

The Impact of Mobile Phones on the Status of Women in India

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ABSTRACT

Mobile phones have grown at an extraordinary rate throughout the developing world in recent years. They are potentially an invaluable economic asset to the poor and an important tool for strengthening social ties. Mobile phones may also help women overcome physical boundaries, especially in places where they are separated from their support networks and bound within their husband's social sphere. This paper examines the impact of mobile phones on the status of women in India. Using nation-wide cross-sectional data at the individual level, I build on Jensen and Oster's model for measuring women's status. I use domestic violence, decision-making autonomy, child preferences and economic independence as proxies for bargaining power and status of women in their household and society. I find that mobile phones significantly decrease both men and women's tolerance for domestic violence, increase women's autonomy in mobility and economic independence, but do not find significant effects on child preferences and other measures of autonomy. Where the effects are significant, they are also large and in some cases equivalent to more than five extra years of education. These results suggest that the Government of India and those of other countries should consider mobile phones as a policy instrument for empowering women.

Keywords: mobile phones, gender inequality, domestic violence, autonomy, linear probability, probit, ordered probit

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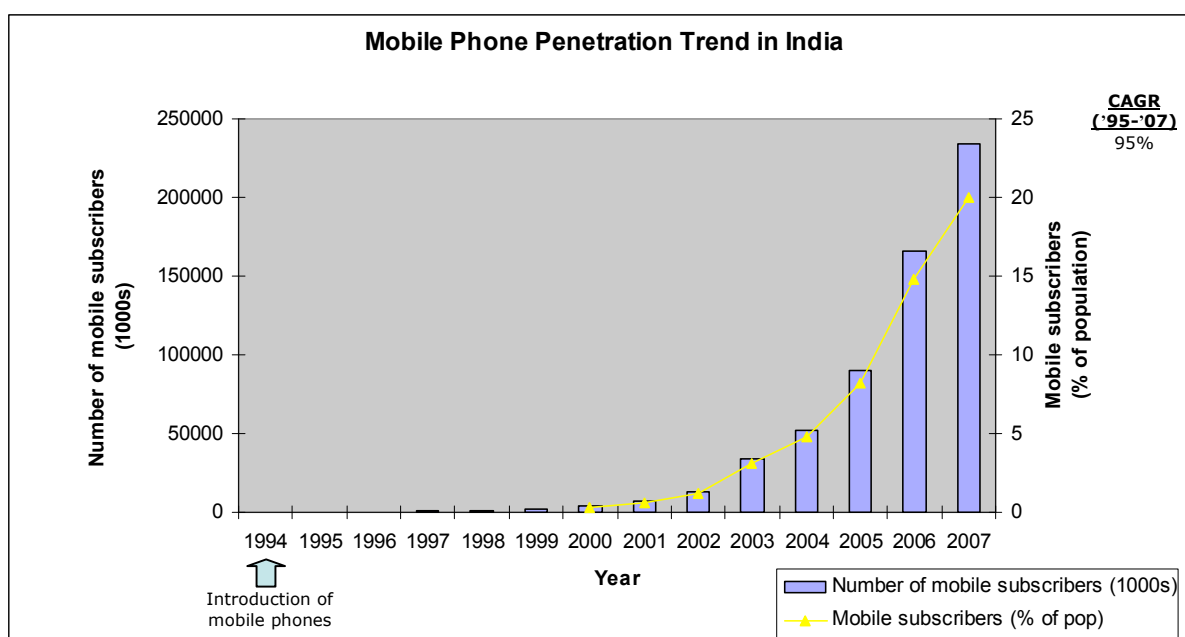
Table of Contents

I.	Background and Introduction	3
II.	Related Literature Review	7
III.	Methodology	9
	A. Data	9
	B. Empirical Strategy	15
IV.	Results	18
V.	Conclusions	27
	Appendix	31
	References	51

I. Background and Introduction

Since the 1990s, mobile phones have proliferated at an astonishing rate in developing countries. South Asia and sub-Saharan Africa, two of the poorest and remotest regions of the world, have been catching up rapidly in mobile access (Pigato 2001). India is the fastest growing market with nearly 6 million additional mobile phone subscriptions per month (Rai 2006). Since mobile phones became available in 1994, subscriptions increased at a compound annual growth rate of 95 percent. The number of mobile phones per 100 inhabitants in India increased from 0.4 in 2000 to 20 by 2007, and surpassed landline phones by 2004 (ITU 2008).

Figure 1



Source: ITU Free Statistics ("ITC-Eye"), 2008.

Rapid penetration of mobile phones in the developing world has important socioeconomic implications. Mobile phones are a key economic asset for the poor. Mobile phones are often more useful than landline phones because users can carry them around, receive

text messages and download simple data. Geser (2005) suggests these features make mobile phones a decent substitute for computers for the poor. While they are complements to landline phones in developed countries, Waverman, Meschi and Fuss (2005) suggest that they are substitutes in developing countries, which implies that they have a “stronger growth impact” (p.1) in the developing world. Providing mobile phone service is cheaper than extending landlines because mobile phones require lower fixed costs in physical infrastructure. One of the reasons why India, despite being one of the poorest countries, boasts the quickest mobile phone growth rate is that India’s per minute charge is cheaper than anywhere else in the world. Rai (2006) reports that “service providers offer deals that include unlimited incoming calls for a one-time fee of 1,000 rupees” (roughly \$21).

Several studies show that mobile phones have a positive impact on the economic development of developing countries. Waverman, Meschi and Fuss find that the per capita GDP growth of a developing country with 10 more mobile phones per 100 inhabitants between 1996 and 2003 was 0.59 percent higher than an otherwise identical country (p.2). They estimate that this impact may be only half as large in developed countries. In another macro level study, Sridhar and Sridhar (2006) show that increased mobile phone penetration in developing countries contribute to about 2.5 percent of annual GDP growth on average while landline penetration contribute to about 1.6 percent. Other micro level studies examine more specific mechanisms and find positive economic impact. Mobile phones improve efficiency in agricultural (Islam & Gronlund 2008; Aker 2008) and fish markets (Jensen 2006) by providing better market information, allow micro-entrepreneurs to expand business contacts (Donner 2007), and facilitate financial transactions such as processing remittances and obtaining microcredit (Talbot 2008).

Mobile phones also have significant social impact. A substantial body of sociology

literature suggests that phones shorten the social time and space (Geser 2005; Green 2002). Using survey data from Taiwan, Wei and Lo (2006) show that mobile phones “strengthen users’ family bonds, expand their psychological neighborhoods, and facilitate symbolic proximity to the people they call” by streamlining communication (p. 53). Phones are especially valuable to women, as they serve as a “liberator” (Frissen 1995; Rakow 1998). Examining women’s use of phones in a small community setting, Rakow (1992) argues that phones mitigate women’s fear, isolation, loneliness, and boredom by helping them cope better with confinement at home and physical separation from their own family members and friends.

This liberating effect is likely to be larger in communities where women’s status is lower and women face higher communication barriers. Women in developing countries face especially high barriers when travelling long distances to visit family, friends or potential business contacts. Hence they have fewer opportunities to voice their concerns, viewpoints, ideas or plans and to form networks to find jobs or start businesses. Phones may empower women by giving them better access to social services. Given the privacy of talking on the phone, women can more easily report domestic violence or consult family planning agencies. Features unique to mobile phones, such as portability, text messaging and data downloading, may also allow women to more easily participate in the labor force by giving them more timely and accurate market information and greater flexibility of communication. In addition, unlike other ICT devices, mobile phones do not require literacy or sophisticated skills that many women lack. Direct access to phones may empower women by increasing opportunities for communication and obtaining information.

Finding a causal link between mobile phones and higher status of women has significant socioeconomic policy consequences. Gender inequality is a serious social problem in India. A

significant body of work in economics, sociology and anthropology emphasizes the dowry system and low levels of female education, as well as other cultural socioeconomic factors as the main causes of gender discrimination in India (Jensen & Oster 2007). Gender disparity is reflected in significantly higher female infant mortality rates, violence against women at the domestic and societal levels, as well as discrimination against girls and women in educational and employment opportunities.

In an influential paper, Dyson and Moore (1983) find that gender inequality is worse in the northern Indian states than in the southern states mainly because marriages tend to be exogamous – to individuals outside the village – in the north and to those who are unrelated by blood. In the southern states, marrying someone close is less taboo and therefore more common. Women in northern states often move into an unfamiliar family in a different village, and are more severed from their support groups. In 2002, the nearest telegraph office or public telephone was more than 10 km away from the village in more than a quarter of all Indian villages (Government of India 2003). Household ownership of mobile phones is likely to help women maintain their support groups after marrying and moving away from their own communities.

The Indian government has been actively promoting policies to improve the status of women since the 1970s (World Bank 2008). In 2001, it launched the National Policy for the Empowerment of Women to outline specific measures states can take to bridge gender gaps. If mobile phones help improve women's status and welfare, the government may want to subsidize mobile phones for women. The government may aim to reduce gender differences in mobile phone usage and ownership instead of targeting greater availability of mobile phones overall, because women are less likely to have access to these phones unless the government intervenes through policies such as subsidies or free-phone programs (Hafkin 2002).

This paper examines the impact of mobile phones on the status of women in India. It first identifies the gap in the existing literature on this subject. It then analyzes the 2005 – 2006 National Family Health Survey (NFHS) data to test whether mobile phones empower women by observing four key areas that reflect women’s status: domestic violence, decision-making autonomy, son and fertility preferences, and economic independence. The first three areas are drawn from Jensen and Oster (2007)’s study of the impact of cable television on women’s status in India. More specifically, I ask whether a household that owns a mobile phone tolerates domestic violence less, gives more decision-making authority and economic independence to women, and has less preference for sons over daughters and less desire to have children, controlling for several other measures that could affect women’s status.

I find that household’s ownership of a mobile phone in India significantly reduces tolerance for domestic violence and increases women’s autonomy in mobility and economic independence, but does not significantly affect son and child preferences or women’s autonomy in other key decisions. Section II discusses the literature linking mobile phones and women’s status and addresses how this paper fits into the existing literature. Section III discusses the data and the empirical strategy. Section IV discusses the results of the analysis. Section V summarizes the key conclusions, discusses the implications of the results and provides directions for further research.

II. Related Literature Review

The existing economics literature on the impact of mobile phones on gender equality is quite small and narrow. Much of the research focuses on Grameen Bank’s Village Phone

Program in Bangladesh, which lends phone kits (mainly mobile) to women for starting a phone booth business in a rural village. The program has been widely praised as one of the most successful cases of the private sector empowering rural communities as well as women, directly by providing jobs to phone ladies and indirectly by facilitating other village women's access to a phone (Richardson, Ramirez & Haq 2000; Bayes 2001; Aminuzzaman 2002; Stanley 2005). By February 2008, there were about 200,000 "phone ladies" in Bangladesh. Their phone booth business contributed to 24 percent of their total household income on average (IFC 2008). In a random sample of thirty female Ugandan Village Phone Operators, all thirty asserted that their business increased their status within their community, while 65 percent stated that "they no longer depend as much on their husbands for economic support as a result of their Village Phone business" (Stanley 2005). A TeleCommons Group study reports that only 6 percent of Grameen Bank members, who are mostly women, used phones operated by a man, while 82 percent used phones operated by a woman, because they perceive women operators to be more dependable in informing them of an incoming call (Bhatnagar, Dewan, Moreno Torres & Kanungo 2004).

Following the success in Bangladesh, the Village Phone Program has been carried out in Uganda, Rwanda, the Philippines, Cambodia, Haiti and Indonesia. While this initiative is clearly important and its coverage of rural areas is impressive, it fails to capture the vast proliferation of mobile phones in the developing world. It makes up only about 3.5 percent of the total telecommunications market in Bangladesh and an even a smaller share in other countries where it exists. Most importantly, it does not yet exist in many developing countries, including India. The broader market must be examined to obtain a more holistic picture of the impact of mobile phones on gender equality.

While other studies focus on gender differences in access and use of mobile phones (Scott, McKemyey, & Batchelor 2004), no studies seem to focus primarily on the impact of mobile phones on the empowerment of women other than the Village Phone Program studies. Using limited gender-disaggregated data, Pigato (2001) examines the impact of Information Communication Technology (ICT) devices on the status of women in sub-Saharan Africa and South Asia. As one case study, she examines Information Shops in South Indian rural communities that provide “information related to health, credit, input price and availability, transportation, pest surveillance and agronomic practices” to both men and women (p. 51). She finds that they helped women workers negotiate better wages through better information on grain prices. She suggests that mobile phones may work similarly by providing similar information through text messages and data downloading features, but does not actually study their impact. At the time of Pigato’s study, mobile phones were much less common.

By empirically examining the impact of increased mobile phone penetration on women’s status outside the context of the Village Phone Program, this paper expands the existing literature on the gender impact of the relatively recent and extraordinary expansion of mobile phones in the developing world.

III. Methodology

A. Data

To analyze the effect of household ownership of mobile phones on the status of women, I use data from India’s National Family Health Survey (NFHS). NFHS is a nationally representative random survey of households and individuals from all 28 states in India that aims

to “collect reliable and up-to-date information on fertility, family planning, mortality, and maternal and child health” (International Institute for Population Sciences 2008). The dataset is useful to this study because it asks many questions that attempt to measure various dimensions of women’s status. The data is available in three waves: 1992 – 1993, 1998 – 1999, and 2005 – 2006. NFHS is not panel data; each wave surveys different randomly selected households and individuals. NFHS 2005 – 2006 surveys about 110,000 households, 74,000 men and 124,000 women aged 15 to 49. 2005 – 2006 is the first wave that includes information about men. Men’s sample is smaller than women’s because the survey aims to gather information such as on fertility, maternal and child health, which is more relevant to women. In addition, men’s survey contains fewer questions.

I only use the 2005 – 2006 data because mobile phones were not available in India prior to 1994, and the 1998 – 1999 data does not track mobile phone ownership. In addition, while only the very rich could afford mobile phones in 1998 – 1999 (less than 0.3 percent of the population), by 2005 – 2006, many middle class and some low income households could afford them. By 2005, India’s mobile service providers extended coverage to nearly a third of India (Rai 2006). Prices declined significantly over these two periods as government regulation relaxed and competition increased. I restrict the data to currently married men and women and drop the observations of never married or previously married individuals, because the dependent variables I observe are essentially measures of the bargaining power between husband and wife.¹ This restriction narrows the dataset to around 45,000 men and 88,000 women.

Dependent Variables

I use four proxies for my dependent variable, women’s status:

¹ Economists’ main approach to measuring women’s status is through bargaining models. The most widely used framework is the Nash bargaining model, in which both husband and wife want to maximize his/her own well-being (Eswaran 2007).

- 1) reported domestic violence
- 2) reported autonomy
- 3) reported son and total children preferences
- 4) reported economic independence

The first three proxies are adopted from Jensen and Oster's study of the impact of cable television on women's status in India. While Jensen and Oster only observe women's responses to measure the bargaining power between husband and wife, I also consider men's responses. Appropriate and equivalent men's data exists for certain measures of 1) and 2), and 3). As Jensen and Oster point out, these various measures of women's status are "highly correlated, but they do contain independent information" (p.10).

Less reported tolerance for domestic violence, greater reported autonomy of women, weaker preference for sons over daughters, and greater economic independence of women reflect higher women's status or greater gender equality. There might be a downward bias for domestic violence and autonomy measures. Domestic violence may occur more often than individuals admit that they tolerate, and women might have less decision-making authority than they or their husbands report.

While domestic violence and women's autonomy reflect the status of women as outcomes of the bargaining power balance, lower fertility and economic independence can also work in the reverse direction. Jensen and Oster explain that fewer pregnancies reduce health risks and less child-rearing burden increases time for economic or social opportunities outside of home. Eswaran (2007) also suggests that lower fertility in India would be "one of the major developmental benefits of empowering women." Basu (2006) suggests that a husband who has greater bargaining power than his wife may prevent his wife from earning money in order to maintain his economic and financial dominance.

To measure the tolerance for domestic violence, I examine the binary responses to two

sets of questions. The first set asks whether beating a wife is justified if she:

- 1) is unfaithful
- 2) is disrespectful to in-laws
- 3) goes out without telling her husband
- 4) neglects children
- 5) argues with husband
- 6) refuses to have sex
- 7) burns food

14 percent to 41 percent of women and 7 percent to 36 percent of men report that beating is justified in the above scenarios. Both men and women report beating a wife as most justified when wife is disrespectful to the in-laws and least justified when she refuses to have sex. It is noteworthy that a significantly lower percentage of men report that wife beating is justified under each scenario. This is perhaps because men are less likely to admit to the interviewer that wife beating is tolerable, as it might indicate that they themselves are culprits of domestic abuse. The second set measures more subtle control issues rather than direct physical violence. It asks whether the husband:

- 1) is jealous if talking with other men
- 2) accuses her of faithfulness
- 3) does not permit her to meet her girl friends
- 4) tries to limit her contact with family
- 5) insists on knowing where she is
- 6) doesn't trust her with money

These questions are only asked to women.

To measure women's autonomy/ decision-making authority, I also use two sets of questions. The first set asks whether the woman has the final say in making decisions about:

- 1) (her own) health care
- 2) large household purchases
- 3) daily household purchases
- 4) visits to family/friends
- 5) what to do with money husband earns
- 6) how to spend money (in general)

I assign a value of 1 if the respondent alone makes the decision, 2 if respondent and spouse jointly make the decision, and 3 if spouse or someone else alone makes the decision. Hence a lower score indicates higher autonomy. These questions are asked to men as well.² Women report they have greater authority than their husbands (a score of less than 2) for daily household purchases and how to spend money. Men report that their wives had greater authority for daily household purchases but not on how to spend money. As with the domestic violence variables, men are more likely report that these decisions are ultimately up to women than women are. The second set asks whether the woman needs permission to travel to:

- 1) the market
- 2) the health facility
- 3) places outside the village or community

I assign values in the same manner as for the first set of autonomy questions. This set of questions is not asked in the men's questionnaire. Women more often do not need permission to travel to these places, and husband's permission is needed the most when travelling outside the village or community.

To measure fertility preferences, I use the question that asks for the total ideal number of children that the respondent would like to have in his/her lifetime.³ I take the difference between the respondent's ideal number of sons and daughters as a measure of son preference. The preferences among men and women were similar, though men wanted slightly more sons and more children overall. On average, women report they desire 2.403 children and men report they want 2.425 children. On average, women want 0.224 more sons than daughters while men want 0.231 more.

² Men's questionnaire does not ask the question about final say on women's health care, and instead of asking who has the final say on money husband earned, it asks who has the final say on money that wife earned.

³ The question partly controls for the number of children people currently have by specifically adding the phrase "irrespective of the number [one] already has."

Finally, I examine several binary questions that attempt to measure women's economic independence. The survey asks whether the woman:

- 1) has money for her own use
- 2) knowledge of loan programs
- 3) given a loan
- 4) has bank or savings account

These questions are not appropriate for the men questionnaire. I do not create composite scores to obtain a single summary measure for economic independence because the 2) and 3) may reflect higher or less economic independence. Women who are more economically independent are less likely to seek loans, but loans also give them greater economic independence. Therefore, instead of combining them to create a composite score, I analyze these questions separately. Table A.2 summarizes all the dependent variables.

Independent Variables

Household ownership of a mobile phone is the key independent variable of interest. Of the roughly 110,000 households in 2005 – 2006 NFHS, 24 percent owns a mobile phone and 19 percent owns a landline phone. 11 percent of the households have both mobile and landline phones, while 68 percent have neither.

I control for women's education levels, whether the household is located in a rural area, household's standard of living, whether the household is located in a northern or eastern Indian state and finally, whether the household owns a landline phone. Women's education level is one of the most important determinants of women's bargaining power. Some bargaining models use women's education as proxies for bargaining power (Knight & Song 2000). Households in rural areas are likely to be less favorable towards women than those in urban areas because they are more isolated and rely more on traditional gender-biased values. Households with higher standards of living may have higher women's status because they are more likely to encounter

ideas favorable to women. Yet men in such households may also have greater bargaining power because higher standard of living is more likely to be a result of higher men's income and assets than women's. Northern and eastern states are known to have worse gender inequality problems than southern states for reasons related to marriage customs that were mentioned in section I of this paper. The division into northern, eastern and southern states is based on Dyson and Moore's north-south division and the demographic statistics from Raju's (1999) *Atlas of Women and Men in India* (see Figure A-1). Finally, I control for whether the household owns a landline phone because landline phones are also expected to be conducive to higher women's status, though not as significantly as mobile phones.

Women's education levels are measured by the number of years of education women received. To measure the household's standard of living, the survey assigns each household a standard of living index between 1 and 3, where 1 is low, 2 is medium and 3 is high. This assignment is based on a number of metrics including wealth and various assets. The rest of the independent/ control variables are binary.

All of the dependent variables and the education variable are found in individual women and men's datasets. Household ownership of mobile phones and the rest of the control variables are contained in the household dataset. Therefore, I merge the individual data with the household data using a household identifier.

B. Empirical Strategy

For each of the dependent variables, I run regressions on household ownership of a mobile phone. My primary regression model is:

$$s = \beta_1 m + \beta_2 e + \beta_3 rural + \beta_4 sli + \beta_5 north + \beta_6 east + \beta_7 landline +$$

s denotes the various measures of women's status, m is a dummy variable for whether the individual household owns a mobile phone, e is the number of years of education woman received, $rural$ is a dummy variable for whether the household is located in a rural area, sli is the household's standard of living index, $north$ and $east$ are dummy variables for whether the household is located in one of the northern or eastern Indian states, and $landline$ is a dummy for whether the household owns a landline phone. This simple regression model applies to continuous dependent variables.

For binary dependent variables, the equation can be interpreted as a linear probability model.

$$Pr\{s = 1 | m, e, rural, sli, north, east, landline\} =$$

$$\beta_0 + \beta_1 m + \beta_2 e + \beta_3 rural + \beta_4 sli + \beta_5 north + \beta_6 east + \beta_7 landline +$$

The coefficients measure the impact of the independent variables on the likelihood that the dependent variable is 1 rather than 0. In other words, they measure how much more likely individuals are to report that beating a wife is justified under the seven circumstances, that husband has different control issues, or that they have various indicators of economic independence when there is a mobile phone in the house, women has received an extra year of education, the household is located in a rural area, household standard of living increases, the household is in a northern or eastern, and there is a landline phone in the house. The coefficients of the linear probability regressions can be difficult to interpret because these probability values can be less than 0 or greater than 1. To overcome this problem and to check for robustness, I also

run probit regressions for these binary dependent variables. Probit is a nonlinear regression model that forces the predicted values to be between 0 and 1. Unlike coefficients in linear probability regressions, coefficients in probit regressions do not reflect marginal effects. Hence, I calculate marginal effects of the independent variables separately.

Where dependent variables are multinomial responses that can be ordered, they follow an ordinal multinomial distribution. Autonomy variables are such variables. They range from 1 to 3 with lower values indicating higher status of women. For these variables, I run ordered probit regressions. Ordered probit regressions are similar to probit regressions, but instead of estimating the likelihood that the dependent variable is equal to 1, they estimate the likelihood that the dependent variable falls under each category given the independent variables. Like binary probit models, ordered probit models' coefficients do not reflect marginal effects. I therefore calculate marginal effects of independent variables on the probability of each categorical outcome.

I also run ordered probit regressions for composite scores, which take the average number of responses in each set of binary or ordered categorical questions. They are ordered because higher or lower averages indicate either higher or lower women's status, and they are multinomial because their values are discrete.

I run essentially equivalent regressions for men's responses. However, a key control variable, women's education, is missing because men's data does not record the number of years wife received education. This omission is an important barrier to comparing the effects of mobile phones on women's self-perceived measures of their status and men's acknowledgement of women's status. I run these regressions even if the model is not well specified in order to broadly test for the effect of mobile phones on men's attitudes towards women.

The theory predicts that β_1 , β_2 and β_7 are likely to be negative for tolerance for beating,

control issues, son and total children preferences, measures of women's autonomy (the lower the scale, the higher the women's autonomy) and positive for economic independence. I expect β_3 , β_5 , and β_6 to have the opposite signs, as status of women tends to be lower in rural areas and in northern and eastern states (Jensen & Oster 2007; Dyson & Moore 1983). I expect β_4 to be generally of the same sign as β_1 , β_2 and β_7 because households with a higher standard of living are likely to have more opportunities of encountering modern values. Yet husbands in these households may have greater bargaining power, as higher living standard is more likely to be due to higher men's income and assets rather than women's. Jensen and Oster find that the log household income per capita is not significant in most of their measures for women's status after controlling for other factors, and the signs of the coefficients are mixed.

IV. Results

In women's responses, I find that mobile phones significantly decrease tolerance for wife beating and husband's control issues, and increase women's autonomy in mobility and economic independence. I do not find significant effects on women's son preferences and total number of desired children or on measures of autonomy in other key decisions. A plausible explanation for why mobile phones are significant for some but not other measures of women's status is that some aspects of women's status take longer to change. Given how recently mobile phones have grown, households with mobile phones are likely to have acquired them in the few years prior to the survey. For example, we can expect mobile phone's strengthening of women's social network to have a much more immediate impact on domestic violence than on fertility preferences. Domestic violence can be relatively quickly curbed by outside support and

intervention while fertility preferences form over a longer period of time and are therefore harder to change. Similarly, whether the wife needs permission to travel is more likely to be directly affected by mobile phone ownership than whether she has the final say in her own healthcare or large household purchases. If women can carry a mobile phone with them while travelling, husband's anxiety about her safety is likely to be mitigated. Key decisions that are not related to travelling reflect bargaining power dynamics at a more day-to-day level. These dynamics are likely take longer to change.

In men's responses, I find that mobile phones are significant in the expected direction in all regressions except in the question on who decides how to spend money. They also generally have larger effects than on women's responses. This could be due to the omitted variable bias from leaving out women's education, which is an important factor that affects gender attitudes. Household ownership of mobile phones is positively correlated with women's education. Therefore, there is positive bias in which the mobile phone coefficient is estimated to be larger than it really is. R^2 s are lower for regressions using men's data than those using women's data, which suggests that the model without a control for women's education is not as well specified.

Where both linear probability models and probit models are tested, these general results hold under both. I report the coefficients on the linear probability models and not the marginal effects in probit models, because they are of similar magnitudes.⁴ Regression results of individual questions (OLS, linear probability, probit or ordered probit, depending on the type of dependent variable) are reported in the appendix (see Tables A.2 to A.9).

Domestic Violence

⁴ In probit models, coefficients cannot be used to directly estimate marginal effects. Instead, I predict dy/dx as the discrete change of the mobile phone dummy variable from 0 to 1. I do not present these magnitudes here, because they are mostly within 1 percent of the coefficients of linear probability models.

Using linear probability models of domestic violence measures, I find that women in households with a mobile phone are 0.8 percent to 4.3 percent less likely to report that wife beating is justified, depending on the circumstance. These coefficients are all statistically significant. The effect is largest on neglecting children and being disrespectful to in-laws and smallest on refusing to have sex. Given that the average responses are 13.8 percent to 40.8 percent, these effects are quite large. They are also equivalent to 0.9 to 4.1 extra years of women's education. Men in households with a mobile phone are 1.6 percent to 6.5 percent less likely to tolerate beating, depending on the circumstance.

Women in households with mobile phones are 0.07 percent to 1.9 percent less likely to report that their husbands have various control issues. These are considerable effects, as the averages range from 6.8 percent to 22.2 percent. They are equivalent to 2.2 to 11.8 extra years of women's education. The effects are largest compared to years of education for forbidding wife to meet with her girl friends and insisting on knowing where she is, and smallest for becoming jealous if wife talks to other men. The relevance of the mobile phone in the former two cases is more apparent than the later. Mobile phones seem to allow women to better maintain her social network and free her from constantly reporting to her husband about her whereabouts.

As theory predicts, men and women in rural households are more likely to be tolerant of wife beating and husbands are more likely to have control issues. The rural effect was large and significant for all wife beating questions, but smaller and only significant for half of the control issues questions. Education reduces all measures of domestic violence with statistical significance, but the effect of an extra year of education is mostly much smaller than the effect of household ownership of mobile phones. Higher standard of living has mixed results. It reduces domestic violence in many cases, but is not significant in some and actually increases domestic

violence in a few cases. Households in northern and eastern India show greater control issues, but counter to expectations, they are less tolerant of wife beating.

It is worth noting that in most cases, landline phones have a slightly larger effect than mobile phones. A plausible explanation is that households have owned landline phones for much longer. Therefore, even if landline phones are less effective because they lack features such as messaging, data downloading and portability, they affected households' gender dynamics for longer than mobile phones. Another explanation is that portability is a vice. Household ownership of mobile phones does not indicate that women have access to them, or that women own them. Because mobile phones can be carried around, husbands may have more complete control over them than over landline phones. If they take the mobile phone to work, for example, women have no means of taking advantage of it. As landline phones stay fixed at home, women may have more chances of using them. If mobile phones had the same time to affect women's status as landline phones and women had equal access to them, they may show greater effect than landline phones.

Autonomy

Ordered probit regressions of autonomy questions show that the coefficients on mobile phones are all of expected signs but they are only significant in increasing women's autonomy in deciding what to do with money and allowing women to travel without permission. Mobile phones do not significantly increase women's autonomy in decision-making for healthcare, large purchases, daily purchases, visits to family and friends, and what to do with money husband earns. Marginal effects of mobile phones on the probability that the wife has the final say in the six key decisions outlined in section III-A are between 1.6 percent and 3.2 percent but not are not

significant. On the other hand, effects on the three measures of autonomy in mobility are between 1.9 percent and 3.3 percent and all statistically significant at the 1 percent level. Mobile phones significantly increase women's decision-making autonomy in men's views and have larger effects than in women's responses, but these coefficients are prone to positive omitted variable bias.

Other variables show similar patterns to the domestic violence regressions. Rural effect was large and significant in decreasing women's autonomy. Year of women's education effect was relatively small but significant in all cases. Higher standard of living and location in northern or eastern states show mixed results. Landline phones have large and significant effects in the expected direction for autonomy in mobility, but are only significant in whether the women has the final say in healthcare and visits to family and friends.

Son and Total Child Preferences

Although household ownership of mobile phones does not significantly alter women's son preference or total desired children, the coefficients are negative as the theory predicts. Men in households with a mobile phone are less likely to prefer sons over daughters by 0.045, and are likely to desire 0.11 less children. Table 1 shows the regression results for children preferences of both women and men. An additional year of education leads to 0.017 less number of sons preferred over daughters and 0.047 children overall for women, while location in a rural area contributes 0.05 more sons preferred and 0.06 more children overall. Higher standard of living has a negative effect on both son preference and total desired number of children, while northern and eastern states have both higher son preference and more children desired.

Table 1

Son preference and total number of desired children, ordinary least squares (OLS) regressions

<i>Dependent Vars:</i>	<i>Women</i>		<i>Men</i>	
	<i>Son preference</i>	<i>Total desired children</i>	<i>Son preference</i>	<i>Total desired children</i>
<i>Explanatory Vars:</i>				
Mobile phone	-0.0080 (0.0058)	-0.0143 (0.0088)	-0.0451*** (0.0086)	-0.1149*** (0.0133)
Landline phone	-0.0023 (0.0060)	0.0391*** (0.0092)	-0.0307*** (0.0091)	-0.0954*** (0.0142)
Years of women's education	-0.0170*** (0.0005)	-0.0472*** (0.0008)	NA	NA
Rural	0.0491*** (0.0046)	0.0623*** (0.0071)	0.0494*** (0.0069)	0.0620*** (0.0107)
Standard of living index	-0.0320*** (0.0035)	-0.0661*** (0.0053)	-0.0579*** (0.0050)	-0.1471*** (0.0078)
North	0.1874*** (0.0050)	0.1862*** (0.0078)	0.1281*** (0.0072)	0.2732*** (0.0112)
East	0.1032*** (0.0054)	0.3623*** (0.0083)	0.1472*** (.00802)	0.5446*** (0.0124)
Constant	0.213*** (0.0120)	2.5183*** (0.0184)	0.2368*** (0.0175)	2.4871*** (0.0272)
Observations	84048	84080	43108	43121
R ²	0.0590	0.1175	0.0266	0.0801

Standard errors in parentheses

*significant at 10 percent; ** significant at 5 percent; *** significant at 1 percent

Economic Independence

I find that mobile phones have positive effects on two economic independence indicators, whether women have money for their own use and whether they have savings or a bank account, but negative effects on the other two, whether women has knowledge of loans and whether they were given a loan. Questions regarding loans are difficult to evaluate, because women who are more economically independent are less likely to seek for loans, while loans also give them greater economic independence. Women's education also contributes negatively to whether they are given a loan, and location in rural areas makes it more likely that women know about and have received loans. Hence, it seems appropriate to interpret negative effects on the knowledge and receipt of loans as signs of greater economic independence rather than less. Where mobile phones have significant positive effects, they are also large. Women in households with a mobile phone are 7.5 percent more likely to have money for their own use, which is equivalent to 8.9 extra years of education. They are 9.5 percent more likely to have savings or a bank account, which is equivalent to 5.6 extra years of education. They are 1.1 percent less likely to have knowledge of loans and 1.6 percent less likely to have received them.

Summary Measures

Composite scores provide single summary measures for each of the four sets of dependent variables – wife beating, control issues, autonomy in decision-making and autonomy in mobility. These scores capture and confirm the above results. Table 2 shows the ordered probit regression results. All mobile phone coefficients are significant at the 1 percent level in the expected direction except for women's self-perceived decision-making autonomy. The

coefficients of ordered probit regressions do not represent marginal effects. I therefore separately analyze the marginal effects of mobile phones on the probability that the dependent variable falls in the lowest category. Where significant, the effect of mobile phones is quite large. Women in households with a mobile phone are 5.1 percent more likely to not tolerate beating under any of the seven circumstances, 3.5 percent more likely to report that their husbands do not have any control issues, and 2.6 percent more likely to not need permission to visit any of the three places. These effects are equivalent to 2.8 extra years of women's education for the domestic violence composite score, 4.4 extra years for control issues, and 4.2 extra years for autonomy in permission to travel.

Mobile phone effect seems larger and significant in reducing men's tolerance for beating and increasing men's perception of women's autonomy in making important decisions, but this comparison is not accurate because women's education is omitted in the analysis of men's responses.

Table 2

Composite scores, ordered probit regressions

Women's Responses				
<i>Dependent Vars:</i>	<i>Domestic violence:</i>		<i>Autonomy:</i>	
	<i>Beating wife justified</i>	<i>Control issues</i>	<i>Decision- making</i>	<i>Permission to travel</i>
<i>Explanatory Vars:</i>				
Mobile phone	-0.1278*** (0.0112)	-0.0918*** (0.0141)	-0.0079 (0.0227)	-0.0663*** (0.0107)
Landline phone	-0.1335*** (0.0118)	-0.1167*** (0.0152)	0.0343*** (0.0240)	-0.1151*** (0.0112)

Years of women's education	-0.0460*** (0.0010)	-0.0207*** (0.0012)	-0.0111*** (0.0017)	-0.0157*** (0.0009)
Rural	0.2615*** (0.0065)	0.0548*** (0.0107)	0.3618*** (0.0160)	0.2638*** (0.0085)
Standard of living Index	0.0003 (0.0077)	-0.0555*** (0.0078)	-0.0379*** (0.0115)	-0.0513*** (0.0062)
North India	-0.4550*** (0.0097)	0.3337*** (0.0121)	0.1416*** (0.0167)	-0.0344*** (0.0093)
East India	-0.2592*** (0.0102)	0.3393*** (0.0127)	-0.1003 (0.0172)	-0.0038*** (0.0099)

Observations	82019	63334	21387	85916
R ²	0.0321	0.0201	0.0122	0.0153

Mobile phone coeff / Yr of women's ed coeff	2.78	4.43	0.71	4.23	8.69
Landline phone coeff / Yr of women's ed coeff	2.90	5.64	-3.08	7.34	6.66

Standard errors in parentheses

*significant at 10 percent; ** significant at 5 percent; *** significant at 1 percent

Men's Responses

Dependent Vars:

*Domestic violence:
Beating wife
justified*

*Autonomy:
Decision-
making*

Explanatory Vars:

Mobile phone	-0.2021*** (0.0156)	-0.0860*** (0.0142)
Landline phone	-0.2428*** (0.0170)	-0.0892*** (0.0152)
Rural	0.1946***	0.2116***

	(0.0121)	(0.0116)
Standard of living index	-0.1434*** (0.0086)	-0.0797*** (0.0085)
North India	0.3339*** (0.0129)	-0.0273** (0.0121)
East India	-0.0839*** (0.0138)	0.0977*** (0.0137)
<hr/>		
Observations	42469	38097
R ²	0.0229	0.0087
<hr/>		

Standard errors in parentheses

*significant at 10 percent; ** significant at 5 percent; *** significant at 1 percent

V. *Conclusions*

Rapid expansion of mobile phones in the developing world has far reaching socioeconomic consequences. In this paper, I focus on one particular social implication that has not yet been thoroughly examined: the status of women in countries where gender inequality is a grave problem. I analyze the impact of mobile phones in Indian households to show that they improve the status of women along several measures. After controlling for women's education, whether the household is in a rural area, household's standard of living, whether the household is in a northern or eastern Indian state and household ownership of landline phones, I find that mobile phones significantly reduce women's tolerance for wife beating and husband's control issues, and increase women's autonomy in mobility and economic independence. However, they do not significantly reduce women's preference for sons over daughters and total number of desired children nor do they improve measures of women's autonomy in other key decisions.

Son and child preferences and bargaining power in key decision-making are arguably more difficult to change than the other measures for which mobile phones show significant effects. As households are likely to have acquired mobile phones only few years prior to the survey, fertility preferences and day-to-day decision-making dynamics formed over many years may take longer to adjust.

I also examine the impact of mobile phones on men's attitudes regarding son preferences and total desired children, wife beating, and autonomy in decision-making. I find significant effects that are larger than those on women's responses for all of these measures. Unfortunately, however, the men's survey does not track their wives' education levels. Hence these effects are likely to be positively biased.

Ownership of a mobile phone is equivalent to about 2 to 4 extra years of women's education for most of the status measures, and 5 to 11 extra years for some. This might have significant policy implications. The Indian government has several programs to encourage education for females under the National Policy for the Empowerment of Women, but no programs yet to encourage more women to use or own mobile phones. It might be cheaper to subsidize or provide free mobile phones for women than to fund special education programs for girls to achieve the same effect on the status of women. The effect of mobile phones shown in this paper may be underestimated because I do not have gender-disaggregated subscription data, and women are less likely to own mobile phones than men. Hence, a subsidy for mobile phones for women may have larger impact on women's status than can be expected from conclusions drawn in this paper. The Indian government should analyze the cost-effectiveness of encouraging mobile phones and compare it to other programs that are intended to bridge gender gaps.

Although this paper focuses on mobile phones, I find that landline phones have overall

slightly larger effects than mobile phones. While mobile phones have rapidly increased over the five years, landline phones have existed for much longer. If I can control for the number of years households owned each type of phone, the mobile phone effect may be larger. In addition, women may have greater access to landline phones because husbands may carry mobile phones with them and have greater control over them. This aspect highlights the importance of any program intended to use mobile phones as tools for empowering women to make sure that women actually have access to them.

My analysis has several limitations. Most importantly, it raises questions of endogeneity. A household in which woman has greater bargaining power might also be more likely to purchase a mobile phone. For example, higher status of women may increase women's say in large household purchases and women may be more likely to buy mobile phones. Further studies may seek panel data to reduce endogeneity. Using panel data allows controlling for individual and yearly fixed effects and allows for employing a difference-in-difference method to examine whether household's purchase of mobile phones lead to greater improvements in the status of women than in households that did not purchase mobile phones. As the expansion of mobile phones is a relatively recent and rapidly increasing phenomenon, I expect more panel surveys to start tracking mobile phone ownership.

In an ideal social experiment, the effects of mobile phones should be observed by splitting households with identical characteristics randomly into two groups, one with mobile phones and one without. However, in this study, household characteristics that make a household more likely to own a mobile phone induce selection bias. To reduce such selection bias, future studies can also incorporate the propensity score matching method. Propensity scores are the conditional probability of receiving a treatment given pre-treatment characteristics (Rosenbaum

& Rubin 1983). By comparing women's status measures of individuals with the same propensity score in households that do and do not own mobile phones, selection bias can be reduced.

Further research may also use gender-disaggregated data on ownership to more explicitly tease out whether women's ownership and use of mobile phones over a certain time period improve their status.

Appendix

Table A.1

Mobile phone statistics in South Asia

Country	Mobile cellular subscribers (000s)					CAGR (%)			per 100 inhabitants			As % of total telephone subscribers mobile/(mobile + fixed)		
	1995	1997	2000	2002	2007	1995 - 00	1997 - 02	2002 - 07	2000	2002	2007	2000	2002	2007
	Afghanistan	-	-	-	25	4668.1	-	-	184.6	-	0.1	17.2	-	43.1
Bangladesh	2.5	26	279.0	1075	34370	156.8	110.5	100	0.22	0.8	21.66	36.2	64	96.7
Bhutan	-	-	-	-	149.4	-	-	-	-	-	17.18	-	-	83.3
India	76.7	881.8	3577.1	13000	233620	115.7	71.3	78.2	0.35	1.23	19.98	9.9	23.9	85.6
Maldives	-	1.3	7.6	41.9	317.8	-	100.6	50	2.83	14.91	104.0	23.8	59.4	90.6
Nepal	-	-	10.2	21.9	1157.1	-	-	169.7	0.05	0.09	4.18	3.7	6.3	65.4
Pakistan	41.0	135	306.5	1698.5	78852.9	49.6	65.9	115.5	0.22	1.16	48.11	9.1	31.7	94.1
Sri Lanka	51.3	114.9	430.2	931.4	7983.5	53	52	53.7	2.33	4.92	41.37	35.9	51.3	74.4

Source: ITU Free Statistics ("ITC-Eye"), 2008.

Table A.2

Summary statistics on dependent variables

Panel A: Women's Responses			
	Mean	Standard Deviation	# Obs
Domestic violence: (Binary)			
<i>Beating justified if wife</i>			
Unfaithful	0.263	0.440	86432
Disrespectful to in-laws	0.408	0.491	87005
Goes out without telling husband	0.291	0.454	87339
Neglects children	0.359	0.480	87393
Argues with husband	0.292	0.455	86950
Refuses to have sex	0.138	0.345	85994
Burns food	0.187	0.390	87231
Composite score: average of the above 7 situations	0.272	0.328	83908
<i>Control Issues - Husband</i>			
Is jealous if talking with other men	0.222	0.416	65258
Accuses her of unfaithfulness	0.068	0.252	65471
Does not permit her to meet her girl friends	0.140	0.346	65455
Tries to limit her contact with family	0.082	0.275	65461
Insists on knowing where she is	0.119	0.324	65345
Doesn't trust her with money	0.159	0.366	65338
Composite score: average of the above 6 situations	0.131	0.208	64790

Autonomy:
(Ordinal Multinomial)

Respondent has final say in [^]

Health care	2.040	0.779	86996
Large household purchases	2.305	0.630	85761
Daily household purchases	1.960	0.838	85721
Visits to family/friends	2.193	0.640	86221
What to do with money husband earns	2.218	0.547	85956
How to spend money	1.871	0.625	23033

Composite score: average of the above 6 situations	2.011	0.447	21864
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*Respondent needs permission to visit**

Market	1.478	0.658	87904
Health facility	1.464	0.561	87904
Outside village/community	1.616	0.605	87899

Composite score: average of the above 3 situations	1.519	0.532	87893
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Child Preferences
(Continuous)

# Desired children	2.403	0.969	85993
Son preference	0.231	0.611	85960

Economic Independence
(Binary)

Has money for her own use	0.439	0.496	87899
Knowledge of loan programs	0.381	0.486	87904
Given a loan	0.102	0.303	33419
Have bank or savings account	0.185	0.388	87781

[^] Wife alone = 1; together with husband = 2; husband or someone else alone = 3

Panel B: Men's Responses			
	Mean	Standard Deviation	# Obs
Domestic violence: (Binary)			
<i>Beating justified if wife</i> Unfaithful	0.251	0.434	44220
Disrespectful to in-laws	0.355	0.478	44465
Goes out without telling husband	0.226	0.418	44701
Neglects children	0.299	0.458	44724
Argues with husband	0.236	0.428	44561
Refuses to have sex	0.068	0.253	44493
Burns food	0.106	0.308	44740
Composite score: average of the above 7 situations	0.217	0.282	43456
Autonomy: (Ordinal Multinomial)			
<i>Wife has final say in</i> [^] Large household purchases	2.195	0.520	44649
Daily household purchases	1.778	0.750	44501
Visits to family/friends	2.100	0.595	44497
What to do with money wife earns	1.915	0.573	44216
How to spend money	2.244	0.493	40095
Composite score: average of the above 5 situations	2.045	0.354	38982
Child Preferences (Continuous)			
# Desired children	2.425	1.043	44125
Son preference	0.224	0.493	44112

[^] Wife alone = 1; together with husband = 2; husband or husband else alone = 3

Table A.3

Domestic violence: justification for beating

Women's Responses

<i>Dependent Vars:</i>	<i>Beating wife justified if she:</i>				
	<i>is unfaithful</i>		<i>is disrespectful to in-laws</i>		<i>goes out without telling husband</i>
<i>Explanatory Vars:</i>					
Mobile phone	-0.0174*** (0.0042)	-0.0829*** (0.0140)	-0.0402*** (0.0046)	-0.1225*** (0.0127)	-0.0259*** (0.0042)
Landline phone	-0.0107** (0.0044)	-0.0567*** (0.0148)	-0.0453*** (0.0048)	-0.1389*** (0.0134)	-0.0349*** (0.0044)
Years of women's education	-0.0123*** (0.0004)	-0.0424*** (0.0012)	-0.0135*** (0.0004)	-0.0382*** (0.0011)	-0.0130*** (0.0004)
Rural	0.0773*** (0.0033)	0.2512*** (0.0107)	0.0736*** (0.0037)	0.2006*** (0.0099)	0.0789*** (0.0034)
Standard of living index	-0.0043* (0.0025)	0.0025 (0.0078)	-0.0010 (0.0028)	0.0080 (0.0074)	-0.0099*** (0.0025)
North India	-0.0355*** (0.0037)	-0.1264*** (0.0119)	-0.1368*** (0.0041)	-0.3795*** (0.0111)	-0.1440*** (0.0037)
East India	0.00057 (0.0039)	0.0018 (0.0125)	-0.0571*** (0.0043)	-0.1551*** (0.0116)	-0.0348*** (0.0044)
Constant	0.2384*** (0.0087)	-0.7579*** (0.0274)	0.4593*** (0.0096)	-0.1182*** (0.0256)	0.3592*** (0.0088)
Model type	Linear prob (OLS)	Probit	Linear prob (OLS)	Probit	Linear prob (OLS)
Observations	84479	84479	85044	85044	85369
R ² / Pseudo R ²	0.0453	0.0425	0.0575	0.0450	0.0640
Mobile phone coeff	1.42	1.96	2.97	3.21	2.00
/ Yr of women's ed coeff					
Landline phone coeff	0.87	1.34	3.34	3.64	2.69
/ Yr of women's ed coeff					

Standard errors in parentheses

*significant at 10 percent; ** significant at 5 percent; *** significant at 1 percent

<i>Dependent Vars:</i>	<i>Beating wife justified if she:</i>				
	<i>goes out without telling husband</i>	<i>neglects the children</i>	<i>argues with husband</i>		
<hr/> <i>Explanatory Vars:</i> <hr/>					
Mobile phone	-0.1121*** (0.0137)	-0.0425*** (0.0045)	-0.1392*** (0.0130)	-0.0217*** (0.0043)	-0.0960*** (0.0137)
Landline phone	-0.1449*** (0.0146)	-0.0505*** (0.0047)	-0.1654*** (0.0137)	-0.0314*** (0.0045)	-0.1296*** (0.0146)
Years of women's education	-0.0438*** (0.0012)	-0.0105*** (0.0004)	-0.0321*** (0.0011)	-0.0133*** (0.0004)	-0.0442*** (0.0012)
Rural	0.2509*** (.0105)	0.0757*** (0.0027)	0.2188*** (0.0101)	0.0773*** (0.0034)	0.2421*** (0.0105)
Household standard of living index	-0.0087 (0.0077)	0.0027 (0.0078)	0.0208*** (0.0075)	-0.0124*** (0.0026)	-0.0171** (0.0076)
North India	-0.4598*** (0.0117)	-0.2213*** (0.0039)	-0.6352*** (0.0113)	-0.0883*** (0.0038)	-0.2862*** (0.0116)
East India	-0.2700*** (0.0121)	-0.0975*** (.0042)	-0.2678*** (0.0117)	-0.0644*** (0.0040)	-0.1988*** (0.0122)
Constant	-0.4045*** (0.0267)	0.4315*** (0.009)	-0.1975*** (0.0260)	0.3382*** (0.0089)	-0.4600*** (0.0268)
Model type	Probit	Linear prob (OLS)	Probit	Linear prob (OLS)	Probit
Observations	85369	85421	85421	84996	84996
R ² / Pseudo R ²	0.0578	0.0682	0.0558	0.0566	0.0510
Mobile phone coeff / Yr of women's ed coeff	2.56	4.07	4.33	1.63	2.17
Landline phone coeff / Yr of women's ed coeff	3.31	4.84	5.15	2.36	2.93

Standard errors in parentheses

*significant at 10 percent; ** significant at 5 percent; *** significant at 1 percent

<i>Dependent Vars:</i>	<i>Beating wife justified if she:</i>			
	<i>refuses to have sex with him</i>		<i>burns the food</i>	
<i>Explanatory Vars:</i>				
Mobile phone	-0.0078** (0.0033)	-0.0813*** (0.0170)	-0.0169*** (0.0037)	-0.1107*** (0.0155)
Landline phone	-0.0051 (0.0034)	-0.0591*** (0.0181)	-0.0184*** (0.0038)	-0.1200*** (0.0166)
Years of women's education	-0.0088*** (0.0003)	-0.0483*** (0.0015)	-0.0102*** (0.0003)	-0.04512*** (0.0013)
Rural	0.0507*** (0.0026)	0.2548*** (0.0128)	0.0650*** (0.0029)	0.2668*** (0.0117)
Household standard of living index	-0.0075*** (0.0020)	-0.0098 (0.0090)	-0.0121*** (0.0022)	-0.0214*** (0.0083)
North India	-0.0860*** (0.0030)	-0.4141*** (0.0137)	-0.0790*** (0.0032)	-0.3218*** (0.0126)
East India	-0.0797*** (0.0031)	-0.3627*** (0.0145)	-0.0944*** (0.0035)	-0.3691*** (0.0135)
Constant	0.1862*** (0.0068)	-0.9628*** (0.0319)	0.2368*** (0.0076)	-0.7814*** (0.0293)
Model type	Linear	Probit	Linear	Probit
	prob (OLS)		prob (OLS)	
Observations	84056	84056	85264	85264
R ² / Pseudo R ²	0.0416	0.0567	0.0499	0.0571
Mobile phone coeff / Yr of women's ed coeff	0.88	1.68	1.66	2.45
Landline phone coeff / Yr of women's ed coeff	0.58	1.22	1.81	2.66

Standard errors in parentheses

*significant at 10 percent; ** significant at 5 percent; *** significant at 1 percent

Table A.4

Domestic violence: husband's control issues

Women's Responses				
<i>Dependent Vars:</i>	<i>Husband:</i>			
	<i>is jealous if talking with other men</i>		<i>accuses her of unfaithfulness</i>	
<i>Explanatory Vars:</i>				
Mobile phone	-0.0185*** (.0047)	-0.0813*** (0.0174)	-0.0074*** (0.0029)	-0.1213*** (0.0262)
Landline phone	-0.0359*** (0.0049)	-0.1791*** (0.0191)	-0.0105*** (0.0030)	--0.1802*** (0.0296)
Years of women's education	-0.0085*** (0.0004)	-0.0320*** (0.0015)	-0.0027*** (0.0002)	-0.0255*** (0.0021)
Rural	0.0174*** (0.0037)	0.0601*** (0.0128)	-0.0001 (0.0022)	0.0064 (0.0177)
Standard of living index	-0.0253*** (0.0027)	-0.0681*** (0.0092)	-0.0224*** (0.0017)	-0.1330*** (0.0125)
North India	0.0769*** (0.0040)	-0.4141*** (0.0137)	-0.0131*** (0.0032)	-0.1222*** (0.0200)
East India	0.0425*** (0.0042)	0.2737*** (0.0144)	0.0089*** (0.0026)	0.0542*** (0.0198)
Constant	0.2641*** (0.0094)	0.1658*** (0.0191)	0.139*** (0.0057)	-1.0350*** (0.0437)
Model type	Linear prob (OLS)	Probit	Linear prob (OLS)	Probit
Observations	63784	63784	63991	63991
R ² / Pseudo R ²	0.0409	0.0415	0.0180	0.0392
Mobile phone coeff / Yr of women's ed coeff	2.17	2.94	2.72	4.75
Landline phone coeff / Yr of women's ed coeff	4.21	5.59	3.88	7.06

Standard errors in parentheses

*significant at 10 percent; ** significant at 5 percent; *** significant at 1 percent

<i>Dependent Vars:</i>	<i>Husband:</i>			
	<i>does not permit her to meet her girl friends</i>		<i>tries to limit contact with her family</i>	
<i>Explanatory Vars:</i>				
Mobile phone	-0.0129*** (0.0039)	-0.0672*** (0.0187)	-0.0072*** (0.0031)	-0.0755*** (0.0228)
Landline phone	-0.0077*** (0.0042)	-0.0449** (0.0200)	-0.0098*** (0.0033)	-0.1007*** (0.0249)
Years of women's education	-0.0016*** (0.0003)	-0.0077*** (0.0016)	-0.0025*** (0.0003)	-0.0183*** (0.0019)
Rural	0.0046 (0.0031)	0.0194 (0.0142)	0.0093*** (0.0024)	0.0654*** (0.0166)
Standard of living index	-0.0053** (0.0023)	-0.0232** (0.0103)	-0.0104*** (0.0018)	-0.0538*** (0.0118)
North India	0.0813*** (0.0034)	0.3937*** (0.0162)	0.0177*** (0.0027)	0.1263*** (0.0187)
East India	0.0413*** (0.0036)	0.2221*** (.0173)	0.0180*** (0.0028)	0.1286*** (0.0195)
Constant	0.1113*** (0.0079)	-1.2451*** (0.0364)	0.2368*** (0.0076)	-1.3591*** (0.0417)
Model type	Linear	Probit	Linear	Probit
	prob (OLS)		prob (OLS)	
Observations	63975	63975	63984	63984
R ² / Pseudo R ²	0.013	0.017	0.01	0.0189
Mobile phone coeff / Yr of women's ed coeff	7.94	8.71	2.94	4.13
Landline phone coeff / Yr of women's ed coeff	4.74	5.82	3.96	5.51

Standard errors in parentheses

*significant at 10 percent; ** significant at 5 percent; *** significant at 1 percent

<i>Dependent Vars:</i>	<i>Husband:</i>			
	<i>insists on knowing where she is</i>		<i>husband doesn't trust her with money</i>	
<i>Explanatory Vars:</i>				
Mobile phone	-0.0154** (0.0036)	-0.1035*** (0.0203)	-0.0128*** (0.0042)	-0.0601*** (0.0180)
Landline phone	-0.0126*** (0.0039)	-0.0899*** (.0219)	-.0123*** (0.0004)	-0.0631*** (0.0192)
Years of women's education	-0.0013*** (0.0003)	-0.0076*** (.00169)	-0.0022*** (0.0004)	-0.0096*** (0.0015)
Rural	0.0137*** (0.0029)	0.0732*** (0.0150)	-0.0004 (0.0033)	-0.0046 (0.0137)
Standard of living index	-0.0056*** (0.0021)	-0.0197* (0.0109)	-0.0035 (0.0024)	-0.0125 (0.0100)
North India	0.0326*** (0.0031)	0.2235*** (0.0183)	0.0713*** (0.0036)	0.3209*** (0.0156)
East India	0.1171*** (0.0033)	0.60163*** (.0180)	0.0562*** (0.0038)	0.2602*** (0.0165)
Constant	0.0729*** (0.0073)	-1.4973*** (0.0386)	0.1372*** (0.0083)	-0.0631*** (0.0192)
Model type	Linear	Probit	Linear	Probit
	prob (OLS)		prob (OLS)	
Observations	63871	63871	63864	63864
R ² / Pseudo R ²	0.0291	0.040	0.0108	0.0132
Mobile phone coeff / Yr of women's ed coeff	11.75	13.55	5.82	6.29
Landline phone coeff / Yr of women's ed coeff	9.64	11.76	5.61	6.60

Standard errors in parentheses

*significant at 10 percent; ** significant at 5 percent; *** significant at 1 percent

Table A.5

Autonomy: decision-making

Women's Responses

<i>Dependent Vars:</i>	<i>Respondent has final say in:[^]</i>			
	<i>Health care</i>	<i>Large household purchases</i>	<i>Daily household purchases</i>	<i>Visits to family /friends</i>
<i>Explanatory Vars:</i>				
Mobile phone	-0.0094 (0.0108)	-0.0109 (0.0112)	-0.0049 (0.0111)	-0.0154 (0.0110)
Landline phone	-0.0750*** (0.0113)	-0.0133 (0.0117)	-0.0035 (0.0116)	-0.0684*** (0.0115)
Years of women's education	-0.0099*** (0.0009)	-0.0082*** (0.0010)	-0.0018* (0.0010)	-0.0072*** (0.0010)
Rural	0.1457*** (0.0086)	0.2544*** (0.0090)	0.2818*** (0.0089)	0.1636*** (0.0088)
Standard of living index	0.0031 (0.0065)	0.0498*** (0.0067)	0.0119* (0.0066)	-0.0162** (0.0066)
North India	0.0393*** (0.0095)	0.2288*** (0.0098)	0.1748*** (0.0097)	0.3143*** (0.0097)
East India	-0.0528 (0.0101)	0.0015 (0.0117)	0.0393*** (0.0104)	0.0107 (0.0103)
Model type	Ordered Probit	Ordered Probit	Ordered Probit	Ordered Probit
Observations	85031	83828	83788	84277
Pseudo R ²	0.0056	0.0137	0.0098	0.0162
Mobile phone coeff / Yr of women's ed coeff	0.95	1.33	2.72	2.14
Landline phone coeff / Yr of women's ed coeff	7.58	1.62	1.94	9.50

Standard errors in parentheses

*significant at 10 percent; ** significant at 5 percent; *** significant at 1 percent

[^] Wife alone = 1; together with husband = 2; husband or someone else alone = 3

<i>Dependent Vars:</i>	<i>Respondent has final say in:</i>	
	<i>What to do with money husband earns</i>	<i>How to spend money</i>
<hr/>		
<i>Explanatory Vars:</i>		
Mobile phone	-0.0048 (0.0115)	-0.0698** (0.0285)
Landline phone	-0.0028 (0.0120)	0.0219 (0.0299)
Years of women's education	-0.0053*** (0.0010)	0.0111*** (0.0022)
Rural	0.1733*** (0.0092)	-0.1056*** (0.0201)
Standard of living index	0.0491*** (0.0069)	0.0107 (0.0147)
North India	-0.0105 (0.0101)	-0.0698*** (0.0214)
East India	-0.0755*** (0.0108)	0.0379* (0.0217)
Model type	Ordered Probit	Ordered Probit
Observations	84035	22113
Pseudo R ²	0.0039	0.004
Mobile phone coeff / Yr of women's ed coeff	0.91	-6.29
Landline phone coeff / Yr of women's ed coeff	0.53	1.97

Standard errors in parentheses

*significant at 10 percent; ** significant at 5 percent; *** significant at 1 percent

Table A.6

Autonomy: permission to travel

<i>Dependent Vars:</i>	Women's Responses		
	<i>Respondent needs permission to visit:</i> [^]		
	<i>Market</i>	<i>Health facility</i>	<i>Outside village/community</i>
<i>Explanatory Vars:</i>			
Mobile phone	-0.0865*** (0.0121)	-0.0620*** (0.0120)	-0.0482*** (0.0113)
Landline phone	-0.1063*** (0.0127)	-0.1116*** (0.0126)	-0.1108*** (0.0119)
Years of women's education	-0.0142*** (0.0010)	-0.0153*** (0.0010)	-0.0155*** (0.0010)
Rural	0.4055*** (0.0095)	0.3185*** (0.0094)	0.0998*** (0.0090)
Standard of living index	-0.0374*** (0.0069)	-0.0367*** (0.0069)	-0.0603*** (0.0067)
North India	-0.1138*** (0.0104)	-0.0263*** (0.0104)	0.0603*** 0.0099
East India	0.0190* (0.0110)	0.0360* (0.0110)	-0.0458*** (0.0106)
Model type	Ordered Probit	Ordered Probit	Ordered Probit
Observations	85925	85927	85922
Pseudo R ²	0.0319	0.0264	0.0136
Mobile phone coeff / Yr of women's ed coeff	6.10	4.05	3.11
Landline phone coeff / Yr of women's ed coeff	7.49	7.28	7.15

Standard errors in parentheses

*significant at 10 percent; ** significant at 5 percent; *** significant at 1 percent

[^] Wife alone = 1; together with husband = 2; husband or someone else alone = 3

Table A.7

Economic independence:

<i>Dependent Vars:</i>	Women's Responses			
	<i>Respondent:[^]</i>			
	<i>Has money for her own use</i>		<i>Knowledge of loan programs</i>	
<i>Explanatory Vars:</i>				
Mobile phone	0.0749*** (0.0047)	0.1908*** (0.0122)	-0.0106** (0.0044)	-0.0299** (0.0126)
Landline phone	0.0295*** (0.0049)	0.0759*** (0.0127)	0.0224*** (0.0046)	0.0593*** (0.0130)
Years of women's education	0.0084*** (0.0004)	0.0217*** (0.0011)	0.0482*** (0.0011)	0.0482*** (0.0011)
Rural	-0.0918*** (0.0037)	-0.2369*** (0.0097)	0.0561*** (0.0035)	0.1568*** (0.0102)
Standard of living index	0.0016 (0.0028)	0.0044 (0.0074)	0.0282*** (0.0026)	0.0835*** (0.0077)
North India	0.0496*** (0.0041)	0.1289** (0.0108)	-0.2834*** (0.0039)	-0.7860*** (0.0111)
East India	-0.0086* (0.0044)	-0.0240*** (0.0115)	-0.1331*** (0.0041)	-0.3402*** (0.0115)
Constant	0.4918*** (0.0097)	-0.0200 (0.0254)	0.2924*** (0.0092)	-0.6020*** (0.0264)
Model type	Linear	Probit	Linear	Probit
	prob (OLS)		prob (OLS)	
Observations	85920	85920	85924	85924
Pseudo R ²	0.0431	0.0316	0.1073	0.0838
Mobile phone coeff / Yr of women's ed coeff	8.94	8.79	-0.62	-0.62
Landline phone coeff / Yr of women's ed coeff	3.51	3.50	1.30	1.23
Standard errors in parentheses				
*significant at 10 percent; ** significant at 5 percent; *** significant at 1 percent				

[^] Wife alone = 1; together with husband = 2; husband or someone else alone = 3

<i>Dependent Vars:</i>	<i>Respondent:[^]</i>			
	<i>Given a loan</i>		<i>Have bank or savings account</i>	
<i>Explanatory Vars:</i>				
Mobile phone	-0.0158*** (0.0044)	-0.1178*** (0.0273)	0.0950*** (0.0034)	0.2678 (0.0135)
Landline phone	-0.0126*** (0.0044)	-0.0868*** (0.0278)	0.1097*** (0.0036)	0.2921*** (0.0137)
Years of women's education	-0.0030*** (0.0004)	-0.0183*** (0.0024)	0.0170*** (0.0003)	0.0635*** (0.0013)
Rural	0.0365*** (0.0036)	0.2238*** (0.0217)	-0.0125*** (0.0027)	-0.0477*** (0.0120)
Standard of living index	-0.0029 (0.0029)	-0.0042*** (0.0165)	0.0193*** (0.0021)	0.2008** (0.0102)
North India	-0.1129*** (0.0041)	-0.6954*** (0.0271)	-0.0390*** (0.0030)	-0.1987*** (0.0128)
East India	-0.0987*** (0.0039)	-0.5258*** (0.0231)	-0.0394*** (0.0032)	-0.1824*** (0.0140)
Model type	Linear	Probit	Linear	Probit
Observations	prob (OLS)		prob (OLS)	
Pseudo R ²	32666	32666	85803	85803
	0.0418	0.0647	0.1618	0.1632
Mobile phone coeff / Yr of women's ed coeff	5.18	6.45	5.59	4.22
Landline phone coeff / Yr of women's ed coeff	4.15	4.76	6.45	4.60

Standard errors in parentheses

*significant at 10 percent; ** significant at 5 percent; *** significant at 1 percent

[^] Wife alone = 1; together with husband = 2; husband or someone else alone = 3

Table A.8

Domestic violence: justification for beating

Men's Responses					
<i>Dependent Vars:</i>					
	<i>Beating wife justified if she:</i>				
	<i>is unfaithful</i>	<i>is disrespectful to in-laws</i>		<i>goes out without telling husband</i>	
<i>Explanatory Vars:</i>					
Mobile phone	- 0.0388*** (0.0057)	-0.1495*** (0.0193)	-0.0646*** (0.0062)	-0.1948*** (0.0177)	-0.0343*** (0.0054)
Landline phone	-0.0483*** (0.0060)	-0.1888*** (0.0210)	-0.0721*** (0.0066)	-0.2219*** (0.0192)	-0.0535*** (0.0058)
Rural	0.0448*** (0.0045)	0.1469*** (0.0147)	0.0531*** (0.0050)	0.1485*** (0.0138)	0.0474*** (0.0044)
Standard of living index	-0.0380*** (0.0033)	-0.1110*** (0.0105)	-0.0367*** (0.0036)	-0.0932*** (0.0099)	-0.0534*** (0.0032)
North India	-0.0326*** (0.0048)	-0.1162*** (0.0159)	-0.0978*** (0.0052)	-0.2796*** (0.0147)	-0.0758*** (0.0046)
East India	0.0846*** (0.0053)	0.2519*** (0.0166)	-0.0072 (0.0058)	-0.0215 (0.0159)	-0.0668*** (0.0051)
Constant	0.2805*** (0.0116)	-0.6099*** (0.0358)	0.4240*** (0.0127)	-0.2049*** (0.0348)	0.3392*** (0.0111)
Model Type	Linear Prob(OLS)	Probit	Linear Prob(OLS)	Probit	Linear Prob(OLS)
Observations	43211	43211	43449	43449	43680
Pseudo R ²	0.0354	0.0323	0.0369	0.0297	0.0361

Standard errors in parentheses

*significant at 10 percent; ** significant at 5 percent; *** significant at 1 percent

Men's Responses

<i>Dependent Vars:</i>					
	<i>goes out without telling husband</i>	<i>Beating wife justified if she:</i>			
		<i>neglects children</i>		<i>argues with husband</i>	
<hr/>					
<i>Explanatory Vars:</i>					
<hr/>					
Mobile phone	-0.1462*** (0.0199)	-0.0520*** (0.0059)	-0.1811*** (0.0186)	-0.0424*** (0.0056)	-0.1721*** (0.0196)
Landline phone	-0.2304*** (0.0219)	-0.0621*** (0.0063)	-0.2171*** (0.0202)	-0.0510*** (0.0059)	-0.2111*** (0.0215)
Rural	0.1676*** (0.0150)	0.0566*** (0.0047)	-0.1156*** (0.0102)	0.0528*** (0.0044)	0.1782*** (0.0149)
Standard of living index	-0.1634*** (0.0106)	-0.0420*** (0.0034)	-0.5752*** (0.0155)	-0.0470*** (0.0032)	-0.1110*** (0.0105)
North India	-0.2696*** (0.0159)	-0.1824*** (0.0049)	-0.1612*** (0.0161)	-0.0489*** (0.0047)	-0.1162*** (0.0159)
East India	-0.2220*** (0.0173)	-0.0562*** (0.0055)	-0.2171*** (0.0202)	-0.0341*** (0.0052)	0.2519*** (0.0166)
Constant	-0.4301*** (0.0373)	0.4125*** (0.0120)	-0.2381*** (0.0357)	0.3105*** (0.0113)	-0.6099*** (0.0358)
Model Type	Probit	Linear Prob(OLS)	Probit	Linear Prob(OLS)	Probit
Observations	43680	43702	43702	43548	43548
Pseudo R ²	0.0353	0.057	0.050	0.0315	0.0302

Standard errors in parentheses

*significant at 10 percent; ** significant at 5 percent; *** significant at 1 percent

Men's Responses

Dependent Vars:

Beating wife justified if she:
refuses to have sex *burns food*

Explanatory Vars:

Mobile phone	-0.0155*** (0.0033)	-0.1827*** (0.0294)	-0.0180*** (0.0040)	-0.1437*** (0.0249)
Landline phone	-0.0157*** (0.0035)	-0.1905*** (0.0328)	-0.0222*** (0.0043)	-0.1753*** (0.0276)
Rural	0.0267*** (0.0027)	0.2149*** (0.0210)	0.0379*** (0.0032)	0.2164*** (0.0183)
Standard of living index	-0.0183*** (0.0019)	-0.1156*** (0.0143)	-0.0297*** (0.0024)	-0.1418*** (0.0126)
North India	-0.0279*** (0.0028)	-0.2309*** (0.0223)	-0.0269*** (0.0034)	-0.1576*** (0.0190)
East India	-0.0126*** (0.0031)	-0.0953*** (0.0234)	-0.0421*** (0.0038)	-0.2314*** (0.0213)
Constant	0.0900*** (0.0068)	-1.4108*** (0.0512)	0.1464*** (0.0082)	-1.1057*** (0.0449)
Model Type	Linear Prob (OLS)	Probit	Linear Prob (OLS)	Probit
Observations	43482	43482	43721	43721
Pseudo R ²	0.0154	0.0331	0.0208	0.0319

Standard errors in parentheses

*significant at 10 percent; ** significant at 5 percent; *** significant at 1 percent

Table A.9

Autonomy: decision-making

Men's Responses					
<i>Dependent Vars:</i>	<i>Respondent has final say in:[^]</i>				
	<i>Large household purchases</i>	<i>Daily household purchases</i>	<i>Visits to family /friends</i>	<i>What to do with money wife earns</i>	<i>How to spend money</i>
<hr/>					
<i>Explanatory Vars:</i>					
Mobile phone	-0.0332** (0.0160)	-0.0648*** (0.0151)	-0.0748*** (0.0153)	-0.0701*** (0.0155)	-0.0094 (0.0169)
Landline phone	-0.0494*** (0.0170)	-0.0223 (0.0160)	-0.1251*** (0.0163)	-0.0668*** (0.0165)	-0.0103 (0.0181)
Rural	0.1074*** (0.0128)	0.1612*** (0.0120)	0.1095*** (0.0122)	0.1805*** (0.0124)	0.0998*** (0.0138)
Standard of living index	-0.0508*** (0.0093)	-0.0780*** (0.0087)	-0.0606*** (0.0089)	-0.0648*** (0.0090)	-0.0288*** (0.0101)
North India	-0.2201*** (0.0134)	0.0362*** (0.0126)	0.0894*** (0.0128)	-0.1132*** (0.0130)	-0.0416*** (0.0143)
East India	-0.1236*** (0.0148)	0.0516*** (0.0140)	0.1420*** (0.0142)	0.1298*** (0.0144)	-0.0482*** (0.0163)
Model type	Ordered Probit	Ordered Probit	Ordered Probit	Ordered Probit	Ordered Probit
Observations	43630	43484	43483	43210	39179
Pseudo R ²	0.0074	0.0074	0.0096	0.0134	0.002

Standard errors in parentheses

*significant at 10 percent; ** significant at 5 percent; *** significant at 1 percent

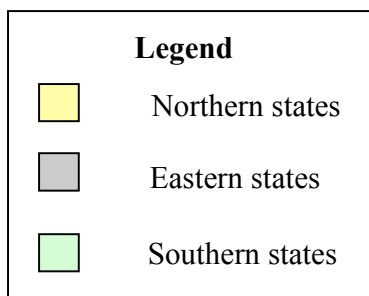
[^] Wife alone = 1; together with husband = 2; husband or someone else alone = 3

Figure A.1

States and Union Territory map of India



Source: Tees Mar Khan, 2008.*



* Colored by author to show geographic division used in analysis

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