THREE ESSAYS IN DEVELOPMENT ECONOMICS: PATTERNS AROUND MEN AND WOMEN'S WEALTH AND ASSET OWNERSHIP IN GHANA AND MALAWI

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ABSTRACT

This dissertation consists of three essays in development economics that explore sex-disaggregated aspects around asset ownership and wealth in Ghana and Malawi. The first essay, GENDER DIFFERENCES IN RISK BEHAVIOR: AN ANALYSIS OF ASSET ALLOCATION DECISIONS IN GHANA, seeks to estimate gender differences in risk preferences based on asset allocation decisions of individuals within households in Ghana. To date, little is known about gender differences in risk preferences (as reflected in allocation decisions within households) outside the developed country context. Using a unique household level, sex-disaggregated data set from Ghana collected in 2010 this paper seeks to fill the gap in the literature by estimating risk aversion of individuals within the Ghanaian household. The study finds that women hold significantly fewer risky assets than men in absolute terms and as a proportion of their wealth. However, men and women in Ghana exhibit decreasing relative risk aversion (in terms of asset allocation) as wealth increases and nearly the entire difference between men and women's proportion of risky assets is due to the substantial wealth gap between men and women and not differences in risk preferences.

Using the same data, the second essay, THE COVARIATES OF DIFFERENCES IN WEALTH HOLDINGS BETWEEN MARRIED MEN AND WOMEN IN GHANA, seeks to explore the determinants of the difference in the gross value of financial and physical assets held by married men and women within households in Ghana. This is the first study of its kind to investigate the composition of differences that play a role in the aggregated wealth gap between

men and women within a developing country context. Using a technique proposed by Firpo et al. (2007; 2009) to decompose the components of the wealth gap at different quantiles, the study finds that gender differences in inheritance and educational attainment contribute to a substantial part of the explained wealth gap between married men and women in Ghana across the wealth distribution. For the 70th and 80th quantiles, the gender difference in labor income is significant and explains about one-fifth of the gender wealth gap.

The third essay, MEN AND WOMEN'S ASSET OWNERSHIP AND HOUSEHOLD INCOME DIVERSIFICATION PATTERNS IN RURAL MALAWI, is a coauthored paper with Caren Grown and Hema Swaminathan. Using a unique data set with detailed information of household income sources and individual level information on land ownership, the paper examines how gender differences in land holdings are associated with different household income diversification patterns in rural Malawi in 1994-1995. The study finds that women's greater land holdings in married households increases the number of total income activities and non-agriculture activities controlling for the composition of the household and landholdings. This has important policy implications in that studies find a correlation between greater income diversification, usually in terms of total non-agricultural income activities, and household wellbeing.

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GENDER DIFFERENCES IN RISK BEHAVIOR: AN ANALYSIS OF ASSET ALLOCATION DECISIONS IN GHANA

Introduction

Physical and financial assets serve a number of important functions. Physical assets--such as a household's residence, a vehicle, and mobile phones--may provide current and future consumption value and may also be a means of production, generating future consumption flows. Financial assets have a monetary value that can be converted into future consumption. Both types of assets may generate profits or losses as well as rent or interest. They also may be held as a form of savings as a way to self insure against possible future economic hardships.

Recent empirical evidence suggests there is a substantial difference in the value of financial and physical assets held by men and women in Ghana (Oduro, Baah-Boateng, and Boakye-Yiadom 2011). Men hold 57 percent more wealth in physical assets than women (70 percent compared to women's share of 30 percent) and 39 percent more wealth in financial assets than women (62 percent compared to women's share of 38 percent) (ibid).[1]

There are a number of reasons that could contribute to this gender wealth gap in Ghana. One such reason could be differences in risk preferences. Risk averse individuals prefer to invest in secure assets or assets with a constant rate of return over risky assets of the same expected value with a variable rate of return. By definition, the expected return on risky assets is greater than risk-free assets (otherwise individuals would not invest in the risky asset). As such, if women are systematically more risk averse than men, women will invest less in risky assets than

[1] The study uses data for physical assets based on all individuals in households. The data for financial assets includes only two individuals in each of the surveyed households.

men and, consequently, will accumulate additional assets more slowly than men. Theoretically, this would widen the gender wealth gap over time, ceteris paribus.

There is some evidence in the literature, mainly based on developed countries, that women are more risk averse than men. However, little is known about gender differences in risk preferences outside the United States and other high-income countries. Using household level, sex-disaggregated data from Ghana from 2010 that contains detailed information on asset ownership at the individual-level, I find that women hold significantly fewer risky assets than men in absolute terms and as a proportion of their wealth. What accounts for this difference? Are women more risk averse in terms of asset allocation decisions than men in Ghana or do other factors account for the way men and women allocate their wealth between risky and less risky assets? This paper seeks to determine whether there are gender differences in risk preferences in Ghana in terms of asset allocation decisions. Ghana is a fitting place to examine whether women are more risk averse than men as reflected in asset allocation decisions at the individual level because assets are primarily held individually and there is a strong separation of property. Assets acquired belong exclusively to the individual who inherits or purchases them, even within marriage (Deere et al. forthcoming).

This paper is organized as follows: the next section provides background on the development literature on gender, risk and asset ownership, and literature on gender-based differences in risk aversion. I then adapt a measure of risk aversion developed by Friend and Blume (1975) to fit a developing country context within a gender framework and define wealth and risky and non-risky assets within the context of Ghana. This is followed by the empirical specifications, a description of the data, the descriptive statistics, and the economic models. The last sections provide the results and conclusion.

Literature Review

Much of the literature within development economics on risk and investment in assets focuses on risk management and risk coping strategies. As a risk coping strategy, accumulating assets is an important form of self-insurance against consumption loss due to a shock. Limited ability to self insure and lack of access to other forms of insurance against shocks impacts a household's portfolio decisions. As a form of risk management, households with lower resilience and higher sensitivity to shocks often try to minimize risk by investing in a number of low-risk, low-return activities rather than higher-risk, higher-return activities to cushion themselves from the effects of a shock (see discussion in Dercon 2005; see also study by Zimmerman and Carter 2003).

The discussion on asset portfolios, risk management, and risk coping strategies largely focuses on households as a whole; however, there are some studies that look at gender differences. For instance, Dercon and Krishnan (1997) find that within households in rural Ethiopia, females tend to bear a greater burden of the negative consequences of a shock than men (see also Behrman and Deolalikar (1990) in India). As such, women may manage their assets differently than men. Other studies suggest there may be differences in investment due to differences in access to financial institutions and differences in social networks (Kuada 2009). However, none of the studies in this strand of literature specifically examine the difference in men and women's risk aversion in terms of asset allocation.

Outside the literature in development economics, there are two strands of literature on gender-based differences in risk aversion, most of which use data from the United States or other OECD countries. One strand is empirical field studies. The other is experimental studies. Of the empirical studies that explore gender differences in risk behavior reflected in asset allocation, most find that women are more risk averse than men (e.g. Jianakoplos and Bernasek 1998;

within retirement portfolios see Riley Jr and Chow 1992; Bajtelsmit and VanDerhei 1997; Bernasek and Shwiff 2001; Arano, Parker, and Terry 2010). However, because of data limitations, the majority of these studies examine risk behavior based on asset allocation of households where gender is reflected by the type of household disaggregated by headship: married households, single female households, and single male households.[2] As such, the results may capture the differences in risk preferences due to the household structure and not differences in risk preferences between men and women.

A recent experimental study—one of the few that examines gender differences in risk in a developing country context— by Fletschner, Anderson, and Cullen (2010), finds that women are less likely to gamble or compete than men in rural Vietnam. Correspondingly, Eckel and Grossman's (2008) survey of the experimental literature generally concurs that women are more risk averse than men. However, the results from this literature are less conclusive than the empirical literature. Many of these studies do not control for individual characteristics or differences in economic conditions. Since men and women face different economic conditions, such as expected earnings over ones' lifetime, any difference found in men and women's risk preferences in these studies may not reflect true gender differences in risk preferences. Indeed, authors from an experimental study in Switzerland find that when economic conditions are controlled, there is no difference in men and women's risk preferences.[3]

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[2] For example, using the 1989 Survey of Consumer Finances (SCF) data of 3,143 households, Jianakoplos and Bernasek (1998) analyze risk aversion between married and single-headed households. The authors find that single female-headed households have greater relative risk aversion than single male-headed households and that married households, which are male-headed by default in the survey, exhibit greater relative risk aversion than single male-headed households but less relative risk aversion than single female-headed households.

[3] In an experimental study using undergraduates at the University of Zurich and the Swiss Federal Institute of Technology by Schubert el al. (1999) find that the way the question is framed determines whether there are differences in risk attitudes between men and women. Schubert el al. (1999) divided their subjects into two groups with roughly equal males and females. One group was given context around each decision and the other was presented with the decisions in terms of abstract gambling. Each subject was asked to choose between a risky

The few experimental studies implemented outside of OECD countries that are not directly related to risk suggest that behavior depends on one's surrounding environment. For example, one experimental study finds that the environmental context shapes the outcome of the ultimatum game across 15 different cultures in 12 countries (Henrich et al. 2001). Rather than the first person offering the smallest amount of the pie to the second and the second accepting it to the alternative of receiving nothing, as the game would predict, the players offered and accepted (or rejected) based on the cultures' social expectations of fairness.

In summary, most studies on risk aversion find that women are more risk averse than men. However, the experimental studies seem to suggest that preferences may vary by country and cultural context, and that differences found in men and women's risk preference may be a consequence of men and women facing different constraints within their environment rather than reflecting actual risk preferences. Further, because of data limitations, most studies in the behavioral and development economics literature examine differences in risk preferences based on the household and not on individuals. To date, little is known about gender differences in preferences (as reflected in allocation decisions of individuals within households) outside of the developed country context. This paper seeks to fill the gaps in the literature by estimating the risk aversion of individuals within the Ghanaian household. Are women more risk averse in terms of asset allocation decisions than men in Ghana or do women and men's different economic constraints account for the difference in the way men and women allocate their wealth

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outcome and a certain outcome of equal expected value four times over two domains; the investment domain and the insurance domain. The authors ran two regression analyses for each group to control for income (as a proxy for wealth), finding gender differences only in the abstract treatment group. The results suggest that when questions are framed in a way that everyone is situated in the same context, there are no differences between men and women in financial choices, but when the economic conditions are not controlled, men and women seem to have different risk propensities. The authors conclude, "Since in practice financial decisions are always contextual, our results suggest that the … gender stereotype [that women are more risk averse than men] may not reflect true male and female attitudes toward financial risks" (1999, 382).

between risky and less risky assets? The results from this study provide support for the idea that gender differences in risk preferences vary by the cultural context.

Conceptualizing Risk Aversion

Portfolio studies in high income countries often gauge risk aversion as measured by the proportion of risky assets held to one's net worth. Assuming that agents are risk-averse and that their utility functions are comprised of the mean and variance of final wealth, Jan Mossin (1966) shows that in a competitive market—where assets are perfectly divisible, assets can be sold at any point in time, there are no transaction costs, and the expected yield on an asset is a random variable whose distribution is known to individuals—there is a general equilibrium for the market price of risk.[4]

Using this equilibrium assumption, Budd and Litzenberger (1972) extend Lintner's (1970) examination of the relationship between the size of the market and the market for risky assets. If we assume that an investor has a utility function that is twice differentiable and $U'(W) > 0$ and $U"(W) < 0$, where W is the investor's asset wealth, then the market price of risk is equal to the inverse of the sum of the measure of individual investors' absolute risk aversion, multiplied by the aggregate market value of all the risky assets (Budd and Litzenberger 1972; Lintner 1970). Using this relationship, Friend and Blume (1975) use a Taylor series expansion to show that the ratio of risky assets to total liquid assets across *k* investors is a function of individual investors' risk tolerance. This means that the proportion of risky assets to total liquid wealth is inversely related to Pratt's (1964) measure of relative risk aversion. Pratt 's (1964)

[4] The Expected Utility Model is often used to represent behavior under conditions of risk. The Mean-Variance Model is a simplification of the Expected Utility Model, where utility can be expressed as the mean and variance of a probably distribution that gives an investor different wealth outcomes at different probabilities. The two models are equivalent when either investors' utility functions can be represented by a function that has only two moments or the portfolio return distribution is an elliptical distribution. While neither assumption is entirely realistic, the Mean-Variance Model is considered a reasonable approximation to the solutions found in the Expected Utility Model.

measure of relative risk aversion is a single dimensional outcome variable that captures an individual's propensity to take risks across wealth. I use a simple version of the Friend and Blume (1975) measure and adapt it to better fit a developing country context, like Ghana, in order to estimate gender differences in risk preferences based on the asset allocation decisions of individuals.

Suppose a risk averse individual k, who has a utility function with respect to wealth, W, that is twice differentiable and $U'(W) > 0$ and $U"(W) < 0$, must decide what proportion, α, of her net worth to allocate her assets in risky, productive investments with a random return, where the expected rate of return is, $\tilde{r}_r$, and $1 - \alpha$ in secure assets with a non-variable expected rate of return, r_f. The individual chooses α such that the expected value of wealth in some future period, $\bar{W}_{t+1} = W_t + \alpha_k W_t(\tilde{r}_r - r_f)$, maximizes her expected utility:

$$max\ E[u_k\left(W_t + \alpha_k W_t(\tilde{r}_r - r_f)\right)] \tag{1}$$

where $\tilde{r}_r - r_f$ is the difference in the return due to investing in risky assets.

The first order condition is then

$$E\left[(\tilde{r}_r - r_f)W_t u_k'\left(W_t + \alpha_k^* W_t(\tilde{r}_r - r_f)\right)\right] = 0. \tag{2}$$

Using a first order Taylor series to expand $u_k'\left(W_t + \alpha_k^* W_t(\tilde{r}_r - r_f)\right)$ around W, the first order condition is approximately

$$E\left[(\tilde{r}_r - r_f)W_t[u_k'(W_t) + \alpha_k^*(\tilde{r}_r - r_f)W_t u_k^{"}(W_t)]\right] \approx 0. \tag{3}$$

This can be rearranged so that

$$\alpha_k^* W_t = \frac{E(\tilde{r}_r - r_f)}{\sigma_r^2} * \left[-\frac{u_k'(W_t)}{u_k^{"}(W_t)}\right] \tag{4}$$

where σ_r^2 is the variance of the additional return to risky assets. Multiplying both sides by $\frac{1}{W}$, equation (4) becomes

$$\alpha_k^* = \frac{E(\tilde{r}_r - r_f)}{\sigma_r^2} * \left[-\frac{u_k'(W_t)}{W_t u_k^{"}(W_t)}\right] \tag{5}$$

or

$$\alpha_k^* = \frac{E(\tilde{r}_r - r_f)}{\sigma_r^2} * \frac{1}{C_k(W_t)} \tag{6}$$

where α_k^* is the optimal demand for risky assets, $C_k(W_t) = -W_t \frac{U"(W_t)}{U'(W_t)}$ is Pratt's (1964) measure of relative risk aversion for the *k*th individual, and $\frac{E(\tilde{r}_r - r_f)}{\sigma_r^2}$ is the price of risk. In market equilibrium, $\frac{E(\tilde{r}_r - r_f)}{\sigma_r^2}$ is constant across individuals. With constant market price of risk, $\frac{E(\tilde{r}_r - r_f)}{\sigma_r^2}$,

equation (6) suggests that the proportion of risky assets to all assets is inversely related to relative risk aversion for a given individual. This means that the lower an individual's relative risk aversion (and thus absolute risk aversion), the greater the optimal demand for risky assets as a proportion of wealth, α_k^*.

The market price of risk, $\frac{E(\tilde{r_r}-r_f)}{\sigma_r^2}$, assumes individuals have similar expectations about the risk of an asset in the market. That is, the expected yield on an asset is a random variable whose distribution is known to individuals. Additionally, only aggregate risks should affect prices. Idiosyncratic risks are assumed to be diversified away, so that the marginal price of risk is constant across individuals. This means individual shocks do not affect the market equilibrium and no individual is subject to a random asset price shock that is not shared with everyone else (i.e. individuals are only subject to covariate shocks). If, for instance, an individual completely lost an asset (so that the return is less than the market price of the asset) due to an idiosyncratic shock such as theft, it is assumed the loss is diversified away and does not affect the marginal price of risk in the local market.

This is a reasonable assumption to make for a developing country if the aggregate market price of risk is limited to a market among kin and/or close social groups, as it resembles something close to a complete market price for risk because of risk-sharing practices and greater likelihood of similar expectations around the price of risk. While households in all countries are vulnerable to shocks, households in low-income countries are more likely to be subject to a lack of or limited access to functioning insurance, credit markets, or other formal institutions to help them avoid consumption shortfalls when a shock occurs. However, studies suggest that informal forms of insurance such as kinship networks provide protection against loss of consumption due to idiosyncratic risks. Among kinship networks in a village, Chiappori et al. (2006) find nearly

complete risk sharing among kin within villages in Thailand. Gifts and transfers among these households reduce the effect of liquidity constraints on household assets. Likewise, in a study using data from Cote d'Ivoire full insurance among tribes is rejected but the degree of co-movement of consumption with the aggregate return on household's capital assets is high, suggesting a great amount of risk sharing (Deaton 1994 cited in Townsend 1995). Similarly, Ogaki and Zhang (2001) allow for decreasing relative risk aversion and find complete risk sharing in villages in India and 29 of 31 villages in Pakistan.[5, 6] Using data from the Nsawam–Aburi area in the Eastern Region of Ghana from July 2004 to January 2005, Vanderpuye-Orgle and Barrett (2009) find that risk pooling is extensive for those who are part of social networks.

[5] Ogaki and Zhang (2001) argue that in low income countries, where many households consume at subsistence or just above subsistence, allowing for decreasing relative risk aversion is appropriate and, indeed, the authors find empirical evidence of decreasing relative risk aversion in their study. At subsistence, (relative and absolute) risk aversion may be infinite. As wealth increases, risk aversion decreases. It suggests that consumption of wealthier households (who are less risk averse) fluctuates more than poorer households when households pool. This is in contrast to Townsend (1994), who uses the same data in India. Townsend (1994) uses an exponential utility function which implies increasing relative risk aversion and finds a great degree of risk sharing among households in the villages, but rejects full risk sharing. Other studies of risk sharing in low-income countries assume constant relative risk aversion, which means that the consumption rate for all households is identical for those who share risk.

[6] Many empirical studies find evidence of decreasing relative risk aversion (see, for instance, Friend and Blume 1975; Riley and Chow 1993) although Arrow (1965) theorized that relative risk aversion increases with wealth.

Likewise, among smaller groups, such as kin and local organizations, it is also more likely that individuals have similar information about assets and similar expectations about the riskiness of assets, than among all individuals of the larger economy. Access to cell phones and radios also increases the likelihood that an individual has greater access to information about assets and their riskiness. Equation (6) holds, therefore, in a developing country context if the market is limited to groups, φ, in which individuals participate in complete risk sharing (as described above) and have similar expectations about riskiness of assets:

$$\alpha_k^*(W \mid \varphi) = \frac{E(\tilde{r_r} - r_f)}{\sigma_r^2} * \frac{1}{C_k(W)} \tag{7}$$

If there is not complete risk sharing and thus not a complete market for risk, members of the local economy will have different expectations about the risk of assets. The price of risk, $\frac{E(\tilde{r_r} - r_f)}{\sigma_r^2}$, will not be constant across members. As a result, the price of risk of assets cannot be captured separately from individuals' risk preferences and empirically it will be more difficult to capture any systematic difference in risk preferences between men and women.

In the discussion so far, the asset owner is referred to as a unitary agent. Most empirical research on risk aversion portrays the household as a consensual unit of analysis particularly with decisions of asset allocations. This is appropriate when households pool their resources and make decisions in unison. However, evidence suggests household members in Ghana do not make decisions in unison. Oduro, Baah-Boateng, and Boakye-Yiadom (forthcoming) find that only one-fifth of couples in Ghana both consult each other on decisions over how to spend income. Additionally, resources are rarely pooled within marriage (Baden et al. 1994; Boni

2002; Oduro, Baah-Boateng, and Boakye-Yiadom 2011). Doss (2001a) finds that while there is some pooling of income to mitigate risk in households in Ghana, there is not complete pooling. Strategies used by individuals to reduce risk are likely shared with individuals from other households.

Additionally, many households in Ghana do not resemble the Western notion of a household where a man, a woman, and their children make up a single household. Household boundaries tend to be fluid, and there are varying household structures. Households may be multi-generational, for instance. Migration, uterine matrilineal systems, and the practice of polygyny in Ghana also make household formations more complicated.

Because of fluid household boundaries and differing household formations in Ghana, an individual level, rather than household-level analysis is most appropriate. However, we would expect decisions around assets to be influenced by an individual's role within the household. Roles in Ghana differ by ethic group and religion; however, in general, a woman's role within the household is the caregiving of household members and household maintenance, including cooking, cleaning, and retrieving water and fuel for the household. Under customary law, women are often also expected to assist their husband in the husband's investments (Fenrich and Higgins 2001). Men, on the other hand, are expected to invest in income generating activities and are traditionally responsible for providing the majority of the money for the household's food, clothing, and medical expenses; although ensuring individuals in the household maintain a level of subsistence often is women's responsibility if income falls short. Older women with grown children have more time to dedicate to non-caregiving activities and are more able to invest in their own income earning activities such as small business enterprises than women of

childbearing age. Divorced or widowed women are also more likely to invest in their own income earning activities than married women.

In summary, the assumptions of household asset pooling and consensual decision-making likely do not hold in Ghana. However, individual decisions are likely made to varying degrees based on other members as well as an individual's role in the household. Thus, I use equation (7) to model individual decisions around asset allocation in Ghana, but with the understanding that individuals make decisions based on their differing gender roles in the household and established norms and practices which affect men and women differently. The next section defines wealth and how risky and non-risky assets are classified.

Defining Wealth and the Classification of Risky and Non-risky Assets in Ghana

Wealth is theoretically defined using Arrow (1965, 1971) and Pratt's (1964) definition as the value of assets within a portfolio that are infinitely divisible (liquid or non-lumpy) and can be reallocated without cost from one asset to another. Financial assets come closest to this definition and are therefore most frequently used in theoretical analyses of portfolio investment decisions. Empirical studies, however, include a broader set of assets, even though they may not be infinitely divisible, under the implicit assumption that wealth as defined by Arrow and Pratt is highly correlated with other measures of wealth (Meyer and Meyer 2006). The analysis in this paper uses two different measures of wealth: (1) a narrow measure of wealth that fits closely within Arrow (1965, 1971) and Pratt's (1964) definition and (2) an expanded measure of wealth which also includes all physical assets. The rest of this section describes how risky and non-risky assets are classified within these two measures of wealth in the context of Ghana.

By definition riskier assets have greater expected return than safer assets, however, the return is more variable. For the narrow measure of wealth, this analysis uses the same division

of risky and less risky assets as previous studies such as Jianakoplos and Bernesek (1998) and Friend and Blume (1975). Risk-free assets are informal and formal savings accounts, cash holdings, and treasury bills and bonds.[7] Risky assets include stocks.[8] Although commercial and residential real estate and formal business enterprises are less divisible than financial assets (and thus fit less well in the Arrow and Pratt definition of wealth), following Jianakoplos and Bernesek (1998) and Friend and Blume (1975), commercial and residential real estate (that can be sold on the market) and formally registered businesses (that can be sold in the market) are also included as risky assets in the narrow measure of wealth. Jianakoplos and Bernasek (1998) do not include household ownership in the value of the household's real estate as it is more difficult to reallocate to other forms of wealth than other financial assets. However, the authors do control for household ownership.

In Ghana, many household dwellings are family owned and cannot be sold. However, there are some individuals in Ghana that own a household dwelling that can be sold on the market. Following Jianakoplos and Bernasek (1998), for the narrow definition of wealth, I control for household ownership, if the house can be sold.

Like household dwellings, very few individuals own agricultural land in Ghana that can be sold. The market for agricultural land is small and the majority of land in Ghana is regulated by customary law and held by authorities in the community (Dejene 2011). Similar to household

[7] GLSS5 (2008) estimates that about 30 percent of households have at least one household member who holds a savings account. Of those who hold a [formal] savings account, nearly 60 percent are men (GLSS5 2008). [Though it is not clear, I believe these statistics exclude susu savings accounts (in addition to other forms of informal savings).] Individuals, particularly women, are more likely to use informal institutions such as susu groups or cooperatives, an informal form of savings, than hold formal savings accounts. [Susu collectors move around collecting savings from individuals at regular intervals. After a period of time the amount is returned to the depositor for a fee.]

[8] Few individuals in Ghana hold stock, although, Ghana has had a stock exchange since 1990. Risky assets also include investments items such as art work and precious metals, but these assets are rare in Ghana and not found in the dataset.

dwellings, I control for agricultural land for the narrow definition of wealth. Table 1 summarizes the classification of risky or secure assets used in this narrow definition of wealth.

Table 1. Risky and secure assets in Ghana in the narrow definition of wealth

Riskier Assets (higher return)	More Secure Assets
• Stocks • Registered businesses (as owner or part owner) that can be sold (i.e. there's a market). • Commercial and residential real estate where there is a market.	• Savings in formal and informal accounts and cash • Treasury bills and bonds
• Control for agricultural land and household dwellings, where there is a market (and it is not family or community owned)	

In the expanded definition of wealth, I include the value of agricultural land and household dwellings. To classify the other physical assets in the expanded definition of wealth, I gauge whether the asset is risky or secure based on its use. Risky physical assets are tangible assets used to invest in income or consumption generating activities that provide a greater expected flow of income or goods for consumption than without investment, but the income or goods for consumption generated are considerably variable. More secure assets may also be used in income or consumption generating activities, but their return is more steady (and by definition, lower). For example, I classify assets such as agricultural equipment that are primarily used in subsistence farming as more secure investments than agricultural equipment that are primarily used for cash crops. Although there is some amount of risk in both due to climatic shocks for example, farming practices for subsistence farming are often have a much lower variable return (and lower productivity) than the farming practices used in producing cash

crops. For similar reasons, I classify fishing boats as risky assets and smaller fishing tools as more secure assets.

Larger livestock generally result in greater returns but are often more risky to own than the smaller stock in Ghana due to disease.[9] Chickens and other poultry, on the other hand, are less risky than larger livestock but are characterized by lower returns or production (Aboe et al. 2006).

Assets not used in income or consumption generating activities, but that are either consumed over time or are used as a store of wealth for future consumption, are secure assets, as the value of these assets (adjusted for the value already consumed) fluctuates little in the market. As such, consumer durables such as a family television or articles of clothing are safe assets.[10]

Like formal businesses, many informal businesses are investments made with the expectation of a large return with the potential of losing some or all the investment, and thus are risky assets. There are some business enterprises in Ghana, however, that operate to make enough income or to trade for goods to take care of the household's subsistence such as food, clothing, and medical expenses. These types of businesses, which often use household appliances, require few inputs and are characterized by low production. These businesses are less risky (in that they are more likely to have a constant, low return) than "for profit" informal

[9] In an assessment of veterinary needs in Ghana, respondents identified disease as the primary problem in producing cattle, sheep, and goats Turkson and Naandam (2003).

[10] A car used as a taxi would be captured in the value of a formal or informal business enterprise. A car used primarily for household purposes would be categorized as a non-risky consumer durable that is consumed over time and could be sold in the local market in case of a shock. This is true of boats as well: where fishing boats are for-profit and thus are a riskier asset, boats used for leisure would be considered a consumer durable, and a more secure asset.

business enterprises (that are more likely to have variable, higher return).[11] The actual value of the business is based on the appliances used in business, which can be sold, but often the business itself cannot be sold. The value of the appliances used in these types of survival-based businesses are captured, if the appliances can be sold in the market, in the value of consumer durables owned and are considered secure assets. Table 2 summarizes the classification of risky or secure assets used in this expanded definition of wealth.

Because we assume assets can seamlessly substituted from asset to another, only assets that can be sold by the individual (either alone or in consultation with others) and for which there is a market are included in the narrow and expanded definitions of wealth. For assets that are owned jointly, as long as the individual can make the decision to sell the asset alone or in consultation, the value of the proportion of the asset owned is included in the individual's wealth.

As mentioned above, the majority of agricultural land cannot be sold. However, agricultural land is a particularly important asset for men and women in many households in Ghana. Agricultural land makes up about 60 percent of the land and agriculture employs more than half the population (EIU 2008). Because of its importance in Ghana, I control for whether an individual holds agricultural land that cannot be sold in the economy.

[11] To supplement "chop money" (the money given by husband for household necessities), women may manage one or more informal micro-enterprise. Often these micro-enterprises are a method of survival and not a principal means of income (Boni 2002).

Table 2. Risky and secure assets in Ghana in the expanded definition of wealth

Riskier Assets (higher return)	More Secure Assets
• Stocks • Registered businesses (as owner or part owner) that can be sold (i.e. there's a market) • Commercial and residential real estate where there is a market	• Savings in formal and informal accounts and cash • Treasury bills and bonds
• Larger stock, including draught animals. Grasscutters are also included[12] • Unregistered business enterprises that are not for survival purposes and can be sold in the market • Fishing boats and large agricultural equipment (not already part of a business) • Agricultural land for investment purposes, where there is a market (and not family or community owned) • Place of residence, where there is a market (and it is not family or community owned)	• Chicken and other poultry • Unregistered business enterprises that are survival-based and low production, whose appliances can be sold in the market • Small agriculture equipment used for subsistence consumption • Consumer durables including assets used in unregistered business enterprises that are for survival purposes

[12] Grasscutters are a game animal similar to a squirrel and are an important source of protein in rural households and a delicacy in the urban areas Annor and Kusi (2008). Respondents of a recent study by Annor and Kusi (2008) in Brong Ahafo in Ghana indicate there's a secure market for grasscutters and other studies suggest grasscutter farming can be highly profitable. For the last decade the Government of Ghana promoted grasscutter farming, however, adoption rates are low in part due to the high start-up costs and learning curve.

Data and Wealth Statistics

The data used in this analysis is from a sex-disaggregated household survey implemented in Ghana from May to July 2010. The survey was designed and carried out as part of a multi-country gender and assets project, *The Gender Asset Gap Project*. The sampling frame is based on 144 enumeration areas from the national census. The number of enumeration areas selected within each of Ghana's ten regions was based on the region's share of the total population.[13] Within each enumeration area, 15 households were randomly selected to be surveyed. In most households two individuals of the opposite sex, who were well-informed about the household's assets, were interviewed. In all, 2,170 households were surveyed.[14] The final sample for this analysis is 1,006 males and 1,261 females from 1,645 of these households.

Tables 10a to 10d in the appendix summarize the average value of individual assets used in both the narrow and expanded definitions of wealth by sex. Women are more likely to hold risky assets in the form of informal businesses than men as a way to balance child care responsibilities with income earning activities. Men, on the other hand, are more likely to own risky assets in the form of formal registered businesses, commercial and residential real estate, larger agricultural equipment, and large livestock than women.

Tables 3 and 4 present the asset statistics based on the narrow definition of wealth, and Tables 5 and 6 present the asset statistics based on the expanded definition of wealth. The majority of assets are owned individually. The value of any assets owned jointly is the value of the full asset divided by the number of owners, except for some of the registered businesses in which the share of the business owned is reported.

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[13] There are fewer enumeration areas in the Upper East Region due to conflict in parts of the region.

[14] Of the 2,170 households surveyed, both spouses were interviewed in 956 households. For the other 1214 households, the second respondent may be a different family member (e.g. sibling, parent, parent-in-law) even if the first respondent is married and lives with his/her spouse.

Nearly 40 percent of women and 54 percent of men in the sample hold a positive value of assets based on the narrow definition of wealth. Of the 40 percent and 54 of women and men respectively women hold GH¢1878 and men hold GH¢4736 in total wealth on average based on the narrow definition of wealth (this is equivalent to approximately US$1312 and US$3310 in 2010). Eighty-eight percent of women and 95 percent of men in the sample hold a positive value of risky or secure assets based on the expanded definition of wealth. Using the expanded definition of wealth, the mean wealth of those who hold positive gross value of assets is GH¢2198 for women and GH¢6432 for men (this is equivalent to approximately US$1536 and US$4495 in 2010).[15]

Recall that alpha is measured as the ratio of the gross value of risky assets to the gross value of wealth. For the narrow definition of wealth, the mean alpha is 0.31 meaning that on average individuals hold about 31 percent of their gross liquid wealth in risky assets. Adding physical assets to the measure increases the ratio. For the expanded definition of wealth, the mean alpha of the average characteristics is 0.45 meaning that, on average, individuals hold about 45 percent of their gross wealth in risky assets. Although not entirely comparable given that the countries are very different, these values are not dissimilar to the average values found in Friend and Blume (1975), who estimated ratios of 0.271 for U.S. households with a net worth of 1,000 to 10,000 USD and 0.586 for those with a net worth of 10,000 to 100,000 USD (see Table 1 in Friend and Blume 1975), where net worth is based on savings and checking accounts, cash balances, savings bonds, life insurance, trust accounts, stocks, equity in businesses, investment in real estate (excluding the household's own home and mortgage on that home), and miscellaneous

[15] This is a low wealth sample. The GLSS5 suggests income is also low in Ghana. The mean annual household income in Ghana in 2005 was GH¢1,217 (GLSS5 2008). The mean annual household income in Ghana in 2005 for the bottom quintile was GH¢728 or GH¢116 per capita. For the top quintile, the mean annual household income was GH¢1,544 or GH¢397 per capita (GLSS5 2008).

assets such as patents. When the authors include additional assets, such as the estimated value for human capital and the market value of a family's home in the measure of risky assets, the ratios are much higher (see Table 3 in Friend and Blume 1975).

For those in Ghana who hold positive wealth based on the narrow definition, women have an average alpha of 0.23 and men have an average alpha of 0.38. A t-test of the male and female average alphas for the narrow definition of wealth suggests that we can reject the hypothesis that the means are equal at a 0.1 percent significance level. Men on average have a greater alpha than women for the narrow definition of wealth. If men and women in Ghana have constant relative risk aversion, meaning the proportion of risky assets to wealth is constant across wealth quintiles, this would suggest women are more risk averse than men on average. However, many empirical studies find evidence of decreasing relative risk aversion as wealth increases (see, for instance, Friend and Blume 1975; Riley and Chow 1993; Jianakoplos and Bernesek 1998; Ogaki and Zhang 2001). If we expect individuals in Ghana also to have decreasing relative risk aversion, it would mean that the proportion of risky assets to wealth would increase across wealth. Indeed, the mean alphas by wealth quintile for the narrow definition of wealth in Table 4 suggest individuals likely have decreasing relative risk aversion. As such, the difference in average wealth between men and women may fully explain the considerable difference in men and women's ratio of the gross value of risky assets to the gross value of wealth.

For the expanded definition of wealth, women have an average alpha of 0.38 and men have an average alpha of 0.53. We can reject that the means are equal the hypothesis at a 0.1 percent significance against the two-sided alternative. Table 6 presents the assets statistics by quintile based on the expanded definition of wealth. The pattern is similar to that of the narrow

definition of wealth. There is evidence of decreasing relative risk aversion, suggesting that the difference between the value of men and women's gross assets may explain the large difference in men and women's proportion of risky asset holdings to gross wealth (i.e. the difference in men and women's mean alphas).

Table 3. Asset Statistics based on the Narrow Definition of Wealth

	Women (n=1,261)	Men (n=1,006)	Total (n=2,267)
Proportion who hold positive gross value of assets (%)	39	54	46
Of those who hold positive gross value of assets:			
Mean value of risky assets of (GH¢)	1670.1	4455.0	3124.6
	(12334.3)	(18772.9)	(16076.0)
Mean wealth (GH¢)	1878.1	4736.2	3370.9
	(12816.7)	(18862.6)	(16312.3)
Mean alpha	0.23	0.38	0.31
	(0.40)	(0.46)	(0.44)

Note: Statistics are unweighted. Standard deviations are in parenthesis.

Table 4. Asset Statistics by Quintiles based on the Narrow Definition of Wealth

Quintile	1 and 2 (n = 1235)	3 (n = 145)	4 (n = 445)	5 (n = 472)
Percent female (%)	62	59	53	39
Mean value of risky assets	0	0.03	13.1	7282.3
(GH¢)	-	(0.33)	(44.2)	(23956.0)
Mean gross wealth (GH¢)	0	12.8	95.6	7769.9
	-	(6.1)	(65.0)	(24252.0)
Mean alpha	0	0.007	0.09	0.63
	-	(0.083)	(0.27)	(0.45)

Note: Statistics are unweighted. Standard deviations are in parenthesis. There are fewer observations in quintile three because more than half the observations hold zero gross wealth.

Table 5. Asset Statistics based on the Expanded Definition of Wealth

	Women (n=1,331)	Men (n=1,060)	Total (n=2,391)
Proportion who hold positive gross value of assets (%)	88	95	91
Of those who hold positive gross value of assets:			
Mean value of risky assets of (GH¢)	2119.7	5743.4	3801.8
	(11812.1)	(19615.7)	(16016.0)
Mean wealth (GH¢)	2502.3	6741.0	4469.9
	(12293.0)	(20846.8)	(16942.1)
Mean alpha	0.38	0.53	0.45
	(0.40)	(0.41)	(0.41)

Notes: Statistics are unweighted. Standard deviations are in parenthesis.

Table 6. Asset Statistics by Quintiles based on the Expanded Definition of Wealth

Quintile	1 (n = 455)	2 (n = 461)	3 (n = 447)	4 (n = 451)	5 (n = 453)
Percent female (%)	73	67	59	45	33
Mean value of risky assets	2.1	32.6	150.8	871.8	16303.9
(GH¢)	(7.8)	(52.0)	(173.0)	(675.3)	(31168.7)
Mean gross wealth (GH¢)	16.9	127.2	414.7	1389.2	18467.1
	(18.7)	(50.3)	(131.4)	(523.5)	(32555.0)
Mean alpha	0.11	0.27	0.35	0.59	0.82
	(0.28)	(0.35)	(0.36)	(0.36)	(0.26)

Notes: Statistics are unweighted. Standard deviations are in parenthesis.

Empirical Model

Equation (7) provides the theoretical basis for testing whether women are more risk averse than men in Ghana. Because Pratt's (1964) measure of relative risk aversion for the *k*th individual, $C_k(W)$, is a function of wealth, we can estimate changes in relative risk aversion to changes in wealth by regressing the proportion of assets, $\alpha_{k.}^{*}$, on wealth. Thus, to test whether women are more risk averse than men I use the following equation:

$$\widehat{\alpha_k} = \beta_0 + \beta_1 \ln(wealth_k) + \beta_2 female_k + \beta_3 female_k * \ln(wealth_k) + local\ market_{kn}\boldsymbol{\varphi_m} + individual\ variables_{km}\boldsymbol{\psi_n} + household\ variables_{kq}\boldsymbol{\gamma_q} + \boldsymbol{\epsilon} \quad (8)$$

where $\widehat{\alpha_k}$ is the proportion of risky assets to total wealth held by the individual, $\beta_0, \beta_1, \beta_2,$ and β_3 are parameters to be estimated as are the vector of *n* coefficients of variables that capture risk sharing and similar expectations about the market (so that the market price of risk holds), $\boldsymbol{\varphi_m}$, the vector of *m* coefficients of individual variables, $\boldsymbol{\psi_n}$, and the vector of *q* coefficients of household variables, $\boldsymbol{\gamma_q}$, and $\boldsymbol{\epsilon}$ is the error term. To the extent possible, the individual variables as well as some of the variables that capture risk sharing and similar expectations about the market capture differing gender roles in the household and established cultural norms and practices which affect men and women differently.

The $\ln(wealth_k)$ variable is defined as the natural log of gross wealth owned by the individual using the narrow and expanded definitions of wealth above. It is the natural log of the sum of the value of risky productive assets and risk-free savings. Based on the descriptive statistics of the wealth variables, and the fact that theoretically at subsistence level (or zero

wealth) relative risk aversion is infinite and decreases as wealth increases, I expect to find that individuals in Ghana have decreasing relative risk aversion, such that $\beta_1 > 0$.

$Female_k$ is a dummy variable where female = 1 and male = 0 and $Female_k *$ ln($wealth_k$) is the interaction of the dummy variable and wealth. If $\beta_2 \neq 0$ or $\beta_3 \neq 0$, we reject that men and women do not systematically have statistical significant differences in their level of risk aversion. If $\beta_2 < 0$, it indicates women generally hold a smaller proportion in value of risky productive assets to their gross worth than men across the wealth distribution. If $\beta_3 < 0$, it means there is a greater difference between men and women's alpha ratios at higher levels of gross wealth than lower levels of wealth. Both suggest women have greater relative risk aversion than men on average (and thus greater absolute risk aversion), ceteris paribus.

Tables 7a and 7b present the descriptive statistics for the variables that capture risk sharing and similar expectations about the market, $\boldsymbol{\varphi_m}$, the individual level variables, $\boldsymbol{\psi_n}$, and other household variables, $\boldsymbol{\gamma_q}$.

The risk sharing literature often examines risk sharing within villages. Although kinship and networks among family may provide a better basis for full risk sharing it is often difficult to capture kinship and networks in the data. Villages likely contain kinship networks and usually have their own local contract enforcement systems and, as such, Townsend (1994) argues villages are a suitable proxy for risk sharing networks. Unfortunately, I am not able to control at the village or district levels. To attempt to capture risk sharing networks (or lack of) and the extent to which there are similar expectations about the market, $\boldsymbol{\varphi}$, I control for the ethnic group, religion, and region. I also control for whether an individual is a member of a social group or organization. Following Oduro, Baah-Boateng, and Boakye-Yiadom (forthcoming), I classify Ghana's ethnic groups into seven categories: Ewe, Ga Dangbe, Gurma, Grusi/Mande, Dagbon,

Akan, and other ethnic groups. The primary religions in Ghana are Christianity (Protestant and Catholic), Islam, and traditional ethnic religions. There are ten regions in Ghana: Western, Central, Greater Accra, Volta, Eastern, Ashanti, Brong Ahafo, Northern, Upper East, and Upper West. Since norms vary by ethnicity and religion in Ghana, these variables also partially control for gender norms. In addition, I control for whether the individual has a cell phone as those with access to phones are more likely to share information about the market with others, and thus have similar expectations, than those without.

I also control for whether the individual is part of a household that reduced consumption due to an idiosyncratic shock between 2005 and 2010 as this suggests these individuals are not likely part of a full risk sharing arrangement.[16] Very few households in the survey reduced food or non-food consumption in order to cope with an individual level household shock. Most households received assistance from family, community members, and organizations or used their savings or sold or pawned physical assets such as livestock, harvest, and cloth.

The individual level variables, $\boldsymbol{\psi}$, include the individual's age, marital status, whether the individual has children under five or ages 6-11, the individual's weekly average hourly contribution to unpaid household chores, and whether the individual is most senior (in terms of age) in the household. Together these variables partially capture gender roles within the household in that they reflect presence of caregiving and marital responsibilities as well as an individual's position in the household. The majority of individuals are in a monogamous union. About seven percent of individuals are in a polygamous union and 31 percent of individuals are not in a union. There is a significant difference in men and women's average time contributions to unpaid household chores. About 60 percent of women compared to only about 12 percent of

[16] Individual level shocks include major illness of a household member; death of a household member; abandonment, separation, or divorce; loss of a job by a household member; a decrease in remittances; destruction of property; theft; and a major accident.

men spend 20 hours or more a week on unpaid household chores. The majority of men (about 64 percent) spend 10 hours or less a week on unpaid household chores, compared to only about 18 percent of women.

Because expectations around inheritance may affect how an individual allocates his or her assets, I include a dummy variable that captures whether an individual expects future inheritance. Agriculture is an important livelihood in Ghana and thus I include whether the individual holds agricultural land that cannot be sold on the market—specifically family and community land—and control for whether an individual's occupation is agriculture, animal husbandry, forestry work, fishing, or hunting. In addition, because I use gross wealth rather than net wealth, I control for whether an individual has debt. Fifteen percent of women and a little more than thirty percent of men in the sample have business, real estate, or some other type of debt; this includes loans held jointly. Ideally, I would control for whether an individual has access to credit as this would affect portfolio decisions. However, there is not a variable that measures access to credit in the data.

Investment in human capital is a non-marketable (i.e. cannot be directly traded) asset and is controlled for or included in the value of risky assets in other studies (see for example Friend and Blume 1975). In this analysis, I also control for education. The majority of the sample has either no education or only attended primary school. Nearly 30 percent of women and 40 percent of men have attended at least some junior secondary school but did not continue to senior secondary school. About seven percent of women and nearly 13 percent of men attended at least some senior secondary school or vocational or technical training. Only three percent of women and seven percent of men attended post senior secondary school such as professional training or the university.

In addition to region and whether the individual is part of a household that reduced consumption due to a household level idiosyncratic shock, I include whether the household is in a rural or urban setting as a household variable, $\boldsymbol{\gamma_q}$, as this helps determine the type of assets an individual will possess. I also control for the size of the household. The descriptive statistics are in Tables 7a and 7b below.

Table 7a. Descriptive Statistics

	Women (n=1,261)	Men (n=1,006)	Total (n=2,267)
Mean age	45.1	46.3	45.6
	(16.7)	(17.0)	(16.9)
Marital Status (%)			
In a monogamous union	45.6	56.9	50.6
In a polygamous union	6.7	8.0	7.2
In a consensual union	10.4	10.5	10.5
Never married	6.6	13.3	9.7
Divorced, widowed, or deserted	30.7	11.2	22.1
Oldest in the household (%)	47.7	90.5	65.9
Religion (%)			
Protestant	62.0	52.9	58.1
Catholic	15.0	15.6	15.1
Muslim	16.2	19.4	18.0
Traditional	4.7	6.3	5.3
Other religion	1.9	5.9	3.6
Ethnic group (%)			
Akan	47.7	42.7	45.5
Ga Dangbe	9.3	7.6	8.5
Ewe	11.8	13.6	12.6
Gurma	7.5	9.0	8.2
Dagbon (Mole Dagbani)	13.8	16.3	14.9
Grusi/Mande	4.2	4.8	4.5
Guan and other ethnic groups	5.6	6.0	5.8
Lives in a rural setting (%)	63.3	66.0	64.4

Notes: Statistics are unweighted. Standard deviations are in parenthesis.

Table 7b. Descriptive Statistics

	Women (n=1,261)	Men (n=1,006)	Total (n=2,267)
Employment (%)			
Occupation is agriculture, animal husbandry, forestry work, fishing, or hunting	42.7	54.5	47.9
Children (%)			
Has child(ren) age(s) five years and under	36.2	34.8	35.6
Has child(ren) age(s) six to 11	35.0	33.8	34.4
Contribution to unpaid household chores (%)			
Does not participate in household chores	5.4	32.8	17.6
Spends up to 10 hours a week	12.3	31.2	20.7
Spends 10 to 20 hours a week	22.4	24.4	23.2
Spends 20 to 30 hours a week	36.2	9.1	24.2
Spends more than 30 hours a week	23.7	2.5	14.3
Education (%)			
No education or attended some primary school only	60.2	40.2	51.9
Attended some junior secondary school or equivalent	29.6	39.8	34.1
Attended at least some senior secondary school or vocational or technical training	6.5	13.0	9.4
Attended at least some university, professional training, or other post senior secondary education	2.7	7.0	4.6
Owns dwelling (%)	7.6	21.7	13.9
Owns agricultural land that can be sold (%)	5.2	11.7	8.1
Holds agricultural family land (%)	2.9	8.5	5.4
Holds agricultural community land (%)	0.6	2.5	1.5
Expects an inheritance (%)	8.4	8.5	8.5
Individual is a member of at least one social group or organization (%)	62.2	57.7	60.3
Individual owns a mobile phone (%)	38.5	59.5	47.8
Household reduced consumption due to a idiosyncratic shock anytime between 2005-2010 (%)	2.9	1.7	2.4
Individual has debt (business, real estate or other) (%)	15.0	30.3	21.8
Mean household size	4.1	4.0	4.0
	(2.6)	(2.8)	(2.7)

Notes: Statistics are unweighted. Standard deviations are in parenthesis.

Empirical Results

Equation (7) is estimated for both the narrow and expanded definitions of wealth. Table 8 presents the results of the coefficients of interest (see appendix for the full models).

There are a number of individuals who do not hold any wealth based on both the narrow and expanded definitions. The proportion an individual allocates to risky assets is observed only when an individual holds net wealth (α_k is undefined for an individual without wealth). This means the dependent variable, the proportion of risky assets to net wealth, α_k, is incidentally truncated and may result in a specification error if not addressed. Studies such as Jianakoplos and Bernesek (1998) usually do not include households below a certain wealth threshold and, thus, do not need to address truncation. I do not choose a threshold.[17] However, to address truncation, I use a two-step Heckman selection model. The first stage of the Heckman selection model estimates the likelihood an individual has positive gross wealth using a probit model. The second stage estimates the amount of gross wealth an individual decides to allocate to risky assets while incorporating information from the first stage, a generated regressor (the inverse Mill's ratio), and adjusting the standard errors. I am not able to find nontrivial variables that would explain whether or not an individual has positive wealth and does not impact allocation of wealth. As a result, exclusion variables (additional variables in the selection equation that are not in the outcome equation) are not included in my Heckman models. Instead, I assume the nonlinearity of the selection equation creates enough exclusion restrictions.

The estimated coefficients of wealth, β_1, are positive and statistically significant, suggesting that for both models, as wealth increases, alpha or the inverse of Pratt's measure of relative risk aversion increases. This means that individuals exhibit decreasing relative risk

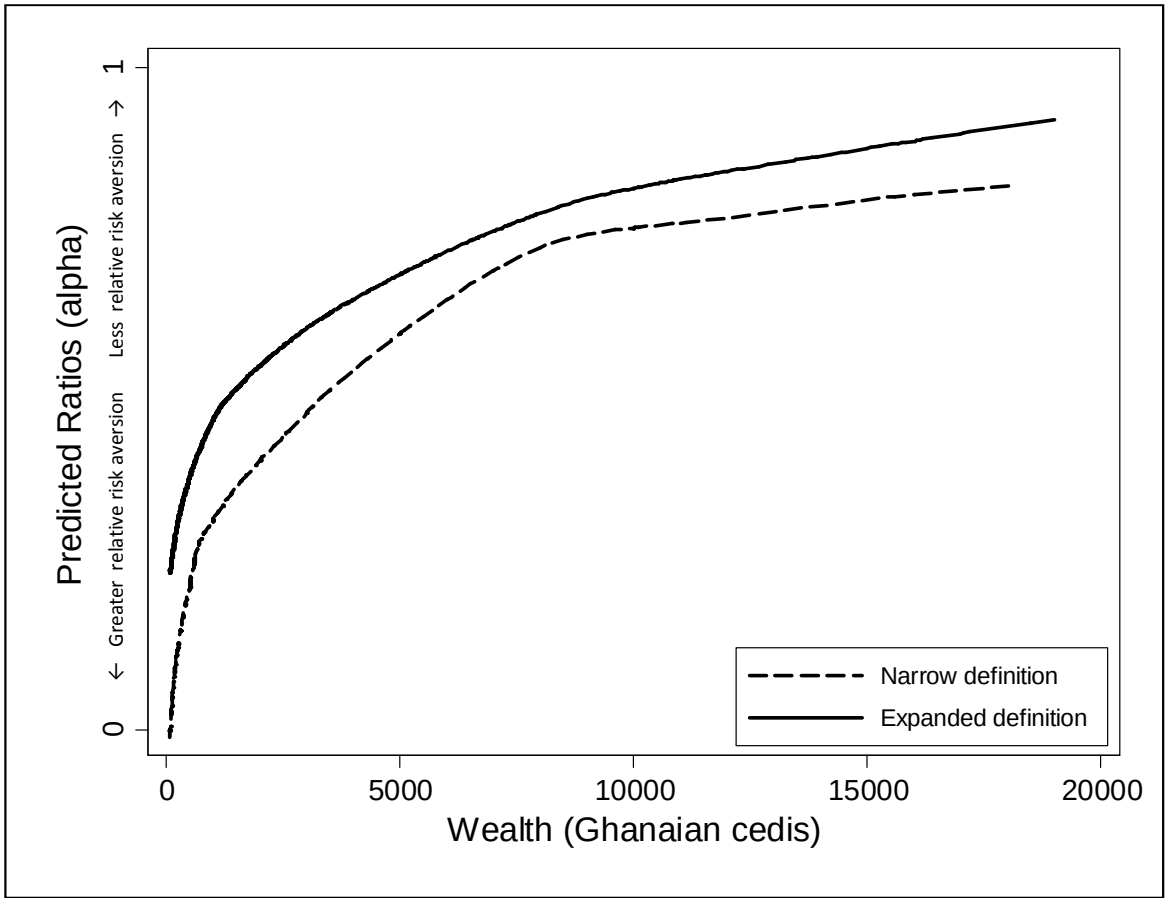
[17] Studies in the United States, such as Jianakoplos and Bernesek (1998), often only include households with wealth greater than US$1000 in their analyses.

aversion, ceteris paribus. These empirical results are consistent with previous studies (e.g. Friend and Blume 1975; Riley and Chow 1993; Jianakoplos and Bernesek 1998). Figure 1 presents the mean predicted ratios across wealth for both the narrow and expanded definitions of wealth.

Table 8. Important Coefficients of the Risk Preference Models for the Narrow and Expanded Definitions of Wealth (Based on the Outcome Equations of Two-step Heckman Selection Models)

Dependent variable: alpha	Model based on the narrow definition of wealth (1)	Model based on the expanded definition of wealth (2)
Natural log of the narrow definition of wealth	0.146006**	
	(0.005683)	
Natural log of expanded definition of wealth		0.141025**
		(0.005023)
Female dummy variable	0.005267	0.011808
	(0.063124)	(0.047687)
Interaction between natural log of Arrow-Pratt wealth and female dummy	-0.006643	
	(0.008657)	
Interaction between natural log of expanded definition of wealth and female dummy		-0.001200
		(0.006893)
Constant	-1.038763**	-0.599542**
	(0.407249)	(0.088464)
Observations	2267	2267
Censored observations	1235	199
Chi-squared	1380.69	1976.39

Notes: Standard errors are in parentheses. * p<.10, ** p<.05. The standard errors of the coefficients in both models are corrected for heterogeneity between individuals of the same household. The full models are in the appendix.



Notes: Predicted values are based on average characteristics.

Figure 1. Predicted Ratios (alpha) Across Wealth

Controlling for men and women's differing characteristics, men and women do not have statistically different levels of relative risk aversion for both definitions of wealth. For the narrow definition of wealth, β_2 and β_3 are not individually statistically significant and a Wald-test suggests there is not joint statistical significance for the coefficients (chi-squared = 1.24). Likewise, β_2 and β_3 are not individually statistically significant for the expanded definition of wealth, and a Wald-test suggests there is not joint statistical significance for the coefficients (chi-squared = 0.08). Both suggest that women's average ratio of risky assets to gross wealth, α_k, is not statistically significantly different than men's when different characteristics are controlled.

The results suggest that women are not more relatively risk averse than men; rather it is men and women's different characteristics that contribute to the considerable difference in average ratios of risky assets to gross wealth, α_k, in Ghana. Since there is evidence of decreasing relative risk aversion, is the difference in men and women's average proportion of risky assets to gross wealth, α_k, due primarily to the difference in average wealth or do other differences in characteristics play a role? For instance, individuals who hold agricultural family or community land and whose occupation is agriculture, animal husbandry, forestry work, fishing, or hunting, hold a greater proportion of risky asset to gross wealth in the narrow definition of wealth. Men are more likely to hold agricultural family or community land and to work in is agriculture, animal husbandry, forestry work, fishing, or hunting than women and, thus, I expect that these gaps contribute to difference in men and women's mean proportion of risky assets to gross wealth in the narrow definition of the model. On the other hand, higher levels of human capital, such as vocational training and university degrees, is a substitute for other risky assets. As such, I expect women's lower levels of education than men's to decrease the difference in men and women's average proportion of risky assets to gross wealth, α_k. To test this, I use a Oaxaca-Blinder decomposition technique. This technique is typically used in the labor market literature, but it can be used to study differences in any outcome variable.

Equation (8) is estimated separately for men and women, and as a pooled equation that includes a dummy variable for sex using a two-step Heckman selection model for each equation.[18] The difference in men and women's average ratios of risky assets to gross wealth, $E(\alpha_k^m|\boldsymbol{x_k^m}) - E(\alpha_k^f|\boldsymbol{x_k^f})$, is divided into explained and unexplained components. The explained component is the sum of the product of the estimated coefficients for the pooled equation except

[18] I use a pooled regression with group indicator so that unexplained factors due to sex are not transferred to the coefficients in the explained components (see Jann (2008)).

for the coefficient for the dummy sex variable and difference of men and women's expected values. The unexplained component includes the coefficient on the sex dummy variable (an indicator of group membership) from the pooled equation. This is added to (1) the product of the expected values of men and the difference between the male coefficients the pooled coefficients, and (2) the product of the expected values of women and the difference between the female coefficients from the pooled coefficients:

$$E(\alpha_k^m|\boldsymbol{x_k^m}) - E(\alpha_k^f|\boldsymbol{x_k^f}) = \underbrace{\{(\bar{\boldsymbol{x}}^m - \bar{\boldsymbol{x}}^f)'\boldsymbol{\beta}^{pooled} - \beta_{sex}^{pooled}\}}_{\text{Explained component}} + \underbrace{\{\beta_{sex}^{pooled} + \bar{\boldsymbol{x}}^{m\prime}(\boldsymbol{\beta}^m - \boldsymbol{\beta}^{pooled}) + \bar{\boldsymbol{x}}^{f\prime}(\boldsymbol{\beta}^{pooled} - \boldsymbol{\beta}^f)\}}_{\text{Unexplained component}} \quad (9)$$

where β^{pooled}, β^{m}, and $\beta^{\text{f}}$are vectors containing the intercepts and slope parameters (φ_{m}, ψ_{n}, and γ_{q}) for the pooled equation, the estimated equation consisting of only men, and the estimated equation consisting of only women.

Table 9 presents the results (see appendix for estimations for the individual contributions to the explained component of the decomposition of all predictors). For the narrow definition, the explained part of the outcome differential is significant and accounts for nearly the total difference between men and women's mean proportion of risky assets to gross wealth. The unexplained part, which is the effects of the unobserved predictors, is not significant. The results for the expanded definition of wealth mirror the narrow definition.

Although minimal, nevertheless the gap between men and women holding agricultural family or community land and whose occupation is agriculture, animal husbandry, forestry work, fishing, or hunting, contributes to the difference in men and women's mean proportion of risky

assets to gross wealth in the narrow definition of the model but not the expanded definition of the model. The results from the two models suggest that women who hold agricultural family or community land and whose occupation is agriculture, animal husbandry, forestry work, fishing, or hunting are more likely than men to hold risky assets in the form of informal businesses, large livestock, or agricultural equipment rather than in the form of registered businesses, real estate, and stocks.

The education variables are statistically significant and negative, as hypothesized, in the expanded definition of wealth model but not in the narrow definition of wealth model. The results suggests that individuals with greater levels of education are less likely to make investments in informal businesses, agricultural and fishing activities, and livestock than those with less education; as such, women's lower levels of education compared to men contributes to a reduction in the difference in men and women's mean proportion of risky assets to gross wealth in the expanded definition of the model. Similarly, owning a home (that can be sold and for which there is a market), which is a control variable in the narrow definition of wealth, is a substitute for holding other financial assets (formal businesses, real estate, and stocks) in the narrow definition of wealth. Men's greater likelihood of owning a home than women contributes to a reduction in the difference in men and women's mean proportion of risky assets to gross wealth in the expanded definition of the model.

Table 9. Oaxaca-Blinder Decomposition of Men and Women's Proportion of Risky Assets to Gross Wealth (alpha) for the Narrow and Expanded Definitions of Wealth with Estimations of the Individual Contributions of the Explained Component of the Decomposition for Some Predictors

	Model based on the narrow definition of wealth (1)	Model based on the Expanded definition of wealth (2)
Differential		
Male	0.376371	0.528338
	(0.019923)	(0.013121)
Female	0.229673	0.382619
	(0.018190)	(0.012120)
Difference	0.146698**	0.145719**
	(0.026978)	(0.017861)
Decomposition		
Explained	0.139363**	0.151920**
	(0.028520)	(0.019414)
Unexplained	-0.099059	-0.030156
	(0.352607)	(0.036469)
Individual contributions to the explained component of the decomposition of some of the variables		
Natural log of the narrow definition of wealth	0.120729**	
	(0.019545)	
Natural log of expanded definition of wealth		0.154964**
		(0.012604)
Education (base: no education or some		
Attended at least some senior secondary	-0.000887	-0.003106**
school or vocational or technical training	(0.001222)	(0.001558)
Attended at least some university,	-0.002336	-0.006674**
professional training, or other post senior	(0.002553)	(0.002164)
Holds agricultural family or community land	-0.003946	-0.011835**
	(0.002974)	(0.003093)
Occupation is agriculture, animal husbandry,	0.011475**	0.002745
forestry work, fishing, or hunting	(0.004587)	(0.002433)
Individual owns the place of residence (there	-0.008808**	
is a market and individual and has the right to	(0.003998)	

Notes: Robust standard errors are in parentheses. * p<.10, ** p<.05. The estimates are based on using a pooled Oaxaca-Blinder approach (see Jann 2008). The estimates are found using two-step Heckman models for all three equations. The estimations for the individual contributions to the explained component of the decomposition of all predictors are in the appendix.

The greatest contribution to the difference in men and women's average proportion of risky assets to gross wealth in both models, however, is the difference in wealth. I find that a difference in wealth contributes to nearly all of the explained part of the outcome differential.

Specifically, if women held the same average wealth as men, women's mean proportion of risky assets to gross wealth would be 0.35 (with standard deviation of 0.14) for the narrow definition of wealth and 0.53 (with a standard deviation of 0.15) for the expanded definition of wealth, compared to 0.38 (0.02) and 0.53 (0.013) respectively for men. Because men and women exhibit decreasing relative risk aversion in Ghana, women's lower average wealth than men means women will invest less in risky assets proportional to their overall wealth than men and, consequently, will accumulate additional assets more slowly than men. All else equal, this difference contributes to widening the already substantial gender wealth gap in Ghana over time.

Conclusion

This paper is one of the first studies to investigate whether women are more risk averse than men as reflected in allocation decisions over assets within households in a developing country context. The analysis uses unique sex-disaggregated data with information on individual ownership of assets from Ghana collected in 2010. Women hold significantly fewer risky assets than men in absolute terms and as a proportion of their wealth. However, I find that men and women in Ghana have decreasing relative risk aversion in terms of asset allocation and that nearly the entire difference between men and women's proportion of risky assets is due to the substantial wealth gap between men and women and not to differences in risk aversion.

The results in this paper differ from the results in many empirical studies in the United States and other OECD countries, where women are found to be more risk averse than men. The results from this study provide support for the idea that gender differences in risk preferences vary by country and the cultural context as the experimental literature suggests. In Ghana, women and men may have similar risk preferences, but in other countries and communities, this may not be the case.

This analysis is specific to Ghana in 2010. As data permits, future research could explore gender differences in risk aversion in terms of asset allocation over time in Ghana, as well as in other developing countries. Sex-disaggregated panel data on asset ownership would also help address potential endogeniety issues in these types of analyses. Further, this analysis simply divides assets into two categories: risky and non-risky. Since men and women tend to hold different types of risky assets in Ghana, as data permits, an extension could be to look more closely at the different types of assets men and women hold and estimate the expected rate of return over a period of time of men and women's asset portfolios.

Appendix

Table 10a. Descriptive Statistics of Individual Assets by Sex in Ghana

	Women (n=1,261)	Men (n=1,006)	Total (n=2,267)
Financial savings (cash and savings) (GH¢)	71.02	149.47	105.83
	(289.98)	(521.55)	(410.99)
Treasury bills (GH¢)	10.31	1.19	6.26
	(223.37)	(32.15)	(167.99)
Stocks (GH¢)	2.51	1.25	1.95
	(84.55)	(32.18)	(66.59)
Registered businesses (gross value) (GH¢)	147.53	317.81	223.09
	(2373.21)	(3612.84)	(2987.96)
Real estate (gross value) (GH¢)	502.89	2067.87	1197.36
	(7327.96)	(12943.48)	(10235.59)
Agricultural land (gross value) (GH¢)	501.99	857.02	659.54
	(5692.61)	(6586.17)	(6106.46)
Primary residence (gross value) (GH¢)	485.43	1550.00	957.84
	(4361.05)	(9961.78)	(7407.30)

Notes: Standard errors in parentheses. Savings accounts consist of bank accounts, cooperative or NGO savings institution, savings and loans, other savings programs, and other financial institutions. If the value in account is left blank but the account is listed, it is assumed the account balance is GH 0 and not missing. Stocks consist of stocks and shares as well as teacher's mutual funds. Registered businesses, real estate, agricultural land, and primary residence only includes holdings the individual has the right to sell and where there is a market.

Table 10b. Descriptive Statistics of Individual Assets by Sex in Ghana (continued)

	Women (n=1,261)	Men (n=1,006)	Total (n=2,267)
Nonregistered businesses (gross value) (GH¢)	189.36 (1420.46)	336.11 (1966.09)	254.48 (1685.72)
Assets of survival businesses not included in household inventory (GH¢)	7.35 (101.32)	0.01 (0.19)	4.09 (75.64)
Jewelry (GH¢)	28.88 (152.50)	2.80 (20.58)	17.30 (115.27)
Cloth (GH¢)	78.02 (185.79)	20.26 (119.25)	52.39 (162.25)
Other durables (GH¢)	125.62 (550.08)	692.07 (4367.66)	376.99 (2950.95)

Notes: Standard errors in parentheses. Non-survival businesses only include those with highest level of ownership (right to sell with or without consultation or permission with others) and there is a market to sell the business. Survival businesses are non-registered businesses those equipment is reported as part of household's assets (not the businesses), or a spouse (husband) financed the business and the individual did not take out a loan since starting the business.

Table 10c. Descriptive Statistics of Individual Assets by Sex in Ghana (continued)

	Women (n=1,261)	Men (n=1,006)	Total (n=2,267)
Tractor (GH¢)	-	40.76 (774.81)	17.30 (115.27)
Mills (GH¢)	-	14.71 (278.88)	6.53 (185.87)
Plough (GH¢)	0. 01 (0.49)	2.50 (41.30)	1.12 (27.53)
Canoe (GH¢)	-	11.93 (258.92)	5.29 (172.54)
Fishing Boat (GH¢)	-	1.19 (37.83)	0.53 (25.20)
Other agricultural equipment (small tools) (GH¢)	2.09 (28.26)	50.36 (855.75)	23.51 (570.79)

Notes: Standard errors in parentheses.

Table 10d. Descriptive Statistics of Individual Assets by Sex in Ghana

	Women (n=1,261)	Men (n=1,006)	Total (n=2,267)
Large stock (GH¢)	32.76	279.58	142.29
	(121.71)	(1010.46)	(690.02)
Small stock (GH¢)	12.88	35.82	23.06
	(51.69)	(223.63)	(154.26)

Notes: Standard errors in parentheses. Large stock includes bullock, donkeys, cattle, sheep, goats, pigs and grass cutters. Small stock includes chicken, guinea fowl, ducks, and rabbits. It only includes livestock that the individual has the right to sell with or without consultation or permission with others.

Table 11. Risk Preference Models for the Narrow and Expanded Definitions of Wealth (Two-step Heckman Selection Models)

Outcome model predictions Dependent variable: alpha	Model based on the narrow definition of wealth (1)	Model based on the expanded definition of wealth (2)
Natural log of the narrow definition of wealth	0.146006** (0.005683)	
Natural log of expanded definition of wealth		0.141025** (0.005023)
Female dummy variable	0.005267 (0.063124)	0.011808 (0.047687)
Interaction between natural log of Arrow-Pratt wealth and female dummy	-0.006643 (0.008657)	
Interaction between natural log of expanded definition of wealth and female dummy		-0.001200 (0.006893)
Married	-0.009193 (0.027364)	-0.011812 (0.019792)
Age	0.006183 (0.006437)	0.004311* (0.002611)
Age squared	-0.000048 (0.000065)	-0.000033 (0.000024)
Individual has child(ren) age(s) five years and under	0.037622 (0.028537)	-0.024695 (0.019112)
Individual has child(ren) age(s) six to 11	-0.016294 (0.026309)	0.022409 (0.017679)
Contribution to unpaid household chores		
Spends up to 10 hours a week	-0.013126 (0.036105)	-0.029331 (0.022075)
Spends 10 to 20 hours a week	-0.004062 (0.033666)	-0.025015 (0.022255)
Spends 20 to 30 hours a week	-0.038304 (0.038021)	-0.036406 (0.024492)
Spends more than 30 hours a week	-0.062189 (0.042360)	-0.038357 (0.028266)
Religion (base: Christian)		
Muslim	-0.026725 (0.043579)	-0.018413 (0.025819)
Traditional and other religions	0.004776 (0.038465)	0.015432 (0.026533)

Education (base: no education or some primary school)		
Attended some junior secondary school or equivalent	0.008495 (0.044587)	-0.039015** (0.016885)
Attended at least some senior secondary school or vocational or technical training	0.009106 (0.056753)	-0.112465** (0.026879)
Attended at least some university, professional training, or other post senior secondary education	0.011184 (0.095197)	-0.281185** (0.033590)
Individual has debt (business, real estate or other)	0.178585** (0.048469)	0.108090** (0.024814)
Household reduced consumption due to a idiosyncratic shock anytime between 2005-2010	0.087961 (0.065637)	-0.025788 (0.046857)
Owns a mobile phone	0.026245 (0.081558)	-0.084095** (0.021251)
Individual is a member of at least one social group or organization	0.054707 (0.048621)	-0.018042 (0.014938)
Ethnic group (base: Akan)		
Ewe	-0.029341 (0.041702)	-0.009793 (0.027459)
Ga	-0.119580** (0.037965)	-0.019023 (0.028235)
Gurma	0.071939 (0.062897)	0.054232 (0.035564)
Grusi or Mande	0.047377 (0.061600)	-0.007243 (0.039035)
Mole Dagbani	0.104573* (0.059882)	0.034292 (0.033312)
Other ethnic group	-0.017916 (0.048792)	0.050808 (0.032904)
Holds agricultural family or community land	0.081131* (0.047878)	0.001138 (0.027961)
Occupation is agriculture, animal husbandry, forestry work, fishing, or hunting	0.049573 (0.040584)	0.020550 (0.017057)
Individual expects an inheritance	-0.035124 (0.036473)	-0.040072* (0.023940)
Oldest in household	0.025915 (0.032117)	0.020308 (0.021861)
Number of household members	0.001031 (0.005676)	0.002747 (0.003729)

Regions (base: Western)		
Central	0.285484**	0.105715**
	(0.048837)	(0.030272)
Greater Accra	0.166777**	0.014065
	(0.061808)	(0.034238)
Volta	0.083367	0.104136**
	(0.060229)	(0.034678)
Eastern	0.201363**	0.043297
	(0.054101)	(0.029058)
Ashanti	0.157858**	0.043371
	(0.040995)	(0.027400)
Brong Ahafo	0.222932**	0.059768**
	(0.052376)	(0.028283)
Northern	0.131817*	0.107808**
	(0.074499)	(0.038025)
Upper East	0.057459	0.114751**
	(0.067584)	(0.043995)
Upper West	-0.089788	0.132854**
	(0.088571)	(0.045745)
Lives in a rural setting	0.016789	0.080638**
	(0.026395)	(0.018352)
Individual owns agricultural land (there is a market and individual and has the right to sell)	0.017466	
	(0.039993)	
Individual owns the place of residence (there is a market and individual and has the right to sell)	-0.057442*	
	(0.030945)	
Constant	-1.038763**	-0.599542**
	(0.407249)	(0.088464)
Selection equation (probability individual holds wealth)	Model based on narrow definition of wealth	Model based on expanded definition of wealth
Female dummy variable	-0.216763**	-0.185057
	(0.082815)	(0.124524)
Married	0.059519	0.514057**
	(0.076489)	(0.119229)
Age	0.037259**	0.050875**
	(0.010519)	(0.013527)
Age squared	-0.000378**	-0.000402**
	(0.000101)	(0.000128)
Individual has child(ren) age(s) five years and under	0.070134	0.190362
	(0.082533)	(0.131096)
Individual has child(ren) age(s) six to 11	0.031569	0.183365
	(0.076662)	(0.118528)

Contribution to unpaid household chores		
Spends up to 10 hours a week	-0.119607	-0.281192
	(0.097751)	(0.173424)
Spends 10 to 20 hours a week	-0.054559	0.004735
	(0.098961)	(0.181037)
Spends 20 to 30 hours a week	-0.072877	-0.202425
	(0.107219)	(0.177722)
Spends more than 30 hours a week	-0.047913	-0.287156
	(0.121347)	(0.189438)
Religion (base: Christian)		
Muslim	-0.137469	-0.296459*
	(0.110314)	(0.154201)
Traditional and other religions	0.003938	-0.434131**
	(0.109897)	(0.148755)
Education (base: no education or some primary school)		
Attended some junior secondary school or equivalent	0.248127**	0.204599*
	(0.072459)	(0.119663)
Attended at least some senior secondary school or vocational or technical training	0.304031**	0.025611
	(0.116843)	(0.195445)
Attended at least some university, professional training, or other post senior secondary education	0.705876**	0.317587
	(0.159301)	(0.351641)
Individual has debt (business, real estate or other)	0.267365**	0.206543
	(0.111366)	(0.210570)
Household reduced consumption due to a idiosyncratic shock anytime between 2005-2010	-0.009306	-0.397213
	(0.193397)	(0.242485)
Owns a mobile phone	0.532832**	0.876171**
	(0.066655)	(0.120630)
Individual is a member of at least one social group or organization	0.311987**	0.111309
	(0.063605)	(0.095049)
Ethnic group (base: Akan)		
Ewe	-0.094536	0.052806
	(0.122785)	(0.212104)
Ga	0.045637	-0.162301
	(0.123557)	(0.205251)
Gurma	0.245236	-0.111666
	(0.153450)	(0.212342)
Grusi or Mande	0.150043	0.091134
	(0.172773)	(0.247984)
Mole Dagbani	0.261808*	-0.157506
	(0.145191)	(0.206115)
Other ethnic group	0.006005	-0.264525
	(0.143409)	(0.212897)
Holds agricultural family or community land	-0.132825	0.315345
	(0.124625)	(0.214139)

Occupation is agriculture, animal husbandry, forestry work, fishing, or hunting	-0.223470**	0.009511
	(0.074671)	(0.110944)
Individual expects an inheritance	0.135161	0.212528
	(0.104521)	(0.177133)
Oldest in household	0.102404	0.538432**
	(0.083712)	(0.124357)
Number of household members	0.002616	-0.018581
	(0.015978)	(0.023004)
Regions (base: Western)		
Central	-0.106159	-0.358821*
	(0.126904)	(0.189002)
Greater Accra	0.313228**	-0.286102
	(0.151381)	(0.251607)
Volta	-0.201734	-0.083863
	(0.152856)	(0.249427)
Eastern	0.238066*	0.202706
	(0.126759)	(0.227089)
Ashanti	0.022181	-0.250421
	(0.117960)	(0.187953)
Brong Ahafo	0.224689*	-0.109408
	(0.123718)	(0.198098)
Northern	-0.321351*	0.033950
	(0.168721)	(0.243746)
Upper East	-0.150375	-0.567532**
	(0.185881)	(0.263241)
Upper West	-0.317043	-0.210938
	(0.202423)	(0.278435)
Lives in a rural setting	0.012497	0.024712
	(0.079585)	(0.123717)
Individual owns agricultural land (there is a market and individual and has the right to sell)	0.127741	
	(0.110551)	
Individual owns the place of residence (there is a market and individual and has the right to sell)	0.032750	
	(0.088779)	
Constant	-1.464767**	-0.502936
	(0.271417)	(0.371180)
Lambda	0.203353	0.022066
	(0.231926)	(0.093435)
Observations	2267	2267
Censored observations	1235	199
Chi-squared	1380.69	1976.39

Notes: Standard errors are in parentheses. * p<.10, ** p<.05.

Table 12. Oaxaca-Blinder Decomposition of Men and Women's Proportion of Risky Assets to gross wealth (alpha) for the Narrow and Expanded Definitions of Wealth with Estimations of the Individual Contributions of the Explained Component of the Decomposition of all Predictors

	Model based on the narrow definition of wealth (1)	Model based on the Expanded definition of wealth (2)
Differential		
Male	0.376371**	0.528338**
	(0.019923)	(0.013121)
Female	0.229673**	0.382619**
	(0.018190)	(0.012120)
Difference	0.146698**	0.145719**
	(0.026978)	(0.017861)
Decomposition		
Explained	0.139363**	0.151920**
	(0.028520)	(0.019414)
Unexplained	-0.099059	-0.030156
	(0.352607)	(0.036469)
Individual contributions of the explained component of the decomposition		
Natural log of the narrow definition of wealth	0.120729**	
	(0.019545)	
Natural log of expanded definition of wealth		0.154964**
		(0.012604)
Married	-0.002578	-0.001952
	(0.003811)	(0.002825)
Age	0.002085	0.006852
	(0.006408)	(0.005027)
Age squared	0.000416	-0.005389
	(0.006777)	(0.004558)
Individual has child(ren) age(s) five years and under	0.000879	-0.000116
	(0.001172)	(0.000530)
Individual has child(ren) age(s) six to 11	0.000470	-0.000100
	(0.000848)	(0.000476)
Contribution to unpaid household chores		
Spends up to 10 hours a week	0.000268	-0.005553
	(0.006348)	(0.003999)
Spends 10 to 20 hours a week	0.000019	-0.000225
	(0.000321)	(0.000510)
Spends 20 to 30 hours a week	0.008724	0.010241
	(0.011407)	(0.006936)
Spends more than 30 hours a week	0.010366	0.007875
	(0.007509)	(0.006147)

Religion (base: Christian)		
Muslim	-0.000688	-0.000940
	(0.003203)	(0.001398)
Traditional and other religions	0.000237	0.001115
	(0.001701)	(0.001813)
Education (base: no education or some primary school)		
Attended some junior secondary school or	-0.000887	-0.003106**
equivalent	(0.001222)	(0.001558)
Attended at least some senior secondary school	-0.002336	-0.006674**
or vocational or technical training	(0.002553)	(0.002164)
Attended at least some university, professional	-0.003946	-0.011835**
training, or other post senior secondary	(0.002974)	(0.003093)
Individual has debt (business, real estate or	0.000456	0.001818
other)	(0.002631)	(0.001338)
Household reduced consumption due to a	-0.000508	0.000269
idiosyncratic shock anytime between 2005-	(0.000850)	(0.000529)
Owns a mobile phone	-0.008815	-0.016841**
	(0.005468)	(0.003879)
Individual is a member of at least one social	-0.001162	0.001244
	(0.002252)	(0.001102)
Ethnic group (base: Akan)		
Ewe	0.000121	-0.000136
	(0.000428)	(0.000395)
Ga	0.003428	0.000492
	(0.002603)	(0.000768)
Gurma	0.001467	0.001284
	(0.001910)	(0.001072)
Grusi or Mande	0.000512	-0.000055
	(0.001131)	(0.000308)
Mole Dagbani	0.004614	0.001787
	(0.003220)	(0.001884)
Other ethnic group	-0.000049	0.000319
	(0.000278)	(0.000563)
Holds agricultural family or community land	0.006992**	0.000024
	(0.003068)	(0.002043)
Occupation is agriculture, animal husbandry,	0.011475**	0.002745
forestry work, fishing, or hunting	(0.004587)	(0.002433)
Individual expects an inheritance	-0.000110	0.000127
	(0.000992)	(0.000501)
Oldest in household	0.005261	0.008291
	(0.010781)	(0.008535)
Number of household members	-0.000018	-0.000116
	(0.000179)	(0.000360)

Regions (base: Western)		
Central	-0.004321	-0.002875*
	(0.004968)	(0.001539)
Greater Accra	-0.005875	-0.000120
	(0.003604)	(0.000350)
Volta	-0.003672	-0.001400
	(0.002608)	(0.001502)
Eastern	-0.000797	-0.000771
	(0.003678)	(0.000794)
Ashanti	-0.002042	-0.000254
	(0.003451)	(0.000686)
Brong Ahafo	-0.005295	-0.000420
	(0.004280)	(0.000856)
Northern	0.011579**	0.004907**
	(0.004790)	(0.002311)
Upper East	0.001616	0.001475
	(0.001613)	(0.001268)
Upper West	-0.001153	0.002209
	(0.001614)	(0.001421)
Lives in a rural setting	0.000682	0.002762
	(0.001269)	(0.001825)
Individual owns agricultural land (there is a market and individual and has the right to	0.000026	
	(0.001990)	
Individual owns the place of residence (there is a market and individual and has the right to sell)	-0.008808**	
	(0.003998)	

Notes: Standard errors are in parentheses. * p<.10, ** p<.05. The estimates are based on using a pooled Oaxaca-Blinder approach (see Jann 2008). The estimates are found using two-step Heckman models for all three equations.

ESSAY 2

THE COVARIATES OF GENDER DIFFERENCES IN WEALTH HOLDINGS BETWEEN MARRIED MEN AND WOMEN IN GHANA

Introduction

Economic security in the form of physical and financial wealth allows for socioeconomic wellbeing. Physical and financial assets can provide a source of financial income, a means of consumption as well as a means to additional assets through collateral. Additionally, greater ownership over physical and financial assets can improve one's influence within the community (see for instance Agarwal (1994) on women's asset ownership and influence in the community). Further, precautionary saving of assets can help ensure an individual's future economic security, particularly when faced with uncertainty around future income and limited opportunities to borrow.

Recent studies find a substantial difference in the gross value of financial and physical assets held by men and women in households in Ghana (see Oduro, Baah-Boateng, and Boakye-Yiadom 2011). What accounts for the substantial difference between men and women's aggregate wealth in Ghana? To what extent is gender wealth inequality in Ghana due to gender differences in acquiring gifted and inherited land? To what extent is it due to gender differences in self-acquired wealth? Do differences in men and women's educational attainment account for the gap? Is the wealth gap the same across the wealth distribution? If we are concerned about gender equity, then identifying the channels that exacerbate or improve the gender wealth gap is essential.

To begin disentangling the sources of differences between men and women's wealth, it is useful to use a decomposition method, such as the Oaxaca-Blinder (1973), as is common in

literature that explores wage inequality. Decomposition methods allow one to identify the contribution of male-female differences to components of the gender wealth gap, and provide clues as to what explanations of the gap need to be researched further.

Using a household-level data set from 2010 collected as part of a multi-country project, *The Gender Asset Gap Project*, this paper seeks to explore the determinants of the difference in the gross value of financial and physical assets held by men and women within households in Ghana. The data is unique in that it contains information on asset ownership of individuals within households, rather than the household as a whole, which allows for this type of analysis. Additionally, unlike many asset surveys, the data contains information on the estimated value of all assets, including minor wealth components such as household durables. In a developing country context, this is particularly important as consumer durables often represent a large portion of an individual or household's wealth.

The paper is organized as follows: the next sections review previous literature; describe a simple model for wealth accumulation; and discuss possible causes for gender differences in men and women's wealth accumulation in Ghana. This is followed by a description of the data and empirical model. The next section presets and discusses the results. The final section concludes.

Previous Literature

Only a few studies have looked at the magnitude of aggregate gender wealth gaps within countries. Most surveys collect asset information at the household level with the assumption that assets owned by individuals within the household are pooled. As such, sex-disaggregated data is not readily available and sex-disaggregated data with information on the value of the asset is even less common. To begin to fill this gap *The Gender Asset Gap Project* implemented sex-disaggregated asset surveys in three countries: Ghana, Ecuador, and the state of Karnataka in

India. The project found that in Ghana and Karnataka, there is a substantial difference in the value of financial and physical assets held by men and women (Deere et al. 2013). In Ecuador, in contrast, men and women claim they hold many household assets jointly within marriage; as such, the project finds men and women hold similar levels of financial and physical wealth (ibid).

Other studies that examine the magnitude of the gender gap usually do so for a particular asset, often in terms of the difference in the quantity or size of the asset owned or in the difference in the number of male and female owners, and not the difference in the value of the assets owned by men and women. For example, in Latin America, Deere and Leon (2003) estimate gender differences in land ownership. They find that more men than women own land and that male landowners tend to own larger plots than female landowners in Latin America (Deere and Leon 2003). Similarly, Doss, Meinzen-Dick, and Bomuhangi (2014) find there is a gap between men and women who report ownership over any land plot and an even larger gap between the number of men and women who have their name on any land ownership document in Uganda.[19] Others have found gender ownership gaps in livestock, agricultural equipment, and consumer durables (see, for instance, Oladele and Monkhei 2008 for Botswana; Doss et al. 2012 for Ghana, Uganda, Karnataka, India, and Ecuador; and Peterman et al. (2010) for a general overview of many developing countries).

All these studies suggest that gender gaps in asset ownership are prevalent in many areas of the world. Some studies discuss the reasons for these gender gaps (see, for instance, Deere and Leon (2003) for a discussion of marital and inheritance regimes in Latin America; for gender analyses and changes in land ownership regimes see Doss, Meinzen-Dick, and Bomuhangi (2014) in Uganda and Widman (2014) in Madagascar). Yet few studies within economics

[19] See Table 4 in Doss, Meinzen-Dick, and Bomuhangi (2014).

examine what accounts for the differences in men and women's aggregate wealth. Because of data limitations, it is more common to look at the differences in wealth between male- and female- headed households (see, for example, Schmidt and Sevak (2006); Austen et al. (2014)). To date I found only one study that investigates the determinants of the gender wealth gap between men and women within the household. Sierminska et al. (2010) use a 2002 cross-section of the German Socio-Economic Panel (SOEP) that includes asset data at individual level to estimate men and women's differences in wealth across the wealth distribution. The authors use a semi-parametric approach introduced by DiNardo, Fortin, and Lemiux (1996) to decompose the wealth gap. They find the mean net wealth differential between married men and women in Germany is about 50,000 Euros, and that the gap is greater at the top of the distribution than at the bottom. While a large portion of the wealth gap is unexplained (and thus due to aspects not observed in the authors' model), the analysis suggests that the majority of the wealth gap in the model is due to men and women's differences in labor market income and experience across the wealth distribution. Differences in men and women's educational attainment—which also impacts self-made wealth by affecting an individual's opportunities in the labor market and may also have an effect on an individual's investment strategies—also partially determines the wealth gap at the bottom of the distribution. However, at the top of the distribution, men and women's differences in educational attainment has the reverse effect. This finding may suggest that men and women have similar levels of educational attainment at the top of the distribution and that other factors, such as type of education, may better explain differences in wealth.[20] Strikingly, the authors find that intergenerational factors, such as

[20] The type of educational attainment is captured in the large unexplained portion of the model, and partially captured by differences in income earnings.

inheritance, explain very little of the wealth gap between men and women in Germany (Sierminska et al. 2010).

In summary, because of data limitations, few studies investigate how men and women's differences in acquiring wealth are correlated with the difference in men and women's aggregate wealth. Following Sierminska et al. (2010), but using a different decomposition approach, this paper seeks to fill a part of that gap in the literature. The analysis focuses on married individuals (and individuals in a consensual union), and is the first study of its kind to investigate the contribution of male-female differences in the married male-female wealth gap within a developing country context.[21] Ghana is a particularly interesting country to examine the determinants in men and women's differences in wealth because there is a strong separation of property even within marriage, and men and women generally own assets individually. Additionally, nearly the same percent of women as men in Ghana are economically active, and thus any differences in self-acquired wealth through labor income are more likely due to differences in income activities than differences in participation in the labor market.[22]

Modeling Wealth Accumulation

The life-cycle savings model introduced by Modigliani and Brumberg (1954) provides the basis for consumption and savings models used today to portray wealth accumulation and to predict savings and consumption behavior of economic agents. The basic model assumes agents are rational and forward-looking and optimize their consumption behavior, not just in the present

[21] This analysis focuses on partnered individuals for two reasons. First, asset strategies of partnered individuals likely differ from those who are not yet married and, therefore, are at a different point in his or her lifecycle. They also likely differ from those who have been previously married and are currently sole head of a household. Second, because sex-disaggregated household data is scarce, few studies look at wealth composition of partnered individuals, making it an important contribution.

[22] About 90 percent of men and about 84 percent of women ages 25 - 64 years are economically active, and 63 percent of men and 46 percent of women continue to be economically active at 65 and older (GLSS5 2008).

period but over many periods. The model predicts that consumption in a given period is not based on current income, but the amount of wealth accumulated over the agent's lifetime. In a simple environment with perfect capital markets and where individuals know their future earnings and do not face liquidity constraints, the traditional life-cycle savings model assumes an individual will borrow early in his or her lifetime, accumulate wealth over the middle of his or her lifetime, and dissave at the end so to smooth consumption overtime. In this way, saving patterns, and thus wealth accumulation, are determined by where an individual is in his or her life-cycle.

The basic life-cycle savings model assumes retirement is an important motive for wealth accumulation. However, in Ghana, where many individuals work late into life, retirement is not likely the primary motive for wealth accumulation. Indeed, using an asset index of market wealth from 2003 DHS survey of households in Ghana, Burger et al. (2006) find no evidence of dissaving among household head in the oldest cohorts across different levels of educational attainment, as would be expected if individuals in Ghana were inclined to save and then dissave for retirement.

Additionally, the assumption that individuals know their future earnings and do not face liquidity constraints, thus are able to borrow against their future earnings, do not likely hold for many individuals in Ghana. Many, particularly agricultural households, face uncertain future income, and access to formal credit markets to help smooth consumption is limited.

A more likely motive for accumulating wealth in Ghana is to protect consumption from fluctuations in income.[23] In particular, when future income is uncertain and individuals face

[23] It is difficult to test the motive behind wealth accumulation.

liquidity constraints, individuals will save and accumulate in good times to buffer for potential income shocks in the future (Deaton 1991).[24]

Wealth transfers may also be a motive for wealth accumulation for some individuals in Ghana. In Ghana, most assets are customarily passed down through one's lineage based on customary laws and norms. Much of the additional property acquired in an individual's lifetime is also considered property of the lineage; however, proportions of the property acquired during one's lifetime can be gifted and bequeathed to those outside one's lineage. These types of gifts depend on the norms and practices of the particular ethnic groups. For instance, among Akans in the past few decades, it has become common to transfer land to a husband's wife and children as an intervivos gift if they labored in his cocoa fields (Quisumbing et al. 2001).

A general model of savings and consumption model, which is based on Deaton's (1991) "bufferstock" version of the model, predicts individual accumulate wealth to buffer against potential future income shocks and captures other motives for wealth accumulation, is as follows: suppose an individual maximizes his or her intertemporal utility, which is the expected value in time t of the sum of future discounted value $(1+\delta)^{t-\tau}$ of his or her instantaneous utility $v(\cdot)$ at time t, $t+1$, $t+2$, $t+3\ldots\ t+n$ such that

$$u = \left\{ E_t \sum_{\tau=t}^{\tau} (1+\delta)^{t-\tau} v(c_t) \right\}, \tag{1}$$

where the rate of time preference, δ, is strictly positive and the individual's instantaneous utility function, $v(c_t)$, is twice differentiable, strictly concave, and increases with consumption, c_t. The

[24] Even in the United States, the 1983 Federal Reserve Board's Survey of Consumer Finances finds that preparing for a possible emergency was the number one reason households save for 43 percent of households compared to only fifteen percent who say they save primarily for retirement (Carroll and Samwich 1997).

individual's wealth, X, at time $t+1$ is determined by physical investments or assets, A_t, and the return, r_{t+1}, on these investments, noncapital income acquired, y_t, less the individual's goods consumed, c_t, in the previous period t:

$$X_{t+1} = (1 + r_{t+1})A_t + y_t - c_{t.}$$

Based on this general model, wealth at a given point in time is associated with previous asset holdings and investments, the potential to earn income and the certainty of future income, current consumption, the value placed on future consumption or others' future consumption (by saving to bequeath), and the extent which the agent faces liquidity constraints. Using this model, differences in wealth between men and women could be a result of gender differences in previous asset holdings as a result of differences in received inheritance and gifts or differences in self-accumulated assets due to dissimilarities in investment and labor income earnings over time. Additionally, the wealth gap may be the result of differences in men and women's consumption behavior and liquidity constraints. These are discussed in turn, below.

Differences in Men and Women's Wealth Accumulation in Ghana

There are several reasons why men and women may hold differ levels of wealth. One may be that norms around inheritance may favor one sex over the other. In Ghana, both matrilineal and patrilineal family systems of inheritance favor men. Akans make up the largest ethnic group in Ghana and with few exceptions ascribe to the matrilineal system.[25] The Lobi, the Tampolese, and the Vagala or Baga in the Upper East and Upper West regions are also matrilineal. In matrilineal family systems, property primarily belongs to the mother's family.

[25] The exceptions are some Akan groups in the Volta region and Jasikan District.

Inheritance is usually passed from the male to his uterine brother. If there is no uterine brother, the son of the uterine sister will inherit the property. The Mole-Dagbani community, which is the second largest ethnic group in Ghana, is patrilineal. Other patrilineal communities include Ewe, Ga-Dangme, Ewe, Guan, Gurma, Grusi, and Mande-Busanga. Although there is some variation, within these patrilineal family systems, men's property is often passed from the father to his sons.

Rules around property ownership in marriage may also contribute to differences in men and women's wealth holdings. In countries where property in marriage is community property, the wealth gap between men and women is likely to be smaller than in countries where there is separation of property (Deere and Doss 2006). In Ghana, the majority of marriages take place under customary traditions. Under customary law there is a strong separation of property within marriage. All property that is acquired is individually owned and the cultural norms of the various ethnic groups acknowledge the individual property of husbands and wives.

Additionally, the norms and practices in Ghana around property in the dissolution of a marriage tend to favor men, which could also contribute to differences in men and women's wealth holdings. There are few provisions in customary law for divorcees. The type of provision depends on the ethnic group as well as whom in the marriage initiated the divorce. Generally, any gifts or money exchanged at marriage is returned and the husband and wife settle debts to each other (Fenrich and Higgins 2001; Baden et al. 1994; Duncan 2004). For instance, the wife's debts may include the bride price, advances lent for trade, and valuable ornaments (Duncan 2004). Alimony is rare in Ghana, but the wife is often entitled to a 'send off' by the husband; although, the amount of the 'send off' may be insignificant (Baden et al. 1994, 277 ftnt 99).

In the event of death of spouse, the Intestate Succession Law of 1985 requires that the surviving spouse(s) and children are entitled to one house of the deceased and all the household goods including jewelry, clothes, furniture, appliances, vehicles not used for businesses, and household livestock (Fenrich and Higgins 2001; Awusabo-Asare 1990, 12). Any additional intestate self-acquired property is divided so that three-sixteenths and nine-sixteenths go to the spouse(s) and children. The rest of the estate is divided between a surviving parent and individuals based on customary law (Fenrich and Higgins 2001). In practice, however, widows are at risk of not inheriting any household property and often the family of the deceased will claim the property. Widowers are less likely to have this problem as they are more likely to be seen than widows as the primary owners of the household property.

Another reason men and women may hold different levels of wealth may be that there are differences in self-made wealth over time due to dissimilarities in investments and labor income. In Ghana, men and women tend to have separate income streams. Based on equation (2), women's lower earnings in investments and labor income over time imply they will accumulate lower levels of wealth, ceteris paribus.

In terms of investment, in Ghana, women are more likely than men run small low-income earning enterprises for which they are the only employee, rather than larger, more profitable enterprises. Women's investment in smaller enterprises may be due to women's greater risk aversion than men. Indeed, many empirical studies find that women are more risk averse than men (e.g. Jianakoplos and Bernasek (1998); within retirement portfolios see Riley and Chow (1992); Bajtelsmit and VanDerhei (1997); Bernasek and Shwiff (2001); Arano, Parker, and Terry (2010). In Ghana, however, I find no difference in men and women's level of relative risk aversion once other factors are controlled for (see Essay 1). Women’s greater likelihood of

investing in small business enterprises, rather than larger ones, is more likely due to the fact this type of income earning activity allows for flexible hours and for multitasking with other activities, such as childcare. In Ghana, women often dedicate more hours on average than men to caregiving and household maintenance including cooking, cleaning, and—in rural areas—retrieving water and fuel (Fenrich and Higgins 2001).

Differences in investment may also be due to women's greater credit constraints than men's. Studies suggest there may be gender differences in access to financial institutions. For instance, using data from a small field study, Kuada (2009) finds that female entrepreneurs in Ghana have more difficultly than men accessing financial support through formal lending institutions. Women are more likely to rely on informal support (such as family) as a source of capital, which is a less consistent source of funding (across individuals) than loans from formal lending institutions.

Differences in risk sharing and risk sharing networks could also contribute to differences in investment. Dercon and Krishnan (1997) find that that within households in rural Ethiopia, females tend to bear a greater burden of the negative consequences of a shock than men (see also Behrman and Deolalikar (1990) in India). In Ghana, Doss (2001a) finds that risk-sharing in households in Ghana is also imperfect. Indeed, while there is some amount of risk-sharing between male and female members within households, according Udry and Conley (2004), men are more likely to engage in risk sharing with other men in their extended families, and women are more likely to engage in risk sharing with other women in their communities. If women bear a greater burden of the household shocks than men in Ghana (as they do in Ethiopia) and their networks do not perfectly insure against these shocks, women are more likely to engage in lower risk, lower-return activities and save more than men, to help mitigate the effects of these shocks,

assuming all else is equal. Similarly, men and women may be vulnerable to different shocks. For instance, women are more likely to be more susceptible to economic difficulty than men in the event the marriage dissolves. This may also lead women to invest more conservatively than men.

In terms of labor income, women earn approximately than 20 percent less than men in Ghana for similar work (World Economic Forum 2013). There is a wage premium for education, as such, women's lower labor earning than men is in part due to women's lower levels of educational attainment than men. In 2005 nearly twice as many females (2.7 million) as males (1.4 million) never attended school and there are there are fewer females (0.7 million) than males (1.1 million) with secondary or higher qualification (GLSS5 2008). Women's lower earnings may also in part be due to social discrimination, which creates a feedback effect that contributes to parent's lower investment in their daughter's educational attainment compared to their son's (Quisumbing et al. 2004).

Finally, based on equation (2), differences in consumption (or expenditure behavior) could result in differences in men and women's wealth over time, ceteris paribus. In Ghana, gender roles primarily determine responsibilities for different expenditures within the household. Men are traditionally responsible for providing the majority of the money for a household's food, clothing, and medical expenses. However, ensuring individuals in the household maintain a level of subsistence is often women's responsibility if income falls short. Also, additional expenditures for children are often met by women (Chao 1999).

In summary, there are many male-female differences in Ghana that could contribute to the gender wealth gap at a given point in time. Applying the general savings and consumption model (equations (1) and (2)) in the last section to a decomposition method, this paper estimates

the composition of gender differences that play a role in the difference in gross wealth holdings between married men and women in Ghana. The next section describes the data and presents descriptive statistics of men and women's wealth.

Description of the Data and Wealth Statistics

To estimate the difference in men and women's accumulated wealth in Ghana, this paper uses data from a 2010 Ghanaian household survey which was part of a larger project, *The Gender Asset Gap Project*, that collected sex-disaggregated asset data in three countries: Ghana, Ecuador, and the state of Karnataka in India. The data is unique in that it contains information on the ownership of assets and the assets' value for individuals within the household, rather than for households as a whole. In Ghana, the enumeration areas match that of the national census. The 144 enumeration areas were selected within each of Ghana's ten regions based on the region's share of the total population.[26] Fifteen randomly selected households were surveyed within each enumeration area for a total of 2,170 households.[27] In most households two individuals of the opposite sex, who were well-informed about the household's assets, were interviewed about the household's and their own individual assets.

This analysis uses the individual asset data from the respondents who are partnered, meaning individuals are either in a common law union, monogamous marriage, or polygamous marriage. The final sample consists of 700 and 665 partnered women and men within 892 households.[28]

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[26] There are fewer enumeration areas in the Upper East Region due to conflict in parts of the region.

[27] Both spouses were interviewed in only 956 of the households. For the other 1,214 households, the second respondent may be a different family member (e.g. sibling, parent, parent-in-law) even if the first respondent was married and lives with his/her spouse.

[28] This analysis looks at the overall gap between partnered men and women, not at the gap within households.

Common law, or mutual consent, is an informal union and may be a temporary form of marriage or a marriage that has not yet completed the various stages of the marriage ceremony (Duncan 2010). In 2005, nearly eight percent of the population in Ghana was in a common law union (GLSS5 2008). These types of partnerships are common in the cocoa regions of Ghana; in particular, the forest areas of Ashanti, Brong-Ahafo, Central, Eastern, Western and Volta regions (EIU 2008). In these areas, women may enter short term unions to work for her spouse with an agreement of payment in cash or in kind at the end of the term (Duncan 2010). Men do not take on full legal responsibilities in a temporary union as they would in a formal marriage, but it guarantees women freedom to leave (Boni 2001).

The majority of marriages (monogamous or polygamous) in Ghana take place under customary law.[29] Often a couple may marry under another type of law as well.[30] In the Northern, Upper East, Upper West, and Brong Ahafo regions than the other regions of Ghana, where there is a greater proportion of Islamic households, many individuals marry also under the Marriage of Mahammedans Ordinance. In the middle and lower regions of Ghana, individuals are more likely to be married in the Church and registered under the Marriage Ordinance. Customary law and the Marriage of Mahammedans Ordinance allow men to have multiple wives. The Marriage Ordinance does not allow polygamy and men who marry more than one woman can legally be found guilty of bigamy; however, bigamy is widely practiced in Ghana even within the Church and as of 2001 there was only one prosecution of bigamy in Ghana (Fenrich and Higgins 2001).

[29] Indeed, of those who are married in the sample (not in a common law union), the majority who knew the law in which they married stated they married under customary law.

[30] Specifically, a marriage may be customary and then registered under the Marriage Ordinance or Marriage of Mahammedans Ordinance (Awusabo-Asare 1990).

Table 1 summarizes the marital characteristics and the average age by sex. The majority of individuals in the sample are in a monogamous marriage. About 16 percent of individuals are in a consensual union and 10 percent are in a polygamous marriage. A substantial number of individuals were previously married. Nearly 33 percent of men and 25 percent of women in the sample have been married more than once.

Table 1. Age and Marital Characteristics

	Partnered Men (n = 665)	Partnered Women (n = 700)	Total (n = 1365)
Mean age	48.1	40.1	44.0
	(15.75)	(13.18)	(15.03)
Type of union			
Monogamous marriage (%)	74.7	72.3	73.5
Polygamous marriage (%)	10.1	10.3	10.2
Consensual union (%)	15.2	17.4	16.3
Spouse or partner does not live in same household (%)	19.8	20.0	19.9
Individual was previously married (%)	32.5	25.1	28.7

Notes: Statistics are unweighted. Standard deviations are in parenthesis.

The gross wealth of a respondent is estimated by summing the value of all financial and physical assets the respondent reports he or she owns and can be sold in the market. Specifically, this is the sum of the value of the individual's stocks, savings in formal and informal savings accounts, cash holdings, treasury bills and bonds, the value of registered and unregistered businesses, the value of commercial and residential real estate for which there is a market, the value of agricultural land holdings that are not family or community land and for which there is a market, agricultural equipment, livestock, and consumer durables. The majority of assets in Ghana are owned individually. The value of assets that are owned jointly is divided

by the number of owners, with the exception of businesses, where the value is based on the share owned.

Doss, Meinzen-Dick, and Bomuhangi (2014) argue that it is useful to think of property ownership as a "bundle of rights" where different individuals may have different privileges with regard to the asset. An individual may consider him or herself an owner if he or she has access or management rights to the family land, for instance, but not the right to sell the land to someone else. It is useful therefore to define what is meant by ownership, particularly for land and real estate. In Ghana, there are very few land owners who hold ownership documents for non-agricultural and agricultural real estate (Oduro et al. 2011). To capture whether an individual has the right to transfer an asset to another individual, I assume an individual owns the asset if he or she considers himself the owner, or one of the owners, of the asset and he has the right to sell the asset alone or with someone else. The specific question in the survey instrument is "with regard to this [asset], do you have the right to sell it?" The potential answers are (1) Yes, alone; (2) Yes, in consultation; (3) Yes, with permission; (4) No, someone else has the right; (5) No, it cannot be sold; and (6) There is not market for this asset. For agricultural land, residence and commercial real estate, and businesses, ownership is based on the right to sell alone or with others, in consultation or with permission. However, for agricultural land, the plot is not included in the wealth component if the respondent stated "land is not sold in this area." Family land, community land, stool land, and land that is sharecropped or rented are also not included in the wealth component.[31] For livestock, consumer durables, and agricultural equipment, the survey does not ask if the individual has the right to sell the asset. For livestock,

[31] Stool land is customary land owned and controlled by ethnic groups. Stools, or officials in the community, possess the highest level of land ownership and allocate the land to members of their community who then have rights of access.

ownership instead is determined based on who has rights over the money if the livestock is sold. Ownership of consumer durables and agricultural equipment is based solely on whether the individual claims ownership.

Debt is minimal in Ghana. Relatively few individuals have debt in the sample, and average gross wealth and average net wealth are not statistically significantly different overall and across marital status and sex.[32] As such the rest of this analysis focuses on gross wealth.

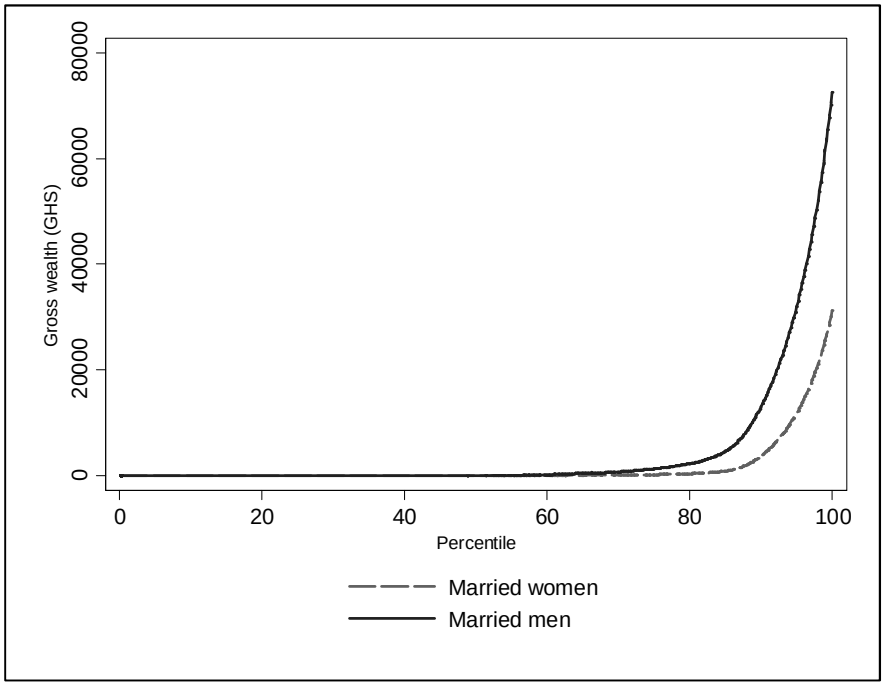
Table 2 summarizes gross wealth holdings by marital status and sex. Men and women's gross wealth are statistically significantly different across marital status with the exception of men and women in consensual unions. On average, partnered men hold GH¢4,829 more than partnered women, based on gross wealth (this is equivalent to approximately US$3374 in 2010). This gap is large in that, as a comparison, in 2005 the mean annual household expenditure in Ghana was GH¢1,918 or GH¢644.00 per person or about two US$ a day per capita (GLSS5 2008). The wealth gap is the largest for men and women in polygamous relationships, where men's average gross wealth is GH¢7940 and women's is GH¢295. Figure 1 shows that the difference in wealth between married men and women in Ghana is largest at the top of the wealth distribution.

[32] In all, 104 individuals (less than eight percent of the sample) have debt (see appendix for descriptive statistics on debt).

Table 2. Gross Wealth by Marital Relationship and Sex in Ghanaian Cedi

	Monogamous Relationship		Consensual Union		Polygamous Relationship		Total	
	Men (n = 497)	Women (n = 506)	Men (n = 101)	Women (n = 122)	Men (n =67)	Women (n = 72)	Men (n = 665)	Women (n = 700)
Average wealth (GH¢)	7908.8 (23598.20)	2691.1 (14901.66)	2267.5 (4802.72)	1438.0 (5259.345)	7940.31 (12792.83)	294.8 (591.55)	7055.2 (20972.15)	2226.2 (12880.30)
Median wealth (GH¢)	1140.0	251.3	719.8	157.5	2690.0	67.5	1185.0	196.0

Notes: Statistics are unweighted. Standard deviations are in parenthesis.



Notes: Based on unweighted data.

Figure 1. Wealth Distribution of Married Women and Men in Ghana, 2010 (Unconditional Quantiles)

As mentioned above, only agricultural land that can be sold by the individual and for which there is a market is included in gross wealth statistics. However, this excludes a

substantial amount of Ghana's land holdings. Nearly 80 percent of land is customary land owned by the community or family/clan and usually passed down the lineage based on customary norms and practices. Individual members, usually men, inherit the rights to use these lands over their lifetimes (Dejene 2011; Mahama and Baffour 2009). Married women often have access to their husband's land, but if a marriage dissolves, women are usually expected to revert back to their own lineage and no longer have access to their husband's family land. Table 3 presents the statistics by marital status and sex of those who have usufruct rights over land that cannot be sold. More men than women hold agricultural land for which there is not a market or the land is family, community, or stool land. If this land was included in the gross wealth, the gender wealth gap presented here would be considerably larger.

Table 3. Percent of Men and Women who hold Agricultural Land by Marital Status

	Monogamous Relationship		Consensual Union		Polygamous Relationship		Total	
	Men	Women	Men	Women	Men	Women	Men	Women
Total agricultural land not included in wealth value* (%)	26.2	5.5	7.9	2.5	61.2	6.9	26.9	5.1
Holds family land (%)	9.1	2.4	4.0	1.6	19.4	2.8	9.3	2.3
Holds community land (%)	2.2	0.0	1.0	0.0	12.0	4.2	3.0	0.4
Holds stool land (%)	0.4	0.0	0.0	0.0	0.0	0.0	0.3	0.0

Notes: Statistics are unweighted. *The family, community, and stool land holdings do not sum to the total agricultural land held in the first row because the total in the first row includes land individuals state they own (not of family, community, and stool land) but for which there is no market and thus cannot be sold.

Empirical Model

The general savings and consumption model presented above provides the theoretical basis for examining men and women's gross wealth at a point in time and investigating what are the most important explanations accounting for men and women's wealth differences in Ghana. As shown above in Figure 1, the distribution of wealth is highly skewed with a larger percent of total wealth held by a small percentage of the population. In addition, the majority of the mean gross wealth gap of GH¢4,829 is due to men and women's differences in wealth above the 60^{th} percentile. For these reasons, it is advantageous to look at the relationship between gender and wealth across the wealth distribution and not just at the mean. Further, in order to investigate individual contributions of male-female differences in the male-female wealth gap, a method that allows for a detailed decomposition analysis is needed.

Sierminska et al. (2010) use a DiNardo, Fortin and Lemieux (1996) decomposition method to estimate the differences in married men and women's wealth in Germany across the wealth distribution. DiNardo, Fortin and Lemieux's (1996) method is a semi-parametric approach that uses reweighting to look at comparisons of the distribution. The method is simple to implement and provides consistent estimates for the explained and unexplained aggregate components of the decomposition; however, the model does not easily allow for a detailed decomposition analysis (Fortin et al. 2011). In order to obtain a more detailed analysis, Sierminska et al. (2010) partition the explanatory variables into four groups and estimate wealth distributions based on several counterfactuals. The order in which the components of the detailed distribution are computed affects the results of the detailed decomposition (the decomposition procedure is path dependent). To address this, the authors take the average results of the counterfactuals for all possible order combinations.

Only a few other comprehensive approaches are available for a detailed decomposition analysis beyond the mean. Machado and Mata (2005) propose a detailed decomposition method using traditional quantile regressions. However, this method is computationally burdensome in that it requires a quantile regression analysis for each possible percentile and simulation procedures to estimate counterfactuals and predicted values. Additionally, Fortin et al. (2011) argue that this does not allow for consistent estimates of the (explained) sub-components of the decomposition without using a reweighting procedure proposed by DiNardo, Fortin and Lemieux (1996), in which case it is best to begin with a reweighting approach.

A method that is simpler than both these approaches, and has the added advantage of allowing the analyst to use the more intuitive traditional Oaxaca-Blinder (1973) to perform a detailed decomposition analysis on unconditional quantile regressions, was recently proposed by Firpo, Fortin, and Lemieux (2007; 2009). Firpo, Fortin, and Lemieux (2007; 2009) suggest first transforming the dependent variable, Y, using a recentered influence function (RIF) and then performing a linear regression on the transformed variable at the different percentiles. Empirically this means an observation, y_i, is transformed for the τth quantile so that the transformed variable, RIF_i, is equal to the quantile value, q_τ, plus τ divided by the marginal density Y at q_τ, $f_Y(q_\tau)$, if y_i, is greater than or equal to q_τ; and equal to the quantile value, q_τ, plus $(\tau - 1)$ divided by $f_Y(q_\tau)$ if y_i is less than q_τ. That is,

$$RIF_i(y_i;\ q_\tau) = \begin{cases} q_\tau + \dfrac{\tau}{f_Y(q_\tau)} & \text{if } y_i \geq q_\tau \text{ and} \\ q_\tau + \dfrac{\tau - 1}{f_Y(q_\tau)} & \text{otherwise.} \end{cases} \tag{3}$$

Next a linear regression of the transformed variable at q_τ on explanatory variables estimates the expected value of $RIF(Y; q_\tau, F_Y)$ given the explanatory variables, $\boldsymbol{X}$, at that quantile. This method is equal to running a linear probability model for whether y_i is above the quantile of interest; however, the coefficients are divided by the density at that quantile given the explanatory variables, $\boldsymbol{X}$ (Heywood and Parent 2012):

$$E[RIF(Y;\ q_\tau)|\boldsymbol{X}] = \boldsymbol{X\beta_\tau} \tag{4}$$

where $\boldsymbol{\beta_\tau}$ are the parameters of interest. An individual's accumulated wealth, Y, at a given point in time $t+1$ based on equation (2) can be empirically estimated at different quantiles using equation (4) such that the explanatory variables, $\boldsymbol{X}$, are made up of a vector of coefficients that explain an individual's wealth.

The expected value of the recentered influence function is the quantile of the marginal distribution so that β_τ can be interpreted as the effect of the change on $E[X]$ to the change on $E[Y]$, unlike traditional (conditional) quantile regressions. Because of this interpretation of β_τ, the Oaxaca-Blinder decomposition can then be used to estimate the wealth gaps at various percentiles. For each unconditional quantile, equation (4) is estimated for men, for women, and as a pooled equation that includes a dummy variable indicator for sex.[33] The difference in men and women's mean gross wealth is separated into two components: explained and unexplained. The explained component is the sum of the product of the estimated coefficients for the pooled equation and the difference of men and women's mean values, less the coefficient for the dummy sex variable. The unexplained component is the product of men's mean values and the

[33] A group indicator variable (i.e. sex) is used so that unexplained factors due to sex are not transferred to the coefficients in the explained components (see Jann 2008).

difference between the estimated coefficients in the male only equation and the pooled equation, plus the product of women's men values and the difference between the estimated coefficients in the female only equation and the pooled equation. The unexplained component also includes the coefficient on the sex dummy variable (indicator of group membership) from the pooled equation:

$$E[RIF(Y^m;\ q_\tau)|\boldsymbol{X^m}] - E[RIF(Y^f;\ q_\tau)|\boldsymbol{X^f}] = \underbrace{\left\{(\bar{\boldsymbol{X}}^m - \bar{\boldsymbol{X}}^f)'\boldsymbol{\beta}^{pooled} - \beta_{sex}^{pooled}\right\}}_{\text{Explained component}} +$$

$$\underbrace{\left\{\beta_{sex}^{pooled} + \bar{\boldsymbol{X}}^{m\prime}(\boldsymbol{\beta}^m - \boldsymbol{\beta}^{pooled}) + \bar{\boldsymbol{X}}^{f\prime}(\boldsymbol{\beta}^{pooled} - \boldsymbol{\beta}^f)\right\}}_{\text{Unexplained component}} \quad (5)$$

where $\boldsymbol{\beta}^{pooled}$, $\boldsymbol{\beta}^m$, and $\boldsymbol{\beta}^f$ are vectors containing the intercepts and slope parameters for the pooled equation, the estimated equation consisting of only men, and the estimated equation consisting of only women. β_{sex}^{pooled} is the parameter for the sex variable in the pooled equation. The total explained component tells us what differences in characteristics account for the amount of the wealth gap. The explained part of the differential of the decomposition can be further disaggregated as the sum of the individual predictors which equals the total component, which will allow us to better understand what accounts for the gender wealth gap in Ghana. The unexplained component captures the total group differences in the unobserved predictors.

Using equation 2 in the savings and consumption model above as the theoretical basis, I estimate men's, women's, and total (i.e. pooled regression) accumulated wealth, Y, with a linear regression on the recentered influence function (RIF) of Y, $E[RIF(Y_k;\ q_\tau)|\boldsymbol{X}]$, at the different quantiles:

$$\begin{aligned} E[RIF(Y_k;\ q_\tau)|\boldsymbol{X}] \\ &= inital\ assets_{km}\boldsymbol{\phi_m} + income_{kn}\boldsymbol{\theta_n} + consumption_{kl}\boldsymbol{\varphi_l} \\ &+ control\ variables_{kp}\boldsymbol{\psi_p} + \boldsymbol{\epsilon}_k \end{aligned} \tag{6}$$

where $\boldsymbol{\phi_m}$ is the vector of *m* coefficients of variables that capture initial physical investments or assets; $\boldsymbol{\theta_n}$ is the vector of *n* coefficients of variables that capture income from noncapital sources and capital investments such as businesses; $\boldsymbol{\varphi_l}$ is the vector of *l* coefficients of variables on consumption patterns; $\boldsymbol{\psi_p}$ is a vector of *p* coefficients of additional control variables; and $\boldsymbol{\epsilon}_k$ is the error term. I then estimate the explained and unexplained contributions of the gender wealth gap using the Oaxaca-Blinder decomposition.

Ideally, I would use the total value of assets owned by an individual at a given point of time to capture initial physical investments or assets. However, while there is information on when assets were acquired, the survey did not ask about assets that were disposed of, except for the disposal of agricultural land and real estate in the last five years. To proxy initial assets, I use the value of agricultural land, non-agricultural land, and real estate that was inherited and gifted to the individual and for which there is a market. I control for whether the individual inherited land or real estate that is no longer owned. Only 118 individuals, 86 men and 32 women, inherited or were gifted land or real estate including their place of residence. The mean value of

inherited or gifted land and real estate is GH¢7719. I also include whether an individual holds agricultural land that is family, community, or stool land, or in a place for which there is not a market. Nearly 27 of men compared to only about five percent of women hold agricultural land for which there is not a market or the land is family, community, or stool land (Table 3).

I use the wealth held by an individual's family of origin at marriage to try to further convey an individual's initial wealth. Although the wealth of the individual's family of origin does not likely differ by sex, it is necessary to control for it in the (RIF) wealth regressions. To capture wealth held by an individual's family of origin, I include whether the respondent's mother and father owned agricultural land, non-agricultural land, or buildings at the time the respondent established his or her own household and the respondent's father's educational attainment as proxies for the value of initial assets. The respondents' mother's educational attainment is low and few respondents knew their mother's level of education, so this variable is not included. Approximately eight percent knew their father attended senior secondary school or higher. Seventy-nine percent of fathers and 38 percent of mothers owned agricultural land, non-agricultural land, or building at the time the respondent established his or her own household. Table 4 summarizes the variables used to proxy initial assets.

Table 4. Initial Assets

	Men (n = 665)	Women (n = 700)	Total (n = 1365)
Father attended senior secondary school or higher (%)	7.8	8.7	8.2
Father owned l land (%)	80.0	78.1	79.0
Mother owned land (%)	36.5	40.0	38.3
Inherited or gifted a house, land, or other real estate (%)	12.9	4.6	8.6
Positive mean of inherited or gifted a house, land, or other real estate (GH¢)	7843.1 (13152.92)	7386.9 (10767.44)	7719.4 (12507.73)
Inherited a house or plot of land no longer owned (%)	3.3	0.6	1.9

Notes: Statistics are unweighted. Standard deviations are in parenthesis.

The data does not contain information on the individual's annual income. However, it does contain information on the individual's employment status, occupation, and education. The majority of the population in Ghana resides in rural areas, where agriculture is an important livelihood for the majority of men and women (Table 6). Fifty-seven percent of men and 45 percent of women are engaged in agriculture as their primary occupation. The majority of men and women, who are engaged in income earning activities in both urban centers and rural areas, are engaged in self-employment activities. These businesses are primarily unregistered micro-enterprises that are run individually without employees (Table 5). Men are five times more likely than women to be engaged in wage employment, and women are more likely than men to not be engaged in paid labor.

The majority of partnered men and women in the sample have a low level of educational attainment and, overall, women have less education than men (Table 7). Nearly 58 percent do not have an education beyond primary school. About 11 percent of partnered men and six percent of partnered women attended senior secondary school or vocational school. Only six

percent of partnered men and two percent of partnered women attended a university or obtained professional training beyond senior secondary school.

In addition to one's employment status and occupation, I use an individual's age and age-squared and the number of hours one spends in unpaid household chores to help control for labor income. An individual's age estimates an individual's experience within a profession and signifies where one is in their lifecycle. I use the number of hours an individual spends in unpaid household chores, which are hours that cannot be spent on paid labor, as a proxy for time available for paid labor as the data does not contain the number of hours an individual dedicates to paid labor. This differs significantly by gender. Table 8 summarizes the average hours worked in unpaid household chores per week. Nearly 70 percent of women in the sample engage in 20 hours or more a week of unpaid household chores; whereas nearly 70 percent of men engage in only 10 hours or less a week.

Table 5. Percent Engaged in Activity by Employment Status

	Men (n = 665)	Women (n = 700)	Total (n = 1365)
Wage employee (%)	21.7	4.1	12.7
Self-employment with employees (%)	6.0	4.4	5.2
Self-employment without employees (%)	64.7	62.1	63.4
Casual or day labor (%)	0.6	0.7	0.7
Not engaged in paid labor (%)	7.1	28.5	18.2
Apprentice	0.0	1.3	0.7
Student	0.3	0.0	0.2
Homemaker	0.0	10.1	5.2
Other unpaid work or not employed	6.8	17.1	12.1

Notes: Statistics are unweighted.

Table 6. Percent Engaged in Particular Occupations

	Men (n = 665)	Women (n = 700)	Total (n = 1365)
Professional occupations (%)	9.9	3.1	6.4
Non-professional sales work including street vendors (%)	3.6	23.6	13.8
Service professions (%)	12.8	6.4	9.5
Agriculture, animal husbandry, hunting, and fishery professions (%)	57.4	45.3	51.2
Production and manufacturing work (%)	10.2	8.4	9.3
No occupation (%)	6.0	13.1	9.7

Notes: Statistics are unweighted. Production work is mining, drilling, wood treating, paper makings, and other manufacturing and production occupations.

Table 7. Percent by Type of Education by Sex

	Men (n = 665)	Women (n = 700)	Total (n = 1365)
No education or only preschool (%)	29.2	40.7	35.0
Some primary school (%)	9.6	14.0	11.9
Completed primary school (%)	8.7	12.4	10.6
Completed junior high school and no more (%)	35.5	25.0	30.1
At least some senior secondary school or vocational school (%)	10.8	6.1	8.4
At least some university, professional training, or other post-senior secondary school (%)	6.2	1.7	3.9

Notes: Statistics are unweighted.

Table 8. Percent Engaged in Unpaid Household Chores

	Men (n = 665)	Women (n = 700)	Total (n = 1365)
Does not participate in household chores (%)	38.2	3.6	20.4
Up to 10 hours a week (%)	29.9	8.6	19.0
10 to 20 hours a week (%)	22.8	20.1	21.5
20 to 30 hours a week (%)	7.1	40.0	24.0
More than 30 hours a week (%)	2.0	27.7	15.2

Notes: Statistics are unweighted.

I control for household size and number of children an individual has, as a way to capture consumption patterns. To reflect cost of living, I control for the region where the individual resides and whether the individual resides in a city or rural environment. There are ten regions in Ghana: Western, Central, Greater Accra, Volta, Eastern, Ashanti, Brong Ahafo, Northern, Upper East, and Upper West. Additionally, as control variables, I include remittances, which are a form of non-labor income, individual's ethnic group, religion, whether the individual belongs to an organization, and whether an individual drew down his or her savings or sold an asset to cope with a household shock in the last five years.[34] These variables help proxy for an individual's risk sharing network and ability to cope with shocks, which could differ by sex.

Since expectations of future inheritance could affect an individual's current motives for saving, I control for whether an individual expects inheritance in the future. Interestingly, more women than men expect to receive an inheritance, although, the data does not contain the type of inheritance one expects to receive, which likely differs in value by sex.

There is a difference in the lives of an individual who has few assets and little or no debt and someone who has plentiful assets and substantial debt. As such, I use gross wealth and control for debt (see Table 2 for summary statistics). In all, 108 individuals report they have some form of debt; nine percent of men and nearly seven percent of women.

[34] The "Shocks and Losses" module asks if the individual drew down saving or sold an asset to cope with a shock.

Table 9. Control Variables

	Men (n = 665)	Women (n = 700)	Total (n = 1365)
Average number of individuals in household	4.6 (2.62)	4.8 (2.52)	4.7 (2.57)
Respondents with children ages 5 years and younger (%)	44.4	52.1	48.4
Respondents with children ages 6 to 11 years (%)	42.3	46.9	44.6
Lives in a rural area (%)	65.9	64.0	65.0
Region (%)			
Western	10.4	9.7	10.0
Central	7.8	8.6	8.2
Greater Accra	8.4	10.1	9.3
Volta	10.1	10.3	10.2
Eastern	10.8	10.9	10.8
Ashanti	15.6	14.3	14.9
Brong Ahafo	12.5	12.9	12.7
Northern	12.2	13.1	12.7
Upper East	6.2	4.4	5.3
Upper West	6.0	5.7	5.9
Receives remittances (%)	24.1	17.3	20.1
Belongs to at least one organization or network (%)	61.2	62.0	62.0
Ethnicity (%)			
Akan	41.5	43.3	42.4
Ewe	12.2	10.0	11.1
Ga	7.4	9.1	8.3
Gurma	9.0	7.9	8.4
Grusi / Mande	5.6	5.7	5.6
Mole Dagbani	17.6	17.7	17.7
Other	6.8	6.2	6.5
Religion (%)			
Protestant	51.7	58.4	55.2
Catholic	16.1	13.9	14.9
Muslim	20.8	21.1	21.0
Traditional	6.3	4.7	5.5
Other	5.1	1.9	3.4
Withdrew savings or sold an asset to cope with a shock (%)	14.3	8.4	11.3
Expects inheritance (%)	8.1	9.6	8.8
Individual has debt (%)	8.1	6.1	7.1

Notes: Statistics are unweighted. Standard deviations are in parenthesis.

Empirical Results

I first present the estimates from the pooled RIF-regressions for the different log wealth percentiles from equation 6 followed by the findings for the decomposition.

For the RIF-regression, I begin the analysis at the 30th percentile, as there is little difference between men and women's level gross wealth at the bottom of the distribution (see Figure 1 above). The distribution of the level gross wealth variable is highly skewed and thus I transform the gross wealth variable using the natural log. There are 12 men and 82 women who report having zero gross wealth (of assets that can be sold in the market) and thus are undefined with the log transformation. To address this, I replace these 94 observations with $ln(0 + \epsilon)$, where ϵ is a positive number $\cong 0$. Since the RIF regression only provides a local approximation of the effect of the changes in the distribution of the covariate, beginning at the 30th percentile starts the analysis above those individuals who have near zero wealth and thus limits any bias in transforming these observations.

The RIF-regression results for the main coefficients for the 30th through 90th quantiles with bootstrap standard errors (400 replications) in parentheses are presented in Table 10.[35] The full table is in the appendix. Even after controlling for the different factors that are correlated with wealth, the negative female coefficient in the RIF-regressions across percentiles suggest that other factors are not being captured in the models. The female coefficient is larger at the lower percentiles than at the upper percentiles, suggesting the other regressors (initial assets, primarily gifted assets and inheritance; the income proxies, particularly educational attainment;

[35] The influence function is estimated using the sample estimate of q_τ and the kernal density estimate of $f_Y(q_\tau)$ using Epanechnikov kernal denisty with a bandwidth of 0.1.

and the control variables) better capture the differential at the top of the distribution than at the bottom of the distribution.

Table 10. Pooled Unconditional Quantile Regressions (RIF regressions) of the Natural Log of Gross Wealth the Primary Coefficients

	(1)	(2)	(3)	(4)	(5)	(6)	(7)
Percentiles:	30	40	50	60	70	80	90
Female	-1.31**	-1.33**	-1.30**	-1.20**	-1.02**	-0.69**	-0.78**
	(0.27)	(0.24)	(0.26)	(0.27)	(0.27)	(0.30)	(0.33)
Father attended senior secondary school or higher	-0.24	-0.35	-0.16	-0.00	0.03	-0.04	-0.52
	(0.27)	(0.24)	(0.21)	(0.30)	(0.35)	(0.28)	(0.38)
Mother owned land	-0.02	0.03	0.10	0.17	0.11	0.13	0.35*
	(0.16)	(0.15)	(0.17)	(0.16)	(0.18)	(0.22)	(0.21)
Father owned land	-0.06	-0.11	-0.19	-0.13	-0.13	0.05	0.05
	(0.18)	(0.19)	(0.20)	(0.19)	(0.20)	(0.19)	(0.25)
Value of inheritance (Reference group: no inheritance)							
1000 GHS or less	1.42**	1.58**	1.70**	1.55**	0.89	-0.28	-0.46
	(0.40)	(0.43)	(0.43)	(0.53)	(0.73)	(0.61)	(0.59)
1000 to 2900 GHS	1.44**	1.84**	2.57**	3.28**	4.60**	1.25	-0.84
	(0.33)	(0.36)	(0.45)	(0.50)	(0.66)	(0.86)	(0.57)
2900 to 8000 GHS	1.49**	1.72**	2.35**	2.99**	4.35**	5.07**	1.60
	(0.31)	(0.30)	(0.38)	(0.53)	(0.59)	(0.91)	(1.33)
More than 8000 GHS	1.23**	1.54**	2.17**	2.84**	4.27**	5.54**	11.39**
	(0.29)	(0.31)	(0.35)	(0.45)	(0.61)	(0.96)	(1.83)
Inherited land or building not captured in inheritance total	0.44	0.00	0.63	1.02**	0.78	0.93	1.57
	(0.38)	(0.48)	(0.54)	(0.50)	(0.72)	(0.67)	(1.20)

Education (Reference group: no education or only preschool)							
Some primary school	0.41	0.02	0.06	0.07	0.46*	0.29	0.32
	(0.33)	(0.27)	(0.21)	(0.22)	(0.27)	(0.24)	(0.34)
Completed primary school	0.81**	0.22	0.44*	0.52**	0.34	0.44	0.14
	(0.32)	(0.26)	(0.26)	(0.23)	(0.31)	(0.33)	(0.32)
Completed junior high school and no more	0.65**	0.31	0.43**	0.64**	0.72**	0.51*	0.56*
	(0.26)	(0.22)	(0.22)	(0.24)	(0.27)	(0.27)	(0.31)
At least some senior secondary school or vocational school	0.99**	0.74**	0.91**	0.84**	0.86**	0.93**	0.86*
	(0.35)	(0.29)	(0.37)	(0.39)	(0.42)	(0.41)	(0.52)
At least some university other post-senior secondary school	0.70	0.59	1.15**	1.22**	1.40**	1.02*	0.78
	(0.47)	(0.45)	(0.46)	(0.49)	(0.55)	(0.57)	(0.77)
Occupation (Reference group: no occupation)							
Professional	0.55	0.77	1.31**	1.44**	1.59**	1.73**	2.14**
	(0.54)	(0.47)	(0.53)	(0.51)	(0.67)	(0.68)	(0.86)
Non-professional sales work	0.87*	0.65	0.76*	0.28	0.01	0.12	-0.24
	(0.47)	(0.40)	(0.40)	(0.41)	(0.40)	(0.33)	(0.42)
Service professions	0.03	0.38	0.92**	0.99**	0.80	1.03**	1.12**
	(0.48)	(0.43)	(0.45)	(0.45)	(0.49)	(0.48)	(0.56)
Agriculture	-0.75**	-0.53	-0.16	-0.25	-0.46	-0.18	-0.30
	(0.38)	(0.35)	(0.34)	(0.32)	(0.34)	(0.24)	(0.39)
Production	-0.17	0.01	0.08	-0.02	-0.29	-0.30	-0.16
	(0.50)	(0.36)	(0.41)	(0.41)	(0.44)	(0.36)	(0.51)
Employment status (Reference group: not engaged in paid labor, which includes students, apprentices, homemakers, those who are engaged in other unpaid work, and those engaged primarily in leisure activities)							
Wage employee	0.77*	-0.04	-0.47	-0.98**	-1.23**	-1.10**	-1.14**
	(0.42)	(0.39)	(0.35)	(0.40)	(0.48)	(0.46)	(0.56)
Self-employed with employees	1.29**	1.24**	1.37**	1.55**	2.06**	2.03**	1.68**
	(0.41)	(0.39)	(0.38)	(0.43)	(0.50)	(0.56)	(0.64)
Self-employed without employees	1.11**	0.76**	0.64**	0.48**	0.46**	0.25	0.23
	(0.29)	(0.27)	(0.27)	(0.24)	(0.21)	(0.21)	(0.26)
Casual or day laborer	-0.40	-1.50	-1.89**	-2.22**	-2.68**	-2.16**	-2.21**
	(1.14)	(0.97)	(0.82)	(0.92)	(0.85)	(0.77)	(0.81)
Age	-0.01	0.04	0.05	0.07**	0.07**	0.05	0.07**
	(0.03)	(0.03)	(0.03)	(0.03)	(0.03)	(0.03)	(0.03)
Age squared	0.00	-0.00	-0.00	-0.00*	-0.00*	-0.00	-0.00*
	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)

Time spent on unpaid household chores (Reference group: no time spent)							
Less than 10 hours per week	-0.35	-0.28	-0.31	-0.23	-0.31	-0.51	-0.77*
	(0.24)	(0.20)	(0.21)	(0.24)	(0.30)	(0.32)	(0.40)
10 to 20 hours per week	-0.59**	-0.37	-0.48**	-0.38	-0.58*	-0.77**	-0.97**
	(0.24)	(0.23)	(0.24)	(0.25)	(0.32)	(0.35)	(0.39)
20 to 30 hours per week	-0.52*	-0.43*	-0.52*	-0.55**	-0.66**	-0.98**	-1.05**
	(0.29)	(0.25)	(0.28)	(0.27)	(0.28)	(0.35)	(0.41)
More than 30 hours per week	-0.34	-0.19	-0.40	-0.69**	-0.62**	-0.89**	-0.90**
	(0.34)	(0.27)	(0.33)	(0.27)	(0.27)	(0.34)	(0.41)
Rural	-0.19	-0.35	-0.34*	-0.47**	-0.66**	-0.57**	-0.67**
	(0.18)	(0.21)	(0.19)	(0.20)	(0.22)	(0.27)	(0.30)
Holds land that that cannot be sold	0.37	0.28	0.38*	0.63**	0.49	0.04	-0.21
	(0.27)	(0.24)	(0.23)	(0.24)	(0.31)	(0.32)	(0.28)
Constant	5.09**	5.09**	4.69**	4.77**	5.15**	6.56**	6.81**
	(0.83)	(0.87)	(0.78)	(0.84)	(0.90)	(0.93)	(1.09)
Observations	1365	1365	1365	1365	1365	1365	1365
R-squared	0.26	0.27	0.30	0.34	0.34	0.34	0.33

Notes: Bootstrapped standard errors (400 repetitions) are in parentheses * p<.10, ** p<.05. Also controlled for region, religion, type of union, spouse does not live in household, previously married, member of at least one social group or organization, ethnicity, number of household members, has children 5 years and younger, has children 6 to 11 years, receives remittances, has debt, and sold an asset or withdrew savings to cope with shock in last five years.

Figures 2 through 6 present the contribution to an individual's wealth of many of the important covariates. The values for Figures 2 to 6 were found by running RIF regressions for every half percentile from 0.30 to 0.90 and using a locally weighted smoothing estimator (lowess) with a bandwidth of 0.2. With the exception of the inheritance variables, the regressors for the initial assets are small and insignificant (Table 10 and Figure 2). Inheritance and past gifts, however, are statistically significant across all the percentiles. It is a substantial component of individuals' wealth in Ghana at the bottom percentiles and associated with an even larger percentage of wealth of individuals at the top of the distribution.

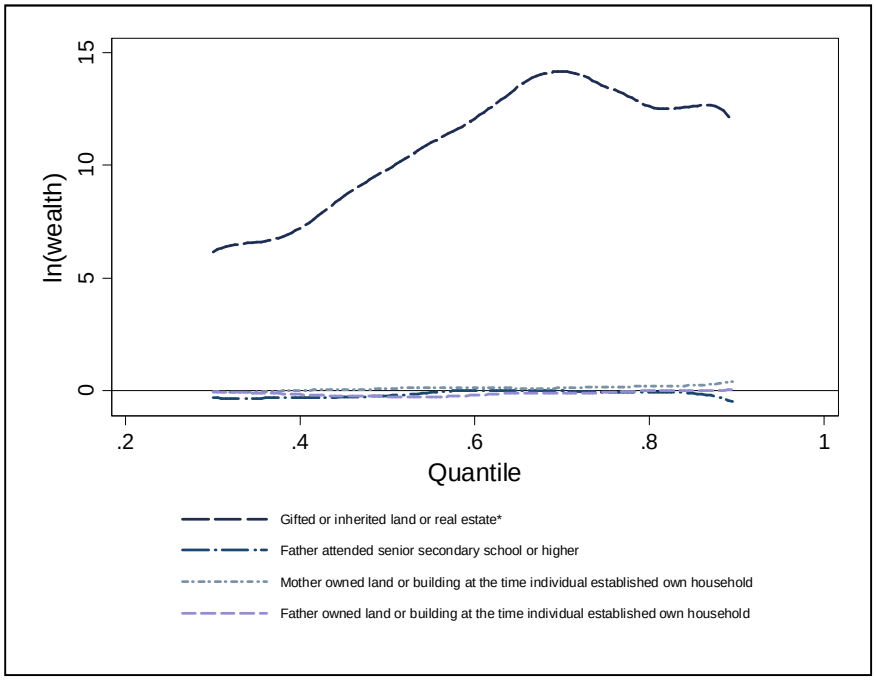
Two of the five education variables are significant across the distribution: completing junior high and attending senior secondary school or vocation school. Completing junior high school is associated with between about 36 to 105 percent greater wealth and attending senior secondary school or vocational school is associated with between about 110 to 169 percent greater wealth than no education, across the distribution. Completing primary school is positive and significant for the lower percentiles (specifically the 30th, 50th, and 60th percentiles). For the 50th to the 80th percentiles, post-secondary education is significant and contributes to one and three-fourths to three times greater wealth than no education. Figure 3 presents the contributions of the education variables across the wealth distribution.

The labor and income variables vary by percentile. Professional positions are positive and significant in the top half of the wealth distribution. Individuals in professional positions in the 50th to 80th percentiles have between about 2.5 to 4.5 times greater wealth than individuals who are not engaged in paid labor. At the 90th percentile, professional positions are associated with 7.5 times greater wealth. Service professions are positive and significant in the 50th, 60th, 80th, and 90th percentiles (Table 10 and Figure 4). Wage employment is significant across the wealth distribution with the exception of the 40th and 50th percentiles. At the 30th percentile, wage employment is associated with greater wealth. However, for the 60th – 90th percentiles, wage employment is associated with less wealth.

Across the distribution, self-employment with employees is positive and significant. Individuals who are self-employed with employees have between 2.5 and 6.5 times more wealth than those who are not engaged in paid labor. Similarly, self-employment without employees is positive and significant from the 30th to the 70th percentiles. It is a substantial component to individuals' wealth in Ghana at the bottom percentiles, but associated with only a small

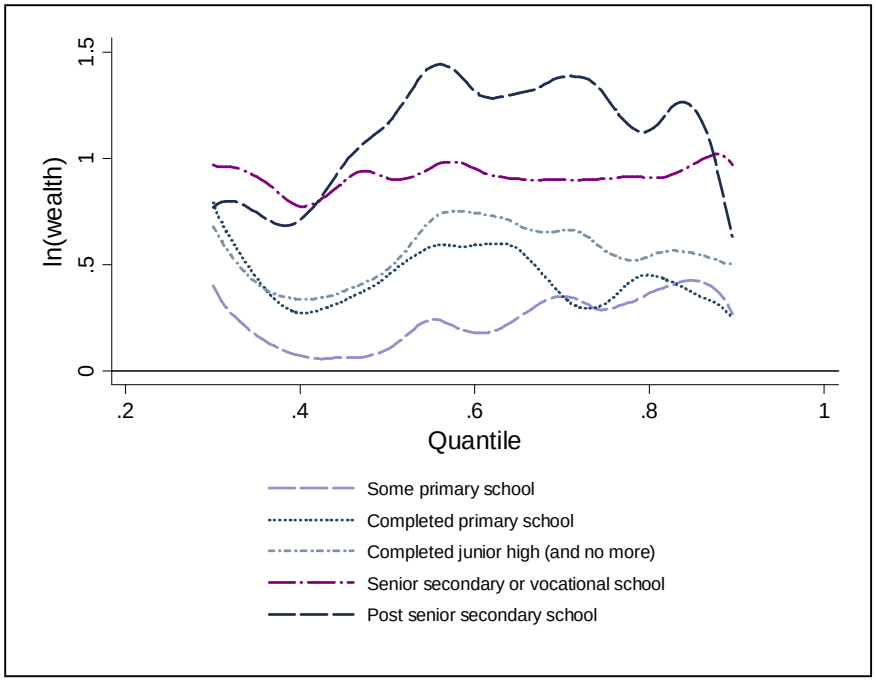
percentage of wealth in the 40th through 70th percentiles. Figures 4 and 5 present the contributions of these variables across the wealth distribution.

Across the distribution, time spent on unpaid labor is significantly associated with wealth. Spending 10 or more hours a week on unpaid household chores is associated with between 63 and 95 percent less wealth than spending no time on unpaid household chores (Table 10). Figure 6 presents the cost of unpaid labor on average wealth accumulation across the distribution. The downward sloping curves suggest the cost is greater in the higher percentiles than the lower percentiles.



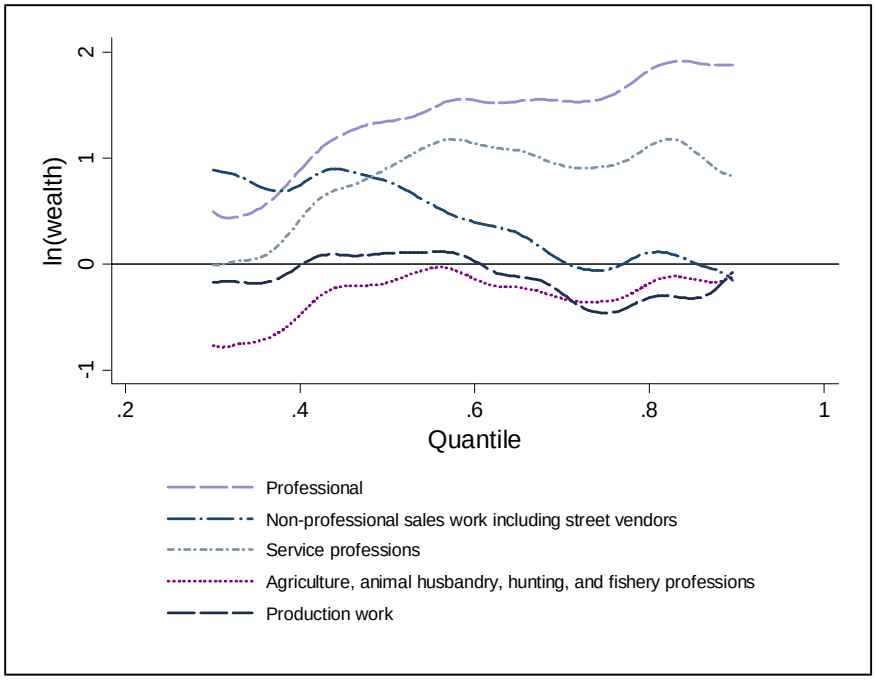
Notes: * The total ln(wealth) premium on gifted or inherited land or real estate is the sum of the coefficient values of gifted or inherited land or real estate of 1000 GHS or less, 1000 to 2900 GHS, 2900 to 8000 GHS, more than 8000 GHS, and inherited land or building not captured in inheritance total. The coefficient values are found by running RIF regressions for every half percentile from 0.30 to 0.90 and using a locally weighted scatterplot smoothing estimator (lowess) with a bandwidth of 0.2.

Figure 2. Unconditional Quantile Regression of the Initial Asset Coefficients



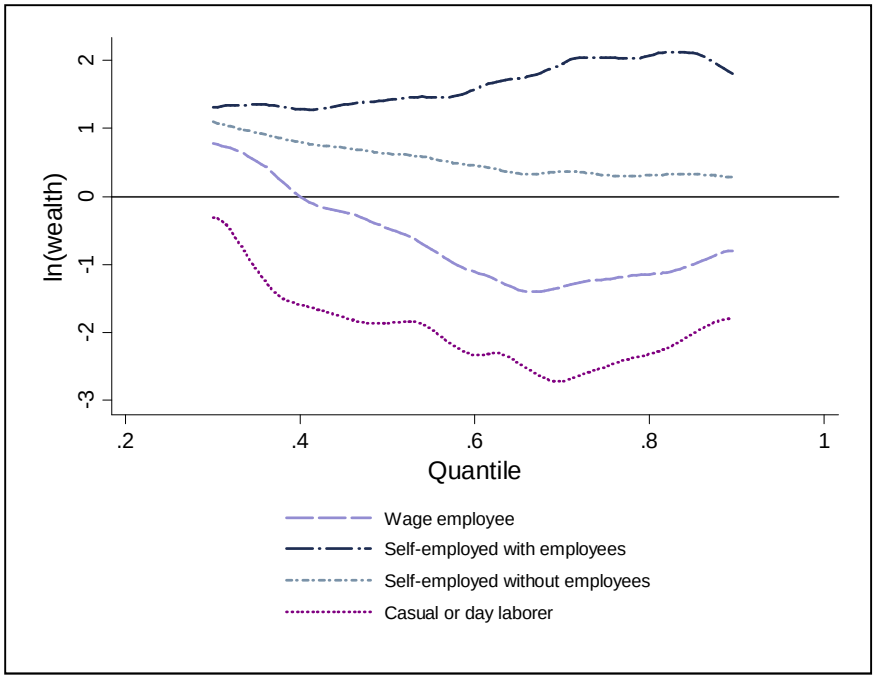
Notes: The reference group is no education or attended only preschool. The coefficient values are found by running RIF regressions for every half percentile from 0.30 to 0.90 and using a locally weighted scatterplot smoothing estimator (lowess) with a bandwidth of 0.2.

Figure 3. Unconditional Quantile Regression of the Education Coefficients



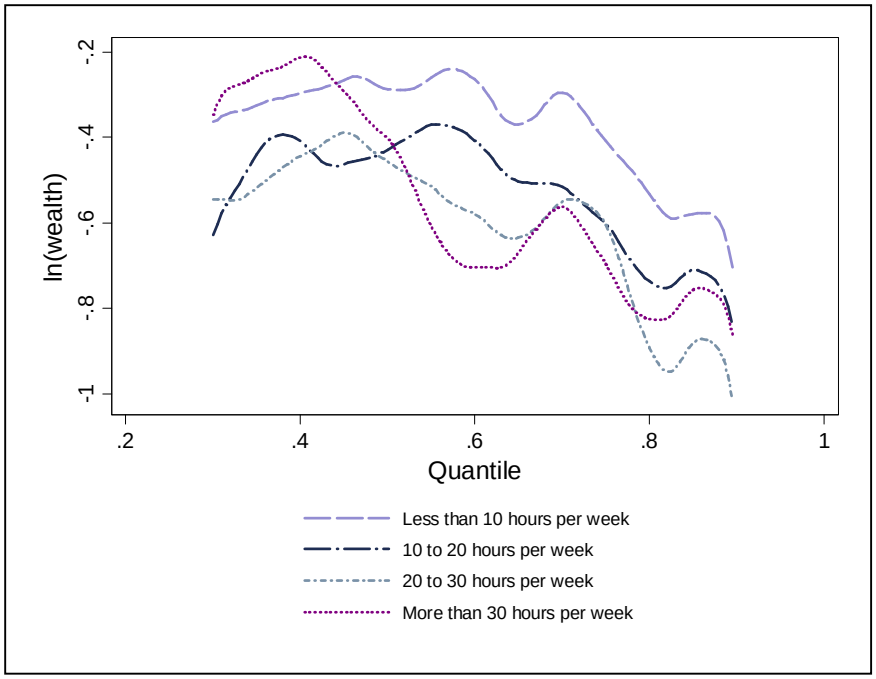
Notes: The reference group is no occupation. The coefficient values are found by running RIF regressions for every half percentile from 0.30 to 0.90 and using a locally weighted scatterplot smoothing estimator (lowess) with a bandwidth of 0.2.

Figure 4. Unconditional Quantile Regression of the Occupation Coefficients



Notes: The reference group is not engaged in paid labor (includes students, apprentices, homemakers, those who are engaged in other unpaid work, and those engaged primarily in leisure activities. The coefficient values are found by running RIF regressions for every half percentile from 0.30 to 0.90 and using a locally weighted scatterplot smoothing estimator (lowess) with a bandwidth of 0.2.

Figure 5. Unconditional Quantile Regression of the Economic Status Coefficients



Notes: Reference group is no time spent. The coefficient values are found by running RIF regressions for every half percentile from 0.30 to 0.90 and using a locally weighted scatterplot smoothing estimator (lowess) with a bandwidth of 0.2.

Figure 6. Unconditional Quantile Regression of Time Spent on Unpaid Household Chores Coefficients

Table 11 presents the results of the Firpo et al. (2007; 2009) decomposition approach using RIF regressions and a detailed Oaxaca-Blinder (1973) decomposition. The RIF regressions results for men and women only are in the appendix. More than a quarter of the log wealth gap is explained and significant for all percentiles (Figure 7). As expected from the female dummy coefficient in the RIF-regressions across the distribution, more of the wealth gap is explained at the top of the distribution than at the bottom.

Recall that the savings and consumption model presented in equations (1) and (2) suggests that wealth at a given point in time is associated with previous asset holdings or initial assets as well as differences in self-acquired wealth. Based on the model, men and women's

differences in gross wealth could be a result of gender differences in previous asset holdings such as assets given based on birthright, which in this study is primarily proxied by inherited or gifted land. The gap may also be due to differences in self-acquired wealth as a result of dissimilarities in investment and labor income earnings over time, which are proxied by educational attainment, economic status, occupation type, age, and hours spent on unpaid household chores.

Figure 8 attributes the contribution of each set of covariates to the explained part of the decomposition. Of the characteristics that are explained, differences in initial endowment (which is primarily differences in inheritance and gifts of land and other real estate) are significant across the distribution and explain a considerable amount of the gap, suggesting that men's greater likelihood than women of receiving inheritance and land gifts contribute considerably to the gender wealth gap in Ghana. At the 80th and 90th percentiles, more than 13 and 16 percent of the total gender wealth gap is explained by differences in initial endowments (primarily inheritance). At the 30th percentile, 11 percent of the gender wealth gap is explained by differences in initial endowments. For the 40th to 70th percentiles, between nine and 10 percent of the gender wealth gap is explained by differences in initial endowment.

A second major contribution to the difference in men and women's wealth is the education gap. Gender differences in educational attainment are significant across the wealth distribution and explain between four and nine percent of the total difference in men and women's wealth endowments. These two findings concurs with Quisumbing et al. (2004) who observe that sons are favored over daughters in both land transfers and educational attainment in cocoa-growing regions of Western Ghana. These results, however, suggest that male favoritism

of inheritance and land gifts as well as education in Ghana is evident across the wealth distribution and is broader than the cocoa-growing regions of Western Ghana.

For the 70th and 80th percentiles, differences in men and women's labor market participation contributes to about 20 percent of the differences in men and women's wealth endowment, a finding similar to the Germany analysis by Sierminska et al. (2010). Sierminska et al. (2010) find that labor market experience and income are the most important factors in explaining the gender wealth gap, particularly at the top half of the distribution. Although the countries are dissimilar in many ways, in both countries men and women engage differently in the labor market due to norms, opportunities, and constraints. In Germany, women are more likely to engage in part-time work than men (ILO 2006). Part-time positions allow women more flexibility in juggling household and caregiving responsibilities, but often the hourly pay is less than full-time positions and career advancement is not an option. In Ghana, women are more likely to run small business enterprises, rather than engage in professional positions, than men as a way to manage their domestic household work, including childcare, while earning income. In both countries, the differences in types of employment result in women accumulating less self-made wealth over time.

Disaggregating labor income further, as expected, I find men's greater likelihood of being in a professional occupation than women contributes to the gender wealth gap across the distribution. On the other hand women's greater likelihood of engaging in non-professional sales work, including street vending has the opposite effect at the 30th, 40th, and 70th percentiles. Additionally, women's greater time spent in unpaid labor than men in the sample contributes to a greater wealth gap, particularly at the top of the wealth distribution. In fact, women's greater time spent in unpaid labor compared to men contributes to more than one-fourth of the explained different in wealth at the 70th and 80th percentiles. Table 12 presents the individual components of the labor income estimates.

Table 11. Quantile Decomposition Results of the Gender Wealth Gap

	(1)	(2)	(3)	(4)	(5)	(6)	(7)
Percentile:	30	40	50	60	70	80	90
Raw ln(wealth) gap	1.69	1.85	1.80	1.84	1.84	1.78	1.59
Raw gross wealth gap (GH¢)	308	620	989	1728	2765	5374	12,226
Raw gross wealth of men (GH¢)	379	736	1185	2055	3285	6458	15,375
Raw gross wealth of women (GH¢)	71	116	196	327	520	1084	3149
Decomposition Method: RIF regression with Oaxaca-Blinder Decomposition							
Men	5.94	6.60	7.08	7.63	8.10	8.77	9.64
	(0.13)	(0.09)	(0.10)	(0.11)	(0.10)	(0.11)	(0.14)
Women	4.26	4.75	5.28	5.79	6.25	6.99	8.05
	(0.09)	(0.11)	(0.10)	(0.08)	(0.09)	(0.13)	(0.16)
Estimated mean RIF ln (wealth) gap:	1.68**	1.85**	1.80**	1.84**	1.85**	1.78**	1.59**
$E[RIF(Y^m;\ q_\tau)\|\boldsymbol{X^m}] - E[RIF(Y^f;\ q_\tau)\|\boldsymbol{X^f}]$	(0.16)	(0.14)	(0.14)	(0.14)	(0.14)	(0.18)	(0.22)
Total explained characteristics	0.61**	0.42**	0.44**	0.45**	0.69**	0.85**	0.85**
	(0.21)	(0.19)	(0.18)	(0.17)	(0.20)	(0.26)	(0.29)
Total unexplained	1.07**	1.43**	1.36**	1.39**	1.15**	0.93**	0.73**
	(0.22)	(0.23)	(0.22)	(0.22)	(0.24)	(0.30)	(0.35)
Explained							
Initial assets	0.18**	0.16**	0.18**	0.18**	0.17**	0.24**	0.26**
	(0.05)	(0.04)	(0.04)	(0.05)	(0.05)	(0.07)	(0.10)
Educational attainment	0.12**	0.11**	0.08**	0.10**	0.13**	0.16**	0.12*
	(0.05)	(0.05)	(0.04)	(0.04)	(0.05)	(0.07)	(0.07)
Labor income	0.23	0.04	0.08	0.13	0.37*	0.38*	0.33
	(0.17)	(0.16)	(0.15)	(0.14)	(0.17)	(0.20)	(0.23)
Control variables	0.07	0.10	0.10	0.04	0.02	0.07	0.15
	(0.08)	(0.07)	(0.07)	(0.07)	(0.07)	(0.09)	(0.11)
Observations	1365	1365	1365	1365	1365	1365	1365

Notes: Bootstrap standard errors (400 replications) in parentheses. * p < 0.10, ** p < 0.05
Initial assets: father attended senior secondary school or higher; mother owned agricultural land, non-agricultural land, or building at the time individual established own household; father owned agricultural land, non-agricultural land, or building at the time individual established own household; value of inheritance (gifted or inherited land or real estate of GH¢1000 or less, gifted or inherited land or real estate of GH¢1000 to 2900, gifted or inherited land or real estate of 2900 to GH¢8000, gifted or inherited land or real estate of more than GH¢8000); inherited land or building not captured in inheritance total.
Labor income: professional occupations; non-professional sales work including street vendors; service professions; agriculture, animal husbandry, hunting, and fishery workers; wage employee; self-employed with employees; self-employed without employees; casual or day laborer; age; age-squared; time spent on unpaid household chores (less than 10 hours per week, 10 to 20 hours per week, 20 to 30 hours per week, more than 30 hours per week)
Education: level of education attained (some primary school, completed primary school, completed junior high school and no more, at least some senior secondary school or vocational school, at least some university, professional training, or other post-senior secondary school)
Control variables: all other coefficients

Table 12. Quantile Decomposition Results of the Labor Income Component of the Gender Wealth Gap

	(1)	(2)	(3)	(4)	(5)	(6)	(7)
Percentile:	30	40	50	60	70	80	90
Labor income	0.23	0.04	0.08	0.13	0.37*	0.38*	0.33
	(0.17)	(0.16)	(0.15)	(0.14)	(0.17)	(0.20)	(0.23)
Professional occupation	0.09**	0.08**	0.06*	0.10**	0.10**	0.10**	0.06
	(0.04)	(0.04)	(0.03)	(0.03)	(0.04)	(0.04)	(0.05)
Non-professional sales work	-0.17**	-0.16*	-0.10	-0.10	-0.12*	-0.11	-0.10
including street vendors	(0.08)	(0.09)	(0.08)	(0.07)	(0.07)	(0.08)	(0.09)
Service professions	0.05*	0.05	0.02	0.05*	0.05**	0.05	0.06*
	(0.03)	(0.03)	(0.03)	(0.03)	(0.03)	(0.03)	(0.04)
Agriculture, animal							
husbandry, hunting, and	-0.02	-0.06	-0.08*	-0.03	-0.01	-0.02	-0.03
fishery workers	(0.05)	(0.05)	(0.04)	(0.03)	(0.03)	(0.04)	(0.04)
Production and manufacturing	0.01	-0.00	-0.01	-0.00	0.00	-0.00	-0.00
occupations	(0.01)	(0.01)	(0.01)	(0.01)	(0.01)	(0.01)	(0.01)
Wage employee	-0.05	-0.09	-0.08	-0.14**	-0.09	-0.09	-0.04
	(0.08)	(0.07)	(0.06)	(0.05)	(0.06)	(0.07)	(0.08)
Self-employment with	0.02	0.02	0.03	0.02	0.03	0.03	0.04
employees	(0.02)	(0.02)	(0.02)	(0.02)	(0.02)	(0.03)	(0.03)
Self-employment without	0.02	0.02	0.02	0.01	0.02	0.02	0.02
employees	(0.02)	(0.02)	(0.02)	(0.01)	(0.02)	(0.02)	(0.02)
Casual or day labor	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	(0.01)	(0.01)	(0.00)	(0.01)	(0.01)	(0.01)	(0.01)
Age	0.10*	0.08	0.06	0.10**	0.11**	0.13**	0.05
	(0.06)	(0.05)	(0.05)	(0.05)	(0.05)	(0.06)	(0.07)
Time spent on unpaid	0.17	0.10	0.16	0.12	0.28**	0.28**	0.26
household chores	(0.13)	(0.11)	(0.11)	(0.10)	(0.11)	(0.13)	(0.16)
Observations	1365	1365	1365	1365	1365	1365	1365

Notes: Bootstrap standard errors (400 replications) in parentheses. * $p < 0.10$, ** $p < 0.05$
Labor income: professional occupations; non-professional sales work including street vendors; service professions; agriculture, animal husbandry, hunting, and fishery workers; wage employee; self-employed with employees; self-employed without employees; casual or day laborer; age; age-squared; time spent on unpaid household chores (less than 10 hours per week, 10 to 20 hours per week, 20 to 30 hours per week, more than 30 hours per week)
Age: age; age-squared
Time spent on unpaid household chores: less than 10 hours per week; 10 to 20 hours per week; 20 to 30 hours per week; more than 30 hours per week

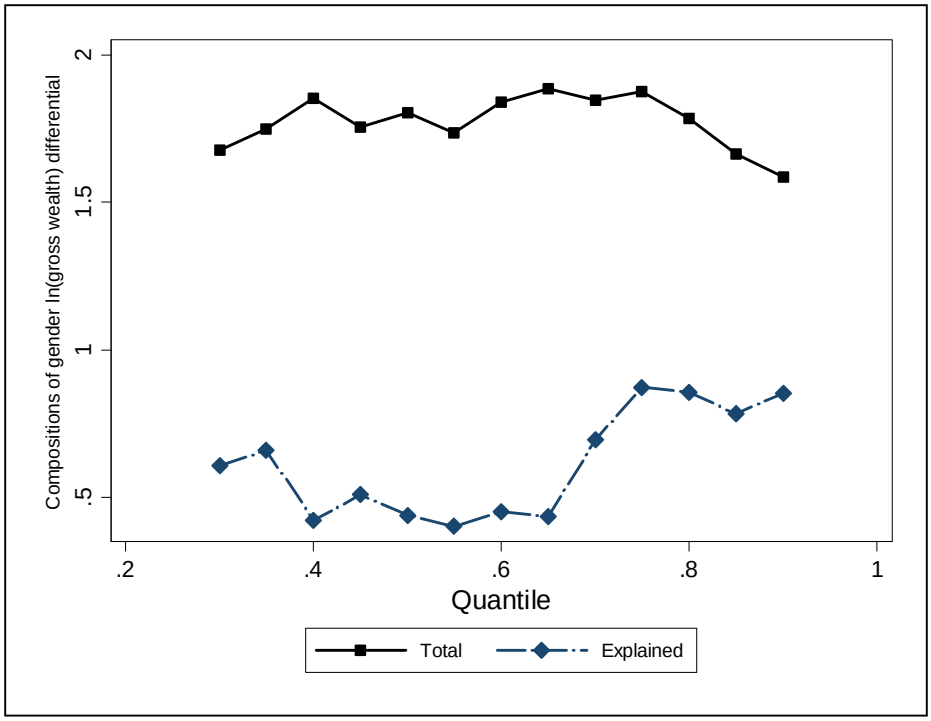


Figure 7. Decomposition of the Total and Explained Effects

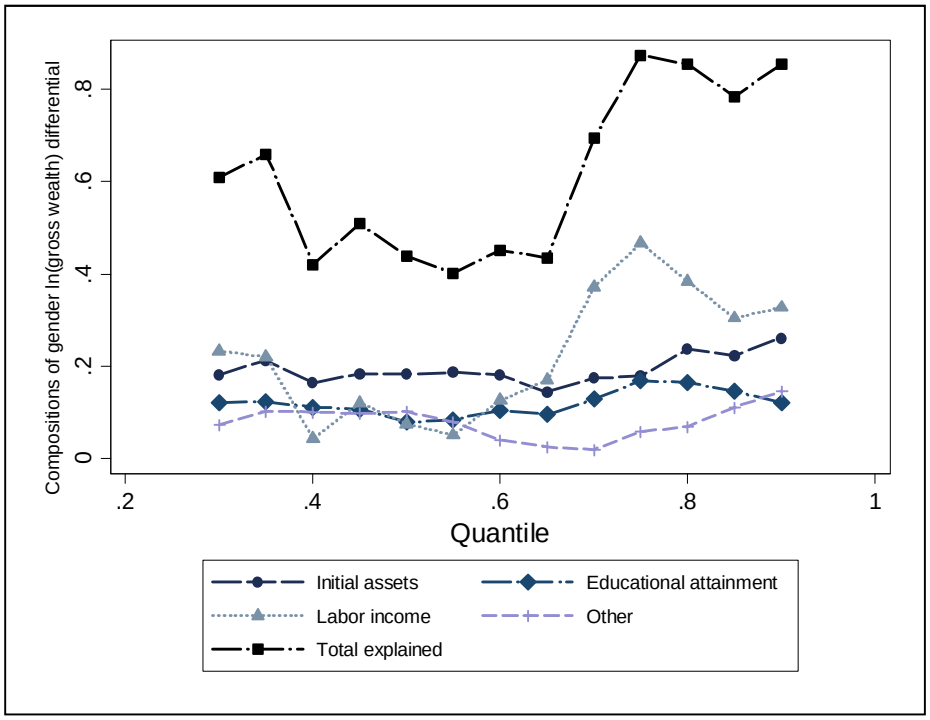


Figure 8. Explained Composition Effects

In addition to the wealth gap being due to gender differences in inheritance and gifts and differences in self-accumulated wealth, the wealth gap may be the result of differences in men and women's consumption and expenditure behavior, liquidity constraints, and differences in certainty in future income. These factors are not easily captured in the data; and their absence may account for the large unexplained part of the wealth gap decomposition. For instance, many of the variables that proxy for consumption (and expenditures patterns) are primarily household level variables and thus the gender differences in responsibilities over expenditures in households in Ghana are not likely fully captured in the explained differences. Instead these differences contribute to the significant unexplained component of the decomposition. Similarly, there are likely systematic gender differences in saving patterns in Ghana due to gender differences in access to formal and informal forms of insurance as a way to cope with shocks, and due to the fact that men and women face different shocks.

Differences in men and women's returns on the assets they inherited, particularly agricultural land, may also account for the unexplained part of the wealth gap. For instance, differences in access to resources and improved technologies as well as differences in knowledge of agricultural production could contribute to mean productivity differences, and thus returns on assets, between men and women farmers (see Quisumbing (1996) for a review of the literature on the relationship between gender and agricultural productivity). The large unexplained part of the wealth gap may also capture differences in men and women's return in education and labor employment due to social discrimination in Ghana.

Conclusion

There is a substantial difference in gross wealth holdings between men and women in Ghana, and the gap is much greater at the top of the distribution than at the bottom. This paper

uses sex-disaggregated asset data to estimate the covariates of the substantial difference in wealth endowments between men and women in Ghana in 2010 across the wealth distribution. A limitation of the data is that it is a cross section rather than a panel set and as such it is difficult to address endogeneity of the coefficients on wealth accumulation. Additional limitations of the data are that wealth data is noisy, and, as with any data set, I had to use a number of proxies and imperfect variables to estimate the covariates of the wealth endowment.

The analysis excluded the value of land holdings that could not be sold in the market, such as family and community land. Since this excludes the majority of land in Ghana and much of this type of land is primarily passed to men, the wealth measure used in this analysis underestimates the wealth gap between men and women, and likely underestimates the extent to which inheritance favoring men is associated with the wealth gap in Ghana. Nonetheless, the study finds that male favoritism in land inheritance and gifts contributes significantly to the gender wealth gap across the wealth distribution. The analysis also finds that male favoritism in education contributes significantly to the gender wealth gap across the wealth distribution and that differences in labor market participation (including differences in time spent in unpaid labor) contributes to about one-fifth of men and women's difference in wealth at the top of the wealth distribution.

While other studies have explored the reasons men and women have differences in particular types of wealth in Ghana and other developing countries, this is the first study of its kind to investigate the composition of differences that play a role in the aggregated wealth gap between men and women within a developing country context. Additionally, it is the first study of its kind to explore the components of the wealth gap between men and women within a developing country context across the wealth distribution. To my knowledge, this study is also

the first to find that differences men and women's in time in unpaid labor contributes to differences in men and women's wealth.

Like other decomposition analyses, this analysis provides useful indications of particular explanations of the wealth gap that need to be explored further. There continues to be an education gap between girls and boys in Ghana, particularly in rural areas. It is worth exploring how policies that encourage school attendance, particularly for girls, could lead to an eventual decrease in the gender wealth gap. Similarly, it is worth further exploring how discrimination in labor markets and in access to agricultural resources contributes to the gender wealth gap in urban and rural areas respectively.

Given that women are more likely than men to own businesses in Ghana and women's greater likelihood of engaging in non-professional sales work including street vending was found to reduce the gender wealth gap, measures that provide women greater access to credit to allow investment in businesses is also worth investigating. Women have limited access to both formal and informal credit sources compared to men (Baden et al. 1994; Duncan 2004). Greater access to credit could ease potential capital constraints women face in investing in their businesses. Credit could allow them to invest in more efficient technologies and thereby increase women's business productivity.

Additionally, women in Ghana are more constrained than men by the amount of time they spend in unpaid labor. Investing in time-saving infrastructure that would allow women to allocate their time elsewhere. For instance, women often have to travel long distances for water.[36] As such, it is worth exploring how investments in infrastructure for easier access to water, for instance, could contribute to reducing women's time in unpaid labor, which in turn

[36] In the Ashanti and Volta regions lived 1-2 miles from potable water access and in Brong Ahafo and Northern regions lived 3-6 miles from potable water access (Duncan 2004).

could lead to greater time investments in other activities. While not easy to implement, policies that change gender norms around men and women's responsibility over unpaid labor so that amount to time spent in unpaid labor is more equal could also help level the playing field between men and women in terms of self-acquired wealth accumulation in the long run.

Finally, polices that addressed the unequal land inheritance norms and/or changed the norms and legal framework around the marital regimes to a common law property framework, would help address overall inequality of aggregate wealth between married men and women in Ghana.

Appendix

Debt

To calculate the debt from agricultural land and real estate, I assume the owners of the asset are responsible for the debt, as the survey does not ask who is responsible for the loan. This is a reasonable assumption in Ghana because individuals have a clear understanding of separation of property, individuals within the household manage finances separately, and husbands and wives do not tend to shoulder debt together. For individuals who have taken out loans for their businesses since they acquired their business, the survey contains information on the amount outstanding on the loan and the names on the loan. Few business loans are jointly held; of those that are joint, I divide the debt evenly among the individuals. If a business was purchased with a loan, I assume this loan is captured in the value of all other debt. In addition to business loans, all other debt includes loans taken out for educational purposes, agricultural machinery, food, rent, travelling, as well as for the purchase of agricultural inputs. Table 12 summarizes the debt held by partnered men and women in Ghana in the sample.

Table 13. Debt

	Percent of sample (%)	Percent of women (%)	Positive Mean (GH¢)
Debt on place of residence	0.1	0.1	1500.0 (707.12)
Debt on other real estate	0.5	0.3	546.4 (677.68)
Debt on agricultural land	0.3	0.0	50.0 (46.90)
Debt on businesses (other than a loan for startup)	1.8	2.1	1835.7 (5103.74)
Other debt*	5.7	4.9	415.0 (1298.17)
Total debt	7.9	6.9	772.7 (2681.62)

Notes: Statistics are unweighted. Standard deviations are in parenthesis. * Other debt includes loans taken out for educational purposes, agricultural machinery, food, rent, travelling, loans to startup businesses, as well as for the purchase of agricultural inputs.

Table 14. Pooled Unconditional Quantile Regression (RIF Regression) Coefficients

Dependent variable: Natural Log of Gross Wealth	(1)	(2)	(3)	(4)	(5)	(6)	(7)
Percentiles:	30	40	50	60	70	80	90
Female	-1.31**	-1.33**	-1.30**	-1.20**	-1.02**	-0.69**	-0.78**
	(0.27)	(0.24)	(0.26)	(0.27)	(0.27)	(0.30)	(0.33)
Father attended senior secondary school or higher	-0.24	-0.35	-0.16	-0.00	0.03	-0.04	-0.52
	(0.27)	(0.24)	(0.21)	(0.30)	(0.35)	(0.28)	(0.38)
Mother owned land	-0.02	0.03	0.10	0.17	0.11	0.13	0.35*
	(0.16)	(0.15)	(0.17)	(0.16)	(0.18)	(0.22)	(0.21)
Father owned land	-0.06	-0.11	-0.19	-0.13	-0.13	0.05	0.05
	(0.18)	(0.19)	(0.20)	(0.19)	(0.20)	(0.19)	(0.25)
Value of inheritance							
Reference group: no inheritance							
1000 GHS or less	1.42**	1.58**	1.70**	1.55**	0.89	-0.28	-0.46
	(0.40)	(0.43)	(0.43)	(0.53)	(0.73)	(0.61)	(0.59)
1000 to 2900 GHS	1.44**	1.84**	2.57**	3.28**	4.60**	1.25	-0.84
	(0.33)	(0.36)	(0.45)	(0.50)	(0.66)	(0.86)	(0.57)
2900 to 8000 GHS	1.49**	1.72**	2.35**	2.99**	4.35**	5.07**	1.60
	(0.31)	(0.30)	(0.38)	(0.53)	(0.59)	(0.91)	(1.33)
more than 8000 GHS	1.23**	1.54**	2.17**	2.84**	4.27**	5.54**	11.39**
	(0.29)	(0.31)	(0.35)	(0.45)	(0.61)	(0.96)	(1.83)
Inherited land or building not captured in inheritance total	0.44	0.00	0.63	1.02**	0.78	0.93	1.57
	(0.38)	(0.48)	(0.54)	(0.50)	(0.72)	(0.67)	(1.20)
Education							
Reference group: no education or only preschool							
Some primary school	0.41	0.02	0.06	0.07	0.46*	0.29	0.32
	(0.33)	(0.27)	(0.21)	(0.22)	(0.27)	(0.24)	(0.34)
Completed primary school	0.81**	0.22	0.44*	0.52**	0.34	0.44	0.14
	(0.32)	(0.26)	(0.26)	(0.23)	(0.31)	(0.33)	(0.32)
Completed junior high school and no more	0.65**	0.31	0.43**	0.64**	0.72**	0.51*	0.56*
	(0.26)	(0.22)	(0.22)	(0.24)	(0.27)	(0.27)	(0.31)
At least some senior secondary school or vocational school	0.99**	0.74**	0.91**	0.84**	0.86**	0.93**	0.86*
	(0.35)	(0.29)	(0.37)	(0.39)	(0.42)	(0.41)	(0.52)
Post-senior secondary school	0.70	0.59	1.15**	1.22**	1.40**	1.02*	0.78
	(0.47)	(0.45)	(0.46)	(0.49)	(0.55)	(0.57)	(0.77)

Occupation							
Reference group: no occupation							
Professional occupations	0.55	0.77	1.31**	1.44**	1.59**	1.73**	2.14**
	(0.54)	(0.47)	(0.53)	(0.51)	(0.67)	(0.68)	(0.86)
Non-professional sales work	0.87*	0.65	0.76*	0.28	0.01	0.12	-0.24
	(0.47)	(0.40)	(0.40)	(0.41)	(0.40)	(0.33)	(0.42)
Service professions	0.03	0.38	0.92**	0.99**	0.80	1.03**	1.12**
	(0.48)	(0.43)	(0.45)	(0.45)	(0.49)	(0.48)	(0.56)
Agriculture	-0.75**	-0.53	-0.16	-0.25	-0.46	-0.18	-0.30
	(0.38)	(0.35)	(0.34)	(0.32)	(0.34)	(0.24)	(0.39)
Manufacturing and production	-0.17	0.01	0.08	-0.02	-0.29	-0.30	-0.16
	(0.50)	(0.36)	(0.41)	(0.41)	(0.44)	(0.36)	(0.51)
Employment status							
Reference group: not engaged in paid labor (includes students, apprentices, homemakers, those who are engaged in other unpaid work, and those engaged primarily in leisure activities)							
Wage employee	0.77*	-0.04	-0.47	-0.98**	-1.23**	-1.10**	-1.14**
	(0.42)	(0.39)	(0.35)	(0.40)	(0.48)	(0.46)	(0.56)
Self-employed with employees	1.29**	1.24**	1.37**	1.55**	2.06**	2.03**	1.68**
	(0.41)	(0.39)	(0.38)	(0.43)	(0.50)	(0.56)	(0.64)
Self-employed without employees	1.11**	0.76**	0.64**	0.48**	0.46**	0.25	0.23
	(0.29)	(0.27)	(0.27)	(0.24)	(0.21)	(0.21)	(0.26)
Casual or day laborer	-0.40	-1.50	-1.89**	-2.22**	-2.68**	-2.16**	-2.21**
	(1.14)	(0.97)	(0.82)	(0.92)	(0.85)	(0.77)	(0.81)
Age	-0.01	0.04	0.05	0.07**	0.07**	0.05	0.07**
	(0.03)	(0.03)	(0.03)	(0.03)	(0.03)	(0.03)	(0.03)
Age squared	0.00	-0.00	-0.00	-0.00*	-0.00*	-0.00	-0.00*
	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)
Time spent on unpaid household chores							
Reference group: no time spent							
Less than 10 hours per week	-0.35	-0.28	-0.31	-0.23	-0.31	-0.51	-0.77*
	(0.24)	(0.20)	(0.21)	(0.24)	(0.30)	(0.32)	(0.40)
10 to 20 hours per week	-0.59**	-0.37	-0.48**	-0.38	-0.58*	-0.77**	-0.97**
	(0.24)	(0.23)	(0.24)	(0.25)	(0.32)	(0.35)	(0.39)
20 to 30 hours per week	-0.52*	-0.43*	-0.52*	-0.55**	-0.66**	-0.98**	-1.05**
	(0.29)	(0.25)	(0.28)	(0.27)	(0.28)	(0.35)	(0.41)
More than 30 hours per week	-0.34	-0.19	-0.40	-0.69**	-0.62**	-0.89**	-0.90**
	(0.34)	(0.27)	(0.33)	(0.27)	(0.27)	(0.34)	(0.41)

Region							
Reference group: Western							
Central	-0.32	-0.18	-0.08	-0.36	0.32	0.40	0.29
	(0.33)	(0.32)	(0.36)	(0.33)	(0.39)	(0.45)	(0.35)
Greater Accra	-0.60	-0.69*	-0.63	-1.05**	-0.68	-0.77	-0.40
	(0.43)	(0.41)	(0.43)	(0.46)	(0.45)	(0.52)	(0.50)
Volta	-1.06**	-0.78*	-0.67	-1.02**	-0.81	-0.41	-0.02
	(0.46)	(0.41)	(0.43)	(0.41)	(0.51)	(0.49)	(0.47)
Eastern	-0.44	-0.49	-0.37	-0.61*	-0.00	0.29	-0.12
	(0.38)	(0.36)	(0.35)	(0.36)	(0.37)	(0.43)	(0.42)
Ashanti	-0.57*	-0.45	-0.69**	-0.66**	-0.27	-0.22	-0.18
	(0.30)	(0.29)	(0.32)	(0.33)	(0.30)	(0.35)	(0.38)
Brong Ahafo	-0.39	-0.45	-0.51*	-0.87**	-0.43	-0.33	-0.22
	(0.37)	(0.31)	(0.30)	(0.29)	(0.32)	(0.39)	(0.41)
Northern	-0.72*	-0.66*	-0.59	-0.91**	-0.94**	-0.83*	-1.06*
	(0.38)	(0.38)	(0.40)	(0.44)	(0.44)	(0.50)	(0.54)
Upper East	-0.70	-0.61	-0.45	-0.77	-0.77	-0.26	-0.21
	(0.54)	(0.45)	(0.50)	(0.50)	(0.49)	(0.49)	(0.53)
Upper West	-1.21**	-0.80*	-0.67*	-1.09**	-0.87*	-0.11	0.64
	(0.55)	(0.42)	(0.37)	(0.47)	(0.50)	(0.54)	(0.62)
Religion							
Reference group: Christian							
Muslim	-0.19	0.10	0.39	0.73**	1.00**	1.14**	1.17**
	(0.27)	(0.25)	(0.29)	(0.28)	(0.32)	(0.32)	(0.47)
Traditional	-0.60	-0.63*	-0.62	-0.19	0.31	-0.20	-0.50
	(0.43)	(0.38)	(0.39)	(0.35)	(0.44)	(0.33)	(0.40)
Other	-0.39	-0.09	0.35	0.87**	0.69	0.39	0.72
	(0.44)	(0.35)	(0.35)	(0.40)	(0.53)	(0.47)	(0.68)
Type of union							
Reference group: monogamous union							
Consensual union	-0.41*	-0.50**	-0.22	-0.06	-0.13	-0.48**	-0.30
	(0.23)	(0.24)	(0.23)	(0.21)	(0.23)	(0.21)	(0.26)
Polygamous union	0.32	0.66**	0.44*	0.31	0.41	0.26	-0.12
	(0.26)	(0.28)	(0.25)	(0.27)	(0.30)	(0.28)	(0.39)
Spouse does not live in household	0.34	0.10	0.12	0.15	0.14	0.03	0.19
	(0.23)	(0.19)	(0.24)	(0.21)	(0.21)	(0.21)	(0.28)
Previously married	-0.13	-0.03	0.07	0.19	0.37*	0.47**	0.65**
	(0.17)	(0.15)	(0.16)	(0.17)	(0.20)	(0.23)	(0.24)
Member of at least one social group or organization	0.46**	0.51**	0.38**	0.43**	0.45**	0.35*	0.29
	(0.17)	(0.17)	(0.16)	(0.16)	(0.18)	(0.18)	(0.20)

Ethnicity							
Reference group: Akan							
Ewe	0.03	0.04	0.15	0.33	0.12	-0.15	-0.33
	(0.33)	(0.33)	(0.33)	(0.35)	(0.39)	(0.39)	(0.39)
Ga	0.62**	0.90**	0.86**	0.55	0.10	0.15	0.21
	(0.29)	(0.37)	(0.36)	(0.38)	(0.38)	(0.41)	(0.45)
Gurma	-0.01	-0.02	0.19	0.25	0.49	0.34	0.47
	(0.42)	(0.35)	(0.36)	(0.36)	(0.43)	(0.36)	(0.50)
Grusi / Mande	0.49	0.48	0.32	0.48	0.31	-0.37	-0.55
	(0.38)	(0.41)	(0.36)	(0.37)	(0.44)	(0.40)	(0.50)
Mole Dagbani	0.17	-0.30	-0.11	-0.29	0.00	-0.51	-0.41
	(0.40)	(0.27)	(0.31)	(0.35)	(0.38)	(0.40)	(0.48)
Other	-0.01	-0.37	-0.28	-0.46	-0.39	-0.53	-0.86**
	(0.33)	(0.30)	(0.35)	(0.36)	(0.41)	(0.44)	(0.43)
Rural	-0.19	-0.35	-0.34*	-0.47**	-0.66**	-0.57**	-0.67**
	(0.18)	(0.21)	(0.19)	(0.20)	(0.22)	(0.27)	(0.30)
Number of all household members	0.04	0.03	0.05	0.10**	0.12**	0.06	0.15**
	(0.04)	(0.04)	(0.04)	(0.04)	(0.05)	(0.05)	(0.06)
Has children 5 years or younger	-0.13	-0.17	-0.08	-0.03	-0.10	0.12	0.07
	(0.19)	(0.20)	(0.19)	(0.18)	(0.21)	(0.23)	(0.31)
Has children ages 6 to 11 years	-0.00	-0.05	-0.14	-0.08	-0.16	-0.01	0.23
	(0.19)	(0.16)	(0.17)	(0.15)	(0.18)	(0.18)	(0.23)
Receives remittances	0.03	0.04	-0.00	0.11	0.05	0.10	0.37
	(0.20)	(0.19)	(0.19)	(0.17)	(0.22)	(0.21)	(0.26)
Has debt	0.18	0.41	0.58**	0.61**	0.85**	0.69**	1.07**
	(0.24)	(0.25)	(0.27)	(0.30)	(0.33)	(0.35)	(0.45)
Holds land that that cannot be sold	0.37	0.28	0.38*	0.63**	0.49	0.04	-0.21
	(0.27)	(0.24)	(0.23)	(0.24)	(0.31)	(0.32)	(0.28)
Sold an asset or withdrew savings to cope with shock	0.10	0.23	0.36*	0.32	0.17	0.13	-0.43**
	(0.19)	(0.19)	(0.20)	(0.22)	(0.25)	(0.25)	(0.22)
Constant	5.09**	5.09**	4.69**	4.77**	5.15**	6.56**	6.81**
	(0.83)	(0.87)	(0.78)	(0.84)	(0.90)	(0.93)	(1.09)
Observations	1365	1365	1365	1365	1365	1365	1365
R-squared	0.26	0.27	0.30	0.34	0.34	0.34	0.33

Notes: Bootstrapped standard errors (400 repetitions) are in parentheses * p<.10, ** p<.05

Table 15. Unconditional quantile regression (RIF regression) coefficients (Men)

Dependent variable:	(1)	(2)	(3)	(4)	(5)	(6)	(7)
Natural Log of Gross Wealth Percentiles:	30	40	50	60	70	80	90
Father attended senior secondary school or higher	-0.90**	-0.19	-0.39	-0.47	-0.21	0.18	-0.47
	(0.40)	(0.34)	(0.41)	(0.39)	(0.43)	(0.54)	(0.63)
Mother owned agricultural land, non-agricultural land, or building at the time individual established own household	0.11	0.05	0.02	0.07	0.01	0.20	0.23
	(0.27)	(0.19)	(0.20)	(0.23)	(0.21)	(0.22)	(0.30)
Father owned agricultural land, non-agricultural land, or building at the time individual established own household	-0.31	-0.29	-0.22	-0.28	-0.14	-0.24	-0.03
	(0.26)	(0.27)	(0.27)	(0.34)	(0.27)	(0.30)	(0.33)
Value of inheritance							
Reference group: no inheritance							
Gifted or inherited land or real estate of 1000 GHS or less	1.60**	0.61	-0.17	-0.53	-0.64	-0.36	-0.32
	(0.47)	(0.62)	(0.67)	(0.53)	(0.43)	(0.40)	(0.57)
Gifted or inherited land or real estate of 1000 to 2900 GHS	2.88**	1.97**	2.76**	2.80**	0.71	0.03	-0.93*
	(0.49)	(0.53)	(0.56)	(1.04)	(0.86)	(0.62)	(0.52)
Gifted or inherited land or real estate of 2900 to 8000 GHS	2.11**	1.63**	2.29**	2.99**	3.28**	2.18**	0.49
	(0.53)	(0.54)	(0.52)	(0.73)	(0.73)	(1.02)	(1.04)
Gifted or inherited land or real estate of more than 8000 GHS	2.03**	1.67**	2.44**	3.01**	3.63**	5.46**	8.32**
	(0.59)	(0.48)	(0.49)	(0.77)	(0.69)	(0.93)	(2.54)
Inherited land or building not captured in inheritance total	0.77	0.75	0.81	0.59	0.96	1.29**	0.33
	(0.56)	(0.49)	(0.53)	(0.64)	(0.60)	(0.65)	(0.91)

Education							
Reference group: no education or only preschool							
Some primary school	-0.23	-0.07	-0.04	0.15	0.32	0.67	0.07
	(0.45)	(0.39)	(0.35)	(0.38)	(0.44)	(0.45)	(0.54)
Completed primary school	-0.10	-0.00	0.22	0.19	0.57	0.56	-0.07
	(0.48)	(0.44)	(0.39)	(0.42)	(0.42)	(0.36)	(0.53)
Completed junior high school and no more	-0.11	0.06	-0.00	0.34	0.46	0.56	-0.14
	(0.37)	(0.32)	(0.27)	(0.31)	(0.36)	(0.35)	(0.40)
At least some senior secondary school or vocational school	0.68	-0.01	0.03	0.26	0.48	0.60	-0.33
	(0.57)	(0.42)	(0.40)	(0.47)	(0.49)	(0.58)	(0.52)
At least some university, professional training, or other post-senior secondary school	0.79	0.67	0.63	0.76	0.62	0.37	0.51
	(0.68)	(0.58)	(0.49)	(0.60)	(0.66)	(0.57)	(0.87)
Occupation							
Reference group: no occupation							
Professional occupations	0.73	0.83	0.78	-0.22	1.05	1.60	1.45
	(1.28)	(1.09)	(1.21)	(1.29)	(1.13)	(1.29)	(2.24)
Non-professional sales work	-0.74	-0.91	-0.88	-1.93	-0.45	-0.14	0.96
including street vendors	(1.30)	(1.06)	(1.21)	(1.42)	(1.15)	(1.29)	(2.09)
Service professions	0.40	0.76	0.45	-0.70	0.37	0.45	1.21
	(1.34)	(1.09)	(1.20)	(1.27)	(1.10)	(1.22)	(2.02)
Agriculture, animal husbandry, hunting, and fishery workers	-0.96	-0.45	-0.75	-1.98	-0.53	-0.33	0.62
	(1.25)	(1.02)	(1.07)	(1.30)	(0.96)	(1.10)	(1.95)
Production	-0.49	-0.30	-0.63	-2.14	-0.58	-0.11	1.07
	(1.33)	(1.11)	(1.18)	(1.37)	(1.09)	(1.19)	(2.08)
Employment status							
Reference group: not engaged in paid labor (includes students, apprentices, homemakers, those who are engaged in other unpaid work, and those engaged primarily in leisure activities)							
Wage employee	0.04	-0.97	-1.20	0.13	-0.51	-0.21	-0.69
	(1.17)	(0.97)	(1.16)	(1.04)	(0.92)	(1.04)	(2.07)
Self-employed with employees	1.94	0.96	1.42	2.94**	1.67*	1.78	0.49
	(1.21)	(1.01)	(1.02)	(1.25)	(0.98)	(1.11)	(2.14)
Self-employed without employees	1.11	0.24	0.16	1.50	0.63	0.63	-0.22
	(1.16)	(0.93)	(1.04)	(1.11)	(0.83)	(1.00)	(1.94)
Casual or day laborer	-2.97	-1.72	-1.68	-1.45	-2.03	-1.84	-1.90
	(2.23)	(1.74)	(1.61)	(1.49)	(1.39)	(1.45)	(2.59)

Age	0.07	0.06	0.06	0.08*	0.06	0.08**	0.03
	(0.05)	(0.04)	(0.04)	(0.04)	(0.04)	(0.03)	(0.05)
Age squared	-0.00	-0.00	-0.00	-0.00	-0.00	-0.00**	-0.00
	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)
Time spent on unpaid household chores							
Reference group: no time spent							
Less than 10 hours per week	-0.18	-0.11	-0.26	-0.25	-0.40	-0.30	-0.29
	(0.29)	(0.22)	(0.24)	(0.26)	(0.26)	(0.29)	(0.37)
10 to 20 hours per week	-0.18	0.01	-0.18	-0.25	-0.47	-0.46*	-0.20
	(0.37)	(0.29)	(0.28)	(0.28)	(0.31)	(0.27)	(0.39)
20 to 30 hours per week	-0.45	-0.20	0.07	-0.10	-0.65*	-0.34	-0.18
	(0.51)	(0.41)	(0.35)	(0.42)	(0.35)	(0.41)	(0.51)
More than 30 hours per week	0.15	-0.18	-0.77	-0.39	-1.08*	-0.49	-0.29
	(1.02)	(0.85)	(0.65)	(0.61)	(0.55)	(0.68)	(0.97)
Region							
Reference group: Western							
Central	-0.68	-0.66	-0.17	0.41	0.44	0.53	0.73
	(0.50)	(0.50)	(0.47)	(0.48)	(0.50)	(0.44)	(0.70)
Greater Accra	-2.16**	-1.38**	-1.29**	-0.92	-0.67	-0.48	0.30
	(0.72)	(0.60)	(0.60)	(0.72)	(0.62)	(0.55)	(0.77)
Volta	-2.14**	-1.51**	-0.83	-0.54	-0.35	0.11	0.08
	(0.68)	(0.64)	(0.59)	(0.73)	(0.45)	(0.47)	(0.66)
Eastern	-1.11	-0.90**	-0.75	-0.39	0.11	0.13	-0.42
	(0.68)	(0.43)	(0.48)	(0.54)	(0.53)	(0.48)	(0.64)
Ashanti	-1.36**	-0.97**	-0.71	-0.46	-0.19	-0.16	0.04
	(0.56)	(0.41)	(0.52)	(0.54)	(0.40)	(0.37)	(0.53)
Brong Ahafo	-1.43**	-0.93*	-0.60	-0.45	-0.20	0.18	-0.51
	(0.49)	(0.49)	(0.46)	(0.45)	(0.40)	(0.41)	(0.46)
Northern	-1.39**	-1.25**	-1.16*	-1.21	-0.85	-0.35	-0.73
	(0.63)	(0.62)	(0.60)	(0.84)	(0.55)	(0.67)	(0.72)
Upper East	-0.99	-1.28*	-1.19*	-0.92	0.05	0.48	0.30
	(0.76)	(0.68)	(0.65)	(0.86)	(0.64)	(0.66)	(0.72)
Upper West	-1.94**	-1.59**	-1.37**	-1.20	0.14	1.02	0.62
	(0.74)	(0.59)	(0.64)	(0.89)	(0.58)	(0.75)	(1.02)
Religion							
Reference group: Christian							
Muslim	0.41	0.61*	0.70*	1.09**	1.26**	1.25**	0.83
	(0.36)	(0.33)	(0.41)	(0.43)	(0.43)	(0.41)	(0.64)
Traditional	-1.30*	-0.32	0.19	0.43	-0.10	-0.24	-0.06
	(0.67)	(0.52)	(0.52)	(0.55)	(0.39)	(0.48)	(0.62)
Other	0.56	0.62	0.24	0.65	0.13	0.01	-0.20
	(0.50)	(0.47)	(0.44)	(0.60)	(0.47)	(0.49)	(0.58)

Type of union							
Reference group: monogamous union							
Consensual union	0.01	0.02	-0.02	-0.03	-0.45	-0.73**	-0.23
	(0.37)	(0.26)	(0.34)	(0.32)	(0.39)	(0.33)	(0.41)
Polygamous union	1.60**	0.74*	0.60	0.41	0.67	0.49	-0.19
	(0.45)	(0.38)	(0.45)	(0.40)	(0.41)	(0.56)	(0.75)
Spouse does not live in household	0.23	0.17	0.09	0.18	0.04	0.31	-0.21
	(0.39)	(0.29)	(0.30)	(0.29)	(0.24)	(0.30)	(0.42)
Previously married	0.07	0.03	0.23	0.18	0.40	0.48*	0.39
	(0.30)	(0.20)	(0.24)	(0.22)	(0.24)	(0.28)	(0.33)
Member of at least one social group or organization	0.83**	0.54**	0.50**	0.32	0.26	0.11	0.51*
	(0.28)	(0.23)	(0.21)	(0.22)	(0.25)	(0.24)	(0.30)
Ethnicity							
Reference group: Akan							
Ewe	0.84*	0.47	0.25	0.10	-0.26	-0.75*	-0.38
	(0.48)	(0.51)	(0.43)	(0.47)	(0.49)	(0.42)	(0.61)
Ga	1.31**	0.45	0.54	0.42	0.20	0.47	0.63
	(0.52)	(0.51)	(0.45)	(0.48)	(0.42)	(0.45)	(0.62)
Gurma	0.81	0.61	0.60	0.49	0.19	-0.08	0.21
	(0.67)	(0.52)	(0.56)	(0.55)	(0.52)	(0.54)	(0.65)
Grusi / Mande	0.86	0.54	0.47	-0.38	-0.57	-0.81	-0.71
	(0.70)	(0.51)	(0.57)	(0.65)	(0.55)	(0.52)	(0.62)
Mole Dagbani	0.73	0.14	0.38	0.44	-0.51	-0.80	-0.09
	(0.53)	(0.48)	(0.52)	(0.63)	(0.48)	(0.54)	(0.66)
Other	0.33	-0.08	-0.17	-0.07	-0.82	-0.82	-0.68
	(0.58)	(0.47)	(0.44)	(0.53)	(0.56)	(0.51)	(0.69)
Rural	-0.65*	-0.6**	-0.82**	-0.9**	-0.8**	-0.59*	-0.33
	(0.33)	(0.26)	(0.31)	(0.35)	(0.34)	(0.35)	(0.51)
Number of all household members	0.08	0.09	0.11**	0.12*	0.08	0.15**	0.16
	(0.07)	(0.05)	(0.05)	(0.07)	(0.06)	(0.07)	(0.12)
Has children 5 years or younger	0.06	0.26	0.02	0.26	0.12	0.25	-0.64
	(0.29)	(0.25)	(0.26)	(0.29)	(0.24)	(0.27)	(0.48)
Has children ages 6 to 11 years	-0.34	-0.21	-0.17	-0.29	-0.15	-0.00	0.11
	(0.26)	(0.24)	(0.25)	(0.26)	(0.29)	(0.25)	(0.33)
Receives remittances	-0.27	0.08	0.11	0.21	0.41	0.74**	0.56
	(0.36)	(0.28)	(0.30)	(0.31)	(0.33)	(0.36)	(0.41)
Has debt	1.13**	0.59*	0.80**	1.01**	0.53	0.61	0.45
	(0.38)	(0.32)	(0.40)	(0.43)	(0.34)	(0.43)	(0.56)
Holds land that that cannot be sold. (There is no market or it is family or community land.)	-0.11	0.24	0.28	-0.12	-0.26	-0.36	-0.50
	(0.34)	(0.24)	(0.27)	(0.28)	(0.29)	(0.29)	(0.33)

Sold an asset or withdrew savings to cope with shock in last five years	0.22 (0.32)	0.32 (0.26)	0.49* (0.29)	0.17 (0.29)	0.15 (0.29)	-0.24 (0.28)	-0.51 (0.33)
Constant	3.76** (1.46)	5.20** (1.28)	5.89** (1.13)	5.42** (1.14)	6.27** (1.24)	5.18** (1.19)	7.97** (1.55)
Observations	665	665	665	665	665	665	665
R-squared	0.19	0.24	0.27	0.32	0.30	0.32	0.32

Notes: Bootstrapped standard errors (400 repetitions) are in parentheses * p<.10, ** p<.05

Table 16. Unconditional quantile regression (RIF regression) coefficients (Women)

Dependent variable:	(1)	(2)	(3)	(4)	(5)	(6)	(7)
Natural Log of Gross Wealth Quantiles:	30	40	50	60	70	80	90
Father attended senior secondary school or higher	-0.29	-0.21	-0.41	-0.11	0.10	0.36	0.33
	(0.29)	(0.32)	(0.31)	(0.29)	(0.39)	(0.55)	(0.64)
Mother owned agricultural land, non-agricultural land, or building at the time individual established own household	0.10	-0.03	0.13	0.05	0.26	0.38	0.45
	(0.19)	(0.22)	(0.21)	(0.21)	(0.23)	(0.34)	(0.35)
Father owned agricultural land, non-agricultural land, or building at the time individual established own household	0.11	0.15	-0.16	-0.18	-0.33	0.14	0.42
	(0.23)	(0.22)	(0.25)	(0.21)	(0.27)	(0.38)	(0.41)
Value of inheritance							
Reference group: no inheritance							
Gifted or inherited land or real estate of 1000 GHS or less	2.02**	2.63**	3.04**	3.12**	2.57**	3.49**	2.29
	(0.61)	(0.74)	(0.78)	(0.67)	(0.97)	(1.71)	(2.34)
Gifted or inherited land or real estate of 1000 to 2900 GHS	1.10**	1.75*	2.27**	2.24**	3.41**	6.06**	1.35
	(0.52)	(0.90)	(0.84)	(0.79)	(0.98)	(2.01)	(2.48)
Gifted or inherited land or real estate of 2900 to 8000 GHS	1.47**	2.02**	2.16**	2.25**	3.37**	5.65**	11.92**
	(0.41)	(0.53)	(0.42)	(0.47)	(0.65)	(1.75)	(4.28)
Gifted or inherited land or real estate of more than 8000 GHS	1.03*	1.98**	2.18**	2.16**	3.22**	5.72**	11.66**
	(0.56)	(0.63)	(0.51)	(0.46)	(0.71)	(1.86)	(4.01)
Inherited land or building not captured in inheritance total	1.49*	1.97**	2.34*	0.93	1.49	2.81	-0.61
	(0.78)	(0.90)	(1.37)	(1.46)	(1.70)	(2.62)	(1.73)

Education							
Reference group: no education or only preschool							
Some primary school	0.49	0.76**	0.25	0.08	0.02	0.27	0.11
	(0.34)	(0.37)	(0.31)	(0.25)	(0.33)	(0.45)	(0.48)
Completed primary school	0.78**	0.97**	0.62*	0.45*	0.69**	1.08**	0.55
	(0.39)	(0.37)	(0.37)	(0.27)	(0.34)	(0.48)	(0.51)
Completed junior high school and no more	1.03**	1.26**	0.73**	0.56**	0.86**	1.42**	0.77
	(0.31)	(0.38)	(0.30)	(0.28)	(0.39)	(0.57)	(0.48)
At least some senior secondary school or vocational school	1.18**	1.54**	1.32**	1.20**	1.43**	2.34**	2.66*
	(0.40)	(0.59)	(0.48)	(0.45)	(0.57)	(0.98)	(1.36)
At least some university, professional training, or other post-senior secondary school	1.35*	1.34*	1.02	1.52*	1.86*	1.52	2.47
	(0.73)	(0.78)	(0.74)	(0.82)	(0.96)	(1.28)	(2.51)
Occupation							
Reference group: no occupation							
Professional occupations	1.02	1.51*	1.03	1.59**	1.53	1.38	2.75*
	(0.80)	(0.91)	(0.71)	(0.72)	(0.98)	(1.23)	(1.56)
Non-professional sales work including street vendors	1.40**	1.43**	1.15**	1.11**	1.14**	1.11	1.22**
	(0.49)	(0.52)	(0.44)	(0.40)	(0.51)	(0.68)	(0.56)
Service professions	0.98*	0.96	0.34	0.77*	1.02**	1.42	2.05**
	(0.54)	(0.61)	(0.52)	(0.45)	(0.51)	(0.88)	(0.96)
Agriculture, animal husbandry, hunting, and fishery workers	0.20	-0.23	-0.30	0.17	0.23	0.23	0.06
	(0.41)	(0.44)	(0.38)	(0.32)	(0.40)	(0.44)	(0.37)
Production	1.08*	0.59	0.32	0.48	0.65	0.63	0.16
	(0.59)	(0.61)	(0.50)	(0.47)	(0.56)	(0.75)	(0.72)
Employment status							
Reference group: not engaged in paid labor (includes students, apprentices, homemakers, those who are engaged in other unpaid work, and those engaged primarily in leisure activities)							
Wage employee	0.27	-0.11	0.22	-0.68	-0.81	-1.84*	-2.29**
	(0.63)	(0.76)	(0.63)	(0.52)	(0.66)	(1.01)	(1.14)
Self-employed with employees	0.87*	0.80	1.14**	1.02**	1.39*	1.84*	3.03**
	(0.52)	(0.58)	(0.51)	(0.46)	(0.79)	(1.04)	(1.51)
Self-employed without employees	0.36	0.44	0.40	0.28	0.35	0.04	-0.13
	(0.35)	(0.38)	(0.32)	(0.23)	(0.31)	(0.35)	(0.30)
Casual or day laborer	-0.55	-1.19	-0.39	-1.06	-1.03	-2.94*	-3**
	(1.50)	(1.38)	(1.04)	(0.91)	(1.04)	(1.65)	(1.49)

Age	-0.03	-0.01	0.01	0.02	-0.02	0.01	-0.06
	(0.05)	(0.06)	(0.05)	(0.04)	(0.05)	(0.05)	(0.06)
Age squared	0.00	0.00	-0.00	-0.00	0.00	0.00	0.00
	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)
Time spent on unpaid household chores							
Reference group: no time spent							
Less than 10 hours per week	-1.02	-0.66	-0.62	-0.64	0.04	-0.83	0.15
	(0.64)	(0.73)	(0.65)	(0.53)	(0.61)	(0.71)	(0.80)
10 to 20 hours per week	-0.70	-0.63	-0.33	-0.75	0.05	-0.71	-0.48
	(0.59)	(0.63)	(0.57)	(0.47)	(0.51)	(0.66)	(0.68)
20 to 30 hours per week	-0.80	-0.54	-0.50	-0.62	-0.08	-1.01	-0.80
	(0.59)	(0.63)	(0.53)	(0.46)	(0.50)	(0.73)	(0.69)
More than 30 hours per week	-0.74	-0.36	-0.34	-0.46	0.05	-0.63	-0.41
	(0.58)	(0.64)	(0.58)	(0.47)	(0.50)	(0.63)	(0.67)
Region							
Reference group: Western							
Central	-0.38	-0.14	-0.30	0.09	0.03	0.01	0.02
	(0.38)	(0.46)	(0.51)	(0.42)	(0.50)	(0.68)	(0.81)
Greater Accra	-0.59	-0.67	-0.76	-0.34	-0.04	-0.42	-1.26
	(0.50)	(0.58)	(0.54)	(0.48)	(0.62)	(0.86)	(1.23)
Volta	-1.21**	-0.89	-0.32	-0.22	0.16	-0.68	-0.98
	(0.51)	(0.68)	(0.52)	(0.41)	(0.69)	(0.89)	(0.84)
Eastern	-0.65	-0.33	-0.38	-0.20	0.01	0.04	0.28
	(0.50)	(0.52)	(0.46)	(0.45)	(0.52)	(0.71)	(0.91)
Ashanti	-1.02**	-0.91*	-0.70	-0.42	-0.46	-0.26	-0.66
	(0.44)	(0.53)	(0.46)	(0.41)	(0.46)	(0.56)	(0.77)
Brong Ahafo	-0.38	-0.41	-0.23	-0.11	-0.52	-0.62	-0.65
	(0.42)	(0.50)	(0.50)	(0.36)	(0.53)	(0.53)	(0.67)
Northern	-0.96*	-1.08*	-0.50	-0.19	-0.16	-0.31	-0.94
	(0.54)	(0.59)	(0.58)	(0.44)	(0.60)	(0.63)	(0.67)
Upper East	-1.21**	-1.87**	-0.99	-0.43	-0.25	-0.57	-1.43*
	(0.60)	(0.79)	(0.68)	(0.52)	(0.63)	(0.86)	(0.73)
Upper West	-0.72	-1.33*	-0.61	-0.20	-0.11	-0.52	-1.02
	(0.61)	(0.74)	(0.60)	(0.54)	(0.62)	(0.63)	(0.68)
Religion							
Reference group: Christian							
Muslim	-0.32	-0.54	-0.09	-0.09	0.49	0.85**	0.88*
	(0.39)	(0.44)	(0.40)	(0.30)	(0.35)	(0.40)	(0.47)
Traditional	-1.64**	-1.22**	-0.39	-0.37	0.05	0.36	0.00
	(0.57)	(0.58)	(0.46)	(0.36)	(0.40)	(0.64)	(0.70)
Other	-1.02	-0.88	-0.68	-0.14	0.39	1.66	2.58
	(0.86)	(0.96)	(0.61)	(0.63)	(0.65)	(1.09)	(1.89)

Type of union							
Reference group: monogamous union							
Consensual union	-0.54*	-0.66**	-0.86**	-0.45*	-0.45	-0.62	-0.91**
	(0.32)	(0.34)	(0.29)	(0.26)	(0.28)	(0.43)	(0.43)
Polygamous union	-0.36	-0.19	0.03	0.03	-0.30	-0.46	-0.50
	(0.38)	(0.46)	(0.38)	(0.28)	(0.29)	(0.42)	(0.44)
Spouse does not live in household	0.43	0.43	0.38	-0.09	0.04	0.37	0.61
	(0.27)	(0.35)	(0.27)	(0.25)	(0.32)	(0.40)	(0.51)
Previously married	-0.18	-0.16	-0.28	-0.13	0.13	0.43	0.57
	(0.25)	(0.28)	(0.20)	(0.20)	(0.25)	(0.36)	(0.43)
Member of at least one social group or organization	0.19	0.11	0.19	0.16	0.09	0.16	0.29
	(0.22)	(0.24)	(0.24)	(0.19)	(0.22)	(0.28)	(0.35)
Ethnicity							
Reference group: Akan							
Ewe	0.11	-0.03	-0.34	-0.30	-0.33	0.45	0.35
	(0.43)	(0.51)	(0.46)	(0.36)	(0.57)	(0.72)	(0.74)
Ga	0.12	0.35	0.74*	0.48	0.58	0.30	0.06
	(0.39)	(0.43)	(0.42)	(0.38)	(0.44)	(0.68)	(0.78)
Gurma	0.12	0.51	-0.27	-0.31	-0.10	0.07	0.78
	(0.49)	(0.59)	(0.53)	(0.42)	(0.47)	(0.73)	(0.83)
Grusi / Mande	0.47	0.68	0.49	0.28	0.14	0.28	0.31
	(0.56)	(0.63)	(0.52)	(0.48)	(0.53)	(0.61)	(0.67)
Mole Dagbani	-0.01	0.41	-0.52	-0.53	-0.73*	-0.81	-0.46
	(0.48)	(0.47)	(0.45)	(0.35)	(0.44)	(0.51)	(0.46)
Other	0.04	0.02	-0.62	-0.23	-0.17	-0.59	-0.43
	(0.45)	(0.49)	(0.42)	(0.39)	(0.50)	(0.65)	(0.69)
Rural	-0.12	-0.06	-0.26	-0.22	-0.02	-0.01	0.11
	(0.28)	(0.28)	(0.27)	(0.22)	(0.25)	(0.38)	(0.39)
Number of all household members	0.06	0.05	0.02	0.05	0.06	0.12	0.06
	(0.06)	(0.06)	(0.06)	(0.05)	(0.06)	(0.09)	(0.09)
Has children 5 years or younger	-0.17	-0.24	-0.38	-0.46*	-0.29	-0.64*	-0.27
	(0.25)	(0.27)	(0.29)	(0.24)	(0.31)	(0.38)	(0.44)
Has children ages 6 to 11 years	-0.17	-0.02	-0.04	-0.02	-0.04	0.30	0.24
	(0.22)	(0.23)	(0.20)	(0.18)	(0.24)	(0.29)	(0.30)
Receives remittances	-0.05	0.10	-0.03	0.01	0.07	-0.17	-0.37
	(0.25)	(0.32)	(0.25)	(0.22)	(0.26)	(0.36)	(0.40)
Has debt	0.22	0.41	0.43	0.39	0.50	0.56	1.05
	(0.29)	(0.35)	(0.40)	(0.32)	(0.40)	(0.56)	(0.66)
Holds land that that cannot be sold. (There is no market or it is family or community land.)	0.39	-0.06	-0.20	0.20	0.32	0.99	1.68
	(0.39)	(0.52)	(0.46)	(0.38)	(0.46)	(0.66)	(1.10)

Sold an asset or withdrew savings to cope with shock in last five years	0.00 (0.27)	0.07 (0.31)	0.21 (0.28)	0.44 (0.29)	0.30 (0.37)	0.02 (0.47)	0.01 (0.53)
Constant	4.80** (1.06)	4.41** (1.46)	5.31** (1.15)	5.43** (0.96)	5.04** (1.01)	5.01** (1.51)	7.19** (1.41)
Observations	700	700	700	700	700	700	700
R-squared	0.25	0.26	0.28	0.28	0.29	0.35	0.41

Notes: Bootstrapped standard errors (400 repetitions) are in parentheses * p<.10, ** p<.05

ESSAY 3

MEN AND WOMEN'S ASSET OWNERSHIP AND HOUSEHOLD INCOME DIVERSIFICATION PATTERNS IN RURAL MALAWI

Introduction

In many developing countries, it is the norm for households to construct a portfolio of multiple income-earning activities to meet or pursue an adequate standard of living (Ellis 2000a).[37] Income diversification is recognized as an important survival strategy for poor households in rural Africa and, indeed, many studies of households in developing countries find that income diversification is positively associated with greater welfare in rural households, particularly when the diversification is in activities outside of agriculture (see for instance, Ersado 2006; Block and Webb 2001; Davis et al. 2010).[38]

Holding productive assets, such as land, is an important determinant of income diversification (Ellis 2000a). Limited access to and rights over productive assets can limit a household's options for diversification. Income diversification is also partly determined by social and cultural factors, which can determine how individuals within a household can contribute to the diversification of the household's income. Specifically, social and cultural norms affect the ways in which men and women engage in activities within the economy as well as in the household, and as a result, the ways in which men and women diversify their income

[37] Income earning activities may include earnings or in kind from wage labor, agricultural activities that produce goods for consumption or sale, profits from small businesses, rent from leasing land, remittances from a family member, as well as income or in kind transfers from the government or other organizations.

[38] Using national-level data for Zimbabwe in 1990-1991 and 1995-1996 to examine the implications income diversification and changes in consumption, Ersado (2006) finds that income diversification is associated with greater household consumption and that with greater income diversification households were better able to withstand shocks. Similarly, Block and Webb (2001) find that greater household income is associated with greater diversification away from crops (towards alternative income-generating activities). Davis et al. (2010) uses a cross-country database to examine trends in rural households' income generating activities in 16 developing countries. The authors find that with the exception of Pakistan, greater household income expenditure is associated with a greater share of income derived from diverse activities outside of agriculture.

generating activities differ (Niehof 2004; Ellis 1998). Within agriculture, men and women tend to work on different tasks. Although the distinction between cash crops and food crops is not always obvious, often women are concerned with crop production for consumption at home whereas men may be more likely to be concerned with cash crops (Doss 2001b in reference to agriculture in Africa). Additionally, gender norms may also define which occupations outside of agricultural work are appropriate for males and females.

While gender norms partly determine the way a household diversifies income, little is known about the processes through which households diversify their income. Most studies are at the household level and explore the relationship between household asset ownership and household income diversification (see the multi-country analysis by Winters et al. (2009)). Few studies explore the relationship between individual asset ownership and household diversification. This paper aims to partly fill that gap by exploring productive asset ownership and the gendered determinants of household income diversification in Malawi. More specifically, using a unique data set with detailed information of household income sources and individual level information on land ownership, the paper examines how gender differences in landholdings are associated with different household income diversification patterns in rural Malawi in 1994-1995, an economically volatile period for many households.

The paper is organized as follows: The next section reviews literature on income diversification strategies with an emphasis on Africa and Malawi in particular. The data and descriptive statistics are then presented followed by a description of the methodology and results. Some conclusions and policy implications are discussed in the final section.

Income Diversification in Rural Households in Malawi

There are several reasons why rural households diversify income, which can be classified as opportunity and choice, or "pull" factors, and necessity, or "push" factors (Barrett et al. 2001).[39] Diversification due to "pull" factors is a response by households to exploit economic opportunities that are created by local economic and population growth, proximity to urban markets, and improvements in infrastructure. It can be a means of wealth accumulation for wealthier households, such as a way to obtain liquidity for future investments or a way to improve farm productivity for rural households (Ellis 1998).

In contrast, diversification due to "push" factors is often characterized as mitigating risk in an environment where households face income uncertainty or as a coping strategy after a shock. It is useful to think of these reasons for diversification as either *ex ante* risk management or *ex post* coping of shocks (Reardon et al. 1998). In areas where there are missing or incomplete credit and insurance markets, households may create a portfolio of weakly covariate activities to minimize variation in their total income as *ex ante* risk management (Reardon 1997; Reardon et al. 1998). For instance, in addition to engaging in agricultural activities, a household may also run a small-business enterprise in a non-agriculture sector. As an *ex post* coping strategy in response to income shocks, such as crop failure, households may diversify into other forms of labor to help meet the shortfall in their consumption. This may happen when households lack access to formal insurance markets or informal insurance mechanisms, such as social networks, or resources for self-insurance (Barrett et al. 2001). While "pull" and "push" factors of diversification are not necessarily mutually exclusive, meaning households may diversify income activities and engage in multiple activities for more than one reason,

[39] See Barrett *et al.* 2001 for a detailed review.

diversification by poor households in developing countries is usually a response to "push" factors.

Households' ability to diversify is interconnected with its access to and control over productive assets.[40] Indeed, Ellis' definition of household diversification of income activities, which is often cited in the development literature, includes the household's asset endowment (Ellis 2000b). Households with rights over important assets possess a great number of income generating activity possibilities than those without (Ersado 2006; Chadha 1992; Lanjouw *et al.* 2001).[41] Land, for instance, is an important asset not just for agricultural diversification, but also for non-agricultural forms of diversification. Land can be used for crops. Additionally, depending on the rights over the land, the property can be leased or it may be used as collateral for credit to purchase other productive assets that could generate income.

In Malawi, where 90 percent of the population is rural, land is a particularly important asset for the majority of the population. Nearly 70 percent of land in Malawi is classified as customary land (Government of Malawi 2001 in Matchaya 2009). Customary land tenure arrangements may vary depending on the tribe or ethnic group, but some of the common features of customary tenure are: (1) households and individuals have usufruct rights without the right to sell the land; (2) land is allocated to the household or individual by the village chief and is considered as being under their (household's or individual's) ownership; and (3) use rights to the

[40] For instance, in a multi-country analysis, Winters et al. (2009) finds that in the majority of the countries studied, greater landholdings is associated with greater likelihood of participating in self-employment activities in agricultural activities and being less likely to participate in wage employment.

[41] Ersado (2006) finds that asset ownership is positively associated with number of incomes sources in rural areas in Zimbabwe. Similarly, in rural India, Chadha (1992) finds that individuals who own land generated much higher rural nonfarm earnings from self-employment than did those without land. The relationship seems to depend on the country and well as the type of asset, however. Unlike Chadha (1992), Lanjouw *et al.* (2001) find that larger per capita landholdings of peri-urban households in Tanzania are associated with a lower probability of business activities, until the landholdings become large. Beyond per capita landholdings of around 8.8 ha, the negative relationship disappears and larger landholdings are associated with a higher probability of business activities. However, households with very large landholdings have a greater probability of engaging in business activities (Lanjouw *et al.* 2001).

land may be inherited (Kishindo 2004; Green and Baden 1994). Most rural households hold some customary land, although the average size of the landholdings is small; 72 percent of small farmers in Malawi cultivate less than 1 ha (Diagne and Zeller 2001).

Kinship is the primary determinant of access to land and who holds land in Malawi is largely determined by the family system. Women are more likely to hold customary land in matrilineal family systems than in patrilineal systems. Matrilineal family systems are prevalent in Southern Malawi as well as in parts of Central Malawi. In these family systems, the inheritance passes from the maternal side to the male child and women receive land from their mothers on marriage. Women's rights to customary land tend to be primary (Matchaya 2009). Husbands can receive land from the village chief or from their in-laws, but in the event of divorce or wives' death, they retain right only to the land given to them by the chief (Dickerman and Bloch 1991, Baden et al. 1994). Davison (1992) notes that in matrilineal systems, due to both better and independent access to land, women enjoy a greater degree of economic security that is uncommon to women in patrilineal systems.[42] The patrilineal systems found mainly in Northern Malawi usually involve the payment of lobola after which the wife moves to the husband's village.[43] The man is assumed to own everything in the marital home and the woman often has no right to own property, including land (Strickland 2004).

Rights over land give an individual greater control and authority over the asset. An individual may make decisions regarding the cultivation of crops on land or on the care of livestock they do not own; however, ownership rights over land or livestock gives the individual

[42] Unfortunately, in recent times, matrilineal systems of inheritance have been on the decline with a shift from uxorilocal to virilocal residence (Baden et al. 1994). Furthermore, since there is also a decrease in the availability of unallocated customary land, land reallocation tends to reduce women's customary rights to land (World Bank 1996). [Virilocal is the custom in which the wife moves to her husband's place after marriage. In an uxorilocal system, the husband is expected to live in his wife's community.]

[43] Payment from the bridegroom to the bride's parents usually in the form of cattle (Kishindo 2004; Wanda 1998).

greater control over the decisions about these assets. Indeed, empirical evidence suggests command over resources and greater decision-making power are interlinked (see, for example, Fafchamps, Kebede, and Quisumbing 2009; Brown 2009; Doss 2006; Quisumbing and Maluccio's 2003). Accordingly—given that men and women face different constraints, incentives, and opportunities—different patterns of male and female ownership and/or control over productive assets will influence the household's income diversification activities.

Of the few studies that explore the relationship between who within the household holds the productive assets and income diversification, a recent discussion paper by Bhaumik, Dimova, and Gang (2014) explores men and women's ownership of land, the patrilineal and matrilineal systems, and a household's participation in cash crop production--an important form of income diversification in Malawi. The authors find that the size (measured in ha) of women and men's landholdings are equally important in households' decision to produce high value cash crops, tobacco and groundnuts, in patrilineal family systems. However, in matrilineal family systems, men's ownership of land is more important in households' decision to produce high value cash crops. The authors conclude that facilitating female ownership of assets as a form of poverty reduction is inappropriate without women's better access to complementary resources.

Women are less likely to participate in cash crops in many countries in Africa and often they are more constrained than men in the resources needed for producing cash crops. However, women's greater landholdings could contribute to other forms of diversification, as rights over land and other productive assets are important for access to credit, technical information, and other inputs, which has implications not only for agricultural productivity but also for participation in the nonfarm sector.

Given that women often control the production and output of food crops for home consumption, while men may have more decision-making power over cash crops, women's greater land ownership may result in greater diversification in food crops. In Malawi, where local maize is the principal food crop and central to the staple diet, diversifying from local to hybrid maize as well as diversifying to an array of food crops can help create greater food security as it can result in higher output (Ellis, Kutengule, and Nyasulu 2003). Holding everything else constant, a greater number of total crops would contribute to a greater number of total household income activities, which is a measure of income diversification often used in the literature.

A second measure of diversification is the household's total number non-agricultural activities. Many studies consider this to be the most important form of income diversification for households in Malawi (Ellis 2000a, Ellis, Kutengule, and Nyasulu 2003; Kutengule 2000; Orr, Mwale, and Saiti 2001). Income from these types of activities, such as nonfarm small business enterprises, is less likely to depend on agricultural seasons and thus can be an important source of income when the need for income is at its highest. Non-agricultural activities are particularly important in that with the small landholdings for the majority of households in Malawi, agricultural diversification alone cannot fully address food insecurity (Ellis, Kutengule, and Nyasulu 2003).

This paper examines whether household income diversification strategies in rural Malawi respond to differences in men and women's landholdings. Specifically, taking into account the difference in matrilineal and patrilineal systems and controlling for the households' land endowment and population demographics, this paper seeks to test whether, because of gender differences in economic activities, women's greater land holdings in married households

increases household diversification, ceteris paribus.[44] In this paper we define diversification in two ways: (1) the household's total number of income (agricultural and non-agricultural) activities and (2) the household's total number of non-agriculture activities. The first definition of diversification assumes that the greater the total number of incomes sources (regardless of the type of activities) contributes to the overall wellbeing of the household. The second assumes that either substituting an agricultural activity for a non-agricultural activity or simply adding additional non-agricultural activities to the household's diversification portfolio contributes to greater household wellbeing.

This paper focuses on the household level rather than the individual level because the number and type of activities an individual engages in are not likely to be made independently of the others in the household. The decisions around one's income activities are likely influenced by the knowledge of the others' preferences in the household and based on a process of negotiation with other members of the household. Additionally, although women and men may have different tasks and control the cultivation of different crops, agricultural production is usually a joint process.[45]

The paper focuses on a time in Malawi (in 1994-1995) when many households dealt with highly adverse conditions. The households faced two major droughts, one in 1991-1992 and another in 1993-1994, and policy changes due to market liberalization, which included the termination of credit and fertilizer subsidies in the early 1990s (Diagne and Zeller 2001). As such, diversification of income sources was likely due to "push" factors more than "pull" factors,

[44] In a separate paper, the authors are also examining patterns of diversification between couple households and female-headed households.

[45] Survey data from Kenya finds, for instance, there is not a single crop in which only men or only women do all the work (Saito, Mekonnen, and Spurling 1994). This makes it difficult to separate individually.

and diversification in to non-agricultural activities could be particularly important to a household's security.

Data and Descriptive Analysis

The data used in this research is from the 'Financial Markets and Household Food Security' collected by the International Food Policy Research Institute (IFPRI) in Malawi in 1995. IFPRI surveyed 404 households in 45 villages in rural Malawi spread over five districts: Dowa, Mangochi, Nkhotakota, Rumphi and Dedza. Following a choice-based sampling procedure, fifty percent of the sample is comprised of households who are members of several credit programs, with the remaining sample comprised of non-participating households.[46] The non-participants are further equally divided between those who never received credit from an organization and defaulters and, hence, are no longer eligible for loans. The non-participants are drawn from the same villages as the participants. Households were interviewed in a three-round household survey with a recall period of up to two years for some data. The first round was conducted in February – April 1995, the second round in July – August 1995, and the last round in November – December 1995.[47] The survey was conducted at three levels: the household level, community level, and credit group level. The household-level survey was administered in all three rounds and consists of seven modules: (i) demographics, (ii) crop and livestock incomes, (iii) asset ownership and transactions, (iv) food and non-food expenditure, (v) credit and savings, (vi) non-farm income and time allocation, and (vii) anthropometric measures. One of the unique features of this data set is that it has detailed information at the individual level on land ownership and mode of acquisition, which makes it appropriate for the current analysis.

[46] The four programs considered in the study are the Malawi Rural Finance Company (MRFC), Malawi Mudzi Fund (MMF), Malawi Union of Savings and Credit Cooperatives (MUSCCO), and the Promotion of Micro-Enterprises for Rural Women (PMERW).

[47] It is not possible to use the data as panel because the rounds capture different information of the household.

The analysis in this paper is based on 256 married households.[48] Tables 1 thru 3 report the patterns of income diversification by sex within married households in Dowa, Mangochi, Nkhotakota, Rumphi and Dedza. There are five broad categories of income earning activities – self-employment, wage and contract labor, income from crops or livestock, income from land, and remittances. The number of income earning sources in self-employment is determined by the total number of business enterprises in the household. For wage and contract labor, each position by each individual in the household is counted as an income activity. The number of income sources by crops is divided by type of crop, but not disaggregated further by variety of crop. Nearly all households have at least one crop activity (Table 1). Livestock counts as an income source if the animal itself or the product from the livestock was sold or consumed by the household. Each type of animal is counted as an income source.

Non-agricultural income activities include non-agricultural self-employment, non-agriculture wage labor, income from remittances, and income from leasing land. Households rely on 1.9 income sources on average (Table 1).

Table 2 presents the distribution of the total number of income sources and total number of non-agricultural income sources. Very few households rely on only one source of income. The vast majority of households (76 percent) rely on between three to seven income sources (Table 2). All households have at least one non-agricultural income source, with the large majority having two or three (Table 2).

[48] There are three polygamous households in the sample. In these cases, the information from the oldest wife is used.

Table 1. Household Participation in Income Sources and Diversification of Income Sources

	Married households (n = 256)
Percent of households that engages in	
Non- agriculture self-employment (%)	40.5
Non-agriculture wage labor (%)	48.3
Agricultural wage labor (%)	18.5
Livestock (%)	70.3
Crops (%)	98.9
Household leases land (%)	0.1
Household receives remittances and other income transfers* (%)	61.9
Total non-agricultural income sources	1.87
	(0 .10)
Total income sources	5.11
	(0.28)

Notes: Standard deviation is in parentheses. The statistics are weighted using the household population weights as suggested by Diagne and Zeller (2001). * This includes gifts from donors, neighbors, and ngos.

Table 2. Number of Income Sources

	Married households (n = 256)
Percent of households with number of agricultural and non-agricultural income sources (%)	
1	1.2
2	6.3
3	19.5
4	16.7
5	13.8
6	11.7
7	13.8
8	8.3
9	5.5
10	0.1
11	0.3
12	1.3
13	0.1
14	0.1
15	0.0
Percent of households with number of non-agricultural income sources (%)	
1	8.4
2	27.9
3	42.2
4	12.8
5	8.2
6	0.7
7	0.0
8	0.1

Notes: The statistics are weighted using the household population weights as suggested by Diagne and Zeller (2001).

Tables 3 and 4 disaggregate self-employment activities, wage and contract labor, income from crops or livestock and present the participation of income activities by sex. In married households, men and women engage in similar activities. However, very few income activities are joint. In married households, women are less likely to work in agricultural wage labor (*ganyu*) and fishing businesses than the primary male (Table 4). Wage labor (*ganyu*) yields low returns, is considered as distress labor, and is usually undertaken only by the poorest households (Gladwin *et al.* 2001).

Table 3. Participation in Particular Income Activities by Type of Household

	Married households (n = 256)
Self Employment (%)	
Selling produce	12.8
Beer brewing	10.1
Fishing business	13.8
Grocer or hawker	8.1
Baker	3.6
Restaurant	1.0
Weaver	6.2
Other handicrafts	1.1
Service (carpentry, tailoring, repairs)	2.1
Other trading activities	5.9
Wage and Contract Labor (%)	
Crop production/processing/transporting	18.5
Small cottage industry	0.5
Fishing/work at pond	15.9
Guarding goods/servant	2.0
Construction/repair of house/brick layer	8.6
Work in shop/business for wage	3.4
Local/government service	2.7
Other	13.1
Crops (%)	
Maize	96.5
Food crops	46.0
Cash crops	23.4
Livestock sources (%)	
Poultry	37.9
Goats	16.9
Sheep	2.5
Cattle	2.7
Dairy cow	2.3
Oxen	0.1
Pig	0.3
Other	0.4
Income from leasing land (%)	0.1
Income from remittances (%)	61.9

Notes: The statistics are weighted using the household population weights as suggested by Diagne and Zeller (2001). Maize includes local and hybrid varieties. Food crops include cassava, beans, vegetables, fruits, and other food crops. Cash crops include groundnuts, tobacco, and other cash crops.

Table 4. Intrahousehold Participation in Wage and Business Income Activities of Married Households

	Primary Male	Primary Female	Joint
Self Employment (%)			
Selling produce	6.0	6.6	1.3
Beer brewing	5.5	4.7	1.0
Fishing business	12.8	3.2	0.2
Grocer or hawker	6.2	0.9	0.0
Baker	1.8	2.0	0.0
Restaurant	0.2	0.7	0.0
Weaver	5.8	0.4	0.0
Other handicrafts	1.1	0.1	0.0
Service (carpentry, tailoring, repairs)	2.0	0.1	0.0
Other trading activities	5.6	1.2	0.0
Other	0.0	0.0	0.0
Wage and Contract Labor (%)			
Crop production/processing/transporting	15.9	7.2	-
Small cottage industry	0.5	0.0	-
Fishing/work at pond	14.4	0.0	-
Guarding goods/servant	1.6	0.0	-
Construction/repair of house/brick layer	6.8	1.4	-
Work in shop/business for wage	0.9	2.3	-
Local/government service	2.6	0.0	-
Other	10.3	5.6	-
			-

Notes: The statistics are weighted using the household population weights as suggested by Diagne and Zeller (2001). Maize includes local and hybrid varieties. Food crops include cassava, beans, vegetables, fruits, and other food crops. Cash crops include groundnuts, tobacco, and other cash crops.

Empirical Methods

As mentioned above, the data is stratified along the program membership status variable with random selection within each stratum. Therefore, the corresponding bias in the estimation process caused by this type of sampling needs to be corrected. The estimation procedure follows a two-step approach based on the methodology in Diagne and Zeller (2001) to correct for the bias in estimation. In the first step, a multinomial logit model estimates the corrected probability choices of the household. The three possible choices are specified as: (i) never participated in a credit program ($j = 0$), (ii) current member of any credit program ($j = 1$), and (iii) previous member of the program ($j = 2$). Each household can belong to only one of the three alternatives. The probability choices for household *i* are specified as:

$$Prob(y_i = j) = \frac{e^{\boldsymbol{x}_i'\boldsymbol{\beta}_j}}{1+\sum_{k=0}^{2} e^{\boldsymbol{x}_i'\boldsymbol{\beta}_k}}, \tag{1}$$

where $j = 0, 1, 2,$ and $\boldsymbol{x}_i$ is a vector of case-specific regressors, and $\boldsymbol{\beta}$ is a vector of household characteristics. For the purpose of identification, $\boldsymbol{\beta}_j$ is set to zero at $j = 0$ and the coefficients are then interpreted with respect to this base category so that

$$Prob(y_i = j) = \frac{1}{1+\sum_{k=0}^{2} e^{\boldsymbol{x}_i'\boldsymbol{\beta}_k}} = F_0(\boldsymbol{x}_i, \boldsymbol{\beta}) \tag{2}$$

when $j = 0$ and

$$Prob(y_i = j) = \frac{e^{\boldsymbol{x}_i'\boldsymbol{\beta}_j}}{1 + \sum_{k=0}^{2} e^{\boldsymbol{x}_i'\boldsymbol{\beta}_k}} = F_j(\boldsymbol{x}_i, \boldsymbol{\beta}) \tag{3}$$

when $j = 1, 2$. The model is estimated as a full information maximum likelihood (FIML) using the Manski and Lerman (1977) weighted-exogenous-sample maximum likelihood (WESML) estimator to correct for choice-based sampling (Greene 2007). Let p_0, p_1, and p_2 be the sample proportions and w_0, w_1, and w_2 be the true population proportions (which are known) that correspond to the three possible choices. The maximum likelihood estimator, $\widehat{\boldsymbol{\beta}}$, maximizes the weighted log-likelihood:

$$\ln L(\boldsymbol{\beta}) = \sum_{i=0}^{n}[y_{i0}\left(\frac{w_0}{p_0}\right) + y_{i1}\left(\frac{w_1}{p_1}\right) + y_{i3}\left(\frac{w_2}{p_2}\right)]\sum_{j=0}^{2} y_{ij}\ln\left(F_j(\boldsymbol{x}_i, \boldsymbol{\beta})\right). \qquad (4)$$

The estimated probability choices of the household with regard to membership status estimated using this maximum likelihood model are then used as weights, $\widehat{\Omega}_{ji}$ in the outcome equations.

The two outcome equations (5) and (6) test the hypothesis that women's greater landholdings in married households increases the number of total income activities, *T*, and non-agriculture activities, *NA*:

$$\widehat{T_i} = \widehat{\Omega}_{ji} G(\, female\ land\ holdings_i,\ male\ land\ holdings_i, matrilineal_i, X_i,\ Z_i) \qquad (5)$$

$$\widehat{NA_j} = \widehat{\Omega}_{ji} G(\, female\ land\ holdings_i,\ male\ land\ holdings_i, matrilineal_i, X_i,\ Z_i) \qquad (6)$$

In these two equations, the sample is restricted to i = 1, 2, 3…l, where l is the number married households.

The $female\ land\ holdings_i$ variable is the value of land held (Mk) by the primary female and the $male\ land\ holdings_i$ variable the value of land held (Mk) by the primary male in married households. Both land holding variables are divided into categorical variables to account for possible non-linear relationships between diversification and land. To control for potential endogeneity between income diversification and landholdings, the variables are restricted to agricultural land owned in October 1993 that were acquired through inheritance, gifts, allocations from chiefs, and from marriage and thus are more likely to be exogenous from income activities in 1994 and 1995. Even without these restrictions, the rural Africa land markets are often poorly functioning, and by and large thin. As such, the assumption of exogeneity may not be so unacceptable.

Table 5 presents the estimated the value of land held by individual within households. The primary female and male hold 786 Mk and 2087 Mk in "exogenous" land. The total household land is the sum of the exogenous land held by the primary female and male. The majority of women (67 percent) hold little or no land; whereas only 17 percent of men hold little or no land. Forty-seven percent of men hold on average exogenous land valued at 5656 Mk; but only 7.5 percent of women hold this much land on average.

Table 5. Estimated Value of Land either Inherited, Gifted, or Given by Chief before October 93

Total household value (Mk)	Land value held by primary male (Mk)	Land value held by primary female (Mk)
2873.36	2087.36	786.00
(419.02)	(346.17)	(154.72)

Notes: Standard deviation is in parentheses. The statistics are weighted using the household population weights as suggested by Diagne and Zeller (2001). The value of the land is based on respondents' perceptions of how much the land is worth at time of the survey.

In both outcome equations, $matrilineal$, takes the value of 1 if the primary female in the married household is from the Chewa or Yao ethnic groups that are primarily matrilineal. In about a third of the households, the primary female in the married household is matrilineal (Table 6).

X, is a vector of household characteristics: the age of the household head, the number of adult household member (ages 15-64) by sex, the number of children household members from 7 to 14 by sex, the number of children 6 years and under, the number of adults 65 and older, the average years of schooling of members 15 and older, and whether the household has access to credit. Given that the number of household sources is a function of labor supply, the household population variables help control for the different demographics between households. Greater education and access to credit broaden a household's available income source opportunities.

As shown in Table 6, the average household size is 4.4 members. The average number of years of education for adults in the household is low. The majority of households rely on remittance income have access to credit.

Table 6. Household Characteristics by Type of Household

	Married households
Mean age of household head	40.20
	(1.85)
Mean household size	4.43
	(0.22)
Number of males ages 15 – 64	1.31
	(0 .07)
Number of females ages 15 – 64	1.22
	(0 .05)
Number of males ages 7 – 14	0.54
	(0.09)
Number of females ages 7 – 14	0.64
	(0.09)
Number of children 6 and under	0.87
	(0.10)
Number of adults over 64	0.08
	(0.03)
Average years of education of household members 15 and older	2.19
	(0.19)
Female belongs to matrilineal family system* (%)	70.7
Household receives remittances (%)	62
Households with access to credit (%)	79

Notes: Standard deviation is in parentheses. The statistics are weighted using the household population weights as suggested by Diagne and Zeller (2001). * The primary female is from the Chewa or Yao ethnic group, which are primarily matrilineal.

Z is a vector of community characteristics which includes the district where the household is located, the distance of the house from the city center (kilometers), whether the household has access to clean water, and the number of wells and pumps in the nearest village. Table 7 presents community level statistics of the households' surrounding environment. Access to clean water is a proxy for the surrounding infrastructure, which can influence the extent of which a household is able to engage in income activities. More than forty percent of households do not have access to clean water. The household's income activities are also influenced by the household's proximately to markets. Married households in these districts are on average five kilometers from the nearest town center.

Table 7. Characteristics of Surrounding Environment by Type of Household

	Married households (n = 256)
Percent of households with no access to clean water (%)	42.2
Distance to city center (km)*	5.00
	(0.61)
Number of wells or pumps in nearest village	1.68
	(0.167)
Live in the following district (%)	
Dowa	18.9
Mangochi	33.4
Nkhotakota	9.9
Rumphi	5.5
Dedza	32.2

Notes: Standard deviation is in parentheses. The statistics are weighted using the household population weights as suggested by Diagne and Zeller (2001). * It is not clear from the data, survey instruments, or the codebooks what measure is used; kilometers are assumed.

Results

The outcome equations are estimated using a Poisson Maximum Likelihood model in order to address the count nature and long right tail of the dependent variables (see Tables 5 and 6). The probability of an occurrence, or in this case, the probability of a specific number of income activities, is denoted by the probability mass function:

$$Prob[(Y = y_i)|x_i] = \frac{e^{-\lambda_i}{\lambda_i}^{y_i}}{y_i!}, \qquad y_i = 0, 1, 2, 3 \ldots \tag{5}$$

where $\lambda_i = e^{x_i\boldsymbol{\beta}}$. The model assumes the first two moments are equal. [49]

The key variables of interest for this paper the value of exogenous land owned by the primary female in married households, controlling for male landholdings. Accordingly, the discussion of results will focus mainly on these variables. The full models are in the appendix.[50]

Tables 8 present the results for the two outcome equations. Columns (1) and (3) are the coefficient estimates and columns (2) and (4) are the average marginal effects. The results suggest that women's landholdings are important to household diversification. Households with women who hold at least some land have between 0.49 and 0.69 more non-agricultural income sources than households where women hold little or no land (column (2) in Table 8). Additionally, households with women who hold at least 1000 Mk in land have 1.3 to 1.4 additional total income source than households where women have no land. Men's landholdings are also important for income sources, but only in the top land category. Households with men holding land valued at 2500 Mk or more have 0.49 more non-agricultural income sources and 1.5

[49] In both models, the conditional variance does not exceed the conditional mean of the dependent variable.

[50] Interacting the matrilineal variable with the land value variables resulted in similar estimations in all four models.

more total income sources than those households where men have less land (column (2) and (4) in Table 8).

The sex composition of the household seems to matter for diversification. An additional adult male (15 to 64) household member results in 0.18 additional non-agricultural income sources and 0.68 additional total income sources (see columns 2 and 4 in Table 8). An additional adult female between the ages of 7 and 15 results in 0.13 additional non-agricultural income sources (see columns 2 in Table 8).

Overall, greater total landholdings held by (men and women) contribute to a greater number of total number of (agricultural and non-agriculture) income activities and number of non-agricultural activities only a household engages in. This partly corresponds to Winters et al. (2009) who find that households' overall greater landholdings are associated with a greater likelihood of participating in agricultural activities, with the exception of agriculture wage employment. However the results in this paper differs from the authors in that Winters et al. (2009) find that greater landholdings are not associated with activities outside of agriculture in Malawi.

Indeed, the results in Table 8 suggest that who within the household holds the land seems to matter for the number of non-agricultural income and total (non-agricultural and non-agricultural) income sources in households in Malawi. While the majority of men in married households hold land, only one-third of their spouses hold land and the value of the land held is minimal compared to the men's. Households where women own at least a little land benefit by having a greater household income diversification.

Table 8. Income Diversification of Married Households (Poisson Maximum Likelihood)

	(1)	(2)	(3)	(4)
Dependent variable	Number of non-agricultural income sources		Number of total income sources	
	Model	Marginal effects	Model	Marginal effects
Land value held by primary female				
150 to 1000	0.328**	0.691**	0.108	0.629
	(2.89)	(2.58)	(1.38)	(1.32)
1000 to 2500	0.295**	0.611**	0.224**	1.392**
	(2.79)	(2.55)	(3.28)	(3.05)
Greater than 2500	0.242**	0.487**	0.214**	1.322**
	(2.13)	(1.98)	(2.76)	(2.57)
Land value held by primary male				
150 to 1000	-0.0566	-0.100	0.0274	0.146
	(-0.50)	(-0.50)	(0.40)	(0.40)
1000 to 2500	0.0882	0.168	0.104	0.574
	(0.93)	(0.93)	(1.50)	(1.50)
Greater than 2500	0.209**	0.423**	0.258**	1.540**
	(2.35)	(2.37)	(4.02)	(4.14)
Matrilineal	-0.0322	-0.0639	0.0111	0.0658
	(-0.35)	(-0.35)	(0.22)	(0.22)
Number of males 15-64	0.0931**	0.184**	0.116**	0.686**
	(2.02)	(2.01)	(3.59)	(3.52)
Number of females 15-64	0.0712	0.141	0.0192	0.113
	(1.43)	(1.43)	(0.51)	(0.51)
Number of males 7-14	-0.00276	-0.00545	0.0291	0.172
	(-0.06)	(-0.06)	(1.08)	(1.08)
Number of females 7-14	0.0649*	0.128*	0.0176	0.104
	(1.75)	(1.75)	(0.85)	(0.85)
N	256	256	256	256
Chi-squared	168.3	168.3	169.0	169.0
p-value	0.00	0.00	0.00	0.00

Notes: The models are weighted using the weights created based on the methodology in Diagne and Zeller (2001) to correct for the bias in estimation. The marginal effects are the average marginal effects across the distribution. Full model is in the appendix. Z-values are in parenthesis.

Conclusion

This paper finds that women's greater landholdings in married households increases the number of total income activities and non-agriculture activities, controlling for male landholdings. We are not able to separate the activities in the study into higher and lower earning sources. However, many studies find a positive association between the number of income sources, particularly non-agricultural activities, and a household's wellbeing. The households with greater income diversification are better able to withstand adverse shocks. This is likely particularly in the case of Malawi during this time (the early and mid-1990s), when households faced a number of welfare shocks due to weather and policy changes.

Women own very little land worldwide, a fundamental asset not just for agricultural production but also for securing other forms of income (see Allendorf 2007). The fact that this study finds that married households, where the female holds at least some land have more non-agricultural income sources than those households where the female holds little or no land, has important policy implications. Promoting female land ownership in Malawi could indirectly contribute to households' greater food security in the face of unfavorable conditions (by allowing households a greater number of income sources). This differs from the conclusions drawn by Bhaumik, Dimova, and Gang(2014) who assert that men's greater ownership of agricultural land in matrilineal societies in Malawi results in greater well-being through cash crop production so that promoting female land ownership on its own is not a panacea for greater household welfare.

In a forthcoming paper, using the same data, we investigate differences in diversification patterns between single female-headed and married households in Malawi. We find that female-headed household hold less land and engage in fewer income activities than married households. However, after controlling for land holdings and household demographics (including size), we find that single female-headed households engage in just as many income activities as married

households and, in both household types, holding land is an important determinant of diversification. The results suggest that it is not the sex of the head of household that determines the difference in diversification, but rather other important factors, such as asset ownership, within the household.

Few studies explore the relationship between male and female asset ownership and household diversification. The results of this paper (as well as our future paper) suggest there are nuances in the relationship between male and female asset ownership and household diversification and that there is a need for further studies regarding household income diversification patterns, men and women's asset ownership patterns, and its impact on overall household welfare.

Appendix

Table 9. Income Diversification of Married Households (Poisson Maximum Likelihood)

	(1)	(2)	(3)	(4)
Dependent variable	Number of non-agricultural income sources		Number of total income sources	
	Model	Marginal effects	Model	Marginal effects
Land value held by primary female (Mk)				
150 to 1000	0.328**	0.691**	0.108	0.629
	(2.89)	(2.58)	(1.38)	(1.32)
1000 to 2500	0.295**	0.611**	0.224**	1.392**
	(2.79)	(2.55)	(3.28)	(3.05)
Greater than 2500	0.242**	0.487**	0.214**	1.322**
	(2.13)	(1.98)	(2.76)	(2.57)
Land value held by primary male (Mk)				
150 to 1000	-0.0566	-0.100	0.0274	0.146
	(-0.50)	(-0.50)	(0.40)	(0.40)
1000 to 2500	0.0882	0.168	0.104	0.574
	(0.93)	(0.93)	(1.50)	(1.50)
Greater than 2500	0.209**	0.423**	0.258**	1.540**
	(2.35)	(2.37)	(4.02)	(4.14)
Matrilineal	-0.0322	-0.0639	0.0111	0.0658
	(-0.35)	(-0.35)	(0.22)	(0.22)
Age of head	-0.0101**	-0.0200**	-0.00573**	-0.0339**
	(-2.56)	(-2.58)	(-2.34)	(-2.36)
Number of males 15-64	0.0931**	0.184**	0.116**	0.686**
	(2.02)	(2.01)	(3.59)	(3.52)
Number of females 15-64	0.0712	0.141	0.0192	0.113
	(1.43)	(1.43)	(0.51)	(0.51)
Number of males 7-14	-0.00276	-0.00545	0.0291	0.172
	(-0.06)	(-0.06)	(1.08)	(1.08)
Number of females 7-14	0.0649*	0.128*	0.0176	0.104
	(1.75)	(1.75)	(0.85)	(0.85)
Number of adults > 64	-0.0332	-0.0656	0.0707	0.418
	(-0.23)	(-0.23)	(0.80)	(0.80)
Number of children < 7	0.0429	0.0848	0.0397**	0.235**
	(1.34)	(1.34)	(2.02)	(2.03)
Average education	-0.00922	-0.0182	0.0202	0.120
	(-0.35)	(-0.35)	(1.11)	(1.11)
Access to credit	0.272**	0.538**	0.212**	1.257**
	(1.97)	(1.99)	(3.06)	(3.03)
No access to clean water	-0.0176	-0.0348	-0.0412	-0.243
	(-0.21)	(-0.21)	(-0.80)	(-0.80)
Distance to city center	-0.0584**	-0.115**	-0.00425	-0.0251
	(-2.40)	(-2.40)	(-0.45)	(-0.45)

Number of wells	0.263**	0.521**	0.0142	0.0842
and pumps	(3.77)	(3.72)	(0.41)	(0.41)
District (reference variable is the Mangochi district)				
Dowa	1.270**	2.510**	0.646**	3.823**
	(2.87)	(2.86)	(3.21)	(3.19)
Nkhotakota	-0.481**	-0.950**	0.397**	2.350**
	(-3.93)	(-3.90)	(4.56)	(4.49)
Rumphi	0.0837	0.165	0.111	0.657
	(0.37)	(0.37)	(0.85)	(0.85)
Dedza	0.0269	0.0532	0.370**	2.191**
	(0.13)	(0.13)	(3.08)	(3.05)
Constant	-0.0363		1.016**	
	(-0.12)		(6.11)	
N	256	256	256	256
Chi-squared	168.3	168.3	169.0	169.0
p-value	0.00	0.00	0.00	0.00

Notes: The models are weighted using the weights created based on the methodology in Diagne and Zeller (2001) to correct for the bias in estimation. The marginal effects are the average marginal effects across the distribution. Z-values are in parenthesis.

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