

# **Fast Track Land Reform, Tenure Security and Investments in Zimbabwe**

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## **Abstract**

Zimbabwe has, since independence in 1980, pursued a Land Reform and Resettlement Program aimed at addressing a racially skewed land distribution. The most recent phase of this program, the Fast Track Land Reform Program, was launched in 2000 with the aim of acquiring at least five million hectares of land for redistribution. This paper investigates the impact of this program on perceptions of tenure security and investments in soil conservation. Evidence suggests that the program not only created some tenurial insecurities among its beneficiaries but also had an adverse impact on investments in soil conservation. Interestingly, households who believe investing on land enhances tenure security invest significantly more and their perceptions of tenure security depend positively on investment levels, supporting the contention that households invest in long term land-related investments to enhance security of tenure.

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## 1. Introduction

Zimbabwe has, since independence in 1980, pursued a Land Reform and Resettlement Program aimed at addressing a racially skewed land distribution. The program is premised on land acquisition and redistribution. The most recent phase of this program, the Fast Track Land Reform Program (FTLRP), on which our analysis is based, was officially launched in July 2000 with the aim of an extensive compulsory land acquisition and redistribution targeting at least five million hectares for resettlement (Zimbabwe, 2000). While in principle the land tenure system under the FTLRP offers each household a 99-year lease with an option to purchase the land, the reality is that the FTLRP settlers have been issued with many different types of temporary licenses which the government intends to convert, in time, to permanent leases. This has been argued to be a source of tenurial insecurities among beneficiaries of the FTLRP (Munyuki-Hungwe and Matondi, 2006).

Unfortunately the FTLRP has been accompanied by a drop in agricultural production which had dropped by 30% by 2004 (Richardson, 2004). Given that agricultural production is directly influenced by the level of investments, it can be argued that the rapid decline in production is partly due to low levels of land-related investments conditioned by the reform process<sup>2</sup>. Moreover, a survey in 2003 concluded that about one-quarter of land in Zimbabwe is severely eroded (Richardson, 2004) implying that comparatively large benefits can be derived from land-related investments. Furthermore Zikhali (2008) finds that soil conservation enhances agricultural productivity in Zimbabwe. Thus using Zimbabwe as a case study allows for an interesting empirical contribution to existing literature that assesses empirically the link between tenure security and investment incentives in the context of land reforms.

Economic theory postulates three links between tenure security and agricultural investment incentives<sup>3</sup>. The first link is what Besley (1995) refers to as a ‘Security Argument’ and captures the direct and positive link between tenure security and investment incentives. The logic is that insecure tenure leads to market imperfections and increases the risk associated with farming through threat of dispossession. The

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<sup>2</sup> Of course there are other explanations such as the loss of economic scale as well as replacement of experienced farmers with less experienced ones that are more geared towards production for subsistence, among others.

<sup>3</sup> See Besley (1995) for a comprehensive summary.

second link is referred to as ‘a Collateral-Based View’ which is based on the premise that when land tenure is secure and thus easier to collateralize, this would reduce the price of capital and subsequently increase the value of investments. The third and final link is referred to as ‘a Gains-from-Trade Perspective’ and is based on the fact that secure land rights increase investment incentives by lowering transaction costs if land is to be either rented out or sold thereby expand trading opportunities and the ability to take advantage of gains from trade.

Existing literature on the empirical analysis of the link between land tenure and investment reveal mixed results.<sup>4</sup> Studies by Feder (1987), Besley (1995), Alemu (1999) and Holden and Yohannes (2002) underscore the significance of tenure security in promoting land-related investments. Ayalew et al. (2005) and Zerfu (2008) find that the risk of future expropriation and limited perceived transfer rights has an adverse impact on households’ investments on land in Ethiopia. Other studies, however, find little impact of property rights on land-related investments (see Migot-Adholla et. al, 1994 for the Kenyan case; Roth et. al, 1994 for the case of Somalia and Gavian and Fafchamps, 1996 for the case of Niger). The main econometric challenge faced by most studies analysing the link between tenure security and investments arises from the fact that in most African countries there is a causality problem in that land rights may depend on past investments and vice versa (Besley, 1995; Brasselle et al., 2002). Consistent with this, tree planting has been identified as a way of establishing and/or enhancing tenure security (Place and Hazell, 1993; Besley, 1995; Sjaastad and Bromley, 1997).

Few studies have explored the link between tenure security and land-related investments in Zimbabwe. Moor (1996) finds that perceived tenure security in the form of land titling and registration has a significant and positive effect on long-term on-farm investments by small-scale farmers in Zimbabwe. However, the sample comprised only beneficiaries of pre-2000 land reform programs. A study by Fortmann (1998) suggests that lack of tenure security discourages female farmers from making long term, ecologically beneficial investments on their land. Kinsey (1999) using a 400-resettlement area household panel study and a contrasting group of communal

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<sup>4</sup> See Brasselle et al. (2002) for a survey of empirical studies of land tenure and land investment in Africa.

area households finds that beneficiaries of pre-2000 land reform programs increased their incomes, reduced income variability and at the same time accumulated wealth in the form of cattle. Deininger et al. (2004) find a positive though modest economic return (US\$17) to land reform programs before the FTLRP. No study, to the best of our knowledge, has conducted an empirical analysis of the impact of Zimbabwe's FTLRP on tenure security and land-related investments.

This paper investigates the impact of Zimbabwe's FTLRP on perceptions of tenure security and investments in soil conservation. Our study contributes to the scarce literature on the empirical analysis of the FTLRP on tenure security and land-related investments. We deal with the causality problem between land rights and investment by controlling for whether the household believes investing on land enhances tenure security. Using data from Mashonaland Central province in Zimbabwe, our results provide evidence that the program created some tenurial insecurities among its beneficiaries and had an adverse impact on investments in soil conservation. In addition evidence suggests that households who believe investing on land enhances tenure security are not only significantly more likely to invest but their perceptions of tenure security depend positively on levels of investments in soil conservation.

The rest of the paper is organised as follows; the following section gives a brief background on the FTLRP. Section 3 presents the underlying conceptual framework while the econometric framework and estimation strategy used in the paper are discussed in section 4. Section 5 discusses the data used in the empirical estimation. A discussion of the results is done in section 6. We conclude with section 7.

## **2. Fast Track Land Reform in Zimbabwe**

Zimbabwe inherited a racially skewed agricultural land ownership pattern at independence in 1980. The white large-scale commercial farmers, consisting of less than 1% of the population occupied 45% of agricultural land, with 75% of this in the most agriculturally productive areas (Shaw, 2003).<sup>56</sup> Consequently, the Zimbabwean government has, since independence in 1980, adopted a Land Reform and

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<sup>5</sup> See also <http://www.lands.gov.zw/landreform/landreform.htm>

<sup>6</sup> It is also worth noting that commercial farms were crucial in e.g. employment creation, total agricultural production as well as export earnings. For example in the 1990s commercial farms accounted for 68% of gross agricultural output and 40% of export earnings (Addison and Laakson, 2003).

Resettlement Program premised on land acquisition and redistribution. The main long-standing objectives of this program have been to address the imbalances in land access while alleviating population pressure in the communal areas; extending and improving the base for productive agriculture in the smallholder farming sector; improving the living standards of the majority of the population and bringing idle or under-utilised land into full production (Kinsey, 1999).

The Land Reform and Resettlement Program can be classified into two broad phases<sup>7</sup>. The first phase began in 1980 with the primary objectives of addressing inequitable land ownership, insecurity of tenure and unsustainable and sub-optimal land use (Moyo, 2006). Given the government's policy of national reconciliation and reconstruction as well as the restrictive Lancaster House Constitution<sup>8</sup>, the government pursued a land resettlement program based on a willing-seller/willing-buyer approach. However, in 1997 the Government of Zimbabwe initiated a process of radical land reform premised on extensive compulsory land acquisition and redistribution targeting at least five million hectares for resettlement (Moyo, 2004). This heralded the start of the second phase of the program. The FTLRP, on which our analysis is based, was officially launched in July 2000 and is viewed as a sub-phase of the second phase.

The main objectives of the FTLRP were to speed up the identification for compulsory acquisition of not less than five million hectares of land for resettlement; to accelerate the planning and demarcation of acquired land and settler emplacement on this land and to provide limited basic infrastructure and farmer support services (Zimbabwe, 2000; Moyo, 2006). The program comprises two models, Model A1 and Model A2. The former is intended to de-congest communal areas and is for the generality of land-constrained Zimbabweans. This model is based on existing communal area organization whereby peasants produce mainly for subsistence with small surpluses for the market in good seasons. Model A2, on the other hand, is a commercial settlement scheme comprising small, medium and large-scale commercial settlements intended at creating a cadre of black commercial farmers and is based on the concept

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<sup>7</sup> <http://www.lands.gov.zw/landreform/landreform.htm>

<sup>8</sup> The Lancaster House Constitution obligated the government to acquire land on a willing seller-willing buyer basis during the first ten years of independence.

of full cost recovery from the beneficiary. This is in principle targeted at any Zimbabwean citizen who can prove their farming experience and/or resource availability (Zimbabwe, 2000). The bulk of the program is, however, based on Model A1.

As mentioned above, while in principle the tenure system under the FTLRP offers each household a 99-year lease with an option to purchase the land, the reality is that the FTLRP settlers have been issued with many different types of temporary licenses. This has been claimed to be a source of tenurial insecurities among beneficiaries of the FTLRP (Munyuki-Hungwe and Matondi, 2006). This paper attempts to provide an empirical contribution to this discourse by assessing empirically how the FTLRP has affected perceived tenure security among farming communities. It goes a step further to analyse how the program also affected land-related investments.

In communal areas, on the other hand, land ownership continues to be vested in the state with rights of usufruct being allocated to an individual (usually a male) by a chief for as long as he may need it or is cultivating on it. These rights can in principle be passed on as inheritance on the death of the original owner with the inheritor of the land being based on primogeniture but the wife of the deceased can continue to cultivate the land (Mutema, 2003).

### **3. The Conceptual Framework**

The conceptual framework models households' perceptions of tenure security and investments in soil conservation, conditioned by the FTLRP.

#### *3.1. Fast Track Land Reform and Soil Conservation Investments*

We have the following simple model for soil conservation investments

$$I = I(S(R), \Lambda) \tag{1}$$

where  $I$  is the level of soil conservation investments, measured as the total parcel area under soil conservation structures constructed in the last five years, normalized by the total parcel size.  $S$  is an indicator of perceived tenure security. Perceived tenure security is assumed to be affected by  $R$ , the dummy indicating whether the

household got the parcel via the FTLRP or otherwise. We maximize on the information we have by having dummies that capture the different modes of acquisition of the parcel (i.e. whether the parcel was bought, inherited, allocated to the household by a traditional leader or acquired via the FTLRP).  $\Lambda$  is a vector of the household's socioeconomic as well as parcel characteristics which include for example, gender, age and education of household head, household composition, social capital indicators, involvement in off-farm activities, size and steepness of parcel, distance from the homestead to the parcel, contact with agricultural extension workers and initial endowment of soil conservation structures.<sup>9</sup> We also control for whether the household believes investing on land enhances tenure security to allow for the possibility that households invest to establish and/or enhance tenure security. This is supported by the fact that about 58% of the households in the sample said they believe land investments reduce the probability of losing land via e.g. evictions or expropriation.

Consistent with theoretical postulations we hypothesise that

$$\frac{\partial I}{\partial S} > 0$$

and assuming the FTLRP has led to tenurial insecurities we have

$$\frac{\overset{(+)}{\partial I}}{\partial S} \frac{\overset{(-)}{\partial S}}{\partial R} < 0$$

That is, levels of investments are inversely related to whether the parcel was acquired via the FTLRP or not. Tenure security is more important when we consider medium to long term investments (Holden and Yohannes, 2002). This has been the justification for most researchers' approach of looking at the impact of tenure security on more long term investments such as tree planting and construction of conservation structures (see e.g. Besley, 1995; Hayes et al., 1997; Holden and Yohannes, 2002).

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<sup>9</sup> Ideally the level of investment will be a function of the desired stock of soil conservation structures or rather the difference between the household's desired stock and the current stock. However we are not able to model this due to data limitations.

### 3.2. Fast Track Land Reform and Tenure Security

We present the following simple model of tenure security:

$$S = S(R, I, \Omega) \quad (2)$$

We include  $I$  to explore whether households feel more secure about parcels they have invested on. We also include an interaction of a dummy that captures whether the household believes investing on land enhances tenure security with investment levels to investigate whether believing investing on land enhances security and actually undertaking investments affects perceived tenure security. The vector  $\Omega$  includes variables to capture socioeconomic as well as parcel characteristics hypothesised to affect perceptions of tenure security.

We hypothesise that farmer's feel less tenure secure about the land they got under the FTLRP, that is,

$$\frac{\partial S}{\partial R} < 0$$

and that for households who believe investing on land enhances tenure security,

$$\frac{\partial S}{\partial I} > 0.$$

## 4. The Econometric Framework and Estimation Strategy

Equations (1) and (2) imply the estimation of the following reduced form equations

$$I = \alpha_0 + \alpha_1 R + \alpha_2 \Lambda + \nu \quad (3)$$

and

$$S = \beta_0 + \beta_1 R + \beta_2 I + \beta_3 \Omega + \varepsilon \quad (4)$$

where  $\beta_0, \beta_1, \beta_2, \beta_3$ ,  $\alpha_0, \alpha_1$  and  $\alpha_2$  are parameters to be estimated while  $\varepsilon$  and  $\nu$  are error terms. We assume that the error terms are independently, identically and normally distributed with zero means (Wooldridge, 2002).

To deal with the challenge posed by the fact that beneficiaries of the FTLRP might not form a randomly selected sub-group of all farmers in the sample, we use the propensity score matching method to estimate the average treatment effect of the

FTLRP on the intensity of soil conservation investments as well as on perceptions of tenure security. We retain the observations within common support from the matching process which we then use to estimate a Heckman selection model (to estimate equation 3) and an OLS model (to estimate equation 4). Thus the analysis complements nonparametric methods with parametric methods and by using observations that fall within common support from the matching process we ensure that we have a comparable sample in estimating the parametric models. A detailed discussion of the estimation strategy follows below.

#### 4.1. Propensity Score Matching

We use the propensity score matching method to address the ‘selection on observables’ problem, that is, it might not be the case that beneficiaries of the FTLRP form a randomly selected sub-group of all farmers in the sample. Propensity Score Matching is a nonparametric method used to estimate the average treatment effect of a binary treatment on a continuous scalar outcome. The main idea with this method is to estimate nonparametric regression models to construct the counterfactual under an assumption of selection on observables. In our analysis we take land reform as the treatment variable while investments in soil conservation and tenure security are the outcomes. Thus the group that benefited from the reform is the treatment group while those in the communal areas form the control group.

Our objective with this method is to estimate the average treatment effect of the FTLRP in the FTLRP sub-sample. To do this we consider the following equation

$$ATT = E[I_1 | R = 1] - E[I_0 | R = 1] \quad (5)$$

where  $ATT$  is the average effect of the treatment on the treated,  $I_0 | R = 1$  is the level of soil conservation investments that would have been observed if the parcel had not been acquired via the FTLRP while  $I_1 | R = 1$  is the level of investment we actually observe in the land reform sub-sample. The challenge is that we cannot observe  $E[I_0 | R = 1]$  necessitating the creation of a counterfactual of what we observe by matching treatment and control groups. The key assumption is that conditional on  $X$ , the outcomes must be independent of the targeting dummy  $R$ , with  $X$  being the set of covariates that influence selection into the FTLRP. This gives the following equation

$$ATT = E[I_1 | R = 1, X] - E[I_0 | R = 0, X]$$

We match the treated to the control units with similar values of  $X$ . Following Rosenbaum and Rubin (1983) we match the two groups using propensity scores, which are basically the probabilities of being in the land reform group conditional on  $X$ . This means that we have

$$ATT = E[I_1 | R = 1, p(X)] - E[I_0 | R = 0, p(X)] \quad (6)$$

where  $p(X)$  is the propensity score. We use the Kernel matching method, which matches a treated unit to all control units weighted in proportion to the closeness between the treated unit and the control unit. We also estimate equation (6) for perceived tenure security instead of  $I$  with the aim of estimating how the FTLRP has affected households' perceptions of tenure security. More details on this method can be found in Becker and Ichino (2002). Our estimation uses the `psmatch2` routine in STATA.

#### 4.2. *The Heckman Selection Model*

The fact that some farmers did not invest in soil conservation poses a sample selection problem. To circumvent this and at the same to fully utilize the data we have on these households we use a Heckman sample selection model to estimate equation (3). The Heckman model removes the bias in regression weight calculation due to censorship (Wooldridge, 2002). It is a two equation model where the regression equation is

$$I^* = \alpha_0 + \alpha_1 R + \alpha_2 \Lambda + \nu$$

The participation equation, whether the household decides to invest or not, is given by

$$I = 1[\mu_0 + \mu_1 R + \mu_2 \Lambda + u > 0] \quad (7)$$

where  $I^*$  is observed only when  $I = 1$ . We assume a normal distribution of the error terms. The analysis uses the probability of investing in soil conservation and the total area of the parcel on which soil conservation structures were constructed in the last five years prior to the survey normalised by size of the parcel, as dependent variables. We use observations that fall within common support from the matching process.

#### 4.3. *OLS on Tenure Security*

We use OLS to investigate whether the FTLRP had any impact on perceptions of tenure security, with investment levels used as an explanatory variable. We also include an interaction of a dummy that captures whether the household believes investing on land enhances tenure security with investment levels to investigate whether believing investing on land enhances security and actually undertaking investments affects perceived tenure security. We also use observations that fall within common support from the matching process.

### **5. The Data and Survey Area**

The empirical analysis employs data from Mazowe district, one of the seven districts in Mashonaland Central province in Zimbabwe. Mazowe district lies in Natural Region II and III<sup>10</sup> and is divided into 29 wards, 13 of which are found in Chiweshe communal areas.

The data were collected for 635 parcels of 424 randomly selected households that fall under three different chieftainships. The sample includes households from both communal and resettlement areas. In resettlement areas we find beneficiaries of the FTLRP while in communal areas households get land either through inheritance, allocation by a traditional leader, buying or renting. The bulk of the FTLRP group (about 79%) in our sample are households who acquired land under Model A1 making the FTLRP group fairly comparable to communal areas households. This kind of sample allows us to test for behavioural differences between the two groups and to investigate if this can be attributed to the FTLRP.

The questionnaire had detailed questions on households' perceptions of tenure security, the investments they have made in the last five years, parcel<sup>11</sup> characteristics, production accounts and socioeconomic indicators. The data collection was done in May 2007, seven years after the official launch of the FTLRP. Summary statistics are given below in Table 1 for parcel level data and Table 2 for household

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<sup>10</sup> On the basis of the climatic pattern, altitude, and soil type, the country is classified into five agro-ecological regions with agricultural potential declining from Region I to Region V.

<sup>11</sup> A parcel is defined as a contiguous piece of land on which one or more different crops could be cultivated.

level data used in the analysis. We test for the significance of the inter-group differences.

**Table 1:** Descriptive statistics of parcel level variables

Variable	Description	Resettlement		Communal		Pooled	
		Mean	Std. Error	Mean	Std. Error	Mean	Std. Error
<i>Tenure Security Indicators</i>							
Bequeath	Can easily bequeath the parcel (1=yes, 0=no)	0.520	0.501	0.794	0.405	0.707***	0.455
Rent	Can easily rent out the parcel (1=yes, 0=no)	0.193	0.396	0.261	0.440	0.239*	0.427
Collateral	Can easily use the parcel as collateral (1=yes, 0=no)	0.277	0.449	0.374	0.484	0.343**	0.475
Tenure Security	Aggregate indicator of tenure security from Principal Components Analysis	0.574	0.476	0.830	0.465	0.749***	0.484
<i>Mode of Acquisition</i>							
FTLRP	Acquired the parcel under the FTLRP (1=yes, 0=no)					0.318	0.466
Inherited	Inherited the parcel (1=yes, 0=no). The reference mode of acquisition variable.			0.380	0.486	0.258	0.438
Allocation	Allocated the parcel by a traditional leader (1=yes, 0=no)			0.437	0.497	0.296	0.457
Bought	Bought the parcel (1=yes, 0=no)			0.094	0.292	0.0637	0.244
Rented	Renting in the parcel (1=yes, 0=no)			0.089	0.285	0.061	0.239
<i>Soil Conservation Investments</i>							
Investment Decision	Decision to construct contour ridges on the parcel in the last 5 years (1=yes, 0=no)	0.347	0.034	0.282	0.022	0.302*	0.46
Investment Level	Total length of contour ridges constructed in the last 5 years, in square metres per ha	53.217	7.319	85.842	8.423	75.463**	6.223
Endowment	Total length of contour ridges constructed more than 5 years ago, in square metres per ha	107.684	11.385	204.491	11.646	173.7***	8.906
<i>Parcel Characteristics</i>							
Parcel Size	Size of the parcel, in hectares	21.833	3.561	3.552	0.173	9.368***	1.186
Distance	Distance from homestead to the parcel, in km	0.000		1.117	0.132	0.762***	0.092
Steep Slope	Steep slope (1=yes, 0=no)	0.094	0.021	0.12	0.016	0.112	0.013
Moderate Slope	Moderate slope (1=yes, 0=no)	0.728	0.031	0.439	0.024	0.531***	0.02
Light Slope	Light slope (1=yes, 0=no). The reference slope variable.	0.178	0.027	0.441	0.024	0.357***	0.019
Deep Soils	Deep Soils (1=yes, 0=no)	0.257	0.031	0.268	0.021	0.265	0.018
Moderately Deep Soils	Moderately Deep Soils (1=yes, 0=no)	0.663	0.033	0.439	0.024	0.51***	0.02
Shallow Soils	Shallow Soils (1=yes, 0=no). The reference soil depth variable.	0.079	0.019	0.293	0.022	0.225***	0.017

Source: Own survey data, 2007. \*Difference significant at 10%; \*\* significant at 5%; \*\*\* significant at 1%.

**Table 2:** Descriptive statistics of household level variables

Variable	Description	Resettlement		Communal		Pooled	
		Mean	Std. Error	Mean	Std. Error	Mean	Std. Error
<i>Socioeconomic Characteristics</i>							
Male	Sex of the household head (1=male, 0=female)	0.797	0.028	0.7117	0.030	0.752**	0.020
Age	Age of the household head	46.525	0.767	52.73	1.129	49.774***	0.71
Education	Number of years of formal schooling of the household head	9.653	0.244	7.814	0.239	8.693***	0.177
Children	Number of household members younger than 15 years	2.515	0.142	2.482	0.121	2.498	0.093
Male Adults	Number of male household members older than 15 years	2.114	0.104	1.829	0.163	1.964	0.099
Female Adults	Number of female household members older than 15 years	2.054	0.124	2.383	0.209	2.226	0.124
Chiweshe	Chief Chiweshe (1=Chief Chiweshe)	0.495	0.035	0.14	0.023	0.309***	0.022
Negomo	Chief Negomo (1=chief Negomo)	0.406	0.035	0.568	0.033	0.491***	0.024
Makope	Chief Makope (1=chief Makope). Reference chieftainship variable.	0.099	0.021	0.293	0.031	0.194***	0.038
Livestock Holdings	Livestock holdings (in Tropical Livestock Units)	3.898	0.366	3.453	0.24	3.665	0.215
Livestock Holdings2000	Livestock holdings in year 2000 (in Tropical Livestock Units)	1.967	0.208	2.841	0.23	2.424***	0.157
Investments enhance security	Believes investing on land reduces the probability of losing land via e.g. eviction (1=yes, 0=no)	0.515	0.035	0.644	0.032	0.583***	0.024
<i>Farmer Support Services</i>							
Extension	Number of household visits and community meetings called by an extension worker and attended by the household in the last season	6.53	0.489	2.518	0.26	4.429***	0.287
Farming Certificates	Number of household members with a farming qualification	0.223	0.029	0.23	0.028	0.226	0.02
Contours Improve Productivity	Believes Contours improve parcel productivity (1=yes, 0=no)	0.9	0.021	0.874	0.022	0.887	0.015
<i>Off-farm Activities and Social Capital</i>							
Remittances	Receipt of remittances (1=yes, 0=no)	0.243	0.03	0.41	0.033	0.33***	0.023
Off-farm	Principal components scores on involvement in off-farm activities	0.907	0.075	1.66	0.081	1.3***	0.058
Farm worker2000	Household head farm worker before FTLRP (1=yes, 0=no)	0.079	0.019	0.014	0.008	0.046***	0.01
Communal farmer2000	Household head a communal farmer before FTLRP (1=yes, 0=no). The reference occupation of household head before FTLRP.	0.356	0.034	0.957	0.014	0.663***	0.023
Non-farmer2000	Household head engaged in non-farming before FTLRP (1=yes, 0=no)	0.564	0.035	0.024	0.011	0.289***	0.022
Social Capital	Principal components scores of whether or not household can get assistance from neighbours	0.744	0.059	1.09	0.05	0.925***	0.04
Media	Principal components score on access TV, Radio and newspapers	1.055	0.046	0.641	0.039	0.838***	0.032

Source: Own survey data, 2007. \* Difference significant at 10%; \*\* significant at 5%; \*\*\* significant at 1%.

Summary statistics show that about 32% of the surveyed parcels were acquired via FTLRP; 26% were inherited; 30% allocated to the household by a traditional leader; 6% rented in and 6% bought. The data reveals thin land rental and sales markets.

The data has three indicators of perceptions of tenure security at parcel level. These include the perceived right to bequeath the parcel, the perceived ease to rent out the parcel as well as the perceived ease of using the parcel as collateral against a financial loan. These are all dummy variables taking the value of one if the answer is in the affirmative and zero otherwise. To capitalise on the information we have, we used the Principal Components Analysis (PCA) to construct an overall indicator of tenure security, *Tenure Security*. PCA is used here to statistically weigh the three indicators in order to calculate an aggregate index of tenure security (Jolliffe, 1986). We retained a component that had an eigen-value higher than one and in this component all the three indicators had loadings or weights of more than 0.3 implying that the component we use here is influenced by all of the three indicators. The communal group exhibits higher levels of tenure security than those in the resettlement areas.

The analysis takes a particular focus on a specific type of soil conservation structures; contour ridges. The decision to focus on contour ridges is guided not only by availability of data but also their popularity as soil conservation technology in the study area. Contour ridges are small earthen ridges, 15 to 20 cm high, with an upslope furrow which accommodates runoff from a catchment strip between the ridges. Initially, similar to the experience in countries such as Niger and Kenya, the construction of contour ridges was promoted through projects and government policy. Nevertheless, contour ridges continue to be widely used both in commercial and communal farming areas in southern Africa as a means of controlling soil erosion (Critchley et. al, 1992). Just over 30% of the surveyed parcels experienced investments in the last five years. The average length of contour ridges stands at 75.5 square metres per hectare, with a significantly higher level of investments in communal areas relative to resettlement areas. The average initial endowment of contour ridges is around 173.7 square metres per hectare. About 89% of the households believe contour ridges enhance land productivity.

Around 75% of the households in the sample are male-headed, with the land reform group having a significantly greater proportion of male-headed households. The original off-farm activities variables (the number of household members involved in small-scale artisanship, natural resource utilization, formal employment and cross-border trade) were aggregated using PCA resulting in the variable *Off-farm*, which turned out to be influenced by involvement in small-scale artisanship, natural resource utilization and cross-border trade. *Social Capital* is a social capital indicator resulting from PCA of dummy variables indicating whether the household can easily borrow about one United States dollar, borrow oxen, get about 25kgs of maize and/or ask for extra labour from neighbours. Similarly, PCA of dummy variables indicating whether the household has access to a radio, television and newspapers led to the variable *Media*, influenced by all three original variables.

## **6. Empirical Results and Discussion**

In this section we present and discuss empirical results from the econometric estimation discussed above.

### *6.1. Propensity Score Matching*

A probit model was estimated using a broad set of socioeconomic control variables to construct propensity scores used in the matching process. The matching process attempts to make use of the variables that capture the situation before the start of the FTLRP in 2000. This poses a challenge since we have a cross-sectional data set. The easiest variable for which we could infer its levels prior to the onset of the program is the age of household head. Fortunately the questionnaire had questions on livestock holdings as well as the occupation of the household head in year 2000. While we assume variables such as education of household head, number of male and female adults might not have significantly changed since the onset of the program, there could be concerns that variables such as the number of children, number of household members with a farming qualification, access to remittances and media as well as involvement in off-farm activities might have changed between the start of the program and the time the data was collected. To deal with this problem we use two models in the matching process; the first one includes only the variables that we are sure existed at the start of the FTLRP while the second model includes also variables

that might have changed over the years. The ensuing discussion of the results is based on the second model. Table 3 below presents the probit results of participation or likelihood of benefiting from the FTLRP.

**Table 3:** Probit estimates for selection into the FTLRP

Variable	Restricted Model		Full Model	
	Coefficient	Std. Error	Coefficient	Std. Error
Male	0.151	0.175	-0.179	0.212
Age in year 2000	0.080**	0.031	0.058*	0.035
Square of age in year 2000	-0.001***	0.000	-0.001**	0.000
Education	0.037	0.024	0.024	0.028
Male Adults	0.049	0.036	0.170***	0.047
Female Adults	-0.020	0.029	0.011	0.047
Livestock Holdings in year 2000	-0.030	0.021	-0.058**	0.024
Farm worker2000	1.642***	0.305	2.175***	0.408
Non-farmer2000	2.453***	0.206	3.057***	0.304
Children			0.065	0.046
Farming Certificates			0.161	0.201
Remittances			-0.898***	0.188
Off-farm			-0.585***	0.085
Media			0.777***	0.142
Constant	-2.711***	0.701	-2.035**	0.802
Observations		617		617
Pseudo R-Squared		0.423		0.573
Log-Likelihood		-224.981		-166.692
Chi2		330.32		446.89

Note: \* significant at 10%; \*\* significant at 5%; \*\*\* significant at 1%

The results reveal a concave relationship between the age of household head and the probability of benefiting from the FTLRP. This means that although the likelihood of benefiting from the land reform increases with age, the rate of this increase decreases with age. The more male adults a household has the more likely it is to benefit from the FTLRP. Customarily in Zimbabwe, rights to land have been a preserve for men and thus the more men a household has, the greater the comparative advantage with regards to land access. The results indicate that efforts to increase women's access to land within the FTLRP might have been ineffective, echoing concerns by Goebel (2005) that the FTLRP has continued to privilege men as primary beneficiaries of land reform.

Interestingly the more livestock a household has the less likely it is to benefit from the program. One possible explanation is that because the program had poverty alleviation goals, it tended to favour poorer households, given that we use livestock holdings as a proxy for wealth. Contradictory to the program's goal of decongesting communal areas, results indicate that households for which the household head was either a commercial farm worker or engaged in non-farm activities prior to the commencement of the FTLRP were more likely to have benefited from the program relative to households for which the household head was a communal farmer. While we would expect commercial workers to have had an advantage in taking over commercial farms given that they were already in the system; the significant positive effect of having a household head who was engaged in non-farm before the program could be indicative of corrupt tendencies that could frustrate the program's goal to decongest communal areas.

There is a negative association between participation and involvement in off-farm activities. This may be evidence of some screening within the FTLRP in favour of people that depend mainly on farming for a living. This explanation holds true for the negative significant coefficient for remittances, if we view remittances as an off-farm activity. Access to information or media increases the probability of being in the land reform group. This indicates that media plays a significant role in providing detailed information on e.g. program eligibility and the application process.

We used estimated propensity scores from both models in Table 3 to generate samples of matched land reform and communal areas group using Kernel matching methods. Firstly, equivalent to estimating equation (3) we use the results to calculate the impact of the program on the intensity of soil conservation investments. Secondly, equivalent to estimating equation (4) we use the results to calculate the impact of the program on perceptions of tenure security. We present the results in Table 4 below. Only observations within common support are used and the standard errors for the ATT are calculated using bootstrapping with 200 replications.

**Table 4: Results from Propensity Score Matching**

	Investment Level		Tenure Security	
	Restricted Model	Full Model	Restricted Model	Full Model
Resettlement	54.635	51.491	0.586	0.58
Communal	69.509	106.033	0.815	0.679
Difference, ATT (Std. Error)	-14.874 (19.697)	-54.542* (30.601)	-0.229** (0.117)	-0.099 (0.129)
<i>Total number of observations</i>				
Resettlement	202	202	202	202
Communal	415	415	415	415
<i>Number of observations within common support</i>				
Resettlement	142	95	142	95
Communal	415	415	415	415

Note: \* significant at 10%; \*\* significant at 5%; \*\*\* significant at 1%

Although the direction of the effect of the program is consistently negative across both models for both outcomes, the levels of significance differ. This underscores the need for a precise and careful data collection process that captures variable levels as they existed at the start of the program. This would mean we would not have to be concerned about whether some household variables changed since the start of the program. With this in mind, we proceed to consider the results from the full model in discussing the results.

Results reveal a significant and negative direct effect of the FTLRP on investment levels. The average level of investments is 51.49 square metres per hectare for the land reform group while that of the communal areas group is 106.03 per hectare, after controlling for differences in observed characteristics. The difference in levels of investments is about 54.54 square meters per hectare. This ATT implies that a randomly chosen farmer from the land reform group would invest significantly less in soil conservation than if she or he were in the communal areas.

On the contrary, results from both matching methods do not reveal a significant direct effect of the FTLRP on perceptions of tenure security. The ATT for the tenure security indicator is about -0.09 points. The results indicate that the land reform program might have had a negative impact on perceptions of tenure security with farmers that got land under the FTLRP feeling less secure than their counterparts in the communal area. However this difference is not significant. This does not,

however, lead to the conclusion that the FTLRP had no effect on perceived tenure security but could be indicative of the need to control for factors such as parcel characteristics that we do not control for in the matching process, a possibility we investigate below using parametric methods.

### 6.2. *Fast Track Land Reform and Soil Conservation Investments*

To investigate the impact of the FTLRP on soil conservation investments we estimate a Heckman selection model which not only controls for variables used in the matching process but also controls for parcel characteristics. The selection of variables used is based on the assumption that there exists a set of preferences that affect only the decision to invest while resource constraints might affect both the decision as well as the level of investments. This set of preferences is envisaged to include household characteristics such as the gender, age and education of household head, involvement in off-farm activities, whether the household believes soil conservation improves productivity of land as well as whether they believe investments enhance tenure security, among other factors. We also believe parcel characteristics such as slope are crucial in conditioning the need for soil conservation and would thus affect the decision to invest. Availability of resources such as the number of male and female adults in the household, livestock holdings, remittances and off-farm activities are, in addition to parcel characteristics, assumed to determine the level of investments undertaken.

Although we believe the explanatory variables we use are not endogenous to investment behaviour, some might argue that variables such as households' contact with extension workers, whether the household believes contour ridges improve productivity as well as whether they believe investing on land enhances tenure security, among other variables, could be endogenous to investment behaviour. Accordingly we estimate a Heckman model without these variables and present the results in Table A1 in Appendix A. The following discussion of the results, however, is based on results reported in Table 5 below which we consider to be our full model. The results are from a robust estimation of the Heckman selection model using maximum likelihood. The presence of selection bias is confirmed at 5% level of significance.

**Table 5:** Heckman estimation of soil conservation investments

Variable	Investment Level		Decision to Invest	
	Coefficient	Robust Std. Error	Coefficient	Robust Std. Error
<i>Mode of Acquisition</i>				
FTLRP	-109.628***	40.405	0.258	0.247
Allocation	64.247*	38.784	-0.195	0.16
Bought	16.959	68.309	-0.183	0.265
Rented	10.102	61.517	-0.105	0.268
<i>Socioeconomic Characteristics</i>				
Male			0.234	0.163
Age	2.428	4.804	-0.002	0.024
Age Squared	-0.018	0.04	0.000	0.000
Education	1.062	5.838	-0.012	0.024
Male Adults	-16.967	12.131		
Female Adults	-0.45	5.245		
Children			0.021	0.036
Livestock Holdings	-5.979*	3.601	0.041**	0.016
Social Capital	-20.91	18.991	0.009	0.09
Remittances	-48.732	34.818	-0.063	0.139
Off-farm	-2.152	11.201	0.067	0.057
Farming Certificates			-0.081	0.151
Extension			-0.005	0.015
Media			-0.035	0.122
Farm worker2000			0.916**	0.370
Non-farmer2000			-0.701*	0.375
Contours Improve Productivity			-0.029	0.218
Investments Enhance Security	-5.646	43.47	0.673***	0.155
Chiweshe			-0.304	0.224
Negomo			-0.296*	0.159
<i>Parcel Characteristics</i>				
Parcel Size	-4.516***	1.720	0.004	0.004
Parcel Size Squared	0.014**	0.007		
Distance	2.703	6.292	0.01	0.023
Steep Slope	46.491	55.73	0.345	0.219
Moderate Slope	46.659	33.478	0.515***	0.154
Deep Soils	84.887**	38.180	-0.626***	0.198
Moderately Deep Soils	69.237*	37.341	-0.355*	0.182
Endowment	-0.233**	0.109	-0.001***	0.000
Constant	365.136**	163.970	-0.942	0.764
Rho		-0.442** (0.1658)		
Observations		508		
Censored		361		
Log-Likelihood		-1222.883		
Chi2		67.34		

Note: \* significant at 10%; \*\* significant at 5%; \*\*\* significant at 1%

Results suggest that the FTLRP had a negative and significant effect on the intensity of investments. Relative to inherited parcels, parcels acquired via the FTLRP experience significantly less investment levels. This adverse effect of the FTLRP on land-related investments could partly explain the decline in agricultural productivity following the launch of the program. However, the program had no significant effect on the decision to invest. Furthermore, farmers invest significantly more on parcels they got via allocation by a traditional leader relative to those that they inherited.

In line with findings by Holden and Yohannes (2002) and Hayes et al. (1997), wealthier households, proxied by livestock holdings, are more likely to adopt soil conservation technology. Wealthier households are better able to amass resources e.g. hired labour, needed for construction of soil conservation structures. However this has a negative effect on the level of investments. Having a household head who was a commercial farmer before the onset of the FTLRP increases the likelihood of investing in soil conservation relative to having a household head who was a communal farmer. This could be an indication of the possibility that commercial farm workers, with more ‘professional’ experience from commercial farming, might be better placed to understand the comparative gains of investing in soil conservation. On the contrary, in cases where the household head was engaged in non-farm activities before the start of the program, the household is less likely to have invested in soil conservation relative to cases where the household head was farming in the communal areas before the start of the program. Similarly this captures an understanding of the comparative gains of investing in soil conservation; an understanding that intuitively comes with farming experience. The significance of the Negomo chieftainship dummy, basically a regional dummy, in the decision to invest points to the importance of location specific determinants of adoption of soil conservation technology.

Consistent with Gebremedhin and Swinton (2003), investment levels decline with parcel size and this decrease increases with size i.e. there is a convex association between parcel size and investment levels. This could be indicative of possible diminishing marginal returns to contour ridges within a given parcel. The result could also suggest that households with smaller parcels are forced to practise agricultural intensification which implies more contour ridges, given that they can be perceived as an input in agricultural production that helps increase agricultural productivity.

Steepness of the parcel has a positive effect on the decision to construct conservation structures, with moderately steep parcels being more likely to have investments relative to those with a light slope, consistent with Nyangena (2007) and Gebremedhin and Swinton (2003). Taking perceived soil depth as an indicator of soil quality (or abundance); parcels with deep to moderately deep soils are less likely to have conservation investments. However the level of soil conservation increases with soil depth. This is intuitive since contour ridges are earthen structures implying that their construction is relatively easier on deeper soils. The probability of investing as well as investment levels decrease with levels of initial endowments of conservation structures, reflecting possible declining marginal returns to contour ridges.

We find evidence that households invest on their land to establish and/or enhance their security of tenure. Specifically, households who believe investing on land reduces the probability of losing land via e.g. evictions are more likely to invest in soil conservation than those who do not hold this belief. This indicates that households invest in long term land-related investments to enhance security of tenure, consistent with Place and Hazell (1993), Besley (1997), and Deininger and Jin (2006). This may result in suboptimal or inefficient investment levels from a social perspective as households might not focus on productivity-enhancing investments.

### 6.3. *Fast Track Land Reform and Tenure Security*

In investigating the effect of the FTLRP on tenure security we start by estimating a model which not only controls for variables that were used in the matching process but also controls for parcel characteristics. In the second estimation we explore whether investments in soil conservation has an effect on perceived tenure security, especially for households who believe investing on land strengthens tenure security<sup>12</sup>. We do this by introducing soil conservation investment levels and an interaction term (*Investment Level given that investments enhance security*) of a dummy that captures whether the household believes investing on land enhances tenure security and investment levels as control variables<sup>13</sup>. The ensuing discussion on results is based on

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<sup>12</sup> We also estimate an OLS without possibly endogenous variables. We report the results in Table A2 in Appendix A.

<sup>13</sup> We do not separately include the dummy that captures whether the household believes investing on land enhances tenure security as we believe that it has no effect on tenure security in the absence of investment levels, which is the modifying variable in this case.

the second model which we consider to be our full model. The results are presented in Table 6 below.

**Table 6:** OLS estimation of perceived tenure security

Variable	Model 1		Model 2	
	Coefficient	Robust Std. Error	Coefficient	Robust Std. Error
<i>Mode of Acquisition</i>				
FTLRP	-0.417***	0.079	-0.391***	0.079
Allocation	-0.08*	0.048	-0.079	0.048
Bought	-0.076	0.089	-0.062	0.089
Rented	-0.787***	0.064	-0.757***	0.065
<i>Socioeconomic Characteristics</i>				
Male	0.085*	0.047	0.084*	0.047
Age	0.001	0.008	0.000	0.007
Age Squared	0.000	0.000	0.000	0.000
Education	0.005	0.006	0.005	0.006
Children	-0.028***	0.010	-0.026***	0.010
Male Adults	-0.02**	0.009	-0.02**	0.008
Female Adults	0.013*	0.008	0.012	0.008
Livestock Holdings	-0.004	0.005	-0.003	0.004
Extension	-0.003	0.005	-0.003	0.005
Remittances	-0.048	0.041	-0.042	0.04
Farming Certificates	0.13***	0.049	0.127***	0.049
Off-farm	-0.011	0.018	-0.007	0.018
Media	-0.031	0.04	-0.033	0.04
Social Capital	0.064**	0.028	0.06**	0.028
Farm worker2000	0.133	0.148	0.113	0.134
Non-farmer2000	0.149	0.11	0.129	0.109
Chiweshe	-0.034	0.068	-0.017	0.068
Negomo	-0.031	0.05	-0.022	0.05
<i>Parcel Characteristics</i>				
Parcel Size	0.001	0.001	0.001	0.001
Distance	-0.001	0.006	-0.001	0.006
Steep Slope	0.114	0.072	0.118	0.072
Moderate Slope	-0.01	0.047	-0.005	0.047
Deep Soils	0.133**	0.062	0.13**	0.062
Moderately Deep Soils	0.075	0.056	0.072	0.055
<i>Soil Conservation Investments</i>				
Investment Level			-0.0008***	0.000
Investment Level given that investments enhance security			0.0009***	0.000
Constant	0.872***	0.226	0.86***	0.225
Observations		509		509
F-value		8.55		8.69
R-squared		0.27		0.29

Note: \* significant at 10%; \*\* significant at 5%; \*\*\* significant at 1%

The results reveal a highly significant and negative impact of the FTLRP on perceptions of tenure security, consistent with our apriori hypothesis. Specifically we find that the FTLRP is associated with a fall in perceived tenure security of about 0.39 standard deviations relative to inherited parcels. This could be due to the fact that the FTLRP was done in an accelerated pace overriding legal procedures thereby raising tenurial insecurities among beneficiaries. Moreover since the introduction of the FTLRP, government policy and stated aims in relation to redistribution and land occupations have repeatedly changed further fueling tenurial insecurities among the newly resettled farmers. In addition the use of different sets of laws, administration and policies on multiple tenure systems created grounds for conflicts (Munyuki-Hungwe and Matondi, 2006), contributing to tenurial insecurities. Farmers also feel insecure about parcels they rent in relative to parcels that are acquired via inheritance. This reflects the uncertainty of tenure that apparently accompanies rented parcels. These results are worrisome as tenurial insecurities might have adverse implications on planning horizons and consequently agricultural productivity.

As expected in a patriarchal society such as that of Zimbabwe, having a male household head is associated with higher levels of tenure security. Customarily in Zimbabwe, rights to land have been a preserve for men and this might make households feel more secure if the household head is male. This could suggest that women face discrimination with regards to access and use of land in rural Zimbabwe, which manifests itself in female headed households having lower perceived tenure security compared to their male headed counterparts. However the number of male adults a household has has a negative effect on perceived tenure security. A possible explanation for this is that in rural areas, men are more connected to the wider events of the country and thus they would be more informed and thus concerned with the general instability in both the agricultural and political scenes and this would translate into perceived tenure insecurity. Thus although having a male household head implies increased tenure security due to the institutional discrimination in favour of men, having a lot of male adults could reduce perceived tenure security due to increased awareness of the prevailing situation in Zimbabwe with regards to land.

The higher the number of children a household has, the lower the perceived tenure security. Having a lot of children is demanding in terms of labour hours spent taking

care of them and this obviously implies less time spent monitoring parcels. Given that one of the criteria the government used in selecting people for resettlement within the FTLRP was farming experience or knowledge, we would expect households with more household members with a farming qualification to feel more secure. Thus the results are as expected. Social capital strengthens tenure security; having more community ties assures the household of support from neighbours in case there is need to defend land rights and thus a household that has stronger ties with its neighbours would generally feel more secure.

Households perceive higher tenure security for parcels with deep soils relative to parcels with shallow soils. Given that deep soils are one of the indicators of good parcel quality, having high quality parcels could also be confounded with other qualities that capture unobserved relative social power of the household, with socially powerful households getting higher quality parcels. These households will naturally have higher perceived tenure security than other less socially powerful households.

To investigate the overall effect of investment levels for households who believe investing on land enhances tenure security on perceived security we test for the joint significance of the coefficients for the variables: *Investment Level* and the interaction term '*Investment Level given that investments enhance security*'. The coefficients indicate that the net effect of investment levels on perceived tenure security for households who believe investing on land enhances tenure security is 0.0001 and this is statistically different from zero at 1% level of significance. Thus we find evidence that for households who believe investing on land enhances tenure security and actually undertake soil conservation investments; perceptions of tenure security depend positively on levels of investments in soil conservation.

## **7. Conclusion**

This paper used data from Mashonaland Central province in Zimbabwe to investigate the impact of Zimbabwe's Fast Track Land Reform Program on perceptions of tenure security and investments in soil conservation. Results from the analysis provide evidence that the program created some tenurial insecurities among its beneficiaries and had an adverse impact on investments in soil conservation. In addition we find evidence that for households who believe investing on land enhances tenure security; they are not only significantly more likely to invest in soil conservation but their perceptions of tenure security depends on levels of investments in soil conservation. This lends support to the contention that households invest in long term land-related investments to enhance security of tenure.

The analysis suggests that the program might have failed to offer tenure security necessary for long term planning horizons of farmers who got land under the reform program. The results underscore the need for the government of Zimbabwe to restore confidence and credibility in the agricultural property rights system.

The fact that we find evidence that some households might be investing in soil conservation to enhance tenure security implies that measures that effectively increase land tenure security are necessary as these might allow households to focus only on productivity-enhancing investments.

The significance of the gender of the household head and in particular the fact that female-headed households feel less tenure secure reiterate the need for the government to review the gender implications of its reform programs and consequently formulate policies that will discourage discrimination of women when it comes to land access and use.

## Appendix A

**Table A1:** Heckman estimation of soil conservation investments without (possibly) endogenous explanatory variables

Variable	Investment Level		Decision to Invest	
	Coefficient	Robust Std. Error	Coefficient	Robust Std. Error
<i>Mode of Acquisition</i>				
FLLRP	-101.117***	33.751	0.015	0.209
Allocation	92.389**	43.179	-0.249	0.152
Bought	48.324	65.185	-0.173	0.246
Rented	28.385	71.628	-0.289	0.258
<i>Socioeconomic Characteristics</i>				
Male			0.3**	0.152
Age	-0.251	4.391	-0.005	0.022
Age Squared	-0.004	0.037	0.000	0.000
Education	-0.609	6.179	-0.014	0.022
Male Adults	-15.866	12.027		
Female Adults	-0.397	3.629		
Children			0.024	0.033
Social Capital	-13.89	20.798	0.069	0.085
Chiweshe			-0.551***	0.213
Negomo			-0.241	0.149
<i>Parcel Characteristics</i>				
Parcel Size	-5.072***	1.696	0.006*	0.004
Parcel Size Squared	0.016**	0.006		
Distance	4.357	5.333	0.003	0.022
Steep Slope	40.508	51.685	0.281	0.211
Moderate Slope	48.712	33.305	0.444***	0.149
Deep Soils	92.85**	39.789	-0.589***	0.191
Moderately Deep Soils	67.739*	37.361	-0.286*	0.174
Constant	373.621**	166.673	-0.415	0.678
Rho		-0.453***	(0.115)	
Observations		509		
Censored		362		
Log-Likelihood		-1250.013		
Chi2		61.31		

Note: \* significant at 10%; \*\* significant at 5%; \*\*\* significant at 1%

**Table A2:** OLS estimation of perceived tenure security without (possibly) endogenous variables

Variable	Model 3	
	Coefficient	Robust Std. Error
<i>Mode of Acquisition</i>		
FTLRP	-0.42***	0.073
Allocation	-0.082*	0.046
Bought	-0.062	0.088
Rented	-0.79***	0.065
<i>Socioeconomic Characteristics</i>		
Male	0.103**	0.047
Age	0.001	0.007
Age Squared	0.000	0.000
Education	0.002	0.006
Children	-0.029***	0.01
Male Adults	-0.02**	0.008
Female Adults	0.013	0.008
Media	-0.037	0.038
Social Capital	0.059**	0.028
Farm worker2000	0.082	0.137
Non-farmer2000	0.103	0.106
Chiweshe	-0.022	0.069
Negomo	-0.036	0.05
<i>Parcel Characteristics</i>		
Parcel Size	0.001	0.001
Distance	-0.002	0.006
Steep Slope	0.103	0.072
Moderate Slope	-0.021	0.047
Deep Soils	0.135**	0.061
Moderately Deep Soils	0.074	0.055
Constant	0.899***	0.222
Observations		509
F-value		9.08
R-squared		0.26

Note: \* significant at 10%; \*\* significant at 5%; \*\*\* significant at 1%

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