of M-bank. Furthermore, if the wife is more educated than her husband,

the likelihood of wife's use of M-bank increases. In such a case, the husband also tends to use M-bank individually.

Study iii) relied on the same restricted data as for study ii). The results from the comparison analysis of the three sub-groups (wife users, husband users, and non-users) in wife's socio-economic factors suggest that wife's socio-economic status may be marginally related to the use of M-bank. This conclusion is drawn mainly from the following findings. First, wife's decision/choice on income and mobility is related to the use of M-bank, though not statically significant for most relevant variables. Second, though not statistically supported, wives using M-bank prefer to use their income more in savings and investment in farming and other business activities. Interestingly, wife users who don't have their own income prefer to spend on education and buying luxury items which is statistically confirmed. Third, wife users of M-bank are more likely to feel that social factors are obstacles to their mobility, while wives who do not use M-bank are more likely to feel that economic factors are obstacles to their mobility. Forth, the wife user households are more likely to have monthly surplus while the husband and non-user households are more likely to have more shortage. This implies that based on relative income levels, wife user households, husband user households, and non-user households could be viewed as wealthier families, middle-class families, and poor families respectively. Because all of the wives who use M-bank belong to wife user households, they are regarded as part of wealthier families, suggesting the existence of a positive correlation between M-bank use and income level.

7.2 Conclusions

In the surveyed area, M-bank has not been effectively used in generating household income through enhancing business activities. Rather the main purpose of using M-bank for personal money transaction with migrant family members. For example, female-headed households are more likely

to use M-bank for getting the income transfer from the government. These findings suggest that the extent that the use of M-bank has contributed to financial inclusion among rural households in the study area is limited.

The other noteworthy finding is that a gender gap exists in the use of M-bank. Wife's use of M-bank is quite limited compared with husband's use of M-bank. The determinants of wife's use of M-bank differs from for household's use of M-bank. Type of jobs and having migrants in the family are very important factor for the household's use, while wife's educational status significantly contributes to the likelihood of wife's use of M-bank in the male-headed household. Among wives, the wife with higher educational attainment is more likely to use M-bank individually. Further, if she is more educated than her husband, she is more likely to individually use M-bank. And interestingly, so is her husband. One plausible reason for this is that a highly educated wife is more likely to have bargaining power in the decision-making process within the household. This is because she has office job in cities and gets her own salary that would facilitate her choice in financial issues including M-bank use.

However, presently, even if the wife is highly educated, have her own salary and is using the M-bank, her bargaining power in the household decision-making is limited in the surveyed area. Evidence of no difference in response across the three sub-groups was hardly found for most of wife's socio-economic status variables. Interestingly, the wife who uses M-bank is found to be more likely to feel that social factors are obstacles to her mobility than the wife who does not use M-bank. This result may be a reflection of the Bangladeshi patriarchal society under the Islamic tradition, where regardless of wife's status (including the use of M bank), the household head or elder's head is the main decision-maker in the family.

It can be concluded that an impact of the use of M-bank on rural livelihood in northern Bangladesh has been still limited. Its impact on financial inclusion is limited because M-bank has

currently been used mainly for personal transaction and little for business activities. Its impact on the improvement of household's wellbeing is also limited due partially to the presence of social and cultural restrictions on wife's choice/decision on family budget allocation and her mobility outside home in the patriarchal society.

These suggest that socio-economic development (e.g. poverty reduction, improvement of household wellbeing) through financial inclusion associated with the diffusion of new technology such as M-bank require the expansion of business opportunities coupled with trainings in managerial skills and entrepreneurship and women's empowerment in rural society in northern Bangladesh.

7.3 Limitation of the Study

Due to the time and data constraints, the study was conducted subject to the following limitations:

I. The focus of this study was placed on the poor and female for financial inclusion. The role of intermediaries or agents is also important because it might influence the use of M-bank for the rural poor.

II. Some village farmers did not record their production performance. The researcher had to depend on the data from respondents who recorded and answered such questions for our face-to-face questionnaire survey. Thus, our data may have selection bias inherent in no response errors.

III. Limited time and data constraints did not allow for a comprehensive study in full depth and width.

7.4 Recommendations

Nowadays all kinds of people are being interested in using the latest mobile technology (Baabdullah et al., 2019). However, in spite of opportunities, there exist major shortcomings such as network

coverage, security, low-cost effectiveness, inconvenience in using a mobile handset, education and knowledge about information and technology, etc. On the basis of the foregoing discussion, the following recommendations are provided for the policymakers.

i. Strengthening training program regarding the use of technology and financial services

Government and NGOs can arrange education and training programs for the females and rural farmers about latest banking using technology among local people in remote rural areas.

ii. The low price of financial services

Pricing structure must be transparent. The middleman or agent charging unfair costs, cheating by fake people should be minimized in occurrence.

iii. Increasing security and trust

Efforts to increase the security of M-bank and trustworthy behavior of agents and bankers will strengthen the advantage of M-bank for different categories of users.

iv. Enacting proper laws and regulation

To avoid fraud activity, the government should establish laws and regulation which ensure the safety of personal information of M-bank users.

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Appendix I: Additional Information

Table A.1 Description of the variables of Chapter 4

Variable	Description
Socio-demographic variables of household (HH) in 2010	
HHhead age	Age of household head
HHhead sex	1 if head is male
Household size	Total members in the HH
No. of children	Total children in the HH
Educational attainment of household head in 2010 (dummy variables)	
No	None
Primary	1 if had 1 - 5 years of schooling
Secondary	1 if had 6 - 10 years of schooling
Higher	1 if had longer than 10 years of schooling
Occupation of household head in 2010 (dummy variables)	
Agriculture	Farmer
Labor	Labor
Self-managed business	Self-managed business
Office employed	Office employee
Others	Politics, cooperative members
Student	Student
Unemployed	Unemployed
Mobile phone use in the household in 2010 (dummy variables)	
HH M-phone use	HH uses any mobile-phone
Land holdings of household in 2016	
Owned land (hector)	Owned land size
Homestead (acre)	Size of homestead land
Location of household in 2016 (dummy variables)	
Village-1	Gilabary
Village-2	Akhanagar
District town	Collegepara

Table A.2 Description of the variables of Chapter 5

Level variable	Description
Husband's and wife's characteristics	
Mobile phone use (dummy variables)	
The use of M-phone	1 if husband/wife is using M-phone
Age	Age of husbands
Educational attainments in schooling (dummy variables)	
No education	1 if no education, 0 otherwise
Up to secondary	1 if 1-10 years of schooling
Above secondary	1 if more than 10 years of schooling
Main job sector (dummy variables)	
Agriculture	Farmer
Non-agriculture	
Skilled	Office employed
	Self-business
Non-skilled	labor
Others	Politics, students, unemployed etc.
Religion	1 if husband/wife is Muslim, 0 otherwise
Households' variable	
Households size	Total members in the hhs
No. of children	Total childrens in the hhs
Land holdings of households	
Owned land (ha)	Owned land size
Homestead size (a)	Size of Homestead
Location of households	
Village-1	Gilabary
Village-2	Akhanagar
District city	Collegepara
Living condition	1 if couple living together
Migrants in the hhs	Having migrant family members in the hhs
Relative variable	
Age gap 1 to 8 years	If yes=1, 0 otherwise
Age gap 9 to 16 years	If yes=1, 0 otherwise
Husband's education higher than wife	If yes=1, 0 otherwise
Wives education higher than husbands	If yes=1, 0 otherwise

Table A.3 Wife socio-economic variables description of Chapter 6

Variable	Variable Description
Income related variables	
Having training	1 if having training, 0 otherwise
Having income	1 if having income, 0 otherwise
Having self-business	1 If having self-managed business, 0 otherwise
Contribute to household	1 if contribute to household monthly income, 0 otherwise
Freedom to sell asset	1 if have freedom of selling asset, 0 otherwise
Having membership	1 if having membership in business association, 0 otherwise
Types of business association	
Micro-finance institution	1 If involved in microcredit or micro financial institution, 0 otherwise
Mutual business	1 if involved in mutual business association, 0 otherwise
Others	1 if involved others type of business association, 0 otherwise
Investment in more productive purposes*	
Food	1 if spend on food, 0 otherwise
Education	1 if spend in educational purposes, 0 otherwise
Buying asset	1 if buy asset, 0 otherwise
Saving	1 if save, 0 otherwise
Expenditure related variables	
Freedom to spend	1 if feeling free to spend the money, 0 otherwise
Have small expense	1 wife said to have very small expenditure, 0 otherwise
Decision on spend	
Personally	1 if wife decide to spend her expenditure by own, 0 otherwise
With husband	1 if husband and wife decide jointly, 0 otherwise
Husband	1 husband decide to spend all family expenditure, 0 otherwise
With other members	1 wife decide to spend consulting with other family member, 0 otherwise
With outsiders	1 wife decide jointly with outside of family, 0 otherwise
Reject to answer	1 if reject to answer about decision to they spend
Expenditure on self-consumption in less productive purposes*	
Daily expenses	1 if spend on food, cloth, transport fare, utilities etc., 0 otherwise
Education	1 if spend in educational purposes, 0 otherwise
Health	1 if spend in health, 0 otherwise
Luxury product	1 if buy any expensive items jewelry, gift, hobby etc., 0 otherwise
Save and buy asset	1 if save and buy any asset, 0 otherwise
Freedom of Mobility	
Feel free to go outside	1 if feeling free to go outside, 0 otherwise
Reasons not feeling free to go outside	

Religious factor	1 if feel wife going outside is not allowed, 0 otherwise
Social barrier	1 if feel problem for roads, transports, lack scope for child and parental care
Need permission	1 if wife need permission from family, 0 otherwise
Insecurity	1 if feel not safe, 0 otherwise
Obstacles faced to work/start work	
No obstacles	1 if does not think any problem, 0 otherwise
Financial problem	1 if face financial constraint, 0 otherwise
Family and work pressure	1 if don't knowledge about type job activities
Lacks initial fund	1 if feel pressure in combining family and work, 0 otherwise
Lacks cooperation	1 if lack access to initial fund in order to start work, 0 otherwise
Others	1 if lack support from family, 0 otherwise

Table A.4 M-phone usage characteristics of Chapter 6

Variable	Variable Description
The purpose of using M-phone	
Calling	1 If call to talk, 0 otherwise
SMS	1 If send message, 0 otherwise
Purchase	1 when paid bill by M-phone, 0 otherwise
Information	1 If use to get news, 0 otherwise
Others	1 to use internet, or social media, 0 otherwise
Monthly mobile usage	Numerical variable, calculated in taka (1 taka= 0.73 yen)
M-phone user	If wife/husband is using M-phone
One M-phone	1 If having one mobile phone, 0 otherwise
More than one M-phone	1 If having more than one mobile phone, 0 otherwise
HH monthly surplus	1 If monthly total HHs income-expense>0,0 otherwise
HH monthly shortage	1 If monthly total HHs income-expense<=0,0 otherwise

Table A.5 Characteristics of the use of M-Bank of Chapter 6

Variable	Variable Description
The purpose of using M-bank	
Money transfer	1 If to transfer money, 0 otherwise
Savings	1 If save, 0 otherwise
Other	1 If use to pay bill, buy airtime/talk time, 0 otherwise
M-bank user	1 If wife/husband is using M-bank
One M-bank	1 If having one M-bank, 0 otherwise
More than one M-bank	1 If having more than one M-bank, 0 otherwise

Table A. 6 presents the image of overall financial inclusion of people above 15 years of age in 2014.

Table A.6 The overall access, use and ownership of accounts in Bangladesh

Financial Access	Value, (% of population age 15+)		
	Bangladesh	**South Asia**	**Developing countries**
Account ownership all adults	31.0	46.4	54.1
Account ownership women	26.5	37.4	49.6
Financial institution account Mobile account	29.1	45.5	53.1
	2.7	2.6	2.5
Used an account to receive wages	1.6	3.5	11.2
Use an account to receive government transfer	0.4	3.1	6.0
Used a financial institution account to pay utility bills	0.7	2.7	7.2
Has a debit card	5.2	18.0	31.2
ATM is the main mode of withdrawal (% with an account)	7.5	31.1	49.7
Used a debit card to make payments	1.0	8.5	13.6
Used a credit card to make payments	0.2	2.6	8.1
Used the internet to pay bills or make purchase	0.4	1.2	8.4
Saved at a Financial Institution past year	7.4	12.7	22.5
Saved at a saving club or person outside family past year	5.2	8.8	9.3
Borrowed from a financial institution past year	9.9	6.4	9.0
Loan from family or friends past year	25.2	31.4	29.0
Account used to receive remittance (% of Recipients)	8.6	15.8	25.7

Source: The data book of Financial Inclusion, World Bank 2015, drafted by Akter, 2016.

Bank

A bank is a financial institution to receive deposits, make loans, pay interest act as an intermediary in financial transactions. In the past the concepts of bank are mainly for credit and lending activities. Now-a-days it is providing a variety of financial services, such as wealth management, currency exchange and safe deposit boxes. The main functions of banks are accepting deposit and lending loans.

Services Provided by the Bank for Users

Banks offer many different channels to access their banking and other services are as following:

Automated teller machines (ATM): An ATM is also known as cash point. The banks nowadays provide ATM facilities. The customers can withdraw money easily and quickly 24 hours a day.

Mail: Most banks accept cheque deposits via mail and use mail to communicate to their customers.

Mobile banking: is a method of using one's mobile phone to conduct banking transactions

Online banking: is a term used for performing multiple transactions, payments etc. over the Internet

Relationship managers: mostly for private banking or business banking, often visiting customers at their homes or businesses.

Mobile Banking, and Online Banking

Mobile Banking

An upgraded version of e-commerce when commercial activities are conducted with the help of wireless devices such as mobile, tablets, laptop, IPad. M-bank, a new way of banking services allows users to deposit, withdraw and transfer funds as well as purchase goods and services using mobile phone without using internet (Bangladesh Bank, 2017; Munyegera and Matsumoto, 2016). Various mobile-banking services are fund transfer, bill payment, balance inquiries, sharing news and information. (Sadik Sohail, 2003) Banking services are provided through mobile device such as mobile phone without using internet. In case of online banking, internet access is mandatory.

In 1967, the first cash point machine come in London, at first there was only SMS. First, the automated teller machine (ATM) introduced by New York's Chemical Bank in American public in 1969. Then come Internet/online banking in the mid-1990s. Later, with the advent of mobile phone technology, the bank moved into offering banking services to customers on mobile devices. The first mobile banking and payment initiatives were announced during 1999. Founder of Mobile Banking is "Pay box" "Mobi Pago" to "Mobi Pay".

4.7 billion people are using mobile phones at the end of 2015. Mobile banking services are now available to 1.9 billion people (GSMA, 2016; ITU, 2010). The number of unbanked has reduced from 2.7 billion adults in 2010 to 2 billion adults in 2014 (Demirguc-Kunt *et al*., 2015).

Online Banking

Online banking refers to any banking transaction that can be conducted over the internet, generally through a bank's website under a private profile, and with a desktop or laptop computer. These transactions include services traditionally offered at local branches without having to go to one. Customers can perform financial transactions while banking online, like paying bills or transferring money from one account to another. Other basic activities include:

1. Viewing account balances at any time of day

2. Viewing or printing statements

3. Viewing images of checks

4. Applying for loans or credit cards

5. A customer can do almost any activity online that he or she would be able to do in person when visiting a branch.

Difference between Mobile banking and Online banking

Online banking is generally defined as having the following characteristics:

1. Financial transactions are conducted over the internet through a bank's secure website.

2. The bank may have physical branch locations, or it may exist only online.

3. The user must register with the financial institution online and create a login ID and password.

Mobile banking allows you to perform many of the same activities as online banking using a phone or tablet instead of a smartphone or desktop computer. However, simply accessing the bank's website on a mobile device is not the only method of mobile banking. Mobile banking's includes:

1. Logging into a bank's mobile website

2. Using a mobile banking app

3. Text message (SMS) banking

While more banks are making their sites easier to use on mobile devices, mobile banking is more commonly associated with accessing your accounts through an app. According to a consumer and mobile financial services report by the Federal Reserve, last year, mobile banking apps were used on 52% of smartphones in the US, Apps can offer a wide range of services that are not limited to account access and include the following:

1. Making mobile check deposits

2. Transferring money

3. Paying Bills

4. Locating ATMs

Mobile and online banking both options allow a person to conduct financial business from outside a banking facility.

Registration, Withdrawal and Deposit Process in M-bank in Bangladesh (Parvez et al., 2015) are

shown in the following flowchart:

Registration to open a M-bank account

Near by agent/shop

- o   Mobile phone number

- o   Application form

- o   Photograph

- o   National identity card

- o   An amount around 30 yen (1 taka BDT.

    = .75 yen)

⇩

Processing the registration by the agent.

⇩

Customer received a message where they need to

provide password.

⇩

Account will be activated after 2-4 days.

Deposit or withdrawal from a M-bank account

Near by agent/shop

- o   Mobile phone no/ account no

- o   Inform the amount to agent/shop

- o   Confirmation message/call by 4

    digit pin-code

- o   Additional charge for deposit (1%),

    withdrawal (2%)

Table A.7 List of banks and their products in Bangladesh

SL	Bank Name	Product Name
1.	Dutch-Bangla Bank Limited.	Mobile-Banking
2.	BRAC Bank Limited.	bKash
3.	Prime Bank Limited.	Easy Cash
4.	Islami Bank Bangladesh Limited.	mCash
5.	Trust Bank	Mobile Money
6.	National Credit and Commerce Bank Limited	SureCash
7.	Bank Asia Limited.	Mobile Banking
8.	Dhaka Bank	SMS Banking
9.	Mercantile Bank	Mobile Banking
10.	AB Bank	SMS Banking
11.	South East Bank	SMS Banking
12.	First Security Islami Bank	SureCash
13.	Bangladesh Commerce Bank	SureCash
15.	United Commerce Bank	SMS Banking

Source: Bangladesh Bank, 2017.

Appendix II: Household Questionnaire
Household Survey in Thakurgaon District, Bangladesh
Tokyo University of Agriculture and Technology, Japan
December 2016-January 2017

Date of Interview: _____   Name of the Household Head: _____

Name of Village: _____   Name of the Respondent: _____

Name of District: _____   Relationship to the HH head _____

1. Demographic profile of the all household member:

	1. Name of the members	2. Sex	3. Age	4. Relationship to household head	5. Present marital status	6. Employment	7. Education			8. place of the residence	9. Monthly household income (Average)	10. Monthly household living Expenditure (Average)
							Highest school she/he enrolled	Complete or incomplete	Highest school she/he attained			
I D C O D E		Male....1 Female....2		Head.....................1 Wife/Husband..........2 Child/Adopted child...3 Grandchild.............4 Niece/Nephew..........5 Father/Mother.........6 Sister/Brother..........7 Son/Daughter-in-law...8 Brother/Sister in law...9 Grandfather/Mother.10 Parents-in-law.........11 Other relative.........12 Others(specify).......13	Married.1 Divorced.2 Widow...3 Never married...4	0. No 1.On-farmemployment 2.Non-farm employment 1) employment in the rural non-farm labor market 2) self-employment in the local market 3) Employment in the migration labor market 4) Employment in the farm labor market	No................0 Primary school....1 Secondary school..............2 College.............3 University.........4 Master course....5 Others (specify)...6	Complete......1 Incomplete....2 Continue.....3	No................0 Primary school....1 Secondary school.......2 College.............3 University.........4 Master course....5 Others (specify)...6	Same house....1 Same village....2 Town of this village...3 Another village....4 Other city....5 Others....6	None.............0 1-1999.........1 2000-3999.......2 4000-5999.......3 6000-7999......4 8000-9999.......5 10000-11999....6 12000-13999....7 14000-15999....8 16000-17999....9 18000-19999...10 20000-above.11 (Unit taka)	None.............0 1-1999.........1 2000-3999.......2 4000-5999.......3 6000-7999......4 8000-9999.......5 10000-11999....6 12000-13999....7 14000-15999....8 16000-17999....9 18000-19999...10 20000-above.11 (Unit taka)
Q.no	1.1	1.2	1.3	1.4	1.5	1.6	1.7.1	1.7.2	1.7.3	1.8	1.9	1.10
1.												
2.												
3.												
4.												
5.												
6.												

XXI

2. Asset holding
Please tell me about the asset your family holds
2.1 Which asset of the followings do you have?

Toilet…………………1	**Bicycle………………………9**
Bathroom…………….2	**Motorcycles…………………10**
Water supply………….3	**Tractor………………………11**
Gas range…………….4	**Harvesters…………………12**
Television……………5	**Car…………………………13**
Computer……………6	**Commercial car (rickshaw, van, auto taxi, tempo, minibus, bus, truck) ……….14**
Internet connection…7	
Refrigerator……….8	

2. **Farming/Agriculture** (Household Member most knowledgeable about agriculture)

2.1 Landholding (Please tell me the decimal of farmland by the following categories)

Owned land (Decimal)	Borrowed land (Decimal)	Homestead area (Decimal)

2.2 How many family members are engaging in agriculture?

	Permanent (throughout a year) persons	Temporary (just for some activity) persons
Male		
Female		

2.3 How much do you spend for agricultural production activity in a year? (normal year)

Answer _____ (taka)

2.4 How much do you earn from agricultural activity in a year? (normal year)

Answer_____ (taka)

XXII

3. General farming information:

ID CODE	Crop 1						Crop2					
	Crop	**Yield (Kg/dec)**	**Consu mption**	**Sold amount (kg)**	**Place of sold**	**Price (kg/tk)**	**Crop**	**Yield (kg/dec)**	**Consu mption**	**Sold amount (kg)**	**Place of sold**	**Price (taka/kg)**
	1.Rice 2.Wheat 3.Maize 4.Potato 5.Mustard 6.Pulse(specify), 7. Vegetables 8. chili 9.onion/ garlic 10.Watermelon, 11. Mango, 12. Other fruits				Nearest market (haat)…….1 Central Market….2 Farmgate …3 Directly to customer...4 Traders…. 5		1.Rice 2.Wheat 3.Maize 4.Potato 5. Mustard 6.Pulse(specify) 7.Vegetables 8. chili 9. onion/ garlic 10.Watermelon11.Mango, 12. Other fruits			Market ….1 Traders….2 Farmgate .3 Directly to customer….4	Market…..1 Trader …….2 Farmgate ….3 Directly to customer….4	
Q.no	**2.2.1.1**	**2.2.1.2**	**2.2.1.3**	**2.2.1.4**	**2.2.1.5**	**2.2.1.6**	**2.2.2.1**	**2.2.2.2**	**2.2.2.3**	**2.2.2.4**	**2.2.2.5**	**2.2.2.6**
1.												
2.												
3.												
4.												
5.												
6.												

4. Job-Business History

ID CODE	Present Occupation Agriculture…1 Service……2 Industry……3		Date of start	2011 Agriculture…1 Service……2 Industry……3		Date of start	2006 Agriculture…1 Service……2 Industry……3		Date of start	2001 Agriculture…1 Service……2 Industry……3		Date of start
	Main	Side		Main	Side		Main	Side		Main	Side	
1.												
2.												
3.												
4.												
5.												
6.												

XXIV

5. M-phone History (Household Members)

I D C O D E	1. Do you have your own phone? Do you share phone with your family and others?	2. How many phones you have?	3. When did you start to use mobile phone?	4. Purpose of using mobile phone? (multiple answer)			5. How much do you spend on mobile phone in a month on average?
	Own Yes………...1 No…………2 **Share phone** Yes………...3 No…………4		**Year**	1.Call 2. SMS 3. Money transfers 4. Information 5. Others			**Taka/Month**
Q. no	5.1	5.2	5.3	5.4			5.5
				1st	2nd	3rd	
1.							
2.							
3.							
4.							
5.							
6.							

6. M-Banking History

ID CODE	1. Do you have M-banking account? Own Yes……1 No……2 Share account Yes……3 No……4	2. From when you started to use M-banking account? Year	3. Purpose of using M-banking (multiple answer) 1. Money transfer 2. Saving 3. Withdraw 4. Information 5. Others			4. Reason for money transfer Sending to 1.Public transfer (tax) 2.Utility payment 3.Domestic remittance 4.International remittance 5.Agricultural product sale 6.Shopping payment 7. Other	Receiving from 1.Public transfer (social welfare subsidies) 2.Utility payment 3.Domestic remittance 4.International remittance 5.Agricultural product sale 6. Other sales 7. Other	5. Frequency of using mobile banking Average/week (times)	6. How do you operate m-banking 1.By yourselves 2. Agents 3. others	7. How far the agent is located? (km)	8. What type of company providing M-bank? 1. Commercial bank 2. Govt. bank 3. Govt. organization 4. NGO 5. Other	9. Which type of company provide credit through M-bank? 1.Commercial bank 2. Govt. bank 3. Govt. organization 4. NGO 5. Other
Q.no	6.1	6.2	6.3			6.4.1	6.4.2	6.5	6.6	6.7	6.8	6.9
			1st	2nd	3rd							
1.												
2.												
3.												
4.												
5.												
6.												

7. Migration and Remittance (about the Migrant from HH head)

- Number of migrant living outside household …………………………….……….
- Number of migrant living outside household except from household or family members……………………………

ID CODE	1. Residence of the migrants			2. Working Place of the relatives	3. What are they doing?	4 Educational attainments	5. Marital status	6. Do you receive any remittance from the members of the households?	7. How do you get this remittance?	8. For What purpose, do you use this remittance?	9. How do you want to use your savings?	10. Advantage of M-bank
	This village	Other area	Urban rural									
	1.Yes 2.No >>next		Urban….1 Rural….2	Same village…1 Local town ….2 Other rural ….3 Other city…….4 Capital……….5 Others……….6		No…….0 Primary school……...1 Secondary school…...2 College….3 University…4 Master course……...5 Others (specify)……6	Married.1 Divorced……….2 Widow...3 Never married.4	Yes…1 No….2	Bank…….1 M-bank….2 Bus ……...3 Relatives….4 Post office...5 Currier ….6 Others……7	1.Daily expenditure 2. Education 3. Health 4.Land/Machine 5. Asset purchasing 6.Emergency 7.Others businesses 8.Natural disaster 9. Misuse or waste 10. To save 11. others	1. Daily expenditure 2. To buy new asset 3. Emergency 4. Others	1.No internet 2.Easy to open 3.Cost savings 4. Time savings 5. Account check 6. others
Q.no												
1.												
2.												
3.												
4.												
5.												
6.												

XXVII

Appendix III: Female Questionnaire
Household Survey in Thakurgaon District, Bangladesh
Tokyo University of Agriculture and Technology, Japan
December 2016-January 2017

Date of Interview: _____   Name of the Household Head: _____

Name of Village: _____   Name of the Respondent: _____

Name of District: _____   Relationship to the HH head _____

1. Demographic profile of the household female:

	1. Name of the members	2. Sex	3. Age	4. Relationship to head	5. Present Marital Status	6. Employment	7. Education			8. place of the residence	9. Monthly Income (Average)	10. Monthly living Expenditure (Average)
							Highest school she/he enrolled	Complete or Incomplete	Highest school she/he attained			
I D C O D E		Male ....1 Female 2		Head…………………1 Wife………….…….2 Child/Adopted child…3 Grandchild………….4 Niece………………5 Mother…………….6 Sister………………7 Daughter-in-law…...8 Sister in law…………9 Grandmother…….10 mother-in-law……...11 Other relative………13 Others(specify)…….14	Married.1 Divorced.2 Widow…3 Never married...4	0. No 1.On-farmemployment 2.Non-farm employment 1) employment in the rural non-farm labor market 2) self-employment in the local market 3) Employment in the migration labor market 4) Employment in the farm labor market	No……………0 Primary school….1 Secondary school…………..2 College………….3 University………4 Master course….5 Others (specify)…6	Complete…...1 Incomplete….2 Continue..….3	No……………0 Primary school….1 Secondary school…….2 College…………..3 University………4 Master course….5 Others (specify)…6	Same house….1 Same village….. 2 Town of this village…3 Another village….4 Other city….5	None…………..0 1-1999………1 2000-3999…....2 4000-5999…….3 6000-7999……4 8000-9999……5 10000-11999….6 12000-13999….7 14000-15999….8 16000-17999….9 18000-19999…10 20000-above..11 (Unit Taka)	None…………0 1-1999………1 2000-3999…....2 4000-5999…….3 6000-7999……4 8000-9999……5 10000-11999….6 12000-13999….7 14000-15999….8 16000-17999….9 18000-19999…10 20000-above..11 (Unit Taka)
Q.no	1.1	1.2	1.3	1.4	1.5	1.6	1.7.1	1.7.2	1.7.3	1.8	1.9	1.10
1.												
2.												
3.												
4.												
5.												

2. General Cropping Information:

ID CODE	Crop 1						Crop2					
	Crop	**Yield (kg/dec)**	**Consum ption**	**Sold amount (kg)**	**Place of sold**	**Price (kg/taka)**	**Crop**	**Yield (Kg/dec)**	**Consum ption**	**Sold amount (kg)**	**Place of sold**	**Price (taka/kg)**
	1.Rice 2.Wheat 3.Maize 4.Potato 5.Masturd 6.Pulse(specify), 7. Vegetables 8. chili 9.onion/ garlic 10.Watermelon, 11. Mango, 12. Other fruits				**Market….1 Traders…2 Farmgate…3 Directly to customer...4**		**1.Rice 2.Wheat 3.Maize 4.Potato 5. Mustard 6.Pulse(specify) 7.Vegetables 8. chili 9. onion/ garlic 10.Watermelon1 1.Mango, 12. Other fruits**			**Market………. 1 Traders……2 Farmgate……. 3 Directly to customer….4**	**Market………… .1 Trader………… 2 Farmgate……… 3 Directly to customer………. 4**	
Q.no	2.2.1.1	2.2.1.2	2.2.1.3	2.2.1.4	2.2.1.5	2.2.1.6	2.2.2.1	2.2.2.2	2.2.2.3	2.2.2.4	2.2.2.5	2.2.2.6
1.												
2.												
3.												
4.												
5.												

XXX

3. Economic Status of the women:

SL. No.	Questions/Query	Response/Answer	Code
1.	Do you have any self-business? If yes, What kind of business do you have?		**Yes……….1,** **No…………2**
2.	Do you make any contribution to the household's monthly income		**Yes……….1,** **No…………2**
3.	Could you sell any assets without getting permission from your husband?		**Yes…….1** **No………2** **If yes>>>>>**
4.	Are you a member of any business association?		**Yes……….1No………2** **If yes>>>>>**
5.	please name the association(s).		**1.Micro credit** **2. Mutual helping association** **3.SME** **4.handicrafts** **5. Other (Please specify)**
6.	If you wanted to make some expenditure (small or big) from the income of your business, would you feel free to do it without consulting your husband? Please explain your answer.		**Yes……….1,** **No…………2**
7.	How do you decide to spend		**1=personally, 2= Jointly with husband,** **3=husband,** **4=Jointly with other family members, 5= Jointly outsiders**

8.	Describe your expenditure types		1= Daily expenditure 2= Education 3= Health 4= Shopping luxurious product 5= Misuse/ waste 6= others
9.	Do you have any income by yourself?		Yes…….1 No………2
10.	How do you utilize your income?		1=Food 2=Household education 3=Buying asset 4=by save 5= others
11.	Did you attend any course/s, professional training/s?		Yes…….1 No………2
12.	Would you feel to go outside? If no, what problem do you face?		1=religious factor 2=social barriers 3=need permission from husband/household 4= insecurity 5= others
13.	What were the main obstacles you faced if you want to start work?		1=no obstacles, 2=financial questions, 3=lack of information / advice 4=combining family and work life, 5=Lack of access to initial fund, 6=No cooperation from the husband and family? 7= others (please specify)

ACKNOWLEDGMENTS