THREE ESSAYS IN DEVELOPMENT ECONOMICS

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Abstract

This dissertation focuses on certain policies and programmes that could help achieve four of the seventeen Sustainable Development Goals (SDGs) endorsed by the United Nations (UN) to be achieved by 2030: ensure sustainable consumption and production patterns, achieve gender equality and empower all women and girls, ensure access to water and sanitation for all. The three chapters build upon existing related literature in the field of development economics, with the first chapter offering a theoretical analysis from an environmental perspective and the other two chapters providing empirical contributions to the questions on women empowerment and quality of housing, water and sanitation.

Most of the literature on trade and the environment has focused on production-generated pollution and ignored pollution emitted at the consumption stage such as municipal waste and exhaust from automobiles and home heating. The first chapter explores the importance of life-cycle environmental considerations in an oligopoly model of international trade with three countries (two exporters and one importer) and one traded good. It considers the implications of accounting for consumption-generated pollution on the optimal choice of environmental policy and welfare level in the exporting country with the lower marginal abatement cost relative to the other exporting country as well as on the optimal tariff, both when production-generated pollution is perfectly local and when it is a pure public bad.

Whereas chapters two and three use data from the 1996 Matlab Health and Socioeconomic Survey (MHSS) to study the effects of an intense outreach family planning program implemented in half of the 141 villages of rural Matlab, Bangladesh, from 1977 to 1996, on women's empowerment and on the quality of housing and general sanitation. To be able to capture the multidimensional nature of women's empowerment, we assess the program according to its impacts on different dimensions of women's empowerment: socio-economic and socio-cultural. Our findings support the idea that the family planning program enhanced women's empowerment in the treatment area in the socio-economic dimension and contributed, in some key aspects, to improvements in the quality of housing and sanitary conditions in the treatment area.

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Introduction

In September of 2000, the United Nations (UN) endorsed the Millennium Declaration, which was translated into a roadmap setting out eight time-bound and measurable goals to be reached by 2015, known as the Millennium Development Goals (MDGs). At the end of 2015, the UN report on the MDGs mentioned that significant progress had been achieved in certain areas but unevenly across regions and countries, especially the poorest and those deprived due to geographic location, sex, age, disability and ethnicity. On January 2016, an even more ambitious set of goals was endorsed by the UN known as the Sustainable Development Goals (SDGs) to build on the eight MDGs to be achieved by 2030. These seventeen SDGs emphasized everything from "zero poverty, zero hunger, good health, quality education, gender equality, clean water and sanitation, and affordable clean energy, to decent work and economic growth, innovation, reduced inequalities, sustainable cities, responsible consumption, climate action, unpolluted oceans and land, and partnerships to achieve the goals" (UN). This dissertation consists of three chapters which relate to certain policies and programmes that could help achieve four of the seventeen SDGs: ensure sustainable consumption and production patterns, achieve gender equality and empower all women and girls, ensure access to water and sanitation for all.

The objective of this thesis is to build upon the existing literature in the field of development economics, with a theoretical chapter that considers the environmental dimension of sustainable consumption and production patters and two empirical chapters that use data from Bangladesh, a developing South Asian economy, to tackle the issues of women's empowerment and quality of housing, water and sanitation. The four SDGs above mentioned which this thesis focuses on tend to be acute problems in the context of a developing country, such as Bangladesh.

According to the World Bank Group (WBG) 2009 energy strategy approach paper, the global economy is set to grow four-fold by 2050, and energy-related carbon dioxide (CO_2) emissions will more than double if transformational changes are absent. As a result, developing countries will suffer the most from this climate change, even though they are least responsible for it, at least until now.

In order to meet the future energy needs in a sustainable manner, there is a growing pressure in the international community to come up with energy saving policies with low life-cycle greenhouse gas (GHG) emissions. The rising scientific evidence on the pace of climate change makes it crucial to transform the global production and consumption of energy in a sustainable manner. Along with developed economies, developing economies need to step in to reduce the current emission trajectory and stabilize global GHG concentrations. Countries which are not part of the Organisation for Economic Co-operation and Development (OECD) are currently at par with emissions of OECD members (WBG, 2009), but, according to the forecast by the International Energy Agency (IEA), if significant actions are not taken and current policies are continued, energy related CO_2 emissions will be twice than those in OECD countries by 2030 (WBG, 2009). Significant financial and technological aid needs to be made available to developing economies in order to curb GHG emission. IEA (2008) estimated that on average it would cost US$85 billion a year during 2010-2030 to limit the long-term CO_2 concentrations in non-OECD countries to 550 parts per million (ppm) and the cost will increase to US$230 billion a year if the goal is to achieve 450 ppm (WBG, 2009). Even though short run policies are currently in place, they will not work when the challenge is of this magnitude; hence, in order to attain sustainable energy, long term coordinated efforts are required from a wide range of actors, such as industry, finance, government and international organizations.

Most of the literature on trade and the environment has focused on production-generated pollution and ignored pollution emitted at the consumption stage such as municipal waste and exhaust from automobiles and home heating. For pollutants such as emissions from electronic appliances and automobile exhaust, it is the location of consumption, and not of production, that determines where pollution occurs. Hence, recent policy efforts to protect the environment have attempted to look at the life-cycle impacts of goods and services as opposed to considering only the industrial processing of products as the main source of pollution and the implementation of cleaner production techniques. The importance of integrating consumption through the development of a better understanding of the role of consumption has been emphasized since the 1992 UN Conference on the Environment and Development (UNCED) in Rio De Janeiro.

Energy consumption and its related GHG emissions per capita in developing economies are fractions compared to those in developed economies today. In 2001, the consumption of goods and services in the European Union (EU) caused 4,700 Mt (Million Tonnes) of (CO_2) emissions. This was 500 Mt higher than the reported (CO_2) emissions of 4,200 Mt. the year before. The 500 Mt difference was from products imported into the EU (Bang et al., 2008). According to Dickinson (2007), just under half of all the (CO_2) emissions in New York City are generated through consumption. Munksgaard et al. (2000) found that most of the (CO_2) emissions growth in Netherlands during 1966-1992 was due to consumption. Gopalakrishnan (1997) found that at least 34% or at most 52% of the air pollution in Kolkata, India, ensues from consumption.

Grossman and Krueger (1993) examined the impact of the North American Free Trade Agreement and gave rise to a renewed interest in exploring the relationship between trade and the environment. Copeland and Taylor (2003) suggested that their model, which has become the standard for studying the impact of international trade on environmental quality, should be expanded to include pollution from consumption to study different pollutants. Cole (2004) also suggested that "future research should focus on the environmental impact of consumption at the expense of the more traditional emphasis on production." Hence, consumption plays an important role in the assessment of the environmental feasibility of a product. Unless the complete life cycle of a product or service (i.e., emission footprint) is examined, its environmental impact cannot be fully captured.

The first chapter of this dissertation is a theoretical piece that explores the importance of life-cycle environmental considerations in an oligopoly model of international trade. The above facts from developed and developing countries indicate that, due to globalization and trade, consumption related pollution is increasing, and its contribution towards the total pollution level in an economy is significant. We use a very simple model with three countries (two exporters and one importer) and one traded good. The exporters differ in their marginal abatement cost, which is exogenously determined, but are subjected to the same tariff on their exports to the third country. The model consists of four stages: in stage one, each of the exporting countries chooses its environmental policy; in stage two, the importing country selects a uniform tariff on the exported good; in stage three, exporters determine how much to produce for the local and foreign markets; in the final

stage, international trade and consumption take place. We then consider the welfare implications of adding consumption-generated pollution into the environmental damage function when production-generated pollution is either perfectly local or a pure public bad. Finally, we evaluate the implications of accounting for consumption-generated pollution on the optimal choice of environmental policy.

Over the last 15 to 20 years, FDI has increased considerably especially in developing countries. We know that FDI has potential benefits for both trading partners: the host countries may benefit from new technologies and employment opportunities and the donor countries may benefit from cheaper factors of production and more lax environmental policies. By expanding the model, we can evaluate policies adopted by developing economies with respect to whether to manipulate tariff (i.e., adopt uniform tariffs versus discriminatory tariffs if they are importing), and the donor country can decide whether to export or do FDI or impose tariffs if they are importing the product from the host country.

For example, Bangladesh is the second largest apparel exporter in the world after China. It also enjoys tariff-free market access in EU, Canada, Australia, and other developed countries of the world. The thriving ready-made garment (RMG) sector in Bangladesh has both benefits and a negative externality. Dhaka, the capital of Bangladesh, a megacity of 15 million residents, is struggling to provide enough drinking water for its residents even though it sits near four major rivers in a wide delta region. According to Citiscope, an organization that delivers expert commentary and analysis on cities around the world, one of the key offenders are the 1,700 factories producing fabric for Bangladesh's booming textile industry. Most of them are located in Dhaka and on its fringe. They are also known as "wet processors," which consume as much as 300 liters of water to produce one kilogram of fabric. These factories use six times more water than what is considered to be best international practice. According to a recent World Bank report, the textile mills in and around Dhaka may consume as much groundwater as goes to all the residents of Dhaka city. Lastly and most importantly, these wet processors are one of the biggest culprits, dumping used dyes and chemicals directly into the surface waters and polluting rivers; this limits options for Dhaka to find new freshwater sources.

Chapters two and three are empirical pieces considering women's empowerment and basic human rights concerning housing, water, and sanitation. Gender equality and empowered women are a catalyst for multiplying development efforts. Among all the development investments, gender equality yields the highest return (OECD, 2010). According to the OECD 2012 report, an increase in the female-male ratio of workers by 10 percent in India could increase GDP by 8 percent. If women get the same access to agricultural inputs in Africa as men, total agricultural outputs could increase by up to 20 percent. Women owned small registered businesses comprise up to 38 percent worldwide, and the number is rapidly growing in Africa, Asia, Eastern Europe and Latin America, with direct impacts on job creation and poverty reduction. Therefore women's economic empowerment is a precondition for sustainable development and growth. The OECD report also suggests that gender gap is due to women's limited agency, i.e., women's lower ability to make effective choices towards desired outcomes. The drawback is that women are often at a disadvantage in their ability to make effective choices ranging from household decisions, what kind of employment to get into, whether or when to get married, and fertility.

Long-term sound public policies are required to enhance women's economic empowerment, and a holistic approach regarding specific perspectives must be integrated at the design stage of policy and programming. Women must have more equitable access to assets and services; as Duflo (2012) sums up, "increasing women's control over resources, even in the short run, will improve their say within the household, which will not only increase their welfare, but as research seems to have shown repeatedly, child nutrition and health as well."

In all countries, the behaviors and expectations that are deemed appropriate to men and women are shaped by tradition, culture, and history. The common pattern is that women have limited power over decision making processes, less personal autonomy, and fewer resources at their disposal. In many cultures, child marriage is prevalent even in the presence of laws against it. Adolescent pregnancy rate is high and women have limited control over their own sexual and reproductive health decisions.

Most of these patterns are mutually dependent and reinforce each other. Improving women's health and access to sexual and reproductive information and services strengthens their socio-economic

status and increases their chances of achieving higher education (and, eventually, coming out of poverty). Delaying marriage is associated with lower fertility and, as a result, higher educational attainment. Lower fertility also benefits children's health and education, i.e., there exists a benefit for future generations and economic prosperity. In developing countries, child marriage is widespread even though it is illegal. For example, child marriage has been illegal in Bangladesh since the 1920s, nevertheless, 66 percent of Bangladeshi girls get married by the age of 18 and over one-third before the age of 15; with respect to the entire world, one third of the world's child brides are in India (UNICEF). According to the World Bank, if this trend continues, every year 15 million girls will marry before the age of 18 worldwide, i.e., 41,000 girls each day.

In developing countries, families believe that marriage will improve daughters' economic and social circumstances. In reality, girls who marry young are more likely to remain poor. Evidence from Bangladesh and Sub-Saharan Africa shows that women who are married at a young age are less likely to be literate by over five percentage points and less likely to have any secondary education by over eight percentage points (Field and Ambrus, 2008).

Mason and Smith (2003) analyze measures of married women's empowerment in 56 communities across five Asian countries (India, Malaysia, Pakistan, the Philippines, and Thailand). Their results indicate a positive influence of gender relations in their community norms and values. Matters related to sexuality are considered inappropriate for women in many cultures, especially in the rural areas. Cultural norms prevent girls from learning about sex and contraceptive use, which gives men autonomy on fertility. Policy makers need to address these patterns of cultural norms in their policy frameworks as it will be very critical for increasing sexual and reproductive agency.

According to the International Center for Research on Women (ICRW), compared to four decades ago, women today have far fewer children due to family planning methods. In 2005, 78 percent of Colombian women used contraception, compared to only 21 percent back in 1970. Bangladesh has experienced one of the most rapid fertility declines on record (Kabeer, 2009). Since 1971, after getting its independence, the average fertility went down from close to seven children to two (United Nations, 2015).

We still have a long way to go as many women in the world are unable to realize their fertility preferences. According to Klugman et al. (2014), about 80 million women have unintended pregnancies in developing countries. Globally, 54 million unplanned pregnancies could be averted if unmet contraceptive need is fulfilled. Unmet need could be due to inadequate access to supplies and factors such as distance, cost, insufficient supplies and inconvenient hours. Along with adequate supply, increasing women's agency and education is vital for adopting regular use of contraceptive. Ten percent of women in South Asia and 21 percent in Sub-Saharan Africa say their husband makes the decision alone of using contraceptives. A study across 55 developing countries shows that, on average, 6 percent of women are not using family planning because their husbands or others are opposed, whereas two thirds of couples make joint decisions regarding contraception.

Chapters 2 and 3 explore the effects of an outreach family program implemented in half of the 141 villages of rural Matlab, a sub-district located about 60 km south-east of Dhaka, Bangladesh. Eighty-five percent or more of the people in Matlab are Muslims, while 10 percent are Hindus. The Matlab district was chosen for this specialized family planning social experiment because its population of about 180,000 was systematically registered in 1966 as part of field experiments to test the efficacy of new cholera vaccines. Monthly Demographic Surveillance System (DSS) recorded vital information regarding all births, deaths, marriages and population movements in the Matlab district. During 1970s, few places in rural South Asia had more reliable data from which birth and death rates could be calculated, ensuring that any demographic consequences of a family planning or public health social experiment in Matlab could be inferred from vital records with considerable confidence. In October 1977, the Centre for Diarrhoeal Disease Research, Bangladesh (ICDDR, B), started an experimental family planning, maternal and child health (FPMCH) program in Matlab. Out of 141 villages with a total population of about 180,000, 70 of the villages in the study area (blocks A, B, C and D) received new family planning outreach services, whereas the remainder villages (blocks E and F) continued to receive only regular government health and family planning programs, which generally required women to visit their local health clinic.

The specialized family planning program had 80 trained female Community Health Workers who visited women in the treatment area once every two weeks (Aziz and Mosley, 1994; Schultz, 2009).

During their bi-weekly visits, they provided married women with information regarding different kinds of contraceptives and their side-effects. They were offered a choice of pills, condoms, foam tablets or injectable contraceptives (depo-medroxy-progesterone acetate), and later the copper T intra-uterine device was added, and women wanting menstrual regulation or a tubectomy were referred to the local district clinic or hospital (Phillips et al., 1982). Aside from this, they also supplied non-clinical methods. The Community Health Workers were women from generally influential families in the village, who were married, had 8 or more years of education and were users of contraception themselves.

Twenty years after the implementation of the program, in 1996, the Matlab Health and Socioeconomic Survey (MHSS) was carried out, where a random sample of baris (a compound in rural Bangladesh, which usually consists of a cluster of households in close physical proximity) and households from the baris was drawn from the 141 villages of Matlab, half of which being in the program treatment villages and the other half in the comparison areas. From a perspective of a low-income country, the MHSS improved Life Surveys and Living Standards Measurement Surveys as it was designed to document more in-depth socioeconomic characteristics of the district, often studied only from a demographic and health perspective.

Several features of the Matlab MHSS data are helpful for examining the effects of the intensive family planning program in the treatment areas. First of all, individuals in the surveillance area are assigned permanent identification numbers so that more accurate matching and merging of information is possible over time. Also, prior exposure of policy interventions are known by village of residence, and long-term consequences of the policy treatments for the women can be inferred. Secondly, for each married woman, the survey collected detailed information regarding their health, maternity history, children's health, anthropometric indicators, and schooling outcomes. Finally, the program also conducted a community-level questionnaire about local health care providers, schools, NGO's and village infrastructure.

Joshi and Schultz (2007 and 2012) and Schultz (2009) used the same Matlab Health and Socioeconomic Survey (MHSS) data to investigate the impact of family planning program on child and women's health, economic productivity, household assets. Our goal in this thesis is to

investigate the possible effects of this successful family planning program towards empowering women.

Chapter 2 contributes to the literature on a developing country in South Asia (Bangladesh). Data from Matlab provide an appropriate focus for our study for several reasons. First, and from an empirical viewpoint, decline in fertility has continued long enough to examine its influence on aspects of gender inequality and gender relations. Second, the vast dataset allows us to explore the idea of interactions between men and women in the domestic sphere, which bring about transformations in gender relations; the day-to-day negotiations and struggles around the domestic division of labor between women and men are in fact part of a wider social process that involves slow transformative changes in consciousness and practice. Hence, the dataset allow us to study the impact of the program on different measures of women empowerment.

According to Malhotra (2012), controlling the use of contraceptives by women may be a prerequisite for shifts in patriarchal social systems. Delaying pregnancy could lead women to use that extra time for their schooling and employment. Such development will increase their bargaining power within the household and weaken the patriarchal system. Studies from countries such as Egypt, Thailand, and Taiwan show that there is a positive correlation between fertility declines and women's empowerment in terms of increased education, credit, and employment (Amin and Lloyd, 2002; Hardee and Yu, 2004; Schuler et al., 1995). A recent paper by Upadhyay et al. (2014) conducts a literature review on many studies done around the world regarding fertility and women empowerment. According to their findings, the vast majority of these studies found some positive association between women's empowerment and lower fertility.

Besides the economic dimension, this paper also looks at the socio-cultural dimension and the participation of women in decision making process. For the socio-economic aspect, we looked at whether women own any productive assets; purchase small and large household items with their own money; whether they need permission to purchase small households items and involved in major household decisions. For the socio-cultural variables such as: whether women can travel alone within and outside the perimeter of the village; whether they participated in group action against injustice in the society and whether they were the victims of physical assault.

The vast dataset provided by the Matlab MHSS survey allows researchers to investigate different socioeconomic topics. In chapter 3 we use the same dataset to study whether there were additional spillovers of fertility decline with respect to housing and water quality and general sanitation. According to Dungumaro (2009), reaching the MDG goal for water and sanitation will not only contribute to economic development and healthy population, but will also aid to promote gender equality and the empowerment of women. In the rural area, access to water supplies for the household is a vital part of the role of women in the household. Easy access to water reduces their workloads, and in most South Asian and African societies, it is the responsibility of women to keep their households nutritional and hygienic state at an acceptable level. Households make use of young girls to fetch water in areas that require long walking, distance to access water supply, and as a result their school attendance is poor compared to boys. According to UNICEF (2006), school enrolment rates for girls have been shown to improve by over 15 percent when provided with clean water and a toilet facility, given girls no longer have to walk miles every day to fetch water.

According to the 2007 report of United Nations Population Fund (UNFPA), for the first time in history back in 2008, more than half of the world's population (3.3 billion people) were living in urban areas. It is projected that the urban population will continue to grow to almost 5 billion by 2030, and that much of the urbanization will take place in developing economies, with Africa and Asia having the largest populations. Achieving a minimum housing quality is an indicator of development in the developing nations and one of the most important sign of success of their respective governments (Struyk and Turner, 1986). According to the World Health Organization (WHO), today nearly 40 percent of urban growth is in unhealthy slum housing, and the availability of safe water and adequate sanitation is critical for economic development. In developing countries, due to the increasing population and scarce economic resources, housing, water and general sanitation has become major issues. Urban poverty leads to inadequate access to water and sanitation; according to Lawrence et al. (2002), socioeconomic status is a significant factor of household's access to water and basic sanitation.

The First Inter-Ministerial Conference on Health and Environment in Africa (2008) called for greater interregional cooperation so that there is better housing quality, access to safe drinking

water, hygiene and sanitation. Today, 836 million people live in extreme poverty, 2.4 billion lack adequate sanitation and 663 million have no access to clean water.

The government always prioritizes projects that bring higher return on their investments such as those in the industrial, transportation and energy sectors, but when it comes to the housing sector, the priority of the government is on urban areas rather than rural (Gilbert and Ward, 1985). This widens the gap between urban and rural development, and hence leads to the rise of rural to urban migration and unhealthy slum housing. Due to the huge influx of migrants in developing nations and especially in South Asia, urban areas struggle with traffic congestion, high crime rate, and infectious diseases. Investing in rural sector development such as road infrastructure, and better housing quality will reduce and control some of the above problems in urban areas. Poor housing and poor hygiene can lead to many health problems, and is associated with infectious disease, stress and depression. Better housing, access to clean water and adequate sanitation are more important for the vulnerable population groups: poor; sick; children; elderly and disabled who spend more of their time inside their dwellings are most susceptible and in need of healthy living environments. According to Fogden and Wood (2009), during 1970 and 1975, access to safe drinking water for the world population rose by 11.1 percent and in 1977 the international community came together in an effort to increase its growth further. During 2000 and 2006, it only grew by merely 2.4 percent, and according to estimates, access to safe drinking water may fall below the 1977 level within the next 50 years, which will impinge economic growth by no later than 2050, and emerging developing economies will be affected the most.

"Research in housing quality has been limited and should be expanded to include housing quality in the rural areas of developing nations as an indirect measure of policy and program adequacy" (Yust et al., 1997). It has also been shown that low housing quality has a negative effect on housing satisfaction (Galster and Hesser, 1981; Fred, 1982; Morris and Winter, 1997). This chapter contributes in filling that gap in the literature and also bridges a link with regards to women's empowerment. Bangladesh is a perfect candidate in this scenario, as it is a low-income country with substantial poverty, inequality, deprivation and particularly the rural sector is limited with economic resources, high fertility, high mortality, high morbidity and low educational attainment. Environmental hazards are high, poorly developed community health and educational infrastructure and alternative sources of financial support outside the family is scarce (Jansen,

1990; Menken and Phillips, 1990; Rahman et al. 1992). Bangladesh being the eight most populous country of the world, almost one-third of the population lives below the poverty line and a large fraction live under extreme poverty. Compared to the urban sector (28 percent), the poverty rate is higher in rural areas (36 percent). The government has very negligible involvement in rural housing and the current infrastructure is very inadequate. 83 percent of the rural dwelling units are not built properly and do not provide protection from wind, rain and flood (Das et al., 2007). Housing constructions are done by the villagers themselves, and the government has no significant contribution in rural housing, except in areas ravaged by natural calamities, such as floods and cyclones, where some building materials were provided by them as relief measures (Hasan, 1999). Along with high population density, improved sanitation is a very big issue in rural areas. In 1996, 38 percent of the rural population has access to improved sanitation facility compared to 58 percent in the urban area (MDG, 2012).

To measure the quality of housing, water and general sanitation and see the effect in the treatment area we introduce the following dependent variables. For housing quality, we looked at whether the household has electricity, the number of rooms in the households and types of flooring and roofing materials used in the main bed room. For general sanitation and water quality, we considered the cleanliness of the surrounding vicinity of the household, quality of washroom that male, female and children has access to, and main source of drinking water and cleaning utensils in the household.

The results from our theoretical (chapter 1) and empirical (chapter 2 and 3) analysis provides some insight on policies and programs that the government should implement in order to achieve long term development goals especially with respect to: environmental quality, women's empowerment, health, education, and rural infrastructure support.

Chapter 1

Trade and the Environment: Welfare Implications of Life-Cycle Environmental Assessments

1.1 Introduction

In most of the literature on international trade and the environment, researchers have focused on production-generated pollution and ignored pollution emitted at the consumption stage such as municipal waste and exhaust from automobiles and home heating. For pollutants such as automobile exhaust, it is the location of consumption, and not of production, that determines where pollution occurs. Hence, recent policy efforts to protect the environment have attempted to look at the life-cycle impacts of goods and services as opposed to considering only the industrial processing of products as the main source of pollution and the implementation of cleaner production techniques. The importance of integrating consumption through the development of a better understanding of the role of consumption has been emphasized since the 1992 UN Conference on the Environment and Development (UNCED) in Rio De Janeiro.

The relevance of accounting for the environmental effects of consumption in decision making processes involving environmental damages (e.g., welfare maximization) is probably most arguable in instances in which trade occurs and countries face different environmental standards and thus make their production decisions (in terms of what, how much, and where to produce) taking environmental policy differences across locations into account. According to the Pollution Haven hypothesis, in fact, trade encourages firms producing dirty goods to relocate to regions/countries with lax environmental policies. Given that developing countries tend to have weak environmental policies as they are poor and environmental quality is considered to be a normal good, industrialized countries facing tighter environmental standards can produce in

developing countries, some of which, not surprisingly, are becoming the world's main manufacturers, and then import. By so doing, they thus create pollution havens and are able to consume pollution-intensive goods (through imports) without compromising their ability to comply with their pollution standards.

Grossman and Krueger (1993) examine the impact of the North American Free Trade Agreement. Since then, there has been renewed interest in exploring the relationship between trade and the environment. With the elimination of trade restrictions, imports of pollution-intensive goods raise serious concerns for the environment. Since 2005, Mexico has imported over 2.5 million used vehicles from the United States. In their analysis of the environmental impact of international trade in the used car market between the United States and Mexico, Davis and Kahn (2010) find that vehicle emissions per mile have tended to decreases in both countries as the traded vehicles are dirtier than those in the United Stated and cleaner than those in Mexico, but this trade has increased total lifetime emissions, mainly due to low vehicle retirement rates in Mexico.

The importance of consumption-generated pollution is supported by data in several studies. In 2001, the consumption of goods and services in the European Union (EU) caused 4,700 Mt (Million Tonnes) of CO_2 emissions. This was 500 Mt higher than the reported CO_2 emissions of 4,200 Mt. the year before. The 500 Mt difference was from products imported into the EU and it amounted to more than Italy's domestic emissions (Bang et al., 2008). According to Dickinson (2007), just under half of all the CO_2 emissions in New York City are generated through consumption. Munksgaard et al. (2000) find that most of the CO_2 emissions growth in Netherlands during 1966-1992 is due to consumption; they also find that emissions through consumption represent increasingly a larger share of total emissions. Gopalakrishnan (1997) reports that at least 34% or at most 52% of the air pollution in Kolkata, India, results from consumption activities. According to Statistics Canada (2004), the Canadian government and businesses disposed of 31 million tonnes of municipal, commercial, industrial, construction and demolition waste in 2002 which is equivalent to 2.7 kg of waste for each Canadian per day.

Governments around the world have relied on different policies to curb consumption-related pollutions, such as driving restrictions, encouraging public transit, and incentives to buy energy

efficient products. Empirical analysis does, however, show that these policies often fail and their costs thus exceed their benefits. Gallego (2013) uses data from Mexico (Mexico City) and Chile (Santiago) where an effort was taken to reduce air pollution with policies aimed at restricting driving personal vehicles to some extent and influencing households in favor of public transport. Based on hourly concentration records of carbon monoxide, Gallego finds that, in response to the policies, both cities experienced an increase in the number of cars on the road and higher pollution levels. Households adjust quickly to restrictions and find ways of bypassing them through different loopholes.

Consumption thus plays an important role in the assessment of the environmental feasibility of a product. Unless the complete life cycle of a product or service (i.e., emissions footprint) is examined, its environmental impact cannot be fully captured. And, as environmental damages are part of a country's welfare, meaningful welfare comparisons across countries can only be carried out when emissions from both production and consumption are taken into account. At the consumption level, vehicles represent a major source of local and global pollutants. Copeland and Taylor (2003) suggest that their model, a standard setup up for exploring the impact of international trade on environmental quality, should be expanded to include pollution from consumption to study different pollutants. Cole (2004) also suggests that "future research should focus on the environmental impact of consumption at the expense of the more traditional emphasis on production."

In this paper, the welfare implications of allowing for consumption-generated pollution into the environmental damage function are considered, and optimal tariff is used as a policy instrument to evaluate the overall effects on imports, exports, and welfare of all the trading partners. Copeland and Taylor (1995) show that the pollution haven hypothesis is a concern when emissions are generated by production or consumption. Although accounting for emissions at the consumption stage is likely to yield most interesting results in the context of a model in which location-related decisions, whether to export or FDI are contemplated, as a first step, the focus of this paper is on the extent to which the difference in the welfare levels of two countries is affected by the presence of consumption-generated pollution when environmental policies are endogenously determined, and on which key parameters determine the direction of the change in the welfare gap.

The remainder of the paper is structured as follows. In Section 2, a four-stage oligopoly model of international trade is presented which involves three countries and one traded good. Two of the three countries produce for their own consumption and compete in quantities to export to the third country which does not have the proper technology to produce the good. The two exporters, which face different environmental standards in production, can be thought of two neighboring developed countries while the importer, which imposes the same tariff on its imports independently of which country they come from, is the developing country. In Section 3, environmental policy is derived and welfare analysis is carried out both in the absence and presence of consumption-generated pollution. In Section 4, concluding remarks are provided.

1.2 Basic Model

A simple oligopoly model of international trade is employed which involves three countries (*A*, *B*, and *C*) and one traded good (*X*). While each of the three countries consumes *X*, only *A* and *B* produce it. Countries *A* and *B* are two neighboring developed countries which compete in quantities to export *X* to *C*, a developing country with no proper technology to produce *X*. Pollution generates as a by-product of both production and consumption. While consumption-generated pollution is perfectly local and thus only affects the consuming country, production-generated pollution can have spillover effects which are captured by *s*, a parameter in the [0,1] interval with $s = 0$ if pollution is perfectly local and $s = 1$ if pollution is a pure public bad.

In each of the two exporting countries, the good is produced by a single profit-maximizing firm at zero marginal cost under an environmental standard equal to e_i, for $i = A, B$, which is endogenously determined. The exporters differ in their marginal abatement costs σ_i, which is exogenous, where $i = A, B$. Given that each unit of production is assumed to generate a unit of pollution, as in Copeland and Taylor (1994), the environmental standard specifies the proportion of a unit of pollution that must be abated, that is, $e_i \in (0,1)$. With φ denoting the marginal damage of unabated pollution, the environmental damage function in country *i* when only pollution from production is accounted for can be written as

$$\Psi_i = \varphi\,(1 - e_i)\,X_i + s\varphi\,(1 - e_{-i})\,X_{-i}, \tag{1}$$

where $-i$ denotes the other producing country (e.g., $-i = B$ when $i = A$). On the consumption side, demand in each country, including the importing country, is linear and given by

$$D_i = \alpha - \beta P_i, \tag{2}$$

where α and β are positive parameters and P_i denotes the price level in country i.

As country C does not produce and must thus import from countries A and B to be able to consume X, the price levels in the three countries are such that

$$P_A + t_A = P_B + t_B = P_C, \tag{3}$$

where t_i is the tariff country C imposes on country *i's* exports. For consistency with the World Trade Organization (WTO)'s principle of non-discrimination according to which, when choosing their trade policies, WTO member countries must treat all other members in a non-discriminatory fashion (that is, any tariff concession to a member country has to be extended to all the other member countries), country C is assumed to impose the same tariff on countries A and B, that is $t_A = t_B = t$ so that the above non-arbitrage condition reduces to $P_A = P_B = P_C - t$.

If each unit of consumption also generates a unit of pollution and each unit of consumption-generated pollution contributes γ_i to environmental deterioration in country i, the environmental damage function in country i becomes

$$\Psi_i = \varphi\,(1 - ei)\,X_i + s\varphi\,(1 - e_{-i})\,X_i + \gamma_i D_i. \tag{4}$$

The value of the parameter γ reflects, to some extent, the environmental friendliness of services in place to collect and dispose of consumption-generated pollution, with a lower value suggesting the presence of services that are less detrimental to the environment (e.g., recycling). Hence, it is reasonable to expect countries A and B to face the same marginal damage of pollution from consumption but country C to face a higher marginal damage, that is $\gamma_C > \gamma_A = \gamma_B = \gamma$. As a notational simplification, γ_C can be expressed relative, or in terms of, φ as $\gamma_C = f\varphi$, where f is positive but can exceed or fall short of unity.

To examine the welfare implications of including pollution from consumption into the environmental damage function, a model is considered involving four stages: in the first stage, each of the exporting country chooses its environmental policy; in the second stage, country *C* chooses the tariff to impose on the two exporting countries that maximizes its welfare; in the third stage, countries *A* and *B* simultaneously decide how much to produce for local consumption and how much to export taking their own environmental policies and tariffs imposed by *C* into account; in the fourth stage, international trade and consumption take place. For countries *A* and *B*, welfare (*W*) is defined as the sum of consumer surplus (*CS*) and producer surplus (*PS*) less environmental damage (Ψ). For country *C*, welfare is just equal to consumer surplus plus tariff revenues (*TR*) when only production-generated pollution is considered and the difference between consumer surplus and environmental damages from consumption-generated pollution plus tariff revenues otherwise. Solving the model by backward induction, the fourth stage is considered first, followed by the third-stage, the second-stage and, finally, the first stage where *A* and *B* choose their environmental policies. Two scenarios are thus considered: the first one involves only production-generated pollution; the second includes both pollution from production and pollution from consumption.

1.2.1 Production-Generated Pollution

In the final stage, equilibrium is determined by the market clearing condition which requires that import demand (M_C) be equal to total export supply. Under the assumption that preferences are the same across the three countries,

$$M_C = \alpha - \beta P_C. \tag{5}$$

Total export supply of good *X*(*E*) is the sum of the net (after abatement) output levels of good *X* in countries *A* and *B* minus their local consumption levels, that is,

$$E = X_A(1 - e_A) - (\alpha - \beta P_A) + X_B(1 - e_B) - \alpha - \beta P_B). \tag{6}$$

Market clearing combined with the non-arbitrage condition then gives that

$$P_A = P_B = \frac{3\alpha - X_A - X_B - \beta t}{3\beta} \tag{7}$$

and

$$P_C = \frac{3\alpha - X_A - X_B + 2\beta t}{3\beta}. \tag{8}$$

Given these prices, the import level of country *C* and export level of country *i* (*i* = *A*, *B*) can be found at market clearing as

$$M_C = \frac{X_A + X_B - 2\beta t}{3} \tag{9}$$

and

$$E_i = \frac{2X_i - X_{-i} - \beta t}{3}. \tag{10}$$

In the third stage of the game, the monopolist in country *i* chooses its production level in order to maximize its producer surplus taking the tariff imposed by country *C* and the production level of the monopolist in the other exporting country (country *–i*) as given, namely,

$$PS_i = \frac{X_i}{3}\left(\frac{3\alpha - X_i - X_{-i} - \beta t - 3\sigma_i \beta e_i}{\beta}\right), \tag{11}$$

with σ_i representing the marginal cost of abatement for country *i* (*i* = *A*,*B*) and Ψ_i as in (4). Maximization of (11) with respect to X_i yields monopolist *i's* reaction function as

$$X_i = \frac{3\alpha - X_{-i} - \beta t - 3\sigma_i \beta e_i}{2}. \tag{12}$$

Solving (12) for *i* = *A*, *B* simultaneously gives

$$X_i = \alpha - \frac{1}{3}\beta t - 2\sigma_i \beta e_i + \sigma_{-i}\beta e_{-i}. \tag{13}$$

Production in country *i* thus decreases with the local environmental standard but increases with the environmental standard in the other country; furthermore, the marginal effect of the local standard is larger (in absolute terms) than the standard in the rival country. The difference between the two production levels is equal to

$$X_A - X_B = -3\sigma_B \beta \left(de_A - e_B\right). \tag{14}$$

The marginal abatement costs of *A* and *B* are exogenously determined: $(\sigma_A = d^*\sigma_B) < \sigma_B$ where *d* is a constant $(0 < d < 1)$. The production difference could be either positive or negative as it depends on the parameter values and whether pollution is perfectly local ($s = 0$) or pure public bad ($s = 1$).

In the second stage, taking the productions levels of the two trading partners into account, country *C* chooses the tariff as to maximize

$$\begin{aligned} W_C &\equiv CS_C + TR \\ &= \frac{1}{162}\frac{(6\alpha - 8\beta t - 3\sigma_A\beta e_A - 3\sigma_B\beta e_B)\,(6\alpha + 10\beta t - 3\sigma_A\beta e_A - 3\sigma_B\beta e_B)}{\beta}. \end{aligned} \tag{15}$$

The optimal tariff is thus equal to

$$t = \frac{3}{80}\frac{(2\alpha - \sigma_A\beta e_A - \sigma_B\beta e_B)}{\beta}. \tag{16}$$

In the first stage, taking the tariff into consideration, countries *A* and *B* choose their own environmental standards e_A and e_B, and welfare is thus computed by substituting *t*, e_A, and e_B in their respective welfare functions:

$$W_i \equiv CS_i + PS_i - \Psi_i, \tag{17}$$

where

$$CS_i = \frac{1}{18}\left(\frac{X_i + X_{-i} + \beta t}{\beta}\right)^2 \tag{18}$$

and PS_i and Ψ_i are given in (11) and (1).

1.3 Environmental Policy and Welfare Difference (Pollution from Production)

Both exporting countries are similar in many aspects, i.e., developed economies with identical preferences, same marginal damage of unabated pollution (φ) and marginal damage from

consumption (γ), but country *A* is a low-cost exporter as its marginal abatement cost is lower than *B*'s, that is, $\sigma_A < \sigma_B$. It is exogenously determined that country *A*'s marginal abatement cost is lower than *B*'s, but the magnitude of the difference depends on the parameter *d*, where $0 < d < 1$ as $\sigma_A = d\sigma_B$. If σ_B is very high but *d* is very low, then country *A*'s marginal abatement cost is very low compared to *B*'s; hence, the marginal abatement difference between the exporting countries becomes large, whereas, on the other hand, a high *d* value results in a lower difference. While choosing environmental policies, both *A* and *B* take their own marginal abatement costs σ_i into consideration; because of their different marginal abatement costs, they end up with different environmental policies. The production level (X_i) is decided by taking the tariff *t*, marginal abatement costs, and environmental policies into consideration. Hence, a change in the magnitude of the marginal abatement costs affects environmental policies and production of good *X* in both countries. As a result, it effects their producer surpluses (PS_i) and environmental damages (Ψ_i), and thus welfare (W_i).

The sign and magnitude of the welfare gap depend only on the producer surplus difference and environmental damage difference since the exporters have identical preferences, i.e., same consumer surpluses. There are different variables that determine the sign of the producer surplus and environmental damage differences, and thus the welfare gap. The producer surplus PS_i given in (11) is negatively related to the production level of the competitor: the monopolists *i*'s reaction function given in (12) shows that, as one exporter produces more of good *X*, it reduces the production of its competitor. Tariff imposed by *C*, each country's own marginal abatement cost (σ_i), and environmental policy (e_i) reduce the producer surplus for both *A* and *B*. The environmental damage function from (1) shows that higher production of good *X* increases the environmental damage (Ψ_i) for both exporting countries. Stricter environmental standard lowers damages and, when pollution is a pure public bad (i.e., $s = 1$), environmental damages are higher and equal for both exporting countries. Hence, the magnitude and sign of the welfare gap depend on the marginal abatement cost difference ($\sigma_A - \sigma_B$), environmental policy difference ($e_A - e_B$), production difference ($X_A - X_B$), and transboundary effect, that is, whether $s = 0$ or 1.

Environmental policy and welfare of each exporting country are measured by taking some assumptions into consideration. These assumptions are $\alpha = \beta = \varphi = 1$; $0 < \sigma_B \leq 1$, $0 < \sigma_A$, $d < 1$, and

they are only used to simplify the expressions. When pollution is perfectly local ($s = 0$), the policy difference ($e_A - e_B$) can be expressed as

$$(e_A - e_B) = \frac{4(d-1)[\lambda_1 \sigma_A \sigma_B + \lambda_2(\sigma_A + \sigma_B) - \lambda_3]}{\sigma_B d \lambda_0} \gtrless 0. \tag{19}$$

The above expression shows that the environmental policy gap between the exporting countries depends on their marginal abatement costs. Similarly, when $s = 0$, the welfare difference $\hat{W} = (W_A - W_B)$ is equal to

$$\hat{W} = \frac{318(d-1)[(1+d)(\lambda_4 \sigma_B - \lambda_5 \sigma_B^3 d) - \lambda_6 \sigma_B^2 (1+d^2) + \lambda_7 \sigma_B^4 d^2 + \lambda_8 \sigma_B^2 d + \lambda_9]}{\sigma_B d \lambda_0^2} > 0, \tag{20}$$

where λ_i ($i = 1 \ldots 9$) are positive constants and $\lambda_0 > 0$. In this scenario, the welfare difference between the exporting countries depends on their producer surplus and environmental damage differences. The welfare difference is always positive in this scenario, that is,

$$\hat{W} = \left\{ \underset{>0}{(PS_A - PS_B)} + \underset{\leqslant 0}{(\Psi_B - \Psi_A)} \right\} > 0, \tag{21}$$

When pollution is perfectly local and pollution from consumption is ignored, the environmental policy gap ($e_A - e_B$) could be either positive or negative. A high marginal abatement for country *B* compared to *A* makes the environmental policy for *B* stricter than for *A*. When the magnitude of the marginal abatement cost difference is smaller, country *A* has stricter policies than *B*.

From the above scenario, the environmental damage difference between the exporting countries could be either positive or negative: $\varphi(1 - e_B)X_B - \varphi(1 - e_A)X_A$. In this scenario, country *A* always produces more of good *X* than *B*, i.e., $X_A > X_B$. The sign of the damage difference depends on the relative values between e_A and e_B. The damage difference is positive when the environmental standard of country *A* is stricter than the standard of country *B*, that is, $e_A > e_B$, and vice-versa when the difference is negative. Producer surplus of country *A* is always higher than country *B*, whether the environmental standard of *A* is stricter or more relaxed than that of country *B*. Overall, the welfare gap ($W_A - W_B$) is always positive, i.e., country *A* has a higher welfare than *B* when pollution is perfectly local. This is due to the magnitude of the production difference ($X_A - X_B$), the lower

marginal abatement cost for country *A*, and the fact that pollution is perfectly local plays a vital role in the overall welfare gap. Environmental damages caused through production of *X* for both exporters are not affected by the production of their competitors due to pollution being perfectly local. Otherwise, the welfare of the country which produces less is affected more through transboundary pollution. Hence, the welfare of country *A* is always higher than the welfare of country *B* when pollution from production is perfectly local.

Similarly, when pollution is transboundary, i.e., $s = 1$, no matter where the production of good *X* occurs, environmental damages are the same in both countries, and, independently of the *s* value, both exporters have the same consumer surplus given their identical preferences. Now, the welfare gap depends only on the difference in producer surplus. The production difference ($X_A - X_B$) is always positive when pollution is perfectly local but, when pollution is transboundary, it can be either positive or negative. Environmental policy difference between the exporting countries depends on the magnitude of the marginal abatement cost difference. The magnitude of the ($\sigma_A - \sigma_B$) difference decides whether country *A* imposes a stricter or laxer environmental standard than country *B*. When country *A* has a laxer standard, it produces more of good *X* than country *B* and vice versa if *A*'s policy is stricter. When pollution is transboundary, environmental damages are higher for both exporting countries, but the country that produces less of good *X* is effected more in terms of its welfare than its competitor. Hence country *A* has a higher producer surplus, and thus higher welfare than *B* if its production is higher. If the production level of *B* is higher, then the welfare difference, $\hat{W} = (W_A - W_B)$, is negative. So, it can be said that the sign and magnitude of the welfare gap depend on the production difference between the two exporters when pollution is a pure public bad.

1.3.1 Pollution from Production and Consumption

As environmental damages are only taken into account by country *C* in the setting of the tariff, the inclusion of consumption-generated pollution affects the first and the second stages. With the environmental damage function as given in (4) for $i = C$, the optimal tariff that maximizes country *C's* welfare is equal to

$$t_1 = \frac{3}{80}\frac{(2\alpha - \sigma_A\beta e_A - \sigma_B\beta e_B + 24\beta\gamma_C)}{\beta}. \tag{22}$$

Accounting for both pollution at the production stage and pollution at the consumption stage thus amounts to a higher tariff country *C* imposes on exports from *A* and *B*. Given the higher tariff, production falls and consumption increases ($0.3\beta\gamma_C$ and $0.1\beta\gamma_C$) in both exporting countries by the same amounts; exports thus decrease in both countries by $0.4\beta\gamma_C$. As the *t* value goes up, the amount of *X* produced by both exporting countries goes down as

$$X_i = \alpha - \frac{1}{3}\beta t - 2\sigma_i\beta e_i + \sigma_{-i}\beta e_{-i}, \tag{23}$$

By taking the new tariff into consideration, countries *A* and *B* choose their own environmental standards.

1.3.2 Environmental Policy and Welfare Difference (Pollution from Production and Consumption)

Now, after considering pollution from consumption along with production, whether pollution is transboundary or not, the environmental policy difference between the exporting countries depends not only on their marginal abatement costs but also on the marginal damage from consumption of good *X*, i.e., $\gamma_C = f\varphi$. The greater the value of *f* is, the higher the impact it has on their environmental standards. When pollution is perfectly local, the environmental policy difference can be expressed as

$$(e_A^c - e_B^c) = \frac{(2d-2)(\lambda_{10}d\sigma_B^2 + \lambda_{11}\sigma_B^2 f - \lambda_{12}) + (2-2d^2)(\lambda_{13}\sigma_B f - \lambda_{14}\sigma_B)}{\sigma_B d\lambda_0} \gtrless 0, \tag{24}$$

where λ_i (i = 10...14) are positive constants. When only pollution from production is considered, the welfare difference is always positive for $s = 0$. When pollution from consumption is accounted for, given the new higher tariff and new environmental standards, the welfare difference can be either positive or negative when pollution is perfectly local, that is,

$$\hat{W} = \left\{ \underset{\lesseqgtr 0}{(PS_A - PS_B)} + \underset{>0}{(\Psi_B - \Psi_A)} \right\} \lesseqgtr 0. \tag{25}$$

When pollution from consumption is introduced, the optimal tariff *C* imposes on the two exporting countries increases and production thus decreases in each of the two producing countries. As a result, environmental damages from production decreases. The more polluting consumption (the higher γ_C) is, the greater the increase in the tariff is, and therefore the greater the impact on production and the resulting reduction in environmental damages from production are. As the environmental damage of *B* is higher than *A*, the standard of country *A* has to be stricter relative to that of country *B*, i.e., $e^c_A > e^c_B$, when $s = 0$. A unit decrease in production has however a greater impact in terms of reduction in environmental damages in country *B* than in country *A* as the former has a lower standard; in other word, as country *A* abates a larger proportion of each unit of pollution, a unit reduction in production gives rise to a unit reduction in pollution and thus a reduction in unabated pollution equal to $(1 - e_B)$ in country *B* which is greater than the reduction in country *A* equal to $(1 - e_A)$. Hence, the larger γ_C is, the larger the reduction in damages from production in *B* relative to *A*. Clearly, the size of the relative reduction depends on the marginal abatement costs (σ_i) and marginal environmental damage of unabated pollution (φ). Even though reduction in damages should be higher in *B*, its higher marginal abatement cost ($\sigma_B > \sigma_A$) triggers an effect that moves in the opposite direction.

When only pollution from production is considered, the environmental damage difference could be either positive or negative depending on the environmental policies of the exporting countries. With pollution from consumption also accounted for in the environmental damage function, country *A*, which produces more of good *X*, imposes a strict policy compared to *B*. Strict policy helps country *A* to deteriorate the environment less than *B*, even though it produces more.

On the other hand, there is a reduction in producer surplus as the country with the tighter environmental policy incurs larger savings in abatement costs from each unit reduction in production and, overall, a smaller loss in producer surplus. Even though country *A* should have a smaller loss in producer surplus due to its tighter environmental policy, its lower marginal abatement cost ($\sigma_A < \sigma_B$) implies that country *B* might incur larger savings in abatement costs from each unit reduction in production. The end results depends on which effect dominates, that is, the

environmental policy difference or the marginal abatement costs difference. The producer surplus difference also depends on the γ_C value. The larger the marginal damage from consumption is, the greater the magnitude of the production difference ($X_A - X_B$), becomes. A higher production difference makes the producer surplus difference positive, and welfare of *A* thus becomes higher than that of *B*. If pollution from consumption is not that deteriorating, i.e., low γ_C, the production difference is still positive, but the magnitude is smaller. In this case, the producer surplus of *B* is higher than that of *A* and outweighs the damage difference, making the welfare gap negative. So, after introducing pollution from consumption in the damage function, country *A*'s welfare can be lower than *B*'s when pollution from production is perfectly local.

When pollution is transboundary, the welfare difference can be either positive or negative as in the case when only pollution from production is considered, but the magnitudes of the welfare gap differ. As pollution is a pure public bad, the sign and magnitude of the welfare gap depends only on the producer surplus difference like before. The magnitude of the marginal abatement cost difference determines whether country *A* imposes a stricter or laxer environmental standard than country *B*. Along with their respective environmental policies, the two exporting countries are face a higher tariff (t_1) imposed by *C* when pollution from consumption is considered. The new production function for *A* and *B* becomes

$$X_i = \alpha - \frac{1}{3}\beta t_1 - 2\sigma_i \beta e_i^c + \sigma_{-i}\beta e_{-i}^c. \tag{26}$$

Due to the higher tariff, production decreases in each of the two producing countries, and their production difference determines whether the welfare gap is positive or negative. Like before when only pollution from production is considered, if country *A* has a laxer standard than *B*, i.e., $e^c_B > e^c_A$, it produces more of good *X* than *B*, and vice versa when *A*'s policy is stricter. As pollution from consumption is considered and pollution from production is transboundary, environmental damages increase for both *A* and *B*. In this scenario, when pollution from both production and consumption is considered, the magnitude of the welfare gap becomes larger, whether positive or negative, than the gap when only pollution from production is considered. The country that produces less of good *X* is effected more in terms of its welfare than its competitor like before, but the effect is larger here because the magnitude of the production difference is larger. Adding pollution from consumption changes the environmental policies for both exporting countries in

such a way that it widens the production difference gap. The country that produces more of good *X* has higher welfare than its competitor. Hence, the difference between the two scenarios is the magnitude of the welfare gap once pollution from consumption is introduced.

When the welfare change within the two exporting countries, i.e., ($W_A - W^c_A$) or ($W_B - W^c_B$), is compared, it can be seen that both exporting countries generally experience a decrease in welfare due to an increase in the tariff. As the value of *f* increases, both *A* and *B* pay a higher tariff to *C* and the impact on the production of good *X* is greater. Hence, the magnitude of the loss in producer surplus outweighs the reduction in environmental damages from lower production resulting in a lower welfare for both exporting countries. If pollution from consumption is more deteriorating, the magnitude of the welfare gap within each exporting country becomes larger. Similarly, if the value of *f* approaches zero, both exporting countries do not pay that much extra tariff relative to the scenario when consumption is more polluting and as a result, the welfare gap shrinks.

1.3.3 Welfare Analysis of Country C

When pollution from production is only considered, country *C*'s welfare is the sum of its producer surplus and tariff revenue as shown in equation (15). Its welfare is positively related to tariff (*t*) but negatively related to the environmental policies (e_i) and marginal abatement costs (σ_i) of the exporting countries. When pollution from consumption is considered, then the tariff imposed by *C* increases to t_1. Hence, the new tariff increases by $0.9\gamma_C$. The more deteriorating pollution from consumption, i.e., the higher $\gamma_C = f\varphi$ is, the greater the increase in the tariff imposed by *C*. The new tariff results in lower production and each country's exports are thus reduced by $0.4\beta\gamma_C$; ovrerall, exports to country *C* are reduced by $0.8\beta\gamma_C$ or $0.8\gamma_C$ as $\beta = 1$. Hence, there is a reduction in consumer surplus as the price level goes up in *C* according to equation (3). The new tariff revenue is higher as the increase in tariff is greater than the reduction in imports ($0.9\gamma_C > 0.8\gamma_C$). Welfare of *C* is lower than before if the reduction in consumer surplus less environmental damages is more than the increase in tariff revenues. The new welfare of *C* can be written as

$$\begin{aligned} W_C &\equiv CS_C + TR - \gamma_C D_C \\ &= \frac{1}{162}\frac{(6\alpha - 8\beta t_1 - 3\sigma_A\beta e^c_A - 3\sigma_B\beta e^c_B)\,(6\alpha + 10\beta t_1 - 3\sigma_A\beta e^c_A - 3\sigma_B\beta e^c_B)}{\beta} - \gamma_C D_C. \end{aligned} \quad (27)$$

When pollution from consumption is considered, country *C* imposes a new tariff (t_1) and both the exporting countries choose new environmental standards (e^c_i) as shown in the above expression. The effect on the welfare of *C* is negative if the new environmental standards of *A* and *B* become stricter than when only pollution from production is considered, whereas a higher tariff increases *C*'s welfare. On the other hand, if the exporting countries choose laxer standards than before, the first part of the equation, ($CS_C + TR$) has a higher value compared to the old welfare of *C*, but pollution from consumption ($\gamma_C D_C$) has a negative effect on the welfare. If the environmental damage is greater than the increase in consumer surplus plus tariff revenue, welfare decreases overall. The new welfare of *C* is higher only when both *A* and *B* have laxer standards and the new tariff is high enough to outweigh the negative effect of the environmental damage caused through consumption. Appendix A has summary tables and equations for both $s = 0$ and $s = 1$.

1.4 Conclusion

In this paper, the welfare implications of capturing consumption-generated pollution associated with a consumer product are assessed in a simple oligopoly model of international trade involving two exporters and one importer. Although accounting for emissions at the consumption stage is likely to yield most interesting results in the context of a more complex model in which location-related decisions are contemplated, including the decisions of whether to have uniform or discriminatory tariffs, export or to do FDI, as a first step, the focus of this paper is on how the welfare gap between the two exporters, which differ in their exogenously determined marginal abatement costs, changes when consumption-generated pollution is included in the analysis and production-generated pollution is either perfectly local or a pure public bad.

As preferences in the three countries are identical, any welfare gap between the two exporting countries results from differences in producer surplus and, when pollution is perfectly local, from differences in environmental damages and producer surplus. When production-generated pollution is a pure public bad, each country faces the same environmental damages independently of its production level and resulting pollution. When consumption-generated pollution is included into the framework, both exporting countries generally experience a decrease in welfare due to an

increase in the tariff imposed by the importing country (*C*) because of the additional environmental cost of consumption. Consumer surplus and environmental damages are also affected in each of the two exporting countries, but the effect is identical with respect to the former because of identical preferences and with respect to the latter because of the pure public good nature of pollution.

If pollution is however perfectly local, the inclusion of consumption-generated pollution yields a tariff increase which raises the price level and reduces the production level in the two exporting countries, ultimately triggering two effects on the welfare gap. On one hand, there is a reduction in producer surplus. On the other hand, there is a decrease in environmental damages. The overall effect on the welfare gap depends on which of the differential effects (the producer surplus or the environmental damage) dominates. Consumer surplus is also affected through the price increase but, given the identical nature of the preferences, the effect is the same in the two exporting countries and the welfare gap is thus unaffected by a decrease in consumer surplus. Two key parameters that condition the direction of the change in the welfare gap are the marginal abatement cost (σ_i), which determines the size of savings in abatement costs from a production decrease, and the marginal environmental damage of unabated pollution (φ), which determines the size of foregone environmental damages from a pollution decrease through a production decrease. The magnitude of the welfare gap change depends on the gap in environmental standards ($e_A - e_B$), the marginal effect of a price change on local consumption (β), and the marginal environmental damage of consumption-generated pollution in country *C* (γ_C). The more consumers adjust to a price change (higher β) and/or the more damaging consumption-generated pollution in country *C* is (higher γ_C), the larger the decrease in production that countries *A* and *B* experience relative to a situation in which pollution generated as a by-product of consumption is ignored, and the larger the resulting welfare gap change thus is. Furthermore, the less different countries *A* and *B* are with respect to their environmental policies (lower gap in environmental standards), the smaller the differential effects on producer surplus and environmental damages are and the smaller the resulting welfare gap change is.

The model employed in this paper can be modified or extended to examine the relevance of life-cycle environmental assessment of a traded consumer product in the choice of whether to adopt

uniform versus discriminatory tariffs, chosen as to maximize a country's welfare, or in the choice of whether to export dirty goods or engage in FDI. In this paper, there is a cost asymmetry between the two producers of *X* due to a difference in marginal abatement costs. Country *A* is a low-cost exporter whereas country *B* is the high-cost exporter. Instead of imposing a uniform tariff, the importing country can opt for discriminatory tariffs, thus taking into account the cost asymmetry between its two trading partners. Being able to discriminate, country *C* can extract more rents from the country that enjoys higher mark-ups and can thus increase its welfare by imposing a higher tariff on the low-cost exporter. The larger the cost differential between countries *A* and *B*, the greater the degree of tariff discrimination by country *C* is. Hence, tariff discrimination is likely to yield a higher tariff for country *A* but a lower tariff for country *B* relative to MFN. While tariff discrimination may be more environmentally sound, MFN is found to dominate from a world's welfare perspective in Saggi and Yildiz (2005) in the context of a model involving two exporters and one importer in which, however, the environmental impact of production and/or consumption is ignored; in fact, in the presence of cost asymmetries between the two exporters, the welfare gain by the importer through tariff discrimination does not outweigh the welfare loss by the two exporters. Given the welfare implications of accounting for consumption-generated pollution derived in this paper, the comparative analysis of tariff discrimination and MFN from a world's perspective may yield varied results in terms of the desirability of uniform versus discriminatory tariffs.

Hence, the model would consist of four stages: in stage one, each of the two exporters would choose its own environmental policy as to maximize its welfare; in stage two, the importer country would choose tariffs (MFN or discriminatory) to impose on its two trading partners as to maximize its welfare; in stage three, firms within each exporting country would determine how much to produce for both the local market and the foreign market given the local environmental policy and the tariff imposed by the importing country; in stage four, international trade and consumption would take place. Within the modified setup, a number of interesting questions could be addressed about (1) the impact of consumption-generated pollution on environmental policy, (2) the environmental and welfare implications of differences in marginal environmental damage from consumption-generated pollution between developed and developing countries (e.g., the latter can reasonably be assumed to have less environmentally friendly means of disposing of waste which

is generated at the consumption stage and thus to face a higher marginal environmental damage), and (3) the desirability of uniform versus discriminatory tariffs from an international perspective based on environmental considerations alone or welfare considerations.

For the last 15 to 20 years, global FDI has increased considerably, especially to developing countries. FDI has potential benefits for both the host and the donor countries. Host countries may benefit from new technologies, management skills, and employment opportunities; donor countries may benefit from cheaper factors of production and more lax environmental policies. Given its impact on tariffs and environmental policies (when they are endogenously determined), the inclusion of consumption-generated pollution is likely to affect a country's (*A*'s or *B*'s) decision of whether to export to country *C* or engage in FDI as well as country *C*'s decision of whether to facilitate export or FDI. The extent of the impact on tariffs relative to the impact on environmental standards is then likely to be a key element in the two decisions. The model could thus be simplified to two countries (e.g., country *A*, the potential FDI donor country, and country *C*, the potential FDI host country) but expanded to allow for country *A* to determine whether to export or do FDI and for country *C* to determine whether to manipulate its tariff to facilitate FDI both when only pollution at the production stage is accounted for and when life-cycle environmental effects are considered.

Chapter 2

The Effects of Family Planning Interventions on Women's Empowerment: Evidence from Rural Bangladesh

2.1 Introduction

The term empowerment, especially with reference to women, has become popular in the development field since the mid-1980s. The concept of women's empowerment is the result of important criticism generated by the women's movement, particularly by a newer feminist movement which started in the 1960s and focused on advocating equal economic, social, and political rights for women. In general, compared to developed economies, more women in developing economies lack control over resources and the self-confidence and opportunity to participate in decision making processes. Especially in South Asia, and particularly in rural Bangladesh, women's empowerment requires challenging patriarchal power relations that result in women having less control over material assets and intellectual resources.

Women's control of the use of contraceptives to reduce fertility may be a precondition for shifts in patriarchal social systems (Malhotra, 2012). If women control contraception, they control a vital aspect of their lives and, thus, they may gain the ability to redefine family structures and patriarchal institutions (Dixon-Mueller and Germain, 1994; Germain, 1987). Many researchers argue that low fertility levels, along with other social changes such as delayed marriage, can dramatically change women's lives. Such developments can weaken the patriarchal systems by reducing the centrality of marriage, motherhood, and domestic roles in women's lives (Davis and Pietronella, 1982; Davis, 1984). An effective fertility program might reduce the responsibility for additional children,

thereby increasing the free time available to a mother. Hence, the extra time could be used either for employment, home production, or a combination of both, and their bargaining power will increase within the household (Schultz, 2009).

It is often argued that women's empowerment is best pursued at the local level, through grassroots participatory methods. While much attention has focused on transforming gender relations in the public sphere, changes in the domestic/household sphere have been less than fully addressed in both theoretical and empirical studies. There have been many attempts to measure women's empowerment in the development field, but many of these have suffered from various shortcomings, including lack of disaggregated data, limited information on household dynamics, and, most importantly, the lack of a properly well-defined control and treatment groups. Studies from countries such as Egypt, Thailand, and Taiwan show that there is a positive correlation between fertility declines and women's empowerment in terms of increased education, credit, and employment (Amin and Lloyd, 2002; Hardee et al., 2004; Schuler et al., 1995). In the family planning literature there is scarce evidence about the causal impact of fertility declines on gender inequality and gender relations (Malhotra, 2012; Lee-Rife et al., 2010).

This paper aims to contribute to the literature of women's empowerment by focusing on a developing country (Bangladesh) in South Asia. We employ data from the Matlab Health and Socioeconomic Survey (MHSS) to study the effects on women's empowerment of an intensively designed outreach family planning program that was implemented in half of the 141 villages of rural Matlab, Bangladesh, from 1977 to 1996. The population at the time of the study consisted of 180,000 individuals who were divided into two groups of equal size, i.e., the "comparison/control" group and the "treatment/program" group. In the treatment area, 80 trained female workers who visited all women once every two weeks to provide married women with information regarding different kinds of contraceptives and their side-effects.

Matlab provides an appropriate focus for our study for several reasons. First, and from an empirical viewpoint, fertility declines have continued for long enough that we have the opportunity of examining its influence on aspects of women's lives, gender inequality, and gender relations where change may take some time to manifest. The program was in place for a long term (20 years)

before the Matlab Health and Socioeconomic Survey (MHSS) was conducted. Two years after the implementation of the program (i.e., during 1978/79), Phillips et al. (1982) found from the birth registration data (DSS) that women in the program villages (age between 15 and 49) reported 25 percent lower fertility rates than in the comparison villages.

The vast dataset we employ in this paper allows us to explore the idea of interactions between men and women in the domestic sphere, which bring about transformations in gender relations; the day-to-day negotiations and struggles around the domestic division of labor between women and men are in fact part of a wider social process that involves slow transformative changes in consciousness and practice.

Joshi and Schultz (2007) used the same Matlab MHSS data and found out that the family planning program is associated with improvements in: women's health, their economic productivity outside of their household, and their household assets. Child mortality before the age of five is five percentage points lower among women who reside in the treatment villages. The use of six preventive health inputs is observed to be more widespread in the program areas. Similar results with respect to lower child mortality and greater use of preventative health inputs were also found by Joshi and Schultz (2013). Schultz (2009) looked at wage productivity of adult women; physical household assets owned by women; and similar child and maternal health related indicators as reported by Joshi and Schultz (2007 and 2013). Results indicate that the wage productivity of adult women is enhanced in the program area and households in the program villages report to hold a larger share of their assets in financial savings, jewelry, and consumer durables. However Joshi and Schultz didn't explore the potential effect of the program on women's empowerment, which is the focus of our paper.

In this paper, we use a weighted linear probability estimation procedure on two broad empowerment categories: socio-economic and socio-cultural dimensions to estimate the impact of the Matlab family planning program on women's empowerment, using information on age, education, religion, vicinity of secondary school, and household head, among other variables. We analyze the heterogeneity of the effect by considering age, religion, and education.

Our findings suggest that, compared to the control area, there have been major improvements in some of the variables that belong to the socio-economic category for women in the treatment area. In terms of being involved in major domestic decisions, buying small and large household items with their own money, and participating in group actions, results suggest that women in the treatment area are significantly better off compared to women in the control area.

We also look at whether the effect of the Matlab family planning program differs between: younger and older women; Muslim and Hindu women; more educated and less educated women in the treatment area. Younger women in the treatment area are more likely to own productive assets and buy sarees (traditional Bengali dress) and daily groceries with their own money, whereas older women are more likely to be involved in major household decisions. In the treatment area, Muslim women are less likely to own productive assets compared to Hindus women, whereas, with respect to major household decisions, Muslim women are more likely to be involved before buying or selling land.

We structure the remainder of the paper as follows: in section 2, a literature review on fertility programs and the link to women empowerment is presented; in section 3, we review the background of the Matlab program; in section 4, we describe the data; in section 5, we present the empirical strategy; in section 6, we summarize the results followed by a discussion; finally, in section 7, we provide concluding remarks.

2.2 Literature Review

This section discusses fertility related programs and their estimated results around the world and explores other factors that are believed to help women reach a higher level of autonomy other than their reproductive choice.

Research from sub-Saharan African countries reveals that fewer children are associated with many women empowerment dimensions and gender related factors (Upadhyay 2010). Another paper by Do and Kurimoto (2012) uses data from the latest round of Demographic and Health Surveys

(DHS) conducted between 2006 and 2008 in Ghana, Namibia, Uganda, and Zambia. Use of contraceptives by both partners or just by the female is analyzed against six dimensions of women empowerment for both married and cohabiting women between the age of 15 and 49 years. Findings suggest that there is a positive relationship between contraceptive use, i.e., lower fertility, and the overall empowerment score. Previous studies also suggest that higher autonomy is associated with lower fertility (Balk, 1994; Dyson and Moore, 1983; Hindin, 2000). According to Wu et al. (2012), reduced fertility levels in China are connected with women spending less time doing household work and being happier with their status in the family.

This paper also relates to a number of studies about the relationship between fertility declines and women's welfare in Bangladesh. Cleland et al. (1994) show that the link between women's domestic decision making and the use of contraception is strong. Another study by Phillips and Hossain (1998) uses longitudinal panel data on rural women who received women's family planning services at home and finds improvement in their status. Amin and Lloyd (2002) find a rise in the level of education for women with low fertility. Many research findings indicate that the level of education is considered to be an important factor contributing towards women's autonomy. A paper by Field and Ambrus (2008) which uses data from rural Bangladesh finds that, due to social and financial pressure to marry young, women attain less schooling. Results suggest that each additional year of marriage delay is associated with 0.22 additional years of schooling and 5.6 percent higher literacy among females. Breierova and Duflo (2004) study the role of parental education on fertility, child mortality, and human capital in Indonesia where a proper experimental setup was used to see the effect of the program. Results indicate that, along with an increase in higher income, higher female education leads to fewer early births and lower child mortality. According to their findings, girls' education creates a ripple effect of opportunity that influences generations to come, thus enabling gender equality elsewhere in society.

Other studies of empowerment in other South Asian countries also argue that education plays a vital role in enhancing women's empowerment. Malhotra and Mather (1997) use data from Sri Lanka and find a positive relationship between education and women's decision making in financial household matters. Other factors, such as female leadership, are considered by Duflo et al. (2011), where a randomized natural experiment in India investigates the effect of female

leadership on adolescent girls' career aspirations and educational attainment. Their results indicate that villages with quotas on female leadership inspire adolescent girls in their career ambitions and educational attainment. Compared to villages where a reservation for women was never in place, the gender gap in aspirations closed by 25% in parents and 32% in adolescents in villages assigned to a female leader for two election cycles. Duflo and Topalova (2004) show that villagers in India are less likely to pay bribes in villages reserved for women, hence corruption diminishes. Therefore, giving authority to women may also bring development along with empowerment.

Although empowerment is a multi-dimensional concept, household decision-making is a powerful indicator of the internal dynamics of sexual stratification within the household. Hence, a woman's access to financial and household resources is an indicator of status as suggested by previous studies (Stromquist, 1995; Jejeebhoy, 1995; Hashemi et al., 1996; Sen, 1999; Kishor, 2000a; Hindin, 2000). Acharya and Bennett (1983) use survey data from Nepal and find that women's participation in employment is positively associated with increased decision making power within the household. For example, in a recent study by Benhassine et al. (2011), very small cash was distributed to both genders in Morocco in a random manner. They found that money was spent differently when the recipient was a woman; in particular, the donation had a larger effect on education of young children, and especially girls. As summarized by Duflo (2012), "Increasing women's control over resources, even in the short run, will improve their say within the household, which will not only increase their welfare, but as research seems to have shown repeatedly, child nutrition and health as well." A recent paper by Upadhyay et al (2014) conducts a literature review on 60 studies exploring the relationship between women's empowerment and several fertility-related topics. Among the papers chosen, 58% were conducted in South Asia. Overall, the vast majority of studies found some positive association between women's empowerment and lower fertility. However, the estimated relationships cannot be considered causal, so we don't know whether lower fertility fosters empowerment or it is a third factor that drives both fertility and empowerment.

One of the few randomized experiments was conducted in the city of Taichung in Taiwan during 1963-1966 (Freedman and Takeshita, 1969; Chandrasekaran and Hermalin, 1976; United Nations, 1985); however, in Taichung city, those women who decided to use family planning were self-

selected and, with respect to the average population, they may differ in unobserved way. Hence, the difference in fertility is not an adequate estimate of the program's effect, and there may be factors other than the program which could explain the earlier decline in fertility in Taichung city (Freedman and Takeshita, 1969, p. 307-308). Even though randomization was not used in the Matlab study, there is a trade-off between the intensive program in Matlab (across fewer larger contiguous clusters of communities) and a randomized program such as the one in Taichung city (across small communities). In the case of Taichung city, the program effect will be understated if it is scaled up to a regional or national level due to the spillover effect into neighboring control areas, whereas, in the case of Matlab, assigning treatment and control communities contiguously reduces the number of distinct areas available for evaluation, and administering the project is easier and more cost effective.

The vast dataset provided by the Matlab MHSS survey allows researchers to investigate different socioeconomic topics. By using this data, we want to investigate the additional spillovers of the program facilitated fertility decline, i.e., especially with respect to empowering women. On top of the economic dimension, this paper looks at the socio-cultural dimension and the participation of women in decision making processes in the household, as, especially in South Asia, women's empowerment requires challenging patriarchal power relations that result in women having less control over material assets and intellectual resources.

2.3 Background

Matlab is one of the nine field research stations of the International Center for Diarrhoeal Disease Research, Bangladesh (ICDDR, B), located about 60 km south-east of Dhaka, Bangladesh. The region is always prone to flooding due to being situated in a deltaic plain. Poverty is persistent in the region which results in poor infrastructure development and high mortality. Like any other South Asian village, Matlab is traditional and religiously conservative: the majority of its population is Muslim and only 10 percent of the population is Hindu. ICDDRB kept a 120 bed hospital in Matlab, which was open to all, and provided free treatment of diarrheal disease, maternal services, and child health care.

The objective of the Matlab family planning program was to test whether cost efficient contraceptive services could stimulate a demographic change in rural Matlab (Phillips et al., 1982). The population at the time of the study consisted of 180,000 people who were divided into two groups of equal size. The villages were divided into 6 blocks (A, B, C, D, E, and F). The "comparison/controlled" group belongs to blocks E and F, whereas the "treatment/program" group belongs to blocks A to D which were adjacent to one another to avoid spillover effects of the program to the controlled group. The treatment villages received special family planning services from ICDDRB, whereas the residents of the control villages only received regular family planning services provided by the government. Both control and treatment areas were also subjected to other kinds of services by ICDDRB, such as the 120 bed hospital, but the effect of that is netted out when we compare the effect of the specialized family planning program in the treatment and control villages.

Following the implementation of the program, the total fertility rate went down from more than 6 to 3.2 children per women in the treatment area between 1976 and 1995 (ICDDR, B, 2004; Fauveau, 1994). According to Hossain et al. (1994), since the inception of the program the total fertility rate in the treatment area went down from more than 6 to 2.9 between 1976 and 1993, whereas, for the same period, total fertility rate in the comparison area went down to 3.9 children, suggesting that the program was effective in reducing the fertility rate. According to Schultz (2009), surviving fertility was 16 percent lower in program areas than in comparison villages in 1996.

In terms of differences in service between the treatment group and the control group, the ICDDRB family planning program had 80 trained female workers. According to my personal conversations with a scholar who was involved in the survey work at RAND, these trained female workers visited all women regardless of their age in the treatment area (70 of the 141 regionally-clustered villages included in the Demographic Surveillance System (DSS) of the Matlab district). They visited women in the treatment area once every two weeks (Aziz and Mosley, 1994; Schultz, 2009). These outreach female workers belonged to reputable families within the area and were also respected amongst the women. During their bi-weekly visits, they provided married women with information regarding different kinds of contraceptives and their side-effects; aside from this information, they also supplied non-clinical methods such as pills, condoms, foam tablets, and oversee

depomedroxyprogesterone acetate (DMPA) injections. The bi-weekly visits allowed for individual follow ups to motivate women to use contraceptives continuously unless they wished to have a child and to deal with any kind of side effect they were facing. Regular home visits were key to the success of the program as, due to cultural norms, physical mobility of women was restricted, particularly in the villages. Hence, access to information and delivery of information and contraceptives at their doorstep effectively reduced the cost of contraceptives women in the treatment area faced. In addition, there were four clinics in the treatment area to enhance the services ICDDRB provided to women. In contrast, married women in the other 71 villages (control area) surveyed in 1996 had access to regular government services provided by community clinics for free but they required a woman to come to the clinic to obtain information and supplies (Phillips et al., 1982), resulting in an inconvenience in terms of travel arrangements and time, which in turn increased the cost of getting contraceptives.

2.4 Data

In 1996, a major family and community survey entitled the Matlab Health and Socio Economic Survey (MHSS) was carried out. This survey was a collaborative effort of RAND, the Harvard School of Public Health, the University of Pennsylvania, the University of Colorado at Boulder, Brown University, Mitra and Associates, and ICDDR, B.

The survey we employ in this paper consists of household and individual level information on 4,364 households clustered in 2,687 baris. This is approximately one-third random sample of the total number of baris in the surveillance area. The bari refers to a compound in rural Bangladesh, which usually consists of a cluster of households in close physical proximity linked in many instances in a kin network. Within each bari, in gathering the data, up to two households were selected for detailed interviews; within households, individuals were selected for interview. The first household pick was referred to as the primary household and, for baris with exactly two households, the second household was automatically chosen. For baris with more than two households, the second household was selected from the bari in order of preference as follows: (i) the household of the father and/or mother of the head of the first sampled household; (ii) a

household containing a son of the head of the first sampled household and, if there was more than one household in the bari containing a son, one was picked at random; (iii) a household containing a brother of the head of the first sampled household and, if there was more than one household in the bari containing a brother, one was picked at random; (iv) if none of the above three categories of households applied, a household was selected at random from the bari. Due to the complexity and multi-stage nature of sampling, in extrapolating from sample statistics to population parameters, we use household and individual analytic weights, whenever appropriate.

In total, four surveys were conducted of which we use the main survey in this paper which consists of household and individual level information on 4,364 households clustered in 2,687 baris (residential compounds).

According to previous literature on empowerment (summarized in section 2.2 and Appendix B), women's empowerment comprises several interdependent components: women's access to and control over their own income, savings, and other household's economic resources; whether they have the decision making authority or have a say in their family ranging from small to major decisions; how close they are to their spouses emotionally and whether they are free from physical and psychological abuse; the extent to which they exhibit their legal rights and enjoy their freedom of physical mobility. In this paper, to investigate the above components, we divide them into two categories: (a) socio-economic and (b) socio-cultural, as explained in Table 1.

For the socio-economic dimension, we consider several questions: whether a woman has the ability to use her own money for small purchases (e.g., oil/spices, glass bangles, and ice-cream) as well as for large purchases (betel leaf/nut, sarees, which is the traditional Bengali dress, and daily bazaar or grocery); whether a woman owns productive assets (e.g., sewing machine, cattle) and has cash savings that give her financial stability and independence; whether a woman participates in domestic decisions; whether she needs permission from her husband or another family member before buying small household items; whether she is involved in major family decisions (e.g., building a new house, purchasing goats/cows, and leasing/buying/selling land); whether they have been victims of physical abuse in their lifetime, and whether their parents choose their husbands. For the socio-cultural dimension, the following were considered: a woman's freedom of movement

in and out of the villages without any male presence, i.e., mobility can range from visiting the hospital and cinema, buying daily groceries, and visiting other women in different households (bari) within the same village to travelling outside the village alone; whether women in the villages participate in group actions and raise their voices for proper wages and right prices and against wife beating, divorce, and misuse of relief money and goods; whether women are prevented from visiting their parents either by their husbands or their in-laws.

In Table 2, we report the responses from the household survey questions for the two categories mentioned above. The first two columns reports the treatment/program and the control/comparison proportions for all the dependent variables. The third column reports the difference between means and whether the two means are statistically different. The results indicate that they are all statistically significantly different.

In terms of the socio-economic dimension, women in the program area are better off than those in the control area: they are more likely to own productive assets (15.29% in the program area versus 12.57% in the control area) and more likely to have cash savings and purchase small and large household items with their own money. Whereas, women in the control area are about five percentage points less likely to seek permission before buying small household items. The number of respondents for both groups, reported in parentheses for each question, is relatively similar. Women in the program area are about three percentage points less likely compared to the comparison area to have their husbands chosen by the parents. In terms of major family decisions such as building a new house, buying a goat, and leasing or buying land, women in the program area tend to be more involved. For example, ten percentage points more women in the program area are involved in the decision of buying a goat, whereas the difference between the two groups is approximately five percentage points when it comes to the decision of building a new house or the decision of buying, selling, or leasing a piece of land. Whereas more women in the program area seek permission before buying all types of small household items and regarding domestic violence, one percent more women in the treatment area report having suffered from physical abuse in their lifetime compared to the control area.

With respect to the socio-cultural category, higher proportions of women from the control area visit other neighboring women and travel outside their villages alone, whereas women in the program area are more mobile within the perimeter of their villages, that is, going to the hospital, cinema, and for daily grocery. More women in the treatment area participate in raising awareness against husbands who beat their wives or divorce them for the wrong reason, also partake in group actions ensuring workers receive proper wages and raise their voice against misuse of relief money and goods by corrupt authorities.

Overall, the statistics in Table 2 suggest that women in the program/treatment area are more financially stable, more involved in major decisions within the household, more mobile within the village engaging in daily activities on their own, and participate more in group actions against social injustice. On the other hand, more women in the comparison area can travel outside their villages on their own.

2.5 Empirical Methodology

2.5.1 Characteristics prior to program intervention

Before using the survey data, we need to find out whether the program area and the comparison area are similar in characteristics associated with fertility and other relevant dimensions before implementation of the program in 1977. Often during experiments individuals or samples are screened for participation in programs by using certain characteristics they have and thus creating selection bias and a poor comparison group. In the absence of common characteristics between the groups prior to 1977, it will be impossible to find out the real treatment effect when evaluating the spillover effect of family planning and health policies on women's empowerment.

Joshi and Schultz (2007) compare the number of live births of married women who, in 1996, reside in the program and comparison areas. Their results show that "fertility among women over the age of 55 in 1996 appears indistinguishable between the treatment and comparison villages, consistent with the hypothesis that the fertility of these older women was not substantially affected by the

program, probably because they were age 38 or older when the program started and thus had by then virtually completed their childbearing." Hence, before the program started, fertility was quite similar among all women in the 141 villages. Migration between villages or from outside of Matlab can make things complicated when evaluating the impact of the family planning program. Migration occurs when a woman gets married; in the rural area, it is very common for a woman to get married outside of their village of birth. The MHSS provides data on a woman's children, including those who have migrated and when they left. The migration rate by date of birth and gender of their children do not indicate significant differences between program and comparison villages.

Also, for other characteristics, Joshi and Schultz (2007) make use of the first Census of Matlab which was conducted in 1974. The Census did not collect comprehensive information on income, wealth, or other variables that would help us comment on differences in economic conditions between the two areas but did record information on several other dimensions such as education, housing quality, and religion. In Table 3, we include the partial Census data as reported by Joshi and Schultz (2007). Based on this information, there are insignificant differences between program and comparison villages. Before the program was introduced in the Matlab area, the entire population of the area was divided into two groups of equal size with treatment villages adjacent to one another to avoid spillover effects of the program to the control areas, and, during the survey, all households were randomly chosen from the surveillance area.

2.5.2 Main Analysis

To measure women's empowerment, we introduce the following dependent variables:

1) Socio-Economic Dimension

(i) Own productive assets; (ii) Purchase of small household's items (e.g., oil/spices, glass bangles, and ice-cream) with own money; (iii) Cash savings; (iv) Purchase of large household's items (e.g., betel leaf/nut, sarees, and daily bazaar) with own money; (v) Permission to purchase small households items such as oil/spices, glass bangles, and ice-cream); (vi) Whether involved in major

decisions such as building a new house, purchasing a goat or a cow, and leasing/buying/selling land.

It can be argued that the purchase of household items with their own money should not be considered an indicator of women's empowerment. In some cultures, it is the men who are responsible for this, and a woman using her own money for household goods can actually be argued to be less empowered. In rural Bangladesh, the men are also responsible for taking care of their households' needs, but a woman's buying household items with their own money shows that she is financially independent and most likely to have a say in other household decisions. Also betel leaf and betel nut are considered to be large household items in rural Bangladesh as they are expensive and consumed together by adults within the household daily.

2) Socio-Cultural Dimension

Whether women can travel alone to: (i) Hut/bazaar, (ii) Hospital/clinic, (iii) Cinema, (iv) Visit other women, and (v) Visit outside the village. Whether women participated in group actions: (i) Protesting/stopping a man from beating his wife, (ii) Protesting/stopping a man from abandoning/divorcing his wife, (iii) For proper wages, (iv) Ensuring payment of proper wages for worked performed, and (v) Protesting against misuse of relief. Finally, (i) Whether they are victims of physical abuse, and (ii) Whether parents choose husband.

For each of the dichotomous situations/variables listed above, we employ a weighted probit estimation procedure to estimate the impact of the Matlab family planning program for the various aspects of women's empowerment, controlling for: religion, age, education (number of schooling years), individual and household controls, and village controls such as vicinity of secondary school, nearby financial institutions, village accessible by engine boat, km to hospital, village having pucca (paved) road and household head. We use a parsimonious approach with three main specifications: (i) the first one includes religion and age, i.e., the pre-determined variables; (ii) the second specification adds other household and individual variables; and (iii) the third adds all the village controls.

$$Y_i = \beta_0 + \beta_1 Treat + \beta_2 Muslim + \beta_3 Age + \varepsilon_i, \qquad (28)$$

$$Y_i = \beta_0 + \beta_1 Treat + \beta_2 Muslim + \beta_3 Education + \beta_4 Unmarried\ Female\ Head + \beta_5 Married\ Female\ Head + \beta_6 Husband\ Absent\ NH + \varepsilon_i, \quad (29)$$

and

$$Y_i = \beta_0 + \beta_1 Treat + \beta_2 Muslim + \beta_3 Education + \beta_4 Unmarried\ Female\ Head + \beta_5 Married\ Female\ Head + \beta_6 Husband\ Absent\ NH + \beta_7 Secondary\ School\ Nearby + \beta_8 Finance\ Institution + \beta_9 Engine\ Boat + \beta_{10} Km\ to\ Hospital + \beta_{11} Pucca\ Road + \varepsilon_i, \quad (30)$$

where $Y_i \in \{0,1\}$ represents the dependent variables used to measure women empowerment, β_0 is the coefficient for the constant term, $\beta_i \in [1, (3 \text{ or } 6 \text{ or } 11)]$ are the coefficients of all the explanatory variables used in the baseline model, either quantitative or qualitative with no controls, household controls, and with village controls, respectively. *Treat* is a dummy variable that represents whether the individual belongs to the treatment area or not. *Muslim* equals one if the individual is Muslim, and zero otherwise (Hindu). The variable *Age* represents the age of the individual. Education is usually positively associated with women's income, assets, and cash savings, and we thus include years of schooling (*Education*) as a control variable. There are two instances in which a woman might be the head of the household. Accordingly, Joshi (2004) identifies two types of women and refers to them as: widows who are unmarried and also the household head, and married women whose husbands are not residing in the same bari (housing compound) as they are migrant workers or businessmen who live outside the village (e.g., in the city or other countries). Hence, we use the indicators *Unmarried Female Head* and *Married Female Head* to denote the two types. In terms of differences based on descriptive statistics, married women and their family members are better off financially compared to widows, as their husbands send money back from the city or remittances if they are working in a foreign country. Another instance in which the husband is not the head of the household is when he is absent; in this particular situation, the family head could be the in-laws or another member who resides in the same bari; we denote this type of women with the indicator *Husband Absent NH.* Women's education before the program started was similar between the treatment group and the comparison group (Table 3).

Finally, we use five infrastructure features of the 141 villages in the 1996 MHSS as controls, which could influence the economic, health, and environmental conditions of families in the village. We control for whether there is a secondary school either in the same village or in a neighboring village through the inclusion of the indicator *Secondary School Nearby*. For the presence of any kind of financial institutions or NGO, we use *Financial Institution*. We include the indicator *Engine Boat* to see whether the villages are accessible by boat. *Km to Hospital* indicates the distance between the village and a hospital where contraceptives are believed to be provided by regular government programs, and, finally, *Pucca Road* indicates the presence of a paved road in the village. It is very important to take into consideration that, across individuals, the error term (ε_i) may not be independent because women from the same village or from the same bari (housing compound) may be subject to specific common shocks compared to others in a different village/bari. In order to avoid interpreting this correlation as an effect of the specialized family planning program, we cluster standard errors at the village level.[1]

2.5.3 Heterogeneity Analysis

We want to study whether the effect of Matlab family planning program differs between: younger and older women; Muslim and Hindu women; more educated and less educated women. The program started in 1977 and was in place for 20 years before the Matlab Health and Socioeconomic Survey (MHSS) was conducted in 1996. Hence, age is an important factor; in order to measure the effect of the program, we create two age groups, i.e., younger and older than 70 years of age. We are assuming 50 years to be the maximum age for someone who could have received the specialized family planning program during 1977. As the survey was conducted after 20 years during 1996, we introduce a dummy variable *Age<70* for women younger than 70 years as a cut-off age. In order to see if the effect of the program is different for younger women, we use the following three specifications, with and without village controls, respectively:

$$Y_i = \beta_0 + \beta_1 Treat + \beta_2 Treat * Age < 70 + \beta_3 Age < 70 + \beta_4 Muslim + \varepsilon_i, \qquad (31)$$

[1] We also run the regressions clustering at the bari (housing compound) level, and results are similar.

$$
\begin{aligned}
Y_i &= \beta_0 + \beta_1 Treat + \beta_2 Treat * Age < 70 + \beta_3 Age < 70 + \beta_4 Muslim + \beta_5 Education \\
&+ \beta_6 Unmarried\ Female\ Head + \beta_7 Married\ Female\ Head \\
&+ \beta_8 Husband\ Absent\ NH + \varepsilon_i, \qquad (32)
\end{aligned}
$$

and

$$
\begin{aligned}
Y_i &= \beta_0 + \beta_1 Treat + \beta_2 Treat * Age < 70 + \beta_3 Age < 70 + \beta_4 Muslim + \beta_5 Education \\
&+ \beta_6 Unmarried\ Female\ Head + \beta_7 Married\ Female\ Head + \beta_8 Husband\ Absent\ NH \\
&+ \beta_9 Secondary\ School\ Nearby + \beta_{10} Finance\ Institution + \beta_{11} Engine\ Boat \\
&+ \beta_{12} Km\ to\ Hospital + \beta_{13} Pucca\ Road + \varepsilon_i, \qquad (33)
\end{aligned}
$$

where $Y_i \in \{0,1\}$ represents the dependent variables used to measure women empowerment, β_0 is the coefficient for the constant term, $\beta_i \in [1, (4 \text{ or } 8 \text{ or } 13)]$ are the coefficients for the heterogeneity model, are either quantitative or qualitative with pre-determined variables such as religion and age, with and without village controls, respectively, as well as interactions of the regressors with age. The interaction of *Treat*Age<70* refers to an individual who is less than 70 years and resides in the treatment area.

For the heterogeneity analysis, instead of using *Education*, we use a dummy variable *Higher Education* that divides women's education into two broad categories: more educated and less educated. Median years of schooling from the survey were five years, so anyone with more than five years of schooling was considered to be more educated. *Treat*Higher Education* is used to see if the effect of the program is different for someone who is more educated. About 90% of the population of Matlab is Muslim (the rest Hindus). Hence, an interaction variable (*Treat*Muslim*) is introduced to check the statistical significance of religion along with the effect of the program in the treatment area.

In order to incorporate the effect of religion and education, we add interaction variables and we use the following three specifications for the heterogeneity analysis:

$$Y_i = \beta_0 + \beta_1 Age + \beta_2 Treat + \beta_3 Muslim + \beta_4 Treat * Muslim + \beta_5 Higher\ Education + \beta_6 Treat * Higher\ Educaton + \varepsilon_i, \quad (34)$$

$$Y_i = \beta_0 + \beta_1 Treat + \beta_2 Muslim + \beta_3 Treat * Muslim + \beta_4 Higher\ Education + \beta_5 Treat * Higher\ Educaton + \beta_6 Unmarried\ Female\ Head + \beta_7 Married\ Female\ Head + \beta_8 Husband\ Absent\ NH + \varepsilon_i, \quad (35)$$

and

$$Y_i = \beta_0 + \beta_1 Treat + \beta_2 Muslim + \beta_3 Treat * Muslim + \beta_4 Higher\ Education + \beta_5 Treat * Higher\ Educaton + \beta_6 Unmarried\ Female\ Head + \beta_7 Married\ Female\ Head + \beta_8 Husband\ Absent\ NH + \beta_9 Secondary\ School\ Nearby + \beta_{10} Finance\ Institution + \beta_{11} Engine\ Boat + \beta_{12} Km\ to\ Hospital + \beta_{13} Pucca\ Road + \varepsilon_i, \quad (36)$$

where $Y_i \in \{0,1\}$ represents the dependent variables used to measure women empowerment, β_0 is the coefficient for the constant term, $\beta_i \in [1,(6 \text{ or } 8 \text{ or } 13]$ are the coefficients for the heterogeneity model, which are either quantitative or qualitative.

As noted above, we use weighted probit regressions for all dimensions of women's empowerment discussed in Table 2. Probit regression measures report the marginal effect, that is, the change in the probability. The coefficients of the independent variables represent the change in magnitude in the probability of the dependent variable when the value of the respective independent variables changes.

2.6 Results

The following sections focus on the treatment effects of the main and heterogeneity analysess of the first specification (i.e., 28, 31, and 34) which includes religion and age, i.e., the pre-determined variables. Appendix C provides the entire regression results, which include co-efficients of the control variables for all three specifications (from 28 to 36) used in each scenarios: baseline; heterogeneity with age; religion and education.

2.6.1 Main Analysis

Socio-Economic: Panel A of Tables 4 and 5 represents the summary of the treatment effect of the baseline specification (discussed in section 2.5.2) where all the socio-economic variables are used to measure women's autonomy. The results suggest that the program has no significant effects in the treatment area regarding whether women own productive assets or not. Results do indicate the effect on their ability to purchase large household items with their own money, that is, women in the treatment area are more likely to purchase betel leaf/nut (2.2 percentage points) with their own money compared to women in the control area.

With respect to women seeking permission before buying small households items, such as: oil/spices, glass bangles, and ice-cream, the treatment effects indicate statistical significance for ice-cream. With respect to major household decisions (Table 5, panel A) made in the previous five years, the magnitude of the treatment effect is large and significant. Women in the treatment area are more likely to be involved before purchasing a goat and buying/selling land.

Hence, socio-economic results indicate that the program has positive effects on women buying large household items with their own money, which means that they are more likely to be financially independent. They are also more likely to be involved in major household decisions, and this reflects their status within the family.

Socio-Cultural: Panel A of Tables 6 and 7 represents the summary of the baseline treatment effects of all the socio-cultural variables, i.e., mobility of women within and outside their villages; their participation in various group actions; whether their parents chose the husband; whether they were

physically assaulted used to measure women autonomy. Table 6 shows that women in the treatment area are less likely to visit other women and travel outside their villages alone. Table 7 indicates that women in the treatment areas are more likely to participate in group actions such as ensuring proper wages, ensuring right prices being paid, and raising their voices against misuse of relief money as Bangladesh receives lots of international aid.

In addition to the individual regressions for each socio-economic and socio-cultural variable, we also estimate summary indices that aggregate information of socio-economic and socio-cultural dimensions, a technique used by Kling et al. (2007). We create socio-economic and socio-cultural indices to check the significance of these two broad categories in general. The treatment effect of the intense family planning program indicates significance only for the socio-economic dimension, whereas the socio-cultural dimension is not significant (Table 8).

In the treatment area, we also look at change in attitudes: towards using contraceptives amongst husbands or women; whether a household member consults before spending the money women have earned; and whether women are prevented from working outside the home. Table 9 (columns 1 and 2) indicates that in the treatment area they are more likely to use contraceptives and more likely to be consulted by family members.

With respect to individual characteristics and village level controls, unmarried female heads are more likely to buy small household items with their own money (Appendix C, columns 2 to 4 of Table C29 and C50). The presence of financial institutions or NGOs increases the likelihood of women owning productive assets, buying all small and large household items with their own money, being involved in decisions such as purchasing a cow for the household, and going to the marketplace alone (Appendix C, Tables C36, C37, C38, and C40).

2.6.2 Heterogeneity Analysis

Socio-Economic and Socio-Cultural with Age: The likelihood of owning productive assets (Panel B, Table 4, column 2) for younger women who received specialized family planning services in the treatment area increases, whereas older women (column 3) in the treatment area are less likely

to own assets. The likelihood increases with respect to buying betel leaf/nut and sarees with their own money. Younger women also have higher odds (4.2 percentage points) of buying daily bazaar (grocery). Daily bazaar is one of the major expenses for any household and, according to the statistics of the household survey (Table 2), only 3.58 percent of women in the treatment area buy daily groceries with their own money. Hence this increase in the likelihood of 4.2 percentage points for younger women in the treatment area is a significant effect.

With respect to major household decisions (Table 5, panel B column 3), older women are more likely to be involved before buying and selling land. Panel B of Tables 6 and 7 gives the socio-cultural results, which indicate that younger women are more likely to go to the market place alone (Table 6, column 2), whereas for older women the likelihood goes down (column 3).

Socio-Economic with Religion and Education: In the treatment area, Muslim women have lower odds of owning productive assets compared to Hindus (Table 4, panel C, column 4). Religion and education seem to have no effect on individuals' cash savings, but higher educated women in the treatment area are more likely to buy betel leaf/nut with their own money. With regards to major decisions taken in the households (Table 5, panel C), results indicate that Hindu women in the treatment area are more likely to be involved before purchasing goat and cow for their household (column 4), whereas Muslim women are more likely to be involved in buying and selling land (column 4). Higher educated women in the treatment area are more likely to be involved before the household decides to build a new house or lease a land (column 5).

Overall, heterogeneity analysis for socio-economic category indicates that Hindu women in the treatment area are more likely to get involved in some major household decisions and owning productive assets. Women with higher education level in the treatment area are more likely to buy large household items such as betel leaf/nut with their own money and be involved in major household decisions.

Socio-Cultural Education and Religion: Religion in the treatment area seems to have no effect on their mobility except with regards to going outside their villages (Table 6, panel C, column 4), i.e.,

Muslim women are more likely to travel alone compared to Hindus. Higher education in the treatment area has no effect on any of the socio-cultural variables.

2.6.3 Discussion

Even though the above results suggest an increase in empowerment for women in the treatment area, there are some variables that show no improvement even after receiving the specialized family planning program. The reason why some dimensions are significant and some are not could be that the fertility program has an indirect effect on women autonomy through reduced number of birth or it also could be a direct effect where factors other than reduced fertility rate empower women. Amartya Sen mentioned in his book Development as Freedom that education is crucial in giving people capabilities such as literacy, confidence, and attitudes to participate in society. Higher educated individuals are more likely to participate in meetings of local political bodies and managing resources such as education, health, and water.

According to UNICEF, "providing girls with an education helps break the cycle of poverty: educated women are less likely to marry early and against their will; less likely to die in childbirth; more likely to have healthy babies; and are more likely to send their children to school. When all children have access to a quality education rooted in human rights and gender equality, it creates a ripple effect of opportunity that influences generations to come." Hence, education can be considered one of the factors that directly influence women's autonomy.

In order to disentangle between these two channels, we try to investigate whether the direct effect plays a role in increased autonomy by dividing the women into 2 groups. One group includes women with higher education who completed 8-12 years of formal schooling and the other group includes less educated women with 1-5 years of education. Table 10 shows that, for both groups, women in the treatment area have lower fertility rates compared to the control group. The objective is to find out whether women with higher education level in the treated area have reduced fertility and are still more empowered compared to the control group. If their fertility is not reduced but they are more empowered, that would suggest the second channel (direct) is important for improved autonomy.

When we run the regressions separately for the two education groups, our results indicate that higher educated women in the treatment area are more likely to own productive assets and the rest of the variables are not significant.[2] For the less educated group, they are less likely to own productive assets and buy nut/betel leaf and groceries (large household items) with their own money. They are also less likely to ask permission to buy small household items (glass bangles), but more likely to be involved in major household decisions such as leasing land and to join group actions against misuse of relief. Typically, more educated women join action groups but, in this case, the less educated group are more likely to be active. Hence, the involvement of direct channel cannot be confirmed nor denied and the indirect channel cannot be rejected.

2.7 Conclusion

In this paper, we employ data from the 1996 Matlab Health and Socioeconomic Survey to study the long run consequences of an intensive door-to-door outreach family planning program implemented in half of the 141 villages of rural Matlab, Bangladesh, from 1977 to 1996. In addition to our focus on a developing country, we contribute to the literature on the topic by considering the multidimensional nature of women's empowerment, thus assessing the Matlab family planning program according to its impacts on two broad dimensions: socio-economic and socio-cultural.

In particular, we measure women's empowerment in terms of: women's access to and control over their own income, savings, and other household's economic resources; the extent to which they enjoy their freedom of physical mobility; whether they have the decision making authority or have a say in their family ranging from small to major households decisions; how close they are to their spouses emotionally and whether they are free from physical and psychological abuse; the extent to which they exhibit their legal rights.

[2] Regression results are not shown for space limitations.

For each dimension, we consider several questions: for the socio-economic dimension, we have whether (1) productive assets are owned, (2) purchases of small household items are made with own money, (3) purchases of large household items are made with own money, (4) there are cash savings, (5) need permission to purchase small households items, and (6) whether involved in major decisions. For the socio-cultural dimension, we have whether women can travel alone to (1) hut/bazaar, (2) hospital/clinic, (3) cinema, (4) visit other women, and (5) visit outside the village, and whether women have participated in group actions against (6) beating wife, (7) divorcing wife, (8) proper wages, (9) ensuring right prices paid, (10) misuse of relief, (11) parents choose husband, and whether women were (12) victims of physical abuse. For each of the dichotomous situations/variables, we then employ a probit estimation procedure to estimate the impact of the Matlab family planning program on various aspects of women's empowerment using age, education, religion, household head, village level controls, and interaction variables with age, education, and religion with the treatment area as independent variables.

From the baseline analysis, our results suggest that there have been major improvements in different aspect of women's empowerment in the areas targeted under the Matlab family planning program. Our findings support improvements in women's lives in the treatment area in the realms of buying large household items with their own money (financial independence) and participation in major domestic decisions and group actions compared to the control area. Similar results with respect to the economic dimension were also reported by Schultz (2009) where households in program villages reported to hold a larger share of their assets in financial savings, jewelry, and consumer durables. Attitudes amongst family members towards women also improved through greater consultation in household decisions

Heterogeneity analysis with age indicates that younger women in the treatment area are more likely to own productive assets, buy large household items, and go to the marketplace alone. The treatment effect is larger and significant for Muslim women in terms of getting involved in major household decisions such as buying and selling land, whereas Hindu women are more likely to be involved before buying a goat or a cow. In terms of mobility, by receiving the family planning program, Muslim women from the treatment area are more likely to go outside their villages alone.

Women with higher level of education are more likely to purchase large household items with their own money and be involved in major household decisions.

Population is one of the biggest problems in South Asia and in the African nations. Unplanned pregnancy results in lost economic productivity, maternal mortality, and affects continual education and employment opportunities of women. When all these effects are taken into consideration, the benefit of implementing such programs will far outweigh the cost. Along with other developmental projects such as infrastructure, providing better educational facility which seems to take precedence over other, policy makers should also be more committed towards policies that target equality between men and women. According to Duflo (2012), even though economic development and women empowerment are interrelated, the links are probably too fragile to be self-sustaining; hence, continuous policy commitments are required from policy makers regarding equality among men and women. Achieving gender equality and women's empowerment means that women have equal capabilities such as education, health, and mobility, and equal access to resources and opportunities such as land, productive assets, employment, and entrepreneurship. Instead of just advocating the use of contraceptives, programs may need to use different approaches such as promoting couples' discussion of fertility preferences, improving women's strength in negotiating sexual activity, and increasing their economic independence.

Chapter 3

The Effects of Family Planning Interventions on Housing Quality and General Sanitation: Evidence from Rural Bangladesh

3.1 Introduction

In developing countries, due to the increasing population and scarce economic resources, housing problems have become a major issue. According to the World Health Organization (WHO), adequate housing "is a physical structure used for shelter and the surroundings, which includes all necessary services, facilities, equipment and devices required for physical and mental health and social well-being." Large part of the world today is still experiencing slow implementation of health improving infrastructure, such as clean water and sanitation (Banerjee and Duflo, 2007; Baisa et al., 2010), as was the problem for North America and Europe a hundred years ago.

According to the UN, rapid urbanization is putting pressure on housing, and, by 2030, about three billion people in the world will need proper housing and access to basic infrastructure and services such as water and sanitation systems. This means 96,150 proper housing units need to be completed per day until 2030 to address this issue. Especially in the developing world, supply of proper housing is limited, illegal slums are being constructed due to poor governance, lack of both human resources and capacity of institutions, and, for a majority of the population, safe housing remains a dream. Governments consider affordable housing a social burden, and prioritize projects that bring higher returns on their investments such as in the industrial, transportation, and energy sectors. This widens the gap between urban and rural development and thus leads to a rise of rural to urban migration. Due to the huge influx of migrants in the developing nations, and especially in

South Asia, urban areas struggle with traffic congestion, high crime rate, infectious diseases, and unhealthy slums. Since 2000, 55 million new slum dwellers have been added to the global population. Poor housing and poor hygiene can lead to many health problems and is associated with infectious diseases, stress, and depression. The responsibility of housing quality on health is more important for the vulnerable population groups: poor; sick; children; elderly and the disabled, who spend even more of their time inside their dwellings and are therefore most susceptible and most in need of healthy living environments. Limited research in housing quality has been done so far and should be expanded to include housing quality in rural areas in developing countries.

Bangladesh is a low-income country with significant poverty, severe overpopulation, poor infrastructure, corruption, insufficient power supplies, water shortages because of falling water tables, inequality (particularly in rural areas), and slow implementation of economic reforms. Almost half of the population is employed in the agricultural sector, and many people are landless and forced to live and cultivate flood-prone land. During the monsoon, poor people are hit the hardest, because they are more densely concentrated in badly constructed housing on land that is prone to hazards. Housing constructions mostly use decaying, low quality and unsafe materials (Hoek-Smit, 1998; Loton, 2004). The poor population cannot afford to live in houses that can properly resist natural hazards like storms or heavy rain (Haque, 2009).

The mud house is a traditional housing used by poor families, mainly in rural areas, but also in the outskirts of small cities, and it is locally known as *Kutcha* house. This type of construction has been in practice for more than 200 years, typically one or two stories, and is mostly used by a single family. Their walls are weak in strength, with no major joints between the wall and the roof, and are highly susceptible to seismic forces and high pressures due to flooding. Hence, they behave poorly during earthquakes and winds. Seventy-four percent of houses in Bangladesh are *Kutcha* houses. Compared to urban areas (46%), the proportion of these kinds of houses in the rural areas is much higher (83%). Back in 1993, about 80 percent of the population used to live in the rural settlements (GOB 1993), but, as of 2015, according to data from World Bank, the proportion went down to 66 percent. The reduction is partly due to economic development, but mostly due to migration to urban areas and the creation of unhealthy slum housing. Forty percent of the households in the slums share their drinking water source with more than 11 families, and about

50% share latrines with at least six families (CUS 2006). Along with urbanization, the growth of slums created lower quality of sewage disposal. Overall, 42.3% of urban population and 37.9% of rural population need improvements in their sanitation facilities (World Bank 2015).

For years, there has been a well-documented relationship between water hygiene and sanitation and water related diseases; however, 80% of morbidity and mortality in the developing world is still due to water related diseases today (Toepfer, 2004). Water related diseases are responsible for more than five million deaths per year in developing countries, but, according to United Nations (2010), it could be almost entirely prevented. According to the 2014 report of Joint Monitoring Programme of UNICEF and WHO, 20 million people in Bangladesh are currently exposed to water having arsenic contamination, and more than half of the latrines used are unsanitary in design, operation, or maintenance.

This paper aims to contribute to a literature on rural housing quality and general sanitation in Bangladesh, a developing economy in South Asia, but from a different point of view. It tries to see whether lower fertility outcomes through a specialized family planning program brings indirect achievement in terms of housing quality and hygiene in the treatment area. We employ data from the Matlab Health and Socioeconomic Survey (MHSS) to study the effects on women's empowerment of an intensively designed outreach family planning program that was implemented in half of the 141 villages of rural Matlab, Bangladesh, from 1977 to 1996. Matlab provides an appropriate focus for our study for several reasons. First, and from an empirical viewpoint, fertility declines have continued for long enough that we have the opportunity of examining its influence on aspects of women's lives, gender inequality, and gender relations where change may take some time to manifest. Two years after the implementation of the program, during 1978/79, Phillips et al. (1982) found, based on birth registration data (DSS), that women in the program villages (age between 15 and 49) reported 25% lower fertility rate than in the comparison villages. Second, the vast dataset allows us to examine the indirect effect of the specialized family planning program.

In this paper, we use weighted linear probability estimation and weighted ordered logistic regressions on various dimensions used in the literature to estimate the impact of the Matlab family

planning program on quality of housing and sanitation, controlling for individual as well as village characteristics.

Our findings suggest that the treatment effect is significant with respect to better quality of: flooring materials, drinking water, and washroom accessibility to men and women. Additionally, an extra year of education is associated with improvement in all the variables regarding housing quality and general sanitation. Finally, we find that the effect of the treatment is greater for Muslim women with respect to having additional rooms and better quality of flooring, roofing, and drinking water than for Hindu women.

The remainder of the paper is structured as follows: in section 2, a literature review on housing quality and general sanitation is presented; in section 3, we review the background of Matlab; in section 4, we describe the data; in section 5, we present the empirical strategy; in section 6, we summarize the results; in section 7, we provide concluding remarks.

3.2 Literature Review

This section discusses the related studies and policy papers on housing quality and sanitation around the world and explores factors that could have a positive effect on quality of housing and hygiene through a successful fertility program.

A study of fertility, family planning, and health in India by Chattopadhyay et al. (2005) states that the "explosive quantitative increase of the Indian population is thinning down the quality of life of the mass due to skewed distribution of resources." The "quality of life" mentioned by Chattopadhyay et al. (2005) is a subjective opinion that initiates with the overall view of all the important elements an individual holds at a particular point of time (Anantharajan, 1983; Olayiwola et al., 2006). Hence, with respect to the quality of housing, the appropriate indicators to assess the qualitative aspect are: sanitation, drainage, sewage and waste disposal, access to basic housing facilities, aesthetics, adornment, age of the building, noise level within the neighborhood, and spatial adequacy (Ebong, 1983). Depending on the location of study, quality indicators

changes: for developed economies, some researchers focus on structural items and other give emphasis to service amenities such as freezer, dishwasher, fireplace, and washer and dryer (Harris, 1976); for developing economies, structural items include the condition of the walls, and service items include the presence of toilet facilities (Morris et al., 1972). Along with structural items, housing materials are used as an indicator of housing quality (Selman et al., 1994).

According to researchers, housing quality is positively associated with the socioeconomic status of the household (Morris et al., 1972). The difference in quality is linked with the income level of the household, as higher income can improve structural form, service items, and materials used within the house. Findings from papers which only look at factors that affect sanitation quality (one of the qualitative aspects of housing) also suggest that, along with education level, socioeconomic standing plays a positive role in improving sanitation quality (Nath, 2003). According to Cropper and Griffiths (1994), as income grows, sanitation and waste water treatment improve. Another paper by Gross and Gunther (2014) looks into the sanitation situation in rural Benin (sub-Saharan Africa) by analyzing 2000 rural households. Results indicate that wealth and latrine prices may play a vital role for sanitation demand and ownership. Browne and Barrett (1991) find a strong association between the education level and improved hygiene, better health, higher child survival rates, and lower fertility levels. Desai and Alva (1998) use data from Health and Demographic Surveys from 22 developing countries to estimate the effect of maternal education on infant mortality and other markers of child health. After controlling for husbands' education and access to piped water and toilet, their results indicate that maternal education is associated with a reduced infant mortality.

A few studies using an experimental setup with regards to housing quality suggest that income and education level are important determinants of housing quality. Yust et al. (1997) use data from ten villages in Philippines, with villages and individual households within the villages randomly selected. Logistic regression results are significant with respect to factors such as the household's socioeconomic status, location, and ownership type. Breierova and Duflo (2004) study the role of parental education on fertility, child mortality, and human capital in Indonesia with a proper experimental setup. The data used in this paper come from the 1995 inter-census survey of Indonesia (SUPAS) with a large sample size of 148,845 women of whom 122,818 have children.

The program effect amounts to an increase in income along with a decrease in age at marriage, early births, and child mortality. Also girls' education creates a ripple effect of opportunity that influences generations to come. Wei et al. (2013) use 2005-06 survey data from the Third National Family Health Survey (NFHS-3) of India which represents households living in all 29 states and covers 99 percent of India's population. The paper explores in detail the relationship between the type of bathroom facilities and women's educational level in India. The level of education is divided into categories such as whether women have completed secondary school or high level of education. Results indicate that the quality of toilet facilities improves steadily with increases in girls' education level.

Using data from the same area in Bangladesh as this paper, Schultz (2009) looks at wage productivity of adult women and physical household assets owned by women. Results indicate that the wage productivity of adult women is enhanced in the program area, and the households in the program villages report to hold a larger share of their assets in financial savings, jewelry, and consumer durables. Joshi and Schultz (2007 and 2013) use the same Matlab data and find that the family planning program in the treatment area is associated with improvements in women's health, their economic productivity outside of their household, and their household assets. According to Schultz (2009), an effective fertility program might reduce the responsibility for additional children, thereby increasing the free time available to a mother. Hence, the extra time could be used for employment, that is, higher income for the household and lower fertility lead to a decline in the persons-to-room ratio. Another belief is that, as the ratio of persons-to-room increases, housing quality decreases (Yust et al., 1997).

The above mentioned housing related studies look at different variables believed to be responsible for better housing and sanitation quality, whereas fertility related papers try to investigate the effects of lower fertility rates on variables such as income, education level, and so on. By using the vast dataset provided by the Matlab MHSS survey, this paper tries to investigate whether a direct link exists between lower fertility and better housing and sanitation quality, which, to our knowledge, is one of the few studies on this topic for a rural area.

3.3 Background

Matlab is one of the nine field research stations of the International Center for Diarrhoeal Disease Research, Bangladesh (ICDDR, B), located about 60 km south-east of Dhaka, Bangladesh. The region is always prone to flooding due to being situated in a deltaic plain. Poverty is persistent in the region which results in poor infrastructure development and high mortality. Like any other South Asian village, Matlab is traditional and religiously conservative: the majority of its population is Muslim and only 10 percent of the population is Hindu. More background information about the data can be found in section 2.3 as Chapter 2 uses the same data set.

3.4 Data

In 1996, a major family and community survey entitled the Matlab Health and Socio Economic Survey (MHSS) was carried out. This survey is a collaborative effort of RAND, the Harvard School of Public Health, the University of Pennsylvania, the University of Colorado at Boulder, Brown University, Mitra and Associates, and ICDDR, B. More information regarding the data can be found in section 2.4.

As explained in the literature review in section 3.2, we use the following to measure the quality of housing and general sanitation: the number of rooms in the household, types of flooring and roofing materials used in the main bed room; whether the household has electricity; the cleanliness of the surrounding vicinity of the household; the main source of drinking water and cleaning utensils in the household; the quality of washrooms that men, women, and children have access to.

Table 10 reports the responses from the household survey questions for all of the dependent variables used to measure housing quality and general sanitation of a typical household in the treatment/program and the control/comparison areas. The third column reports the difference between means and whether the two means are statistically different. Results indicate that the difference in means for the majority of the variables is statistically significant.

Twice the proportion (14.35%) of households has access to and utilizes electricity in the program area than in the control area (7.86%). In rural areas, the quality of housing is reflected by the type of materials used while constructing the roof and floor of the houses. The number of rooms also reflects their economic status or financial condition compared to others. In the Matlab area, roofing materials used in the construction of houses could be cement, tin, bamboo, or straw/leaves. In terms of cost, cement roof is the most expensive followed by tin, bamboo, and straw/leaves being the least expensive. With regards to quality and strength, the same order follows. Overall, the proportion of households that use cement for the roof is very low in both the control and treatment areas, but it is evident that the proportion of households that has cement roofs and resides in the treatment area is significantly higher (almost 3 times) than in the control area. The proportion of households that use the other three materials is about the same between the two groups.

Materials used in flooring are cement, dirt/mud, wood, and bamboo. In terms of durability, cost, and appearance, cement is the best and most expensive followed by dirt/mud, wood, and bamboo. In the program area, 4.51% of the households have cement flooring in their main bedroom, whereas the proportion is only 1.07% in the comparison area. In the survey, responses related to the number of rooms in the households ranges from 0 to 13, but almost 99% of the responses in both the treatment and the program areas range from 1 to 6 rooms. The Table shows that, in the program area, proportions of households that have 2, 3, 5, and 6 rooms are higher than in the control group.

Outside appearance and cleanliness of the household are very important as they reflect the living condition and thus the quality of housing. In the comparison area, more households are surrounded by piles of trash, which is detrimental to the environment and, most importantly, to the health of the household members, especially the children. Compared to the control area, more households in the treatment area have clean and well-kept yards. According to statistics, households in the program area are relatively cleaner and less likely to be surrounded by piles of trash.

The households in Matlab have six different options to relieve their bowel movements: (i) modern latrine; (ii) slab latrine; (iii) pit latrine; (iv) open latrine; (v) hang latrine; (vi) no latrine/yard/field. In terms of quality and hygiene, the modern latrine is the best followed by the other options in the

same order as shown above. The statistics from Table 1 show that households in the treatment area have more than twice the proportion of modern latrines compared to the control area. The next type is the slab latrine, and the results are similar to those for the modern one but smaller in magnitude. For the remaining four types, the proportions become smaller for households in the treatment area and higher in the control, that is, higher proportions of households in the control area use low quality latrines. For children between two to ten years of age, the statistics are quite similar in terms of difference in magnitude between the two groups, but the proportion using open field for bowel movement is one-fourth of the respondents for both groups. The statistics are not surprising because, even though they have access to proper latrines in their households, children in the village area use open areas as latrines because they spend most of their times playing in their household compound, which is a big area, or else they might be playing in open fields with other village children. Hence, they are reluctant to going back to their households to use proper latrines, and use open fields instead. In some cultures, modern latrines are not considered to be the most hygienic, but, in Bangladesh, the concept of community managed jointly owned latrines does not seem to be a very attractive alternative, unlike some conventional belief in other cultures, and development projects are undertaken to improve environmental sanitation in rural areas (Hadi, 2000).

Quality of water that the household has access to is one of the most important dimensions that determine the quality of living for any household irrespective of which part of the world it resides. Households use water for drinking, cleaning utensils, and other activities. The last two dependent variables of Table 1 look at the source of water households has access to: (i) tap water; (ii) tube well; (iii) regular well; (iv) pond; (v) canal; (vi) river. The six options of water source mentioned above are ranked in descending order in terms of quality and in ascending order in terms of distance travelled.

Overall, the proportion of households that use tap water is very low for both groups, but the proportion of households that have access to tap water for drinking and reside in the treatment area is higher (2.5 times) compared to the control area. For cleaning utensils, the proportion is more than five times larger compared to the control area. Almost all of the households drink water from tube wells and, compared to the comparison area, 1% more households have access to tube well

in the program area, 2% fewer households in the program area have to go to a river to have access to drinking water, and the difference becomes 6% for cleaning utensils.

3.5 Empirical Methodology

3.5.1 Characteristics prior to program intervention

Before using the survey data, we need to find out whether the program area and the comparison area are similar in characteristics associated with fertility and other relevant dimensions before implementation of the program in 1977. Often, during experiments, individuals or samples are screened for participation in programs by using certain characteristics they have and thus creating selection bias and a poor comparison group. In the absence of common characteristics between the groups prior to 1977, it will be impossible to find out the real treatment effect when evaluating the spillover effect of family planning and health policies on quality of housing and general sanitation.

Joshi and Schultz (2007) compare the number of live births of married women who, in 1996, reside in the program and comparison areas. Their results show that "fertility among women over the age of 55 in 1996 appears indistinguishable between the treatment and comparison villages, consistent with the hypothesis that the fertility of these older women was not substantially affected by the program, probably because they were age 38 or older when the program started and thus had by then virtually completed their childbearing." Hence, before the program started, fertility was quite similar among all women in the 141 villages. Migration between villages or from outside of Matlab can make things complicated when evaluating the impact of the family planning program. Migration occurs when a woman gets married; n the rural area, it is very common for a woman to get married outside of their village of birth. The MHSS provides data on a woman's children, including those who migrated and when they left. The migration rates by date of birth and gender of their children do not indicate significant differences between program and comparison villages.

Also for other characteristics, Joshi and Schultz (2007) make use of the first Census of Matlab which was conducted in 1974. The Census did not collect comprehensive information on income, wealth, or other variables that would help us comment on differences in economic conditions between the two areas but did record information on several other dimensions such as education, housing quality, and religion. In Table 3, we report the partial census data as in Joshi and Schultz (2007). Based on this information, there are insignificant differences between program and comparison villages. Before the program was introduced in the Matlab area, the entire population of the area was divided into two groups of equal size with treatment villages adjacent to one another to avoid spillover effects of the program to the control areas, and, during the survey all households were randomly chosen from the surveillance area.

3.5.2 Main Analysis

The measures for housing quality are: (i) Number of rooms in the households; (ii) Household utilizing electricity; (iii) Flooring type of main bedroom; (iv) Roofing type of main bedroom.

General sanitary conditions measures are: (i) Whether the household is surrounded by piles of trash; (ii) Whether the yard is well kept and always cleaned-up; (iii) Quality of washroom male household member has access to; (iv) Quality of washroom female household member has access to; (v) Quality of washroom children have access to; (vi) Main source of drinking water in the household; (vii) Main water source for cleaning utensils in the household.

For each of the dichotomous situations/variables listed above, we estimate the impact of the Matlab family planning program on various aspects of housing quality and general sanitation, controlling for religion, age, education (number of schooling years), individual and household controls, and village controls such as vicinity of secondary school, nearby financial institutions, village accessible by engine boat, km to hospital, village having pucca (paved) road, and household head. We use a parsimonious approach with three main specifications: (i) the first one includes religion and age, i.e., the pre-determined variables, (ii) the second specification adds other household and individual variables, and (iii) the third specification adds all the village controls.

We use the following three specifications for: whether household utilizes electricity, whether the household is surrounded by piles of trash, and whether the yard is well kept and always cleaned-up:

$$Y_i = \beta_0 + \beta_1 Treat + \beta_2 Muslim + \beta_3 Age + \varepsilon_i, \tag{37}$$

$$\begin{aligned} Y_i \;=\; & \beta_0 + \beta_1 Treat + \beta_2 Muslim + \beta_3 Education + \beta_4 Unmarried\ Female\ Head \\ & + \beta_5 Married\ Female\ Head + \beta_6 Husband\ Absent\ NH + \varepsilon_i, \end{aligned} \tag{38}$$

and

$$\begin{aligned} Y_i \;=\; & \beta_0 + \beta_1 Treat + \beta_2 Muslim + \beta_3 Education + \beta_4 Unmarried\ Female\ Head \\ & + \beta_5 Married\ Female\ Head + \beta_6 Husband\ Absent\ NH + \beta_7 Secondary\ School\ Nearby \\ & + \beta_8 Finance\ Institution + \beta_9 Engine\ Boat + \beta_{10} Km\ to\ Hospital \\ & + \beta_{11} Pucca\ Road + \varepsilon_i, \end{aligned} \tag{39}$$

where $Y_i \in \{0,1\}$ represents the dependent variables, β_0 is the coefficient for the constant term, β_i $\in$ [1, (3 or 6 or 11)] are the coefficients of all the explanatory variables used in the baseline model, either quantitative or qualitative with no controls, household controls, and with village controls, respectively. *Treat* is a dummy variable that represents whether the individual belongs to the treatment area. *Muslim* equals one if the individual is Muslim and zero otherwise (Hindu). The variable *Age* represents the age of the individual. Education is usually positively associated with women's income, assets, and cash savings, and we thus include years of schooling (*Education*) as a control variable. There are two instances in which a woman might be the head of the household. Accordingly, Joshi (2004) identifies two types of women and refers to them as: widows who are unmarried and also the household head, and married women whose husbands are not residing in the same bari (housing compound) as they are migrant workers or businessmen who live outside the village (e.g., in the city or other countries). Hence, we use the indicators *Unmarried Female Head* and *Married Female Head* to denote the two types. In terms of differences based on

descriptive statistics, married women and their family members are better off financially compared to widows, as their husbands send money back from the city or remittances if they are working in a foreign country. Another instance in which the husband is not the head of the household is when he is absent; in this particular situation, the family head could be the in-laws or another member who resides in the same bari; we denote this type of women with the indicator *Husband Absent NH.* Women's education before the program started was similar between the treatment and the comparison groups (Table 3).

Finally, we use five infrastructure features of the 141 villages in the 1996 MHSS as controls, which could influence the economic, health, and environmental conditions of the families in the village. We control for whether there is a secondary school either in the same village or in a neighboring village through the inclusion of the indicator *Secondary School Nearby*. For the presence of any kind of financial institutions or NGOs, we use the *Financial Institution*. We introduce the indicator *Engine Boat* to see whether the villages are accessible by boat. *Km to Hospital* indicates the distance between the village and a hospital where contraceptives are believed to be provided by regular government programs, and, finally, *Pucca Road* indicates the presence of a paved road in the village. It is very important to take into consideration that across individuals the error term (ε_i) may not be independent because women from the same village or from the same bari (housing compound) may be subject to specific common shocks compared to others in a different village/bari. In order to avoid interpreting this correlation as an effect of the specialized family planning program, we cluster standard errors at the village level.[3]

3.5.3 Heterogeneity Analysis

We also want to study whether the effect of Matlab family planning program differs between younger and older women, Muslim and Hindu women, and more educated and less educated women. The program started in 1977 and was in place for 20 years before the Matlab Health and Socioeconomic Survey (MHSS) was conducted in 1996. Hence, age is an important factor and, in order to measure the effect of the program, we create two age groups: younger and older than 70

[3] We also run our regressions clustering at the bari (housing compound) level and obtain similar results.

years of age. We assume 50 years to be the maximum age for someone to have received the specialized family planning program during 1977. As the survey was conducted after 20 years during 1996, we introduce a dummy variable *Age<70* to denote women younger than 70 years. In order to see if the effect of the program is different for younger women, we use the following three specifications, with and without village controls, respectively:

$$Y_i = \beta_0 + \beta_1 Treat + \beta_2 Treat * Age < 70 + \beta_3 Age < 70 + \beta_4 Muslim + \varepsilon_i, \quad (40)$$

$$\begin{aligned} Y_i \;=\; & \beta_0 + \beta_1 Treat + \beta_2 Treat * Age < 70 + \beta_3 Age < 70 + \beta_4 Muslim + \beta_5 Education \\ & + \beta_6 Unmarried\ Female\ Head + \beta_7 Married\ Female\ Head \\ & + \beta_8 Husband\ Absent\ NH + \varepsilon_i, \end{aligned} \quad (41)$$

and

$$\begin{aligned} Y_i \;=\; & \beta_0 + \beta_1 Treat + \beta_2 Treat * Age < 70 + \beta_3 Age < 70 + \beta_4 Muslim + \beta_5 Education \\ & + \beta_6 Unmarried\ Female\ Head + \beta_7 Married\ Female\ Head + \beta_8 Husband\ Absent\ NH \\ & + \beta_9 Secondary\ School\ Nearby + \beta_{10} Finance\ Institution + \beta_{11} Engine\ Boat \\ & + \beta_{12} Km\ to\ Hospital + \beta_{13} Pucca\ Road + \varepsilon_i, \end{aligned} \quad (42)$$

where $Y_i \in \{0, 1\}$ represents the dependent variables, β_0 is the coefficient for the constant term, $\beta_i \in [1, (4 \text{ or } 8 \text{ or } 13)]$ are the coefficients for the heterogeneity model, are either quantitative or qualitative with and without village controls, respectively, as well as interactions of the regressors with age. The interaction of *Treat*Age<70* refers to an individual who is less than 70 years and resides in the treatment area.

For the heterogeneity analysis, instead of using *Education*, we use a dummy variable *Higher Education* that divides women's education into two broad categories: more educated and less educated. Median years of schooling from the survey is five years, so anyone with more than five years of schooling is considered to be more educated. We use *Treat*Higher Education* to see if

the effect of the program is different for someone who is more educated. About 90% of the population of Matlab is Muslim (the rest Hindus). Hence, we include an interaction variable (*Treat*Muslim*) to check the statistical significance of religion along with the effect of the program in the treatment area.

In order to incorporate the effect of religion and education, we add interaction variables, using the following three specifications for the heterogeneity analysis:

$$\begin{aligned} Y_i &= \beta_0 + \beta_1 Age + \beta_2 Treat + \beta_3 Muslim + \beta_4 Treat * Muslim + \beta_5 Higher\ Education \\ &\quad + \beta_6 Treat * Higher\ Educaton + \varepsilon_i, \end{aligned} \tag{43}$$

$$\begin{aligned} Y_i &= \beta_0 + \beta_1 Treat + \beta_2 Muslim + \beta_3 Treat * Muslim + \beta_4 Higher\ Education \\ &\quad + \beta_5 Treat * Higher\ Educaton + \beta_6 Unmarried\ Female\ Head \\ &\quad + \beta_7 Married\ Female\ Head + \beta_8 Husband\ Absent\ NH + \varepsilon_i, \end{aligned} \tag{44}$$

and

$$\begin{aligned} Y_i &= \beta_0 + \beta_1 Treat + \beta_2 Muslim + \beta_3 Treat * Muslim + \beta_4 Higher\ Education \\ &\quad + \beta_5 Treat * Higher\ Educaton + \beta_6 Unmarried\ Female\ Head \\ &\quad + \beta_7 Married\ Female\ Head + \beta_8 Husband\ Absent\ NH \\ &\quad + \beta_9 Secondary\ School\ Nearby + \beta_{10} Finance\ Institution \\ &\quad + \beta_{11} Engine\ Boat + \beta_{12} Km\ to\ Hospital + \beta_{13} Pucca\ Road + \varepsilon_i, \end{aligned} \tag{45}$$

where $Y_i \in \{0, 1\}$ represents the dependent variables, β_0 is the coefficient for the constant term, $\beta_i \in [1, (6 \text{ or } 8 \text{ or } 13]$ are the coefficients for the heterogeneity model, which are either quantitative or qualitative and include interactions with religion and education.

For the remaining dependent variables such as number of rooms, type of roofing and flooring for the main bedroom, quality of washroom, and source of water in the households, we use the

weighted ordered logistic regression for the main and heterogeneity analysis specifications as the responses given by the respondents are no longer dichotomous but different categories ordered from high quality to low quality with respect to the dependent variables mentioned above except for the number of rooms within the household for which a larger number of rooms represents better housing quality. The probability of observing outcome *i* corresponds to the probability that the estimated linear function, plus a random error, is within the range of the cut-points estimated for the outcome:

$$\Pr(outcome_j = i) = \Pr(k_{i-1} < \beta_1 x_{1j} + \beta_2 x_{2j} + \cdots + \beta_k x_{kj} + u_j \leq k_i) ,$$

where u_j is assumed to be logistically distributed in the ordered logit. In either case, we estimate the coefficients $\beta_1, \beta_2, \ldots, \beta_k$ together with the cut-points $k_1, k_2, \ldots., k_{k-1}$, where *k* is the number of possible outcomes. k_0 is taken as -∞, and k_k is taken as +∞.

3.6 Results

The following sections focus on the treatment effect of the main and heterogeneity analyses of the first specification (37, 40, and 43) which includes religion and age, i.e., the pre-determined variables. Appendix D provides the entire regression results, which include coefficients of the control variables for all three specifications (from 37 to 45) used in each scenario: baseline and heterogeneity with age and with religion, and education.

3.6.1 Main Analysis

Panel A of Tables 12 and 13 represents the summary of the treatment effect on housing quality and general sanitation for the baseline specification (discussed in section 3.5.2). The program has no significant effects in the treatment area with respect to whether the households have access to electricity, are surrounded by trash, and are kept clean for all of the above three specifications.

To test the treatment effects of all the dependent variables in Table 13 we utilize an ordered logistic regression where the responses are no longer dichotomous. With regards to the number of rooms

within the household, responses are discrete values starting from one - housing quality increases as the number of rooms increases within a household. For the rest of the variables in Table 13, such as from types of flooring to washroom used by children, responses are ordered from high to low quality. For example, responses regarding flooring materials in the survey are ordered from cement to bamboo, i.e., from better to poor quality.

The treatment effect regarding flooring materials used in the main bedroom shows improvement in quality. As the responses are ordered from high to low quality, the negative coefficient of the odds ratio shows that households in the treatment area are more likely to have better quality of flooring materials in their main bedroom. With respect to the main source of drinking water and cleaning utensils, the treatment effect shows that households are significantly more likely to have access to better quality of drinking water.

Quality of washroom that men, women, and children have access to are also ordered from better to poor quality, i.e., from modern to no latrine at all, respectively. For both adult men and women, the treatment effects are very significant and the negative coefficient of the odds ratio indicates that men and women in the treatment area are more likely to have access to better quality of washroom (Table 13).

Hence, the baseline analysis suggests that households in the treatment area have better quality of flooring materials, access to better quality of washroom for both men and women, and better quality of water for drinking and cleaning utensils.

Similarly, as for chapter 2, we also estimate the summary indices of housing and sanitation quality variables, a technique used by Kling et al. (2007). The treatment effect of the intensive family planning program on housing and sanitation quality is significant (Table 14).

3.6.2 Heterogeneity Analysis with Age

Panel B of Tables 12 and 13 reports whether the quality of housing and sanitation differs between younger and older women in the treatment area. The effect of the Matlab family planning program

doesn't differ between younger and older women in the treatment area with respect to access to electricity and cleanliness of the household for the above two specifications. Younger women in the treatment area are more likely to have access to better quality of washroom (Table 13, column 2), whereas older women are more likely to have access to better source of drinking water (column 3).

3.6.3 Heterogeneity Analysis with Education and Religion

Panel C of Table 12 and 13 reports whether the quality of housing and sanitation differs between Muslim and Hindu women; more educated and less educated women in the treatment area. With respect to whether the households have access to electricity, are kept clean, and are surrounded by trash, results indicate that religion and education level have no effect. Muslim women in the treatment area are less likely to have access to better quality of water for cleaning utensils (Table 12, column 4) compared to Hindus. Religion and education level play no role in regard to the quality of washroom household members have access to.

With respect to individual characteristics, results indicate that, for married female headd and for those whose husband is absent from the household, the likelihood of having more rooms goes down. Generally, for Muslim women (a pre-determined variable), the likelihood of having more rooms increases (Appendix D). Also, education level in general is a positive indicator for better housing quality and general sanitation for any household (Appendix D).

3.7 Conclusion

In this paper, we use data from the 1996 Health and Socioeconomic Survey from Matlab district of Bangladesh. Since 1977, an intensive family planning outreach program (FPMCH) was launched, which brought family planning and health services and contraceptive supplies to the homes of married women of childbearing age every two weeks in the treatment area. This paper studies the effects of the program after 20 years on the quality of housing and general sanitary conditions in the households residing in the treatment area compared to the households that only

received general government services during the same time period. To our knowledge, ours is one of the few studies on this topic for a rural area.

In order to measure housing quality and general sanitary conditions, we use the following dependent variables: (1) Number of rooms the households have, (2) Whether it uses electricity, (3) Type of flooring materials used in the main bed room and (4) Roofing type of the main bed room, (5) Whether the household is surrounded by piles of trash, (6) Whether the yard is always cleaned-up and kept well, Quality of washroom that (7) males, (8) females, and (9) children have access to, (10) Main source of drinking water in the household, and (11) Main water source for cleaning utensils in the household.

We estimate the impact of the Matlab family planning program on various aspects of housing quality and general sanitation, controlling for education (number of schooling years), religion, age, vicinity of secondary school, nearby financial institutions, village accessible by engine boat, km to hospital, village having pucca (paved) road, and household head.

Results suggest that there are key improvements in the treatment area with regards to quality of housing and sanitary conditions. Individuals who actually received the specialized family planning services are more likely to have better quality of drinking water and flooring materials used in their main bedroom. With regards to quality of washroom, men and women in the treatment area are more likely to have access to better and more hygienic washroom facilities. We also consider the heterogeneity effect by examining the interaction of the program with age, education, and religion. Results show that younger women in the treatment area are significantly more likely to have access to better quality of washroom and older women are more likely to have better source of drinking water.

According to Halder and Kabir (2008), "In Bangladesh, hygienic latrines are not available free of charge. As cost is involved in the purchase of sanitary latrines, the most socially-disadvantaged groups may not have much access to the protective effect of hygienic latrines." The paper also finds a strong positive association between the wealth index and the ownership of hygienic latrine. In the rural area, building a hygienic latrine costs a substantial amount of money relative to income.

As our findings suggest that, in the treatment area, households have higher odds of having access to better quality of washroom, we can conclude that, beyond fertility reductions, this kind of outreach family planning services may have other benefits with respect to better quality of housing and sanitary conditions. Housing quality and sanitation are vital for the development of public health and, as a result, the economic productivity of a nation. Assessment of family planning services outside the realm of fertility shows that policymakers should consider the overall benefit that fertility reduction brings to a society.

In developing countries, sustainable housing is yet to gain importance and it is rare that policies include all the aspects: social, cultural, environmental, and economic in an integrated way. Most often the housing programs provide poor standards of accommodation in remote locations with little consideration to the dwellers' lifestyle and livelihood approach. Some housing developments create large carbon footprint and further negative impacts on the environment. Hence, with strong political determination coupled with adequate regulations and proper course of actions, economies should be able to provide adequate shelter and reduce slum growth, ultimately ensuring sustainable development.

Concluding Remarks

This thesis provides key insights that could help policy makers accomplish certain development goals, especially in developing economies, i.e., ensuring environmental sustainability, proving access to safe drinking water and basic sanitation, and promoting gender equality by empowering women.

Previous literature suggests that women's empowerment and economic development are closely interrelated. Development will bring about women's empowerment, while empowering women will have a direct impact on development through changes in the decision making ability of women. According to Duflo (2012), women's control over resources, which improves their autonomy, increases their welfare and has positive impact on their child's nutrition and health. Another avenue of empowering women is by implementing successful family planning programs, where women have control over their reproductive choices which may generate broad improvements in their well-being and that of their children. On top of poverty alleviating effects which enable families to reallocate more resources within a smaller family over its entire life cycle, family planning programs could also have financial benefits through averted births. Data used in this thesis from the intensive family planning program in Matlab was also used by Joshi and Schultz (2007 and 2013) and Schultz (2009), whose findings suggest that the specialized family planning program is associated with improvements in: women's health, their economic productivity outside of their household, and their household assets in the treatment area. However Joshi and Schultz didn't explore the potential effect of the program on women's empowerment, housing and sanitation quality. Our results indicate that there have been major improvements in different aspects of women's empowerment in the areas targeted under the Matlab family planning program, especially with regards to their socio-economic status, i.e., in the realms of buying small and large household items with their own money and participation in major domestic decisions. There have also been key improvements in the treatment area with regards to quality of housing and sanitary conditions.

Our findings along with those of others who used the same data suggest that women economic empowerment is a precondition for sustainable development and growth which could be achieved

through job creation and women owning their own businesses and coming out of poverty. Hence policy makers should keep in mind the improvement in women's empowerment through the socio-economic dimension while considering the costs and benefits of family program interventions. Also from an environmental perspective, lower fertility rates mean less pollution, and, in developing economies where fertility rates are very high, we see more environmental damage. Along with higher fertility, lax environmental standards and free trade policies with lower or no tariffs are responsible for environmental degradation as shown in the first chapter.

The theory could be tested in prevalent sectors of developing economies such as Bangladesh. According to AlterNet, a project of the non-profit Independent Media Institute, the majority of the world's apparel conglomerates are based in the U.S., but more than 60 percent of the world clothing is manufactured in developing countries. Countries like China and Bangladesh, the most and the eighth most populous nations in the world, respectively, are huge exporters of ready-made garment (RMG). Abundant cheap labor and relax environmental standards in these economies have given rise to a growing RMG sector. Along with benefits, such as economic profit and providing millions of women with their financial freedom, the negative implication of RMG is substantial. If we look locally, dyes and chemicals used during production are dumped directly into the surface waters and polluting rivers; this dumping limits options for new freshwater sources. This sector also draws a huge inflow of workers from rural to urban areas, deteriorating housing quality through the creation of unhealthy slums with poor sanitation quality that leads to infectious diseases and many other health problems. From the global perspective, the apparel sector is a complicated business which involves: long and wide-ranging supply chains of production, raw material, textile manufacture, clothing manufacturing, shipping, retail, consumption, and disposal. More than half trillion gallons of fresh water are used in the dyeing of textiles each year throughout the world. Often untreated, the dye wastewater is discharged into nearby rivers, where it reaches the sea, eventually spreading around the globe. China discharges roughly 40 percent of these chemicals (AlterNet). Countries like Bangladesh, Vietnam, Pakistan, and the Philippines might not have the raw materials, so these harmful materials are often shipped from countries like China, U.S., and India – in addition to water pollution, shipments of these chemicals also contribute to air pollution. A single ship can produce as much asthma and cancer causing pollutants as 50 million cars in just one year. Low grade bunker fuel used by ships is 1,000

times dirtier than diesel used in the trucking industry (AlterNet). Once manufactured, the garments are sent by container ships, rail, and trucks to the retailer.

Now, if we consider the automobile as the finish product, then, along with the pollution generated during the production and shipment stages, the negative externality it creates at the consumption stage is very significant for the global environment. The potential magnitude of externalities linked with automobile use is significant, and it is not shocking that they have attracted unprecedented attention from policy makers. For example, in the United States, there are various taxes on vehicle ownership which average about 18% (Harrington and McConnell, 2004), and gasoline taxes average about $0.40 per gallon across states. When compared to international standards, $0.40 per gallon tax is low, whereas the tax exceeds $3 per gallon in the Netherlands, Germany, and United Kingdom (Parry et al., 2006). This suggests that automobile policies in the United States, one of the largest consumers in the world, require dramatic change. With this policy backdrop, estimates of the external costs of motor vehicles, both at the production and the consumption stages, are important for more than academic interest and should be seriously considered both in developed and developing economies where environmental policies tend to be more lax.

The theoretical piece provides us with a better understanding of the entire life-cycle of a product with respect to pollution. Now that we are aware of the negative effects caused by free trade, the simple oligopoly model could be extended to examine whether to adopt uniform versus discriminatory tariffs and export dirty goods or engage in FDI. With respect to future extensions of the empirical analysis, a new survey could be conducted now, i.e., 20 years from the initial survey (1996) and 40 years from the implementation of the specialized fertility program (1977), to see whether there is any inter-generational effect of the specialized fertility program in the treatment areas.

Using the context of Bangladesh, there is a vital connection between these three chapters with respect to development. Economic growth not only requires an increase in the labor force along with better technology, but it is also important for any economy to have a balance between environmental degradation and economic prosperity through trade. Whereas, a successful fertility program is a double edged sword: lower fertility means less pollution and, at the same time, women with lower fertility tend to be more financially independent, i.e., a precondition for any economy to grow. For example, there is an influx of women migrating from rural to urban areas in Bangladesh, where the booming ready-made garment (RMG) sector employs over three million

people, of whom 85 percent are women (Sadeka et al., 2014). Women are delaying their marriage or pregnancies for employment in the urban areas, but migrating to it also creates unhealthy slums with poor housing and hygiene that leads to infectious diseases, and many other health problems. Governments should consider long-term measures to accomplish these objective with a holistic approach where perspectives from different policies from various areas such as the environment, gender equality, and basic housing and sanitation standards must be integrated at the design stage of policy and programming.

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TABLE 1: Dimensions of empowerment in the household

Categories	Household
Socio-Economic	Women's control over income; relative contribution to family support; access to and control of family resources; Participation in domestic decision-making; control over sexual relations; ability to make childbearing decisions, use contraception, access abortion; control over spouse selection and marriage timing; freedom from domestic violence.
Socio-Cultural	Women's freedom of movement; lack of discrimination against daughters; commitment to educating daughters; Knowledge of legal rights; domestic support for exercising rights; Self-esteem; self-efficacy; psychological well-being.

TABLE 2. Dimension of Women's Autonomy Statistics

Dimension	Survey Questions	Control / Comparison (%)	Program / Treatment (%)	Difference in Mean (Control -Program)
Socio Economic	1. Own any productive assets (for example cattle, sewing machine etc.)	12.57 (7050)	15.29 (6842)	-0.026*** (0.006)
	2. Small purchases made with money earned by her:	5.74	6.80	-0.039***
	a) Oil/Spices	6.23	7.73	(0.005)
	b) Glass Bangles/Soap	7.39	8.92	-0.053***
	c) Ice-cream	(12847)×	(12360)×	(0.006)
				-0.051***
				(0.006)
	3. Large purchases made with money earned by her:			
	a) Betel Leaf/Nuts	4.86	6.23	-0.038***
	b) Sarees	3.64	4.05	(0.005)
	c) Daily Bazaar	3.41	3.58	-0.019***
		(12847)×	(12360)×	(0.004)
				-0.014***
				(0.004)
	4. Cash Savings	11.46 (7066)	12.86 (6881)	-0.022*** (0.005)
	5. Need to seek permission before buying small purchases:			
	a) Oil/ Spices	45.18 (6850)	49.63 (6695)	-0.053*** (0.008)
	b) Glass Bangles / Soap	42.94 (6877)	47.84 (6710)	-0.056*** (0.008)
	c) Ice-cream	33.54 (6446)	40.05 (6399)	-0.065*** (0.008)
	6. Involved in major decisions in the past five years:			
	a) Build New House	28.32 (3969)	31.73 (3180)	-0.045*** (0.011)
	b) Purchased Goat	29.51 (715)	39.08 (765)	-0.086*** (0.024)
	c) Purchased Cow	23.10 (1251)	22.65 (945)	0.048** (0.018)
	d) Leased land	18.82 (1246)	23.76 (1376)	-0.059*** (0.016)
	e) Bought/Sold Land	21.06 (1021)	25.99 (1012)	-0.064*** (0.019)

Socio Cultural	1. Go alone to:			
	a) Hat / Bazar	29.26 (7065)	34.76 (6846)	-0.042*** (0.008)
	b) Hospital /Clinic/Doctor	83.72 (7051)	84.31 (6858)	0.013* (0.006)
	c) Cinema	20.98 (7027)	24.99 (6824)	-0.028*** (0.007)
	d) Visit other women	91.89 (7053)	87.23 (6839)	0.043*** (0.005)
	e) Visit outside the village	94.26 (7019)	89.06 (6807)	0.054*** (0.005)
	2. Participated in any group actions involving:			
	a) Protesting/stopping a man from beating his wife	7.39 (12792)	9.51 (12297)	-0.010** (0.003)
	b) Protesting/stopping a man from abandoning/ divorcing his wife	6.22 (12792)	8.17 (12297)	-0.009** (0.003)
	c) Ensuring payment of proper wages for worked performed	3.89 (12789)	6.63 (12297)	-0.015*** (0.002)
	d) Ensuring payment of right prices for product sold	3.67 (12791)	6.01 (12296)	-0.017*** (0.002)
	e) Protesting against misuse of relief	2.98 (12791)	5.62 (12291)	-0.015*** (0.002)
	3. Victim of Physical Abuse	15.69 (7347)	16.57 (7406)	0.012† (0.006)
	4. Husband Chosen by Parents	64.56 (12847)	61.69 (12360)	0.017** (0.006)

Columns 1 and 2: (i) Results reported represents the percentage; (ii) Number of respondents is in parentheses; (iii) × = number of respondents is same for the respective survey questions. Column 3: (i) Results reported are the difference in mean; (ii) Robust standard errors are in parentheses. (iii) $* p < 0.10$; $** p < 0.05$; $*** p < 0.01$.

TABLE 3: Differences between the Program and Comparison Areas in 1974 Census

Panel (A): 1974 Census	Comparison Areas (Treatment = 0)			Program Areas (Treatment = 1)			Program-Comparison Difference	
	Persons	Mean	Standard Deviation	Persons	Mean	Standard Deviation	Mean	(|t|)
Average Years of Schooling of persons age 15 or more	31560	1.77	0.533	38780	1.80	0.463	0.0602	(0.67)
Average Years of Schooling of persons age 6 to 14	15895	1.41	0.425	19691	1.42	0.330	0.016	(0.26)
Persons age 15 or more with no schooling	31560	0.700	0.097	38780	0.699	0.067	-0.0011	(0.08)
Persons age 6 to 14 with no schooling	15895	0.407	0.139	19691	0.411	0.167	-0.0090	(0.38)
Person in house with Tin roof	76268	0.820	0.094	83757	0.811	0.077	-0.0088	(0.61)
Muslim	77047	0.881	0.214	84472	0.794	0.289	-0.087	(2.01)

Source: Table 2 from "Family Planning as an Investment in Development: Evaluation of a Program's Consequences in Matlab, Bangladesh," by Joshi, Shareen, and T. Paul Schultz. (2007). Center Discussion Paper No. 951.

TABLE 4
Weighted Probit Regression for Socio-Economic Category (Baseline and Heterogeneity)

Dependent Variables	Panel A: (1)Treatment Effect Panel B: (2)Treatment*Age<70 and (3) Treatment Effect Panel C: (4)Treatment*Muslim and (5)Treatment*Higher Education					
	Panel A (1)	Panel B (2)	(3)	Panel C (4)	(5)	Observations (N1,N2,N3)
Productive Assets	0.028 (0.022)	0.205*** (0.055)	- 0.175*** (0.060)	-0.188*** (0.062)	0.007 (0.041)	(18537,18537,8770)
Small Purchases with own money (Oil/Spices)	0.012 (0.009)	-0.016 (0.036)	0.027 (0.035)	0.030 (0.025)	0.001 (0.016)	(32412,32412,16087)
(Glass Bangles)	0.013 (0.010)	0.003 (0.039)	0.011 (0.037)	0.063* (0.037)	0.00005 (0.017)	(32412,32412,16087)
(Ice-Cream)	0.009 (0.010)	0.014 (0.043)	-0.004 (0.042)	0.034 (0.039)	-0.010 (0.019)	(32412,32412,16087)
Cash Savings	0.013 (0.023)	-0.700 (0.057)	0.077 (0.052)	-0.002 (0.077)	0.005 (0.040)	(18599,18599,8798)
Large Purchases with own money (Betel Leaf/Nut)	0.022** (0.011)	0.052* (0.027)	-0.027 (0.027)	-0.009 (0.027)	0.030* (0.019)	(32412.32412,16087)
(Sarees)	0.001 (0.008)	0.068*** (0.027)	-0.066** (0.028)	0.028 (0.023)	0.016 (0.018)	(32412,32412,16087)
(Daily Bazaar)	0.009 (0.009)	0.042* (0.021)	-0.032 (0.023)	0.011 (0.019)	0.024 (0.017)	(32412,32412,16087)
Permission to Buy Small Purchases (Oil/Spices)	0.063 (0.039)	0.044 (0.093)	0.021 (0.105)	-0.032 (0.119)	-0.031 (0.058)	(18078,18078,8540)
(Glass Bangles)	0.063 (0.039)	0.009 (0.098)	0.054 (0.109)	-0.082 (0.119)	-0.038 (0.059)	(18102,18102,8534)
(Ice-Cream)	0.063* (0.037)	0.067 (0.100)	0.001 (0.104)	-0.054 (0.117)	-0.021 (0.059)	(17234,17234,8053)

Notes: (i) Results reported are the co-efficient of the marginal effects. (ii) Robust standard errors clustered at the village level are in parentheses. (iii) $* p < 0.10; ** p < 0.05; *** p < 0.01$. (iv) N1, N2, N3 = Number of observations of Main results, Heterogeneity with Age, Heterogeneity with Religion and Higher Education respectively. (v)The dummy variable Muslim equals one if the individual is Muslim, and Treatment*Muslim checks the significance of religion in the treatment area. (vi) Higher Education is a dummy variable which represents more educated women, and Treatment*Higher Education is used to see if the effect of the program is different for someone who is more educated.

TABLE 5
Weighted Probit Regression for Socio-Economic Category (Baseline and Heterogeneity)

Dependent Variables	Panel A: (1)Treatment Effect Panel B: (2)Treatment*Age<70 and (3) Treatment Effect Panel C: (4)Treatment*Muslim and (5)Treatment*Higher Education					
	Panel A (1)	Panel B (2)	(3)	Panel C (4)	(5)	Observations (N1,N2,N3)
Involved in Major Decisions						
Build New House	0.039 (0.038)	-0.109 (0.136)	0.144 (0.146)	-0.154 (0.174)	0.188** (0.081)	(9219,9219,4500)
Purchase Goat	0.128** (0.060)	-0.156 (0.193)	0.274 (0.182)	-0.942*** (0.018)	0.029 (0.177)	(1888,1888,1046)
Purchase Cow	-0.064 (0.052)	-0.156 (0.151)	0.087 (0.144)	-0.979*** (0.005)	0.086 (0.122)	(2830,2830,1559)
Lease Land	0.019 (0.044)	0.028 (0.157)	-0.007 (0.153)	0.104 (0.178)	0.272** (0.124)	(3282.3282,1914)
Buy/Sell Land	0.083* (0.047)	-0.197 (0.152)	0.263* (0.135)	0.370*** (0.132)	0.180 (0.124)	(2483,2483,1428)

Notes: (i) Results reported are the co-efficient of the marginal effects. (ii) Robust standard errors clustered at the village level are in parentheses. (iii) $* p < 0.10; ** p < 0.05; *** p < 0.01$. (iv) N1, N2, N3 = Number of observations of Main results, Heterogeneity with Age, Heterogeneity with Religion and Higher Education respectively. (v)The dummy variable Muslim equals one if the individual is Muslim, and Treatment*Muslim checks the significance of religion in the treatment area. (vi) Higher Education is a dummy variable which represents more educated women, and Treatment*Higher Education is used to see if the effect of the program is different for someone who is more educated.

TABLE 6
Weighted Probit Regression for Socio-Cultural Category (Baseline and Heterogeneity)

Dependent Variables	Panel A: (1)Treatment Effect Panel B: (2)Treatment*Age<70 and (3) Treatment Effect Panel C: (4)Treatment*Muslim and (5)Treatment*Higher Education					
	Panel A (1)	Panel B (2)	(3)	Panel C (4)	(5)	Observations (N1,N2,N3)
Mobility:						
Hat /Bazaar (marketplace)	0.023 (0.037)	0.229*** (0.075)	-0.197** (0.086)	0.014 (0.108)	0.085 (0.059)	(18571,18571,8797)
Hospital	0.002 (0.031)	0.041 (0.081)	-0.035 (0.085)	0.060 (0.059)	0.001 (0.037)	(18530,18530,8784)
Cinema	0.019 (0.022)	-0.019 (0.073)	0.037 (0.070)	0.027 (0.094)	0.006 (0.050)	(18444,18444,8732)
Visit Other Women	-0.040* (0.022)	-0.014 (0.057)	-0.27 (0.060)	0.067 (0.045)	-0.021 (0.038)	(18535,18535,8762)
Visit Outside the Village	-0.042** (0.017)	-0.020 (0.045)	-0.023 (0.045)	0.062* (0.040)	0.028 (0.024)	(18422,18422,8707)

Notes: (i) Results reported are the co-efficient of the marginal effects. (ii) Robust standard errors clustered at the village level are in parentheses. (iii) $* p < 0.10; ** p < 0.05; *** p < 0.01$. (iv) N1, N2, N3 = Number of observations of Main results, Heterogeneity with Age, Heterogeneity with Religion and Higher Education respectively. (v) The dummy variable Muslim equals one if the individual is Muslim, and Treatment*Muslim checks the significance of religion in the treatment area. (vi) Higher Education is a dummy variable which represents more educated women, and Treatment*Higher Education is used to see if the effect of the program is different for someone who is more educated.

TABLE 7
Weighted Probit Regression for Socio-Cultural Category (Baseline and Heterogeneity)

Dependent Variables	Panel A: (1)Treatment Effect Panel B: (2)Treatment*Age<70 and (3) Treatment Effect Panel C: (4)Treatment*Muslim and (5)Treatment*Higher Education					
	Panel A (1)	Panel B (2)	(3)	Panel C (4)	(5)	Observations (N1,N2,N3)
Participated In Group Actions						
Beating Wife	0.008 (0.011)	0.053 (0.036)	-0.043 (0.036)	-0.009 (0.040)	0.007 (0.023)	(32286,32286,16016)
Divorcing Wife	0.011 (0.010)	0.035 (0.031)	-0.021 (0.030)	-0.004 (0.038)	0.010 (0.029)	(32289,32289,16016)
Proper Wages	0.019** (0.009)	0.034 (0.031)	-0.012 (0.028)	0.041 (0.035)	-0.002 (0.018)	(32283,32283,16014)
Ensuring Right Prices Paid	0.017* (0.009)	0.039 (0.029)	-0.020 (0.025)	-0.010 (0.028)	0.021 (0.028)	(32287,32287,16013)
Misuse of Relief	0.019* (0.009)	-0.001 (0.026)	0.020 (0.028)	-0.019 (0.028)	0.002 (0.021)	(32277,32277,16005)
Victim of Physical Abuse	-0.008 (0.026)	0.061 (0.069)	-0.067 (0.073)	-0.040 (0.057)	0.001 (0.035)	(18408,18408,8726)
Does Parents Choose Husband	-0.002 (0.007)	0.014 (0.022)	-0.015 (0.023)	0.010 (0.032)	-0.001 (0.016)	(32412,32412,16087)

Notes: (i) Results reported are the co-efficient of the marginal effects. (ii) Robust standard errors clustered at the village level are in parentheses. (iii) $* p < 0.10; ** p < 0.05; *** p < 0.01$. (iv) N1, N2, N3 = Number of observations of Main results, Heterogeneity with Age, Heterogeneity with Religion and Higher Education respectively. (v) The dummy variable Muslim equals one if the individual is Muslim, and Treatment*Muslim checks the significance of religion in the treatment area. (vi) Higher Education is a dummy variable which represents more educated women, and Treatment*Higher Education is used to see if the effect of the program is different for someone who is more educated.

TABLE 8
Regression for Summary Indices (Socio-Economic and Socio-Cultural)

Explanatory Variables	Dependent Variables	
	Socio-Economic Index	Socio-Cultural Index
Treat	5.117** (2.440)	-0.334 (0.352)
Muslim	4.487*** (1.419)	0.044 (0.360)
Age	-0.054 (0.123)	-0.009* (0.005)
Constant	-6.069 (4.293)	-0.256 (0.494)
Observations (N)	146	18003

Notes: (i) Results reported are the coefficients of the linear probability model. (ii) Robust standard errors clustered at the village level are in parentheses. (iii) $* p < 0.10$; $** p < 0.05$; $*** p < 0.01$. (iv) Socio-Economic Index includes 16 measures and Socio-Cultural Index includes 12 measures.

TABLE 9
Weighted Probit Regression for Attitude (Baseline)

Explanatory Variables	Dependent Variables		
	Attitude		
	Whether you or your husband now use Contraceptives (1)	Whether you are consulted before spending the money you have earned (2)	Whether husband any household member prevent you from working outside of the home (3)
Treat	0.055** (0.028)	0.0300*** (0.111)	-0.002 (0.035)
Muslim	-0.095** (0.042)	0.065 (0.113)	0.028 (0.045)
Age	-0.002*** (0.0005)	-0.003 (0.003)	-0.002*** (0.0005)
Observations (N)	18078	669	17234

Notes: (i) Results reported are the coefficients of the marginal effects. (ii) Robust standard errors clustered at the village level are in parentheses. (iii) $* p < 0.10$, $** p < 0.05$, $** p < 0.01$.

TABLE 10
Comparison between fertility rates among higher and lower educated groups

Years of Formal Education More Educated Group	Fertility Rate (Treatment)	Fertility Rate (Control)
8	1901/533 = 3.56	4563/1167 = 3.91
9	2610/718 = 3.63	5044/1327 = 3.80
10	3044/782 = 3.89	5947/1488 = 4.00
11	1199/341 = 3.51	2402/620 = 3.87
12	730/223 = 3.27	1325/363 = 3.65
Less Educated Group		
1	1329/399 = 3.33	2596/628 = 4.13
2	3159/827 =3.82	3194/810 = 3.94
3	2404/658 = 3.65	3053/752 = 4.06
4	3978/1031 = 3.85	4578/1105 = 4.14
5	5440/1459 = 3.72	6086/1510 = 4.03

Table 11. Housing Quality and General Sanitation Statistics

Dimension	Survey Questions	Control / Comparison (%)	Program / Treatment (%)	Difference in Mean (Control -Program)
Quality of Housing	1. Does this household utilize electricity?	7.86	14.35	-0.068***
		(12355)	(12846)	(0.004)
	2. Number of Rooms in the house			
	a. 1	8.79	7.48	
	b. 2	27.75	29.57	
	c. 3	33.84	34.08	-0.007ˣ
	d. 4	18.83	17.10	(0.018)
	e. 5	6.08	6.47	
	f. 6	2.44	3.11	
		(12313)	(12812)	
	3. What is the roofing type of main bed room?			
	a. Cement	0.49	1.31	-0.007***
				(0.001)
	b. Tin	95.60	94.75	0.009***
				(0.002)
	c. Bamboo	0.71	0.74	-0.001
				(0.001)
	d. Straw / Leaves	2.98	3.11	-0.003
		(12360)	(12847)	(0.002)
	4. What is the flooring type of the main Bedroom?			
	a. Cement	1.07	4.51	-0.034***
				(0.002)
	b. Dirt	98.31	94.88	0.035***
				(0.002)
	c. Wood	0.18	0.17	-0.0003
				(0.0005)
	d. Bamboo	0.09	0.22	-0.001*
		(12360)	(12847)	(0.0005)
General Sanitary Condition	1. House is surrounded by piles of trash.	42.01	40.27	0.026***
		(12337)	(12847)	(0.006)
	2. House yard is well kept and always cleaned-up	60.85	63.90	-0.029***
		(12328)	(12815)	(0.006)
	3. Where do the adult men of this household usually go to have their bowel movements?			
	a. Modern Latrine	3.09	6.34	-0.034***
				(0.003)
	b. Slab Latrine	14.80	20.24	-0.050***
				(0.005)
	c. Pit Latrine	7.04	7.44	-0.004
				(0.003)
	d. Open Latrine	48.03	45.84	0.019**
				(0.006)
	e. Hang Latrine	23.81	17.60	0.062***
				(0.005)
	f. No Latrine/ Yard / Field	3.09	2.42	0.006***
		(12360)	(12847)	(0.002)

Dimension	Survey Questions	Control / Comparison (%)	Program / Treatment (%)	Difference in Mean (Control -Program)
	4. Where do the children of this household (aged above 2 years but below 10 years) go to have their bowel movements?			
	a. Modern Latrine	2.15	4.85	-0.023***
				(0.002)
	b. Slab Latrine	12.18	15.11	-0.013**
				(0.004)
	c. Pit Latrine	6.27	5.16	0.009***
				(0.003)
	d. Open Latrine	31.22	34.89	-0.016**
				(0.005)
	e. Hang Latrine	18.27	10.20	0.071***
				(0.004)
	f. No Latrine/ Yard / Field	26.39	26.24	0.019***
		(12360)	(12847)	(0.005)
	5. What is the main source of drinking water in this household?			
	a. Tap Water	0.22	0.57	-0.003***
				(0.001)
	b. Tube Well	92.89	93.96	-0.013***
				(0.003)
	c. Regular Well	0.09	0.26	-0.002**
				(0.001)
	d. Pond	0.67	1.75	-0.007***
				(0.001)
	e. Canal	1.02	0.31	0.006***
				(0.001)
	f. River	5.11	3.15	0.019***
		(12360)	(12847)	(0.002)
	6. Where is the main water source for cleaning utensils?			
	a. Tap Water	0.13	0.70	-0.004***
				(0.001)
	b. Tube Well	19.61	19.76	-0.003
				(0.005)
	c. Regular Well	1.11	1.67	-0.007***
				(0.001)
	d. Pond	57.14	66.87	-0.097***
				(0.006)
	e. Canal	11.25	6.05	0.055***
				(0.003)
	f. River	10.76	4.86	0.059***
		(12360)	(12847)	(0.003)

Columns1 and 2: (i) Results reported represents the percentage. (ii) Number of respondents is in parentheses. (iii) $^{\times}$ = number of respondents is same for the respective survey questions. Column 3: (i) Results reported are the difference in mean. (ii) Robust standard errors are in parentheses. (iii) $* \ p < 0.10, \ ** \ p < 0.05, \ *** \ p < 0.01$.

TABLE 12
Weighted Probit Regression for Housing and Sanitation Quality (Baseline and Heterogeneity)

Dependent Variables	Panel A: (1)Treatment Effect Panel B: (2)Treatment*Age<70 and (3) Treatment Effect Panel C: (4)Treatment*Muslim and (5)Treatment*Higher Education					
	Panel A (1)	Panel B (2)	(3)	Panel C (4)	(5)	Observations (N1,N2,N3)
Household Utilize Electricity	0.039 (0.035)	0.059 (0.044)	-0.016 (0.059)	-0.040 (0.114)	0.016 (0.034)	(24141,24141,12637)
Household Surrounded by Trash	-0.025 (0.037)	0.001 (0.061)	-0.026 (0.073)	-0.009 (0.112)	-0.022 (0.041)	(24124,24124,12629)
Household Kept Clean	0.034 (0.036)	0.009 (0.065)	0.025 (0.075)	-0.004 (0.115)	0.027 (0.037)	(24102,24102,12610)

Notes: (i) Results reported are the coefficients of the marginal effects. (ii) Robust standard errors clustered at the village level are in parentheses. (iii) $* p < 0.10$, $** p < 0.05$, $*** p < 0.01$. (iv) N1, N2, N3 = Number of observations of Main results, Heterogeneity with Age, Heterogeneity with Religion and Higher Education, respectively. (v) The dummy variable Muslim equals one if the individual is Muslim, and Treatment*Muslim checks the significance of religion in the treatment area. (vi) Higher Education is a dummy variable which represents more educated women, and Treatment*Higher Education is used to see if the effect of the program is different for someone who is more educated.

TABLE 13
Weighted Ordered Logistic Regressions for Housing and Sanitation Quality (Baseline and Heterogeneity)

Dependent Variables	Panel A: (1)Treatment Effect Panel B: (2)Treatment*Age<70 and (3) Treatment Effect Panel C: (4)Treatment*Muslim and (5)Treatment*Higher Education					
	Panel A (1)	Panel B (2)	(3)	Panel C (4)	(5)	Observations (N1,N2,N3)
Number of Rooms	-0.008 (0.089)	-0.057 (0.230)	0.048 (0.245)	-0.460 (0.373)	-0.046 (0.201)	(24065,24065,12594)
Flooring Type of Main Bedroom	-0.737* (0.395)	-0.753 (0.736)	-0.042 (0.861)	-0.313 (0.817)	-0.373 (0.410)	(24085,24085,12621)
Roofing Type of Main Bedroom	-0.041 (0.264)	0.247 (0.517)	-0.282 (0.525)	-1.416 (1.822)	-0.427 (0.595)	(24136,24136,12638)
Main Source of Drinking Water	-0.910*** (0.284)	-0.110 (0.377)	-0.806* (0.432)	-0.205 (0.669)	-0.902 (0.565)	(24141,24141,12643)
Source of Water for Cleaning Utensils	-0.436** (0.182)	-0.457 (0.298)	-0.003 (0.309)	1.444*** (0.545)	0.004 (0.197)	(24104,24104,12615)
Type of Washroom used by Men	-0.387*** (0.116)	-0.468 (0.297)	0.059 (0.315)	0.285 (0.477)	-0.219 (0.188)	(24071,24071,12612)
Type of Washroom used by Women	-0.429*** (0.119)	-0.462* (0.260)	0.010 (0.286)	0.293 (0.486)	-0.235 (0.182)	(23899,23899,12520)
Type of Washroom used by Children	-0.159 (0.126)	-0.442 (0.275)	0.263 (0.314)	-0.033 (0.499)	0.125 (0.232)	(19365,19365,10034)

Notes: (i) Results reported are the coefficients of the odds ratio. (ii) Robust standard errors clustered at the village level are in parentheses. (iii) $* p < 0.10$, $** p < 0.05$, $*** p < 0.01$. (iv) N1, N2, N3 = Number of observations of Main results, Heterogeneity with Age, Heterogeneity with Religion and Higher Education, respectively. (v) The dummy variable Muslim equals one if the individual is Muslim, and Treatment*Muslim checks the significance of religion in the treatment area. (vi) Higher Education is a dummy variable which represents more educated women, and Treatment*Higher Education is used to see if the effect of the program is different for someone who is more educated.

TABLE 14
Regression for Summary Indices (Housing and Sanitation Quality)

Explanatory Variables	Dependent Variables
	Housing Quality Index
Treat	1.153*** (0.435)
Muslim	1.890** (0.864)
Age	0.027 (0.006)
Constant	-3.699*** (0.858)
Observations (N)	18942

Notes: (i) Results reported are the co-efficient of the linear probability model. (ii) Robust standard errors clustered at the village level are in parentheses. (iii) $* p < 0.10$, $** p < 0.05$, $*** p < 0.01$. (iv) Housing Quality Index includes 11 measures.

Appendix A

Summary Tables and Equations (Chapter 1)

Table A1: Imposed Tariff with and without Pollution from Consumption

Pollution from Production Only	$t = \frac{3}{80}\frac{(2\alpha - \sigma_A\beta e_A - \sigma_B\beta e_B)}{\beta}$
Pollution from Production and Consumption	$t_1 = \frac{3}{80}\frac{(2\alpha - \sigma_A\beta e_A - \sigma_B\beta e_B + 24\beta\gamma_C)}{\beta}$

Table A2: Environmental Policy Difference ($e_A - e_B$) when Pollution is Local (s = 0)

Pollution from Production Only	$(e_A - e_B) = \frac{4(d-1)[\lambda_1\sigma_A\sigma_B + \lambda_2(\sigma_A + \sigma_B) - \lambda_3]}{\sigma_B d\lambda_0} \gtrless 0$
Pollution from Production and Consumption	$(e_A^c - e_B^c) = \frac{(2d-2)(\lambda_{10}d\sigma_B^2 + \lambda_{11}\sigma_B^2 f - \lambda_{12}) + (2-2d^2)(\lambda_{13}\sigma_B f - \lambda_{14}\sigma_B)}{\sigma_B d\lambda_0} \gtrless 0$

Table A3: Welfare Difference ($W_A - W_B$) when Pollution is Local (s = 0)

Pollution from Production Only	$\hat{W} = \left\{ \underset{>0}{(PS_A - PS_B)} + \underset{\leqslant 0}{(\Psi_B - \Psi_A)} \right\} > 0,$
Pollution from Production and Consumption	$\hat{W} = \left\{ \underset{\leqslant 0}{(PS_A - PS_B} + \underset{>0}{(\Psi_B - \Psi_A)} \right\} \lessgtr 0,$

Table A4: Welfare of Country C with and without Pollution from Consumption

Pollution from Production Only	$W_C \equiv CS_C + TR = \frac{1}{162}\frac{(6\alpha - 8\beta t - 3\sigma_A\beta e_A - 3\sigma_B\beta e_B)(6\alpha + 10\beta t - 3\sigma_A\beta e_A - 3\sigma_B\beta e_B)}{\beta}$
Pollution from Production and Consumption	$W_C \equiv CS_C + TR - \gamma_C D_C = \frac{1}{162}\frac{(6\alpha - 8\beta t_1 - 3\sigma_A\beta e_A^c - 3\sigma_B\beta e_B^c)(6\alpha + 10\beta t_1 - 3\sigma_A\beta e_A^c - 3\sigma_B\beta e_B^c)}{\beta} - \gamma_C D_C$

The following equations shows the policy and welfare gaps when pollution is transboundary, i.e., $s = 1$:

Environmental policy gap (production only):

$$(e_A - e_B) = \frac{(1-d)[\lambda_{15}\sigma_A\sigma_B - \lambda_{16}(\sigma_A + \sigma_B) + \lambda_{17}]}{\sigma_B[\lambda_{18}\sigma_A^2 - \lambda_{19}(\sigma_A + \sigma_B) + \lambda_{20}d - \lambda_{21}(1+d^2)]} \gtrless 0 \tag{46}$$

Environmental policy gap (production and consumption):

$$(e_A^c - e_B^c) = \frac{(1-d)(\lambda_{22}d\sigma_B^2 + \lambda_{23} - \lambda_{24}d\sigma_B^2 f) + (1-d^2)(\lambda_{25}\sigma_B f - \lambda_{26}\sigma_B)}{\sigma_B[\lambda_{18}\sigma_A^2 - \lambda_{19}(\sigma_A + \sigma_B) + \lambda_{20}d - \lambda_{21}(1+d^2)]} \gtrless 0 \tag{47}$$

Welfare gap (production only):

$$\hat{W} = \frac{\lambda_{27}(d-1)[9d\sigma_B - \lambda_{28}(1+d)][(-\lambda_{29}d\sigma_B)(1+d) + \lambda_{30}d - \lambda_{31}(1+d^2) + \lambda_{32}d^2\sigma_B^2]}{[\lambda_{18}\sigma_A^2 - \lambda_{19}(\sigma_A + \sigma_B) + \lambda_{20}d - \lambda_{21}(1+d^2)]^2} \gtrless 0 \tag{48}$$

Welfare gap (production and consumption):

$$\hat{W} = \frac{\lambda_{33}(1-d)[d^2\sigma_B^2(\lambda_{34}f + \lambda_{35}) - (1+d)(\lambda_{36}d\sigma_B f + \lambda_{37}d\sigma_B) - \lambda_{38}(1+d^2) + \lambda_{39}d] * W}{[\lambda_{18}\sigma_A^2 - \lambda_{19}(\sigma_A + \sigma_B) + \lambda_{20}d - \lambda_{21}(1+d^2)]^2} \gtrless 0 \tag{49}$$

where

$$W = [d\sigma_B(\lambda_{40}f + \lambda_{41}) + \lambda_{42}(1+d)] > 0$$

The following equations represents the environmental policy difference within the exporting countries after consumption is considered.

Policy change in country *A* ($s = 0$):

$$(e_A - e_A^c) = \frac{\lambda_{43}[\lambda_{44} - d\sigma_B(\lambda_{45} - \lambda_{46}\sigma_B + \lambda_{47}f - \lambda_{47}\sigma_B f) - \lambda_{48}\sigma_B f - \lambda_{49}\sigma_B]}{\sigma_B d\lambda_0} \gtrless 0 \tag{50}$$

Policy change in country *B* ($s = 0$):

$$(e_B - e_B^c) = \frac{\lambda_{43}[\lambda_{44} - \sigma_B(\lambda_{45} + \lambda_{47}f) + d\sigma_B^2(\lambda_{46} + \lambda_{47}f) - d\sigma_B(\lambda_{48}f + \lambda_{49})]}{\sigma_B d\lambda_0} \gtrless 0 \tag{51}$$

Policy change in country *A* (*s* = 1):

$$(e_A - e_A^c) = \frac{4[\sigma_B f(\lambda_{52} d\sigma_B - \lambda_{50} d - \lambda_{56} d) - \sigma_B(\lambda_{54} + \lambda_{51} d - \lambda_{57} d\sigma_B) + \lambda_{55} d + \lambda_{53}]}{\sigma_B[\lambda_{18}\sigma_A^2 - \lambda_{19}(\sigma_A + \sigma_B) + \lambda_{20} d - \lambda_{21}(1 + d^2)]} \gtrless 0 \qquad (52)$$

Policy change in country *B* (*s* = 1):

$$(e_B - e_B^c) = \frac{4[d\sigma_B f(\lambda_{52} d\sigma_B - \lambda_{50} - \lambda_{56} d) + d\sigma_B(\lambda_{57} d\sigma_B - \lambda_{51} - \lambda_{54} d) + \lambda_{53} d + \lambda_{55}]}{\sigma_B[\lambda_{18}\sigma_A^2 - \lambda_{19}(\sigma_A + \sigma_B) + \lambda_{20} d - \lambda_{21}(1 + d^2)]} \gtrless 0 \qquad (53)$$

Lambda Values

$\lambda_1 = 26447$	$\lambda_2 = 31360$	$\lambda_3 = 69160$	$\lambda_4 = 433771520$	$\lambda_5 = 98344960$
$\lambda_6 = 250525201$	$\lambda_7 = 225058988$	$\lambda_8 = 83448854$	$\lambda_9 = 433771520$	$\lambda_{10} = 94022$
$\lambda_{11} = 38160$	$\lambda_{12} = 95760$	$\lambda_{13} = 9720$	$\lambda_{14} = 28800$	$\lambda_{15} = 30793$
$\lambda_{16} = 45940$	$\lambda_{17} = 55120$	$\lambda_{18} = 85913$	$\lambda_{19} = 119960$	$\lambda_{20} = 195560$
$\lambda_{21} = 14580$	$\lambda_{22} = 10229$	$\lambda_{23} = 38160$	$\lambda_{24} = 19080$	$\lambda_{25} = 4860$
$\lambda_{26} = 28980$	$\lambda_{27} = 84240$	$\lambda_{28} = 13$	$\lambda_{29} = 1729$	$\lambda_{30} = 3160$
$\lambda_{31} = 540$	$\lambda_{32} = 1378$	$\lambda_{33} = 240$	$\lambda_{34} = 6201$	$\lambda_{35} = 16006$
$\lambda_{36} = 4680$	$\lambda_{37} = 18281$	$\lambda_{38} = 4860$	$\lambda_{39} = 28440$	$\lambda_{40} = 477$
$\lambda_{41} = 109$	$\lambda_{42} = 243$	$\lambda_{43} = 8$	$\lambda_{44} = 10640$	$\lambda_{45} = 12901$
$\lambda_{46} = 10282$	$\lambda_{47} = 9540$	$\lambda_{48} = 2430$	$\lambda_{49} = 8480$	$\lambda_{50} = 5985$
$\lambda_{51} = 7760$	$\lambda_{52} = 4770$	$\lambda_{53} = 5320$	$\lambda_{54} = 4240$	$\lambda_{55} = 1080$
$\lambda_{56} = 1215$	$\lambda_{57} = 5141$			

Appendix B: Dimensions of "empowerment" proposed by selected authors

1996	**CIDA**	Legal empowerment Political empowerment Economic empowerment Social empowerment
	Jejeebhoy 1995	Knowledge autonomy Decision-making autonomy Physical autonomy Emotional autonomy Economic and social autonomy and self-reliance
	Kishor 2000a	Financial autonomy Participation in the modern sector Lifetime exposure to employment Sharing of roles and decision-making Family structure amenable to empowerment Equality in marriage (lack of) Devaluation of women Women's emancipation Marital advantage Traditional marriage
	Schuler and Hashemi 1993	Mobility and visibility
	Hashemi et al. 1996	Economic security
	Schuler et al. 1996	Status and decision-making power within the household
	Schuler et al. 1997	Ability to interact effectively in the public sphere Participation in non-family groups
	Stromquist 1995	Cognitive Psychological Economic Political
	A. Sen 1999	Absence of gender inequality in: Mortality rates Natality rates Access to basic facilities such as schooling Access to professional training and higher education Employment Property ownership Household work and decision-making

Source: "Measuring Women's Empowerment as a Variable in International Development," by Anju Malhotra, Sidney Ruth Schuler and Carol Boender, 2002, World Bank Workshop on Poverty and Gender: New Perspectives. Gender and Development Group, World Bank, Washington, DC.

Appendix C (Chapter 2)

Weighted Probit Regression for Socio-Economic Category (Baseline without Household and Village Controls)

TABLE C1

Explanatory Variables	Dependent Variables			
	Productive Assets (1)	Small Purchases by Own Money (2)		
		Oil/Spices (2.1)	Glass Bangles (2.2)	Ice-cream (2.3)
Treat	0.028	0.012	0.013	0.009
	(0.022)	(0.009)	(0.010)	(0.010)
Muslim	0.049*	0.013	0.008	0.012
	(0.025)	(0.011)	(0.013)	(0.013)
Age	-0.001	0.0005	0.0005*	0.0002
	(0.0004)	(0.0002)	(0.0002)	(0.0002)
Observations (N)	18537	32412	32412	32412

TABLE C2

Explanatory Variables	Dependent Variables			
	Cash Savings (3)	Large Purchases by Own Money (4)		
		Betel Leaf/Nut (4.1)	Sarees (4.2)	Daily Bazaar (4.3)
Treat	0.014	0.022**	0.001	0.009
	(0.023)	(0.011)	(0.008)	(0.009)
Muslim	0.015	0.021**	0.010	0.017*
	(0.023)	(0.009)	(0.007)	(0.009)
Age	-0.0003	0.0001	0.00001	-0.00005
	(0.0005)	(0.0003)	(0.0002)	(0.0002)
Observations (N)	18599	32412	32412	32412

Notes: (i) Results reported are the coefficients (the change in probability) of the linear probability model. (ii) Robust standard errors clustered at the village level are in parentheses. (iii) $* p < 0.10$; $** p < 0.05$; $*** p < 0.01$.

Weighted Probit Regression for Socio- Economic Category
(Baseline without Household and Village Controls)

TABLE C3

Explanatory Variables	Dependent Variables		
	Permission to Buy Small Purchases (5)		
	Oil / Spices (5.1)	Glass Bangles (5.2)	Ice-cream (5.3)
Treat	0.062 (0.039)	0.063 (0.039)	0.063* (0.037)
Muslim	-0.147*** (0.049)	-0.148*** (0.049)	-0.134*** (0.045)
Age	-0.0001 (0.0006)	-0.001 (0.001)	-0.0002 (0.0006)
Observations (N)	18078	18102	17234

TABLE C4

Explanatory Variables	Dependent Variables: Involved in Major Decisions (6)				
	Build New House (6.1)	Purchase Goat (6.2)	Purchase Cow (6.3)	Lease Land (6.4)	Buy/Sell Land (6.5)
Treat	0.039 (0.038)	0.134** (0.061)	-0.059 (0.052)	0.018 (0.044)	0.084* (0.047)
Muslim	0.133** (0.045)	0.210** (0.067)	-0.004 (0.114)	0.100 (0.067)	0.078 (0.079)
Age	-0.001 (0.001)	-0.003* (0.002)	-0.002 (0.001)	-0.002 (0.001)	-0.0004 (0.001)
Observations (N)	9219	1888	2830	3282	2483

Notes: (i) Results reported are the coefficients (the change in probability) of the linear probability model. (ii) Robust standard errors clustered at the village level are in parentheses. (iii) $* p < 0.10$; $** p < 0.05$; $*** p < 0.01$.

Weighted Probit Regression for Socio-Cultural Category (Baseline without Household and Village Controls)

TABLE C5

Explanatory Variables	Dependent Variables: Mobility (1)				
	Hat /Bazaar (marketplace) (1.1)	**Hospital (1.2)**	**Cinema (1.3)**	**Visit Other Women (1.4)**	**Visit Outside the Village (1.5)**
Treat	0.023 (0.037)	0.002 (0.031)	0.021 (0.022)	-0.039* (0.022)	-0.041** (0.018)
Muslim	0.017 (0.044)	0.065 (0.046)	0.003 (0.040)	-0.011 (0.021)	-0.015 (0.019)
Age	-0.001 (0.006)	-0.0002 (0.0005)	-0.001 (0.0005)	-0.004 (0.0004)	-0.006* (0.0006)
Observations (N)	18571	18530	18444	18535	18422

TABLE C6

Explanatory Variables	Dependent Variables: Participated In Group Actions (2)				
	Beating Wife (2.1)	**Divorcing Wife (2.2)**	**Proper Wages (2.3)**	**Ensuring Right Prices Paid (2.4)**	**Misuse of Relief (2.5)**
Treat	0.008 (0.037)	0.011 (0.010)	0.019** (0.009)	0.017* (0.009)	0.019* (0.009)
Muslim	0.050*** (0.009)	0.045*** (0.009)	0.027** (0.008)	0.020** (0.009)	0.019** (0.008)
Age	0.0002 (0.0002)	0.0002 (0.0001)	0.0001 (0.0001)	-0.00001 (0.0001)	0.0001 (0.0002)
Observations (N)	32286	32289	32283	32287	32277

Notes: (i) Results reported are the coefficients (the change in probability) of the linear probability model. (ii) Robust standard errors clustered at the village level are in parentheses. (iii) $* p < 0.10$; $** p < 0.05$; $*** p < 0.01$.

Weighted Probit Regression for Socio-Cultural Category (Baseline without Household and Village Controls)

TABLE C7

Explanatory Variables	Dependent Variables	
	Victim of Physical Abuse (3)	**Does Parents Choose Husband (4)**
Treat	-0.008 (0.026)	-0.002 (0.007)
Muslim	0.049 (0.033)	0.012 (0.008)
Age	-0.001 (0.0005)	-0.0001 (0.0001)
Observations (N)	18408	32412

Notes: (i) Results reported are the coefficients (the change in probability) of the linear probability model. (ii) Robust standard errors clustered at the village level are in parentheses. (iii) $* p < 0.10$; $** p < 0.05$; $*** p < 0.01$.

Weighted Probit Regression for Socio- Economic Category (Heterogeneity with Predetermined Variables)

TABLE C8

Explanatory Variables	Dependent Variables			
	Productive Assets (1)	Small Purchases by Own Money (2)		
		Oil/Spices (2.1)	Glass Bangles (2.2)	Ice-cream (2.3)
Treat	-0.175***	0.027	0.010	-0.004
	(0.060)	(0.035)	(0.038)	(0.042)
Treat*Age<70	0.204***	-0.016	0.003	0.014
	(0.055)	(0.036)	(0.039)	(0.043)
Age<70	-0.054	-0.021	-0.039	-0.034
	(0.052)	(0.028)	(0.036)	(0.036)
Muslim	0.052***	0.013	0.008	-0.034
	(0.025)	(0.011)	(0.013)	(0.037)
Observations (N)	18537	32412	32412	32412

TABLE C9

Explanatory Variables	Dependent Variables			
	Cash Savings (3)	Large Purchases by Own Money (4)		
		Betel Leaf/Nut (4.1)	Sarees (4.2)	Daily Bazaar (4.3)
Treat	0.076	-0.027	-0.066**	-0.031
	(0.050)	(0.027)	(0.028)	(0.022)
Treat*Age<70	-0.070	0.052*	0.068***	0.042*
	(0.057)	(0.027)	(0.027)	(0.021)
Age<70	0.011	-0.039	-0.041**	-0.016
	(0.026)	(0.030)	(0.025)	(0.020)
Muslim	0.017	0.021**	0.009	0.016*
	(0.022)	(0.009)	(0.007)	(0.008)
Observations (N)	18599	32412	32412	32412

Notes: (i) Results reported are the coefficients of the marginal effects. (ii) Robust standard errors clustered at the village level are in parentheses. (iii) $* p < 0.10$; $** p < 0.05$; $*** p < 0.01$.

Weighted Probit Regression for Socio-Economic Category (Heterogeneity with Predetermined Variables)

TABLE C10

Explanatory Variables	Dependent Variables		
	Permission to Buy Small Purchases (5)		
	Oil / Spices (5.1)	Glass Bangles (5.2)	Ice-cream (5.3)
Treat	0.021 (0.105)	0.054 (0.109)	0.001 (0.104)
Treat*Age<70	0.044 (0.093)	0.009 (0.098)	0.067 (0.100)
Age<70	0.062 (0.058)	0.075 (0.065)	-0.005 (0.068)
Muslim	-0.146*** (0.049)	-0.147*** (0.048)	-0.133*** (0.045)
Observations (N)	18078	18102	17234

TABLE C11

Explanatory Variables	Dependent Variables: Involved in Major Decisions (6)				
	Build New House (6.1)	Purchase Goat (6.2)	Purchase Cow (6.3)	Lease Land (6.4)	Buy/Sell Land (6.5)
Treat	0.144 (0.146)	0.274 (0.182)	0.087 (0.144)	-0.007 (0.153)	0.263* (0.135)
Treat*Age<70	-0.109 (0.136)	-0.156 (0.193)	-0.156 (0.151)	0.028 (0.157)	-0.197 (0.152)
Age<70	0.024 (0.081)	0.194* (0.081)	0.096 (0.084)	0.069 (0.077)	0.097 (0.065)
Muslim	0.133** (0.045)	0.213** (0.064)	-0.006 (0.114)	0.103 (0.065)	0.079 (0.079)
Observations (N)	9219	1888	2830	3282	2483

Notes: (i) Results reported are the coefficients of the marginal effects. (ii) Robust standard errors clustered at the village level are in parentheses. (iii) $* p < 0.10$; $** p < 0.05$; $*** p < 0.01$.

Weighted Probit Regression for Socio-Cultural Category (Heterogeneity with Predetermined Variables)

TABLE C12

Explanatory Variables	Dependent Variables: Mobility (1)				
	Hat /Bazaar (marketplace) (1.1)	**Hospital (1.2)**	**Cinema (1.3)**	**Visit Other Women (1.4)**	**Visit Outside the Village (1.5)**
Treat	-0.197**	-0.035	0.037	-0.027	-0.023
	(0.086)	(0.086)	(0.069)	(0.060)	(0.045)
Treat*Age<70	0.229***	0.041	-0.018	-0.014	-0.020
	(0.075)	(0.081)	(0.073)	(0.057)	(0.045)
Age<70	-0.056	0.008	0.048	0.019	0.036
	(0.059)	(0.064)	(0.047)	(0.052)	(0.045)
Muslim	0.018	0.065	0.004	-0.010	-0.014
	(0.044)	(0.046)	(0.039)	(0.021)	(0.018)
Observations (N)	18571	18530	18444	18535	18422

TABLE C13

Explanatory Variables	Dependent Variables: Participated In Group Actions (2)				
	Beating Wife (2.1)	**Divorcing Wife (2.2)**	**Proper Wages (2.3)**	**Ensuring Right Prices Paid (2.4)**	**Misuse of Relief (2.5)**
Treat	-0.042	-0.021	-0.012	-0.021	0.020
	(0.036)	(0.029)	(0.028)	(0.025)	(0.027)
Treat*Age<70	0.053	0.034	0.034	0.039	-0.001
	(0.036)	(0.031)	(0.031)	(0.029)	(0.026)
Age<70	-0.035	-0.022	-0.012	0.006	-0.00001
	(0.030)	(0.023)	(0.025)	(0.021)	(0.019)
Muslim	0.050***	0.045***	0.027**	0.020**	0.019**
	(0.009)	(0.009)	(0.008)	(0.009)	(0.008)
Observations (N)	32286	32289	32283	32287	32277

Notes: (i) Results reported are the coefficients of the marginal effects. (ii) Robust standard errors clustered at the village level are in parentheses. (iii) $*$ $p < 0.10$; $**$ $p < 0.05$; $***$ $p < 0.01$.

Weighted Probit Regression for Socio-Cultural Category (Heterogeneity with Predetermined Variables)

TABLE C14

Explanatory Variables	Dependent Variables	
	Victim of Physical Abuse (3)	**Does Parents Choose Husband (4)**
Treat	-0.067 (0.073)	-0.015 (0.024)
Treat*Age<70	0.061 (0.069)	0.0143 (0.022)
Age<70	0.022 (0.057)	-0.019 (0.018)
Muslim	0.051 (0.032)	0.012 (0.008)
Observations (N)	18408	32412

TABLE C15

Explanatory Variables	Dependent Variables			
	Productive Assets (1)	**Small Purchases by Own Money (2)**		
		Oil/Spices (2.1)	**Glass Bangles (2.2)**	**Ice-cream (2.3)**
Treat	0.217*** (0.059)	-0.00001 (0.022)	-0.031 (0.033)	-0.010 (0.036)
Age	-0.001*** (0.0005)	-0.0003 (0.0002)	-0.0003 (0.0003)	-0.0005 (0.0002)
Muslim	0.147*** (0.022)	-0.019 (0.019)	-0.072** (0.046)	-0.034 (0.040)
Treat*Muslim	-0.188*** (0.062)	0.028 (0.025)	0.063* (0.037)	0.034 (0.039)
Higher Education	0.019 (0.029)	-0.011 (0.013)	-0.016 (0.013)	-0.003 (0.014)
Treat*Higher Education	0.007 (0.041)	0.00008 (0.016)	-0.00005 (0.017)	-0.010 (0.018)
Observations (N)	8770	16087	16087	16087

Notes: (i) Results reported are the coefficients of the marginal effects. (ii) Robust standard errors clustered at the village level are in parentheses. (iii) $* p < 0.10$; $** p < 0.05$; $*** p < 0.01$.

Weighted Probit Regression for Socio-Economic Category (Heterogeneity with Predetermined Variables)

TABLE C16

Explanatory Variables	Dependent Variables			
	Cash Savings (3)	Large Purchases by Own Money (4)		
		Betel Leaf/Nut (4.1)	Sarees (4.2)	Daily Bazaar (4.3)
Treat	-0.010 (0.076)	0.027 (0.027)	-0.012 (0.022)	0.001 (0.017)
Age	-0.0002 (0.0007)	-0.0005 (0.0003)	-0.0006** (0.0002)	-0.001*** (0.0002)
Muslim	-0.055 (0.075)	0.004 (0.016)	-0.022 (0.028)	0.003 (0.012)
Treat*Muslim	-0.002 (0.076)	-0.009 (0.027)	0.026 (0.024)	0.011 (0.019)
Higher Education	-0.007 (0.024)	-0.015 (0.011)	-0.008 (0.010)	-0.018* (0.009)
Treat*Higher Education	0.005 (0.040)	0.029* (0.019)	0.015 (0.018)	0.024 (0.017)
Observations (N)	8798	16087	16087	16087

Notes: (i) Results reported are the coefficients of the marginal effects. (ii) Robust standard errors clustered at the village level are in parentheses. (iii) $* p < 0.10$; $** p < 0.05$; $*** p < 0.01$.

Weighted Probit Regression for Socio-Economic Category (Heterogeneity with Predetermined Variables)

TABLE C17

Explanatory Variables	Dependent Variables		
	Permission to Buy Small Purchases (5)		
	Oil / Spices (5.1)	Glass Bangles (5.2)	Ice-cream (5.3)
Treat	0.086 (0.112)	0.139 (0.111)	0.111 (0.109)
Age	0.0001 (0.001)	-0.0001 (0.0009)	0.0003 (0.001)
Muslim	-0.084 (0.098)	-0.043 (0.102)	-0.034 (0.101)
Treat*Muslim	-0.032 (0.119)	-0.083 (0.119)	-0.054 (0.117)
Higher Education	-0.041 (0.046)	-0.042 (0.048)	-0.034 (0.051)
Treat*Higher Education	-0.031 (0.058)	-0.038 (0.058)	-0.021 (0.059)
Observations (N)	8540	8534	8053

Notes: (i) Results reported are the coefficients of the marginal effects. (ii) Robust standard errors clustered at the village level are in parentheses. (iii) $* p < 0.10$; $** p < 0.05$; $*** p < 0.01$.

Weighted Probit Regression for Socio-Economic Category (Heterogeneity with Predetermined Variables)

TABLE C18

Explanatory Variables	Dependent Variables: Involved in Major Decisions (6)				
	Build New House (6.1)	**Purchase Goat (6.2)**	**Purchase Cow (6.3)**	**Lease Land (6.4)**	**Buy/Sell Land (6.5)**
Treat	0.181 (0.173)	0.954*** (0.010)	0.988*** (0.005)	-0.118 (0.174)	-0.336** (0.153)
Age	-0.001 (0.001)	-0.002 (0.002)	-0.001 (0.001)	-0.001 (0.001)	0.001 (0.001)
Muslim	0.205* (0.085)	0.365*** (0.044)	0.271*** (0.034)	0.086 (0.103)	-0.273* (0.177)
Treat*Muslim	-0.154 (0.173)	-0.942*** (0.018)	-0.979*** (0.005)	0.105 (0.178)	0.370*** (0.132)
Higher Education	-0.100** (0.049)	0.0008 (0.122)	0.070 (0.073)	-0.126** (0.061)	-0.130* (0.074)
Treat*Higher Education	0.188*** (0.082)	0.029 (0.177)	0.086 (0.122)	0.272** (0.124)	0.180 (0.124)
Observations (N)	4500	1046	1559	1914	1428

Notes: (i) Results reported are the coefficients of the marginal effects. (ii) Robust standard errors clustered at the village level are in parentheses. (iii) $* p < 0.10$; $** p < 0.05$; $*** p < 0.01$.

Weighted Probit Regression for Socio-Cultural Category (Heterogeneity with Predetermined Variables)

Table C19

Explanatory Variables	Dependent Variables: Mobility (1)				
	Hat /Bazaar (marketplace) (1.1)	**Hospital / Clinic (1.2)**	**Cinema (1.3)**	**Visit Other Women (1.4)**	**Visit Outside the Village (1.5)**
Treat	-0.028 (0.112)	-0.053 (0.053)	-0.002 (0.093)	-0.115*** (0.041)	-0.117*** (0.039)
Age	-0.0001 (0.001)	0.001 (0.0005)	0.0002 (0.001)	-0.00003 (0.0005)	-0.0001 (0.0003)
Muslim	0.012 (0.084)	-0.043 (0.033)	-0.066 (0.062)	-0.073*** (0.022)	-0.052** (0.017)
Treat*Muslim	0.014 (0.107)	0.060 (0.059)	0.027 (0.094)	0.066 (0.045)	0.062* (0.040)
Higher Education	0.015 (0.046)	0.007 (0.027)	0.068* (0.037)	0.014 (0.024)	-0.050** (0.025)
Treat*Higher Education	0.085 (0.059)	0.001 (0.037)	0.006 (0.050)	-0.021 (0.038)	0.028 (0.023)
Observations (N)	8797	8784	8732	8762	8707

Notes: (i) Results reported are the coefficients of the marginal effects. (ii) Robust standard errors clustered at the village level are in parentheses. (iii) $*$ $p < 0.10$; $**$ $p < 0.05$; $***$ $p < 0.01$.

Weighted Probit Regression for Socio- Cultural Category (Heterogeneity with Predetermined Variables)

TABLE C20

Explanatory Variables	Dependent Variables: Participated In Group Actions (2)				
	Beating Wife (2.1)	**Divorcing Wife (2.2)**	**Proper Wages (2.3)**	**Ensuring Right Prices Paid (2.4)**	**Misuse of Relief (2.5)**
Treat	0.015 (0.037)	0.013 (0.034)	-0.005 (0.032)	0.028 (0.028)	0.046* (0.026)
Age	0.0006** (0.0002)	0.0006** (0.0002)	0.0005 (0.002)	0.0003 (0.0002)	0.0003 (0.0003)
Muslim	0.058** (0.020)	0.058*** (0.016)	0.015 (0.022)	0.030 (0.015)	0.032* (0.014)
Treat*Muslim	-0.009 (0.040)	-0.004 (0.038)	0.041 (0.035)	-0.010 (0.028)	-0.019 (0.028)
Higher Education	0.024 (0.018)	0.023 (0.019)	0.025** (0.010)	-0.003 (0.014)	0.013 (0.014)
Treat*Higher Education	0.007 (0.023)	0.010 (0.029)	-0.002 (0.018)	0.020 (0.028)	0.002 (0.021)
Observations (N)	16016	16016	16014	16013	16005

TABLE C21

Explanatory Variables	Dependent Variables	
	Victim of Physical Abuse (3)	**Does Parents Choose Husband (4)**
Treat	0.019 (0.053)	-0.014 (0.034)
Age	-0.001 (0.0005)	0.000007 (0.0002)
Muslim	0.044 (0.034)	0.008 (0.025)
Treat*Muslim	-0.040 (0.057)	0.010 (0.032)
Higher Education	-0.021 (0.028)	0.007 (0.011)
Treat*Higher Education	0.001 (0.035)	-0.001 (0.016)
Observations (N)	8726	16087

Notes: (i) Results reported are the coefficients of the marginal effects. (ii) Robust standard errors clustered at the village level are in parentheses. (iii) $* p < 0.10$; $** p < 0.05$; $*** p < 0.01$.

Weighted Probit Regression for Socio-Economic Category (Heterogeneity with Household Controls)

TABLE C22

Explanatory Variables	Dependent Variables			
	Productive Assets (1)	Small Purchases by Own Money (2)		
		Oil/Spices (2.1)	Glass Bangles (2.2)	Ice-cream (2.3)
Treat	-0.258***	0.026	-0.016	-0.015
	(0.089)	(0.031)	(0.033)	(0.040)
Treat*Age<70	0.297***	0.0002	0.043	0.034
	(0.083)	(0.031)	(0.034)	(0.040)
Age<70	-0.106*	0.006	-0.032	-0.007
	(0.063)	(0.019)	(0.032)	(0.028)
Muslim	0.066***	0.004	-0.011	-0.005
	(0.023)	(0.013)	(0.019)	(0.018)
Years of Education	0.003	-0.001	-0.001	-0.001
	(0.003)	(0.001)	(0.001)	(0.001)
Unmarried Female Head	-0.048	0.206***	0.251***	0.259***
	(0.046)	(0.065)	(0.070)	(0.067)
Married Female Head	0.032	-0.002	-0.005	0.001
	(0.029)	(0.008)	(0.008)	(0.009)
Husband Absent NH	0.014	0.010	0.009	0.010
	(0.016)	(0.008)	(0.008)	(0.009)
Observations (N)	8770	16087	16087	16087

Notes: (i) Results reported are the coefficients (the change in probability) of the linear probability model. (ii) Robust standard errors clustered at the village level are in parentheses. (iii) $* p < 0.10$; $** p < 0.05$; $*** p < 0.01$.

Weighted Probit Regression for Socio-Economic Category (Heterogeneity with Household Controls)

TABLE C23

Explanatory Variables	Dependent Variables			
	Cash Savings (3)	Large Purchases by Own Money (4)		
		Betel Leaf/Nut (4.1)	Sarees (4.2)	Daily Bazaar (4.3)
Treat	0.108 (0.082)	-0.001 (0.031)	-0.036 (0.031)	-0.032 (0.035)
Treat*Age<70	-0.132 (0.101)	0.031 (0.032)	0.055* (0.034)	0.053 (0.037)
Age<70	0.037 (0.049)	0.004 (0.019)	-0.003 (0.018)	0.001 (0.016)
Muslim	-0.048 (0.038)	-0.004 (0.018)	-0.001 (0.009)	0.009 (0.008)
Years of Education	0.002 (0.003)	-0.001 (0.001)	0.0001 (0.001)	-0.001 (0.001)
Unmarried Female Head	-0.042 (0.039)	0.196*** (0.067)	0.216*** (0.075)	0.174*** (0.054)
Married Female Head	-0.011 (0.026)	0.002 (0.007)	0.011** (0.006)	0.007 (0.006)
Husband Absent NH	-0.008 (0.021)	0.012* (0.006)	0.020*** (0.006)	0.016*** (0.005)
Observations (N)	8798	16087	16087	16087

Notes: (i) Results reported are the coefficients (the change in probability) of the linear probability model. (ii) Robust standard errors clustered at the village level are in parentheses. (iii) $* p < 0.10$; $** p < 0.05$; $*** p < 0.01$.

Weighted Probit Regression for Socio-Economic Category (Heterogeneity with Household Controls)

TABLE C24

Explanatory Variables	Dependent Variables		
	Permission to Buy Small Purchases (5)		
	Oil / Spices (5.1)	Glass Bangles (5.2)	Ice-cream (5.3)
Treat	-0.134 (0.135)	-0.070 (0.151)	-0.091 (0.142)
Treat*Age<70	0.189 (0.116)	0.127 (0.133)	0.153 (0.128)
Age<70	-0.082 (0.059)	-0.027 (0.086)	-0.073 (0.083)
Muslim	-0.113** (0.055)	-0.111** (0.053)	-0.082 (0.055)
Years of Education	-0.010** (0.005)	-0.011** (0.005)	-0.008 (0.005)
Unmarried Female Head	-0.259*** (0.079)	-0.391*** (0.049)	-0.270*** (0.044)
Married Female Head	-0.021 (0.033)	-0.012 (0.033)	-0.011 (0.033)
Husband Absent NH	-0.020 (0.023)	-0.016 (0.022)	-0.014 (0.023)
Observations (N)	8540	8534	8053

Notes: (i) Results reported are the coefficients (the change in probability) of the linear probability model. (ii) Robust standard errors clustered at the village level are in parentheses. (iii) $* p < 0.10$; $** p < 0.05$; $*** p < 0.01$.

Weighted Probit Regression for Socio-Economic Category (Heterogeneity with Household Controls)

TABLE C25

Explanatory Variables	Dependent Variables: Involved in Major Decisions (6)				
	Build New House (6.1)	**Purchase Goat (6.2)**	**Purchase Cow (6.3)**	**Lease Land (6.4)**	**Buy/Sell Land (6.5)**
Treat	0.370**	0.339	0.166	0.112	0.299
	(0.147)	(0.239)	(0.171)	(0.191)	(0.172)
Treat*Age<70	-0.297*	-0.095	-0.201	-0.051	-0.199
	(0.157)	(0.282)	(0.170)	(0.197)	(0.218)
Age<70	0.126	0.203	0.126	0.086	0.072
	(0.083)	(0.139)	(0.091)	(0.110)	(0.127)
Muslim	0.123**	0.224	-0.349**	0.094	0.100
	(0.049)	(0.123)	(0.158)	(0.066)	(0.056)
Years of Education	-0.005	0.002	0.015*	-0.009	0.003
	(0.005)	(0.016)	(0.008)	(0.008)	(0.007)
Unmarried Female Head	0.335***	0.047	-0.149*	0.381**	0.103
	(0.098)	(0.160)	(0.058)	(0.193)	(0.136)
Married Female Head	0.107**	0.104	0.075	0.079	0.122
	(0.052)	(0.077)	(0.066)	(0.075)	(0.095)
Husband Absent NH	0.076**	0.125**	0.051	0.036	0.069
	(0.029)	(0.049)	(0.035)	(0.034)	(0.052)
Observations (N)	4500	1046	1559	1914	1428

Notes: (i) Results reported are the coefficients (the change in probability) of the linear probability model. (ii) Robust standard errors clustered at the village level are in parentheses. (iii) $* p < 0.10$; $** p < 0.05$; $*** p < 0.01$.

Weighted Probit Regression for Socio-Cultural Category (Heterogeneity with Household Controls)

TABLE C26

Explanatory Variables	Dependent Variables: Mobility (1)				
	Hat /Bazaar (marketplace) (1.1)	**Hospital (1.2)**	**Cinema (1.3)**	**Visit Other Women (1.4)**	**Visit Outside the Village (1.5)**
Treat	-0.243***	0.048	0.055	0.030	0.003
	(0.087)	(0.090)	(0.125)	(0.055)	(0.037)
Treat*Age<70	0.265***	-0.044	-0.037	-0.095*	-0.048
	(0.086)	(0.083)	(0.128)	(0.054)	(0.037)
Age<70	-0.103*	0.017	-0.073	0.057	0.016
	(0.056)	(0.065)	(0.095)	(0.048)	(0.034)
Muslim	0.012	-0.003	-0.037	-0.346*	-0.016
	(0.050)	(0.035)	(0.064)	(0.019)	(0.017)
Years of Education	0.008	0.001	0.012***	0.001	-0.003
	(0.005)	(0.003)	(0.004)	(0.003)	(0.002)
Unmarried Female Head	-0.019	0.049	-0.059	0.051	0.057***
	(0.063)	(0.030)	(0.065)	(0.029)	(0.009)
Married Female Head	0.055*	0.013	-0.009	-0.025	-0.031
	(0.031)	(0.019)	(0.024)	(0.029)	(0.023)
Husband Absent NH	0.067***	-0.003	-0.022	0.009	0.007
	(0.023)	(0.014)	(0.019)	(0.015)	(0.010)
Observations (N)	8797	8784	8732	8762	8707

Notes: (i) Results reported are the coefficients (the change in probability) of the linear probability model. (ii) Robust standard errors clustered at the village level are in parentheses. (iii) $* p < 0.10$; $** p < 0.05$; $*** p < 0.01$.

Weighted Probit Regression for Socio-Cultural Category (Heterogeneity with Household Controls)

TABLE C27

Explanatory Variables	Dependent Variables: Participated In Group Actions (2)				
	Beating Wife (2.1)	**Divorcing Wife (2.2)**	**Proper Wages (2.3)**	**Ensuring Right Prices Paid (2.4)**	**Misuse of Relief (2.5)**
Treat	-0.024 (0.050)	-0.033 (0.046)	-0.006 (0.038)	-0.021 (0.037)	0.041 (0.046)
Treat*Age<70	0.033 (0.051)	0.048 (0.048)	0.039 (0.042)	0.047 (0.042)	-0.015 (0.045)
Age<70	-0.034 (0.042)	-0.052 (0.042)	-0.049 (0.046)	-0.001 (0.033)	-0.010 (0.033)
Muslim	0.054*** (0.012)	0.056*** (0.012)	0.036*** (0.009)	0.023** (0.011)	0.021 (0.012)
Years of Education	0.006*** (0.002)	0.006*** (0.002)	0.004** (0.002)	0.003** (0.001)	0.004*** (0.001)
Unmarried Female Head	-0.022 (0.028)	-0.019 (0.027)	-0.003 (0.021)	-0.002 (0.021)	0.006 (0.023)
Married Female Head	0.003 (0.018)	0.005 (0.018)	0.002 (0.013)	0.012 (0.014)	0.012 (0.014)
Husband Absent NH	-0.018 (0.014)	-0.016 (0.014)	-0.004 (0.007)	-0.004 (0.007)	-0.007 (0.007)
Observations (N)	16016	16016	16014	16013	16005

Notes: (i) Results reported are the coefficients (the change in probability) of the linear probability model. (ii) Robust standard errors clustered at the village level are in parentheses. (iii) $* p < 0.10$; $** p < 0.05$; $*** p < 0.01$.

Weighted Probit Regression for Socio-Cultural Category (Heterogeneity with Household Controls)

TABLE C28

Explanatory Variables	Dependent Variables	
	Victim of Physical Abuse (3)	**Does Parents Choose Husband (4)**
Treat	-0.095 (0.096)	-0.050 (0.036)
Treat*Age<70	0.078 (0.092)	0.045 (0.036)
Age<70	0.029 (0.069)	-0.026 (0.040)
Muslim	0.018 (0.030)	0.014 (0.009)
Years of Education	-0.005** (0.002)	0.001 (0.001)
Unmarried Female Head	0.022 (0.064)	-0.032** (0.008)
Married Female Head	0.018 (0.021)	0.008 (0.008)
Husband Absent NH	0.015 (0.016)	-0.016*** (0.005)
Observations (N)	8726	16087

Notes: (i) Results reported are the coefficients (the change in probability) of the linear probability model. (ii) Robust standard errors clustered at the village level are in parentheses. (iii) $* p < 0.10$; $** p < 0.05$; $*** p < 0.01$.

Weighted Probit Regression for Socio-Economic Category (Heterogeneity with Household Controls)

TABLE C29

Explanatory Variables	Dependent Variables			
	Productive Assets (1)	Small Purchases by Own Money (2)		
		Oil/Spices (2.1)	Glass Bangles (2.2)	Ice-cream (2.3)
Treat	0.211***	-0.006	-0.036	-0.018
	(0.059)	(0.021)	(0.033)	(0.036)
Muslim	0.148***	-0.026	-0.081**	-0.043
	(0.021)	(0.020)	(0.048)	(0.043)
Treat*Muslim	-0.183***	0.036	0.070**	0.044
	(0.062)	(0.025)	(0.038)	(0.039)
Higher Education	0.017	-0.008	-0.013	-0.0004
	(0.029)	(0.019)	(0.012)	(0.014)
Treat*Higher Education	0.009	-0.001	-0.0002	-0.011
	(0.040)	(0.016)	(0.016)	(0.018)
Unmarried Female Head	-0.046	0.209***	0.254***	0.263***
	(0.047)	(0.065)	(0.070)	(0.068)
Married Female Head	0.035	-0.002	-0.005	0.002
	(0.029)	(0.009)	(0.008)	(0.009)
Husband Absent NH	0.014	0.010	0.009	0.010
	(0.017)	(0.008)	(0.008)	(0.009)
Observations (N)	8770	16087	16087	16087

Notes: (i) Results reported are the coefficients (the change in probability) of the linear probability model. (ii) Robust standard errors clustered at the village level are in parentheses. (iii) $* p < 0.10$; $** p < 0.05$; $*** p < 0.01$.

Weighted Probit Regression for Socio-Economic Category (Heterogeneity with Household Controls)

TABLE C30

Explanatory Variables	Dependent Variables			
	Cash Savings (3)	Large Purchases by Own Money (4)		
		Betel Leaf/Nut (4.1)	Sarees (4.2)	Daily Bazaar (4.3)
Treat	-0.012 (0.077)	0.021 (0.026)	-0.016 (0.021)	-0.006 (0.017)
Muslim	-0.053 (0.075)	-0.001 (0.017)	-0.028 (0.028)	-0.002 (0.015)
Treat*Muslim	-0.001 (0.076)	-0.002 (0.026)	0.032 (0.023)	0.019 (0.020)
Higher Education	-0.008 (0.024)	-0.013 (0.009)	-0.005 (0.009)	-0.016* (0.008)
Treat*Higher Education	0.007 (0.040)	0.028* (0.018)	0.014 (0.017)	0.024 (0.017)
Unmarried Female Head	-0.046 (0.037)	0.201*** (0.068)	0.222*** (0.075)	0.179*** (0.055)
Married Female Head	-0.014 (0.027)	0.003 (0.007)	0.011** (0.006)	0.007 (0.006)
Husband Absent NH	-0.102 (0.022)	0.013** (0.006)	0.020*** (0.006)	0.016*** (0.005)
Observations (N)	8798	16087	16087	16087

Notes: (i) Results reported are the coefficients (the change in probability) of the linear probability model. (ii) Robust standard errors clustered at the village level are in parentheses. (iii) $* p < 0.10$; $** p < 0.05$; $*** p < 0.01$.

Weighted Probit Regression for Socio-Economic Category (Heterogeneity with Household Controls)

TABLE C31

Explanatory Variables	Dependent Variables		
	Permission to Buy Small Purchases (5)		
	Oil / Spices (5.1)	Glass Bangles (5.2)	Ice-cream (5.3)
Treat	0.093 (0.113)	0.148 (0.111)	0.120 (0.109)
Muslim	-0.076 (0.098)	-0.032 (0.101)	-0.025 (0.101)
Treat*Muslim	-0.042 (0.119)	-0.095 (0.118)	-0.066 (0.115)
Higher Education	-0.047 (0.045)	-0.050 (0.047)	-0.040 (0.050)
Treat*Higher Education	-0.027 (0.057)	-0.034 (0.058)	-0.018 (0.058)
Unmarried Female Head	-0.253** (0.082)	-0.316*** (0.049)	-0.268*** (0.044)
Married Female Head	-0.018 (0.034)	-0.009 (0.034)	-0.009 (0.034)
Husband Absent NH	-0.019 (0.024)	-0.014 (0.024)	-0.013 (0.024)
Observations (N)	8540	8534	8053

Notes: (i) Results reported are the coefficients (the change in probability) of the linear probability model. (ii) Robust standard errors clustered at the village level are in parentheses. (iii) $* p < 0.10$; $** p < 0.05$; $*** p < 0.01$.

Weighted Probit Regression for Socio-Economic Category (Heterogeneity with Household Controls)

TABLE C32

Explanatory Variables	Dependent Variables: Involved in Major Decisions (6)				
	Build New House (6.1)	**Purchase Goat (6.2)**	**Purchase Cow (6.3)**	**Lease Land (6.4)**	**Buy/Sell Land (6.5)**
Treat	0.165 (0.173)	0.962*** (0.009)	0.988*** (0.005)	-0.123 (0.175)	-0.344** (0.136)
Muslim	0.198 (0.088)	0.365*** (0.045)	0.270*** (0.034)	0.075 (0.108)	-0.290** (0.150)
Treat*Muslim	-0.136 (0.174)	-0.954*** (0.015)	-0.980*** (0.005	0.199 (0.179)	0.381*** (0.117)
Higher Education	-0.100 (0.048)	-0.0001 (0.124)	0.064 (0.071)	-0.123** (0.059)	-0.129* (0.073)
Treat*Higher Education	0.188*** (0.082)	0.028 (0.182)	0.105 (0.123)	0.257** (0.122)	0.187 (0.124)
Unmarried Female Head	0.311*** (0.098)	0.058 (0.161)	-0.127 (0.065)	0.320* (0.198)	0.133 (0.139)
Married Female Head	0.103** (0.051)	0.103 (0.073)	0.084 (0.067)	0.081 (0.076)	0.118 (0.092)
Husband Absent NH	0.077** (0.029)	0.124*** (0.046)	0.051 (0.032)	0.035 (0.034)	0.072 (0.051)
Observations (N)	4500	1046	1559	1914	1428

Notes: (i) Results reported are the coefficients (the change in probability) of the linear probability model. (ii)Robust standard errors clustered at the village level are in parentheses. (iii) $* p < 0.10$; $** p < 0.05$; $*** p < 0.01$.

Weighted Probit Regression for Socio-Cultural Category (Heterogeneity with Household Controls)

TABLE C33

Explanatory Variables	Dependent Variables: Mobility (1)				
	Hat /Bazaar (marketplace) (1.1)	**Hospital / Clinic (1.2)**	**Cinema (1.3)**	**Visit Other Women (1.4)**	**Visit Outside the Village (1.5)**
Treat	-0.027 (0.111)	-0.046 (0.054)	0.0004 (0.093)	-0.115*** (0.040)	-0.118*** (0.037)
Muslim	0.009 (0.083)	-0.043 (0.034)	-0.063 (0.063)	-0.073*** (0.021)	-0.052*** (0.016)
Treat*Muslim	0.012 (0.106)	0.058 (0.060)	0.025 (0.094)	0.067 (0.044)	0.064* (0.038)
Higher Education	0.014 (0.046)	0.009 (0.027)	0.067* (0.038)	0.014 (0.024)	-0.048** (0.025)
Treat*Higher Education	0.086 (0.059)	-0.002 (0.038)	0.006 (0.050)	-0.018 (0.036)	0.028 (0.022)
Unmarried Female Head	-0.021 (0.064)	0.048 (0.031)	-0.066 (0.065)	0.051 (0.029)	0.056*** (0.009)
Married Female Head	0.057* (0.032)	0.013 (0.019)	-0.013 (0.024)	-0.025 (0.028)	-0.033 (0.024)
Husband Absent NH	0.067*** (0.023)	-0.003 (0.014)	-0.026 (0.019)	0.009 (0.015)	0.007 (0.010)
Observations (N)	8797	8784	8732	8762	8707

Notes: (i) Results reported are the coefficients (the change in probability) of the linear probability model. (ii) Robust standard errors clustered at the village level are in parentheses. (iii) $* p < 0.10$; $** p < 0.05$; $*** p < 0.01$.

Weighted Probit Regression for Socio-Cultural Category (Heterogeneity with Household Controls)

TABLE C34

Explanatory Variables	Dependent Variables: Participated In Group Actions (2)				
	Beating Wife (2.1)	**Divorcing Wife (2.2)**	**Proper Wages (2.3)**	**Ensuring Right Prices Paid (2.4)**	**Misuse of Relief (2.5)**
Treat	0.016 (0.038)	0.015 (0.035)	-0.003 (0.031)	0.028 (0.028)	0.046* (0.026)
Muslim	0.058** (0.020)	0.059*** (0.016)	0.016 (0.022)	0.030 (0.015)	0.032 (0.015)
Treat*Muslim	-0.010 (0.041)	-0.005 (0.038)	0.040 (0.035)	-0.011 (0.028)	-0.019 (0.028)
Higher Education	0.025 (0.018)	0.025 (0.019)	0.026** (0.011)	-0.002 (0.014)	0.014 (0.014)
Treat*Higher Education	0.005 (0.023)	0.009 (0.029)	-0.003 (0.018)	0.019 (0.027)	0.001 (0.021)
Unmarried Female Head	-0.023 (0.028)	-0.020 (0.027)	-0.004 (0.022)	-0.003 (0.022)	0.004 (0.022)
Married Female Head	0.003 (0.018)	0.004 (0.017)	0.002 (0.013)	0.012 (0.015)	0.011 (0.014)
Husband Absent NH	-0.019 (0.013)	-0.017 (0.013)	-0.006 (0.007)	-0.004 (0.007)	-0.007 (0.007)
Observations (N)	16016	16016	16014	16013	16005

Notes: (i) Results reported are the coefficients (the change in probability) of the linear probability model. (ii) Robust standard errors clustered at the village level are in parentheses. (iii) $* p < 0.10$; $** p < 0.05$; $*** p < 0.01$.

Weighted Probit Regression for Socio-Cultural Category (Heterogeneity with Household Controls)

TABLE C35

Explanatory Variables	Dependent Variables	
	Victim of Physical Abuse (3)	Does Parents Choose Husband (4)
Treat	0.009 (0.056)	-0.013 (0.034)
Muslim	0.042 (0.036)	0.009 (0.024)
Treat*Muslim	-0.034 (0.059)	0.009 (0.032)
Higher Education	-0.023 (0.027)	0.007 (0.011)
Treat*Higher Education	0.005 (0.035)	-0.001 (0.015)
Unmarried Female Head	0.028 (0.065)	-0.033** (0.008)
Married Female Head	0.021 (0.021)	0.008 (0.008)
Husband Absent NH	0.016 (0.016)	-0.017*** (0.006)
Observations (N)	8726	16087

Notes: (i) Results reported are the coefficients (the change in probability) of the linear probability model. (ii) Robust standard errors clustered at the village level are in parentheses. (iii) $* p < 0.10$; $** p < 0.05$; $*** p < 0.01$.

Weighted Probit Regression for Socio- Economic Category (Baseline with Household and Village Controls)

TABLE C36

Explanatory Variables	Dependent Variables			
	Productive Assets (1)	Small Purchases by Own Money (2)		
		Oil/Spices (2.1)	Glass Bangles (2.2)	Ice-cream (2.3)
Treat	0.048**	0.019**	0.022*	0.014
	(0.024)	(0.009)	(0.011)	(0.013)
Muslim	0.074***	0.003	-0.007	-0.005
	(0.023)	(0.014)	(0.019)	(0.018)
Years of Education	0.003	-0.001	-0.001	-0.001
	(0.003)	(0.001)	(0.001)	(0.001)
Unmarried Female Head	-0.061	0.223***	0.269***	0.281***
	(0.051)	(0.069)	(0.077)	(0.073)
Married Female Head	0.034	0.003	-0.0001	0.001
	(0.031)	(0.009)	(0.009)	(0.010)
Husband Absent NH	0.009	0.009	0.006	0.009
	(0.017)	(0.008)	(0.009)	(0.009)
Secondary School Nearby	-0.063***	0.001	0.002	-0.008
	(0.019)	(0.009)	(0.012)	(0.011)
Finance Institution	0.006	0.010	0.007	0.016
	(0.025)	(0.008)	(0.011)	(0.011)
Engine Boat	0.038	0.005	0.008	0.011
	(0.025)	(0.009)	(0.012)	(0.013)
Km to Hospital	-0.0004	-0.0006**	-0.0005	-0.0003
	(0.0006)	(0.0003)	(0.0003)	(0.0003)
Pucca Road	-0.0004	0.006**	0.005	0.005
	(0.0006)	(0.003)	(0.003)	(0.004)
Observations (N)	7517	13829	13829	13829

Notes: (i) Results reported are the coefficients (the change in probability) of the linear probability model. (ii) Robust standard errors clustered at the village level are in parentheses. (iii) $* p < 0.10$; $** p < 0.05$; $*** p < 0.01$.

Weighted Probit Regression for Socio- Economic Category (Baseline with Household and Village Controls)

TABLE C37

Explanatory Variables	Dependent Variables			
	Cash Savings (3)	Large Purchases by Own Money (4)		
		Betel Leaf/Nut (4.1)	Sarees (4.2)	Daily Bazaar (4.3)
Treat	-0.018 (0.031)	0.022** (0.009)	0.008 (0.007)	0.007 (0.008)
Muslim	-0.064 (0.044)	-0.012 (0.020)	-0.0004 (0.006)	0.003 (0.009)
Years of Education	0.004 (0.003)	-0.0003 (0.001)	0.0004 (0.001)	-0.00005 (0.0008)
Unmarried Female Head	-0.029 (0.044)	0.218*** (0.077)	0.251*** (0.085)	0.189*** (0.062)
Married Female Head	0.004 (0.029)	0.005 (0.007)	0.019** (0.006)	0.012** (0.006)
Husband Absent NH	0.008 (0.021)	0.013** (0.006)	0.021*** (0.006)	0.015*** (0.005)
Secondary School Nearby	0.018 (0.031)	0.003 (0.010)	0.003 (0.008)	0.014 (0.011)
Finance Institution	0.044 (0.029)	0.016 (0.010)	0.011 (0.007)	0.008 (0.007)
Engine Boat	0.053 (0.036)	-0.0003 (0.011)	0.004 (0.007)	-0.011 (0.008)
Km to Hospital	0.0001 (0.001)	-0.001** (0.0003)	-0.0006*** (0.0002)	-0.0006** (0.0002)
Pucca Road	0.018*** (0.007)	-0.003 (0.004)	0.003 (0.002)	-0.003 (0.003)
Observations (N)	7544	13829	13829	13829

Notes: (i) Results reported are the coefficients (the change in probability) of the linear probability model. (ii) Robust standard errors clustered at the village level are in parentheses. (iii) $* p < 0.10$; $** p < 0.05$; $*** p < 0.01$.

Weighted Probit Regression for Socio- Economic Category (Baseline with Household and Village Controls)

TABLE C38

Explanatory Variables	Dependent Variables		
	Permission to Buy Small Purchases (5)		
	Oil / Spices (5.1)	Glass Bangles (5.2)	Ice-cream (5.3)
Treat	0.041 (0.042)	0.028 (0.040)	0.042 (0.043)
Muslim	-0.155*** (0.051)	-0.164*** (0.048)	-0.108** (0.055)
Years of Education	-0.009 (0.005)	-0.011 (0.005)	-0.008 (0.005)
Unmarried Female Head	-0.237** (0.083)	-0.305*** (0.053)	-0.258*** (0.049)
Married Female Head	-0.005 (0.036)	0.007 (0.036)	0.013 (0.036)
Husband Absent NH	-0.005 (0.026)	0.0004 (0.024)	0.002 (0.025)
Secondary School Nearby	-0.045 (0.049)	-0.045 (0.052)	-0.026 (0.047)
Finance Institution	-0.021 (0.045)	-0.011 (0.044)	-0.013 (0.047)
Engine Boat	-0.038 (0.041)	-0.027 (0.038)	0.00001 (0.042)
Km to Hospital	-0.0009 (0.001)	-0.001 (0.001)	-0.001 (0.001)
Pucca Road	-0.028 (0.017)	-0.021 (0.016)	-0.027* (0.016)
Observations (N)	7305	7306	6913

Notes: (i) Results reported are the coefficients (the change in probability) of the linear probability model. (ii) Robust standard errors clustered at the village level are in parentheses. (iii) $* p < 0.10$; $** p < 0.05$; $*** p < 0.01$.

Weighted Probit Regression for Socio-Economic Category (Baseline with Household and Village Controls)

TABLE C39

Explanatory Variables	Dependent Variables: Involved in Major Decisions (6)				
	Build New House (6.1)	**Purchase Goat (6.2)**	**Purchase Cow (6.3)**	**Lease Land (6.4)**	**Buy/Sell Land (6.5)**
Treat	0.051 (0.045)	0.254** (0.102)	-0.045 (0.053)	0.070 (0.045)	0.086* (0.047)
Muslim	0.149*** (0.044)	0.294*** (0.043)	-0.228** (0.129)	0.111** (0.041)	0.123* (0.057)
Years of Education	-0.003 (0.006)	0.010 (0.014)	0.015* (0.008)	-0.004 (0.006)	0.007 (0.007)
Unmarried Female Head	0.308*** (0.114)	-0.041 (0.146)	-0.122 (0.062)	0.045** (0.204)	0.193 (0.162)
Married Female Head	0.102** (0.050)	0.143* (0.081)	0.084 (0.067)	0.056 (0.061)	0.138 (0.098)
Husband Absent NH	0.068** (0.030)	0.139** (0.054)	0.053 (0.038)	0.032 (0.036)	0.088 (0.059)
Secondary School Nearby	0.043 (0.044)	-0.116** (0.056)	-0.005 (0.065)	-0.003 (0.052)	-0.034 (0.073)
Finance Institution	0.071 (0.046)	-0.052 (0.103)	0.058** (0.046)	0.004 (0.049)	0.132 (0.051)
Engine Boat	-0.054 (0.044)	-0.0003 (0.118)	-0.068 (0.051)	-0.048 (0.044)	-0.031 (0.047)
Km to Hospital	0.002* (0.001)	0.002 (0.002)	0.001 (0.001)	0.004*** (0.001)	0.0005 (0.001)
Pucca Road	0.009 (0.021)	0.219 (0.039)	0.004 (0.026)	-0.064 (0.048)	-0.007 (0.015)
Observations (N)	3829	841	1317	1630	1217

Notes: (i) Results reported are the coefficients (the change in probability) of the linear probability model. (ii) Robust standard errors clustered at the village level are in parentheses. (iii) $* p < 0.10$; $** p < 0.05$; $*** p < 0.01$.

Weighted Probit Regression for Socio-Cultural Category (Baseline with Household and Village Controls)

TABLE C40

Explanatory Variables	Dependent Variables: Mobility (1)				
	Hat /Bazaar (marketplace) (1.1)	**Hospital (1.2)**	**Cinema (1.3)**	**Visit Other Women (1.4)**	**Visit Outside the Village (1.5)**
Treat	0.015	0.017	0.018	-0.031	-0.047**
	(0.047)	(0.042)	(0.033)	(0.025)	(0.019)
Muslim	0.016	0.017	-0.033	-0.031	-0.015
	(0.057)	(0.037)	(0.067)	(0.018)	(0.018)
Years of Education	0.005	-0.0002	0.011**	-0.002	-0.002
	(0.005)	(0.006)	(0.004)	(0.003)	(0.002)
Unmarried Female Head	-0.011	0.072**	-0.074	0.049	0.054***
	(0.074)	(0.023)	(0.069)	(0.029)	(0.008)
Married Female Head	0.038	0.020	-0.018	-0.041	-0.029
	(0.033)	(0.019)	(0.027)	(0.031)	(0.024)
Husband Absent NH	0.059**	-0.001	-0.027	0.0006	0.004
	(0.026)	(0.014)	(0.022)	(0.011)	(0.009)
Secondary School Nearby	0.007	-0.018	-0.026	0.040*	-0.013
	(0.040)	(0.029)	(0.028)	(0.019)	(0.021)
Finance Institution	0.103**	-0.013	0.023	0.005	-0.007
	(0.044)	(0.037)	(0.036)	(0.025)	(0.021)
Engine Boat	0.026	-0.001	0.006	0.021	-0.024
	(0.047)	(0.034)	(0.036)	(0.025)	(0.022)
Km to Hospital	0.0003	0.0006	-0.001	0.001*	0.007
	(0.001)	(0.0006)	(0.001)	(0.0006)	(0.0005)
Pucca Road	-0.001	-0.002	0.009	-0.002	-0.002
	(0.015)	(0.010)	(0.010)	(0.008)	(0.006)
Observations (N)	7546	7539	7492	7529	7466

Notes: (i) Results reported are the coefficients (the change in probability) of the linear probability model. (ii) Robust standard errors clustered at the village level are in parentheses. (iii) $* p < 0.10$; $** p < 0.05$; $*** p < 0.01$

Weighted Probit Regression for Socio-Cultural Category (Baseline with Household and Village Controls)

TABLE C41

Explanatory Variables	Dependent Variables: Participated In Group Actions (2)				
	Beating Wife (2.1)	**Divorcing Wife (2.2)**	**Proper Wages (2.3)**	**Ensuring Right Prices Paid (2.4)**	**Misuse of Relief (2.5)**
Treat	0.021 (0.014)	0.026* (0.016)	0.035*** (0.013)	0.025 (0.017)	0.022 (0.014)
Muslim	0.051*** (0.012)	0.054*** (0.012)	0.037*** (0.009)	0.023* (0.011)	0.015 (0.012)
Years of Education	0.007*** (0.002)	0.007*** (0.002)	0.004** (0.002)	0.003** (0.002)	0.004*** (0.001)
Unmarried Female Head	-0.017 (0.027)	-0.013 (0.026)	-0.004 (0.021)	-0.002 (0.020)	0.007 (0.021)
Married Female Head	0.114 (0.149)	0.010 (0.014)	-0.002 (0.011)	0.002 (0.011)	-0.002 (0.007)
Husband Absent NH	-0.011 (0.009)	-0.012 (0.009)	-0.007 (0.007)	-0.006 (0.008)	-0.012 (0.007)
Secondary School Nearby	-0.008 (0.014)	-0.007 (0.013)	-0.008 (0.009)	-0.011 (0.009)	-0.006 (0.011)
Finance Institution	-0.013 (0.015)	-0.011 (0.019)	-0.013 (0.015)	0.004 (0.021)	-0.003 (0.017)
Engine Boat	0.002 (0.016)	-0.002 (0.015)	0.006 (0.011)	0.007 (0.013)	-0.005 (0.013)
Km to Hospital	0.0004 (0.0004)	0.0005 (0.0004)	0.0004 (0.0003)	0.0004 (0.0004)	0.0003 (0.0004)
Pucca Road	-0.005 (0.006)	-0.004 (0.005)	-0.003 (0.004)	-0.009 (0.006)	-0.009** (0.005)
Observations (N)	13766	13766	13765	13765	13756

Notes: (i) Results reported are the coefficients (the change in probability) of the linear probability model. (ii) Robust standard errors clustered at the village level are in parentheses. (iii) $* p < 0.10$; $** p < 0.05$; $*** p < 0.01$.

Weighted Probit Regression for Socio-Cultural Category (Baseline with Household and Village Controls)

TABLE C42

Explanatory Variables	Dependent Variables	
	Victim of Physical Abuse (3)	Does Parents Choose Husband (4)
Treat	-0.026 (0.025)	-0.0007 (0.009)
Muslim	0.022 (0.031)	0.016 (0.010)
Years of Education	-0.006** (0.003)	0.001 (0.001)
Unmarried Female Head	-0.046 (0.074)	-0.038** (0.008)
Married Female Head	0.020 (0.023)	0.008 (0.009)
Husband Absent NH	0.023 (0.018)	-0.017** (0.006)
Secondary School Nearby	-0.034 (0.022)	0.003 (0.009)
Finance Institution	0.034 (0.029)	-0.013 (0.011)
Engine Boat	0.017 (0.028)	0.014 (0.009)
Km to Hospital	0.0003 (0.0005)	0.0001 (0.0002)
Pucca Road	0.020** (0.011)	0.003 (0.003)
Observations (N)	7487	13829

Notes: (i) Results reported are the coefficients (the change in probability) of the linear probability model. (ii) Robust standard errors clustered at the village level are in parentheses. (iii) $* p < 0.10$; $** p < 0.05$; $*** p < 0.01$.

Weighted Probit Regression for Socio- Economic Category (Heterogeneity with Age): Household and Village Controls

TABLE C43

Explanatory Variables	Dependent Variables			
	Productive Assets (1)	Small Purchases by Own Money (2)		
		Oil/Spices (2.1)	Glass Bangles (2.2)	Ice-cream (2.3)
Treat	-0.191**	0.026	-0.013	-0.013
	(0.090)	(0.029)	(0.033)	(0.040)
Treat*Age<70	0.237***	-0.007	0.037	0.029
	(0.084)	(0.029)	(0.033)	(0.039)
Age<70	-0.062	0.003	-0.042	-0.013
	(0.057)	(0.019)	(0.035)	(0.027)
Muslim	0.069***	0.004	-0.007	-0.006
	(0.023)	(0.014)	(0.019)	(0.018)
Years of Education	0.003	-0.001	-0.001	-0.001
	(0.003)	(0.001)	(0.001)	(0.001)
Unmarried Female Head	-0.063	0.223***	0.272***	0.281***
	(0.049)	(0.069)	(0.077)	(0.073)
Married Female Head	0.030	0.003	0.0004	0.001
	(0.031)	(0.009)	(0.009)	(0.010)
Husband Absent NH	0.009	0.009	0.007	0.009
	(0.017)	(0.008)	(0.008)	(0.009)
Secondary School Nearby	-0.061***	0.001	0.003	-0.008
	(0.019)	(0.009)	(0.012)	(0.011)
Finance Institution	0.006	0.010	0.007	0.016
	(0.025)	(0.008)	(0.011)	(0.011)
Engine Boat	0.038	0.005	0.008	0.010
	(0.024)	(0.009)	(0.012)	(0.013)
Km to Hospital	-0.0003	-0.001**	-0.005	-0.0004
	(0.0006)	(0.0003)	(0.0003)	(0.0003)
Pucca Road	-0.012	0.006**	0.005*	0.006
	(0.014)	(0.003)	(0.003)	(0.004)
Observations (N)	7517	13829	13829	13829

Notes: (i) Results reported are the coefficients (the change in probability) of the linear probability model. (ii) Robust standard errors clustered at the village level are in parentheses. (iii) $* p < 0.10$; $** p < 0.05$; $*** p < 0.01$.

Weighted Probit Regression for Socio- Economic Category (Heterogeneity with Age): Household and Village Controls

TABLE C44

Explanatory Variables	Dependent Variables			
	Cash Savings (3)	Large Purchases by Own Money (4)		
		Betel Leaf/Nut (4.1)	Sarees (4.2)	Daily Bazaar (4.3)
Treat	0.132 (0.086)	0.001 (0.030)	-0.032 (0.028)	-0.037 (0.034)
Treat*Age<70	-0.171* (0.109)	0.023 (0.030)	0.040 (0.027)	0.045 (0.033)
Age<70	0.047 (0.053)	0.001 (0.019)	-0.007 (0.018)	-0.005 (0.016)
Muslim	-0.056 (0.039)	-0.013 (0.020)	-0.001 (0.006)	0.002 (0.009)
Years of Education	0.004 (0.004)	-0.0003 (0.001)	0.0004 (0.001)	-0.0001 (0.001)
Unmarried Female Head	-0.028 (0.045)	0.216*** (0.077)	0.249*** (0.085)	0.187*** (0.061)
Married Female Head	0.009 (0.028)	0.004 (0.007)	0.019*** (0.006)	0.011** (0.006)
Husband Absent NH	0.011 (0.019)	0.012** (0.006)	0.021*** (0.005)	0.014*** (0.004)
Secondary School Nearby	0.017 (0.031)	0.003 (0.010)	0.003 (0.008)	0.013 (0.011)
Finance Institution	0.044 (0.029)	0.016 (0.009)	0.011 (0.007)	0.009 (0.007)
Engine Boat	0.051 (0.036)	-0.0001 (0.011)	0.004 (0.007)	-0.011 (0.008)
Km to Hospital	0.001 (0.001)	-0.001** (0.0003)	-0.0006*** (0.0002)	-0.0005** (0.0002)
Pucca Road	0.019*** (0.007)	-0.003 (0.004)	0.003 (0.002)	-0.003 (0.002)
Observations (N)	7544	13829	13829	13829

Notes: (i) Results reported are the coefficients (the change in probability) of the linear probability model. (ii) Robust standard errors clustered at the village level are in parentheses. (iii) $* p < 0.10$; $** p < 0.05$; $*** p < 0.01$.

Weighted Probit Regression for Socio- Economic Category (Heterogeneity with Age): Household and Village Controls

TABLE C45

Explanatory Variables	Dependent Variables		
	Permission to Buy Small Purchases (5)		
	Oil / Spices (5.1)	Glass Bangles (5.2)	Ice-cream (5.3)
Treat	-0.274**	-0.201	-0.234*
	(0.118)	(0.135)	(0.128)
Treat*Age<70	0.327***	0.241*	0.283**
	(0.104)	(0.124)	(0.116)
Age<70	-0.113*	-0.040	-0.084
	(0.063)	(0.091)	(0.093)
Muslim	-0.166***	-0.173***	-0.119**
	(0.048)	(0.046)	(0.054)
Years of Education	-0.010	-0.011**	-0.008
	(0.005)	(0.005)	(0.005)
Unmarried Female Head	-0.240**	-0.307***	-0.260***
	(0.081)	(0.053)	(0.049)
Married Female Head	-0.010	0.002	0.008
	(0.035)	(0.035)	(0.035)
Husband Absent NH	-0.008	-0.002	0.007
	(0.024)	(0.023)	(0.023)
Secondary School Nearby	-0.045	-0.044	-0.024
	(0.048)	(0.051)	(0.046)
Finance Institution	-0.022	-0.019	-0.014
	(0.045)	(0.044)	(0.047)
Engine Boat	-0.039	-0.027	-0.001
	(0.041)	(0.039)	(0.043)
Km to Hospital	-0.001	-0.001	-0.001
	(0.001)	(0.001)	(0.001)
Pucca Road	-0.029	-0.022	-0.028*
	(0.017)	(0.016)	(0.016)
Observations (N)	7305	7306	6913

Notes: (i) Results reported are the coefficients (the change in probability) of the linear probability model. (ii) Robust standard errors clustered at the village level are in parentheses. (iii) $* p < 0.10$; $** p < 0.05$; $*** p < 0.01$.

Weighted Probit Regression for Socio-Economic Category (Heterogeneity with Age): Household and Village Controls

TABLE C46

Explanatory Variables	Dependent Variables: Involved in Major Decisions (6)				
	Build New House (6.1)	**Purchase Goat (6.2)**	**Purchase Cow (6.3)**	**Lease Land (6.4)**	**Buy/Sell Land (6.5)**
Treat	0.353**	0.391	0.258*	0.257	0.276
	(0.145)	(0.208)	(0.141)	(0.184)	(0.201)
Treat*Age<70	-0.335**	-0.175	-0.314**	-0.195	-0.231
	(0.162)	(0.266)	(0.144)	(0.182)	(0.269)
Age<70	0.134	0.189	0.175**	0.081	0.064
	(0.085)	(0.127)	(0.048)	(0.096)	(0.154)
Muslim	0.150***	0.292***	-0.225**	0.111**	0.128*
	(0.045)	(0.044)	(0.128)	(0.041)	(0.054)
Years of Education	-0.002*	0.010	0.017**	-0.003	0.007
	(0.005)	(0.015)	(0.008)	(0.006)	(0.007)
Unmarried Female Head	0.315***	-0.052	-0.128	0.445**	0.191
	(0.117)	(0.142)	(0.056)	(0.205)	(0.162)
Married Female Head	0.107**	0.144*	0.088	0.054	0.138
	(0.050)	(0.083)	(0.067)	(0.061)	(0.098)
Husband Absent NH	0.066**	0.137**	0.048	0.028	0.085
	(0.030)	(0.056)	(0.036)	(0.036)	(0.059)
Secondary School Nearby	0.039	-0.118*	-0.008	-0.014	-0.032
	(0.044)	(0.058)	(0.066)	(0.052)	(0.071)
Finance Institution	0.075	-0.047	0.064	0.008	0.074**
	(0.045)	(0.104)	(0.045)	(0.048)	(0.077)
Engine Boat	-0.051	0.076	-0.061	-0.044	0.134
	(0.044)	(0.119)	(0.051)	(0.043)	(0.052)
Km to Hospital	0.002*	0.002	0.001	0.004***	-0.030
	(0.001)	(0.002)	(0.001)	(0.001)	(0.047)
Pucca Road	0.009	0.022	0.003	-0.169	-0.007
	(0.021)	(0.039)	(0.025)	(0.044)	(0.015)
Observations (N)	3829	841	1317	1630	1217

Notes: (i) Results reported are the coefficients (the change in probability) of the linear probability model. (ii) Robust standard errors clustered at the village level are in parentheses. (iii) $* p < 0.10$; $** p < 0.05$; $*** p < 0.01$.

Weighted Probit Regression for Socio-Cultural Category (Heterogeneity with Age):

Household and Village Controls

TABLE C47

Explanatory Variables	Dependent Variables: Mobility (1)				
	Hat /Bazaar (marketplace) (1.1)	**Hospital (1.2)**	**Cinema (1.3)**	**Visit Other Women (1.4)**	**Visit Outside the Village (1.5)**
Treat	-0.241**	0.049	0.004	0.018	-0.018
	(0.107)	(0.094)	(0.133)	(0.055)	(0.039)
Treat*Age<70	0.263**	-0.033	0.014	-0.053	0.031**
	(0.105)	(0.082)	(0.135)	(0.049)	(0.039)
Age<70	-0.098	0.030	-0.090	0.052	0.011
	(0.071)	(0.068)	(0.094)	(0.045)	(0.037)
Muslim	0.010	0.017	-0.031	-0.031	-0.015
	(0.057)	(0.037)	(0.067)	(0.018)	(0.018)
Years of Education	0.004	-0.0002	0.011**	-0.002	-0.003
	(0.005)	(0.003)	(0.004)	(0.003)	(0.002)
Unmarried Female Head	-0.014	0.072**	-0.073	0.049	0.054***
	(0.074)	(0.023)	(0.070)	(0.029)	(0.008)
Married Female Head	0.034	0.020	-0.015	-0.041	-0.029
	(0.033)	(0.019)	(0.027)	(0.031)	(0.024)
Husband Absent NH	0.059	-0.002	-0.026	0.0003	0.005
	(0.026)	(0.014)	(0.023)	(0.011)	(0.009)
Secondary School Nearby	0.008	-0.018	-0.026	0.039*	-0.013
	(0.040)	(0.029)	(0.028)	(0.019)	(0.021)
Finance Institution	0.102**	-0.013	0.021	0.006	-0.007
	(0.047)	(0.034)	(0.035)	(0.025)	(0.021)
Engine Boat	0.026	-0.001	0.005	0.022	-0.024
	(0.047)	(0.034)	(0.036)	(0.025)	(0.022)
Km to Hospital	0.0004	0.001	-0.001	0.001*	0.001
	(0.001)	(0.001)	(0.001)	(0.001)	(0.0005)
Pucca Road	-0.002	-0.002	0.010	-0.002	-0.002
	(0.015)	(0.011)	(0.010)	(0.008)	(0.006)
Observations (N)	7546	7539	7492	7529	7466

Notes: (i) Results reported are the coefficients (the change in probability) of the linear probability model. (ii) Robust standard errors clustered at the village level are in parentheses. (iii) $* p < 0.10$; $** p < 0.05$; $*** p < 0.01$.

Weighted Probit Regression for Socio-Cultural Category (Heterogeneity with Age): Household and Village Controls

TABLE C48

Explanatory Variables	Dependent Variables: Participated In Group Actions (2)				
	Beating Wife (2.1)	**Divorcing Wife (2.2)**	**Proper Wages (2.3)**	**Ensuring Right Prices Paid (2.4)**	**Misuse of Relief (2.5)**
Treat	-0.001 (0.050)	-0.008 (0.045)	0.008 (0.041)	-0.019 (0.045)	-0.004 (0.041)
Treat*Age<70	0.024 (0.053)	0.037 (0.049)	0.029 (0.046)	0.045 (0.048)	0.028 (0.043)
Age<70	-0.037 (0.046)	-0.052 (0.045)	-0.041 (0.049)	0.005 (0.034)	-0.011 (0.035)
Muslim	0.051*** (0.012)	0.054*** (0.012)	0.036*** (0.009)	0.021* (0.011)	0.014 (0.012)
Years of Education	0.007*** (0.002)	0.007*** (0.002)	0.004** (0.002)	0.003** (0.002)	0.004*** (0.001)
Unmarried Female Head	-0.016 (0.028)	0.012 (0.025)	-0.003 (0.021)	-0.002 (0.019)	0.007 (0.020)
Married Female Head	0.012 (0.015)	0.011 (0.014)	-0.001 (0.011)	0.001 (0.010)	-0.002 (0.009)
Husband Absent NH	-0.010 (0.009)	-0.010 (0.009)	-0.007 (0.007)	-0.007 (0.008)	-0.012* (0.007)
Secondary School Nearby	-0.008 (0.014)	-0.007 (0.013)	-0.008 (0.009)	-0.011 (0.009)	-0.006 (0.011)
Finance Institution	-0.013 (0.015)	-0.011 (0.019)	-0.010 (0.015)	0.004 (0.020)	-0.002 (0.017)
Engine Boat	0.002 (0.016)	-0.002 (0.015)	0.006 (0.011)	0.008 (0.013)	-0.005 (0.013)
Km to Hospital	0.0004 (0.0004)	0.0005 (0.0003)	0.004 (0.0003)	0.0003 (0.0004)	0.0003 (0.0004)
Pucca Road	-0.004 (0.006)	-0.004 (0.005)	-0.003 (0.004)	-0.009* (0.006)	-0.009 (0.005)
Observations (N)	13766	13766	13765	13765	13756

Notes: (i) Results reported are the coefficients (the change in probability) of the linear probability model. (ii) Robust standard errors clustered at the village level are in parentheses. (iii) $* p < 0.10$; $** p < 0.05$; $*** p < 0.01$.

Weighted Probit Regression for Socio-Cultural Category (Heterogeneity with Age): Household and Village Controls

TABLE C49

Explanatory Variables	Dependent Variables	
	Victim of Physical Abuse (3)	Does Parents Choose Husband (4)
Treat	-0.071 (0.109)	-0.055 (0.039)
Treat*Age<70	0.046 (0.105)	0.054 (0.038)
Age<70	0.045 (0.071)	-0.029 (0.044)
Muslim	0.020 (0.031)	0.015 (0.010)
Years of Education	-0.006** (0.003)	0.001 (0.001)
Unmarried Female Head	0.044 (0.073)	-0.037** (0.008)
Married Female Head	0.018 (0.023)	0.008 (0.009)
Husband Absent NH	0.022 (0.018)	-0.016*** (0.006)
Secondary School Nearby	-0.034 (0.021)	0.003 (0.009)
Finance Institution	0.035 (0.029)	-0.012 (0.011)
Engine Boat	0.018 (0.028)	0.014 (0.009)
Km to Hospital	0.0004 (0.0005)	0.0001 (0.0002)
Pucca Road	0.020* (0.010)	0.003 (0.003)
Observations (N)	7487	13829

Notes: (i) Results reported are the coefficients (the change in probability) of the linear probability model. (ii) Robust standard errors clustered at the village level are in parentheses. (iii) $* p < 0.10$; $** p < 0.05$; $*** p < 0.01$.

Weighted Probit Regression for Socio-Economic Category
(Heterogeneity with Religion and Education): Household and Village Controls

TABLE C50

Explanatory Variables	Dependent Variables			
	Productive Assets (1)	Small Purchases by Own Money (2)		
		Oil/Spices (2.1)	Glass Bangles (2.2)	Ice-cream (2.3)
Treat	0.192***	-0.006	-0.022	-0.019
	(0.058)	(0.021)	(0.037)	(0.040)
Muslim	0.146***	-0.023	-0.059	-0.047
	(0.021)	(0.017)	(0.049)	(0.048)
Treat*Muslim	-0.169***	0.030	0.052	0.045
	(0.062)	(0.022)	(0.039)	(0.041)
Higher Education	0.001	-0.008	-0.009	0.004
	(0.031)	(0.013)	(0.013)	(0.015)
Treat*Higher Education	0.036	-0.003	-0.007	-0.018
	(0.044)	(0.016)	(0.016)	(0.018)
Unmarried Female Head	-0.063	0.226***	0.274***	0.284***
	(0.049)	(0.069)	(0.077)	(0.074)
Married Female Head	0.032	0.003	0.0003	0.001
	(0.030)	(0.009)	(0.009)	(0.010)
Husband Absent NH	0.008	0.009	0.007	0.009
	(0.018)	(0.008)	(0.008)	(0.009)
Secondary School Nearby	-0.062***	0.001	0.002	-0.009
	(0.019)	(0.008)	(0.012)	(0.011)
Finance Institution	0.004	0.0001	0.008	0.017
	(0.025)	(0.009)	(0.010)	(0.011)
Engine Boat	0.039	0.005	0.008	0.009
	(0.024)	(0.009)	(0.012)	(0.013)
Km to Hospital	-0.0004	-0.001**	-0.0005	-0.0004
	(0.0006)	(0.0003)	(0.0003)	(0.0004)
Pucca Road	-0.012	0.006**	0.005*	0.006
	(0.014)	(0.003)	(0.003)	(0.004)
Observations (N)	7517	13829	13829	13829

Notes: (i) Results reported are the coefficients (the change in probability) of the linear probability model. (ii) Robust standard errors clustered at the village level are in parentheses. (iii) $* p < 0.10$; $** p < 0.05$; $*** p < 0.01$.

Weighted Probit Regression for Socio-Economic Category
(Heterogeneity with Religion and Education): Household and Village Controls

TABLE C51

Explanatory Variables	Dependent Variables			
	Cash Savings (3)	Large Purchases by Own Money (4)		
		Betel Leaf/Nut (4.1)	Sarees (4.2)	Daily Bazaar (4.3)
Treat	-0.024 (0.083)	0.008 (0.023)	-0.004 (0.015)	-0.022 (0.017)
Muslim	-0.075 (0.089)	-0.019 (0.019)	-0.009 (0.016)	-0.019 (0.018)
Treat*Muslim	0.013 (0.082)	0.006 (0.023)	0.010 (0.015)	0.025 (0.019)
Higher Education	0.010 (0.027)	-0.011 (0.011)	-0.001 (0.009)	-0.010 (0.008)
Treat X Higher Education	-0.009 (0.041)	-0.026* (0.018)	0.006 (0.015)	0.017 (0.015)
Unmarried Female Head	-0.033 (0.043)	0.220*** (0.077)	0.251*** (0.084)	0.189*** (0.062)
Married Female Head	0.004 (0.029)	0.005 (0.007)	0.019*** (0.006)	0.011** (0.006)
Husband Absent NH	0.007 (0.021)	0.013** (0.006)	0.021*** (0.006)	0.014*** (0.005)
Secondary School Nearby	0.017 (0.031)	0.003 (0.010)	0.002 (0.008)	0.013 (0.011)
Finance Institution	0.044 (0.029)	0.016 (0.009)	0.011 (0.007)	0.008 (0.007)
Engine Boat	0.053 (0.037)	-0.0002 (0.011)	0.004 (0.007)	-0.010 (0.008)
Km to Hospital	0.001 (0.001)	-0.001** (0.011)	-0.001*** (0.0002)	-0.001** (0.0003)
Pucca Road	0.019*** (0.007)	-0.003 (0.004)	0.003 (0.002)	-0.003 (0.003)
Observations (N)	7544	13829	13829	13829

Notes: (i) Results reported are the coefficients (the change in probability) of the linear probability model. (ii) Robust standard errors clustered at the village level are in parentheses. (iii) $* p < 0.10$; $** p < 0.05$; $*** p < 0.01$.

Weighted Probit Regression for Socio-Economic Category
(Heterogeneity with Religion and Education): Household and Village Controls

TABLE C52

Explanatory Variables	Dependent Variables		
	Permission to Buy Small Purchases (5)		
	Oil / Spices (5.1)	Glass Bangles (5.2)	Ice-cream (5.3)
Treat	0.128 (0.121)	0.136 (0.121)	0.140 (0.112)
Muslim	-0.097 (0.114)	-0.091 (0.117)	-0.033 (0.106)
Treat*Muslim	-0.074 (0.130)	-0.093 (0.128)	-0.090 (0.119)
Higher Education	-0.023 (0.049)	-0.024 (0.051)	-0.020 (0.053)
Treat*Higher Education	-0.057 (0.062)	-0.069 (0.063)	-0.047 (0.061)
Unmarried Female Head	-0.231** (0.085)	-0.302*** (0.053)	-0.256*** (0.049)
Married Female Head	-0.003 (0.036)	0.009 (0.036)	0.014 (0.036)
Husband Absent NH	-0.004 (0.027)	0.002 (0.025)	0.004 (0.025)
Secondary School Nearby	-0.044 (0.049)	-0.043 (0.052)	-0.024 (0.047)
Finance Institution	-0.018 (0.045)	-0.007 (0.044)	-0.011 (0.046)
Engine Boat	-0.038 (0.041)	-0.027 (0.038)	0.0003 (0.042)
Km to Hospital	-0.001 (0.001)	-0.001 (0.001)	-0.001 (0.001)
Pucca Road	-0.027 (0.017)	-0.020 (0.016)	-0.026 (0.016)
Observations (N)	7305	7306	6913

Notes: (i) Results reported are the coefficients (the change in probability) of the linear probability model. (ii) Robust standard errors clustered at the village level are in parentheses. (iii) $*$ $p < 0.10$; $**$ $p < 0.05$; $***$ $p < 0.01$.

Weighted Probit Regression for Socio-Economic Category
(Heterogeneity with Religion and Education): Household and Village Controls

TABLE C53

Explanatory Variables	Dependent Variables: Involved in Major Decisions (6)				
	Build New House (6.1)	Purchase Goat (6.2)	Purchase Cow (6.3)	Lease Land (6.4)	Buy/Sell Land (6.5)
Treat	0.418***	0.867***	0.971***	-0.043	-0.498*
	(0.119)	(0.024)	(0.011)	(0.153)	(0.279)
Muslim	0.304***	0.324***	0.232***	0.116	-0.437
	(0.032)	(0.043)	(0.032)	(0.059)	(0.352)
Treat*Muslim	-0.437***	-0.852***	-0.979***	0.040	0.460*
	(0.124)	(0.047)	(0.005)	(0.156)	(0.221)
Higher Education	-0.065	0.101	0.106*	-0.098	-0.087
	(0.050)	(0.120)	(0.074)	(0.057)	(0.086)
Treat*Higher Education	0.139*	-0.081	0.077	0.268**	-0.133
	(0.084)	(0.148)	(0.122)	(0.119)	(0.129)
Unmarried Female Head	0.289***	-0.040	-0.105	0.384*	0.218
	(0.115)	(0.147)	(0.064)	(0.223)	(0.159)
Married Female Head	0.103**	0.143*	0.093	0.055	0.128
	(0.051)	(0.080)	(0.069)	(0.062)	(0.095)
Husband Absent NH	0.040	0.139**	0.046	0.029	0.085
	(0.043)	(0.054)	(0.037)	(0.036)	(0.058)
Secondary School Nearby	0.040	-0.114**	-0.004	-0.019	-0.032
	(0.043)	(0.054)	(0.063)	(0.051)	(0.072)
Finance Institution	0.068	-0.057	0.056	0.002	0.129**
	(0.046)	(0.101)	(0.044)	(0.048)	(0.050)
Engine Boat	-0.051	0.002	-0.063	-0.042	-0.030
	(0.045)	(0.116)	(0.048)	(0.042)	(0.047)
Km to Hospital	0.002	0.003	0.001	0.004	0.0003
	(0.001)	(0.002)	(0.001)	(0.001)	(0.001)
Pucca Road	0.008	0.023	0.004	-0.062***	-0.005
	(0.021)	(0.039)	(0.026)	(0.048)	(0.015)
Observations (N)	3829	841	1317	1630	1217

Notes: (i) Results reported are the coefficients (the change in probability) of the linear probability model. (ii) Robust standard errors clustered at the village level are in parentheses. (iii) $* p < 0.10$; $** p < 0.05$; $*** p < 0.01$.

Weighted Probit Regression for Socio-Cultural Category
(Heterogeneity with Religion and Education): Household and Village Controls

TABLE C54

Explanatory Variables	Dependent Variables: Mobility (1)				
	Hat /Bazaar (marketplace) (1.1)	**Hospital (1.2)**	**Cinema (1.3)**	**Visit Other Women (1.4)**	**Visit Outside the Village (1.5)**
Treat	-0.083 (0.130)	-0.064 (0.053)	0.040 (0.090)	-0.064 (0.041)	-0.115*** (0.039)
Muslim	-0.036 (0.101)	-0.043 (0.029)	-0.013 (0.162)	-0.058* (0.025)	-0.042** (0.017)
Treat*Muslim	0.069 (.0119)	0.082 (0.057)	-0.026 (0.096)	0.045 (0.047)	0.046 (0.039)
Higher Education	-0.023 (0.048)	-0.010 (0.029)	0.064 (0.040)	0.006 (0.026)	-0.064*** (0.028)
Treat*Higher Education	0.094 (0.062)	0.013 (0.037)	0.014 (0.054)	-0.029 (0.039)	0.045** (0.019)
Unmarried Female Head	-0.016 (0.074)	0.072** (0.023)	-0.079 (0.069)	0.051 (0.029)	0.052*** (0.008)
Married Female Head	-0.036 (0.034)	0.020 (0.019)	-0.018 (0.027)	-0.039 (0.041)	-0.032* (0.024)
Husband Absent NH	0.059** (0.026)	-0.001 (0.014)	-0.029 (0.023)	0.001 (0.011)	0.004 (0.009)
Secondary School Nearby	0.005 (0.039)	-0.019 (0.029)	-0.028 (0.028)	0.040* (0.019)	-0.012 (0.019)
Finance Institution	0.101** (0.045)	-0.012 (0.037)	0.020 (0.035)	0.006 (0.025)	-0.007 (0.020)
Engine Boat	0.027 (0.048)	-0.002 (0.034)	0.006 (0.036)	0.020 (0.025)	-0.022 (0.022)
Km to Hospital	0.0003 (0.001)	0.001 (0.001)	-0.001 (0.001)	0.001 (0.001)	0.001 (0.0005)
Pucca Road	-0.002 (0.015)	-0.002 (0.010)	0.009 (0.010)	-0.002 (0.008)	-0.002 (0.005)
Observations (N)	7546	7539	7492	7529	7466

Notes: (i) Results reported are the coefficients (the change in probability) of the linear probability model. (ii) Robust standard errors clustered at the village level are in parentheses. (iii) $* p < 0.10$; $** p < 0.05$; $*** p < 0.01$

Weighted Probit Regression for Socio-Cultural Category
(Heterogeneity with Religion and Education): Household and Village Controls

TABLE C55

Explanatory Variables	Dependent Variables: Participated In Group Actions (2)				
	Beating Wife (2.1)	**Divorcing Wife (2.2)**	**Proper Wages (2.3)**	**Ensuring Right Prices Paid (2.4)**	**Misuse of Relief (2.5)**
Treat	0.024	0.024	-0.0002	0.027	0.037
	(0.038)	(0.034)	(0.031)	(0.027)	(0.025)
Muslim	0.050*	0.051**	0.015	0.030	0.026
	(0.022)	(0.017)	(0.023)	(0.015)	(0.015)
Treat*Muslim	0.003	0.009	0.040	-0.013	-0.019
	(0.042)	(0.038)	(0.035)	(0.028)	(0.027)
Higher Education	0.041***	0.047***	0.026**	-0.005	0.014
	(0.016)	(0.018)	(0.011)	(0.015)	(0.015)
Treat*Higher Education	-0.006	-0.010	-0.002	0.030	0.011
	(0.020)	(0.024)	(0.020)	(0.033)	(0.024)
Unmarried Female Head	-0.018	-0.015	-0.004	-0.003	0.006
	(0.028)	(0.026)	(0.021)	(0.020)	(0.021)
Married Female Head	0.011	0.009	-0.002	0.001	-0.002
	(0.015)	(0.014)	(0.011)	(0.011)	(0.010)
Husband Absent NH	-0.011	-0.011	0.007	-0.007	-0.012*
	(0.019)	(0.009)	(0.008)	(0.008)	(0.007)
Secondary School Nearby	-0.009	-0.008	-0.009	-0.011	-0.006
	(0.014)	(0.013)	(0.009)	(0.009)	(0.011)
Finance Institution	-0.015	-0.012	-0.011	0.002	-0.003
	(0.015)	(0.019)	(0.015)	(0.021)	(0.017)
Engine Boat	0.001	-0.003	0.006	0.008	-0.006
	(0.016)	(0.015)	(0.011)	(0.013)	(0.013)
Km to Hospital	0.0004	0.0005	0.0004	0.0004	0.0003
	(0.0004)	(0.0004)	(0.0003)	(0.0004)	(0.0004)
Pucca Road	-0.004	-0.004	-0.003	-0.009*	-0.009
	(0.006)	(0.005)	(0.004)	(0.006)	(0.005)
Observations (N)	13766	13766	13765	13765	13756

Notes: (i) Results reported are the coefficients (the change in probability) of the linear probability model. (ii) Robust standard errors clustered at the village level are in parentheses. (iii) $* p < 0.10$; $** p < 0.05$; $*** p < 0.01$.

Weighted Probit Regression for Socio- Cultural Category
(Heterogeneity with Religion and Education): Household and Village Controls

TABLE C56

Explanatory Variables	Dependent Variables	
	Victim of Physical Abuse (3)	Does Parents Choose Husband (4)
Treat	-0.019 (0.061)	-0.008 (0.035)
Muslim	0.029 (0.042)	0.011 (0.025)
Treat*Muslim	-0.010 (0.063)	0.007 (0.035)
Higher Education	0.029 (0.031)	0.006 (0.012)
Treat*Higher Education	0.001 (0.039)	0.0004 (0.017)
Unmarried Female Head	0.051 (0.075)	-0.038** (0.008)
Married Female Head	0.020 (0.022)	0.008 (0.009)
Husband Absent NH	0.024** (0.018)	-0.017 (0.007)
Secondary School Nearby	-0.033 (0.022)	0.003 (0.009)
Finance Institution	0.035 (0.029)	-0.013 (0.011)
Engine Boat	0.017 (0.028)	0.014 (0.009)
Km to Hospital	0.0004 (0.0005)	0.0001 (0.0002)
Pucca Road	0.021** (0.010)	0.003 (0.003)
Observations (N)	7487	13829

Notes: (i) Results reported are the coefficients (the change in probability) of the linear probability model. (ii) Robust standard errors clustered at the village level are in parentheses. (iii) $* p < 0.10$; $** p < 0.05$; $*** p < 0.01$.

Appendix D (Chapter 3)

Weighted Probit on Electricity Use and General Sanitary Condition
(Baseline without Household and Village Controls)

Table: D1

Explanatory Variables	Dependent Variables		
	Household Utilize Electricity (1)	General Sanitary Condition (2)	
		HH surrounded by Trash (2.1)	HH is Well kept and Clean (2.2)
Treat	0.039 (0.035)	-0.025 (0.037)	0.034 (0.036)
Muslim	-0.107** (0.053)	-0.055 (0.059)	0.023 (0.055)
Age	0.00006* (0.0003)	-0.0006 (0.0004)	0.0002 (0.0004)
Observations (N)	24141	24124	24102

Notes: (i) Results reported are the coefficients (the change in probability) of the linear probability model. (ii) Robust standard errors clustered at the village level are in parentheses. (iii) $* p < 0.10$; $** p < 0.05$; $*** p < 0.01$.

Weighted Ordered Logistic Regressions on Quality of Housing
(Baseline without Household and Village Controls)

Table: D2

Explanatory Variables	Dependent Variables		
	Number of Rooms (1)	Flooring Type of Main Bedroom (2)	Roofing Type of Main Bedroom (3)
Treat	-0.008 (0.089)	-0.737 * (0.395)	-0.041 (0.264)
Muslim	0.501*** (0.128)	-0.654 (0.624)	-0.322 (0.469)
Age	0.013*** (0.001)	-0.010 (0.007)	-0.008** (0.003)
Observations (N)	24065	24085	24136

Notes: (i) Results reported are the coefficients of the odds ratio. (ii) Robust standard errors clustered at the village level are in parentheses. (iii) $* p < 0.10$; $** p < 0.05$; $*** p < 0.01$.

Weighted Ordered Logistic Regressions on Quality of Water and Washroom (Baseline without Household and Village Controls)

Table: D3

Explanatory Variables	Dependent Variables	
	Main Source of Drinking Water (1)	**Source of Water for Cleaning Utensils (2)**
Treat	-0.910*** (0.284)	-0.436** (0.182)
Muslim	-2.488*** (0.353)	-0.668* (0.358)
Age	-0.005 (0.004)	-0.007*** (0.002)
Observations (N)	24141	24104

Table: D4

Explanatory Variables	Dependent Variables		
	Type of Washroom Used By Men (1)	**Type of Washroom Used By Women (2)**	**Type of Washroom Used By Children (3)**
Treat	-0.387*** (0.116)	-0.429*** (0.119)	-0.159 (0.126)
Muslim	-0.094 (0.217)	-0.131 (0.228)	-0.043 (0.235)
Age	-0.004** (0.001)	-0.004** (0.001)	-0.003* (0.002)
Observations (N)	24071	23899	19365

Notes: (i) Results reported are the coefficients of the odds ratio. (ii) Robust standard errors clustered at the village level are in parentheses. (iii) $* p < 0.10$; $** p < 0.05$; $*** p < 0.01$.

Weighted Probit on Electricity Use and General Sanitary Condition (Heterogeneity with Predetermined Variables)

Table: D5

Explanatory Variables	Dependent Variables		
	Household Utilize Electricity (1)	General Sanitary Condition (2)	
		HH surrounded by Trash (2.1)	HH is Well kept and Clean (2.2)
Treat	-0.016 (0.059)	-0.026 (0.073)	0.025 (0.074)
Treat*Age<70	0.059 (0.044)	0.0007 (0.061)	0.009 (0.065)
Age<70	-0.127*** (0.054)	0.062 (0.039)	-0.043 (0.048)
Muslim	-0.107** (0.053)	-0.056 (0.059)	0.023 (0.055)
Observations (N)	24141	24124	24102

Notes: (i) Results reported are the coefficients (the change in probability) of the linear probability model. (ii) Robust standard errors clustered at the village level are in parentheses. (iii) $* p < 0.10$; $** p < 0.05$; $*** p < 0.01$.

Weighted Ordered Logistic Regressions on Quality of Housing (Heterogeneity with Predetermined Variables)

Table: D6

Explanatory Variables	Dependent Variables		
	Number of Rooms (1)	Flooring Type of Main Bedroom (2)	Roofing Type of Main Bedroom (3)
Treat	0.048 (0.245)	-0.042 (0.861)	-0.282 (0.525)
Treat*Age<70	-0.056 (0.230)	-0.753 (0.736)	0.247 (0.517)
Age<70	-0.583*** (0.169)	1.085* (0.653)	0.191 (0.491)
Muslim	0.495** (0.129)	-0.655 (0.631)	-0.323 (0.471)
Observations (N)	24065	24085	24136

Notes: (i) Results reported are the coefficients of the odds ratio. (ii) Robust standard errors clustered at the village level are in parentheses. (iii) $* p < 0.10$; $** p < 0.05$; $*** p < 0.01$.

Weighted Ordered Logistic Regressions on Quality of Water and Washroom (Heterogeneity with Predetermined Variables)

Table: D7

Explanatory Variables	Dependent Variables	
	Main Source of Drinking Water (1)	**Source of Water for Cleaning Utensils (2)**
Treat	-0.805* (0.432)	-0.003 (0.309)
Treat*Age<70	-0.110 (0.377)	-0.457 (0.298)
Age<70	0.935*** (0.295)	0.702*** (0.208)
Muslim	-2.499*** (0.351)	-0.669* (0.358)
Observations (N)	24141	24104

Table: D8

Explanatory Variables	Dependent Variables		
	Type of Washroom Used By Men (1)	**Type of Washroom Used By Women (2)**	**Type of Washroom Used By Children (3)**
Treat	0.058 (0.315)	0.010 (0.286)	0.263 (0.314)
Treat*Age<70	-0.468 (0.297)	-0.462* (0.260)	-0.442 (0.275)
Age<70	0.581*** (0.208)	0.515*** (0.184)	0.594*** (0.216)
Muslim	-0.095 (0.217)	-0.130 (0.228)	-0.044 (0.235)
Observations (N)	24071	23899	19365

Notes: (i) Results reported are the coefficients of the odds ratio. (ii) Robust standard errors clustered at the village level are in parentheses. (iii) $* p < 0.10$; $** p < 0.05$; $*** p < 0.01$.

Weighted Probit on Electricity Use and General Sanitary Condition
(Heterogeneity with Predetermined Variables)

Table: D9

Explanatory Variables	Dependent Variables		
	Household Utilize Electricity (1)	General Sanitary Condition (2)	
		HH surrounded by Trash (2.1)	HH is Well kept and Clean (2.2)
Treat	0.105 (0.122)	-0.002 (0.111)	0.005 (0.111)
Age	0.0005 (0.0004)	-0.0006 (0.0006)	0.0003 (0.0005)
Muslim	-0.122 (0.137)	-0.083 (0.106)	0.077 (0.109)
Treat*Muslim	-0.040 (0.114)	-0.009 (0.112)	-0.004 (0.114)
Higher Education	0.060** (0.029)	-0.051* (0.028)	0.045 (0.030)
Treat*Higher Education	0.016 (0.034)	-0.022 (0.041)	0.027 (0.037)
Observations (N)	12637	12629	12610

Notes: (i) Results reported are the coefficients of the marginal effects. (ii) Robust standard errors clustered at the village level are in parentheses. (iii) $* p < 0.10$; $** p < 0.05$; $*** p < 0.01$.

Weighted Ordered Logistic Regressions on Quality of Housing
(Heterogeneity with Predetermined Variables)

Table: D10

Explanatory Variables	Dependent Variables		
	Number of Rooms (1)	**Flooring Type of Main Bedroom (2)**	**Roofing Type of Main Bedroom (3)**
Treat	0.484 (0.357)	-0.499 (1.069)	1.140 (1.827)
Age	0.014 (0.001)	-0.014** (0.006)	-0.007 (0.005)
Muslim	0.751** (0.294)	0.210 (0.686)	1.375 (1.697)
Treat*Muslim	-0.460 (0.373)	-0.312 (0.817)	-1.416 (1.822)
Higher Education	0.597*** (0.106)	-0.922*** (0.335)	-0.463 (0.447)
Treat*Higher Education	-0.046 (0.201)	-0.373 (0.410)	-0.427 (0.595)
Observations (N)	12594	12621	12638

Notes: (i) Results reported are the coefficients of the odds ratio. (ii) Robust standard errors clustered at the village level are in parentheses. (iii) $* p < 0.10$; $** p < 0.05$; $*** p < 0.01$.

Weighted Ordered Logistic Regressions on Quality of Water Used in Households (Heterogeneity with Predetermined Variables)

Table: D11

Explanatory Variables	Dependent Variables	
	Main Source of Drinking Water (1)	Source of Water for Cleaning Utensils (2)
Treat	0.009 (0.656)	-1.526*** (0.587)
Age	-0.007 (0.005)	-0.008 (0.002)
Muslim	-1.908*** (0.553)	-1.083** (0.496)
Treat*Muslim	-0.205 (0.669)	1.444*** (0.545)
Higher Education	-0.211 (0.454)	-0.389*** (0.149)
Treat*Higher Education	-0.901 (0.565)	0.004 (0.197)
Observations (N)	12643	12615

Notes: (i) Results reported are the coefficients of the odds ratio. (ii) Robust standard errors clustered at the village level are in parentheses. (iii) $* p < 0.10$; $** p < 0.05$; $*** p < 0.01$.

Weighted Ordered Logistic Regression on Quality of Washroom in Households (Heterogeneity with Predetermined Variables)

Table: D12

Explanatory Variables	Dependent Variables		
	Type of Washroom Used By Men (1)	**Type of Washroom Used By Women (2)**	**Type of Washroom Used By Children (3)**
Treat	-0.516 (0.500)	-0.568 (0.502)	-0.101 (0.528)
Age	-0.004* (0.002)	-0.003* (0.002)	-0.002 (0.003)
Muslim	0.037 (0.423)	-0.012 (0.436)	0.238 (0.406)
Treat*Muslim	0.285 (0.478)	0.293 (0.485)	-0.033 (0.499)
Higher Education	-0.460*** (0.111)	-0.450*** (0.106)	-0.468*** (0.123)
Treat*Higher Education	-0.219 (0.188)	-0.235 (0.182)	0.125 (0.232)
Observations (N)	12612	12520	10034

Notes: (i) Results reported are the coefficients of the odds ratio. (ii) Robust standard errors clustered at the village level are in parentheses. (iii) $* \ p < 0.10$; $** \ p < 0.05$; $*** \ p < 0.01$.

Weighted Probit on Electricity Use and General Sanitary Condition (Baseline with Household Controls)

Table: D13

Explanatory Variables	Dependent Variables		
	Household Utilize Electricity (1)	General Sanitary Condition (2)	
		HH surrounded by Trash (2.1)	HH is Well kept and Clean (2.2)
Treat	0.072 (0.048)	-0.016 (0.038)	0.008 (0.037)
Muslim	-0.168*** (0.073)	-0.092 (0.057)	0.076 (0.055)
Years of Education	0.013*** (0.003)	-0.018*** (0.003)	0.015*** (0.003)
Unmarried Female Head	-0.016 (0.026)	-0.078* (0.041)	0.052 (0.038)
Married Female Head	-0.002 (0.008)	-0.013 (0.017)	0.006 (0.016)
Husband Absent NH	-0.012* (0.007)	-0.001 (0.012)	-0.012 (0.012)
Observations (N)	12637	12629	12610

Notes: (i) Results reported are the coefficients (the change in probability) of the linear probability model. (ii) Robust standard errors clustered at the village level are in parentheses. (iii) $* p < 0.10$; $** p < 0.05$; $*** p < 0.01$.

Weighted Ordered Logistic Regressions on Quality of Housing (Baseline with Household Controls)

Table: D14

Explanatory Variables	Dependent Variables		
	Number of Rooms (1)	**Flooring Type of Main Bedroom (2)**	**Roofing Type of Main Bedroom (3)**
Treat	0.018 (0.120)	-0.964* (0.518)	-0.302 (0.332)
Muslim	0.375** (0.172)	-0.022 (0.403)	0.279 (0.667)
Years of Education	0.123*** (0.014)	-0.262*** (0.032)	-0.183*** (0.049)
Unmarried Female Head	-0.533*** (0.166)	0.152 (0.450)	0.328 (0.662)
Married Female Head	-0.329*** (0.043)	-0.025 (0.125)	0.101 (0.124)
Husband Absent NH	-0.211*** (0.042)	0.287* (0.148)	0.101 (0.119)
Observations (N)	12594	12621	12638

Notes: (i) Results reported are the coefficients of the odds ratio. (ii) Robust standard errors clustered at the village level are in parentheses. (iii) $* p < 0.10$; $** p < 0.05$; $*** p < 0.01$.

Weighted Ordered Logistic Regressions on Quality of Water Used in Households (Baseline with Household Controls)

Table: D15

Explanatory Variables	Dependent Variables	
	Main Source of Drinking Water (1)	Source of Water for Cleaning Utensils (2)
Treat	-0.389 (0.290)	-0.144 (0.149)
Muslim	-2.092*** (0.435)	0.090 (0.263)
Years of Education	-0.192*** (0.046)	-0.088*** (0.015)
Unmarried Female Head	-0.076 (0.352)	0.062 (0.150)
Married Female Head	0.279* (0.167)	0.001 (0.053)
Husband Absent NH	0.069 (0.160)	0.086 (0.052)
Observations (N)	12643	12615

Notes: (i) Results reported are the coefficients of the odds ratio. (ii) Robust standard errors clustered at the village level are in parentheses. (iii) $* p < 0.10$; $** p < 0.05$; $*** p < 0.01$.

Weighted Ordered Logistic Regression on Quality of Washroom in Households (Baseline with Household Controls)

Table: D16

Explanatory Variables	Dependent Variables		
	Type of Washroom Used By Men (1)	**Type of Washroom Used By Women (2)**	**Type of Washroom Used By Children (3)**
Treat	-0.317**	-0.367**	-0.073
	(0.145)	(0.146)	(0.151)
Muslim	0.271	0.226	0.205
	(0.196)	(0.205)	(0.183)
Years of Education	-0.125***	-0.126***	-0.084***
	(0.018)	(0.018)	(0.020)
Unmarried Female Head	-0.002	0.029	-0.188
	(0.167)	(0.173)	(0.213)
Married Female Head	0.011	0.018	-0.055
	(0.048)	(0.046)	(0.063)
Husband Absent NH	0.005	0.015	-0.076
	(0.050)	(0.048)	(0.062)
Observations (N)	12612	12520	10034

Notes: (i) Results reported are the coefficients of the odds ratio. (ii) Robust standard errors clustered at the village level are in parentheses. (iii) $* p < 0.10$; $** p < 0.05$; $*** p < 0.01$.

Weighted Probit on Electricity Use and General Sanitary Condition (Heterogeneity with Age): Household Controls

Table: D17

Explanatory Variables	Dependent Variables		
	Household Utilize Electricity (1)	General Sanitary Condition (2)	
		HH surrounded by Trash (2.1)	HH is Well kept and Clean (2.2)
Treat	0.009 (0.091)	0.011 (0.089)	-0.046 (0.087)
Treat*Age<70	0.067 (0.067)	-0.028 (0.084)	0.056 (0.086)
Age<70	-0.170*** (0.081)	0.098* (0.049)	-0.086* (0.048)
Muslim	-0.165*** (0.073)	-0.094* (0.057)	0.077 (0.055)
Years of Education	0.013*** (0.003)	-0.017*** (0.041)	0.015*** (0.003)
Unmarried Female Head	-0.019 (0.026)	-0.079* (0.041)	0.052 (0.038)
Married Female Head	-0.00001 (0.008)	-0.014 (0.017)	0.007 (0.016)
Husband Absent NH	-0.010 (0.007)	-0.002 (0.012)	-0.011 (0.012)
Observations (N)	12637	12629	12610

Notes: (i) Results reported are the coefficients (the change in probability) of the linear probability model. (ii) Robust standard errors clustered at the village level are in parentheses. (iii) $* p < 0.10$; $** p < 0.05$; $*** p < 0.01$.

Weighted Ordered Logistic Regressions on Quality of Housing (Heterogeneity with Age): Household Controls

Table: D18

Explanatory Variables	Dependent Variables		
	Number of Rooms (1)	**Flooring Type of Main Bedroom (2)**	**Roofing Type of Main Bedroom (3)**
Treat	0.039 (0.286)	0.485 (0.868)	0.119 (0.544)
Treat*Age<70	-0.025 (0.292)	-1.599** (0.630)	-0.440 (0.534)
Age<70	-0.557** (0.236)	1.611*** (0.540)	0.245 (0.442)
Muslim	0.399** (0.168)	-0.017 (0.397)	0.286 (0.670)
Years of Education	0.122*** (0.015)	-0.262*** (0.032)	-0.183*** (0.049)
Unmarried Female Head	-0.543*** (0.162)	0.184 (0.480)	0.328 (0.661)
Married Female Head	-0.318*** (0.043)	-0.035 (0.122)	0.100 (0.125)
Husband Absent NH	-0.204*** (0.041)	0.272** (0.138)	0.098 (0.119)
Observations (N)	12594	12621	12638

Notes: (i) Results reported are the coefficients of the odds ratio. (ii) Robust standard errors clustered at the village level are in parentheses. (iii) $* p < 0.10$; $** p < 0.05$; $*** p < 0.01$.

Weighted Ordered Logistic Regressions on Quality of Water Used in Households (Heterogeneity with Age): Household Controls

Table: D19

Explanatory Variables	Dependent Variables	
	Main Source of Drinking Water (1)	**Source of Water for Cleaning Utensils (2)**
Treat	-0.299 (0.606)	0.453 (0.394)
Treat*Age<70	-0.087 (0.666)	-0.629 (0.397)
Age<70	0.961 (0.590)	0.800*** (0.304)
Muslim	-2.103*** (0.435)	0.085 (0.260)
Years of Education	-0.191*** (0.045)	-0.088*** (0.015)
Unmarried Female Head	-0.059 (0.355)	0.067 (0.155)
Married Female Head	0.267 (0.166)	-0.008 (0.054)
Husband Absent NH	0.063 (0.159)	0.076 (0.050)
Observations (N)	12643	12615

Notes: (i) Results reported are the coefficients of the odds ratio. (ii) Robust standard errors clustered at the village level are in parentheses. (iii) $* p < 0.10$; $** p < 0.05$; $*** p < 0.01$.

Weighted Ordered Logistic Regression on Quality of Washroom in Households (Heterogeneity with Age): Household Controls

Table: D20

Explanatory Variables	Dependent Variables		
	Type of Washroom Used By Men (1)	**Type of Washroom Used By Women (2)**	**Type of Washroom Used By Children (3)**
Treat	0.322 (0.382)	0.225 (0.339)	0.538 (0.452)
Treat*Age<70	-0.667* (0.366)	-0.619* (0.321)	-0.635 (0.395)
Age<70	0.741*** (0.279)	0.603*** (0.232)	0.749** (0.326)
Muslim	0.269 (0.196)	0.227 (0.205)	0.206 (0.184)
Years of Education	-0.125*** (0.018)	-0.127*** (0.018)	-0.084*** (0.020)
Unmarried Female Head	0.001 (0.173)	0.032 (0.178)	-0.190 (0.212)
Married Female Head	0.006 (0.047)	0.013 (0.046)	-0.061 (0.062)
Husband Absent NH	-0.003 (0.047)	0.008 (0.046)	-0.083 (0.060)
Observations (N)	12612	12520	10034

Notes: (i) Results reported are the coefficients of the odds ratio. (ii) Robust standard errors clustered at the village level are in parentheses. (iii) $* p < 0.10$; $** p < 0.05$; $*** p < 0.01$.

Weighted Probit on Electricity Use and General Sanitary Condition (Heterogeneity with Religion and Education): Household Controls

Table: D21

Explanatory Variables	Dependent Variables		
	Household Utilize Electricity (1)	General Sanitary Condition (2)	
		HH surrounded by Trash (2.1)	HH is Well kept and Clean (2.2)
Treat	0.108 (0.122)	-0.004 (0.112)	0.005 (0.112)
Muslim	-0.199 (0.136)	-0.084 (0.107)	0.078 (0.110)
Treat*Muslim	-0.043 (0.114)	-0.007 (0.113)	-0.004 (0.115)
Higher Education	0.061** (0.029)	-0.051* (0.028)	0.045 (0.031)
Treat*Higher Education	0.015 (0.034)	-0.022 (0.041)	0.026 (0.038)
Unmarried Female Head	-0.016 (0.027)	-0.077* (0.041)	0.050 (0.039)
Married Female Head	-0.002 (0.008)	-0.011 (0.017)	0.004 (0.016)
Husband Absent NH	-0.012* (0.007)	0.0001 (0.012)	-0.013 (0.012)
Observations (N)	12637	12629	12610

Notes: (i) Results reported are the coefficients (the change in probability) of the linear probability model. (ii) Robust standard errors clustered at the village level are in parentheses. (iii) $* p < 0.10$; $** p < 0.05$; $*** p < 0.01$.

Weighted Ordered Logistic Regressions on Quality of Housing (Heterogeneity with Religion and Education): Household Controls

Table: D22

Explanatory Variables	Dependent Variables		
	Number of Rooms (1)	**Flooring Type of Main Bedroom (2)**	**Roofing Type of Main Bedroom (3)**
Treat	0.573*	-0.567	1.100
	(0.337)	(1.057)	(1.828)
Muslim	0.781***	0.181	1.361
	(0.271)	(0.669)	(1.708)
Treat*Muslim	-0.540	-0.247	-1.381
	(0.353)	(0.806)	(1.823)
Higher Education	0.612***	-0.942***	-0.473
	(0.103)	(0.333)	(0.447)
Treat*Higher Education	-0.069	-0.351	-0.414
	(0.199)	(0.408)	(0.594)
Unmarried Female Head	-0.533***	0.097	0.315
	(0.171)	(0.436)	(0.662)
Married Female Head	-0.323***	-0.019	0.121
	(0.044)	(0.121)	(0.125)
Husband Absent NH	-0.210***	0.281*	0.111
	(0.044)	(0.147)	(0.112)
Observations (N)	12594	12621	12638

Notes: (i) Results reported are the coefficients of the odds ratio. (ii) Robust standard errors clustered at the village level are in parentheses. (iii) $* \ p < 0.10$; $** \ p < 0.05$; $*** \ p < 0.01$.

Weighted Ordered Logistic Regressions on Quality of Water Used in Households (Heterogeneity with Religion and Education): Household Controls

Table: D23

Explanatory Variables	Dependent Variables	
	Main Source of Drinking Water (1)	Source of Water for Cleaning Utensils (2)
Treat	-0.014 (0.658)	-1.569*** (0.605)
Muslim	-1.913*** (0.557)	-1.102** (0.511)
Treat*Muslim	-0.187 (0.667)	1.485*** (0.559)
Higher Education	-0.218 (0.454)	-0.401*** (0.149)
Treat*Higher Education	-0.894 (0.564)	0.015 (0.197)
Unmarried Female Head	-0.059 (0.356)	0.092 (0.160)
Married Female Head	0.296* (0.158)	-0.0002 (0.054)
Husband Absent NH	0.075 (0.159)	0.089* (0.053)
Observations (N)	12643	12615

Notes: (i) Results reported are the coefficients of the odds ratio. (ii) Robust standard errors clustered at the village level are in parentheses. (iii) $* p < 0.10$; $** p < 0.05$; $*** p < 0.01$.

Weighted Ordered Logistic Regression on Quality of Washroom in Households (Heterogeneity with Religion and Education): Household Controls

Table: D24

Explanatory Variables	Dependent Variables		
	Type of Washroom Used By Men (1)	**Type of Washroom Used By Women (2)**	**Type of Washroom Used By Children (3)**
Treat	-0.535 (0.502)	-0.586 (0.503)	-0.111 (0.526)
Muslim	0.033 (0.422)	-0.018 (0.435)	0.237 (0.404)
Treat*Muslim	0.302 (0.478)	0.311 (0.485)	-0.024 (0.497)
Higher Education	-0.464*** (0.112)	-0.455*** (0.107)	-0.473*** (0.123)
Treat*Higher Education	-0.213 (0.188)	-0.231 (0.183)	0.128 (0.231)
Unmarried Female Head	0.013 (0.166)	0.044 (0.171)	-0.168 (0.217)
Married Female Head	0.018 (0.047)	0.024 (0.045)	-0.057 (0.062)
Husband Absent NH	0.011 (0.049)	0.021 (0.048)	-0.072 (0.061)
Observations (N)	12612	12520	10034

Notes: (i) Results reported are the coefficients of the odds ratio. (ii) Robust standard errors clustered at the village level are in parentheses. (iii) $* p < 0.10$; $** p < 0.05$; $*** p < 0.01$.

Weighted Probit on Electricity Use and General Sanitary Condition
(Baseline with Household and Village Controls)

Table: D25

Explanatory Variables	Dependent Variables		
	Household Utilize Electricity (1)	General Sanitary Condition (2)	
		HH surrounded by Trash (2.1)	HH is Well kept and Clean (2.2)
Treat	0.069 (0.049)	-0.021 (0.037)	0.014 (0.037)
Muslim	-0.137** (0.069)	-0.046 (0.056)	0.027 (0.049)
Years of Education	0.010*** (0.004)	-0.017*** (0.004)	0.014*** (0.004)
Unmarried Female Head	-0.014 (0.028)	-0.067 (0.046)	0.061 (0.041)
Married Female Head	-0.005 (0.009)	-0.027 (0.018)	0.018 (0.017)
Husband Absent NH	-0.015* (0.008)	0.001 (0.014)	-0.011 (0.014)
Secondary School Nearby	-0.018* (0.033)	0.028 (0.033)	-0.006 (0.035)
Finance Institution	-0.085 (0.056)	-0.052 (0.048)	0.039 (0.049)
Engine Boat	-0.085* (0.043)	0.043 (0.046)	-0.043 (0.046)
Km to Hospital	-0.085 (0.043)	0.002 (0.001)	-0.001 (0.001)
Pucca Road	-0.027 (0.019)	0.007 (0.024)	-0.007 (0.027)
Observations (N)	10499	10440	10421

Notes: (i) Results reported are the coefficients (the change in probability) of the linear probability model. (ii) Robust standard errors clustered at the village level are in parentheses. (iii) $* p < 0.10$; $** p < 0.05$; $*** p < 0.01$.

Weighted Ordered Logistic Regressions on Quality of Housing
(Baseline with Household and Village Controls)

Table: D26

Explanatory Variables	Dependent Variables		
	Number of Rooms (1)	**Flooring Type of Main Bedroom (2)**	**Roofing Type of Main Bedroom (3)**
Treat	-0.070 (0.136)	-0.467 (0.492)	-0.115 (0.351)
Muslim	0.401** (0.191)	-0.344 (0.502)	0.397 (0.696)
Years of Education	0.129*** (0.015)	-0.255*** (0.036)	-0.195*** (0.051)
Unmarried Female Head	-0.534*** (0.193)	0.772** (0.373)	0.495 (0.432)
Married Female Head	-0.304*** (0.050)	-0.043 (0.143)	-0.014 (0.126)
Husband Absent NH	-0.209*** (0.046)	0.283* (0.169)	-0.041 (0.126)
Secondary School Nearby	0.069 (0.100)	0.209 (0.376)	-0.327 (0.294)
Finance Institution	-0.024 (0.160)	0.745 (0.579)	0.590 (0.388)
Engine Boat	-0.260 (0.180)	0.915** (0.445)	0.500 (0.329)
Km to Hospital	-0.003 (0.005)	0.007 (0.009)	0.017*** (0.005)
Pucca Road	0.018 (0.032)	-0.009 (0.263)	0.055 (0.161)
Observations (N)	10425	10435	10449

Notes: (i) Results reported are the coefficients of the odds ratio. (ii) Robust standard errors clustered at the village level are in parentheses. (iii) $* p < 0.10$; $** p < 0.05$; $*** p < 0.01$.

Weighted Ordered Logistic Regressions on Quality of Water Used in Households (Baseline with Household and Village Controls)

Table: D27

Explanatory Variables	Dependent Variables	
	Main Source of Drinking Water (1)	Source of Water for Cleaning Utensils (2)
Treat	-0.291 (0.336)	-0.014 (0.164)
Muslim	-1.997*** (0.481)	0.107 (0.272)
Years of Education	-0.173*** (0.050)	-0.092*** (0.017)
Unmarried Female Head	-0.138 (0.347)	0.001 (0.181)
Married Female Head	0.312 (0.195)	-0.009 (0.063)
Husband Absent NH	0.179 (0.193)	0.102 (0.063)
Secondary School Nearby	-0.454 (0.285)	-0.141 (0.123)
Finance Institution	-0.380 (0.435)	0.168 (0.195)
Engine Boat	-0.105 (0.367)	0.196 (0.161)
Km to Hospital	-0.004 (0.006)	0.001 (0.004)
Pucca Road	0.058 (0.)	-0.090 (0.061)
Observations (N)	10454	10433

Notes: (i) Results reported are the coefficients of the odds ratio. (ii) Robust standard errors clustered at the village level are in parentheses. (iii) $* p < 0.10$; $** p < 0.05$; $*** p < 0.01$.

Weighted Ordered Logistic Regression on Quality of Washroom in Households (Baseline with Household and Village Controls)

Table: D28

Explanatory Variables	Dependent Variables		
	Type of Washroom Used By Men (1)	**Type of Washroom Used By Women (2)**	**Type of Washroom Used By Children (3)**
Treat	-0.229 (0.155)	-0.269 (0.157)	-0.011 (0.156)
Muslim	0.216 (0.206)	0.164 (0.219)	0.166 (0.194)
Years of Education	-0.122*** (0.019)	-0.127*** (0.020)	-0.083*** (0.022)
Unmarried Female Head	0.052 (0.190)	0.087 (0.192)	-0.210 (0.246)
Married Female Head	-0.024 (0.049)	-0.013 (0.047)	-0.095 (0.075)
Husband Absent NH	0.008 (0.056)	0.019 (0.055)	-0.109 (0.071)
Secondary School Nearby	-0.152 (0.123)	-0.150 (0.114)	0.079 (0.137)
Finance Institution	0.302* (0.176)	0.301* (0.175)	0.093 (0.216)
Engine Boat	0.247 (0.155)	0.209 (0.149)	0.115 (0.210)
Km to Hospital	0.007 (0.004)	0.006 (0.005)	0.002 (0.006)
Pucca Road	-0.021 (0.054)	-0.040 (0.049)	-0.133** (0.053)
Observations (N)	10424	10346	8234

Notes: (i) Results reported are the coefficients of the odds ratio. (ii) Robust standard errors clustered at the village level are in parentheses. (iii) $* p < 0.10$; $** p < 0.05$; $*** p < 0.01$.

Weighted Probit on Electricity Use and General Sanitary Condition (Heterogeneity with Age): Household and Village Controls

Table: D29

Explanatory Variables	Dependent Variables		
	Household Utilize Electricity (1)	General Sanitary Condition (2)	
		HH surrounded by Trash (2.1)	HH is Well kept and Clean (2.2)
Treat	0.003 (0.097)	0.075 (0.088)	-0.101 (0.081)
Treat*Age<70	0.073 (0.068)	-0.102 (0.088)	0.122 (0.086)
Age<70	-0.212*** (0.089)	0.137** (0.055)	-0.113** (0.049)
Muslim	-0.131** (0.069)	-0.048 (0.055)	0.027 (0.048)
Years of Education	0.010*** (0.004)	-0.017*** (0.004)	0.014*** (0.003)
Unmarried Female Head	-0.019 (0.028)	-0.066 (0.046)	0.061 (0.041)
Married Female Head	-0.003 (0.009)	-0.028 (0.018)	0.019 (0.017)
Husband Absent NH	-0.012* (0.007)	-0.0005 (0.013)	-0.009 (0.013)
Secondary School Nearby	-0.017 (0.033)	0.028 (0.033)	-0.006 (0.035)
Finance Institution	-0.085* (0.055)	-0.052 (0.048)	0.039 (0.049)
Engine Boat	-0.085* (0.042)	0.043 (0.046)	-0.041 (0.045)
Km to Hospital	-0.001 (0.001)	0.001 (0.001)	-0.0001 (0.001)
Pucca Road	-0.026 (0.019)	0.006 (0.024)	-0.007 (0.027)
Observations (N)	10449	10440	10421

Notes: (i) Results reported are the coefficients (the change in probability) of the linear probability model. (ii) Robust standard errors clustered at the village level are in parentheses. (iii) $*$ $p < 0.10$; $**$ $p < 0.05$; $***$ $p < 0.01$.

Weighted Ordered Logistic Regressions on Quality of Housing (Heterogeneity with Age): Household and Village Controls

Table: D30

Explanatory Variables	Dependent Variables		
	Number of Rooms (1)	**Flooring Type of Main Bedroom (2)**	**Roofing Type of Main Bedroom (3)**
Treat	0.010 (0.350)	1.051 (0.843)	0.523 (0.362)
Treat*Age<70	-0.084 (0.356)	-1.678*** (0.629)	-0.668* (0.389)
Age<70	-0.535* (0.279)	1.707** (0.567)	0.474 (0.296)
Muslim	0.435** (0.187)	-0.341 (0.487)	0.407 (0.703)
Years of Education	0.128*** (0.015)	-0.255*** (0.036)	-0.195*** (0.051)
Unmarried Female Head	-0.552*** (0.188)	0.838* (0.452)	0.496 (0.430)
Married Female Head	-0.291*** (0.049)	-0.063 (0.136)	-0.017 (0.124)
Husband Absent NH	-0.200*** (0.045)	0.266* (0.158)	0.036 (0.122)
Secondary School Nearby	-0.075 (0.100)	0.203 (0.374)	-0.324 (0.294)
Finance Institution	-0.027 (0.160)	0.758 (0.572)	0.592 (0.388)
Engine Boat	-0.260 (0.178)	0.899** (0.444)	0.491 (0.329)
Km to Hospital	-0.003 (0.005)	0.007 (0.009)	0.017*** (0.005)
Pucca Road	0.022 (0.032)	-0.018 (0.263)	0.053 (0.161)
Observations (N)	10425	10435	10449

Notes: (i) Results reported are the coefficients of the odds ratio. (ii) Robust standard errors clustered at the village level are in parentheses. (iii) $* p < 0.10$; $** p < 0.05$; $*** p < 0.01$.

Weighted Ordered Logistic Regressions on Quality of Water Used in Households (Heterogeneity with Age): Household and Village Controls

Table: D31

Explanatory Variables	Dependent Variables	
	Main Source of Drinking Water (1)	**Source of Water for Cleaning Utensils (2)**
Treat	0.845 (0.729)	0.654 (0.458)
Treat*Age<70	-0.385 (0.834)	-0.707 (0.467)
Age<70	1.108 (0.786)	0.094** (0.366)
Muslim	-2.013*** (0.482)	0.097 (0.268)
Years of Education	-0.170*** (0.049)	-0.092*** (0.017)
Unmarried Female Head	-0.112 (0.349)	0.015 (0.190)
Married Female Head	0.298 (0.196)	-0.022 (0.063)
Husband Absent NH	0.171 (0.192)	0.091 (0.061)
Secondary School Nearby	-0.457 (0.288)	-0.141 (0.122)
Finance Institution	-0.103 (0.368)	0.173 (0.195)
Engine Boat	0.041 (0.371)	0.187 (0.161)
Km to Hospital	-0.004 (0.006)	0.0008 (0.004)
Pucca Road	0.055 (0.100)	-0.095 (0.062)
Observations (N)	1045	10433

Notes: (i) Results reported are the coefficients of the odds ratio. (ii) Robust standard errors clustered at the village level are in parentheses. (iii) $* p < 0.10$; $** p < 0.05$; $*** p < 0.01$.

Weighted Ordered Logistic Regression on Quality of Washroom in Households (Heterogeneity with Age): Household and Village Controls

Table: D32

Explanatory Variables	Dependent Variables		
	Type of Washroom Used By Men (1)	**Type of Washroom Used By Women (2)**	**Type of Washroom Used By Children (3)**
Treat	0.384 (0.455)	0.336 (0.379)	0.737 (0.515)
Treat*Age<70	-0.642 (0.438)	-0.636* (0.361)	-0.780* (0.457)
Age<70	0.770** (0.356)	0.644** (0.275)	0.880** (0.366)
Muslim	0.210 (0.207)	0.165 (0.219)	0.167 (0.194)
Years of Education	-0.122*** (0.019)	-0.127*** (0.020)	-0.083*** (0.022)
Unmarried Female Head	0.063 (0.199)	0.095 (0.200)	-0.212 (0.246)
Married Female Head	-0.033 (0.049)	0.010 (0.112)	-0.106 (0.073)
Husband Absent NH	-0.002 (0.054)	-0.021 (0.047)	-0.119* (0.068)
Secondary School Nearby	-0.149 (0.124)	0.012 (0.052)	0.077 (0.136)
Finance Institution	0.305* (0.175)	0.305* (0.175)	0.100 (0.216)
Engine Boat	0.244 (0.154)	0.203 (0.149)	0.109 (0.209)
Km to Hospital	0.008** (0.004)	0.006 (0.005)	0.002 (0.006)
Pucca Road	-0.025 (0.053)	-0.043 (0.049)	-0.138*** (0.052)
Observations (N)	10424	10346	8234

Notes: (i) Results reported are the coefficients of the odds ratio. (ii) Robust standard errors clustered at the village level are in parentheses. (iii) $* p < 0.10$; $** p < 0.05$; $*** p < 0.01$.

Weighted Probit on Electricity Use and General Sanitary Condition (Heterogeneity with Religion and Education): Household and Village Controls

Table: D33

Explanatory Variables	Dependent Variables		
	Household Utilize Electricity (1)	General Sanitary Condition (2)	
		HH surrounded by Trash (2.1)	HH is Well kept and Clean (2.2)
Treat	0.026 (0.123)	0.123 (0.102)	-0.141 (0.092)
Muslim	-0.189 (0.151)	0.075 (0.077)	-0.095 (0.066)
Treat*Muslim	0.044 (0.111)	-0.152 (0.109)	0.157 (0.103)
Higher Education	0.044 (0.038)	0.053 (0.032)	0.034 (0.031)
Treat*Higher Education	0.017 (0.040)	-0.118 (0.043)	0.034 (0.035)
Unmarried Female Head	-0.012 (0.030)	-0.069 (0.046)	0.063 (0.042)
Married Female Head	-0.006 (0.008)	-0.024 (0.018)	0.015 (0.017)
Husband Absent NH	-0.015* (0.008)	0.002 (0.014)	-0.012 (0.014)
Secondary School Nearby	-0.019 (0.033)	0.028 (0.033)	0.007 (0.035)
Finance Institution	-0.087* (0.056)	-0.049 (0.047)	0.037 (0.048)
Engine Boat	-0.086* (0.043)	0.045 (0.047)	-0.044 (0.046)
Km to Hospital	-0.001 (0.001)	0.002 (0.001)	-0.001 (0.001)
Pucca Road	-0.026 (0.019)	0.005 (0.024)	-0.006 (0.027)
Observations (N)	10449	10440	10421

Notes: (i) Results reported are the coefficients (the change in probability) of the linear probability model. (ii) Robust standard errors clustered at the village level are in parentheses. (iii) $*$ $p < 0.10$; $**$ $p < 0.05$; $***$ $p < 0.01$.

Weighted Ordered Logistic Regressions on Quality of Housing (Heterogeneity with Religion and Education): Household and Village Controls

Table: D34

Explanatory Variables	Dependent Variables		
	Number of Rooms (1)	Flooring Type of Main Bedroom (2)	Roofing Type of Main Bedroom (3)
Treat	0.793**	0.184	1.758
	(0.337)	(1.081)	(1.482)
Muslim	1.046***	0.357	1.967
	(0.249)	(0.704)	(1.370)
Treat*Muslim	-0.820***	-0.844	-2.039
	(0.314)	(0.791)	(1.483)
Higher Education	0.667***	-1.283***	-0.741
	(0.118)	(0.302)	(0.522)
Treat*Higher Education	-0.157	0.141	-0.065
	(0.223)	(0.392)	(0.635)
Unmarried Female Head	-0.514**	0.658*	0491
	(0.204)	(0.361)	(0.431)
Married Female Head	-0.295***	-0.033	0.010
	(0.051)	(0.541)	(0.123)
Husband Absent NH	-0.201***	0.267	0.052
	(0.049)	(0.176)	(0.115)
Secondary School Nearby	0.074	0.234	-0.316
	(0.101)	(0.385)	(0.287)
Finance Institution	-0.050	0.808	0.638
	(0.161)	(0.599)	(0.404)
Engine Boat	-0.249	0.905**	0.520*
	(0.178)	(0.447)	(0.307)
Km to Hospital	-0.003	0.008	0.018***
	(0.005)	(0.009)	(0.004)
Pucca Road	0.016	-0.039	0.025
	(0.033)	(0.269)	(0.175)
Observations (N)	10425	10435	10449

Notes: (i) Results reported are the coefficients of the odds ratio. (ii) Robust standard errors clustered at the village level are in parentheses. (iii) $* p < 0.10$; $** p < 0.05$; $*** p < 0.01$.

Weighted Ordered Logistic Regressions on Quality of Water Used in Households (Heterogeneity with Religion and Education): Household and Village Controls

Table: D35

Explanatory Variables	Dependent Variables	
	Main Source of Drinking Water (1)	Source of Water for Cleaning Utensils (2)
Treat	0.736 (0.691)	-0.951 (0.711)
Muslim	-1.310** (0.629)	-0.669 (0.655)
Treat*Muslim	-0.887** (0.712)	0.938 (0.689)
Higher Education	0.128 (0.495)	-0.416** (0.185)
Treat*Higher Education	-1.145* (0.591)	0.063 (0.216)
Unmarried Female Head	-0.180 (0.359)	0.005 (0.192)
Married Female Head	0.343* (0.181)	-0.009 (0.063)
Husband Absent NH	0.184 (0.188)	0.102 (0.063)
Secondary School Nearby	-0.450 (0.289)	-0.141 (0.0127)
Finance Institution	-0.091 (0.373)	0.187 (0.198)
Engine Boat	0.064 (0.385)	0.188 (0.165)
Km to Hospital	-0.003 (0.006)	0.001 (0.004)
Pucca Road	-0.341 (0.107)	-0.086 (0.064)
Observations (N)	10454	10433

Notes: (i) Results reported are the coefficients of the odds ratio. (ii) Robust standard errors clustered at the village level are in parentheses. (iii) $* p < 0.10$; $** p < 0.05$; $*** p < 0.01$.

Weighted Ordered Logistic Regression on Quality of Washroom in Households (Heterogeneity with Religion and Education): Household and Village Controls

Table: D36

Explanatory Variables	Dependent Variables		
	Type of Washroom Used By Men (1)	Type of Washroom Used By Women (2)	Type of Washroom Used By Children (3)
Treat	-0.156 (0.613)	-0.228 (0.631)	0.423 (0.507)
Muslim	0.168 (0.548)	0.202 (0.574)	0.637* (0.375)
Treat*Muslim	-0.069 (0.596)	-0.050 (0.601)	-0.596 (0.460)
Higher Education	-0.525*** (0.126)	-0.561*** (0.128)	-0.543*** (0.141)
Treat*Higher Education	-0.087 (0.187)	-0.052 (0.190)	0.290 (0.243)
Unmarried Female Head	0.051 (0.192)	0.023 (0.055)	-0.220 (0.251)
Married Female Head	-0.016 (0.049)	-0.005 (0.047)	-0.093 (0.074)
Husband Absent NH	0.011 (0.056)	0.023 (0.055)	-0.106 (0.070)
Secondary School Nearby	-0.148 (0.124)	-0.144 (0.116)	0.092 (0.133)
Finance Institutions	0.314* (0.180)	0.314* (0.181)	0.109 (0.216)
Engine Boat	0.248 (0.158)	0.210 (0.154)	0.118 (0.213)
Km to Hospital	0.007* (0.007)	0.006 (0.005)	0.002 (0.006)
Pucca Road	-0.026 (0.053)	-0.044 (0.049)	-0.140*** (0.051)
Observation (N)	10424	10346	8234

Notes: (i) Results reported are the coefficients of the odds ratio. (ii) Robust standard errors clustered at the village level are in parentheses. (iii) $* p < 0.10$; $** p < 0.05$; $*** p < 0.01$.