Ownership Rights and Investment in Agricultural Land in Ghana: A Gender Analysis

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Abstract

This paper examines the relationship between ownership rights and investment in agricultural land from a gender perspective in Ghana, using the Two-Stage Conditional Maximum Likelihood estimation technique and data from the Ghana Household Asset Survey. The results indicate that investment in agricultural lands is generally low in Ghana and tends to occur mostly in agricultural lands owned by men suggesting its inability to enhance tenure security. Furthermore, investment in agricultural lands owned by men is associated with a wider range of ownership rights. However, the same cannot be said about agricultural land owned by women as investments in their land do not significantly improve their rights to the land. Except for economic rights that appear to have a significant negative association with investments in agricultural lands owned by women, all other rights have no significant relationship with investments in agricultural lands owned by both men and women. There is a positive relationship between age and ownership rights for men suggesting that the youth may have challenges securing their tenure. We recommend the strengthening of the current land administration projects to enhance tenure security. Policies that will support the growing of perennial trees, construction of farmhouses and irrigation should be put in place by the government to encourage men to undertake such investments as they tend to improve ownership rights of agricultural lands. More should also be done to secure the ownership rights of the youth if the government wants them to engage in agriculture.

Keywords: Ownership Rights, Investment, Land Tenure, Gender, Ghana
JEL Classification: P48, Q15, Q24

Introduction

Ownership relates to the rights a person has over an object. Honore (1961) identified eleven rights that can describe the relationship between a person and an object. These are the right to possess, right to use, right to manage, right to income, right to the capital, right to security, right to transmissibility, absence of term, liability to execution, residuary character and prohibition of harmful use. A person's relationship with an object may be defined by some or all eleven rights to ownership proposed by Honore (1961). This then raises the question of which bundle of rights defines an owner. Schlager and Ostrom (1992) provide a framework to answer this question by proposing four categories of rights - the right to access and withdraw, the right to manage, the right to exclude and the right to alienate, and four categories of persons in relation to these rights -the authorized user who only has the right to access and withdraw, a claimant who has management rights together with access and withdrawal rights, a proprietor has all rights apart from alienation rights and the owner who has all the four rights.

The bundle of ownership rights one has to an asset such as agricultural land determines the incentive to invest in that asset. Three main theoretical arguments have been advanced in favour of the relationship between property rights and investment (Brasselle et. al, 2002). These are the assurance effect which argues that farmers are motivated to undertake long-term investment when rights are secured and they are certain of the returns; The realizability effect argument which argues that farmers will be willing to invest in the land when they have transfer rights that provide them with the option to convert the land into a liquid asset through rent or sale (Besley, 1995; Platteau, 1996) and the collateralization effect which argues that land can be used as collateral to secure credit for agricultural investment if the

owner has such rights.

There is inconclusive empirical evidence on the relationship between land ownership rights and investment. This is largely because both land rights and investment have not been measured consistently across studies and different methodological approaches have been adopted. As posited by Fenske (2010) the nature of investment, methodology, sample size and the measurement of the land right variables have a significant effect in determining the nature of the relationship.

The most widely used indicator of ownership rights is formal titles that ensure tenure security (Brasselle et al., 2002). Besley (1995) demonstrated the possibility of endogeneity between investment and rights because when lands have been developed, owners will take measures to protect their investment and secure their rights on such lands. Brasselle et al., (2002) noted that regardless of whether rights are supported by legal titles or enforced informally, the problem of causality still exists. In the case where property rights are supported by legal titles, farmers tend to register lands that potentially can yield a high level of return (Roth et al., 1994). This is because farmers will only bear the cost of registration when they are certain the land can yield such an amount in return. On the other hand, in cases where rights are not formalized, land rights may depend on past investment (Brasselle et al., 2002).

Early studies that examined the relationship between land rights and investment such as Place and Hazell (1993) and Harrison's (1992) did not control for endogeneity. However, studies such as Besley (1995), Brasselle et al. (2002) and Ayamga and Dzanku (2013) have addressed the causality problem by modelling rights as an endogenous variable. Besley (1995), using the same dataset as Migot-Adholla et.al. (1991) modelled rights as an endogenous variable such that farmer's rights on the land are influenced by their previous investment. His results contradicted those of Mighot-Adholla et al. (1991). In Besley's (1995) study, the different rights an owner had on a plot of land were summed to obtain a continuous variable thereby allowing him to employ the Instrumental Variable (IV) approach to deal with endogeneity.

However, this approach was criticized by Plattaeu (1996) because simply adding up rights and attaching equal weights to each right implicitly assumes that ordinal variables can be treated as metric variables and the IV approach comes at the cost of impairing the efficiency of the estimators leading to biased estimators. With this criticism in mind, Brasselle et. al., (2002) measured rights as ordered categorical variables based on a hierarchy of rights. They employed the Two-Stage Conditional Maximum Likelihood Method (2SCML) originally developed by Rivers and Voung (1988) to control for endogeneity. This method is suitable because land rights are measured more rationally, and the econometric technique is appropriate (Platteau, 1996). Brasselle et al. (2002) obtained a positive association between investment and security of tenure of farmers, however, after controlling for endogeneity, improved land rights did not enhance investments.

Abdulai et al (2011) adopted a similar approach and found that differences in land tenure security have a positive and significant influence on investment decisions of farmers in land improvement while Twerefou et al. (2011), following the approach by Brasselle et al. (2002), concluded that tenure security has a significant positive impact on investment; however, investment in farmlands have no influence on tenure security. Meanwhile, Bambio and Agha (2018) concluded for rural Burkina Faso that land rights enhance land-related investment whilst investment in land has a direct impact on strong land rights.

In a more recent study, Vu and Goto (2020) established for rural households in Vietnam that awareness about the increase in the duration of agricultural land-use rights leads to an increment in agricultural investments particularly an increase in the use of irrigation or soil conservation and the adoption of organic fertilizer. Likewise, Suchá et. al., (2020) confirmed that greater land tenure security has a significant positive effect on investments in

urban agriculture in South Africa.

The differences in the results on the relationship between rights and investment can partly be attributed to the different conceptualisation of investment in the literature. Whilst many of the studies define agriculture investment to mean any improvement on the land, the nature of improvement has differed from one study to the other. For instance, Brasselle et.al. (2002) provided five different forms of investment on land while Twerefou et. al., (2011) defines investment to include equipment or technology such as machines and tractors used to develop the land. Other forms of investment include irrigation, building of farmhouses, construction of roads and storage, bullock plough, among others. Other studies have also categorized investment in agricultural land into short, medium and long term (Dube and Guveya, 2013).

In terms of the gender dimension, there is a dearth of studies that compare the relationship between rights and investment of women and men farmers. One study that has a gender dimension is that of Goldstein and Udry (2008) who examined the effect of contested land rights on investment in Ghana. They concluded that women are seldom in influential positions in society to have improved rights to land and likely to invest less on their plots. In Haiti, Deaton et al., (2016) concluded that variations in tenure security by the sex of plot owners have a significant influence on investment decisions. As such women are reluctant to undertake investment on their inherited lands which they have weak rights. In a related study, Ali et al., (2014) demonstrated that land tenure security through land registration leads to increase investment in land by women in Rwanda.

The Food and Agricultural Organization (2011) argues that women in developing countries are likely to have weak land rights while Goldstein and Udry (2008) conclude that in Ghana, women's rights differ by their social status which affects investment. Oduro et al., (2011) also showed that land rights differ by gender. In Uganda, women have problems maintaining some rights to land after the death of their husband or after divorce (Deininger and Castagnini, 2006). Bambio and Agha (2018) also established that women are more likely to have weaker land rights than men. These pieces of evidence suggest that women do not have the same land rights as men. Some socio-cultural practices prohibit and/or discourage women from having particular rights to land and other assets (Hughes et al., 2011). If rights determine the incentive to invest and women and men do not have the same bundle of rights, it will be expected ceteris paribus, that the likelihood of investment in agricultural lands will differ between women and men.

A notable gap in the literature is that none of these studies has paid attention to gender differences in the distribution of the bundle of rights to land and how these differences may influence the investment decisions of women and men farmers in Ghana. The few studies that have examined issues of gender have done so by including a gender dummy. This study goes a step further by estimating separate models for women and men to analyze the relationship between land rights and agricultural investment for women and men. As noted by Singirankabo and Ertsen (2020), there is a need for more research to better understand and appreciate the relationship between land tenure security and agricultural-related investment and productivity.

This paper therefore seeks to investigate the implication of different land rights on investment in land by women and men in Ghana. Specifically, the paper examines the relationship between access and withdrawal rights, management rights, economic rights and alienation rights on investment in agricultural lands owned by women and men in Ghana.

Analysis of these issues is important because even though land is abundant in Africa (Kariuki, 2011) there has been inadequate investment in land because of insecurity of tenure (Twerefou, et al., 2011). An assessment of the causal relationship between ownership rights and investment, especially from a gender perspective, will enable the design of policy measures to increase investment in

land by women and men landowners. This has the potential to address the poverty trap that many Africans find themselves (Chauvin et al., 2012).

Materials and Methods

Model Specification

Following the approach adopted by Besley (1995), Brasselle et al. (2002) and Twerefou et al. (2011) in modelling the causal relationship between rights and investment, the following system of equations are specified:

$$I = \alpha + \beta R + \gamma W + \mu \dots\dots\dots (1)$$

$$R = \delta + \lambda I + \eta Z + \nu \dots \dots\dots (2)$$

Where I is investment, R is ownership rights, W and Z are distinct vectors of exogenous variables, μ and ν represents the residuals in the investment and ownership right equations respectively, α and δ are the constants and β, γ, λ and η are the coefficients.

Estimation Technique

Given the possibility of reverse causality between ownership rights and investment, it is important to test for endogeneity bias. The issue of endogeneity arises because, whereas improvement in rights enhances investment, the converse is also true. This is because, for lands that have been developed, owners will take measures to protect their investment and secure their rights on such lands. The conventional method of testing for endogeneity using the Two-Stage Least Square (2SLS) method is not valid when the dependent variable is binary (Brasselle et al. 2002). We therefore use the Two-Stage Conditional Maximum Likelihood method (2SCML) originally developed by Rivers and Voung (1988) and adopted by Brasselle et al. (2002) and Twerefou et al. (2011).

This method is more appropriate than the Instrumental Variable Probit (IVP) approach because the estimates obtained using this approach are consistent and asymptotically efficient, and therefore reduces the problem of incorrect standard errors compared to the IVP approach (Birungi and Hasan, 2007). The 2SCML is an inbuilt endogeneity test in that, if the residuals of the first stage equation are not statistically significant as a predictor, then there is no simultaneous equation bias or endogeneity (Chard, 2004). However, evidence from Monte Carlo experiments indicates that even in cases where these conditions are not met, the 2SCML is a more efficient estimator compared to other classes of simultaneous equation models (Alvarez and Glasgow, 1999).

The effect of investment on rights is investigated using the Ordered Probit Model (OPM). To test for endogeneity of the investment function, the first stage is to estimate the reduced form of the investment equation (1) labelled as (3) which consists of exogenous independent variables. As noted by Brasselle et.al (2002), equation (3) is a linear probability model and the investment variable is not instrumented as with the Two-Stage Least Squares (2SLS). In the second stage, the estimated residuals in equation (3), $\hat{u}$, are included as an independent variable in the second stage equation for the ownership rights equation (4) which corresponds to an Ordered Probit model.

$$I = \theta + \psi W + \mu \dots\dots\dots\dots\dots (3)$$

$$R_i = \delta + \lambda I + \eta Z + \rho\hat{u} + \nu, \qquad i = 1,2,3,4 \dots\dots (4)$$

The coefficient of the generated residuals (ρ) in equation (4) is used to determine whether there is simultaneous equation bias or not. With a null hypothesis of exogeneity, if ρ is significantly different from zero then the null hypothesis can be rejected, and we conclude that there is simultaneous equation bias. However, if ρ is not significantly different from zero then the null hypothesis cannot be rejected and suggesting there is no simultaneous equation bias.

A similar procedure is used to investigate the effect of rights on investment. The reduced form of equation (2) is estimated and the

residuals generated from these equations are inserted as an explanatory variable in equation (1). However, since rights were captured as an ordered variable with four categories, there will be three endogenous dummy variables in the investment equation (Brasselle, et al. 2002) since the first category is used as the reference dummy. For each of these categories, a reduced form was estimated. The residuals generated from the reduced form equations were used to test for the endogeneity bias for each category of ownership right. The reduced form of equation (2) is specified as equation (5) and the investment function with the generated residuals is accordingly specified as equation (6).

$$R_i = \mathfrak{r} + \mathfrak{o}Z + v_i, \qquad R_i = 1 \ for \ i = 2,3,4 \ldots\ldots\ldots (5)$$

$$I = \alpha + \sum_{i=2}^{4} \beta_i R_i + \gamma W + \sum_{i=2}^{4} \phi_i \hat{v}_i + \mu, for \ i = 2,3,4 \ \ldots\ldots (6)$$

The coefficient of the generated residuals (ϕ) is used in testing for the exogeneity of each category of the rights variable with a null hypothesis of exogeneity of these categories. The significance or otherwise of the coefficients of these residuals (ϕ_i) is used in determining whether there is endogeneity of each category of land rights (Brasselle et al. 2002). Also, in testing for the endogeneity of property rights, a joint Wald test is conducted on the vector (ϕ_i). The test criteria are the same as stated above. To consider the gender dimension of the relationship between each of these rights and investment, equations (4) and (6) were estimated differently for agricultural land owned by women and agricultural land owned by men as specified below:

$$R_i^f = \delta + \lambda I + \eta Z + \rho \hat{u} + \nu, i = 1,2,3,4 \ldots\ldots (7)$$

$$R_i^m = \delta + \lambda I + \eta Z + \rho \hat{u} + \nu, i = 1,2,3,4 \ldots\ldots (8)$$

$$I^f = \alpha + \sum_{i=2}^{4} \beta_i R_i + \gamma W + \sum_{i=2}^{4} \phi_i \hat{v}_i + \mu, for \ i = 2,3,4 \ \ldots\ldots (9)$$

$$I^m = \alpha + \sum_{i=2}^{4} \beta_i R_i + \gamma W + \sum_{i=2}^{4} \phi_i \hat{v}_i + \mu, for \ i = 2,3,4 \ \ldots\ldots (10)$$

Where *f = female* and *m = male*

Data and variable description

The data for the analysis was obtained from the Ghana Household Asset Survey (GHAS) that was carried out from May to July 2010 by the University of Ghana, Department of Economics. A two-stage sampling procedure was employed. In the first stage, enumeration areas were selected from each of Ghana's ten administrative regions. The number of enumeration areas selected was determined by each region's share of the total population. In the second stage, 15 households were randomly selected from each of the enumeration areas. In all, a total of 2,170 households covering all ten regions of Ghana were surveyed. The questionnaire had four main sections. The first section collected information on the demographic characteristics of household members. The second section collected data on household physical assets (agricultural land, place of residence, real estate, agricultural equipment, livestock, consumer durables and businesses) and their owners. The third section collected data on consumption expenditure of the household and the last section collected more detailed information on asset ownership. In addition, this section also collected information on financial assets owned by respondents, rights over assets and any income they generate. In total, the data consist of 7,984 observations from 2,170 households. An observation here is considered as a plot signifying that households on average have more than three plots.

This paper focuses on observations with agricultural land in examining the relationship between ownership rights and investment. Out of the total of 7,984 observations in the 2010 GHAS, only 825 of them are owners of agricultural lands, owning 1410 plots. This implies that some landowners had more than one plot. About 73.1 percent of the plot were owned by men while the remaining 26.9 percent were owned by women. The unit of analysis for this paper is the plot owned by individuals and not the individuals themselves.

Table 1 presents the characteristics of agricultural landowners. Analysis of the responses suggests that over 73 % of the respondents are men indicating that more men own agricultural land than women. Most men who own agricultural lands are currently married (over 86%) whilst most women who own agricultural land are either currently married (46.8%) or previously married (52.2%). Almost all agricultural landowners have either never been to school or have 9 years of basic education. Both women and men landowners are predominantly self-employed without employees with the proportion of men slightly higher than women. The mean age is 51 years for men and 54 years for women. Majority of both women and men agricultural landowners are in the rural areas however the proportion of men landowners in the rural areas is slightly higher than that of women. The predominant crops grown among men and women are annual crops with the proportion of men who grow annual crops a little higher than that of women. More than half of the respondents belong to an organization. However, the proportion of women who belong to an organization is more than men. The average wealth for men and women was (GHC) 20,584.4 and GHC11,423.8 respectively.

TABLE 1
Characteristics of Landowners (percent)

Variables	**Total**	**Men**	**Women**
Marital status			
Never Married	2.9	3.6	1.2
Currently Married	74.6	86.4	47.7
Previously Married	22.5	10	51.1
Location			
Urban	17.5	13.2	27.2
Rural	82.5	86.8	72.8
Education			
Never been to school	38.5	37.3	41.4
Basic education	51.7	51.3	52.6
Secondary education	6.5	7.6	4.1
Tertiary education	3.3	3.8	1.9
Employment			
Wage employment-public	3.7	4.1	2.5
Wage employment-private	2.9	3.3	1.6
Self-employment with employees	6.2	6.0	5.7
Self-employment without employees	86.2	86.2	86.3
Others	1	0.4	3.9
Mean Age	51.9	51.3	54
Social networks			
Belong to organization	54.6	49.9	65.3
Does not belong to an organization	45.4	50.1	34.7
Crops Grown			
Annual Crops	67.2	68.6	64
Tree Crops	32.8	31.4	36
Average Wealth	GHC18,208.1	GHC20,584.4	GHC11,423.8

Source: Ghana Household Asset Survey, 2010. NB: The values should add up to 100% for every variable with categories vertically

Results and Discussions

Ownership Rights and Investment

The existed practice in Ghana was that the first person to clear a prime forest can claim ownership of the land. With the decline in prime forest, the mode of acquiring agricultural land is largely through inheritance, gifts, purchase and by virtue of being a member of a family or community (Table 2). The main mode of acquiring agricultural lands in Ghana among men and women is through inheritance. Over 49 per cent of the plots owned by both women and men were acquired through inheritance. There are gender disparities in the acquisition of land through gifts and by virtue of being a member of a lineage. Men own more family land than women (Table 2). The other modes of acquisition was mainly land obtained through adjudication.

More men than women acquire agricultural land through family lineage as indicated in Table 2. This, to an extent, is consistent with customary laws in Ghana where men are more likely to be heirs of family properties compared to women. As noted by Hughes et al., (2011) in both the patrilineal and matrilineal systems in Ghana, family lands are considered to belong to the lineage through the male family heads. Among matrilineal ethnic groups, fathers, and husbands usually gift land to their children and wives in compensation for their labour services (Duncan 2010). Gifting occurs especially because female children and wives are not expected to inherit the property of their fathers and husbands. This is a way for fathers and husbands to get around this customary practice (Amanor 2001, Boni 2008).

Ownership Rights

The study uses six main types of ownership rights as captured in 2010 GHAS data: These are the right to make decisions about the type of crops to grow on the land, the right to decide what to produce on the land, the right to decide how much of the produce is sold, the right to decide how revenue from the sale of crops is used, the right to use the land as collateral and the right to sell the land. Respondents were asked whether they could exercise these rights alone or in consultation with others. Each of these rights was captured as a discrete variable with a value one (1) if the person can exercise such a right on his or her plot (either alone or in consultation) and zero (0) if otherwise.

Since we captured ownership rights as a categorical variable in hierarchical form, there is an additional task of ranking these

TABLE 2
Descriptive Statistics (percent)

	Men	Women	P-value
Modes of Acquisition			
Purchased plots	9.3	8.2	0.654
Inherited plots	49.5	49.8	0.416
Gifted plots	10.0	27.1	0.000
Family plots[1]	20.6	10.8	0.000
Other	10.6	4.1	0.004
Investment			
Plots that have been improved	34.2	25.0	0.001
Plots that have not been improved	65.8	75.0	0.001
Category of Rights			
Plots with owners having access and withdrawal rights	1.1	8.5	0.000
Plots with owners having management rights	49.8	56.2	0.047
Plots with owners having economic rights	13.2	5.1	0.000
Plots with owners having alienation rights	35.9	30.2	0.062

Source: Ghana Household Asset Survey, 2010. NB: The values should add up to 100% for every variable with categories vertically

[1] For the purposes of this discussion, family plots are plots that belongs to the entire extended family which is available for use by the respondents. On the other hand, inherited plots are plots that have been bequeathed to the respondents as inheritance from any member of the family.

variables. We adopt the classification of rights developed by Schlager and Ostrom (1992) to reclassify the six rights in hierarchical order as presented in Appendix 1. At the top of the hierarchy is the right to sell followed by economic, management and access and withdrawal rights.

There are significant differences in the pattern of ownership rights of plots owned by women and men. About 8.5 per cent of plots owned by women have owners with *access and withdrawal rights* compared to 1.1 per cent of plots owned by men. The proportion of plots owned by women with *management rights* (56.2%) is higher than the proportion of plots owned by men (49.8%). Plots owned by men are more likely to have owners with *economic rights* (13.2%) and *sales rights* (35.9%) compared to plots owned by women (5.1% and 30.2% respectively). These findings confirm the report by Food and Agriculture Organization (2011) that women in developing countries are more likely to have weaker land rights. The description of the exogenous variables is provided as appendix 2.

Investment Variable

Each respondent was asked whether they had made any improvements on the plot in the last five years. The study captures the investment variable as a dummy with a value of one (1) if any improvements had been made on the plot in the last five years and zero (0) otherwise. Investment in land is generally low although the proportion of improved plots owned by men is higher than improved plots owned by women. Specifically, investment was undertaken on about 34 per cent of the plots owned by men compared to 24 per cent of women's plots. Twerefou et al., (2011) also found a low incidence of investment in agricultural plots.

TABLE 3
Ownership Rights Equation

Variables	Men's Sample	Women's Sample
Invest	6.317*(3.355)	1.248(1.162)
Age	0.0139*(0.00819)	-0.00542(0.00662)
Ownership	0.945***(0.224)	0.532**(0.241)
Marital status	-0.788**(0.369)	-0.800***(0.244)
Educational status	0.0642(0.151)	0.272(0.217)
Economic status	-0.655(0.593)	0.970***(0.369)
Mode of acquisition (ref : family land)		
Inherited land	0.652***(0.166)	0.643**(0.263)
Gifted land	0.631***(0.204)	1.088***(0.258)
Purchased land	1.023***(0.255)	0.556(0.349)
Residual	-6.398*(3.350)	-1.314(1.151)
Constant cut1	-0.334(0.992)	0.232(0.803)
Constant cut2	3.141***(0.946)	2.341***(0.812)
Constant cut3	3.474***(0.942)	2.481***(0.812)
Pseudo R2	0.0649	0.1124
Wald $\chi 2$	56.94	39.51
p-value	0.0000	0.0000
Observations	772	307

Robust standard errors in parentheses

*** p<0.01, ** p<0.05, * p<0.1

Source: Authors' computation using GHAS data

Ownership Rights Equation

Identifying the relationship between ownership rights and investment for women and men landowners began by running reduced form investment equations. The residuals obtained from these first-stage regressions were included in the ordered probit regression models on ownership rights. Table 3 presents results from the regression models for women and men respectively. Investment in lands is associated with an improvement in the rights of plots owned by men only.

We find it difficult to discuss this result with previous studies since such studies did not estimate separate regression for men and women. However, there are previous studies that are worth mentioning. For instance, Twerefou et al. (2011) established that investment in farmland does not have any significant influence on the security of tenure of farmers. Also, a recent finding in Ghana by Ayamga et al. (2015) and an earlier study in Burkina Faso by Brasselle et al. (2002) concluded that investment in agricultural lands enhances tenure security. The coefficient of the generated residuals in the first stage investment equation for plots owned by men is statistically significant whilst that of plots owned by women is not significant.

For both men and women, owners of plots acquired through gift and inheritance were more likely to have better rights to their plots compared to plots that are family lands. This is expected since family lands belong to the entire extended family and decisions concerning the land must be taken collectively by the family and therefore owners are less likely to receive permission to exercise the appropriate rights. This is consistent with the findings of Twerefou et al. (2011) that gifted plots are more secured than plots acquired through a lease. Men who acquired their plots through purchase were more likely to have better rights to their plots compared to plots that are family lands. However, plots acquired through purchase by women did not significantly increase the likelihood of increasing their rights compared to family land. This may be that such plots were purchased using the husband's resources. For plots owned by men, there is a positive relationship between rights and the age of the owner. This means that men plot owners are more likely to have better rights on their plot as they get older which is in accordance with customs and traditions since older people are accorded much respect and they are the ones in influential positions and opinion leaders. This supports the findings of Ayamga et al. (2015) that younger people face insecure tenure as compared to older people. It also enforces the assertion by Goldstein and Udry (2008) that influential people and opinion leaders have more secure tenure. However, no significant relation was observed between rights and the age of the owner for plots owned by women.

Both men and women who are not married are more likely to have improved rights over their plots compared to those who are currently married. The reason could be that married people are less likely to receive permission or approval from their spouse to exercise such right (Oduro et. al., 2011). For plots owned by women, owners who are engaged in economic activities are more likely to have stronger rights compared to those who are not engaged in any economic activities. This result is expected as women with higher economic status can better protect their rights since they can afford legal service to secure their ownership. As expected, plots that are owned alone are likely to have owners with better rights compared to those owned jointly. This result is true for plots owned by both women and men and expected since joint ownership requires consultation before decisions are made.

Investment Equation

Table 4 presents the results for the effect of ownership rights on investment. As evident from Table 4, none of the coefficients of the rights variables in the men's regression model is significant suggesting that ownership rights are not significantly related to investments made on the plots. This result is consistent with the recent finding in Ghana by Ayamga et al. (2015) and an earlier study in Burkina Faso by Brasselle et al., (2002) that improved rights over land do not significantly influence

TABLE 4
Investment Equation

Variables	Men's Sample	Women's Sample
Management Rights	-6.889(13.99)	-3.765(3.895)
Economic Rights	-9.907(13.61)	-12.76*(7.336)
Alienation Rights	-6.792(13.38)	-2.505(2.379)
Age	-0.0137(0.00902)	-0.00947(0.00889)
Marital status	0.560*(0.287)	-0.219(0.463)
Location	0.0690(0.183)	1.086**(0.427)
Crop	0.0332(0.139)	-0.277(0.187)
Educational status	-0.247(0.244)	-0.694**(0.329)
Economic status	0.522(0.522)	-0.329(0.660)
Wealth	0.0281(0.0405)	-0.0637(0.0600)
Social network	-0.0665(0.136)	0.0929(0.226)
Residual 2	10.95(14.05)	3.429(3.892)
Residual 3	13.56(13.68)	13.31*(7.360)
Residual 4	10.79(13.46)	2.118(2.402)
Constant	6.438(13.15)	4.582(3.181)
Pseudo R2	0.0276	0.0838
Wald $\chi 2$	357.10	22.61
P-value	0.0000	0.0669
Observations	772	307

Robust standard errors in parentheses

*** p<0.01, ** p<0.05, * p<0.1

Source: Authors' computation using GHAS data

investment. Recent studies such as Ayamga and Dzanku (2013) have also expressed doubts about the existence of an effect of land tenure security on investment. However, Twerefou et. al (2011) came to the opposite conclusion.

In contrast to the men's regression model, there is a significant relationship between rights and investment in the model for women-owned plots. The coefficient of the economic rights variable is negative and significant suggesting that women owners with economic rights are less likely to improve these plots compared to women owners who only have withdrawal and user rights over their plots. This negative relationship could be attributed to the fact that women who own plots improve their plots to secure their lands as with usufruct title. The coefficients of the residuals generated from the first stage equation of all the three categories of ownership rights are not statistically significant for both the men and women sample except residual three for the female sample. Moreover, a joint Wald test on these coefficients is also not statistically significant from zero in both cases.

For the men's sample, plots whose owners are currently married are more likely to be improved than those whose owners are not married. However, no significant relation was found for plots owned by women. This perhaps could be attributed to the fact that men invest in the land so they could leave it as an inheritance for the family. This is not surprising as it is consistent with customary laws in Ghana where men are the heads of the households and are responsible for the family. For plots owned by women, those who have attained some years of formal education are less likely to invest in their land compared to those with no formal education which contradicts several studies suggesting a positive relationship between investment and education (see Bizoza et al., 2007; Wynne and Lyne, 2003). This is surprising as one will

expect people with higher education to invest more in their lands compared to those with no formal education. In the case of plots owned by men, the educational status did not have any significant influence on investment. Plots owned by women in urban areas are likely to be improved than those own by women in rural areas. However, no significant relation was found for plots owned by men with regards to location.

Conclusion and Policy Recommendations

This study examined the patterns of ownership rights as well as the relationship between ownership rights and investment from a gender perspective in Ghana, using the 2SCML estimation technique and data from the GHAS. The distribution of ownership rights is not the same for women and men landowners. Plots owned by men have owners with more rights and more of the hierarchically stronger rights – economic rights and the rights to sell – than plots owned by women.

Investment in land is generally low and tends to occur on plots owned by men. The investment made on plots owned by men strengthens their owners' rights to the land. However, the same cannot be said about plots owned by women as investments in their land do not significantly improve their rights to the land. Apart from economic rights that appear to have a significant negative effect on investment of plots owned by women, all the other rights did not significantly determine investment in plots owned by both men and women.

We recommend that the current land administration project in Ghana is strengthened as it will enhance the ownership (alienation) right of both men and women which is quite low. Also, policies should be put in place to ensure that men are encouraged to make tenure enhancing investments such as growing perennial trees, construction of farmhouses and irrigation as they tend to improve ownership rights of agricultural lands. The positive relation between age and ownership rights for men suggest that more should be done to secure the ownership rights of the youth if the government wants them to engage in agriculture. The fact that having economic right reduces the likelihood of women investing in their land is quite puzzling and needs further investigation.

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Appendix 1
Ownership Right Categorization

Category	Type of Right	Description
1	Access and Withdrawal Rights	Respondents who reported of not having any of the six rights
2	Management Right	Respondents who have the right to make decisions about the type of crops to grow on the land.
3	Economic Right	Respondents who have management rights and have the right to decide what and how much of the produce is sold, decide how revenue from the sale of crops is used and to use the land as collateral.
4	Alienation Right	Respondents who have economic rights in addition to the right to sell the land.

Source: Authors' based on Classification by Schlager and Ostrom (1992)

Appendix 1
Description of Exogenous Variables for regression

Variable	Measurement
Age	Continuous (in years)
Marital status	Dummy: 1 if currently in a union, 0 otherwise
Educational status	Dummy: 1 if any formal education, 0 otherwise
Economic status	Dummy: 1 if engaged in any economic activity, 0 otherwise
Ownership	Dummy: 1 if plot is owned alone, 0 otherwise
Crop	Dummy: 1 if crops grown are annual crops, 0 otherwise
Social network	Dummy: 1if belongs to an organization, 0 otherwise
Purchased	Dummy: if plot was purchased, 0 otherwise
Gift	Dummy: if plot was received as a gift, 0 otherwise
Inheritance	Dummy: if plot was inherited, 0 otherwise
Family land	Dummy: if plot is family land, 0 otherwise

Source: Authors' compilation from Ghana Household Asset Survey (GHAS) (2010)