Market Access for Maize Smallholder Farmers in Tanzania

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Abstract

This paper assessed factors which influence market access for smallholder farmers in the major maize producing districts (Mbozi and Sumbawanga) of Mbeya and Rukwa regions, located in the Southern Highland of Tanzania. Cross sectional data were collected from a sample of 240 smallholder farmers which were randomly selected and interviewed using standardized questionnaires. Data were analyzed using SPSS Computer software. In estimating the effects of transaction costs on market participation and sales of maize, the two-stage Heckman model was used. Results suggest that, asset ownership (cattle, bicycle & ox-cart), family size and price of maize have a significant positive relationship with the amount of maize sold. In contrast, amount of maize consumed and distance to market had shown negative effects on farmers' market participation. This implies that, smallholder farmers' market participation will increase with the increase in maize prices and farm resource endowments. The study concludes that, household characteristics such as family size and gender; price and distance to market play great a role in determining farmers' decision to participate into the market. We recommend that, government should improve market infrastructures such as roads and market centers so as to reduce transaction costs and thus increase market access for farmers.

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Key words: Market access, Smallholder farmers, Maize, Transaction costs, Tanzania

1. Introduction

Maize is the key staple food crop in several Sub-Saharan Africa countries (SSA) and you cannot separate food security and maize. In Tanzania, maize is the widely grown staple crop produced by 4.5 million farm households representing about 82% of all Tanzanian farmers (KI, 2011; NBS, 2014). It is mostly produced by smallholder farmers at the subsistence level and consumed by the majority (90%) of Tanzanian population (NBS, 2014). The crop constitutes for about 45% of total arable land, generating for about 50% of rural cash income (USAID, 2010, World Bank, 2012). Essentially, Tanzania produces white maize which is used for self-consumption and some being sold to the market. Conversely, the maize production sector in Tanzania exhibits a very low productivity and supply, even with improved seeds (Smale *et al.,* 2011). This argument had revealed in the agricultural surveys conducted by NBS in 2008 and 2014 that, the average annual maize yield for the country is 1.3 ton per hectare. This productivity is very far from that of South Africa and world average maize yields which stands at 2.7 and 4.3 ton per hectare respectively (FAO, 2009; Urassa, 2010). This observation may be linked to a low level of access to market for majority of smallholder farmers in Tanzania (Haug and hella, 2013; Jayne *et al.*, 2010). On the other hand, Sebatta *et al.* (2014) noted that market access for smallholder farmer play a great role for households' market participation. Farmers can access the market either by selling to a buyer at the farm gate or physically transporting the produce to the market place using available means. In contrary to this, market access for smallholder farmers in Tanzania is said to be limited only to village markets and very few who manage to access the district and region markets. This also can be associated with the existence of high transaction costs as noted by Mbise *et al.* (2011) in their study on factors affecting supply of beans in Tanzania. Moreover, Maziku *et al.* (2015) also noted that, maize producers in Tanzania find it difficult for themselves to participate into markets probably due to existence of hidden costs (unobservable transaction costs). The situation which could lead to disincentives on increased production and supply of maize in the country for the majority of farmers.

However, transaction costs that are incurred by smallholder farmers when marketing their produce acts as barriers, making markets benefits not to be transmitted to farmers as compared to their counterpart traders. This situation denies farmers' access to different market opportunities and also could reduce the capacity of maize supply and market participation by smallholder famers. In addition, Makhura *et al.* (2001) had reported that, households incur both fixed and variable transaction costs in the process of market exchange for their produce. Key *et al.* (2000) and Sebatta *et al.* (2014) elucidated further that, smallholder farmers incurs these costs when searching trading partners; bargain, monitoring, enforcement of contracts and transferring their produce to market. All these costs are said to

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be impediments to market participation for the poor resource farmer mainly in the rural areas. Moreover, Bwalya *et al.* (2013) noted that, transaction costs consist of a large unobservable component and hence they can only be measured indirectly through actions of potential market actors (farmers and traders). Therefore their presence along the supply chain of an important staple food crop like maize could influence the decisions of smallholder farmers to participate into the market. Also, high transaction costs may make small households even to be completely excluded from the market. The situation where farmers are not qualified to access market opportunities, decisions to diversify to other alternatives could be the best alternative. But this on the other hand could rebut the production and supply of the crop in question for majority producers. This situation is very true when it comes to maize smallholder farmers in Tanzania especially in the rural areas where farmers are located in poorly marketing infrastructures.

However, maize in Tanzania is a very political commodity and therefore trade measures are frequently put in place to ensure food security. For stance, in recent years the Government of Tanzania (GoT) has been embarking into different programs (including Agriculture first-'*Kilimo Kwanza''*) aimed at increasing maize production through provision of subsidies on inputs to major maize producing regions (Ruvuma, Mbeya, Iringa and Rukwa). To absorb the surplus, the government has established Strategic Grain Reserves (SGR) under National Food Reserve Agency (NFRA) which purchases maize from farmers at a fixed floor price above the market prices. These strategies are aimed at ensuring markets for farmers' produce especially in the surplus regions. Surprisingly, the entity (SGR) has been frequently constrained with shortage of funds to purchase all maize brought by farmers at the centre (KI, 2011; Haug and Hella, 2013). This situation leaves farmers with their surplus unsold despite that they have already incurred all the necessary costs of transporting their produce to the buying centers. SGR buying centre at Matai and Itepula villages in Sumbawanga and Mbozi districts failed to purchase all maize brought by farmers in year 2014 and 2015. All these activities are said to amplify the level of transaction costs particularly the variable ones which are only incurred by smallholder farmers when they decide to participate into the market (Makhura *et al*., 2001; Bwalya *et al.,* 2013). In such a situation, where government agents fail to purchase the entire farmer's produce, Seshamani (1999) has reported that a smallholder farmer has to go to the markets to sell to another buyer. This is not easy for poor resource farmers who lack means of transport to reach markets.

Despite all these efforts devoted by the government in promoting maize production, not much effort has been spent on assessing the role of market access to smallholder farmers that plays in stimulating production as well as market participation in Tanzania. All these indicate that households in Tanzania are not well integrated in the crop market particularly in the rural

areas where the majority of farmers are located. It is in this context, this study attempted to determine factors influencing farmers' decision to participate in the maize markets in Tanzania focusing on market participation for smallholder maize producers in Mbozi and Sumbawanga districts. The findings from this study will contribute much on the current government efforts of improving national food security through increased production of staple food crops such as maize and rice. Also it will be resourceful to policy makers and investors in their ways of indentifying intervention areas for enhancing smallholder farmers' market participation in the country.

2. Literature Review

The theory of transaction cost has been used to explain farmers' decisional behavior under the market failures both at input and output markets for many decades. A study by de Janvry *et al.* (1991) and Makhura *et al.* (2001) showed that high transaction costs lead to missing markets for certain commodities. They concluded that in the absence of food markets households must be self-sufficient in terms of food, which confines their ability to reallocate land and labor to cash crops. These households tend to face wide margins between low selling price and high buying price as attributed by transaction costs. The study further argued that, the poorer the infrastructure, the less competitive the marketing systems, the less information is available, and the more risky the transactions which reduce the incentives to market actors. In contrast, Sabatta *et al*. (2014) noted that, market access for farmers is a vital component of market participation as it reduces the margin of transaction cost that farmers could face. However, transaction cost in this study refers to all costs incurred by a farmer in order to bring his produce to the market. These include costs originated from searching information, bargaining, decision making and cost related to Non- Tariff Barriers (NTBs) (Barzel, 2011; Key *et al.,* 2000). Therefore with the existence of market failure, households are burdened with extra costs originated from government interventions through tariffs and non tariffs barriers. These costs include both fixed and variable costs which in the studies of Bwalya *et al.* (2013) and Makhura *et al.* (2001) were reported as impediments of farmers' market participation decisions. These costs in most cases are unobservable and thus they can only be observed through the action of market agents such as farmers and traders. Using a two-stage Heckman model Jagwe (2011) found that, family size, belonging to a farmer's group and distance to the market have a significant influence on the extent of farmers' participation in banana markets in Burundi. All these characteristics have an implication on reducing or increasing transaction costs for a farmer who decide to participate in the market. Similar results were reported in Zambia by Bwalya *et al.* (2013) that, size of harvest, ownerships of ox-carts, radio and television increased the market participation of maize smallholder farmers in the Central province of Zambia. This is because ownership of assets such as radio and

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television enables households to acquire market information at a lower cost thus reducing expenditure on search, negotiation and screening costs (Key *et al.,* 2000; Makhura *et al.,* 2001).

On the other hand, findings from studies of Sebatta *et al.* (2014) and Randela *et al.* (2008) show that, good road condition and access to information were positively influential to farmers' participation and market access due to their effects on reducing transaction costs. In contrast, a buyer who has incurred high searching costs in attempting to find an appropriate seller is likely to pay high prices simply because the seller has to set a price which will include the extra costs incurred as transaction costs. This is what happening to a household which produces and supplies products in the market imperfection where he plays dual roles as producer and consumer at the same time. In such a situation, household as a producer (seller) will receive low price which is eroded with the high transaction costs and pay high price as a buyer inflated with transaction costs (Bwalya *et al.,* 2013; KI, 2011). Furthermore, Key *et al*. (2000) and Karfakis and Rapsomanikis (2008) have further alluded that high transaction costs is one of the key reasons for smallholder farmers' failure to participate in markets and supply the right quantity of produce. This often leads to farmers being exploited by middlemen or brokers who discourage farmers' involvement in maize production and marketing (Rasmussen, 2009; Minot, 2010).

However, agricultural commodities such as maize in Tanzania are often traded in an environment characterized by poor transport and communication infrastructure, giving rise to high market transaction costs (Karfakis and Rapsomanikis, 2008). According to Mbise *et al.* (2011), smallholder farmers in Tanzania are highly influenced by multiple factors related to production as well as market transaction costs. The same authors also found that, NTBs such as road blocks, bribery, local government levies, and custom procedures were contributors of transaction costs in the exchange process at a particular market. The high transaction costs will influence the participation of smallholder farmers especially in the rural areas where majority of them are located in an environment characterized with poor roads and storage facilities. With this situation where households are not integrated in the markets, assessment of the factors influencing smallholder farmers play a great role so as to facilitate the achievement of government goals of improving market access and assurance of markets to farmers' produce in rural area.

3. Methodology

3.1 Research Questions

This study was guided by two research questions; the first one is about the major factors influencing the decisions of smallholder farmers to participation into market. The second is related to the effects of transaction costs on the quantity of maize sold by farmers to the

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market. The Agricultural Households and two-stage Hekman models were used to answer the two study questions**.**

3.2 Modeling of Empirical Model

The paper employed the two–stage Heckman model in analyzing the effects of factors influencing the decisions of households to participate or not in the market. However, in modeling the empirical model, the Agricultural household model under transaction costs was used to derive supply or market participation and demand equations. This is because household under transaction has to make jointly decisions on production, consumption and market participation at the same time (Bwalya *et al.,* 2013; Key *et al.,* 2000). Therefore, using the households' objective utility function under transaction costs the supply or market participation and demand equations were derived as follows:

Households under transaction costs will maximize their utility subject to income, resources and technology constrains and therefore, the objection function will be expressed as:

$$Max\, U_t = U_t \left(C^t, Z^t : H_u \right) \dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots (1)$$

Subject to full income constrain under transaction costs

$$\sum \delta_i^s \left[P^m - t_{vc}^s (h_t) \right] (q_i - S_i) - \delta^c Z^t - \delta^c \left[P^m + t_{vc}^c (h_t) \right] C_i - \delta^s t_{fc} (h_t) - \delta^c t_{fc} (h_t) + TE_i \geq 0$$

$$(2)$$

Where,

$\delta_i^s = 1$ if $S_i > 1$ and $\delta_i = 0$ if $S_i = 0$ where δ_i^s is the revenue/utility gained by the householder under the transaction costs, S_i is the amount sold, t_{fc} and t_{vc} stands for fixed and variable transaction costs. Also it is given that, $Z^t = 0$ when $S_i = 0$ and $\delta^c = 1$ if $C_i > 0$ and $\delta^c = 0$ when $C_i = 0$. Z = is the amount of purchased maize from market by households as a buyer.

From the equation (2), we can derive the supply and demand equations given that the household is facing both fixed and variable transaction costs to maximize utility. Thus the Langrangian equation is given as:

$$Max\, L_t = U_t \left(C^t, Z^t : H_u \right) +$$
$$\mu \sum \delta_i^s \left[P^m - t_{vc}^s (h_t) \right] (q_i - S_i) - \delta^c Z^t - \delta^c \left[P^m + t_{vc}^c (h_t) \right] C_i - \delta^s t_{fc} (h_t) - \delta^c t_{fc} (h_t) + TE_i \geq 0 +$$
$$\lambda \left[P_i (q_i - S_i) - P_i C_i - P_i X_i + Z_i + TE_i \right] + \omega G \left(q_i, X_i : H_q \right)$$

$$(3)$$

Where, $\mu, \varpi,$ and λ are the Lagrange multipliers associated with cash constrain, the resource balance and the technology constraint, respectively.

The above conditions imply that when the household decide to participate in the market, he/she will incur variable transaction costs and if does not participate, no variable transaction

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exist. Then the fixed transaction costs (t_{fc}) will determine whether the household decides to participate in the market or not (Makhura *et al.* (2001). That is, the households' response to transaction costs involves either switching from participating in one market to the other and/or from participating in the market to consuming.

With the presence of transaction costs, the effective price received by household will be lower than market prices by the unobservable amount of t_i^s and higher than market prices by unobservable amount of t_i^b paid by a buyer. Transaction costs as reported by Key et al. (2000) are mostly unobservable but can be observed through households' characteristic (h_u). However, in this study, transaction costs were expressed in terms of households' characteristics as:

$$t_i^s = -\beta_i^s h_t^s$$ (Transaction cost for household as seller).. (4)

$$t_i^s = -\beta_i^b h_t^b$$ (Transaction costs for household as a buyer)... (5)

Then the decision price (effective price) of the household as a seller and buyer will be given as:

$$P_i = P^m - t^s$$ (As a seller).. (7)

and

$$P_i = P^m + t^b$$ (As a buyer)... (8)

Using the decision price (P_i) for households and FOC, then the system of demand and supply equations for household participating into market will be given as:

The system of demand equation will be:

.... (9)

$$C_i^t = C^t \left(P^m + t^{;Y,h_u} \right)$$

.... (10)

$$Z_i^t = Z^t \left(P^m + t; Y, h_u \right)$$

The supply equation

.... (11)

$$q_i^t = q^t \left(P^m - t; h_q \right)$$

Market participation equation

$$S_i^t = S^t \left(P^m - t; h_u, h_q \right)$$ Depending on whether $\delta^c = 0$ or 1.................................... (12)

Where S^s = quantity sold to market by a household. The above equations show that, transaction costs will shift the supply upward for seller and downward for a buyer

If the linear relationships are assumed in equation (12), the market participation equation will be expressed as:

$$S^s\left(P^m; h_q, h_u\right) = \beta_i P^m + \beta_i h_q + \beta_t h_u \quad \text{.. (13)}$$

This leads us to a linear expression of the market participation equation of the household as a seller to be:

$$S^s = \beta_m P^m + \beta_t^s h_t^s + \beta_q h_q \quad \text{.. (14)}$$

Then, the econometric specification is obtained by adding error on the market participation equation of a household as a seller

$$S^s = \beta_m P^m + \beta_t^s h_t^s + \beta_q h_q + \mu_i \quad \text{.. (16)}$$

$$\equiv \beta_i X_i + \mu_i \quad \text{.. (17)}$$

Where, Xi is a vector of exogenous explanatory variables such as household characteristics and location characteristics that influence the market participation.

The market participation indicator variable (Quantity sold, S^s) for the commodity is defined as intensity of market participation:

$$S^s = 1 \quad \text{if} \quad P^m \geq P_i + t_{fc}^s \quad \text{or} \quad P^m \leq P_i - t_{fc}^s \quad \text{(If a household sell to market)}$$

and

$$S^s = 0, \text{ if} \quad p_i - t_{fc}^s \leq P^m < P_i + t_{fc}^s \quad \text{(If a household does not sell to market)}$$

Or $\delta^c = 1$ if $S > 0$ and $\delta^c = 0$ if $S = 0$

3.3 Data Analysis

Data used in this study were collected from a cross sectional survey conducted between December 2013 and June 2014 from smallholder farmers in the two surplus producing maize districts (Sumbawanga and Mbozi). The two districts are located in Rukwa and Mbeya regions on the Southern Highland of Tanzania. A total of 240 small householder farmers were randomly selected from six villages and interviewed using pre-tested structured questionnaires. Data on household characteristics and market access included variables such as age, gender; family size and education level of household head; distance to market, access to information and extension services were collected. Also asset ownership related data such as land, bicycle, motorbike; ox-cart, phones or radio and livestock were included. These factors were used as proxies for transaction costs in answering our research question that high transaction costs associated with long distance to market had a negative significant effect on the amount of maize sold by smallholder farmers. However, the process of data analysis

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involved two steps of estimation, in the first step, a Logistic regression model was estimated to give the probability that a house *i* will decide to participate or not in the market. In the second step ordered Logistics regression was run to estimate the effects factors determining the amount of maize sold by farmers. The ordered Logistic regression was selected because the dependent variable was categorical and binary. Logistic regression is designed to use a mix of continuous and categorical predictor variables to predict a categorical outcome or dependent variable (Sabatta *et al.* 2014; Key *el at.* 2000).

In the first stage, the Logistic regression estimation is stated in the linear form as:

$$Pr(S=1) = \alpha + \beta_1 P^m + \beta_2 QSH_i + \beta_3 DDM_i + \beta_4 HHB_i + \beta_5 i HMB_i + \beta_6 VLK + \beta_6 AGE + \beta_8 EDU + \beta_8 HHS_i + \beta_9 EXP + \beta_{10} SEX + \varepsilon_i$$

(18)

Where: Pr (S = 1) = Probability of a farmer decide to participate into the market, α = constant, Pm = market price of maize (Tshs/kg), QHH = Quantity of harvest by H/holds (kg), DDM = Distance to district market by household (Km). HHB = household ownership of Bicycle (Yes = 1, No = 0), HMB = Ownership of motorbike by household (Yes=1, No = 0), VLK= Value of Livestock owned by a farmer, AGE= Age of household head (Years), EDU= Level of education of household head (No. of year spent in school), HHS= Household family size (Number of person); EXPR = Household market experiences (years), SEX = Sex of household head (Dummy 1= male 2= female) and $\varepsilon_{i=}$ random error term.

In the second step same variables as used in equation (18) with addition of amount of maize consumed at home (HCP), then, the estimation of effects of factors determining the quantity of maize sold by households is expressed as:

$$S^s = \alpha + \beta_1 P^m + \beta_2 QSH_i + \beta_3 DDM_i + \beta_4 HMB_i + \beta_5 i HCP_i + \beta_6 VLK + \beta_6 AGE + \beta_8 EDU + \beta_8 HHS_i + \beta_9 EXP + \beta_{10} SEX + \varepsilon_i$$

(19)

4. Results and Discussions

4.1 Factors Influencing Smallholder Farmers' Market Participation Decisions

Table 1 presents factors which influences households' decisions on market participation in the maize market in Tanzania. Following the two-stage Heckman model analysis, at the first stage, factors related to households' farm and demographic characteristics were regressed by farmers' decisions to participate in the market or not. Results from Logistic regression show that, education level of household head, family size, market price, ownership of motorbike or ox-cart and number of livestock has a positive and significant effect on smallholder farmers' decisions to enter into the maize market in the two districts (Sumbawanga and Mbozi).

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The positive effect of education level of household head (with coefficient of 0.229) implies that, education empowers the farmer to access more information and new existing opportunities from various markets. This makes a farmer with more education to be more informed on market requirements in terms of price, quality, and right volume of maize needed by buyers and thus becomes very likely to participate in the marketing activities. This is because having more market information reduces the searching and bargaining costs that smallholder farmers incur in the process of finding the right buyer. On the other hand, farmers with no education are less informed about market information and hence they find it very difficult to participate into the market due to high fixed transaction costs. These finds are consistence to those of Sabatta *et al.* (214) who found that, in Nigeria smallholder farmers with high level of education were more involved in selling their produce to market. Similarly, Odulaja (1996) argued that, farmer's ability to produce and sell more output to market is highly related to their education levels.

Also results from Table 1 indicate that, price of maize had a positive influence on the farmers' decision to participate in the maize market. This implies that farmers in most cases respond quickly to high price due to the fact that, high price increases their income from maize selling. Therefore, farmers will be more likely to participate into market if the effective price they receive is higher than market prices. Contrary to this farmers will be reluctant to sell their maize to market, the situation which was reported by farmers in Sumbawanga district during the FGD as a reason for not participating in the market. These findings are in consistence with those of Omit *et al.* (2009) and Enete and Igbokwe (2009) who found that, better output price was the key incentive for farmers to participate in the market in Kenya and Nigeria. Similar results were found by Olwande and Mathenge (2012) in Kenya that, farmers sold more maize during the period of higher market prices. Moreover, findings from the study of Sabatta *et al.* (2014) indicates that, price had a positive relationship with the decision of households to participate in the market.

In addition, households who own more livestock and motorbike or bicycle were found to be more involved in selling their maize in the two districts than those who not own such assets. This can be explained by fact that, in African including Tanzania livestock and other assets such as cattle, donkey, motorbike and bicycle are commonly used as major means of transport for the majority of smallholder farmers to reach markets. Thus, households which do not own these assets find it themselves difficult to participate in the market due to high transport costs. These findings supports that of Ohajianya and Ugochukwu (2011) in Nigeria who found that, farmers who own large number of livestock were more likely to participate in the market as sellers and not autarkic. Moreover, households with their own means of transport are likely to transport their agricultural produce on time to the market before losing

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value. On the other hand, households with large number of adult people also found to participate more in selling of maize than those with small family size. This is because households with more adult people have high ability to produce more maize because of having more labour force and thus can sell more surpluses to market. This situation can also be associated with having more productive resources by elders such as land and market experiences which enable them to participate easily into markets. This argument supports the results in the study of Makhura *et al.* (2001) and Bwalya *et al.* (2013) who found that, the likelihood to sale and participate in the market by a farmer increases with the number of person at the family.

In contrast, distance to market and market experiences of a famer showed negative effects to households' decision to participate in the market. This can be explained by the facts that, as a farmer being located far away from the market place, transaction costs incurred in delivering products to the market also becomes higher. These also further indicate that, the longer distance to market place from farmer's premises, the more difficult and costly it will be to participate in the market. This is because of the existence of transaction costs which lower the effective price received by a farmer (seller), thus discouraging him/her to participate into the market. This was revealed by a larger number (81%) of farmers in Sumbawanga being selling their maize at home as means of reducing or avoiding transaction costs. These findings concurs with those of Bwalya *et al.* (2013) and Sabatta *et al.* (2014) in Zambia and Nigeria who found that, distance to market was negatively related to the farmers' decision to participate in the maize and potato markets. Also Makhura *et al.* (2001) argued that as a household becomes away from the nearest market or town, the higher the transaction costs of obtaining information and market outlet. Therefore, the higher the distance to the market the higher transaction costs that farmer will incur in transporting their produce to market. For example, farmer from Itepula village (15km from Mlowo maize market) in Mbozi district reported to incur Tshs 3,000 per bag of 100kg (equivalent to $2.00) to reach the town market at Mlowo. This cost is too high for smallholder farmers to overcome and access markets for their produces.

Table 1: Factors that Determine the Decisions of a Smallholder Farmer to Participate in the Market

Households' characteristics (Variables	Coefficients	Standard error	Exp(B)
Age of household head (Year)	.007	.044	1.007
Gender of household head (Male=1, Female= 0)	.035	.906	1.036
Education level of household (No. of years in schooling)	.229**	.092	1.257
Family size (No. of adult person)	.289**	.140	1.335
Experience in maize market (Years)	-.028	.046	.972
Distance to district market (Km)	-.020**	.034	.980
Total maize harvest (Kg)	.000*	.000	1.000

Average maize price per kg (TSH)	.026***	.009	1.026
Ownership of motorbike (Yes=1, No=0)	.943*	.782	2.567
Number of livestock owned (Cattle)	.191**	.091	1.211
Ownership of Bicycle by a farmer (Yes= 1, No= 0)	.067	.339	1.069
Constant	-13.195***	3.816	.000
R^2 (Cox and Snell)= 037			

Source: Field Survey, 2014

Dependent variable: Framers decision to participate in market (Yes=1, No = 0), *, ***and *** significant level at 10%, 5% and 1% respectively.

4.2 Factors Influencing the Quantities of Maize Sold by Households in Sumbawanga and Mbozi Districts

In the second stage of Heckman model, the ordered logistic regressions was run to estimate the effects of factors determining the quantity of maize sold to market by households .The ordered logistic model was considered suitable for this study because the dependent variable was categorical with two levels for which the normal OLS does not fit as it eliminate none market participant farmers. The fitness of the model was shown by the Cox and Snell R^2 (76%) and Chi-Square (82.246) which was significant at p≤001 indicating that variables include in the model were correct predictors.

The regression results in Table 2 indicate that, family size; education level and market experience of household head were positively related with the amount of maize sold to the market. These can be explained by the fact that, educated householder farmers have higher chance of making informed decisions due to easily access to market information and identification of existing market opportunities for their produce. Also the increase in the size of households will imply more supply of labor and thus more maize will be produced by those households. This in turn will increase the likelihood of the farmers to decide quickly to participate in the market and sell more maize. In addition, results from Table 2 indicates further that, as households have more marketing experiences, it becomes more likely for them to sell large quantities of maize to the market. This is because being more experienced in maize marketing makes the household to incur less information and search costs due to prevalence of social networks established by a farmer. Therefore older farmers have higher probability of participating in the market because they have more market information and low fixed transaction costs. Similar to this, Makhura *et al.* (2001) and Bwalya *et al*. (2013) noted that, experienced households have greater contacts and increased trust gained through repeated exchange with the same parties at the market.

Moreover the findings indicate that, ownership of assets such as livestock and bicycles or motorbike had positive effects on the quantity of maize sold by households. This implies that a farmer with such assets incurs low transaction costs in moving maize to markets than those who does not own such assets. This is because cattle or donkey were commonly used as

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means of transport to move ox-carts with maize from production areas to markets. Also increased in person ownership for means of transport such as bicycle and motorbike has shown to increase the number of households who participate in selling maize due to reduced transaction costs in the two districts. These findings were consistence with those of Bwalya *et al.* (2013) and Sabatta *et al.* (2014) who found that, ownership of assets such as transport equipment (ox- carts, pick up) tends to reduce entry barriers in the market.

Additionally, amount of harvest had also shown a positive effect on quantity of maize sold by households. This can be explained the reason that, householders with more harvest will have more surpluses to sell to the market as compared to the one with few harvests. This argument supports that of Sabatta *et al.* (2014) and Olwande and Mathenge (2011) that, farmers who manage to get more harvests were found to be more likely to sell more maize to markets in Nigeria and Kenya respectively. Also Haug and Hella (2013) in their study of Food balance security in Tanzania found that, farmers in surplus areas such as Rukwa and Mbeya sell lager volume of maize than in the deficit areas like Singida and Shinyanga regions.

On the other hand, amount consumed at home and distance to market showed a negative effect on the amount of maize sold by households and were significant at p≤001 and P≤05 respectively (Table 2). This implies that farmers who keep more maize for home consumption, they are likely to sell a little maize to the market than those consuming less. However, this also can be explained by having large number of people at the family which demand more food for home consumption. This could reduce the surpluses that household could send to market from their produce. Similar results were obtained by Makhura *et al.* (2001); Okoye *et al.* (2010) and Bwalya *et al.* (2013) in Zambia, Nigeria and South Africa.

Table 2: Factors determining the amount of maize sold by smallholder farmers

Characteristics (Variables)	Coefficients	Standard error
Farmer's Age (Years)	-.15788**	.063
Education level of farmer (No. years in school)	2.617**	1.045
Family size (No of adult person)	1.057***	.254
Market experience of farmer (Years)	.216***	.075
Ownership of Motorbike or bicycle by a farmer (Own = 1, Not own= 0)	2.137**	1.168
Value of livestock (Tshs)	.167*	.127
Total maize harvests (Kg)	.005***	.001
Sex of household head (Male =1. Female = 0)	1.475	1.201
Amount of maize consumed at home (Kg)	-.005***	.001
Distance to district maize markets (Km)	-.088**	.053
Constant	-6.590	2.692
R^2 (Cox and Snell)	.76	
Chi- Square	82.246***	

Dependent variable: Amount of maize sold by households (Kg), ***, ** and * Significant at 1%, 5% and 10% respectively.

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5. Conclusions and Recommendations

Results from both logistic and ordered Logistic regression shows that, existence of high transaction costs and home consumption reduces the ability of smallholder farmers to participate in the market. These arguments are implied by a negative coefficient (-.088) of market distance from farmers' premises and farm area. However, access to market by households was explained by education level, ownership of assets and amount of harvests farmers can produce in a given season. In this regard, we recommend formulation and implementation of policies which will reduce transaction costs and empower famers to access market information through educating them. Also improvement of feeder roads and highways will reduce much the transportation costs which farmers incur in moving their produce to markets. Employment of more agricultural extensions and establishment of market collection centre will also motivate more smallholder farmers' participation in the market and thus food security will be improved. However, it is important to note that, this study has used cross sectional data which does not captured the changes over time. We recommend further study which could involve the use of time series data which are capable to capture the trend of change over time.

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