"Women's property rights and gendered policies:
Implications for women's long-term welfare in rural Tanzania"

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Abstract:

This paper is one of the first to empirically evaluate the effects of community level women's property and inheritance rights (WPIR) on women's individual economic outcomes using a 13 year longitudinal panel from the Kagera region in Tanzania. In the preferred model specification, the method of inverse probability weighting is applied to a woman level fixed-effects model to produce estimates controlling for both individual level heterogeneity as well as sample selection due to various forms of attrition. Results indicate that WPIR are significantly associated with several key outcomes for women including employment outside the home and earnings. In addition, these findings are relevant for all women and not limited to sub-groups of marginalized women. This indicates that lack of gender equity in many sub-Saharan African countries may be a significant inhibitor of economic development for women and society as a whole.

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"Women don't need property of their own.
We take care of them…like we take care of our cows."

(Male elder in Bagamoyo, Tanzania (Tenga and Peter, 1996))

A. Introduction

Programs and policies for economic development are increasingly incorporating gender specific components as a means to improve overall human capital outcomes. In fact, the World Bank recently identified gender equality as both an objective in itself, as well as a key means to promote growth, better governance and reduce poverty (WB, 2001a; WB, 2001). The goal of gender equity is both significant and complex for public policy. In addition to marginalization due to socioeconomic status, women face a distinct and unique set of challenges, including reproductive heath and childcare concerns, discrimination and domestic violence (Malhorta et. al., 2002). A more recent challenge is the vulnerability of women to the HIV/AIDS pandemic, reflected not only in terms of higher infection rates, but also in their role as primary care givers.[1] These complications further justify the need for development policies to be evaluated as containing gender specific elements and to promote the objective of gender equity.

Property and inheritance rights are one such realm in which women lag behind men. Especially in sub-Saharan Africa and other regions where gender discrimination is widespread, claims have been made that restrictive customs and policies concerning property rights have hampered economic advancement of women. However, despite an abundance of qualitative evidence, there is almost no empirical evidence surrounding women's property and inheritance rights (WPIR) and their relationship to human development indicators in sub-Saharan Africa. As with many claims which appeal to human rights arguments, critics may argue that adverse effects of restrictive WPIR are built on the exhibition of the worst case scenarios and that these effects are not relevant or significant for women as a group. This paper seeks to provide preliminary empirical evidence exploring claims concerning WPIR and economic

[1] Women constitute nearly 60 percent of the more than 25 million people estimated to be living with HIV/AIDS in sub-Saharan Africa. In many places, HIV prevalence among girls and young women aged fifteen to nineteen is four to seven times higher than among boys of the same age group (Walsh, 2005). In addition to low socio-economic status which fuels transmission, evidence suggests that women are biologically more likely to be infected than men (See Loewenson and Whiteside, 1997 and WB, 1998: 33-34).

outcomes for women using the Kagera Health and Development Survey (KHDS), a longitudinal panel from rural northern Tanzania collected over 13 years from 1991 to 2004. The panel nature of the data offers a unique opportunity to examine long-term effects of WPIR, which are commonly excluded from micro-level quantitative examination in developing countries due to data constraints. Using a baseline cross-section, results indicate that women who live in communities with high WPIR are more likely to engage in non-agricultural, self-employed work and have higher savings and medical expenditures. When extended to a fixed-effects model which controls for individual endowments as well as attrition due to mobility and mortality using the inverse probability weighting method (IPW), results indicate that women who live in communities with high WPIR are more likely to be employed outside the home and have higher earnings. Overall, these effects are not sub-group specific to women who are less educated, poorer or who have experienced widowhood or divorce. These findings suggest that WPIR restrictions placed on women in Kagera significantly hinder the economic advancement of women and that similar situations are likely in other sub-Saharan African countries.

B. Background and significance

B1. Gendered development and WPIR in sub-Saharan Africa

> *"They talk about African traditions,*
> *but there is no tradition you can speak of—just double standards."*
>
> (Priscilla Echaria, widow, Kenya. November 9, 2002 (HRW, 2003)).

There is significant evidence of gender-based discrimination concerning land and property rights across sub-Saharan Africa. The majority of this literature takes the form of qualitative research, case studies, institutional analysis, anecdotal evidence and popular press and is framed using a human rights or legal perspective (See for example COHRE, 2003; LaFraniere, 2005; Manji 2000, Sossou, 2002; Walsh, 2005; HRW, 2003). Documentation in these frameworks typically highlights the social and psychological suffering women are forced to endure due to cultural and ritual practices surrounding WPIR, especially in the context of widowhood. In general, legal examination of WPIR invokes an equity argument and

references the many international conventions and declarations which uphold women's rights to property and equal treatment by law.[2]

More recently, property rights have been examined using an economic development framework. One of the most visible supporters of property rights for economic development is Peruvian economist Hernando de Soto. In his 2000 book *The Mystery of Capital*, he claims that poverty is created and maintained by the fact that poor people are excluded from the legal system, including rights to property created by Western capitalism (de Soto, 2000).[3] Lack of property rights for the general poor can be easily extended to women specifically. In fact, a growing sub-field of development economics examines how women's lack of access to inputs and resources like land, as well as their disadvantaged bargaining position results in negative economic and health outcomes (Agarwal, 2002; Chadha, 1992; Zwarteveen and Meinzen-Dick, 2001). For example, in her influential book *A Field of One's own*, Bina Agarwal uses India as a case-study to argue that land rights for women are good for economic efficiency, welfare, equity and empowerment (Agarwal, 1995). As a basic argument, access to, ownership of and control of property are fundamental determinants of secure livelihoods. These 'privileges' provide a place to live, a site for economic and social activity as well as collateral for credit, other resources and services. However, in developing countries, women's rights to land and tenure are often thought of in the context of their relation to men: as wives, daughters, mothers or sisters (Gray and Kavene, 1999). Even if women have rights to use land, they are typically limited in their ability to transfer, sell, designate an heir and loan land to other parties. Although WPIR have been examined from an economic development perspective, there is a real lack of empirical work, both on the determinants and the effects of restrictive WPIR. Part of this difficulty stems from the fact that WPIR in rural areas are often outside the reach of

[2] See for example the 1966 'International Covenant on Economic, Social and Cultural Rights,' the 1979 'Convention on the Elimination of All Forms of Discrimination against Women,' and more recently the 'Women's Declaration on Population Policies,' the 1995 'Beijing Platform for Action,' and the 2003 'Commission on Human Rights Resolution 2003/22 on Women's equal ownership, access to and control overland and the equal rights to own property and to adequate housing.')

[3] De Soto's solution is to formalize all informal use of land, giving poor the ability to use property as collateral to obtain loans and to further invest funds.

traditional legal structures and therefore necessitate data collection of customary law at the community level in addition to individual level outcome measures.

Ironically, economic development in and of itself cannot guarantee improvements in property rights for women, especially in rural regions. Using case studies, Gray and Kavene claim that in many regions of sub-Saharan Africa, women's land rights have actually eroded with the introduction of new crops, improved transportation and agricultural development including irrigation projects and new farming techniques (Gray and Kavene, 1999). This view is supported by Tripp who asserts that individual men and corporations (dominated by men) have increasingly challenged women's rights because they are better situated to take advantage of the economic gains from increased land value due to technological improvements (Tripp, 2004). Women are disadvantaged in the market systems of property ownership, either because opportunities to buy land are very limited or because local level authorities discriminate against women, preventing them from claiming land which in theory should be upheld by law (Whitehead and Tsikata, 2003). The same instability is often exhibited when legal titling schemes are introduced. This evidence reinforces the need for gender sensitive development policies, without which there exists the potential to adversely effect marginalized groups such as women.

B2. WPIR in the Context of HIV/AIDS

"I don't know this man's HIV status, and if I die my children will suffer."

(Jiwa Felister, 55 year old Luhya widow, Kenya; Forced by in-laws to undergo ritual cleansing (HRW, 2003))

The examination of WPIR is especially crucial in the context of HIV/AIDS. Strickland argues that when women are barred from owning property, they are unable to secure resources that would allow them to improve their chances of preventing infection, even before the dissolution of a marriage or death of her spouse (A conceptual diagram from Strickland, 2004 traces out pathways between WPIR and household level consequences of HIV/AIDS and is included as Figure J2 in the Appendix). For example, lack of rights within a marriage may increase women's vulnerability to domestic violence, unsafe sex, and other HIV related risk factors. It is believed that HIV/AIDS has exacerbated the issue of woman's rights

for two reasons: (1) the epidemic is placing more women and children in the situation of widowhood at a younger age than before; and (2) the specific manner in which HIV/AIDS impoverishes a household means that upon finding herself a widow, a woman has few resources left with which to resist outside pressures exerted by the clan or members of the extended family regarding inheritances (Drimie, 2002).[4] In addition, widows may face several customary practices such as widow inheritance or cleansing in which sexual activity is often unprotected and coerced (Walsh, 2005).[5] Widow inheritance refers to the practice when a male relative of the dead husband takes over the widow as a wife, often in a polygamous marriage. Although variants of the practice exist within tribes, cleansing usually involves sex with a social outcast, supposedly to cleanse the woman of her dead husband's evil spirits. In this practice, sex is often forced and protection is rarely used, as the cleanse is not thought to be valid unless semen enters the woman (Walsh, 2005). Consequences for the spread of HIV/AIDS are especially relevant if the male regularly engages in cleanses with many widows, as is often the case in small communities. Given the associations between property rights and women's ability make economically motivated choices, it is not surprising that lack of WPIR has been cited as fueling the HIV/AIDS epidemic and as a major issue surrounding rural economic development and poverty (Walsh, 2005).

B3. The Setting: Republic of Tanzania

Formed in 1964, the United Republic of Tanzania occupies the largest land area of any country in East Africa and is home to over 38 million inhabitants (WB, 2006). The country borders with eight countries, Kenya and Uganda to the north, Burundi, Rwanda and the Democratic Republic of Congo to the west and Malawi, Zambia and Mozambique to the south. Although enjoying relative political stability, Tanzania ranks among the poorest countries in the world. The per-capita GNI was 340 USD [6] in

[4] For example, AIDS related losses can reduce African household incomes by up to 80 percent, food consumption by 15 to 30 percent and primary school enrollment by 20 to 40 percent (Whiteside, 2002).
[5] Although this practice is increasingly being abandoned where the death of the husband is thought to be caused by AIDS (UNAIDS, 1999).
[6] The per capita GNI (Gross National Income) are converted into USD using the Atlas method. This takes into account GDP plus the net flows from other factors (rents, profits, and labor income) from abroad. The Atlas method smoothes exchange rate fluctuations by using a three year moving average, price-adjusted conversion factor (WB, 2006).

2005 and over 35 percent of the population on mainland Tanzania was below the national poverty line in at the most recent measurement in 2000 (WB, 2006).[7,8] In 2001, Tanzania ranked 160 out of 175 on the Human Development Index collected by the United Nations Development Programme (UNDP) at a value of 0.4, below the average value for sub-Saharan Africa (UNDP, 2003).[9] In addition to overall measures of poverty within the population, women as a social group in Tanzania face particular hardship. Tanzania ranked 130 out of 144 countries on the UNDP Gender-Related Development Index, at a value of 0.396.[10] This inequity is further seen in Tanzanian outcomes for proxy indicators of women's status such as the maternal mortality ratio and women's labor force participation. According to estimates by the WHO, UNICEF and UNFPA, Tanzania had the world's sixth highest number of maternal deaths during 2000 (at an estimated 21,000 maternal deaths), putting a woman's lifetime risk of maternal death at approximately one out of 10 women (UNDP, 2003). The majority of working women or approximately 72 percent are involved in agriculture, primarily working family owned land (TNBS, 2000). The remaining working women are employed in unskilled labor and manual jobs (20 percent). Only two percent of working women hold professional, managerial or technical jobs. According to the ILO, structural adjustment during the late 1980's and early 1990's are thought to have worsened gender inequality in access to employment and economic activities, especially in the formal sector (ILO, 1997). With respect to welfare outcomes, evidence not only suggests that overall indicators lag relative to neighboring countries but that the relative position of women in Tanzania has not been improving.

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[7] The poverty measures were calculated using the Household Budget Survey 2000-01 and the Integrated Labor Force Survey 2000-01, the poverty line refers to the national basic needs poverty line (United Republic of Tanzania, 2003).

[8] Poverty levels differ between urban and rural residence. The proportion of poor living in urban areas is 13 percent, while the proportion poor living in rural areas is 87 percent (United Republic of Tanzania, 2003.)

[9] The Human Development Index is made up of the average achievements in life expectancy at birth, adult literacy, combined primary, secondary and tertiary enrollment ages and gross national income.

[10] The UNDP measures gender inequality by using the unweighted average of three component indices: (1) life expectancy, education and income. Its gender-related development index (GDI) ranges from 0 (lowest gender equality) to 1 (highest gender equality).

B4. WPIR in Tanzania

> *"My in-laws took everything--mattresses, blankets, utensils.*
> *They chased me away like a dog. I was voiceless."*
>
> (Theresa Murunga, widow, Nairobi. October 20, 2002 (HRW, 2003)).

Tanzania is in a unique position to evaluate the effects of changing WPIR. In 1999, Tanzania passed one of the most radical land laws in Africa.[11] The law shifted land administration to the village level, where each community is in charge of registration, adjudication, titling and land disputes (Tripp, 2004). This was done primarily to prevent outside appropriation of land and keep all disputes in communities internal and secondarily to promote the operation of a market in land rights. In addition, the reforms stipulated that women are to be represented in the land administration bodies and protects women's rights to co-ownership of land well as the individual right to acquire, hold, sell and use land.[12] These concessions were the result of much advocacy and public debate lead by the Gender Land Task Force (GLTF), a coalition of women's rights NGOs and associations coordinated by the Tanzania Women Lawyers Association (TWLA) (for full discussion of advocacy and public hearings concerning the Acts of 1999 see Tsikata, 2003).

Historically, the Tanzanian government did not give rural populations and women full access to land and property. Originally Tanzania's administration and law governing bodies reflected proprietary laws established during British colonization, similar to East African neighbors Kenya and Uganda (Walker, 2002). Independence resulted in the forced resettling of people into *ujamaa* villages in the late 1960's and early 1970's, set up around collective agriculture (Ikdahl et. al., 2005). In theory, the equity ideology rooted in collective farming included all community members, however in practice did little for women's property rights. In the late 1970's, this policy was abandoned and through the 1980's land laws

[11] The reforms begin with the appointment of the Presidential commission on Land Matters in 1991 and resulted in the passage of the Land Act and the Village Land Act in 1999. The commission made recommendations in three broad areas: (1) policy and questions of law; (2) administration and adjudication of disputes and (3) gender equity. For detailed description of the reform process see Tsikata, 2003.

[12] The Village Land Act specifies that the Village Council govern land related issues, of which at least one third of its total of 25 members should be women (Walker, 2002).

were in a constant state of confusion due to ambiguous and contradictory laws, poor administration, dual allocation of land rights and the historical villagization process (Ikdahl et. al., 2005). The current Land Acts are a result of both internal and external pressure for land reform due to insecurity and the desire to facilitate a market for land rights.

In addition to laws governing land rights, women are concerned with general marriage laws and specifically transfer of assets in the case of marriage dissolution through divorce or death. Despite the existence of a colonial 'rule of law', prior to 1971 family law in Tanzania was essentially governed by custom or religious beliefs of various communities. In 1971, Tanzania enacted The Law of Marriage Act, aimed at providing uniformity in marriage and divorce and as recognition of equity between husbands and wives (Mtengeti-Migiro, 1997). The Law of Marriage Act also allowed women to hold and sell property, and to be sued in their own name (Tenga and Peter, 1996). Although the act was seen as advancement for Tanzanian women, it did not make clear exactly what a woman would receive upon divorce or death of her husband.[13] For example, woman's rights were retained for any property she may have brought to the marriage; however there is ambiguity as to whether or not unpaid labor including improvements to land, subsistence farming, housekeeping or childcare constitutes contributions to marital assets or are simply 'wifely duties' (Mbilinyi, 1972). Although on paper, women have strong rights to land and possessions, it is widely agreed that considerable resistance and interpretation of the law occurs, especially in rural areas where customary law is strong or where populations lack knowledge about their rights concerning land and property.

C. Impact of WPIR on women's welfare: A conceptual framework

Economic models of household production exploring determinants of labor force participation, time use and expenditure behavior have been widely utilized to guide empirical work in developing countries (See Strauss and Thomas, 1995 and 1998; Behrman and Deolalikar, 1988; Juster and Stafford, 1991 for reviews). These models are rooted in Becker's household production framework in which

[13] For example, the Law of Marriage Act set a minimum legal age of marriage of 15 for women and 18 for men. In addition, it required registration of marriage and provided legal terms for divorce for the protection of the family members. See Tenga and Peter, 1996 or Mtengeti-Migiro, 1997 for further discussion of terms included.

households allocate time and goods to produce a range of market and non-market commodities (Becker, 1965). Household utility is maximized subject to a variety of constraints (time and technology) to recover reduced form demand equations for all inputs in the production function. These reduced form equations map demand for employment, time allocation or certain commodities to exogenous inputs at the individual, household and community level.

For example, following Beegle, 2005, time demand for individual woman *i* in activity *j* (for example working her own land) can be modeled as the following reduced demand equation (Beegle, 2005):

$$(1)\ T_{ij} = T_{ij}\ (T_t, p_m, p_h, w_i, A_i, v_i, v_{ii} \mid Z);$$

Where T_{ij} is total time or hours spent working on her own land, T_t is total time available, p_m and p_h are vectors of prices for market and home-produced commodities, w_i is the wage rate, A_i are assets or unearned income, v_i are unobservable individual level characteristics, v_{ii} are exogenous environmental characteristics, conditional on *Z*, a set of individual level tastes and preferences. As previously mentioned, similar reduced form demand equations may be constructed for other outcomes.

Before extending the model to incorporate WPIR, it is first important to distinguish between potential interpretations of the indicator. For example, lack of WPIR may represent general gender discrimination, in addition to or inclusive of inheritance and property rights issues. Under this interpretation, WPIR may be a proxy measure for, among other things, community level tastes and preferences for gender equity, women's decision-making power/autonomy or other gender specific policies. In this scenario, WPIR would be expected to broadly affect women and girls of all ages though a number of pathways discussed below. Alternatively, the variable may take a narrower interpretation as directly representing the effects of inheritance and property rights. Under this interpretation WPIR have the potential to *indirectly* affect all women though current and future expectations surrounding accumulation and ownership of assets. Further, restrictive WPIR would be expected to *directly* affect a subset of women who are widowed, divorced or separated through actual reduction in assets. The first definition or interpretation has the advantage of including alternative dimensions of gender discrimination

which we may want to capture, while the second definition is more specific and amenable to policy recommendations.

Under these two interpretations, there are a number of pathways through which WPIR may enter into individual reduced demand equations. If we consider the first interpretation of a proxy measure, WPIR could affect time use through exogenous environmental characteristics v_{ii}, the wage rate w_i, or unobservable individual level characteristics v_i. For example, due to gender discrimination, women may have received less education as girls and thus be unable to perform certain jobs such as professional occupations, thus diminishing v_i or individual endowments. Alternatively women could receive a lower wage on average than men working similar occupations because their time is less valued in comparison to male counterparts, thus WPIR would enter through v_{ii}. However, if we consider the second interpretation, it would be expected that the main and dominating effect would be through A_i or unearned income. Because assets in this case represent large and meaningful contributions to the woman's income source (for example land) and security (for example housing) the effect is expected to be large and significant. In addition to income effects, lack of property rights and widow inheritance specifically are expected to enter into the reduced form equations as they have the potential to increase vulnerability to domestic violence, unsafe sex, and other HIV related risk factors (recall discussion in Section B5).

D. Data: Kagera Health and Development Survey (KHDS)

D1. Sampling strategy

The KHDS was originally part of a joint research project titled the "Economic Impact of Fatal Adult Illness from AIDS and Other Causes in Sub-Saharan Africa" launched by the Population and Human Resources and Africa Technical Department of the World Bank (WB-DRG, 2004).[14] The Kagera region is located to the west of Lake Victoria bordering Rwanda and Burundi to the east and Uganda to the north. The region is primarily rural and is home to over two million people, divided into five

[14] The research project is also known as the Economic Impact of Adult Mortality (EIAM) Study. Funding was provided by the World Bank Research Committee, the United States Agency for International Development (USAID) and the Danish Agency for Development Assistance (DANIDA) (WB, 2004).

administrative districts (TNBS, 2002) [15]. In Kagera, adult mortality is higher than would be expected because of the early spread of HIV/AIDS in the area around Lake Victoria. The first case of AIDS in Tanzania was identified in Kagera in 1983, although experts conjecture that HIV was present in the area at least a decade earlier (WB, 2004). The area is a hub for long-range commerce between the East African coast and Central Africa and was heavily affected by the war between Tanzania and Uganda in the late 1970's. More recently, it has been the site of refugee camps for those fleeing from conflicts in Rwanda and Burundi.

The KHDS interviewed 816 households in 51 communities over four passages at seven month intervals between 1991 and 1994 and again in 2004 (WB-DRG, 2004; See Figure J1 for location of clusters within Kagera). Special concern was given to tracking and re-interviewing respondents in an attempt to understand economic mobility and changes in living standards induced by or affecting migration choices. The household sample was randomly selected, stratified on geography, community adult mortality rates[16] and indicators at the household level that were thought to be predictive of future adult deaths. In the first stage, 550 primary sampling units (PSU) in Kagera were classified according to four agronomic zones[17] and either a high or low level of adult mortality. Clusters of households were randomly drawn from each PSU, stratified on agronomic zone, with a probability of selection proportional to population. In the second stage, households were classified as either 'sick' or 'well.'[18] Approximately sixteen households were selected at random from each cluster, fourteen from the 'sick' and two from the 'well' group (see WB, 2004 or Beegle, DeWeerdt and Dercon, 2006 for further

[15] The five districts are Bukoba, Muleba, Karagwe, Biharamulo and Ngara.
[16] Community adult mortality rates were taken from the 1988 census and a subsequent enumeration for the survey (WB-DRG, 2004).
[17] The four agronomic zones were selected to suggest characteristic agricultural patterns: (1) tree crop zone (low fertility soils in areas of high rainfall where main crops are bananas, coffee and tea, in the northern part of Kagera), (2) riverine zone (alluvial and colluvial soils considered high potential, but requiring flood control, main crops are cereals, sugarcane, rice and legumes, in the middle region of Kagera) (3) annual crop zone (soils of low to medium fertility with moderate potential and lower rainfall, main crops are groundnuts, cassava, cotton and cereals, in the southern part of Kagera) and (4) urban zone (town of Bukoba, the capital of Kagera plus additional urban communities) (WB-DRG, 2004).
[18] 'Sick' households were those who either had an adult death (aged 15-50) due to illness in the last year or an adult too sick to work at the time of the survey or both. 'Well' households were all others with no recent deaths or sick members (WB-DRG, 2004).

discussion of sampling procedure). The KHDS questionnaires were modeled after the World Bank's Living Standards Measurement Surveys and collected extensive, detailed information on household income, consumption, expenditure, individual economic activities, education and individual health status (including the height and weight of all household members). In addition, matching community modules were administered at local markets to gather price information and at local health and education facilities.

D2. Organization of data

The baseline rounds of the KHDS (1991 to 1994) are divided into four waves, corresponding to the sequence of interviews administered to each household, and four passages, corresponding to the year of the data collection. For example, a woman interviewed for the first time in the last data collection in 1994 corresponds to wave 1, passage 4, whereas a woman interviewed for the fourth time in the last data collection corresponds to wave 4, passage 4. The baseline for this analysis is made up from the intersection of the four waves of data. To optimize panel size and length between interviews, data for each woman was taken from the first wave, regardless of when the interview was or how many times she was interviewed. The resulting cross-section is comprised of majority passage 1 interviews (77 percent), an additional nine percent from each passage 2 and 3 and five percent from passage 4 interviews. Note that the sample is limited to women between the ages of 15 and 55 in the baseline. This is done to purposefully limit the sample to adult women who may be responsible for economic decisions and produce valid labor force and expenditure indicators. Community characteristics were matched with each woman from contemporaneous passage indicators. The end-line data was collected in one wave starting in early 2004, resulting in a panel length of approximately 13 years.

D3. Attrition

A potential threat in analyzing any longitudinal data is attrition bias. Surveys fielded in developing countries are particularly susceptible to high levels of attrition due to highly mobile populations, incidence of disease and exogenous shocks such as drought or civil conflict. In a review of attrition in longitudinal data from developing countries, Alderman and colleagues find attrition rates between six to 50 percent between survey rounds, or 1.5 to 23.2 percent attrition per year (Alderman et.

al., 2005). In the KHDS, of the total baseline sample of adult women (N = 1,485), approximately 50.9 percent or 3.9 percent per year are lost to attrition over the panel period. Due to the special attention to tracking and adult mortality built into the survey design, it is possible to assign causes to much of the attrition. Of the total attriters, approximately 15.8 percent were lost to mortality, 17.0 percent lost to movement out of sample communities, while the remaining 16.4 percent were lost due to unattributable causes (see Beegle, De Weerdt and Dercon, 2006a for detailed description of re-interview rates among the full sample).[19, 20] There are many reasons why an individual may be 'lost' to unattributable causes in the follow-up, for example being away from the household at the time of the survey, refusal to participate or mobility which is untraceable.[21] If attrition occurs randomly, then estimation strategy does not need to address selection explicitly, however some efficiency may be lost due to reductions in sample sizes. However, since the KHDS was designed to over-sample households in communities with high levels of mortality and since populations are highly mobile, it is unlikely that attrition in this case is random with respect to outcomes of interest. For example, it may be expected that women who experience mortality over the sample would have had the worst welfare outcomes had they lived. If restrictive WPIR contribute to mortality, then not accounting for selection may lead to an underestimation of the effect of WPIR. Likewise, if women who would have otherwise had the best welfare outcomes have migrated out of the sample and having high WPIR help facilitate the move, the effects of WPIR will be underestimated. However the directions of these associations are unclear. For example, it could also be imagined that in certain cases, poor WPIR could result in a woman being stripped of her possessions and forced to migrate back to her birth family or seek other opportunities. Finally, migration and mortality

[19] Note that many of the women who moved out of sample communities were re-interviewed in KHDS, however since they have no community level variables including WPIR, they cannot be included in the sample and are treated as attriters.

[20] In the case of seven women, these categories were not mutually exclusive (reported both mobility and death or mobility and lost). This is not impossible. It could be for example that a woman dies and her family subsequently moves, is tracked and re-interviewed. Although it is possible to determine the year of death, it is not possible to distinguish the relative time of relocation and therefore these women are assigned to the modal category: mobility. In any case the number is small enough that there will be no effect of reassignment.

[21] Note that the percentage of 'lost' or untraceable calculated by Beegle, De Weerdt and Dercon (2006a) is only seven percent, however this is calculated as a household variable where if any household member was found the household was counted as traced. This percentage is expected to be larger for individuals.

may be related, for example households may migrate out as a coping or preventative strategy when facing illness or after experiencing mortality. Due to the unclear direction and magnitude of these biases, a careful and explicit treatment of attrition is necessary for the subsequent welfare analysis.

To investigate the extent of non-random attrition, two tests are conducted. First a comparison using simple t-tests is made on the distributions of individual and community level observables between the attriters and non-attriters in the baseline. Second, an alternative of the BGLW test is performed in which outcome variables are predicted in the baseline as a function of baseline control variables and an indicator for future attrition (Becketti et. al, 1998). The attrition indicator shows whether or not bias exists controlling for observables (in other words, whether or not bias is non-ignorable; see Alderman et. al., 2005 for explanation and notation of testing for attrition). The results of these two tests are reported in Tables J3 and J4 in the Appendix. In these tests, a distinction is made between the unattributable (individuals are 'lost') and attributable attrition (due to mortality and mobility). The t-tests in Table J3 show that there is significant correlation on a number of observed variables between attriters and non-attriters, regardless of why individuals are not re-interviewed, although no clear pattern in significance levels emmerges. However, the BGLW tests summarized in Table J4 show that while the indicator for attrition is significant among the whole sample, nearly all significance is due to the group who experience attrition due to mortality and mobility. The one exception is in medical expenditure. In this case 'lost' attriters have significantly lower expenditures than those re-interviewed, however when aggregated, unattributable attrition is not significantly related to total expenditures. Because non-ignorability of selection bias is generally rejected among the group who is lost to unattributable causes, this group is dropped from further analysis and future discussion of attrition refers only to mortality and mobility related selection.

E. Estimation strategies and variables

The estimation procedure follows four steps described below. First, determinants of WIPR at the community level are explored using the baseline pooled cross-section to identify key characteristics of communities which are initially implementing high levels of WIPR. Second, a re-interview model is

estimated to obtain the probability of being interviewed in the 2004 end-line survey. Third, a model predicting economic outcomes at the woman level is developed to examine how community level WIPR may influence individual welfare. This model is estimated using a baseline cross-section of all women, as well as a fixed-effects model over the panel period among a reduced sample of women who appear in both rounds. Finally, the fixed-effects model examining welfare outcomes is adjusted for non-random attrition using the inverse of probability weighting method (IPW). A number of extensions are explored to assess the robustness of findings.

E1. Trends and community level determinants of WIPR

Although sample size limits the potential to model complex relationships, understanding trends and correlates of WPIR on a community level is a useful exercise for several reasons. First, it will indicate if, when and where WPIR are changing. Second, it will aid in making policy prescriptions. For example, if determinants such as economic indicators are associated with WPIR, community development initiatives may aid in liberalizing WPIR through increased presence of legal structures and increased education of the population. In contrast, if WPIR are significantly associated with tribal or ethnic group majorities, this may indicate the important role of custom and require a more structured intervention to promote change. If this is the case, understanding which cultural groups lag behind others is also valuable information for targeting interventions or providing legal services. In addition, it will help in clarification of the exogeniety assumption surrounding WPIR.[22] In this analysis, an assumption is made that WPIR are exogenous to each individual woman and are rather choice variables at the community. Therefore significance of community level determinants of WPIR will add evidence to this claim.

The model to examine community level determinants of WPIR is as follows:

$$(2)\quad \Pr(\textit{High WPIR}_c = 1) = f(T, \textit{Status}_c, \textit{Custom}_c, \textit{Economic}_c)$$

[22] For example, it could be argued that WPIR is a choice variable on the individual women level. This would occur if specific women or groups of women try to influence or change WPIR. If this is the case, a problem would arise if these women with high WPIR would be expected to have better outcomes (time use or labor force participation) on average than women in communities with poor WPIR because of correlated unobservables at the individual level.

High WPIR is a function of time of survey, women's relative status in the community, custom or traditions and economic development. The equation will be estimated using a probit model among a pooled sample of all five cross-sections containing 51 communities (four baseline waves plus 2004 follow-up). Each community level survey was administered to a group of village leaders who had the most knowledge about various community administrative, economic, health or social issues.[23] To indicate women's status, a variable is constructed indicating the proportion of community 'experts' who were women. It is expected that communities in which women are given equal voice and respected as knowledgeable leaders will call upon a higher proportion of women to respond to survey questions in comparison to communities who assign less importance to women. The vector of custom variables refers to majority ethnic groups and religious groups in the community, while the vector of economic variables refers to indicators of general development of the community (See Table J5 for descriptive statistics of control variables).

The four WPIR indicators utilized in the analysis are collected in each round of all 51 surveyed communities.[24] The key element is the nature of self report, meant to indicate the actual or *de facto* rights of women, as opposed to the legal or political, *de jure* mapping of WPIR. (See Kabeer, 2001 for discussion of necessity to include *de facto* rights in empirical study).[25] Table 1 shows the community level (top panel) and individual level (bottom panel) distribution of WPIR over the survey period. In addition to the baseline (column B) and end-line observations (column C), the 2004 survey asks a retrospective question which asks community leaders to 'recall' what was customary approximately 20 years earlier (or 10 years prior to the baseline). These indicators are included in column A for examination of trends only, as they are likely to include substantial recall bias in comparison to

[23] For example, a minimum of three experts representing the most knowledgeable people in the following areas were called: births, deaths and migration (suggested village secretary/chairman), economic activities (suggested community development officer), education (suggested chairman of education committee), health (suggested chairman of health committee), agriculture and livestock, cultural practices (WB, 2004).
[24] In actuality 49 survey instruments were filled at the community level, two of which represented two clusters each for a total of 51 community clusters (WB, 2004).
[25] The answers to WPIR questions were asked to the group of experts as described above. When there was disagreement among the experts, the majority opinion was honored (WB, 2004).

contemporaneous responses. All WPIR indicators make significant improvements over the two decades. For example, the percentage of women living in communities where it was customary for a woman to inherit land after a husband's death increased from zero in the pre-panel period, to 44 percent in the baseline to 88 percent in the follow-up. The practice of widow inheritance decreases with 39 percent of women exempt from inheritance in the pre-panel period, 61 percent exempt in the baseline to 94 percent in the follow-up.[26] Similar trends are found for the remaining indicators and individual level distributions closely map those found at the community level. The key policy variable termed 'high WPIR' is reported at the bottom of each panel and equals one if all four policies are also equal to one (thus the wife can inherit land, house, assets and is not subject to inheritance herself). The percentage of women living in communities with high WPIR is twenty in the baseline and increases to 81 percent in the end-line.

Table 1: Time trends in WPIR at community and individual level

If her husband dies, is it customary for the...	(A) 10 Years Prior	(B) Baseline (1991-94)[1]	(C) Follow-up (2004)
Panel A: Community level distribution:	(N = 51)	(N = 51)	(N = 51)
(1) Wife to inherit land (=1)	0.00	0.49	0.86
(2) Wife to inherit house (=1)	0.04	0.53	0.90
(3) Wife to inherit other assets (=1)	0.08	0.88	0.98
(4) Wife not to be inherited (=1)	0.39	0.61	0.94
High WPIR (all four policies =1)	0.00	0.24	0.80
Panel B: Individual level distribution: [2]	(N = 1,242)	(N = 1,242)	(N = 756)
(1) Wife to inherit land (=1)	0.00	0.44	0.88
(2) Wife to inherit house (=1)	0.06	0.48	0.93
(3) Wife to inherit other assets (=1)	0.10	0.86	0.97
(4) Wife not to be inherited (=1)	0.36	0.60	0.94
High WPIR (all four policies = 1)	0.00	0.20	0.81

Note: Variables used for column A are collected through recall in the 2004 survey round.
[1] For simplicity, community baseline distribution is calculated from passage 1 in 1991.
[2] Individual level distributions are calculated out of the 'working sample', all women who appear in both panel periods, plus those who only appear in the baseline and whose attrition is attributed to mortality or mobility.

[26] Passages 1 and 2 in the baseline did not ask this question in the community questionnaire. Therefore indicators of exemption from widow inheritance for women in these passages were replaced with the value for Passage 3. In either case, this represents a value collected approximately six months to 12 months after individual level outcomes. Although it is unlikely for the indicator to have changed for a significant portion of the sample, it would result in an underestimation of the change over the panel period and would tend to bias results toward zero or no significant affect of WPIR as a whole.

In addition to the main trends reported in Table 1, it is also interesting to fill in some auxiliary descriptive variables concerning WPIR. Overwhelmingly, in 90 percent of end-line communities, respondents report that 'clans' typically settle inheritance matters, while other responses include family members (six percent), the community (two percent) and other sources (two percent). Over half of communities report inheritance disputes in the past year and the average number of disputes among this group is approximately 3.6 with a maximum of 15 reported disputes. It is interesting to note that in communities with high WPIR as defined above, reported number of disputes are fewer (approximately 1.7) versus those with low WPIR (approximately 3). This indicates that situations in which women are potential victims of property rights abuses, challenges and dispute are more likely to arise, versus those cases in which women are given property and challenges arise from other family seeking to recover inheritance.

E2. Re-interview model

As discussed in the previous section, the data suffer from non-random attrition over the panel period. The IPW method is implemented to overcome the selection bias due to mobility and mortality (See Wooldridge, 2002 for overview; Wooldridge, 2000 for in-depth examination of assumptions; Jayne and Yamano, 2005 for application in economic framework). In the first stage, the IPW method uses a set of excluded variables, for example, denoted '*Z*' to predict re-interview (or non-attrition) in addition to control variables in each time period (in this case only the follow-up, 2004). In the second stage, the inverse of this probability is used to weight all observations in the end-line. The IPW method makes the assumption that observed variables '*Z*' exist which are strong enough predictors of re-interview that the relationship between controls and outcomes in subsequent periods are independent of attrition selection. In other words, the IPW method assumes that *Z* variables soak up any significant unobservables which may predict attrition selection and be correlated with outcomes of interest. Under these conditions, Wooldridge shows that the IPW method is a consistent estimator of population parameters and can be applied to cases with binary outcomes (Wooldridge, 2001).

To predict re-interview, several *Z* variables are used at the household and community level which are theoretically and statistically valid predictors of attrition due to mortality and/or mobility: (1) indicator of presence in all four rounds of the baseline (1991-1994), (2) indicator of daughter of household head, (3) lagged community level proportion of adult deaths due to illness and (4) community level price per tablet of pharmaceuticals.[27] It is expected that variable (1) will be positive predictor of re-interview, while variables (2), (3) and (4) will be negative predictors of re-interview. The re-interview model can be written as follows:

$$(3)\ \Pr(R_{ic,\,2004}=1) = f(\boldsymbol{Z}_{ic,\,1991}, \boldsymbol{X}_{i,\,1991}, \boldsymbol{X}_{c,\,1991})$$

Where the probability of re-interview (woman has not died or moved out of the sample) is a function of the *Z* variables listed above and vectors ***X*** of individual and community level characteristics including WPIR. All control variables at the individual and community level which are used in the subsequent analysis estimating determinants of women's welfare are included in the re-interview model. Not only should all determinants be good predictor of re-interview (as measured by the R^2 value) but in addition the *Z* variables should be jointly significant (rule of thumb, F-test value above 10). The model above is estimated using a probit specification and the recovered predicted probability is applied as an inverse weight to the models estimating women's welfare discussed below. Descriptive statistics of the *Z* variables are given in Table J6 in the Appendix.

E3. Estimating determinants of women's welfare

Predictions of women's welfare are guided by the reduced form demand equations described in section C and can be written as follows:

$$(4)\ \Pr(Employed_{ic,\,2004\text{-}1991}=1) = f(High\ WPIR_{c,\,2004\text{-}1991}, \boldsymbol{X}_{i,\,2004\text{-}1991}, \boldsymbol{X}_{c,\,2004\text{-}1991});$$

[27] The pharmaceutical in name is paracetamol, an aspirin substitute. Other pharmaceuticals were tested in the model but were dropped because of their low correlation with re-interview. In addition, following Beegle, De Weerdt and Dercon (2006), alternative relationships to the household head and indicator of child living elsewhere were also tested as potential predictors of attrition and found to have no correlation with re-interview. Note that Beegle and colleagues are only instrumenting mobility and therefore these mentioned variables have increased validity for their analysis versus this analysis. Additionally mortality related enumeration rates connected with sample selection as well as shock variables at the community level (drought, flood etc.) were tested and also found to lack statistical power with the inclusion of other *Z* variables and controls and were therefore are not utilized.

In the above specification the probability of being employed is a function of community level WPIR, individual characteristics and other community level controls. The model is estimated for each welfare outcome first using OLS and probit models among the working sample baseline cross-section. Subsequent analyses extends the model to include the 2004 round using individual level fixed-effects and fixed-effects adjusted for attrition using IPW method as discussed above. Individual level fixed-effects have the advantage of controlling for heterogeneity due to fixed factors such as initial endowments (for example cognitive ability) or time invariant behaviors (for example work ethic or preference for savings) which may affect outcomes. Due to the small sample size, binary outcomes using the panel specifications will be estimated using linear probability models.[28] The vector of individual level variables includes age, education, religion, tribe/ethnicity and an indicator for lower quintile of wealth index. The wealth index is measured as household per-capita created through principal component analysis using land, dwelling and livestock values and a range of assets (mean values and principal contributions are reported for baseline and follow-up in Table J9). The vector of community level variables includes proxy measures of infrastructure and labor force opportunities such as indicators of urban, population, presence of bank, hospital and health centers, any households have electricity, piped water and an indicator of residing in the district containing Kagera's regional capital. In addition, month indicators are included to control for fluctuations in labor demand due to seasonalities and baseline passage indicators are included to control for time trend differences in the baseline survey round. Descriptive statistics for all control variables at the individual level are included in Table J8.

Table 2 displays descriptive statistics for individual level welfare outcome indicators in the baseline and the follow-up periods. Outcomes are grouped into four categories: (1) labor force participation, (2) time use, (3) expenditures and (4) savings. Following Beegle, 2005, employed outside the home and working self-employed are modeled using binary outcomes (one if yes in the last week, zero if no) while agricultural work is examined in log hours spent in last week due to the relatively low

[28] As an alternative, conditional logit models are run on panel specifications to estimate working outside the home and self employed. Significance does not change for either outcome, however the sample size drops to 220 and thus is not utilized.

incidence of the first two outcomes and the relatively high incidence of the third mentioned outcome (approximately 76 percent of the sample report some work in agriculture in the last week; See Table J7 in Appendix for details on construction of all outcome variables). Although not comprehensive, these measures are meant to capture aspects of economic status for individual women.[29] It would be expected that women who fare better economically will have higher rates of labor force participation, particularly working outside the home, higher earnings, savings and individual expenditures. It is also hypothesized that high WPIR will be a significant determinant or enabler of high welfare for women.

Table 2: Distribution of welfare outcomes in working sample for baseline and follow-up

	Baseline (1991-94) (N = 1,242)		Follow-up (2004) (N = 756)	
Welfare indicator:	Mean	SD	Mean	SD
Labor Force Participation and earnings:				
Employed outside the home (last week = 1)	0.07	0.26	0.11	0.31
Working self employed (last week = 1)	0.06	0.24	0.13	0.34
Working in agriculture (log hrs spent last week)	0.99	3.44	1.27	3.17
Earnings (log shillings)				
Time Use:				
Fetching water/carrying firewood (log hrs spent last week)	-2.61	3.05	-1.02	3.15
Housework (log hrs spent last week)	1.59	2.56	NA	NA
Individual Expenditures: [1]				
Clothing and fabrics (log shillings)	6.97	3.10	6.41	2.83
Food and beverages (log shillings)	1.18	2.22	1.40	2.23
Medical (log shillings)	3.38	3.17	4.18	3.08
Total individual expenditure (log shillings)	7.55	2.45	7.16	2.24
Savings:				
Total individual savings (log shillings)	2.97	3.46	NA	NA
Total household savings (log shillings)	7.88	1.98	NA	NA

[1] Expenditures for clothing and medical categories are recalled for 12 months, all other expenditures are recalled on two weeks.

Generally, welfare of women is improving over the panel period. For example, earnings and labor force opportunities are improving: a larger percentage of women report working outside the home (seven percent versus 11 percent) and working self employed (six percent versus thirteen percent). These changes may be a result of economic development which has taken place over the period including advances in technology or simply the result of aging of women over the sample period. In addition, on

[29] Although many of these variables are subject to recall bias, documentation indicates that individual members were interviewed separately in private for individual level outcomes such as mentioned above, improving accuracy and confidentiality of responses.

average women are reporting working more hours in agricultural production and in tasks such as carrying water and fetching firewood. It is not clear if the increased hours in these tasks are a signal of increased contributions to household production, or cases of excessive additional chores and burdens for women. Overall, the category in which improvements are not seen is for individual expenditures.[30] Although there are slight improvements in medical and food spending, overall spending does not increase over the panel.

F. Results

F1. Community level determinants of WPIR

Table 3 shows the results for the determination of WPIR at the community level. Covariates are added step-wise: column one contains only the time trend and women's status indicators, while column 2 adds custom indicators and column 3 adds economic indicators. A significant predictor of high WPIR in all models is the time trend variable, as would be expected. The proportion of female 'experts' in the community is associated with higher WPIR, although the effect is partially muted when economic controls are introduced. Communities with an ethnic majority Wahangaz are significantly less likely to have high WPIR controlling for other ethnic groups. The economic indicators are not jointly significant, indicating that cultural variables and women's status within communities matter over and independent of relative economic development.

[30] All expenditure and savings indicators were deflated to the baseline (1991) value of the Tanzanian shilling on a yearly basis using the CPI obtained from the Tanzanian Bureau of Statistics on 7/18/07.

Table 3: Community level determinants of WPIR (N = 254)

	High WPIR		
Indicator:	(all four policies = 1; otherwise = 0)		
2004 survey round (=1)	1.693	1.745	1.847
	(0.225)***	(0.241)***	(0.268)***
Proportion female "experts"	1.334	1.31	1.22
	(0.606)**	(0.600)**	(0.712)*
Majority ethnic/religious groups: [1]			
Ethnic group Wanyambo (=1)		-0.265	-0.25
		(0.28)	(0.30)
Ethnic group Wahangaz (=1)		-0.832	-0.966
		(0.249)***	(0.283)***
Ethnic group Sukuma (=1)		0.279	0.661
		(0.40)	(0.52)
Religion Muslim (=1)		-0.694	-0.765
		(0.49)	(0.49)
Economic indicators:			
HHs have electricity (=1)			-0.287
			(0.27)
HHs have piped water (=1)			0.398
			(0.33)
Population (in 1,000's)			0.014
			(0.04)
Bank (=1)			-0.55
			(0.39)
Constant	-1.045	-0.957	-0.941
	(0.146)***	(0.154)***	(0.169)***
Joint significance of ethnic indicators:[2]		0.005***	0.002***
Joint significance of economic indicators:			0.430
Pseudo R2	0.215	0.240	0.249

Note: Probit model is used to predict high WPIR using a pooled cross-section (four baseline passages in addition to the 2004 round). Robust standard errors are reported in parenthesis.
* indicates significant at 10%; ** significant at 5%; *** significant at 1%
[1] The excluded majority ethnic group is Wahaya, while the excluded majority religious group are Christian denominations.
[2] Joint significance is reported using a the p-value from a χ^2 test.

F2. Re-interview model

Table 4 shows results of the re-interview probit model. In the first and second columns, the estimation is conducted using only the *Z* variables, resulting in significance separately and jointly of all four variables. As expected, if women enter into all four baseline rounds, they are significantly more likely to be re-interviewed in the follow-up and if they are a daughter of the household head they are significantly less likely to be re-interviewed. In addition, the community level adult death rate due to illness and price of pharmaceuticals contribute negatively to the probability of re-interview. In the third

and fourth columns, control variables are added to the model, resulting in the insignificance of the relationship to the household head variable. However, since all four variables are still highly significant, all four are retained in the final model. F-tests of joint significance and R^2 values are reported at the bottom of the table.

Table 4: Estimating Re-interview among sample with attrition due to mortality and mobility

	Re-interview	
Determinants (N = 1,242)	(=1 if yes, 0 if no)	
Enters all four baseline rounds (=1)	0.762 (0.053)***	0.867 (0.045)***
Community level illness related adult death rate	-0.539 (0.286)*	-0.708 (0.344)**
Price per tablet of paracet (=1)	-0.025 (0.007)***	-0.024 (0.007)***
Daughter of HH head (=1)	-0.348 (0.113)***	-0.159 (0.145)
Age splines:		
Age 20 to 29 (=1)		-0.05 (0.130)
Age 30 to 39 (=1)		-0.078 (0.162)
Age 40 to 49 (=1)		0.003 (0.132)
Age 50 and over (=1)		0.178 (0.233)
Education:		
No formal education (=1)		0.214 (0.096)**
Incomplete primary (=1)		-0.009 (0.162)
Secondary or above (=1)		-0.599 (0.124)***
Marital Status:		
Never married (=1)		-0.309 (0.132)**
Widowed or separated (=1)		-0.525 (0.065)***
Religion of HH head:		
Muslim (=1)		-0.252 (0.104)**
Other Christian denominations (=1)		-0.115 (0.040)***
Ethnicity/Tribe of HH head:		
Mnyambo (=1)		0.449 (0.188)**
Mhangaza (=1)		-0.031 (0.064)
Other tribe (=1)		-0.174 (0.100)*
Bottom quintile of wealth distribution (=1)		-0.177 (0.079)**
Community level variables:		
High WPIR (=1)		-0.124 (0.078)
Urban (=1)		0.179 (0.104)*
Population (in 1,000's)		0.057 (0.015)***
Bank (=1)		-0.006 (0.117)
Hospital (=1)		-0.023 (0.052)
Health center (=1)		-0.155 (0.073)**
HHs have electricity (=1)		-0.209 (0.138)
HHs have piped water (=1)		0.219 (0.149)
District is regional capital (=1)		-0.161 (0.048)***
Constant	0.618 (0.176)***	0.968 (0.197)***
Pseudo R^2:	0.08	0.143
F-test for joint significance of *Z* variables:[1]	0.000	0.000

Note: Probit model is used to estimate re-interview, standard errors clustered at the district level are reported in parenthesis.

* indicates significant at 10%; ** significant at 5%; *** significant at 1%

[1] Joint significance is reported using the p-value from a χ^2 test.

F3. Determinants of women's welfare

Table 5 is a summary of results from all three specifications of models predicting women's welfare. In the baseline cross-sections (Column 1), high WPIR is significantly associated with working self-employed, higher medical expenditure, total expenditure and individual as well as household savings. Although neither time use variable is significant, when these are converted to proportions, high WIPR is negatively associated with both fetching water/firewood and housework, although only significant for housework (at the 1 percent level). This indicates that while total hours are not associated with WIPR, the share or proportion of work women do decreases in communities with high WIPR. Column 2 indicates that when controlling for unobserved heterogeneity (for example initial endowments), high WPIR retains significance only for working self-employed. Finally, in column 3 when controlling for sample selection, high WPIR is significantly associated with employment outside the home and log earnings. Full regressions are reported in Tables J10, J11 and J12 in the Appendix.

Table 5: Summary of regression results for associations of WPIR and welfare outcomes

	(A) Baseline Cross-section (N = 1,242)		(B) Normal Fixed-effects (N = 756)		(C) Fixed-effects with IPW (N = 756)	
Dependent Variable:	Coeff	SE	Coeff	SE	Coeff	SE
Labor Force Participation and earnings:						
Employed outside the home (last week = 1)	-0.18	(0.23)	0.007	(0.03)	0.106	(0.05)**
Working self employed (last week = 1)	0.498	(0.14)***	0.07	(0.03)**	-0.071	(0.07)
Working in agriculture (log hrs spent last week)	-0.137	(0.41)	0.326	(0.33)	0.353	(0.57)
Earnings (log shillings)	-0.158	(0.23)	0.097	(0.23)	0.955	(0.37)***
Time Use:						
Fetching water/carrying firewood (log hrs spent last week)	0.227	(0.19)	0.452	(0.46)	0.195	(0.46)
Housework (log hrs spent last week)	-0.106	(0.09)	NA	NA		
Individual Expenditures: [1]						
Clothing and fabrics (log shillings)	0.241	(0.23)	-0.13	(0.10)	-0.372	(0.23)
Food and beverages (log shillings)	-0.028	(0.24)	0.393	(0.24)	-0.246	(0.32)
Medical (in log shillings)	0.810	(0.20)***	0.421	(0.42)	0.334	(0.55)
Total individual expenditure (log shillings)	0.310	(0.16)**	0.018	(0.17)	-0.232	(0.22)
Savings:						
Total individual savings (log shillings)	0.462	(0.27)*	NA	NA	NA	NA
Total household savings (log shillings)	0.367	(0.13)***	NA	NA	NA	NA

Note: Employed and self-employed are estimated using probit and LPM model (fixed-effects), the remaining are estimated using OLS models. Standard errors clustered at the district level are reported in parentheses.
See Tables J10, J11 and J12 in the appendix for full models.
* indicates significant at 10%; ** significant at 5%; *** significant at 1%.

F4. Extensions

Two additional explorations are conducted based on the results above. First, interactions are explored between high WPIR and potential inhibitors of welfare outcomes under the hypotheses that lack of property rights effects marginalized groups in a different manner than the general population of women. Three groups are explored: (1) widowed and divorced women,[31] (2) poor women (as measured by lowest wealth quintile) and (3) women with no formal education. Even if WPIR do not significantly affect all women, it is possible that they adversely affect sub-sets that are particularly marginalized due to their family structures, lack of resources or lack of knowledge to uphold and claim property or assets. Secondly, to test the relative importance of each of the four policy variables influencing WPIR, the indicator is disaggregated and each component is tested separately in the models for women's welfare outcomes.

Summary results of the first extension are reported in Table 6. The coefficients for interaction terms are found in column B for the baseline and column D for the IPW fixed-effects model. It would be expected that if high WPIR are especially crucial for the marginalized groups listed above, the interaction term will be positive and significant. In other words, property rights matter significantly more for poor or uneducated women (are substitutes for poverty or educational status) in achieving high welfare outcomes. Although several interaction terms are significant in Column B, these do not carry over to the panel specifications. For example, having high WPIR matters more in determining probability of working outside the home for women of the lowest wealth quintile in comparison to other women. Uneducated women benefit from high WIPR in comparison to other women when it comes to total individual expenditures and household savings, while widows benefit only in the last category. These results show

[31] Although these women are distinctly different, they share common hardships. While widowed women may be subject to abuse by in-laws, divorced or separated women may be denied property by her husband and forced to return to her natal family. In many cases returning home results in forced re-payment of bride price by the woman to her family, and is not necessarily accompanied by welfare improvements (Manji, 2000). To test differences empirically, the groups were separated and coefficients from the cross-sectional models were tested against each-other. Results indicate that the groups do not differ significantly with respect to the outcomes of interest and are therefore retained as one indicator.

that while high WPIR aids marginalized women in achieving certain outcomes, generally no sub-group can be seen as particularly affected by WPIR all women.

Table 6: Summary of interactions (lowest wealth quintile, no schooling and widowhood) and WPIR

	(A) Baseline Cross-section (N = 1, 242)				(B) Fixed-effects with IPW (N = 756)			
	High WPIR		Interaction term		High WPIR		Interaction term	
A. Lowest wealth quintile:	Coeff	SE	Coeff	SE	Coeff	SE	Coeff	SE
Employed outside the home (last week = 1)	-0.03	(0.03)	0.08	(0.05)*	0.08	(0.04)***	0.09	(0.10)
Earnings (log shillings)	-0.36	(0.22)	0.50	(0.37)	0.84	(0.28)***	0.50	(0.77)
Total individual expenditure (log shillings)	0.28	(0.21)	0.13	(0.36)	-0.30	(0.280	0.34	(0.54)
Total household savings (log shillings)	0.40	(0.17)	-0.15	(0.32)	NA	NA	NA	NA
B. No schooling:								
Employed outside the home (last week = 1)	-0.00	(0.03)	-0.05	(0.05)	0.10	(0.05)**	0.04	(0.10)
Earnings (log shillings)	-0.09	(0.22)	-0.34	(0.56)	0.94	(0.39)**	0.06	(0.85)
Total individual expenditure (log shillings)	0.12	(0.10)	0.90	(0.18)***	-0.31	(0.23)	0.41	(0.33)
Total household savings (log shillings)	0.25	(0.14)	0.55	(0.10)***	NA	NA	NA	NA
C. Widow or separated:								
Employed outside the home (last week = 1)	-0.03	(0.03)	0.04	(0.05)	0.05	(0.04)	0.15	(0.10)
Earnings (log shillings)	-0.17	(0.23)	0.04	(0.41)	0.65	(0.30)**	0.91	(0.81)
Total individual expenditure (log shillings)	0.29	(0.14)**	0.10	(0.28)	-0.23	(0.26)	0.01	(0.37)
Total household savings (log shillings)	0.21	(0.14)**	0.27	(0.09)***	NA	NA	NA	NA

Note: Employed is estimated using LPM model (with and without fixed-effects), the remaining are estimated using OLS models with same specifications as in Table 5; * indicates significance at 10%; ** significant at 5%; *** significant at 1%.

Results of the second extension (not displayed) show that no one of the single policy variables is as strong a predictor as the combined indicator of high WPIR. Many of outcomes are predicted by three or more of the policy variables (for example increases in medical expenditure and total household savings), while others are driven by single policy variables (for example, land inheritance drives increases in self-employment). Of the four, the indicator of land inheritance is the strongest in delivering positive and significant results while the indicator of widow inheritance is the weakest. This may be because of the relative similarities between the inheritance of land, house and assets which are likely to be correlated. As predicted by the conceptual framework, widow inheritance may be more influential for welfare outcome in its effect through health, which is not explicitly modeled in these specifications.

G. Discussion and policy implications

Three points of discussion emerge from the results above as warranting further attention. First, how large are the improvements in women's welfare and what do they mean in practical terms? Second, how defendable are they and finally, what can be said to generalize this study to other regions and cultures? Each of these points will be addressed in turn below.

As an example of the magnitude of improvements, take women's employment outside the home. According to simulations using the results reported from the IPW fixed-effects model (Table 5, panel C), the predicted average rate of employment outside the home is approximately 13.94 percent. If we consider a scenario in which there were no improvements in WPIR, the predicted average rate of employment outside the home is 7.85 percent, as compared to a predicted average rate of 18.42 under a scenario in which all communities moved from low to high WPIR. In the baseline cross-section, a similar simulation shows that in communities with high WPIR, women's predicted average individual savings are 1.6 times the predicted average amount in communities with low WPIR. Clearly these are large and meaningful contributions. In fact, the magnitude of WPIR coefficients are on par or larger than those found for education in other developing countries. For example, Mammon and Paxton estimate that women with post-secondary schooling are 23 percent (India) and 25 percent (Thailand) more likely to be in the labor force using data from the 1980's and 1990's than women with less than secondary education (Mammon and Paxton, 2000). Likewise, using data from South Africa in the mid-1990's, Winter shows that women who had completed secondary schooling had a 23 percent higher likelihood of labor force participation in comparison to those who had completed primary school (Winter, 1999). However, not all indicators show significant associations. One area in which no significant improvements are seen when controlling for individual level fixed-effects are expenditures. There are two possible reasons why this may have occurred. First, the categories of individual expenditures may not be the appropriate measures. For example, women may have increased expenditures, however they may be spending on their children, on household expenses or on their businesses rather than spending on an individual level. Alternatively, they could be saving more as predicted in the baseline cross-section rather than spending. Unfortunately

these measures are not collected in the end-line and therefore cannot be tested in more sophisticated models.

As with any analysis, there are many threats to the validity of the results discussed above. One question proposed in the presentation of the conceptual framework is: what are we really measuring? Recall that the *direct* interpretation is that WPIR represent only the customs relating to ownership and inheritance of land, house, assets and the widow herself, while the *indirect* interpretation is that WPIR is actually a proxy measure for gender related status and empowerment norms and policies within each community. Results of the interactions between widows/separated women and high WPIR show that these women are not necessarily more advantaged than other women when it comes to property rights issues. On face value this suggests that WPIR is actually a proxy measure since all women are affected equally (except in the case of savings for the cross-section). In addition, the indicators of women's status in the community level exploration is positive and significant, suggesting that on average communities in which women are regarded as leaders have higher WPIR. However, it is not infeasible that WPIR as they appear in this paper do in fact effect *all* women through expectations and current ownership of property even if they are still in a marriage or are not yet married. In fact, women may use ownership of assets and property to leverage bargaining power both within marriages and in the process to arrange a suitable partner. In addition, inheritances from father to daughters may mirror those specifically asked for wives as is the case in this analysis. Finally, even if WPIR is an indirect measure, the interpretation is simply the effect of policies for high gender equality, something which is useful to measure in itself. Another limitation of the current study is the inability to determine when WPIR changed over the 13 year period. This inability may lead to an underestimation of the effects of WPIR if changes occurred in the early 2000's, thus having little time to effect meaningful and significant changes in women's welfare. A more precise measure would have been able to evaluate a before and after change instead of treating the time between panels as a black box.

Finally, what can be said about generalizability? Clearly Kagera is a somewhat unique region in Tanzania and the sampling process further distinguishes the data as representing a select sub-set of the

population. The situation in Kagera implies that WPIR have been much improved over the late 1990's and early 2000's, however there is still significant discrimination with over 1/5 of the sample still restricting certain aspects of women's rights and nearly half of those communities restricting rights in more than one realm. It could be argued that results are not necessarily generalizable to other regions, especially given the importance of culture in determining property rights and the selective sampling which may drive outcome measures.[32] Although it is difficult to draw conclusions over dozens of sub-Saharan African countries in different stages of development, institutional structures and cultures, there are several similarities to be mentioned. Throughout the literature it is cited that while legal rights for women in these countries often exist, they are not always honored in traditional settings (Drimie, 2002; Tekle, 2001). Second, the limited data on titling which is available suggests that a very small fraction of all titled land is owned by women (Deere and Doss, 2006). For example, in Cameroon less than ten percent of title deeds are held by women, in Kenya only five percent and in Uganda only seven percent of women own land in their names (ICRW, 2005; Rugadva et. al., 2005). In addition, findings suggest that on average women's land is not only smaller in size (Benin, Morocco, Tanzania and Zimbabwe) but also in value relative to men's (Ghana) (FAO, 1997; Doss 2006). However there are some broad distinctions which can be drawn based on priorities within land reform. For example, Walker separates those countries where land redistribution is a major issue (Namibia, South Africa, Zimbabwe) from those in which tenure security and agrarian reform are priorities (Botswana, Lesotho, Malawi, Mozambique, Swaziland and Zambia) and makes policy prescriptions for each grouping (Walker, 2002). In addition, case studies may serve to highlight unique attributes of each country. For example, case studies from Lesotho indicate that while widows are often given rights to their husbands land, it is revoked if they re-marry, therefore incentivising many widows to stay single (Drimie, 2002). In this setting, honoring the right of women to land often is correlated with how educated village leaders are concerning HIV/AIDS

[32] Results from Beegle, De Weerdt and Dercon (2006a) show that there are few differences between the Kagera Rural CWIQ, fielded one month before the start of the 2004 KHDS round and the rural sample from the 2004 KHDS. However, the differences increase if the sample is increased to include the urban sector of the KHDS or those individuals tracked outside Kagera. For more details see Beegle, De Weerdt and Dercon (2006a: Appendix C).

and the level of discrimination towards widows whose husband's deaths were attributed to HIV. In short, it is reasonable to assume that many sub-Saharan African countries are in similar situations as Tanzania which has seen relative liberalization of WPIR, while other countries lag behind.

H. Conclusions

Women's struggle for equal property and inheritance rights in sub-Saharan Africa are not new; they have been documented for decades. Research shows it is not only the liberalization of laws that matters, but how such also how laws are implemented, enforced and protected. In addition, legal rights often have little effect if they are not accompanied by promotion of change in customary law and how communities view the citizenship of their women. This paper adds to the institutional, legal and anthropological evidence by examining the problem from an economic perspective and attempts to quantify some economic effects of granting property rights to women. Findings suggest that WPIR are significant in promoting individual economic advancement for all women, especially in the realms of employment and earnings. If countries want to support human development and economic growth, they should not discount the potential of equitable policies to promote the advancement of women.

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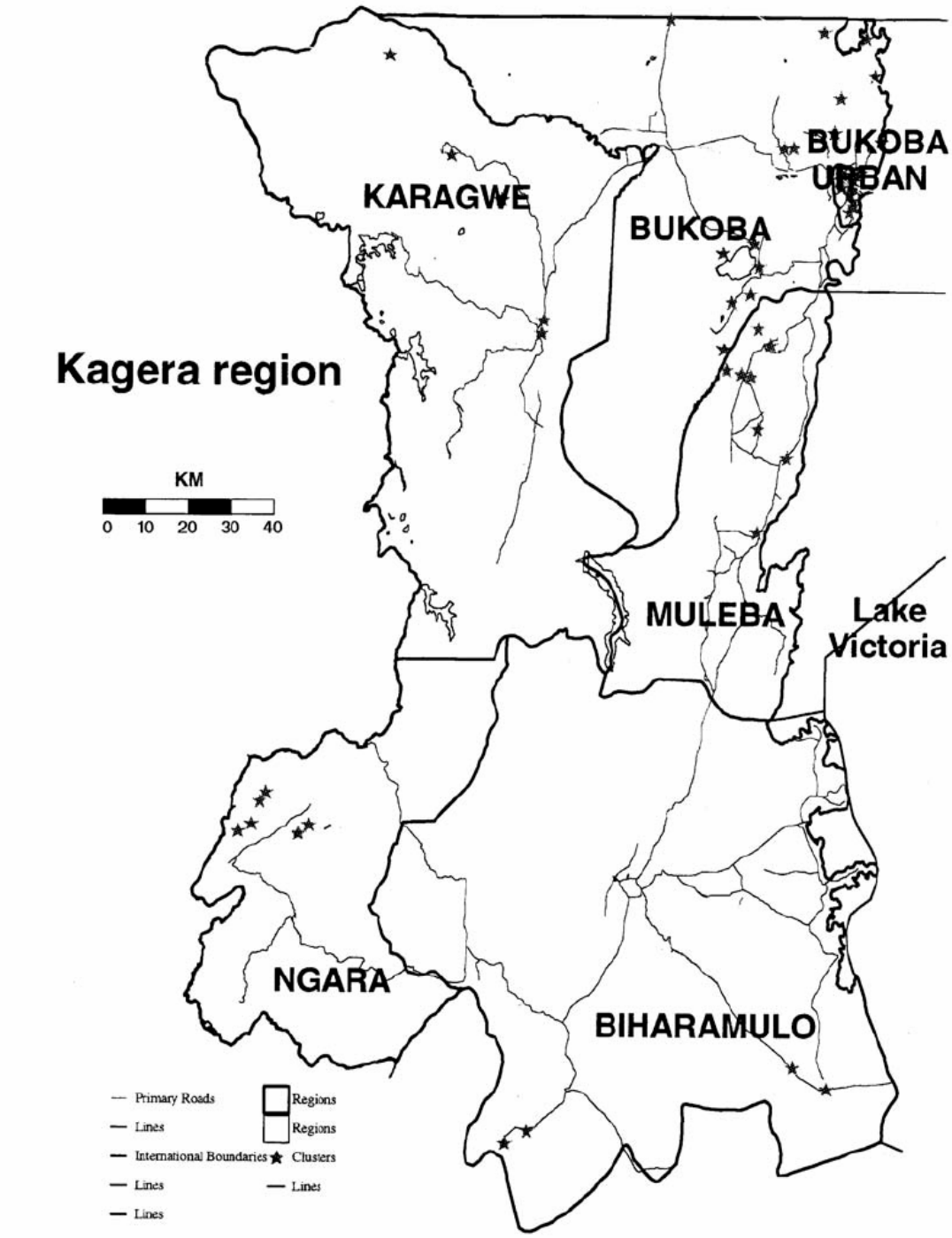
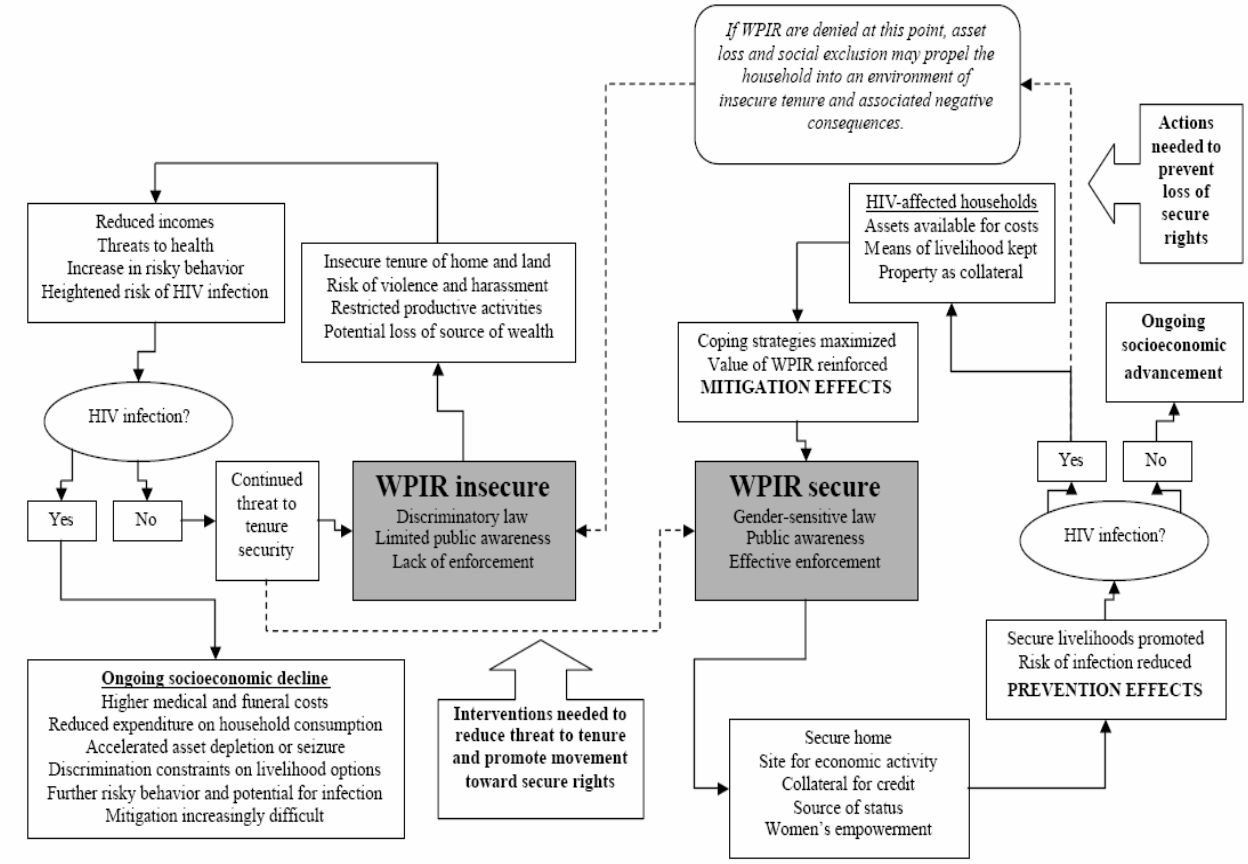
J. Appendices

Figure J1. Location of sampling clusters in the Kagera Region, Tanzania.



Source: WB, 2004.

Figure J2: Potential pathways between WPIR and consequences of HIV/AIDS



Source: Strickland, 2004.

Table J3: T-tests for attriters versus non-attriters (Baseline 1991-1994)

	(A) Full baseline sample (by re-interview) (N = 1,480)			(B) Excluding "lost" (by re-interview) (N= 1,242)			(C) Excluding mobility & mortality (by re-interview) (N = 999)		
Individual level variables:	(=0)	(=1)	p-value	(=0)	(=1)	p-value	(=0)	(=1)	p-value
Age splines:									
Age 20 to 29 (=1)	0.34	0.27	0.047	0.33	0.27	0.034	0.34	0.27	0.047
Age 30 to 39 (=1)	0.17	0.20	0.058	0.17	0.20	0.172	0.15	0.20	0.073
Age 40 to 49 (=1)	0.08	0.16	0.000	0.10	0.16	0.005	0.03	0.16	0.000
Age 50 and over (=1)	0.05	0.09	0.001	0.05	0.09	0.010	0.04	0.09	0.012
Education:									
No formal education (=1)	0.16	0.24	0.000	0.15	0.24	0.000	0.16	0.24	0.162
Completed primary (=1)	0.27	0.32	0.060	0.29	0.32	0.022	0.10	0.03	0.000
Secondary or above (=1)	0.10	0.03	0.000	0.09	0.03	0.000	0.12	0.03	0.000
Marital Status:									
Never married (=1)	0.41	0.25	0.000	0.39	0.25	0.000	0.47	0.25	0.000
Widowed or separated (=1)	0.23	0.18	0.026	0.28	0.18	0.000	0.13	0.18	0.073
Religion of HH head:									
Muslim (=1)	0.16	0.13	0.089	0.16	0.13	0.125	0.16	0.13	0.221
Other Christian denominations (=1)	0.30	0.30	0.863	0.30	0.30	0.817	0.30	0.30	1.000
Ethnicity/Tribe of HH head:									
Mnyambo (=1)	0.09	0.15	0.001	0.07	0.15	0.000	0.12	0.15	0.283
Mhangaza (=1)	0.09	0.14	0.002	0.09	0.14	0.012	0.08	0.14	0.017
Other tribe (=1)	0.17	0.13	0.081	0.17	0.14	0.102	0.16	0.13	0.249
Bottom quintile of wealth distribution (=1)[1]	0.20	0.20	0.678	0.21	0.20	0.534	0.19	0.20	0.911
Community level variables:									
Urban (=1)	0.30	0.18	0.000	0.24	0.18	0.011	0.40	0.18	0.000
Population (in 1,000's)	3.29	2.97	0.007	2.86	2.97	0.333	4.13	2.97	0.000
Bank (=1)	0.15	0.13	0.420	0.13	0.13	0.893	0.18	0.13	0.060
Hospital (=1)	0.07	0.06	0.400	0.05	0.06	0.393	0.12	0.06	0.001
Health center (=1)	0.27	0.24	0.261	0.26	0.24	0.640	0.30	0.24	0.101
HHs have electricity (=1)	0.34	0.25	0.000	0.26	0.25	0.733	0.49	0.25	0.000
HHs have piped water (=1)	0.20	0.21	0.625	0.44	0.21	0.000	0.44	0.21	0.000
District is regional capital (=1)	0.29	0.17	0.000	0.25	0.17	0.001	0.28	0.17	0.000

[1] For construction and contributions to wealth index see Table J9.

Table J4: Summary of attrition significance in welfare estimation (BGLW test)

	(A) Full baseline sample (N = 1,480)	(B) Excluding "lost" (N = 1,242)	(C) Excluding mobility & mortality (N = 999)
Dependent variables:	Any attrition in follow-up (1= yes, 0 = no)	Died or moved in follow-up (1=yes, 0 = no)	"Lost" in follow-up (1= yes, 0=no)
Labor Force Participation and earnings:			
Employed outside the home (last week = 1)	-0.22 (0.11)*	-0.33 (0.10)***	-0.07 (0.16)
Working self employed (last week = 1)	0.05 (0.19)	0.06 (0.19)	0.06 (0.25)
Working in agriculture (log hrs spent last week)	-0.56 (0.11)***	-0.61 (0.12)***	-0.49 (0.14)***
Earnings (log shillings)	-0.25 (0.12)**	-0.36 (0.14)**	-0.07 (0.15)
Time Use:			
Fetching water/firewood (log hrs spent last week)	-0.14 (0.23)	-0.20 (0.25)	-0.04 (0.30)
Housework (log hrs spent last week)	-0.31 (0.15)***	-0.37 (0.16)**	-0.14 (0.10)
Individual Expenditures: [1]			
Clothing and fabrics (log shillings)	-0.12 (0.16)	-0.27 (0.20)	0.03 (0.25)
Food and beverages (log shillings)	-0.16 (0.14)	-0.26 (0.14)*	0.01 0.23
Medical (log shillings)	-0.00 (0.15)	0.07 (0.22)	-0.31 (0.14)***
Total individual expenditure (log shillings)	-0.03 (0.15)	-0.05 (0.18)	-0.09 (0.19)
Savings:			
Total individual savings (log shillings)	-0.18 (0.12)	-0.23 (0.17)	-0.19 (0.21)
Total household savings (log shillings)	0.13 (0.07)**	0.18 (0.09)**	0.04 (0.15)

Note: Binary indicators are estimated using probit models, all others with OLS models. Clustered standard errors at the district level are reported in parentheses.

* indicates significant at 10%; ** significant at 5%; *** significant at 1%.

[1] Expenditures for clothing and medical categories are recalled for 12 months, all other expenditures are recalled on two weeks (See Table J7 for details on construction of dependent variables; see Table J8 for control variables).

Table J5: Summary statistics for community level determinants of WPIR (N = 254)

Community level control variables:	Mean	SD	Min	Max
2004 survey round (=1)	0.20	0.40	0.00	1.00
Percentage female "experts" (%)	0.15	0.15	0.00	0.67
Majority ethnic/religious groups: [1]				
Ethnic group Wanyambo (=1)	0.10	0.30	0.00	1.00
Ethnic group Wahangaz (=1)	0.12	0.32	0.00	1.00
Ethnic group Sukuma (=1)	0.05	0.21	0.00	1.00
Religion Muslim (=1)	0.02	0.14	0.00	1.00
Economic indicators:				
HHs have electricity (=1)	0.36	0.48	0.00	1.00
HHs have piped water (=1)	0.22	0.41	0.00	1.00
Population (in 1,000's)	3.15	2.39	0.00	1.00
Bank (=1)	0.11	0.31	0.00	1.00

[1] The excluded majority ethnic group is Wahaya, while the excluded majority religious group are Christian denominations (including Catholic).

Table J6: Descriptive statistics for Z variables used to predict re-interview

	(Baseline, 1991-94)			
Individual level variables (N = 1,243)	Mean	SD	Min	Max
Enters all four baseline rounds (=1)	0.53	0.50	0.00	1.00
Community level illness related adult death rate[1]	0.64	0.16	0.14	0.94
Community level variables:				
Price per tablet of paracet (in shillings)[2]	11.30	3.94	1.34	20.00
Daughter of HH head (=1)	0.28	0.45	0.00	1.00

[1] Death rate is for 1988, calculated among adults age 15 to 50 as part of the survey sample selection (enumeration round).

[2] Prices are an average of values collected from two types of markets: (1) the nearest community market and (2) roadside shops. In the case of community markets, three prices were gathered from traders at different locations in the market (WB-DRG, 2004). Prices are deflated to 1991 to adjust for differences in survey year.

Table J7: Construction of individual level welfare outcomes

Labor Force Participation and earnings:	
Employed outside the home	Measured as a binary indicator for the last week. Woman is asked if she has worked for someone who is not a member of her household and examples are given (employer, the government, a firm, other people). Asked to all household members over the age of seven.
Working self employed	Measured as a binary indicator for the last week. Woman is asked if she has worked for herself or her household and examples are given (independent merchant or fisherman, lawyer, doctor or other self-employed activity). Asked to all household members over the age of seven.
Working in agriculture	Measured in log hours spent in the last week. Asks hours for each day on the following activities: (1) work on household gardens/shambas, (2) processing crops from household gardens/shambas to sell (example brewing banana beer), (3) feeding caring for, tending and transporting family owned animals, (4) collecting or transforming household animal products for sale. Asked to all household members over the age of seven.
Earnings	Measured in log shillings on a monthly basis, deflated to 1991. Includes paid salary, gratuities and bonuses and in-kind payments for any employed work. Asks for both primary and secondary jobs.
Time Use:	
Fetching water/firewood	Measured in log hours spent in the last week. Asks hours for each day spent (1) collecting firewood and (2) collecting water. Asked to all household members over the age of seven.
Housework	Measured in log hours spent in the last week. Asks hours for each day spent preparing meals, cleaning the house, doing laundry or shopping for food. Asked to all household members over the age of seven.
Individual Expenditures:	
Clothing and fabrics	Measured in log shillings bought or acquired in the last year, deflated to 1991. Includes khangas and kitenges, fabric and cloth, other clothing and footwear. Note that passages 2, 3 and 4 in the baseline ask on a recall basis of 6 months, therefore, this value is doubled to align with recall period of passage 1 and the follow-up. Asked to all household members.
Food and beverages	Measured in log shillings bought or acquired in the last two weeks, deflated to 1991. Includes food and beverages consumed outside the home or bought on the street (bars, restaurants, etc). Asked to all household members over the age of 15.
Medical	Measured in log shillings bought or acquired over the last year, deflated to 1991. Includes medicine, medical services including transportation to and from any health center. Note that passages 2, 3 and 4 in the baseline ask this on a recall basis of 6 months, therefore, this value is doubled to align with recall period of passage 1 and the follow-up.
Total individual expenditure	The sum of clothing/fabrics, food/beverages and medical expenditures for each woman.
Savings:	
Total individual savings	Measured in log shillings deflated to 1991. Asks the amount of personal savings in the following places: bank savings account, checking account, foreign currency account, other bank accounts, other savings at home or in other's homes. Asked to all adult household members over the age of 15.
Total household savings	Measured in log shillings deflated to 1991. Aggregation of total individual savings for all household members.

Table J8: Distribution of control variables for welfare outcomes

	Baseline (1991-94)	
Individual level variables: (N = 1,242)	Mean	SD
Age splines:		
Age 15 to 19 (=1, omitted)	0.31	0.46
Age 20 to 29 (=1)	0.29	0.46
Age 30 to 39 (=1)	0.19	0.39
Age 40 to 49 (=1)	0.13	0.34
Age 50 and over (=1)	0.08	0.26
Education:		
No formal education (=1)	0.20	0.40
Incomplete primary (=1)	0.31	0.46
Completed primary (=1, omitted)	0.49	0.50
Secondary or above (=1)	0.05	0.23
Marital Status:		
Union (=1, omitted)	0.48	0.50
Never married (=1)	0.31	0.46
Widowed or separated (=1)	0.22	0.41
Religion of HH head:		
Catholic (=1, omitted)	0.56	0.49
Muslim (=1)	0.14	0.34
Other Christian denominations (=1)	0.30	0.46
Ethnicity/Tribe of HH head:		
Mhaya (=1, omitted)	0.62	0.49
Mnyambo (=1)	0.12	0.32
Mhangaza (=1)	0.12	0.32
Other tribe (=1)	0.15	0.36
Bottom quintile of wealth distribution (=1)[1]	0.20	0.40
Community level variables:		
Urban (=1)	0.20	0.40
Population (in 1,000's)	2.93	1.98
Bank (=1)	0.13	0.34
Hospital (=1)	0.06	0.23
Health center (=1)	0.25	0.43
HHs have electricity (=1)	0.26	0.44
HHs have piped water (=1)	0.20	0.40
District is regional capital (=1)	0.20	0.40
Baseline passage indicators:		
Passage 1 (=1, omitted)		
Passage 2 (=1)	0.09	0.29
Passage 3 (=1)	0.09	0.29
Passage 4 (=1)	0.05	0.22
Seasonal indicators for interview:		
January (omitted =1)	0.14	0.35
February (=1)	0.15	0.36
March (=1)	0.12	0.32
April (=1)	0.01	0.11
May (=1)	0.03	0.18
June (=1)	0.11	0.16
July (=1)	0.03	0.15
August (=1)	0.02	0.20
September (=1)	0.04	0.34
October (=1)	0.13	0.36
November (=1)	0.15	0.23
December (=1)	0.05	0.35

[1] For construction and contributions to wealth index see Table J9.

Table J9: Construction of wealth index

	Baseline (1991 - 1994) (N = 1,480)			End-line (2004) (N = 755)		
Contributing factors:	Mean	Proportion contribution	Cumulative contribution	Mean	Proportion contribution	Cumulative contribution
(1) Dwelling value (log shillings)	11.07	0.239	0.239	10.77	0.234	0.234
(2) Land value (log shillings)	11.53	0.124	0.364	10.96	0.146	0.380
(3) Livestock value (log shillings)	7.18	0.118	0.482	4.38	0.117	0.497
(4) Toilet (=1)	0.94	0.102	0.584	0.94	0.080	0.576
(5) TV (=1)	0.01	0.077	0.661	0.03	0.076	0.652
(6) Car (=1)	0.03	0.067	0.728	0.02	0.068	0.720
(7) Bicycle (=1)	0.33	0.064	0.792	0.39	0.060	0.780
(8) Refrigerator (=1)	0.01	0.054	0.846	0.01	0.055	0.835
(9) Stove (=1)	0.21	0.050	0.896	0.16	0.049	0.883
(10) Radio (=1)	0.43	0.045	0.942	0.59	0.047	0.930
(11) Dwelling has cement floors (=1)	0.18	0.033	0.974	0.19	0.037	0.967
(12) Number of rooms in dwelling	4.27	0.026	1.000	2.70	0.033	1.000

Note: Factors are listed in the order of their proportion of contribution to the score.
The baseline sample includes the working sample plus all those who were 'lost', while the end-line sample only contains those in the panel. Therefore all quintile measurements are proportional to those in the sample group.
All values are in shillings and deflated to the baseline year 1991.

Table J10: Regression results of baseline welfare estimation (1991-94)

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)
	Employed	Self employed	Log hours agrclture	Log earnings	Log hours water/fire	Log hours homework	Log clothing expend.	Log medical expend.	Log food expend.	Log total expend.	Log ind savings	Log HH savings
High WPIR (=1)	-0.18	0.498	-0.137	-0.158	0.227	-0.106	0.241	0.810	-0.028	0.310	0.462	0.367
	(0.23)	(0.14)***	(0.41)	(0.23)	(0.19)	(0.09)	(0.23)	(0.20)***	(0.24)	(0.16)**	(0.27)*	(0.13)***
Age 20 to 29 (=1)	0.381	0.484	0.411	0.33	0.158	0.100	-0.248	0.738	0.578	0.038	0.904	0.087
	(0.22)*	(0.15)***	(0.338)	(0.25)	(0.18)	(0.28)	(0.27)	(0.19)***	(0.16)***	(0.19)	(0.19)***	(0.13)
Age 30 to 39 (=1)	0.935	0.737	0.608	1.179	-0.383	0.254	-0.378	0.394	0.825	-0.131	1.429	-0.078
	(0.22)***	(0.15)***	(0.64)	(0.37)***	(0.32)	(0.32)	(0.41)	(0.206)*	(0.41)**	(0.24)	(0.42)***	(0.09)
Age 40 to 49 (=1)	0.435	0.898	0.968	0.651	-0.477	0.063	-0.613	1.222	0.828	0.080	2.026	0.280
	(0.28)	(0.34)***	(0.62)	(0.26)**	(0.38)	(0.28)	(0.41)	(0.44)***	(0.27)***	(0.28)	(0.35)***	(0.24)
Age 50 and over (=1)	0.092	0.492	0.123	0.156	-0.205	-0.702	-1.128	0.906	0.761	-0.557	1.647	0.323
	(0.28)	(0.36)	(0.72)	(0.24)	(0.42)	(0.16)***	(0.46)**	(0.61)	(0.49)	(0.307)*	(0.49)***	(0.25)
No formal education (=1)	0.046	-0.720	0.170	-0.009	-0.127	-0.147	-1.536	-0.584	-0.747	-1.198	-2.227	-0.617
	(0.20)	(0.20)***	(0.12)	(0.18)	(0.18)	(0.17)	(0.40)***	(0.38)	(0.32)**	(0.30)***	(0.34)***	(0.09)***
Incomplete primary (=1)	-0.137	-0.344	0.452	-0.321	0.210	0.434	-0.667	0.074	-0.611	-0.558	-1.456	-0.353
	(0.10)	(0.16)**	(0.09)***	(0.12)***	(0.16)	(0.12)***	(0.25)***	(0.14)	(0.15)***	(0.24)**	(0.22)***	(0.12)***
Secondary or above (=1)	0.851	-0.700	-0.321	1.531	-0.688	0.014	0.689	0.535	0.646	0.844	0.468	1.084
	(0.12)***	(0.25)***	(0.29)	(0.45)***	(0.402)*	(0.15)	(0.55)	(0.36)	(0.24)***	(0.424)**	(0.45)	(0.16)***
Never married (=1)	0.379	0.526	0.335	0.377	0.502	-0.366	-1.423	-0.726	0.486	-1.192	-0.215	-0.167
	(0.21)*	(0.19)***	(0.38)	(0.214)*	(0.256)**	(0.17)**	(0.20)***	(0.19)***	(0.45)	(0.17)***	(0.17)	(0.19)
Widowed or separated (=1)	0.368	0.675	-0.032	0.160	0.412	-0.286	-1.004	-0.371	0.105	-0.898	0.803	-0.774
	(0.10)***	(0.16)***	(0.29)	(0.06)***	(0.35)	(0.18)	(0.25)***	(0.18)**	(0.15)	(0.18)***	(0.18)***	(0.09)***
Muslim (=1)	-0.211	0.320	-0.126	-0.262	-0.238	-0.068	0.021	0.441	-0.120	0.116	-0.645	0.125
	(0.30)	(0.08)***	(0.12)	(0.23)	(0.26)	(0.21)	(0.16)	(0.10)***	(0.29)	(0.061)*	(0.33)**	(0.10)
Other Christian denominations (=1)	-0.163	-0.103	-0.163	-0.174	0.379	-0.056	-0.185	-0.156	-0.407	-0.146	-0.293	-0.074
	(0.22)	(0.14)	(0.22)	(0.24)	(0.19)**	(0.18)	(0.24)	(0.11)	(0.09)***	(0.15)	(0.28)	(0.10)
Mnyambo (=1)	-0.545	0.066	0.775	-0.411	0.899	-0.130	-0.389	-0.082	-0.287	-0.300	0.025	0.444
	(0.20)***	(0.23)	(0.36)**	(0.19)**	(0.20)***	(0.24)	(0.29)	(0.13)	(0.23)	(0.13)**	(0.38)	(0.34)
Mhangaza (=1)	-0.192	0.201	0.813	-0.102	1.799	0.111	-0.110	-0.513	0.309	-0.112	-0.341	-0.048
	(0.30)	(0.37)	(0.39)**	(0.19)	(0.27)***	(0.08)	(0.29)	(0.31)	(0.17)*	(0.31)	(0.29)	(0.30)
Other tribe (=1)	0.181	0.256	0.160	0.187	1.433	0.291	-0.359	-0.139	0.008	-0.151	-0.405	-0.281
	(0.31)	(0.26)	(0.27)	(0.37)	(0.61)**	(0.21)	(0.195)*	(0.11)	(0.19)	(0.20)	(0.19)**	(0.12)**
Bottom quintile of wealth (=1)	0.307	0.004	-0.139	0.332	1.222	0.204	-0.514	-0.098	-0.048	-0.543	-0.265	-1.388
	(0.25)	(0.12)	(0.19)	(0.28)	(0.30)***	(0.17)	(0.24)**	(0.39)	(0.281)**	(0.26)*	(0.29)	(0.10)***
Constant	-2.298	-2.850	1.145	-0.165	-2.672	1.618	8.621	3.127	0.520	8.637	2.384	8.016
	(0.47)***	(0.27)***	(0.50)*	(0.43)	(0.74)**	(0.37)***	(0.56)***	(0.35)***	(0.24)*	(0.45)***	(0.35)***	(0.17)***
F-test for community controls (χ^2)	0.013	0.121	0.005	0.243	0.000	0.001	0.124	0.001	0.002	0.002	0.151	0.005
F-test for seasonal controls (χ^2)	0.000	0.000	0.056	0.074	0.033	0.022	0.064	0.062	0.001	0.038	0.084	0.240
F-test for passage controls (χ^2)	0.000	0.003	0.135	0.157	0.042	0.647	0.363	0.004	0.001	0.421	0.042	0.407
R-squared	0.185	0.181	0.089	0.115	0.196	0.051	0.146	0.086	0.114	0.165	0.156	0.279

Note: Columns 1 and 2 are estimated using probit models, the remaining are estimated with OLS models. Standard errors clustered at the district level are reported in parentheses. Also included but not reported are community controls found in Table J8 (urban, population, bank, hospital, health center, HHs have electricity, HH have piped water, district of regional capital), seasonal controls and baseline passage controls).

* indicates significant at 10%; ** significant at 5%; *** significant at 1%.

Table J11. Panel fixed-effects regression results of welfare estimation (1991-94 to 2004)

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
	Employed	Self employed	Log hours agrclture	Log earnings	Log hours water/fire	Log clothing expend.	Log medical expend.	Log food expend.	Log total expend.
High WPIR (=1)	0.007	0.07	0.326	0.097	0.452	-0.128	0.421	0.393	0.018
	(0.03)	(0.03)**	(0.33)	(0.23)	(0.46)	(0.10)	(0.42)	(0.24)	(0.17)
Age 20 to 29 (=1)	0.023	0.102	0.489	0.227	1.45	0.264	0.871	0.845	0.28
	(0.05)	(0.04)**	(0.56)	(0.38)	(0.54)***	(0.27)	(0.56)	(0.50)	(0.22)*
Age 30 to 39 (=1)	0.067	0.14	0.981	0.527	2.335	-0.565	0.431	0.711	-0.558
	(0.03)**	(0.05)***	(0.79)	(0.30)*	(1.13)**	(0.45)	(0.41)	(0.37)	(0.31)*
Age 40 to 49 (=1)	0.078	0.171	1.152	0.662	2.884	-0.702	0.954	0.802	-0.643
	(0.10)	(0.04)***	(0.74)	(0.72)	(1.31)**	(0.79)	(0.41)**	(0.55)	(0.40)
Age 50 and over (=1)	0.074	0.133	0.962	0.429	3.193	-1.047	1.199	0.783	-0.926
	(0.10)	(0.06)**	(1.18)	(0.56)	(1.90)*	(1.13)	(1.08)	(0.42)	(0.74)
No formal education (=1)	0.076	0.014	0.259	0.366	-0.243	-0.462	-0.348	-1.012	-0.483
	(0.06)	(0.05)	(0.47)	(0.55)	(0.70)	(0.73)	(0.32)	(0.43)*	(0.29)**
Incomplete primary (=1)	0.055	-0.011	-0.138	0.24	-0.297	-0.893	-1.146	-0.468	-1.057
	(0.06)	(0.07)	(0.35)	(0.59)	(0.61)	(0.80)	(0.46)**	(0.42)	(0.44)**
Secondary or above (=1)	0.137	0.084	0.264	1.82	-0.176	0.335	0.63	-0.836	0.429
	(0.18)	(0.08)	(2.55)	(0.81)**	(0.67)	(0.75)	(1.17)	(0.84)	(0.47)
Never married (=1)	0.038	0.03	-0.644	0.259	-0.372	-0.903	-0.469	0.016	-1.049
	(0.07)	(0.02)	(0.92)	(0.57)	(0.41)	(0.29)***	(0.58)	(0.42)	(0.26)**
Widowed or separated (=1)	-0.003	0.053	0.64	0.16	-0.332	-0.764	-0.631	0.66	-0.811
	(0.06)	(0.08)*	(0.46)	(0.49)	(0.61)	(0.17)***	(0.68)	(0.26)*	(0.17)***
Bottom quintile of wealth (=1)	0.069	-0.014	0.376	0.562	0.702	-0.463	0.202	-0.116	-0.175
	(0.07)	(0.04)	(0.29)	(0.51)	(0.34)**	(0.49)	(0.42)	(0.20)	(0.46)
Constant	-0.024	-0.103	0.739	0.048	-3.679	8.275	3.508	0.477	8.844
	(0.12)	(0.07)	(0.68)	(0.96)	(1.12)**	(0.90)***	(0.91)***	(0.44)	(0.47)***
F-test for community controls (χ^2)	0.572	0.339	0.001	0.934	0.105	0.402	0.000	0.005	0.010
F-test for seasonal controls (χ^2)	0.571	0.506	0.705	0.250	0.140	0.036	0.024	0.297	0.018
R-squared (within)	0.052	0.092	0.053	0.062	0.192	0.090	0.090	0.072	0.118

Note: Columns 1 and 2 are estimated using a fixed-effects linear probability model, the remaining are estimated with OLS models. Standard errors clustered at the district level are reported in parentheses. Also included but not reported are time variant community controls found in Table J8 (population, bank, hospital, health center, HHs have electricity, HHs have piped water) and seasonal controls.

* indicates significant at 10%; ** significant at 5%; *** significant at 1%.

Table J12. Inverse probability weighting (IPW) fixed-effects regression results of welfare estimation (1991-94 to 2004)

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
	Employed	Self employed	Log hours agrclture	Log earnings	Log hours water/fire	Log clothing expend.	Log medical expend.	Log food expend.	Log total expend.
High WPIR (=1)	0.106	-0.071	0.353	0.955	0.195	-0.372	0.334	-0.246	-0.232
	(0.05)***	(0.07)	(0.57)	(0.37)***	(0.46)	(0.23)*	(0.55)	(0.32)	(0.22)
Age 20 to 29 (=1)	-0.152	-0.072	0.094	-1.502	0.891	-0.688	-0.247	-0.303	-0.798
	(0.06)***	(0.03)***	(0.30)	(0.492)***	(0.57)**	(0.36)*	(0.36)	(0.31)	(0.35)***
Age 30 to 39 (=1)	-0.109	-0.04	0.11	-1.247	1.922	-0.958	-0.703	0.257	-1.139
	(0.06)**	(0.08)	(1.17)	(0.393)***	(0.95)***	(0.48)**	(0.67)	(0.53)	(0.44)***
Age 40 to 49 (=1)	-0.122	0.035	0.795	-1.227	2.708	-0.457	-0.256	0.505	-0.873
	(0.14)	(0.04)	(1.29)	(0.85)**	(1.22)***	(0.98)	(0.61)	(0.61)	(0.66)*
Age 50 and over (=1)	-0.157	0.039	0.911	-1.856	3.261	-0.667	0.027	1.122	-0.962
	(0.14)	(0.05)	(1.85)	(0.66)***	(1.57)***	(1.39)	(0.88)	(0.57)*	(0.81)*
No formal education (=1)	-0.036	0.1	0.536	-0.331	-0.084	-0.746	-0.666	-0.083	-1.092
	(0.09)	(0.11)	(0.74)	(0.80)	(1.01)	(1.05)	(0.67)	(0.27)	(0.59)***
Incomplete primary (=1)	0.068	0.03	0.505	0.459	-0.344	-0.792	-0.143	-0.73	-0.989
	(0.06)	(0.05)	(0.56)	(0.53)	(1.12)	(0.45)**	(0.60)	(0.14)***	(0.41)***
Secondary or above (=1)	-0.031	0.153	-0.834	-0.817	1.569	-1.901	-3.135	0.697	-2.006
	(0.09)	(0.18)	(0.79)	(1.64)	(0.50)***	(1.16)**	(0.70)***	(0.77)	(0.55)***
Never married (=1)	-0.097	-0.039	0.104	-0.906	-0.351	-2.687	-1.423	-0.51	-2.757
	(0.067)**	(0.05)	(0.92)**	(0.61)	(0.51)	(0.25)***	(0.97)**	(0.60)	(0.10)***
Widowed or separated (=1)	0.008	-0.019	-0.456	0.303	-0.633	-2.258	-2.126	-0.443	-2.41
	(0.11)	(0.06)	(0.57)	(0.61)	(0.47)*	(0.69)***	(0.67)***	(0.44)	(0.60)***
Bottom quintile of wealth (=1)	0.042	-0.111	0.225	0.431	0.173	-0.802	-0.452	-0.962	-0.598
	(0.10)	(0.05)***	(0.20)	(0.75)	(0.34)	(0.65)*	(0.47)	(0.21)***	(0.47)*
Constant	0.279	0.395	0.814	2.645	-2.329	15.262	9.25	3.299	16.964
	(0.17)	(0.07)***	(1.53)	(1.14)*	(0.87)**	(0.73)***	(1.07)***	(0.47)***	(0.58)***
F-test for community controls (χ^2)	0.018	0.083	0.041	0.000	0.118	0.000	0.599	0.001	0.001
F-test for seasonal controls (χ^2)	0.042	0.005	0.398	0.003	0.063	0.001	0.146	0.015	0.000
R-squared (within)	0.187	0.338	0.151	0.247	0.185	0.702	0.491	0.38	0.796

Note: Columns 1 and 2 are estimated using a fixed-effects linear probability model, the remaining are estimated with OLS models. Standard errors clustered at the district level are reported in parentheses. Also included but not reported are time variant community controls found in Table J8 (population, bank, hospital, health center, HHs have electricity, HHs have piped water) and seasonal controls.

* indicates significant at 10%; ** significant at 5%; *** significant at 1%.