Will mobile phone use facilitate women's empowerment?

A quantitative study of women in Bangladesh

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Abstract

Despite a steady economic and social development in Bangladesh, women are in an underprivileged situation in many ways. In this context, this thesis aims to explore the impact of mobile phone use on women's empowerment in Bangladesh. The thesis employs ordered logit model and multinomial logit model using Financial Inclusion Insights (2017) survey data to investigate the relationship between mobile phone use and women's empowerment. The main result of the thesis indicates that mobile phone use facilitates women's empowerment in general, but mobile phone use does not give additional support for women's empowerment in a male headed household. Moreover, social media use by one's own mobile phone does not help women's empowerment. The result of this thesis implies that mobile phone conversation does not make any difference in women's performance to comply with gender norms. Another implication of the result is that mobile phone use itself does not ensure women's increasing awareness about their rights and does not in all instances help defeat patriarchy. In addition, social media use may expand social networks, but using social media itself does not confirm that it helps women's empowerment.

Keywords

Mobile phone use, women's empowerment, patriarchy, social media, Bangladesh.

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Introduction

A considerable body of literature has confirmed that Information and Communication Technologies (ICTs) has positive association with women's empowerment. In 2002, United Nations Educational, Scientific and Cultural Organization (UNESCO) assisted a research initiative which was extended across nine locations in South Asia including Bangladesh to examine the impact of ICT on poverty reduction. In the research initiative, UNESCO explored that ICT had a positive impact for women's empowerment as it was connecting women to information, knowledge, and resources. Earlier the studied women were socially and economically excluded due to their gender-based constraint on mobility: the restrictions forced women to interact with only their close family members, neighbors, and some extended family members (United Nations [UN], 2005, p. 8; see also Slater & Tacchi, 2004). The UNESCO study provided two important facts for this thesis: firstly, due to gendered-based restrictions women are restricted within family, and secondly, ICT can empower these restricted women providing information and resources.

Moreover, mobile phones, which is one of the widely used ICTs around the world, helps women achieve important outcomes (Nguyen, Chib, & Mahalingam, 2017) including awareness of own value to others (Chew, Ilavarasan, & Levy, 2015) and reformulating conventional gender roles (Garrido & Roman, 2006). Such a potential of mobile phones to bring change in women's life can be important in Bangladesh context. Because Bangladesh still has millions of women who are restricted within the family despite recent social and economic development in the country. In addition, Bangladesh fits into a regional belt, extended to North Africa and South Asia, which is marked by patriarchal family structures along with female seclusion[1] (Asadullah, Savoia, & Mahmud, 2014, p. 151). So, the situation of women in these countries has little chance to be changed within a short time. In this context, mobile phone use can be a solution for these women to be connected with people outside their family. However, due to the patriarchal family structures women can also be disempowered by mobile phone use if, for example, the husband controls the wife's mobile phone use (e.g., Pei & Chib, 2020).

[1] Seclusion is also known as *purdah*. Seclusion or *purdah* is a kind of social norms and values, which promotes confinement of women from public areas (Anderson & Eswaran, 2009).

There is a large gender gap in mobile phone use despite rapid adoption of mobile phones in Bangladesh over the past two decades. Women lagged behind men as mobile phone owners (Islam, 2019). Thus, the investigation of the effects of mobile phone use on women's life will also help to understand how reducing the gender gap in mobile phone use can affect these women.

A substantial body of research investigated women's empowerment focusing on particular social or economic services, which were delivered via mobile phone. These studies showed that mobile phone use incorporated more women in the economy and social services that empowered women. Mobile phone use provided these women health/educational information (e.g., Grameenphone, 2009), saved time and expanded business (e.g., Sane & Traore, 2009), facilitated flexible communication and faster sales of products (e.g., Munyua, 2009), enhanced mobility (e.g., Bayes, 2001) and so on. However, these studies did not emphasize how mobile phone mediated interaction[2] can be a medium of interaction for the restricted women[3]. The reason is that the interaction, even if that is not related to the above-noted services, can facilitate women's empowerment. For example, once restricted women get access to other women outside their family members, they can be aware about their life compared with others, which ultimately can facilitate their decision-making power within the family. This effect of informal interaction to the life of restricted women and its effect to their empowerment in the household deserve further investigation.

We do not have established scientific knowledge about the discussed issues due to a lack of research in the given contexts (e.g., Hossain & Beresford, 2012). Furthermore, previous studies have some limitations. For instance, a group of studies used small sample sizes and therefore, were "subject to small sample bias" (e.g., Hossain & Samad, 2020, pp. 1-2).

This thesis differentiates between mobile phone mediated interaction and face-to-face interaction. One reason is that, unlike face-to-face interaction, mobile phone mediated interaction gives women an opportunity to not conform to gendered norms. Thus, if women take this opportunity of not conforming to the norms, the results of this thesis will indicate that women do not follow doing gender in all instances. This result will contribute to the discussion of West and Zimmerman (1987)'s doing gender approach, which argues that men and women always perform to conform to the gendered norms. Hence, this thesis testing the doing gender

[2] Mobile phone mediated interaction here means a conversation that takes place over mobile phones.

[3] In this thesis, restricted women mean women who are confined within the household due to religious and social norms.

approach like some earlier researchers (e.g., Evertsson & Nermo [2004, p. 1272] tested the "explanatory value" of the doing gender approach for the division of housework in Sweden and the United States). However, if women conform to the gendered norms in mobile mediated communication, the result of this thesis will indicate that mobile phone use does not help in the empowerment of restricted women. This result will also indicate that mobile phone use does not assist women defeating patriarchy through reshaping awareness about their own rights.

Because of exporting labors, millions of females are becoming household heads in Bangladesh as their husbands migrate for work (Fakir & Abedin, 2020). For example, nearly 3 million Bangladeshi citizens (majority of them are males) migrated internationally for work between 2005 and 2010 (Sander, Abel, & Bauer, 2014). In this context, what is the impact of husband's out-migration on the empowerment of left-behind female household heads is important to know. Although there is a common knowledge that female heads are usually very involved in household decision making, earlier studies lack global consensus about this conclusion (e.g., De Haas & Van Rooij, 2010; Maharjan, Bauer, & Knerr, 2012). While a group of researchers argues that out-migration helps left-behind wives as they get more independence and greater authority to household decision making (e.g., Gulati, 1992; Khaled, 1995), another group of researchers claims that the impact of husband's out-migration on the empowerment of left-behind female household heads varies by cultural norms, households to households, and role of in-laws within the family (Fakir & Abedin, 2020). In this context, comparing the role of mobile phone use between female household heads and spouses of male household heads may help to explore the role of mobile phone use for women's empowerment in a patriarchal family structure.

This thesis used a nationally representative dataset (i.e., Financial Inclusion Insights [FII] survey [2017]) that has variables related to both mobile phone use and empowerment in Bangladesh. In addition, the dataset has not been examined for the discussed questions yet.

The structure of the thesis is as follows: after introduction, the aim is introduced, and thereafter follow research questions and key concepts of the thesis. Then, the thesis discusses how interactional perspective (i.e., the doing gender approach) and radical feminism (see Ritzer, 2011; Giddens, 2009) would help to explore the research questions. Next, the thesis introduces the context of Bangladesh relevant for this study. After that, previous research is synthesized and evaluated to show what is the research progress and gaps in the topic. Once theory and

earlier research are described, the thesis introduces hypotheses, which are mainly informed by earlier research and theory. After that, the thesis discusses data and methods. This chapter also discusses ethical issues and limitations. The thesis presents the result of the statistical analysis before interpreting the results and discussing the relevance of the result to earlier research and theories.

Aim and Research Questions

The aim of this thesis is to explore whether mobile phone use promotes women's empowerment in Bangladesh. Key research questions of this thesis are:

1. What is the impact of mobile phone use on the empowerment of housewives and non-housewives?
2. Does mobile phone use affect women's empowerment in male headed households?
3. Does social media use affect women's empowerment within the family?

This thesis used data that has information about intra-household decision making, so the result of this thesis might not be generalized to other levels such as women's empowerment within commercial organizations. This thesis does not compare or analyze women's empowerment from other development perspectives (e.g., economic). Instead, the thesis focuses on the difference between mobile phone users and non-users, as well as the difference between different groups within the family such as mobile phone user housewives and non-housewives in achieving empowerment.

Key concept

Women's empowerment

This study examines the empowerment of women since it is most relevant in Bangladesh context. This study does not consider women's disempowerment since it is not likely to happen in the context. Men's (dis)empowerment is not assumed as a relevant case in the Bangladesh context. The arguments are as follows.

To operationalize women's empowerment, this study uses the indicators of empowerment such as household decision-making and ideas from Kabeer (1999). According to Kabeer (1999, p. 437), "empowerment entails a *process of change*.... people who exercise a great deal of choice

in their lives may be very powerful, but they are not empowered… because they were never disempowered in the first place". Kabeer (1999) defined empowerment as "the expansion of people's ability to make strategic life choices in a context where this ability was previously denied to them". The author (1999) introduced the definition developing interconnection among resources, agency, and achievements. Based on the idea, this thesis expects a situation where women can be empowered since women, not men, were disempowered in the studied context. Mobile phone use can empower restricted women by providing them information. Because this information helps these women to compare themselves with others that can, for example, enhance their household decision-making power.

Theoretical Background

The thesis uses ideas from an interactional perspective (i.e., doing gender approach) and radical feminism to explore the research questions. Doing gender approach helps to investigate the impact of mobile phone use on women's empowerment. In addition, radical feminism assists to explore the impact of mobile phone use on women's empowerment in patriarchal family structure.

Doing gender

The thesis uses the doing gender concept from an interactional perspective. West and Zimmerman (1987) elaborated as follows.

Doing gender is a process of making distinction between men and women (West & Zimmerman, 1987). This distinction is socially constructed.

According to West and Zimmerman (1987), doing gender happens in social situations through interaction. Distinct "social arrangements" produce this social situation. This social situation justifies the basic divisions of society. Men and women when interacting in a social setting account their behavior to produce, reproduce and sustain the norms assigned by the society to their identity as manly and womanly. In addition, doing gender is accomplished when marking or displaying gender perfectly fits to situations and is transferred as the occasion expects. Doing gender is to manage such occasions as the final outcome conforming to gender-appropriate

norms. Members of society display and celebrate normative behaviors which is linked to particular sex category.

West and Zimmerman (1987) describe that interaction is important for demonstrating doing gender. This is because members of society participate in interaction to organize various activities to indicate gender. Everyday interaction is a continuing action, which is involved in doing gender. Thus, doing gender is something that is recurrently done in interaction with others.

However, Smith (2009) criticizes the doing gender view as, "…doing gender oversimplifies and homogenizes the differences between gender, race, and class". Vidal-Ortiz (2009) claimed that doing gender did not consider human agency and acts of resistance in the discussion.

Considering the doing gender view, this thesis understands that members of a society may perform doing gender, for instance, in mobile phone mediated interaction in general. However, mobile phone mediated interaction can give, for example, women an opportunity of not conforming to gender norms. For example, a woman is forced to avoid a face-to-face conversation with an unknown man in Bangladesh due to societal norms, but mobile phone gives this woman an opportunity of talking with an unknown boy because mobile phone mediated interaction offers private/hidden conversation. In addition, mobile phone mediated interaction with other women can make women aware about their responsibilities, as we know individuals' assessment regarding their income and achievement are easily influenced by comparison with others (e.g., Adams, 1965; Festinger, 1954; Crosby, 1976). This awareness about own responsibilities may lead women to challenge gender norms such as being more involved in household decision making than is expected in society. But it is unclear whether women's tendency of not conforming to the gender norms through mobile phone mediated interaction becomes more prevalent than women's tendency of conforming to the gender norms in any kind of interaction. The important point here is that if the former becomes prevalent, the probability of women's empowerment is expected to be higher.

Radical feminism

According to radical feminist view, "through participation in patriarchy, men learn how to hold other human beings in contempt, to see them as nonhuman, and to control them" (Ritzer, 2011, p. 473). In addition, the view claims that "men deny women access to positions of power and

influence in society" and this oppression is mainly originated in the family (Giddens, 2009, p. 617). Radical feminists believe that this oppression can be defeated through reshaping women's consciousness, which facilitates women to understand their own value and strength, and through united effort with other women (Chasteen, 2001; Whitehead, 2007).

Women's mobile phone use is likely to be controlled by men in Bangladesh because the country has a patriarchal family structure. One outcome is women's decreased possibility to benefit from mobile phone use. On the other hand, if women (especially those who are restricted within family) can use mobile phone to be connected with other women and be aware about their values and strength, they can resist men's domination and therefore can be empowered. However, as Giddens (2009) discussed, radical feminist view is criticized for presenting the explanation as "universal phenomena", which does not consider for "historical or cultural variation". The critics claim that the notion of patriarchy overlooks the effect of class, race, or ethnicity on the essence of women's subservience (Giddens, 2009, p. 617).

The two theoretical views are complementary to each other. While West and Zimmerman (1987) argue that men can be dominant to women and women can be subordinated to men, radical feminism strongly claims that men are subordinating women. Doing gender is explaining through the interaction, while radical feminism is explaining through the structure of patriarchy. So, the thesis uses two different approaches for analyzing the issues related to patriarchal family structure.

Bangladesh: Context of the Research

Over the past few decades, Bangladesh achieved significant progress in different sectors. For example, GDP per capita has increased from USD 401.8 in 2005 to USD 1491.7 in 2019, and seats held by women in national parliaments have increased from 2% in 2005 to 20.7% in 2019 (United Nations, 2020). Both males and females are benefitted by these developments. But progress is not similar for these two groups, where males are over-represented as beneficiaries. For instance, given the above-mentioned gender gaps in women's participation in national parliament, women are also under-represented in local government. Only 0.7% and 25% of

the chairman and members in union parishad[4] were females in 2017 respectively, and in the same year 1.2% of the chairman in upazila parishad[5] were females. In addition, although labor force participation of women has increased from 27.8% (85.5% for men) in 2005 to 36.1% (81.2% for men) in 2019, the gender gap is large. This gap can further be understood by the Labor Force Survey Bangladesh 2016-17 that shows that the working age population (i.e., aged 15 or older) was 54,080,000 males and 54,974,000 females. That is, more females were in working age. However, when it comes to the employed population, it showed almost double the numbers for males (i.e., 42,182,000) who were employed than that of females (i.e., 18,646,000) (Bangladesh Bureau of Statistics, 2019a). These statistics imply a prevalent gender inequality and female's disempowered position in the society.

Moreover, the literacy rate of 7 years+ population in 2018 shows that females (71.2%) are lagging behind males (75.2%). Furthermore, Gender Statistics of Bangladesh 2018, is used to describe the attitude of men towards women's freedom of movement; it shows that 68.7% currently married women in rural areas in 2014 went to a health center alone or with children, while 74.7% of women in urban areas did the same thing (Bangladesh Bureau of Statistics, 2019b). The statistics imply that a lot of women still cannot freely move outside their home due to male restrictions.

In Bangladesh, females are less educated than males, and there is still a considerable number of females who are not independent to make decisions about their essential issues. Therefore, the reality is that many females are not empowered. This picture of gender inequality and women's disempowered position can also be illustrated by the Gender Inequality Index since it shows that Bangladesh ranked 133 among 189 countries in 2019 (Conceicao, 2020).

During the last decades, mobile phone subscription has increased from 1% (2002) to 83% (2016) (World Bank, 2018). But there is a large gender gap. For instance, 2019 GSMA (commonly referred to as Global System for Mobile Communications) Mobile Gender Gap Report shows that 58% of adult women own mobile phones, while 86% adult men own mobile phones (Islam, 2019).

Patriarchal family structure is another important issue that makes Bangladesh an important context. We see that Bangladesh had only 14.2% (13.3% was in 2011) households that were

[4] Lowest level of local government in Bangladesh (Khan, 2012).

[5] Second lowest level of local government in Bangladesh. The parishad is formed by a chairman, two vice-chairmen (1 female+ 1 male), all Union Parishad Chairman, all Mayors of respective Paurashava, and reserved women representatives. These people have voting power. In addition, the Parishad has administrative officials without any voting power such as Upazila Nirbahi Officer (UNO) as a secretary of the Parishad and pooled government officials (Hossain & Khan, 2017).

women headed, while 85.8% (86.7%) households were male headed in 2017 (Bangladesh Bureau of Statistics, 2019b). In addition, 21.1% of husbands decide how much money to be used for household, which is more than that of wife's (8.5%) decision-making power in the issue, and 56.6% such decisions are taken by husband and wife jointly (Bangladesh Bureau of Statistics, 2019b). We also see that only 7.1% of currently married women can attend a health facility for her own health needs, while husbands take such decisions for 13.4% women and 67.9% women take such decisions as joint decisions with husbands (Bangladesh Bureau of Statistics, 2019b). Earlier studies show that women in Bangladesh are not free to move outside the household alone (Hossain & Beresford, 2012, p. 456) due to cultural and religious reasons (Hunt & Kasynathan, 2001). The cultural and religious norms permit males to subordinate females in this case.

In sum, many changes have happened in Bangladesh over the past decades including steady social and economic development. But the situation of women is still deprived in many ways.

Previous Research

How does mobile phone use relate to women's empowerment?

Some earlier research shows that mobile phone use can promote women's empowerment. For example, Pei and Chib (2020) claimed that mobile phone use helps women in resisting structural constraints by three mechanisms: avoidance, accommodation, and collaboration. As avoidance practices, a woman can 'block' men or other guardians who want to monitor her. Women can also 'delete' messages as another form of avoidance practices (Pei & Chib, 2020, p.10). Mobile phone use can empower women by facilitating them in dealing with patriarchal pressure (Pei & Chib, 2020, p. 9). Moreover, Sustainable Development Goals' (SDGs) target 5.b.1, i.e., "proportion of individuals who own a mobile telephone, by sex" is an indicator of gender equality and women's empowerment, which indicates that reinforcing mobile phone use promote the empowerment of women (United Nations, 2021).

However, mobile phone use can disempower women through reinforcing gender-specific social and structural restraint to censor "women's agency through access, surveillance, and intervention" (Pei & Chib, 2020, p.8). To illustrate the surveillance mechanism, Pei and Chib

(2020) elaborated that voice calls help men for confidential supervision of women in actual time in a patriarchal society. In addition, husbands can impose rules on wives over mobile phones while they are not in the same place. Fathers can monitor through voice and video calls whether daughters are dating secretly (Pei & Chib, 2020).

The link between mobile phone use and women's empowerment: research progress and gaps

A considerable number of studies suggests that mobile phone use facilitates women's empowerment (e.g., Hossain & Samad, 2020; Handapangoda & Kumara, 2013; Hossain & Beresford, 2012). Mobile phone use helps women's empowerment in different ways, for example, by (1) expanding social circles and networks for social support (Hossain & Samad, 2020[6]; Handapangoda & Kumara, 2013[7]; Abraham, 2009[8]); (2) providing more information especially for health and education services (Hossain & Samad, 2020; Handapangoda & Kumara, 2013; Hossain & Beresford, 2012[9]); (3) assisting to overcome spatial, physical, and temporal boundaries (Handapangoda & Kumara, 2013; Macueve, Mandlate, Ginger, Gaster & Macome, 2009[10]); (4) enhancing women's freedom of choice and action (Hossain & Samad, 2020; Handapangoda & Kumara, 2013; Bayes, 2001[11]); (5) giving women control over technology (Handapangoda & Kumara, 2013; Hossain & Beresford, 2012); (6) improving the status of women (Bayes, 2001); (7) changing social, cultural, and religious norms in the long run (Hossain & Beresford, 2012); and (8) giving them freedom from the inhibitions and structures imposed on them by the prevailing patriarchy (Kyomuhendo, 2009[12]).

[6] This study was conducted in remote rural areas of Bangladesh to examine the effect of mobile phone on household welfare and women's empowerment.

[7] This study was conducted on poor housewives in Sri Lanka.

[8] This study was conducted to examine the role of mobile phone in advocating women's rights in Zambia.

[9] This paper was a reviewed paper to address the potential of ICT emphasizing on Grameen Bank's village phone programme in achieving women's empowerment in Bangladesh. Please note that The Village Phone (VP) programme was initiated by Grameen Telecom (a non-profit organization) combining with Grameen Bank's (a joint Nobel Peace Prize winner organization) experiences on micro credit. The VP programme was operated to provide mobile phone services to the poorest people in Bangladesh (see Richardson, Ramirez, & Haq, 2000).

[10] This study was conducted in Mozambique.

[11] This study was conducted to examine Grameen Bank's village phone initiative in Bangladesh.

[12] This study was conducted to analyze the role of mobile payphone business to women's empowerment in Uganda.

However, some observations on the above-mentioned studies are pertinent here. For instance, by Handapangoda and Kumara's (2013) study, we do not understand how the result would be if the study had included different groups such as rich housewives.

Moreover, Bayes' (2001) explanation for uplifting women's status was relevant at the time the paper was published, but now the explanation becomes less relevant. The reason is that during 2001, very few people had mobile phones, so the people were used to going to Phone Bari[13] (house of the phone), which is argued as uplifting women's status. But now most of the families have mobile phones, so Phone Bari becomes irrelevant and therefore the explanation based on the Phone Bari business also becomes irrelevant.

Furthermore, Hossain and Beresford (2012) emphasized a particular group of females (i.e., Grameen Bank's village phone programme subscribers), which do not represent all mobile phone users in current Bangladesh. Thus, we should be cautious to generalize the results for understanding contemporary Bangladesh.

Although Kyomuhendo (2009) described the role of mobile pay house to women's empowerment, the author did not discuss whether mobile phone use or the business participation or both combinedly empowered women.

Social media use and women's empowerment

Using social networking sites has different effects on women's empowerment. For example, Ndukwe (2020), in a study from Nigeria in examining the role of mobile phones to women's empowerment, found that women use social networking sites such as Facebook, WhatsApp etc. for skill building, information sharing, emotional support, seeking for help for tackling struggles they face every day, which ultimately empower them. Mobile phones and social network sites use give married women the opportunity of maintaining relationships with their family members even if they are living in a husband's house and can be able to participate in household decision-making in both families (Ndukwe, 2020; Adaugo, Ovute & Obochi, 2015). Mobile phones facilitate women's empowerment through enhancing social capital by promoting stronger and greater social networks and enhancing the activity of social networks through social media/social networking sites (Kuah, 2008). For instance, there are such Facebook groups for supporting new mothers (e.g., McInnes & Chambers, 2008). These studies

[13] This house was known by the name of women mobile phone owner who was using mobile phone for business purpose.

did not show whether social networking sites users are more empowered than those who never used social networking sites but only used mobile phones.

However, it seems that internet users tend to neglect their friends, family, relatives, and neighbors (e.g., Nie & Hillygus, 2002), which can isolate the users from genuine relationships, especially familial social relationships (Stoll, 1995). Both internet and new communication technology users also have the possibility to be isolated within the family for being very involved with online social capital formation since it simultaneously can reduce the communication with family members (Kraut et al. 1998, p. 1019). Thus, although social networking site users are likely to be more aware about their rights, they can be less involved in family matters if they become isolated within family. Since the effect of internet use or social networking sites use should be similar irrespective of the devices used for it such as mobile phone or computer, the above-noted findings are considered as relevant for the thesis.

Hypothesis

Hypothesis 1- women's empowerment

Female mobile phone users are more involved in intra-household economic decision-making than female mobile phone non-users. Since women in Bangladesh are restricted within family, it is plausible to assume that women will be facilitated by mobile phone use in intra-household economic decision making.

Hypothesis 2A- empowerment of restricted women

Mobile phone user housewives are more involved in intra-household economic decision making than mobile phone user non-housewives. Housewives are likely to stay within the family household the whole time, so it is assumed that mobile phone use affects housewives more than non-housewives. Therefore, the thesis considers that mobile phone use is more important for housewives.

Hypothesis 2B- empowerment of restricted women

The difference in probabilities of being involved in intra-household economic decision making between mobile phone users and non-users is higher for housewives than non-housewives. The thesis anticipates that the difference of mobile phone's effect is higher for housewives because housewives are likely to be confined within the family. So, when housewives use mobile phones, it affects their decision-making power more than non-housewives.

Hypothesis 3- patriarchy

The difference in probabilities of being involved in intra-household economic decision making between mobile phone user and non-user females is higher for spouses to heads of household than heads. Generally, female household heads are more involved in household decision-making. So, mobile phone use is not likely to bring significant change in household head's involvement in the household decision-making. In contrast, spouses to male household head are likely to be more dependent on their husband, especially in decision making issues due to the lack of knowledge about their rights. Since mobile phone use can give more information to these women, it is likely that spouses to male head will be more benefitted by mobile phone use than female heads.

Hypothesis 4- social media use

Among female mobile phone users, social media users are more involved in intra-household economic decision-making than those who never used social media. Social media using women can be connected with people outside their family members, which gives these women more opportunity for comparison with others. So, it is assumed that social media using women are more involved in household decision-making.

Data and Methods

Data

This study used the fifth wave of Financial Inclusion Insights (FII) survey which was conducted from 29 July to 7 September 2017. The data is a copyrighted property of the Bill and Melinda Gates Foundation (the BMGF) and provided by The Financial Inclusion Insights Program, InterMedia. The data has a nationally representative of 6000 respondents who represents the aged 15+ population residing in households in Bangladesh. Among these samples, 4839 (i.e., 2472 males and 2367 females) adults responded, so the response rate was 80.7 percent. Here, all adults (15+) means those who have active digital stored-value accounts (i.e., a bank account or non-bank financial institution's account with digital access [a card, online access or a mobile phone application] and a mobile money account) (InterMedia Bangladesh, 2018). The survey is representative in the sense that it includes respondents from all regions of Bangladesh and both males and females. This thesis used 2367 female respondents and the data is restricted to represents the population who have active digital stored-value accounts.

The survey used the list of urban centres (e.g., Division Headquarters, other Municipal Centers, non-municipal Centres or "Thanas") and villages as sampling frames and used a stratified multistage sampling. First the survey stratified each division by urban/rural. Then, the process selected 333 primary sampling units which included all eight divisional headquarters. After that, 24 households were selected from each "Other Municipal Center", and 16 households from each non-municipal center and village. In Dhaka divisional headquarters, the eight largest wards were selected to take 38 households from each ward. Finally, one adult household member was randomly selected from each selected household. Among these adults, 49 percent were female. Using tablets, face-to-face interviews were conducted. Moreover, to infer about the target population (15+), sampling weights were used which was based on 2016 population projections by gender, age, and urban-rural residence (InterMedia Bangladesh, 2018).

Ethical considerations

The author accepted some conditions[14] to get access to the data. The author took approval from the Department of Sociology, Stockholm university as a form of *Thesis Topic Submission*

[14] Conditions according to the Financial Inclusion Insights Program, InterMedia are as follows: first, as a signatory the author agreed that the data would not be sold and transferred to others who were not permitted by the data request form; second, the author is aware that BMGF has full right to deny usage of the data; third, the author

before conducting this study. The data was completely anonymous, so no one can be traced. In addition, the results are not sensitive in any way for any group. This thesis planned to protect the "privacy of the research subjects and the confidentiality of their personal information" as expected by the World Medical Association ("World Medical Association Declaration of Helsinki ethical principles for medical research involving human subjects", 2013). All the data and findings are also planned for preservation for next 10 years. The author will try to publish the results as a journal article in a peer-reviewed journal. This thesis is written during the author's scholarship period at Stockholm University, which is funded by the Swedish Institute (SI reference number: 13910/2019).

Methods

Ordered Logit Model

The effect of mobile phone use is measured in this study by the ordinal variable coming from the question *About how involved or uninvolved are you typically in deciding how to spend your household's income?* - (please read below in this chapter how and why the thesis selected this variable as a dependent variable). The variable has five categories- *very uninvolved, somewhat uninvolved, neither uninvolved nor involved, somewhat involved, and very involved*. These categories are ordered but the distances between the categories are unknown (e.g., Long & Freese, 2014, p. 309). These categories can be recoded as consecutive integers from 1 to 5, which indicates that linear regression model (LRM) can be used. But ordinal dependent variable breaks the assumptions of LRM and may end up leading to wrong results (e.g., shown by Winship & Mare, 1984, pp. 521-523). Previous studies (e.g., Long & Freese, 2014, p. 309) suggest the choice of models that rule out the assumptions that the distances between categories are equal if ordinal dependent variable is used.

Ordered logit model (OLM) can capture the different distances between categories (e.g., distance from very uninvolved to somewhat uninvolved or distance from somewhat involved to very involved).

is aware that in conference papers, journal articles, tweets, blog posts, book chapters, books, and other publications or reports, the data source must be mentioned as The Financial Inclusion Insights Program, InterMedia; and finally the author is conscious that violations of the conditions will be considered as illegal

The model can be written as:

$$\ln\left(\frac{P(Y=1)}{1-P(Y=1)}\right) = a + \boldsymbol{X}_i\boldsymbol{b}$$

$$1\ vs\ 2,\ 3,\ 4,\ 5: \quad ln\left(\frac{P(y_i>1)}{P(y_i\leq 1)}\right) = -\tau_1 + \boldsymbol{X}_i\boldsymbol{b}$$

$$1,\ 2\ vs\ 3,\ 4,\ 5: \quad ln\left(\frac{P(y_i>1)}{P(y_i\leq 1)}\right) = -\tau_2 + \boldsymbol{X}_i\boldsymbol{b}$$

$$1,\ 2,\ 3\ vs\ 4,\ 5: \quad ln\left(\frac{P(y_i>1)}{P(y_i\leq 1)}\right) = -\tau_3 + \boldsymbol{X}_i\boldsymbol{b}$$

$$1,\ 2,\ 3,\ 4\ vs\ 5: \quad ln\left(\frac{P(y_i>1)}{P(y_i\leq 1)}\right) = -\tau_4 + \boldsymbol{X}_i\boldsymbol{b}$$

In the above models, the effect of b is the same regardless of comparing different categories (e.g., the effect of b for 1 vs 2, 3, 4, 5 and 1, 2, 3, 4 vs 5 are the same). This assumption is known as proportional odds assumption or parallel regression assumption which is implicit in the OLM (Long & Freese, 2014, p. 326; McCullagh, 1980). Proportional odds model for ordered logistic regression requires to fit this proportional odds assumption. The thesis primarily decided to use this model for the current study.

It is important to assess the goodness of fit of such models by testing whether proportionality in proportional odds model is violated. If the assumption is violated the data cannot be analyzed by OLM. Brant (1990) proposed a test, which is known as Brant test. This test can be measured in STATA[15] (see Long & Freese, 2014, p. 330 to learn more), to test whether the parallel regression assumption is violated.

This thesis employs the Brant test to assess the goodness of fit of OLM for this study. Multinomial Logit Model (MNLM) is used when parallel regression assumption is violated. However, among two models (i.e., one model without control variables and another model with all control variables) under a hypothesis, if for example a model with no control variables suggests using OLM, this thesis uses OLM for both models to make the results comparable. Another reason for this preference of using OLM is to give importance on ordering of outcome variable. In this case, the thesis also estimates the model with all control variables employing MNLM to see the difference with the results of OLM and mention the results in the text.

[15] The STATA Brant test output gives a test statistic for all independent variables individually and a separate combined test statistic for all variables (also known as Omnibus test). A significant Omnibus test statistic indicates that parallel regression assumption is violated ("Ordered logistic regression: STATA data analysis examples", 2021).

Multinomial Logit Model and interpretation

Multinomial Logit Model (MNLM) is specified for addressing some of the research questions and hypotheses of this thesis. Although MNLM is used when the outcome is a nominal variable, we can use this model for ordinal outcomes if the assumption of parallel regressions is violated (Long & Freese, 2014, p. 385).

The MNLM can be imagined as "simultaneously fitting binary logits for all comparisons among the alternatives" (Long & Freese, 2014, p. 386). For example, in below equation, if categories of the dependent variable are renamed as *VU* for very uninvolved, *SU* for somewhat uninvolved, *SI* for somewhat involved, and *VI* for very involved and *own_Phone* is the independent variable.

$$\ln\left(\frac{Pr(VU|x)}{Pr(SU|x)}\right) = b_{0,VU|SU} + \boldsymbol{b}_{1,VU|SU}, \boldsymbol{own\_phone}$$

$$\ln\left(\frac{Pr(VI|x)}{Pr(SI|x)}\right) = b_{0,VI|SI} + \boldsymbol{b}_{1,VI|SI}, \boldsymbol{own\_phone}$$

$$\ln\left(\frac{Pr(SI|x)}{Pr(VI|x)}\right) = b_{0,SI|VI} + \boldsymbol{b}_{1,SI|VI}, \boldsymbol{own\_phone}$$

$$\ln\left(\frac{Pr(SU|x)}{Pr(VU|x)}\right) = b_{0,SU|VU} + \boldsymbol{b}_{1,SU|VU}, \boldsymbol{own\_phone}$$

In the equations the subscript to the b's shows which comparison is being made. For instance, $\boldsymbol{b}_{1,VU|SU}$ is a coefficient for the first predictor variable to compare between *VU* and *SU*. Fitting a set of binary logits to fit the MNLM is not optimal since each binary logit is formed on a different sample (Long & Freese, 2014, p. 387). For example, in the logit comparing VU with SU, those in VI and SI are dropped. Please note that the thesis does not consider dichotomizing the outcome variable because creating artificial dichotomy may cause a loss of information between the original categories of outcome variable.

However, *mlogit* command in STATA for MNLM can "obtain efficient estimates by simultaneously estimating all equations while imposing constraints that link the equations" (Long, 2015, p. 176). This study uses directly *mlogit* command to get the MNLM output.

Since interpreting the MNLM model is difficult, predicted probabilities are suggested by many authors (e.g., Long, 2015) to facilitate the interpretation of the results. So, this thesis used predicted probabilities for interpretation of the results.

Hypothesis testing

To decide on whether the hypotheses are confirmed, the thesis follows two steps. In the first step, the thesis uses Ordinary Least Square (OLS) regression to see whether one category of an independent variable is significantly different from another category. For example, if

own_phone is an independent variable and it has two categories, i.e., yes and no, this thesis investigates whether *yes* (i.e., mobile phone owner) are significantly different from *no* (i.e., mobile phone non-owner). In the second step, the thesis uses OLM/MNLM and predicted probabilities to see whether the association is similar to what is assumed in a hypothesis. For instance, in hypothesis 1, the thesis will see whether female mobile phone users have larger predicted probabilities than female mobile phone non-users. The thesis will decide a hypothesis is confirmed if the OLS regression shows significant difference between the categories, and predicted probabilities show assumed association. For example, the thesis concludes hypothesis 1 as confirmed if OLS shows that female mobile users are significantly different from female mobile phone non-users, and the predicted probabilities show that female mobile phone users have higher probability of being involved in household decision-making than female mobile phone non-users when all other variables are set at the mean.

Assessment of model fit

The *Likelihood-ratio (LR) chi-square test of all coefficients* will be used to understand the fit of the model. A significant p-value indicates that our model as a whole fits significantly better than a model with no predictor variable.

*Pseudo-R2'*s (also known as McFadden's R2 or LR index) is used as measure of a model fit, which compares a model only with the intercept to a model with all parameters (Long & Freese (2014). This thesis uses this measure to explain how much variation of dependent variable is explained by independent variable(s).

Likelihood-ratio (LR) test in MNLM has a new reason for testing sets of coefficients: testing that *J*-1 coefficients in a minimal set are simultaneously equal to 0 is required to test that a variable has no effect (Long & Freese, 2014). Likelihood-ratio (LR) test can measure the effects of the predictor variables on outcome variable. This thesis measures whether the independent variable significantly affects the dependent variable.

Variables

Dependent variable

Women's empowerment can be measured by indicators of decision-making (e.g., Tareque, Islam, Tareque, & Mostofa, 2011). This thesis selected indicators related to decision-making power such as: (1) *About how involved or uninvolved are you typically in deciding how to spend your household's income? (2) About how involved or uninvolved are you typically in*

deciding how your household's income is spent on basic needs like food and clothing? (3) About how involved or uninvolved are you typically in deciding how your household's income is spent on other things beyond basic needs? From these indicators, the study identified a variable using factor analysis. In factor analysis, as Kaiser criteria suggested to include those factors with eigenvalues equal or higher than 1 (Torres-Reyna, 2021), the study finally found one variable (i.e., *About how involved or uninvolved are you typically in deciding how to spend your household's income?*), which has eigenvalue (i.e., 2.7) higher than 1, factor loadings and uniqueness are 0.9502 and 0.0971 respectively, and explains 91% of variance. Total observations were 4839 in the analysis. Orthogonal variamax rotation retained one variable (i.e., *About how involved or uninvolved are you typically in deciding how to spend your household's income?*), which finds that the variable's variance is 2.7, rotated factor loadings is .9502 and uniqueness is .0971. Since some earlier studies (e.g., Feuerstein, 2000; O'Neil & Abedi, 1996) used principal component analysis method with eigen value more than one criterion and varimax rotation in their factor analysis, this thesis also used these techniques. In addition, as Pohlmann (2004) illustrated in a reviewed article that same data can be analyzed in different ways in factor analysis, this thesis chose Kaiser criteria from different options. This final dependent variable is an ordinal variable which has five categories, such as *very uninvolved, somewhat uninvolved, neither uninvolved nor involved, somewhat involved,* and *very involved*. This thesis interprets the last two involved categories as empowerment.

Key independent variables

"Own a phone" is the main independent variable to examine the effect of using a mobile phone in the context of research questions. This variable is interpreted as mobile phone use in the thesis.

"What were you mainly doing for work?" variable is used to explore the hypothesis 2A and 2B. The respondents were asked *In the past 12 months, what were you mainly doing for work?* Each respondent answered any one of the following 11 categories[16]: (1) working full-time for a regular salary (3.4%), (2) working part-time for a regular salary (1.1%), (3) working occasionally, irregular pay (whenever the work is available) (1.3%), (4) working per season (e.g., only during the harvest season) (.8%), (5) self-employed, working for yourself (4.8%), (6) not working but looking for a job (.4%), (7) housewife or stay-at-home husband doing household chores (77.6%), (8) full-time student (6.6%), (9) not working because of retirement

[16] Percentages distribution of each category is presented within the bracket of respective categories. The percentages are calculated using female respondents.

(1.3%), (10) not working because of sickness, disability, etc., (1.4%) and (11) other (1.4%). To test hypothesis 2A and 2B, the thesis recoded the variables in two categories. Original category 7, i.e., *housewife or stay-at-home husband doing household chores* is recoded as *housewives (77.6%)* and the categories 1, 2, 3, 4, 5, 6 combinedly recoded as *non-housewives (22.4%)*. After a sensitivity analysis[17], the categories 8, 9, 10, and 11 are excluded from the analysis since these categories do not fit with the purpose of the analysis.

"Relation to household head" variable has seven categories[18] such as head (respondent is head of household) (9.9%), spouse (70.6%), son/daughter (11.7%), father/mother (4.9%), sister/brother (1.7%), grandchildren (.1%), other relatives (1%). The OLM model added all the categories in the estimation but only the predicted probabilities of head and spouse are used in the interpretation. The reason is that hypothesis 3 is concerned to understand the effect of patriarchal family structure. But, for all the categories except head and spouse, the data do not clearly mention who is the household head. For example, whether the household head is male/female for *brother/sister* cannot be identified in the data. So, using this variable the thesis investigates the difference of the effect of mobile phone use among female heads and spouses to male heads.

"Social media use" is a categorical variable, which is used to answer hypothesis 4. By social media use, this thesis means use of social network sites such as Facebook, Twitter, Instagram, WhatsApp, or another social networking sites.

Control variables

Age and education were used to examine intra-household economic decision making and women's empowerment in previous studies (e.g., Tareque et al., 2011), so this thesis controls these two variables in the analysis. Age is categorized as five age groups (i.e., 15-24, 25-34, 35-44, 45-54, 55 and over). Education is also categorized as five categories (i.e., No formal education, Primary education, Secondary education, Higher education, and other). In addition, residence type is included as a control variable since the difference in mobile network between rural and urban areas in Bangladesh provides rural people with a poorer network which causes difficulty in mobile phone use. This variable has two categories: rural and urban.

[17] This thesis tested hypothesis 2A and hypothesis 2B using all categories, i.e., *non-housewives* dummy variable included the categories 1, 2, 3, 4, 5, 6, 8, 9,10, and 11 in the measurement. The results of this analysis show that hypothesis 2A and hypothesis 2B are rejected. Detailed results are not presented in the thesis.

[18] The percentages distribution, which is presented within the bracket with each category, are calculated using female respondents.

Each hypothesis has two statistical models, one model is measured without adding any of these control variables, and another model is measured adding all these control variables.

Limitations

There are some limitations in data. Firstly, the study used a cross-sectional data of FII (2017), so analysis does not show the discussed effects of mobile phones over the time.
Secondly, the respondents are those who have active digital stored-value accounts. That means that the samples are not representing those mobile phone users and non-users who do not have such accounts. The thesis did not find any specific statistics of how many mobile phone users there are in Bangladesh who fall in this excluded group. But whatever the size of the group, the results of the study might not be generalized to the group.
Finally, the variable *relation to household head* has some categories except head and spouse, which are not possible to distinguish by whether male/female is household head. So, the study measured only particular groups (i.e., head and spouse), not all groups to investigate how mobile phone use affects females within a male headed household. Thus, the study cannot measure whether the brothers/sisters are more involved in household decision-making. However, only the results of head or spouse in this regard are not affected by this limitation and this study is able to show a valid result regarding head and spouse groups to address the research questions. Because the effect of mobile phone use on any individual group can meaningfully capture what the study wanted to address for that particular group.

Results

Descriptive statistics

Table 1 reports the descriptive statistics of female respondents for dependent, independent and control variables in number and percent. The table indicates that a majority of females are more or less involved in deciding how to spend their household income. Table 1 also shows that 68.5% females own a phone, while 31.8% females do not own a phone. Among the female respondents, 77.6% are housewives. Only 12.8% of the female respondents used social media

by their own mobile phones, whereas 87.2% of the female respondents never used social media by their own mobile phones.

Table 1

Descriptive statistics of female for all variables in numbers and percent.

Descriptive statistics	*Female*	
	N	*%*
About how involved or uninvolved are you typically in deciding how to spend your household's income?		
Very uninvolved	169	7.1
Somewhat uninvolved	348	14.7
Neither uninvolved, nor involved	165	7.0
Somewhat involved	932	39.4
Very involved	753	31.8
Own a phone		
Yes	1622	68.5
No	745	31.5
In the past 12 months, what were you doing for work?		
Housewives	1837	77.6
Non-housewives[19]	530	22.4
Used mobile phone to use Facebook, WhatsApp, Twitter, Instagram or another social networking site (data included only female mobile phone owner)		
Social media user by own mobile phone	208	12.8
Never used social media by own mobile phone	1414	87.2
What is your relationship to the household head?		
Head (respondent is head of household)	235	9.9
Spouse	1672	70.6
Others family members/relatives	460	19.4

[19] In the table, *non-housewives* dummy variable included all categories except 7, i.e., the categories 1, 2, 3, 4, 5, 6, 8, 9, 10, and 11. But after excluding the categories 8, 9, 10, and 11 the descriptive statistics are *non-housewives*=279 (13.2%) and *housewives*=1837(86.8%), which are not presented here.

Education		
No formal education	448	18.9
Primary education	737	31.1
Secondary education	918	38.8
Higher education	257	10.9
Other	7	0.3
Age groups		
15-24	527	22.3
25-34	810	34.2
35-44	536	22.6
45-54	300	12.7
55 and over	194	8.2
Residence type		
Urban	667	28.2
Rural	1700	71.8
N	2367	48.9

Table 2 shows that mobile phone user females are more involved and less uninvolved than non-users in deciding how to spend their household income. In addition, the table indicates that the percentage of involvement in the household decision making is higher for housewives than non-housewives, while the percentage of non-involvement in the household decision making is lower for housewives than non-housewives. Moreover, the table demonstrates that, among female mobile phone users, those who never used social media are more involved and less uninvolved than social media users in the household decision making. Furthermore, the table points out that the percentage of involvement in the household decision making is higher for female household heads than that of spouses of male household head, while the percentage of non-involvement in the household decision making is lower for female household heads than that of spouses of male household head. This table helps to understand the variation in measures. The table also gives a bigger picture of the data.

Table 2

Distribution of females by the key independent variables over *how involved/uninvolved in deciding how to spend your household income*.

Descriptive statistics: independent variables	***VU***	***SU***	***NUNI***	***SI***	***VI***	***N (%)***
	N (%)	***N (%)***	***N (%)***	***N (%)***	***N (%)***	
Own a phone						
Yes	89 (5.5)	209 (12.9)	107 (6.6)	617 (38)	600 (37)	1622 (100)
No	80 (10.8)	139 (18.7)	58 (7.8)	315 (42.3)	153 (20.5)	745 (100)
In the past 12 months, what were you doing for work?						
Housewives	103 (5.6)	244 (13.3)	114 (6.2)	785 (42.7)	591 (32.2)	1837 (100)
Non-housewives[20]	66 (12.5)	104 (19.6)	51 (9.6)	147 (27.7)	162 (30.6)	530 (100)
Used mobile phone to use Facebook, WhatsApp, Twitter, Instagram or another social networking site[21]						
Social media user by own mobile phone	19 (8.4)	49 (21.6)	19 (8.4)	68 (30)	72 (31.7)	227 (100)
Never used social media by own mobile phone	150 (07)	299 (14)	146 (6.8)	864 (40.4)	681 (31.8)	2140 (100)
What is your relationship to the household head?						
Head (respondent is head of household)	05 (2.1)	13 (5.5)	12 (5.1)	38 (16.2)	167 (71.1)	235 (100)
Spouse	83 (05)	204 (12.2)	101 (6)	766 (45.8)	518 (31)	1672 (100)
Others family members/relatives	81 (17.6)	131 (28.5)	52 (11.3)	128 (27.8)	68 (14.8)	460 (100)

Note: VU=very uninvolved; SU=somewhat uninvolved; NUNI=neither uninvolved, nor involved; SI=somewhat involved; VI=very involved

[20] In the table, *non-housewives* dummy variable included all categories except 7, i.e., the categories 1, 2, 3, 4, 5, 6, 8, 9, 10, and 11. But after excluding the categories 8, 9, 10, and 11 the descriptive statistics are *non-housewives*=279 (13.2%) and *housewives*=1837(86.8%), which are not presented here.

[21] Data included only female mobile phone owner

Hypothesis 1- women's empowerment

Female mobile phone users are more involved in intra-household economic decision-making than female mobile phone non-users.

To test hypothesis 1, this thesis will use two steps. In the first step, the thesis will use OLS regression to examine (see Table 3[22]) whether female mobile phone users are significantly different from female mobile phone non-users. Next, the thesis will apply OLM and predicted probabilities to investigate (see Figure 1) whether female mobile phone users are more involved in household decision making than non-users. If this thesis finds in OLS regression that mobile phone user females are significantly different from mobile phone non-user females, and the predicted probabilities show that mobile phone user females are more involved in the household decision making, this thesis will agree that hypothesis 1 is confirmed.

Measures of model fit supports that adding control variables in the model (i.e., full model) is an improvement of the model. Adding control variables in the model increases the value of *Pseudo R2* from 1.2% to 4.2%, which means in full model mobile phone use explains 4.2% of variation of dependent variable. LR chi-square test of all coefficients (Prob > chi2=0.0000) indicates that our model as a whole fits significantly better than a model with no predictor variable.

Table 3 shows that female mobile phone users are significantly different from female mobile phone non-users in all four models.

Figure 1 presents that the predicted probabilities of being involved *in deciding how to spend your household income* are higher for female mobile phone users than female mobile phone non-users. Furthermore, predicted probabilities of being uninvolved in the decision making is lower for female mobile phone users than non-users. Please note that the thesis also measured model 2 using MNLM, as the model has violated parallel regression assumption. The thesis found that both MNLM and OLM produces almost similar results.

In sum, since results in Table 3 and Figure 1 support hypothesis 1, the thesis concludes that hypothesis 1 is confirmed.

[22] Presents four models. Model 1 and Model 2 used original categories of dependent variable, while Model 3 and Model 4 recoded the dependent variable to examine the combined effect of all involved categories and all uninvolved categories. Model 1 and Model 3 did not use any control variable and Model 2 and Model 4 added all control variables in the measurement.

Table 3

OLS regression of *how involved/uninvolved in deciding how to spend your household income* on own a phone.

Independent variable	*Model 1* [Ψa]	*Model 2* [bΨ]	*Model 3* [aΨΨ]	*Model 4* [bΨΨ]
Own a phone (No=ref)				
Yes	.45***	.41***	.23***	.21***
Constant	3.4***	2.9***	2.3***	2***
r^2	0.028	0.093	0.017	0.074
N	2367	2367	2367	2367

Note: [a] Not used control variables in the measurement; [b] Controlled for education, age groups, and residence type

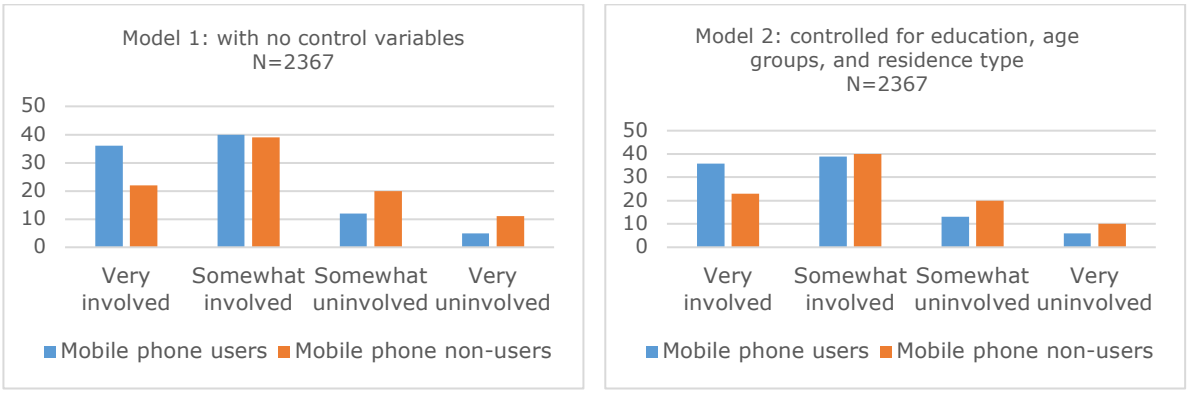
***p<0.001

[Ψ] Dependent variable (i.e., GN2_1) used original categories such as 1=very uninvolved, 2=somewhat uninvolved, 3=neither uninvolved, nor involved, 4=somewhat involved, 5=very involved

[ΨΨ]Dependent variable (i.e., GN2_1) is recoded as 1=very uninvolved+somewhat uninvolved, 2=Neither uninvolved, not involved, and 3=very involved+somewhat involved

Figure 1

Predicted probabilities (percent) of *how involved/uninvolved in deciding how to spend your household income* on female mobile phone users and non-users: ordered logit model.



Hypothesis 2A- empowerment of restricted women

Mobile phone user housewives are more involved in intra-household economic decision making than mobile phone user non-housewives.

This thesis will conclude that hypothesis 2A is confirmed if Table 4[23] shows that mobile phone user housewives are significantly different from mobile phone user non-housewives, and

[23] Presents four models which are estimated by OLS regression. Model 1 and Model 2 used original categories of dependent variable, while Model 3 and Model 4 recoded the dependent variable to examine

Figure 2[24] presents that mobile phone user housewives are more involved in household decision making than mobile phone user non-housewives.

The results in measures of model fit show that adding control variables in the model is an improvement of the model. The value of *Pseudo R2* has increased from 1.4% to 2.9% when the model is controlled for education, age groups, and residence type. The thesis finds that our model as a whole fits significantly better than a model with no predictor variable according to the result of LR chi-square test of all coefficients (Prob > chi2=0.0000). In addition, LR test explains that the effect of mobile phone user housewives on *deciding how to spend their household income* is significant at the 0.013 level (LR chi2= 12.7, df=4, p<0.05).

Results in Table 4 show that mobile phone user housewives are significantly different from mobile phone user non-housewives in model 1 and model 2. However, mobile phone user housewives are not statistically significant when dependent variable is recoded in model 3 and model 4.

Predicted probabilities in Figure 2[25] demonstrate that housewives mobile phone users are less involved in *deciding how to spend their household income* than non-housewives mobile phone users. In addition, the figure also presents that predicted probabilities of being uninvolved in the household decision making is higher for housewives mobile phone users than non-housewives mobile phone users. Since Model 1 and Model 2 show being very involved is lower for mobile phone user housewives, the thesis measured the combined effects of being "somewhat involved" and "very involved" as the effect of being "involved" as well as being "very uninvolved" and "somewhat uninvolved" as the effect of being "uninvolved". The result[26] (not presented in the thesis) of new combined categories confirms that predicted probabilities of being involved in the decision making is higher for mobile phone user housewives than non-housewives, while predicted probabilities of being uninvolved in the household decision making is higher for housewives mobile phone users than non-housewives mobile phone users.

Based on the results presented in Table 4 and Figure 2, the thesis concludes that hypothesis 2A is rejected.

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the combined effect of all involved categories and all uninvolved categories. Model 1 and Model 3 did not use any control variable and Model 2 and Model 4 added all control variables in the measurement.

[24] Employs MNLM and uses predicted probabilities.

[25] The thesis also measured these two models (i.e., one model with no control variable and another with all control variables) using OLM to compare the results with the results of MNLM. The thesis found that both MNLM and OLM produce almost similar results.

[26] Please note that the thesis used OLM regression for measuring these combined effects as the models did not violated the parallel regression assumption.

Table 4

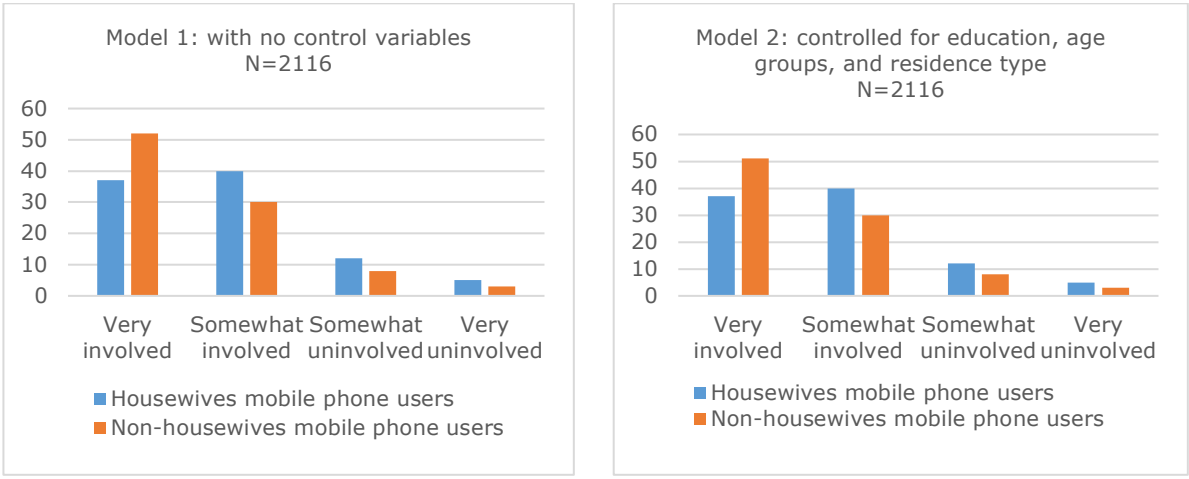
OLS regression of *how involved/uninvolved in deciding how to spend your household income* on housewives and non-housewives mobile phone user and non-users.

Independent variables	*Model 1* $^{\Psi a}$	*Model 2* $^{b\Psi}$	*Model 3* $^{a\Psi\Psi}$	*Model 4* $^{b\Psi\Psi}$
Recoded variable (non-housewives users=ref)				
Housewives users	-.22**	-.22**	-.07	-.07
Housewives non-users	-.55***	-.54***	-.22***	-.22***
Non-housewives non-users	-.16	-.13	-.05	-.03
Constant	4.1***	3.7***	2.7***	2.4***
r^2	0.021	0.046	0.009	0.030
N	2116	2116	2116	2116

Note: [a]Not used control variables in the measurement; [b] Controlled for education, age groups, and residence type
*p<0.05, **p<0.01, ***p<0.001
$^{\Psi}$ Dependent variable (i.e., GN2_1) used original categories such as 1=very uninvolved, 2=somewhat uninvolved, 3=neither uninvolved, nor involved, 4=somewhat involved, 5=very involved
$^{\Psi\Psi}$Dependent variable (i.e., GN2_1) is recoded as 1=very uninvolved+somewhat uninvolved, 2=Neither uninvolved, not involved, and 3=very involved+somewhat involved

Figure 2

Predicted probabilities (percent) of *how involved/uninvolved in deciding how to spend your household income* on mobile phone user housewives and non-housewives: multinomial logit model.



Hypothesis 2B- empowerment of restricted women

The difference in probabilities of being involved in intra-household economic decision making between mobile phone users and non-users is higher for housewives than non-housewives.

This thesis will test hypothesis 2B using two steps. In the first step, this thesis will use OLS regression (see Table 5[27]). If the OLS result shows that there is a significant difference among mobile phone user and non-user housewives but no significant difference among non-housewives users and non-users or the other way around, it means the result in step 1 confirms hypothesis 2B. In the second step, this thesis will employ MNLM, and use predicted probabilities (see Figure 3). If the predicted probabilities show that difference in predicted probabilities (percent) of being involved in the household decision making between mobile phone users and non-users is higher for housewives than non-housewives, the thesis will consider this result as confirmation of hypothesis 2B. This thesis will finally decide that hypothesis 2B is confirmed if results in both steps confirm the hypothesis.

Results in measures of model fit indicate that the model is improved when the model is controlled for education, age groups, and residence type. Adding these control variables in the model also increases the value of *Pseudo R2* from 1.4% to 2.9%. That is, mobile phone use explains 2.9% of variation of dependent variable in the full model. Results of LR chi-square test of all coefficients (Prob > chi2=0.0000) represents that our model as a whole fits significantly better than a model with no predictor variable. Moreover, the LR test explains that the effect of mobile phone user housewives in *deciding how to spend their household income* is significant at the 0.000 level (LR chi2= 23.8, df=4, p<0.001).

Table 5 shows that housewives mobile phone users are significantly different from housewives mobile phone non-users in all four models. On the other hand, non-housewives mobile phone users are significantly different from non-housewives mobile phone non-users in all four models.

Figure 3 presents that the difference in predicted probabilities of being involved in *deciding how to spend their household income* between mobile phone users and non-users is lower for housewives than non-housewives, controlling for education, age groups, and residence type. On the other hand, the difference in predicted probabilities of being uninvolved in the household decision making between mobile phone users and non-users is slightly higher for housewives than non-housewives, controlling for education, age groups, and residence type.

[27]Presents four models. Model 1 and Model 2 used original categories of dependent variable, while Model 3 and Model 4 recoded the dependent variable to examine the combined effect of all involved categories and all uninvolved categories. Model 1 and Model 3 did not use any control variable and Model 2 and Model 4 added all control variables in the measurement.

Finally, this thesis decides that hypothesis 2B is rejected based on the results presented in Table 5 and Figure 3.

Table 5

OLS regression of *how involved/uninvolved in deciding how to spend your household income* on mobile phone user and non-user housewives and non-housewives.

Independent variables	*Model 1*[Ψa]	*Model 2*[bΨ]	*Model 3*[aΨΨ]	*Model 4*[bΨΨ]
Recoded variable (housewives non-user=ref)				
Housewives user	.16**	.15**	.08*	.07*
Constant	3.8***	3.3***	2.5***	2.3***
r^2	0.004	0.030	0.023	0.023
N	2116	2116	2116	2116
Recoded variable (non-housewives non-user=ref)				
Non-housewives user	.31***	.30***	.11*	.11*
Constant	3.8***	3.3***	2.6***	2.3***
r^2	0.006	0.032	0.002	0.023
N	2116	2116	2116	2116

Note: [a] Not used control variables in the measurement; [b] Controlled for education, age groups, and residence type

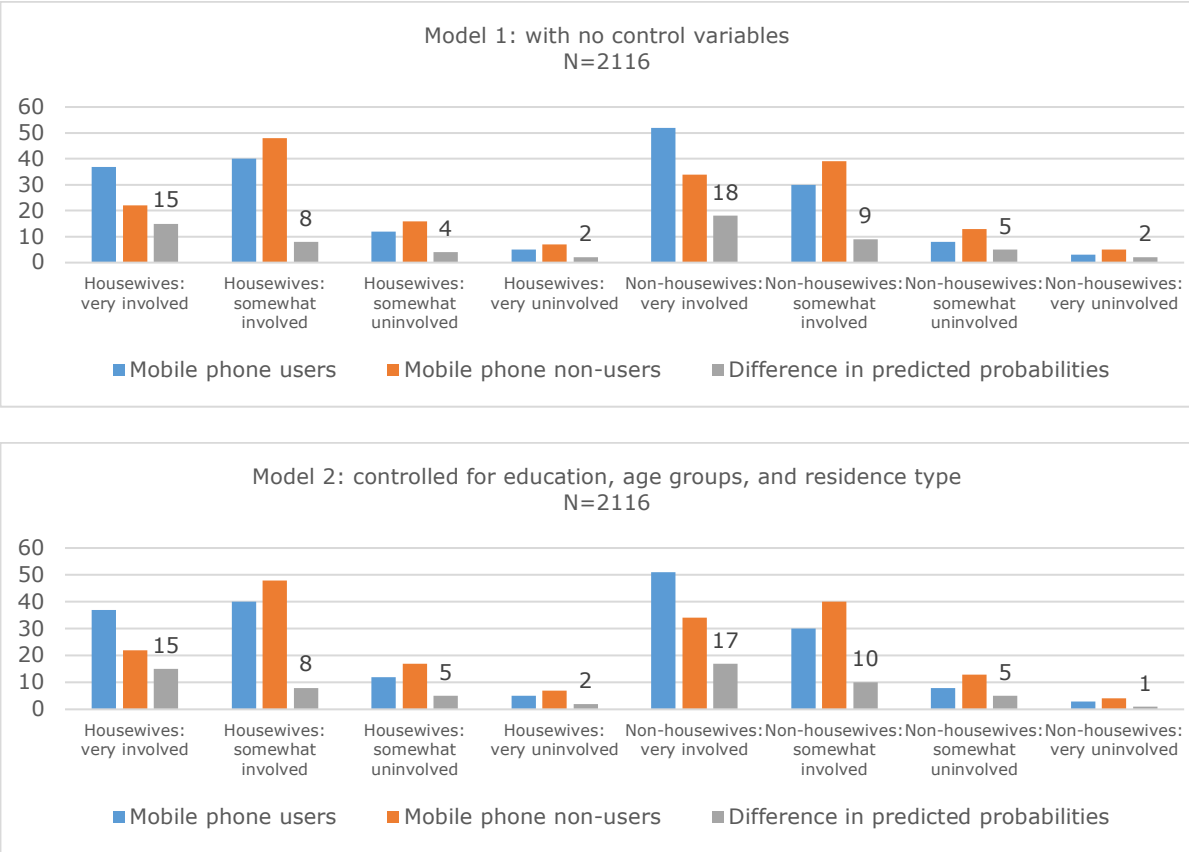
*p<0.05, **p<0.01, ***p<0.001

[Ψ] Dependent variable (i.e., GN2_1) used original categories such as 1=very uninvolved, 2=somewhat uninvolved, 3=neither uninvolved, nor involved, 4=somewhat involved, 5=very involved

[ΨΨ]Dependent variable (i.e., GN2_1) is recoded as 1=very uninvolved+somewhat uninvolved, 2=Neither uninvolved, not involved, and 3=very involved+somewhat involved

Figure 3

Difference in predicted probabilities (percent) of *how involved/uninvolved in deciding how to spend your household income* on mobile phone user and non-user housewives and non-housewives: multinomial logit model.



Hypothesis 3- patriarchy

The difference in probabilities of being involved in intra-household economic decision making between mobile phone user and non-user females is higher for spouses to heads of household than heads.

Like previous hypotheses testing, the thesis will use two steps for testing hypothesis 3. In the first step, this thesis will examine (see Table 6[28]) whether there is a significant difference among spouses to household head mobile phone users and non-users but no significant difference between female heads mobile phone users and non-users or the other way around. In the second step, this thesis will use OLM and predicted probabilities to investigate (see Figure 4) whether

[28] Presents four models which are estimated by OLS regression. Model 1 and Model 2 used original categories of dependent variable, while Model 3 and Model 4 recoded dependent variable to examine the combined effect of all involved categories and all uninvolved categories. Model 1 and Model 3 did not use any control variable and Model 2 and Model 4 added all control variables in the measurement.

the difference in predicted probabilities of being involved in the household decision making between mobile phone user and non-user females is higher for spouses to household head than female heads. If the thesis finds in step 1 that there is a significant difference and step 2 shows the assumed assumption, this thesis will resolve that hypothesis 3 is confirmed.

Results in measures of model fit show that mobile phone use better explains the variation of dependent variable when the model is controlled for education, age groups, and residence type since adding the control variables increases the value of *Pseudo R2* from 7.1% to 8.1%. Furthermore, LR chi-square test of all coefficients (Prob > chi2=0.0000) indicates that our model as a whole fits significantly better than a model with no predictor variable.

Table 6

OLS regression of *how involved/uninvolved in deciding how to spend your household income* on female mobile phone user and non-user heads and spouses to head.

Independent variables	***Model 1 Ψa***	***Model 2b Ψ***	***Model 3a ΨΨ***	***Model 4b ΨΨ***
Recoded variable (spouse non-user=ref)				
Spouse user	.41***	.30***	.28***	.21***
Constant	3.5***	3***	2.4***	2.1***
r^2	0.027	0.084	0.028	0.076
N	2367	2367	2367	2367
Recoded variable (head non-user=ref)				
Head user	.83***	.73***	.33***	.27***
Constant	3.7***	3.1***	2.5***	2.1
r^2	0.033	0.096	0.012	0.069
N	2367	2367	2367	2367

Note: [a] Not used control variables in the measurement; [b] Controlled for education, age groups, and residence type

*p<0.05, **p<0.01, ***p<0.001

[Ψ] Dependent variable (i.e., GN2_1) used original categories such as 1=very uninvolved, 2=somewhat uninvolved, 3=neither uninvolved, nor involved, 4=somewhat involved, 5=very involved

[ΨΨ]Dependent variable (i.e., GN2_1) is recoded as 1=very uninvolved+somewhat uninvolved, 2=Neither uninvolved, not involved, and 3=very involved+somewhat involved

Figure 4

Difference in predicted probabilities (percent) of *how involved/uninvolved in deciding how to spend your household income* on female mobile phone user and non-user heads and spouses to head: ordered logit model.

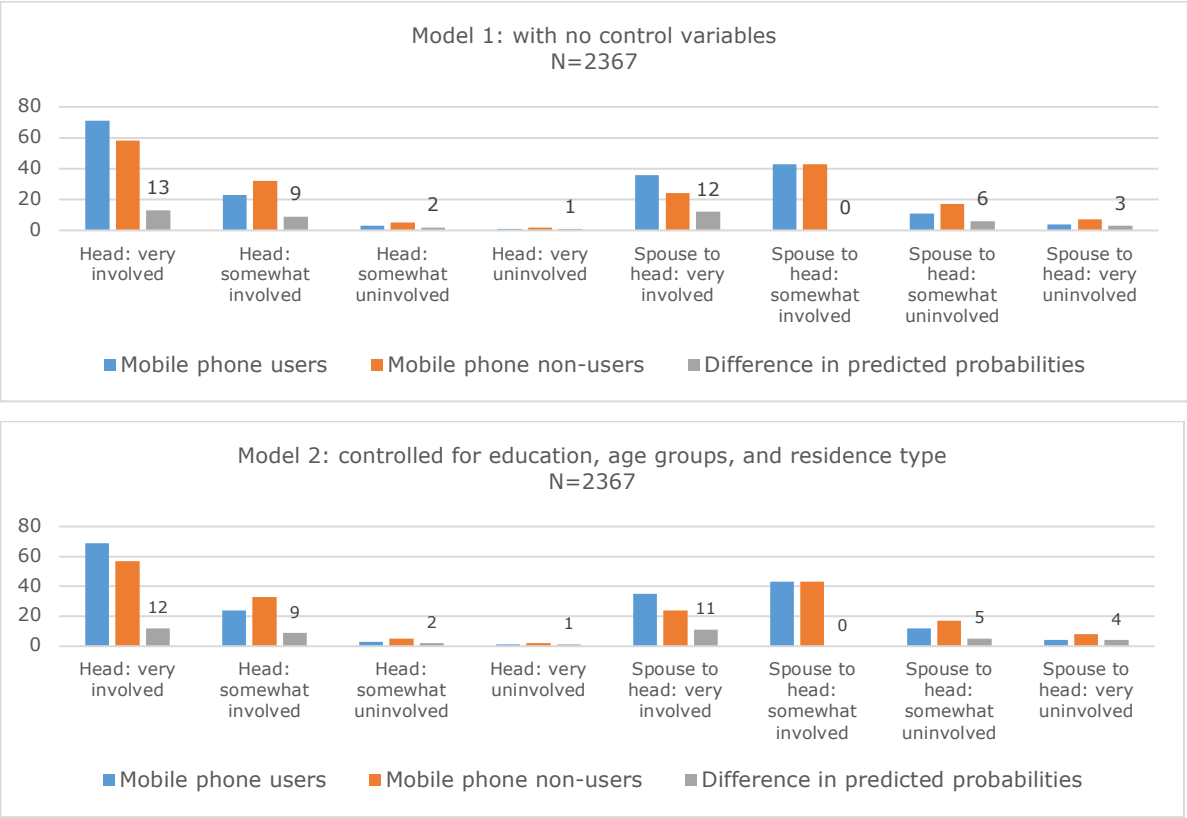


Table 6 demonstrates that female spouses to household head mobile phone users are significantly different from female spouses to household head mobile phone non-users in all four models. In addition, the table presents that female household head mobile phone users are significantly different from female household head mobile phone non-users. That is, step 1 does not meet the requirement of the confirmation for hypothesis 3.

Figure 4[29] presents that the difference in predicted probabilities of being involved in *deciding how to spend your household income* between female mobile phone users and non-users is lower for spouses to head than heads. On the other hand, the difference in predicted probabilities of uninvolved in the household decision making between female mobile phone

[29] Please note that although Model 1 has violated the parallel regression assumption, the thesis finally used OLM regression for measuring the model because Model 2 did not violate the assumption. So, to keep the results comparable, the thesis used OLM regression for both models. Moreover, the thesis measured the Model 1 using MNLM regression and found similar results as found in OLM regression.

users and non-users is higher for spouses to head than heads. Both the model with no control variable and the model with all control variables found these results. So, Figure 4 does not show the assumed association that is required to resolve hypothesis 3 as confirmed.
Since the results presented in Table 6 and Figure 4 do not support hypothesis 3, the thesis finally decides that hypothesis 3 is rejected.

Hypothesis 4- social media use

Among female mobile phone users, social media users are more involved in intra-household economic decision-making than those who never used social media.

This thesis will decide on testing hypothesis 4 based on the results found in two different steps. In step 1, the thesis finds whether results in Table 7[30] shows that among mobile phone user females, social media users are significantly different from those who never used social media, and whether results in Figure 5[31] presents that social media user are more involved in *deciding how to spend their household income*. This thesis will decide hypothesis 4 is confirmed if result in step 1 finds that the two groups are significantly different from each other, and result in step 2 shows that social media user females are more involved in the household decision making.
This thesis finds that the model improves when it is controlled for education, age groups, and residence type. Measures of model fit also indicate that adding control variables (i.e., education, age groups, and residence type) in the model helps mobile phone use explain better the variation of dependent variable since it increases the value of Pseudo R2 from .4% to 2.9%. Furthermore, the results in LR chi-square test of all coefficients (Prob > chi2=0.0000) indicates that our model as a whole fits significantly better than a model with no predictor variable. However, LR test shows that in Model 2 the effects of social media use by own mobile phone on *deciding how to spend household income* is not statistically significant (LR chi2= 5.192, df=4, p<chi2= 0.268), although the effect was significant at the 0.01 level (LR chi2= 17.251, df=4, p<chi2= 0.002) in the Model 1.

[30]Presents four models which are measured by OLS regression. Model 1 and Model 2 used original categories of dependent variable, while Model 3 and Model 4 recoded dependent variable to examine the combined effect of all involved categories and all uninvolved categories. Model 1 and Model 3 did not use any control variable and Model 2 and Model 4 added all control variables in the measurement.

[31] Employs MNLM and uses predicted probabilities.

Table 7

OLS regression of *how involved/uninvolved in deciding how to spend your household income* on social media use by own phone.

Independent variables	*Model 1*[Ψa]	*Model 2*[bΨ]	*Model 3*[aΨΨ]	*Model 4*[bΨΨ]
Used social media by own phone: original variable (never=ref)				
Yesterday	-.47***	-.21	-.36***	-.20*
In the past 7 days	-.21	.03	-.14	-.002
In the past 30 days	-.34	-.11	-.26*	-.13
In the past 90 days	-.21	.03	-.24	-.11
Between 90 days and 1 year	-.21	.05	-.17	-.02
More than 1 year	.68	.90	.40	.54
Constant	3.9***	3.4***	2.6***	2.3***
r^2	0.012	0.056	0.015	0.049
Recoded variable (never used social media by own phone=ref)				
Used social media by own phone	-.32***	-.07	-.24***	-.10
Constant	3.9***	3.4***	2.6***	2.3***
r^2	0.008	0.052	0.011	0.046
N	1622	1622	1622	1622

Note: [b] Not used control variables in the measurement; [c] Controlled for education, age groups, and residence type

*p<0.05, **p<0.01, ***p<0.001

[Ψ] Dependent variable (i.e., GN2_1) used original categories such as 1=very uninvolved, 2=somewhat uninvolved, 3=neither uninvolved, nor involved, 4=somewhat involved, 5=very involved

[ΨΨ]Dependent variable (i.e., GN2_1) is recoded as 1=very uninvolved+somewhat uninvolved, 2=Neither uninvolved, not involved, and 3=very involved+somewhat involved

Table 7 shows that among female mobile phone users, social media users are not significantly different from those who never used social media in Model 2 and Model 4. These results are found in the estimation conducted both by original independent variable and recoded independent variable. However, these two groups were significantly different from each other in Model 1 and Model 3, i.e., in models with no control variable.

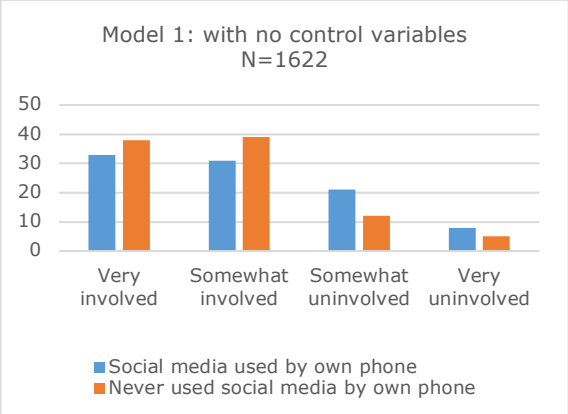
Figure 5 depicts that the predicted probabilities of being both very involved and somewhat involved in *deciding how to spend their household income* is lower for social media users than those who never used social media among female mobile phone users. Model 2 presents that

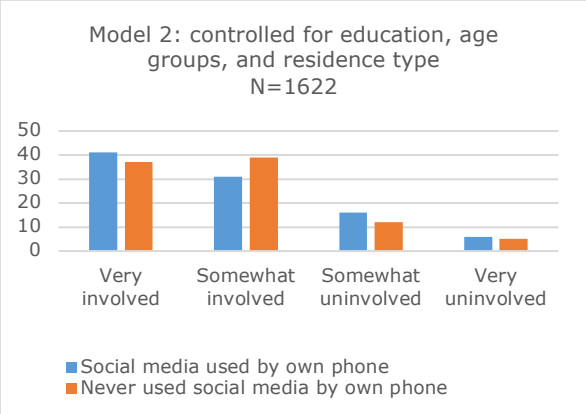
the predicted probabilities of being somewhat involved in the decision making is lower for social media users, although the predicted probabilities of being very involved in the decision making is a little higher for social media users.

Finally, this thesis determines hypothesis 4 as rejected based on the results found in step 1 and step 2.

Figure 5

Predicted probabilities (percent) of *how involved/uninvolved in deciding how to spend your household income* on social media use by own phone: multinomial logit model.





Note: Independent variable (i.e., MT17_9) is recoded as "social_net_user2" which now has 0=never and 1=all social media users (i.e., "yesterday", "in the past 7 days", "in the past 30 days", "in the past 90 days", "between 90 days and 1 year", and "more than 1 year").

Discussion

The main results in the thesis indicate that mobile phone use primarily facilitates women's empowerment in Bangladesh. However, the thesis found variation in the impact of mobile phone use for various groups. For example, mobile phone use does not give increased benefit to housewives for their empowerment. Moreover, mobile phone use has no additional importance for helping women's empowerment in male headed households. In addition, social media use by one's own mobile phone has no extra effect for promoting women's empowerment.

The results of hypothesis testing respond to the research questions. Hypothesis 1 is confirmed, which implies that mobile phone use is important for females in general. But as hypothesis 2A and hypothesis 2B are rejected, the result indicates that mobile phone use does not give added benefit for the empowerment of restricted women, particularly housewives. Moreover, the

results demonstrate that, in the achievement of empowerment, mobile phone use has no extra support for specific groups such as spouses of male headed households and social media users by their own mobile phones since hypothesis 3 and hypothesis 4 are rejected.

West and Zimmerman's (1987) arguments are supported by the results of this thesis. For example, the results of this thesis imply that, in mobile phone mediated interaction, housewives do what perfectly fits the situations they encounter every day and are expected from them as women. Even when they talk over mobile phones, they do not challenge gender norms. Thus, mobile phone use does not help to reshape women's gendered perception within the family, and therefore, mobile phone use does not facilitate housewives more than non-housewives in their empowerment. So, this thesis concludes that doing gender is being accomplished by these housewives in mobile phone mediated interaction as it is done in face-to-face interaction.

The thesis discussed two important points from radical feminist view that relates to the results. First, men control women through the structure of patriarchy; second, oppression against women can be defeated through the awareness of women about their own value and strength. The results in this case indicate that mobile phone use does not help women reduce oppression. Mobile phone use does not help women to challenge men's denial to women's access to positions of power such as involvement in household decision making. Radical feminist view did not say mobile phone use will make women aware, but since mobile phone use gives information to women and facilitates them to be connected with other women, it was likely for women to be able to reshape their consciousness through mobile phone use. But the results do not show any significant evidence of such new consciousness of women through mobile phone use.

Some earlier studies (e.g., Hossain & Samad, 2020; Handapangoda & Kumara, 2013; Hossain & Beresford, 2012) claim that mobile phone use has a positive impact on women's empowerment since it assists women with information. But the result of this thesis indicates that any information that women get via mobile phones does not enhance women's involvement in the household decision making in all instances. Information via mobile phones primarily facilitates women's empowerment, but the information does not help particular groups such as restricted women by changing their perception about their own rights within the family. So, mobile phone use does not equalize the situation of women in Bangladesh but differences within the group of women remains.

Like previous studies (e.g., Hossain & Samad, 2020; Handapangoda & Kumara, 2013; Bayes, 2001) that argued mobile phone use facilitates women's empowerment through enhancing

women's freedom of choice and action, the results show that mobile phone use essentially helps women's empowerment through the higher level of involvement in household decision-making. However, the thesis did not find any significant evidence that mobile phone use still helps in women's empowerment in specific conditions such as under patriarchal family structure.

The thesis did not find any significant effect of social media use on women's empowerment, although some previous studies (e.g., Ndukwe, 2020; Adaugo et al., 2015) argued that social media use helps empowering women since it promotes information sharing, emotional supports, seeking for help and so on. One possible reason for this result could be that very few women use social media by their mobile phones (12.8%). So, these small numbers of women who use social media do not get enough opportunity of knowing other women's status/opinion using the social media platforms. Thus, the effect of social media may remain insignificant. Moreover, another reason might be the tendency of internet users to neglect their friends, family, relatives, and neighbours (e.g., Kraut et al, 1998). Because this negligence can cause isolation of family members from household decision-making (Kraut et al, 1998, p. 1019).

Some earlier studies measured the effect of other variables such as mobile phone provided health services (e.g., Grameenphone, 2009) or business benefits (e.g., Munyua, 2009) to assess the role of mobile phone use on women's empowerment. In addition, mobile phone use was seen as an indicator of other variables such as westernization of attitudes, marital relations and so on. But without focussing on these issues, a contribution of this thesis is to examine the importance of mobile phones as an interactional platform, which may facilitate women in their empowerment through not conforming to the gender norms. The thesis found in this case that mobile phones do not have a different role as an interactional platform in achieving women's empowerment since the results indicate that women conform to the gendered norms. One reason could be a common pattern of conservation is accomplished where similar minded women talk to each other. Perhaps they have almost similar levels of social and economic conditions. So, their conversation over mobile phone does not make any change to their thinking about their position within the family.

Although Hossain & Beresford (2012, p.465) argued that mobile phone use has potential to change social, cultural, and religious norms, the thesis did not find any strong evidence supporting the argument. For example, if mobile phone use can change the norms, it is likely that women who are confined within the family or spouses of male household head will be highly affected by mobile phone use. So mobile phone user women will be more involved in

household decision making since men usually take most of the household decisions in Bangladesh. But hypothesis 2B and hypothesis 3 indicate that mobile phone use does not help these groups of women in their empowerment. One reason for such results could be that women only talk over the phone to convey important information in a short talk considering high mobile phone bills. That is, the interaction over mobile phones may not be like a long discussion about gender issues. Perhaps people who believe in similar gendered norms may join in the mobile phone mediated conversation as discussed above.

In sum, the results of this thesis show that mobile phone use assists women's empowerment in general, although the result does not show any evidence of changing gendered norms through mobile phone mediated interaction. The thesis discussed at the beginning that if women challenge norms through mobile phone mediated interaction, mobile phone use will be important for women in Bangladesh. The reason for such an argument was, firstly, the restrictions generated by socio-cultural norms that confines millions of women within the family, and secondly, patriarchal family structure oppresses women from their rights. In the given context, if mobile phone mediated interaction helps women to challenge gendered norms through building awareness about their own rights, mobile phone use can be an important facilitator of women's empowerment. But the results present strong evidence that mobile phone use does not give any additional benefit to spouses to male household heads or housewives for their empowerment. One reason for this result could be that doing gender is happening in a similar way as argued by West and Zimmerman (1987). That is, women conform to the norms that are expected by society from them.

Future studies can investigate the effects of mobile phone use on women disempowerment from Bangladesh context. In addition, whether female social media users are isolated from family members in Bangladesh and whether this isolation led to being less involved in household decision-making can also be studied.

This thesis has gone through a lot of difficulties. In this regard, one important reflection is that ordinal outcome, which is not artificially dichotomized for analysis, sometimes makes it difficult to know when the hypothesis is rejected or confirmed.

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