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Effects of non tariff barriers on market participation for maize smallholder farmers in Tanzania

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This study assessed the effects of non-tariff barriers (NTBs) on market participation for maize smallholder farmers in the major maize producing districts of Mbozi and Momba in Mbeya region located in the Southern Highland of Tanzania. A two-stage stratified sampling was used in selecting 240 smallholder farmers from the selected villages in two districts and interviewed. In estimating the effects of NTBs on market participation and quantity of maize sold by farmers, the two-stage Henchman model was used. Results showed that, NTBs and distance to market had negative effects on the quantity of maize supplied and market participation. This implies that, for every 100% increase in application of NTBs by the government could decrease market participation and sell of maize by 77% from smallholder farmers. However, ownership of assets and amount of harvest were found to increase maize supply and market participation by 68 and 2%, respectively. The study concluded that, application of NTBs policies in Tanzania could not increase supply of maize especially on surplus regions and districts. In contrast could discourage farmers' market participation. Therefore, it was recommend that, government should eliminate discriminative NTBs and improve market infrastructures such as roads and storage facilities in order to increase farmers' market participation.

Key words: Market participation, maize, non-tariff barriers (NTBs), smallholder farmers.

INTRODUCTION

In several Sub-Saharan African countries (SSA) including Tanzania, food security is linked to staple food production and marketing (Mbise et al., 2010; KI, 2011; FAO, 2012). In most of these countries, maize is a key staple food and major tradable crop (FAOSTAT, 2009; World Bank, 2012). Thus, increasing its production and marketing has the potential for raising the income and welfare of poor small household farmers in the country like Tanzania. Similar to other countries in SSA, maize in Tanzania is a major staple food crop consumed by about 90% of its population followed by rice (17%) (National Bureau of Statistics (NBS), 2008) which is more preferred staple food for medium and high income earners (Kilimanjaro International (KI), 2011). However, for the past 10 years,

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maize production in Tanzania has varied considerably, ranging from 2,638 metric tons in 2006/7, to a low level of 2,107 metric tons in 2009/2010 (UNESCO, 2011). Moreover, in the recent years maize production has declined from 3.5 to 3.2 metric tons for year 2010/11 and 2012/13 and then from 5.4 to 5.0 metric tons for year 2012/13 and 20113/14 respectively (USDA, 2015; NBS, 2014). This amount has remained below to annual staples country demand of 11 metric tons with maize and rice (Minot, 2010; Haug and Hella, 2013). The low level of maize production and thus its supply can be explained by both low use of improved inputs and limited access to market for farmers due to government intervention on the food crops marketing (Bwalya et al., 2013; Sabatta et al., 2014).

According to the Agricultural Distortions Project of the World Bank (2008), the staple food sub sector in Tanzania is still relatively highly regulated and price incentives remain strongly distorted as compared to its neighboring countries like Kenya and Uganda who have changed their policies from taxation to a slight support of farm-gate prices (Ihle et al., 2010). The intervention of government on marketing of staple food crops is through imposition of arbitrary trade restrictions which include tariffs and Non Tariff Barriers (NTBs) from time to time (Karugia et al., 2009). The introduced NTBs includes, weighing bridges and road blocks along main roads, complicated procedures and requirements in securing export permits from the Ministry of Agriculture, Food and Cooperative and Local government Authorities. These government interventions have been reported by the World Bank (2012) and Karugia et al. (2009) as an obstacle to smallholder farmers to access both village and district markets. Haug and Hella (2013) in their study of food balance in Tanzania argued that, government interventions do increase the transaction costs that a poor resource rural households faces when deciding to sell their produce to markets.

The high transaction costs are linked with small households' difficulty to access markets and even completely exclude them from markets (Makhura et al., 2001; Bwalya et al., 2013). Similarly, Mbise et al. (2010) claimed that, the size of transaction costs could also affect the decision of farmers on how much quantity to supply to the market. This was revealed in the study of Bwalya et al. (2013) who found that, in developing countries like Tanzania, small holder farmers only contribute 20 to 30% of marketable surplus. The low rate of supply and market participation can be explained with high transaction costs faced by smallholder farmers in accessing adequate and timely markets as well as fair prices. Moreover, NTBs as noted by Karugia et al. (2009) constitutes for about 13% of the total maize transaction cost in Tanzania which limits farmers to access different market opportunities as being created by different economic integrations such as East Africa Community (EAC) and Southern Africa Development Community (SADC). This is because with the existence of NTBs on staple crops, market access for poor rural farmers who are located in the poor market infrastructures will only be limited to village markets. Therefore in this regards, it is necessary to examine in-depth their effects on market participation by maize smallholder farmers.

In this study NTBs refers to policy measures other than ordinary customs tariffs that are instituted by governments to ensure food security and price stability in the country (Mold, 2005; Karugia et al., 2009). These include: Municipal and Council permits, trade license, export permit, roadblocks, corruption, customs procedures and weighbridges applied at the region, district and cross borders. However, to overcome the problem of low market participation for smallholder farmers, the Government of Tanzania (GoT) has established various strategies such as formation of farmer organizations which provide support services to smallholder farmers in rural areas and Strategic Grain Reserves (SGR) under National Food Reserve Agency (NFRA) which purchases maize from farmers at a fixed floor price which is above the market prices. The SGR strategy is aimed at ensuring markets for farmers' produce especially in the surplus regions (such as Mbeya, Rukwa, Iringa and Ruvuma). Surprisingly, the NFRA has been frequently constrained with shortage of funds to purchase all maize brought by farmers at the centre (KI, 2011; World Bank, 2012). This situation leaves farmers with their maize surplus unsold despite that they have already incurred all the necessary costs of transporting their produce to the buying centers. For instance, NFRA buying centre at Vwawa and Itepula villages in Mbozi district in years 2013 and 2014 failed to purchase all maize brought by farmers. This situation forced some farmers to diverge their production from maize to other crops which fetch higher prices like sunflower and groundnuts. The government's intention of imposing NTBs is to increase price stability and supply of staple foods such as maize and rice in deficit regions. However, fruits from these policies are yet to be fully realized by majority poor rural farmers and consumers in the deficit urban centre as was intended by the government.

Despite Tanzania being imposing periodical NTBs on maize supply and trade yet, the effects of NTBs on the supply and market participation decision for maize smallholder farmers are still not yet explicitly analyzed and known to both policy makers and government (Porteous, 2012: IFPRI, 2013). And to what existent is the imposed NTBs can influence the main government objective of achieving short-term supply and price stability in the country is still remain a question. This gainsay situation have motivated this study to question the current market participation by maize producers in Tanzania. Therefore, the objective of this study was to assess the effects of NTBs on the market participation of maize smallholder farmers in Mbozi and Momba districts

and add value to the existing body of evidence. 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.

METHODOLOGY

Study area and sampling procedures

The study was conducted in the major surplus maize producing districts of Mbozi and Momba in Mbeya region. Mbozi and Momba districts were selected based on their agricultural potential of being maize surplus-producing areas in the region. The two districts also depend more on external markets (Malawi, Zambia and DRC) for their surplus maize (Minot, 2010) and are also situated far from major domestic markets such as Dares Salaam and Arusha. A cross sectional design was employed in the study whereby the population of small scale maize producers in selected villages from the two districts was involved.

A two-stage stratified sampling was used in the selection of sample. In the first stage, wards from the available list at the districts office were stratified into two strata, first stratum for the wards close to district markets and the second for those located far from district markets. Then, four wards were randomly selected, two from each district namely Igamba, Ihanda for Mbozi district, Nkangamo and Chiwenzi for Momba district. Ihanda and Chiwenzi wards being located close to district markets of Mlowo and Tunduma while Igamba and Nkangamo wards being far from the two markets. The selection of wards was also based on the existence of NTBs and quantity of maize produced. In the second stage, two villages from each ward were randomly selected making a total of 8 villages namely, Igamba, Itepula, Shiwinga, Ihanda, Malonji, Mpemba, Chiwanda and Isanga). A total of 240 small householder farmers were randomly selected from the eight villages and interviewed.

Data analysis

Data collected were analyzed with the help of SPSS computer software and the effects of NTBs and other factors on the probability and quantity sold or supplied by households to maize market were analyzed using a two-step Heckman's approach (Bwalya et al., 2013; Makhura et al., 2001). This approach does involve the use of two estimation steps for the facts that market participation decision made by farmers is seen to embody two decisions process: The unobservable decision to participation and the observable extent of participation measured by the amount being sold to market (Musah et al., 2014). In steps one, a binary logistic regression model was estimated to give the probability (decision) that a household *i* purchased or sold maize to market. In the second step, the Ordered Probit regression was run to estimate the effects of NTBs and other households' characteristics on the quantity of maize sold/supplied to market.

To capture the unobservable decision from farmers, the latent variable Y was established which measures the utility outcome that a farmer i get in participating in the market or not. In this regard the Heckman model can be expressed as:

$Y = 1$, if $S_i > 0$ (1)

$Y = 0$, if $S_i < 0$ (2)

Whereby; Y is the binary response (Y = 1, if a farmer decided to participate and sell maize to market and Y= 0, if a farmer do not participate). S_i = is the quantity of maize sold to market.

However, S_i in this study was considered as the market participation indicator variable for a farmer in the study area instead of Y. Therefore, non-observable underlying utility function which ranks the preference of the *ith* farmer can be expressed as the market participation equation in a liner form was stated as:

$$S_i = \beta_i X_i + \mu_i \quad (3)$$

Whereby, Xi is a vector of exogenous explanatory variables such as household characteristics and location characteristics that influence the market participation. For a full derivation of market participation equation is given in Appendix 1.

To estimate the probability (P_r) of farmers to participate or not in the markets in the first step of Heckman model, Equation (3) was expanded to include all variables related to market and households characteristics. Thus, the logistic regression equation in the linear form was stated as:

$$Pr(S=1) = \beta + \beta_1 P^m + \beta_2 QSH_i + \beta_3 DDM_i + \beta_4 HHB_i + \beta_5 i HMB_i + \beta_6 VLK + \beta_6 AGE + \beta_8 EDU + \beta_8 HHS_i + \beta_9 EXP + \beta_{10} SEX + \varepsilon_i \quad (4)$$

Where: Pr (s = 1) = Probability of a farmer decide to participate into the market, β = 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 Ox- cart or Bicycle (Yes = 1, No = 0), HMB = Ownership of motorbike by household (Yes = 1, No = 0), VLK = Value of Livestock for 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), ε_i= random error term.

In the second step, ordered probit regression was used in order to estimate the effects of NTBs and other factors on quantity of maize sold by households and it was expressed as:

$$S^s = \alpha + \beta_1 QSH_i + \beta_2 DDM_i + \beta_3 HMB_i + \beta_4 i HCP_i + \beta_5 VLK_i + \beta_6 AGE + \beta_7 EDU + \beta_8 HHS_i + \beta_9 EXP + \beta_{10} SEX + \beta_{11} Q_i + \varepsilon_i \quad (5)$$

FINDINGS AND DISCUSSION

Descriptive results

Table 1 present demographic characteristics of respondent against level of maize yield per hectare from the two districts. Categorization for the quantity of maize yield was based on the world average yield of 4,300 kg per hectare (FAO, 2009; Urassa, 2010). Table 1 indicate that, majority of maize producers (91.25%) in the two districts come from adult age group of which most of them (75%) experienced low maize yields per hectare and only 8% managed to attain medium and high level of yield (Table 1). This confirm the argument that smallholder farmers in most of rural area in Tanzania their average maize yield stands at 1,962 kg/ha which is below to the world average maize yield of 4,300 kg/ha (NBS, 2014; Urassa, 2010). These findings are

Table 1. Maize yield per hectare and household characteristics in the study area (in Kg/ha).

Households characteristics		Level yield						Total
		Low		Medium		High		
		N	%	N	%	N	%	N
Age groups	Young	11	4.58	0	0	0	0	11
	Adult	181	75.41	19	7.92	19	7.9	219
	Older	8	3.33	2	0.83	0	0	10
Level of education	None	1	0.42	0	0	2	0.3	3
	Primary school	171	71.25	18	7.5	17	7.0	206
	Secondary school	24	10.00	2	0.83	0	0	26
	High school	2	0.83	0	0	0	0	2
Marital status of household	Married	178	74.16	18	7.5	19	7.9	215
	Single	2	0.83	0	0	0	0	2
	Widowed	20	8.33	3	1.25	0	0	23

The classification of maize yield is based on the world average maize yield of 4300kg/ha. Low and high indicate below and above 4300 kg/ha (Source: FAO, 2009; Urassa, 2010).

consistence with that of Aloyce et al. (2014) who found that, about 78% of maize producers in Mbozi and Sumbawanga districts were adult and elder were retired.

Findings on sex of household heads show that, majority (73%) of famers were male with maize yield ranging from low to high (Table 1). This implies that most of households were headed by male and that decisions regarding production and marketing at the household level were made by male households. However, despite the large number of male respondents (59% for low and 7.5% for medium yield), yet agricultural activities were managed by both male and female in both districts. These results agrees with that of Aloyce et al. (2014) in Bariadi and Mbozi districts where they found among of respondents interviewed 85 and 92% were male.

Findings on education level indicate that, a large percent (86%) of farmers in the study area have primary education of which majority of them (71%) experienced low level of maize yield. However, very few (0.83%) farmers managed to attain medium and high level of yield per hectare (Table 1). Surprisingly, as education level increases yields were decreasing among farmers with college education where majority (2 out of 3) of them only produced low yield of maize. This can be explained by the low level of risks taking for graduates since agriculture sector is considered as the higher risk sector in Tanzania due to its dependency on rain fed irrigation. These findings are consistence with that of Minot et al. (2006) and Urassa (2010) who found that, the increase in education level of the household head was positively correlated with the diversification of crops in Ruvuma and Rukwa regions. This implies that household farmers with high education were more likely to diverge from agriculture to other lucrative business ventures. Moreover, the low level of education for most farmers (primary) on the other hand could imply difficult for such farmers to access market information and tape the available opportunities for their produce. This has been revealed by majority (81%) of farmers in the two districts to sell their maize outputs at home.

On the other hand, majority of the respondents were married (74%), only few (8.7 %) of them were single and widowed in the two districts. However, the percentage of widow respondents was higher in two districts (8.3%) compare to other districts in the region. This can be explained by the prevalence of high level of HIV AIDS in the two districts. These results concurs with those of Aloyce et al. (2014) and NBS (2012) who found that there was a large percent of widow households (13%) in Mbozi district compare to other districts (Mvomero, Sumbawanga and Bariadi).

Empirical results

Factors influencing smallholder farmers' market participation decisions

Table 2 presents factors which influences households' decisions on market participation in the maize market in Tanzania. Following the two-stage Heckman model analysis, the binary logistic regression in the first stage was carried out to determine the effects of households' farm and demographic characteristics on farmers' decisions to participate in the market or not. The findings in Table 2 show that, education level of household head, family size, market price and experience, ownership of motorbike or ox-cart and number of livestock had a positive and significant effect on smallholder farmers' decisions to enter in the maize market in the two districts

Table 2. Factors that determine the decisions of a smallholder farmer to participate in the market.

Household characteristics(Variables)	Coefficients	Std. error.	Sig.	Exp(B)
Education level of household (No of years in school)	0.239**	0.091	0.009	1.269
Family size (No of adult persons)	0.218*	0.126	0.083	1.243
Total amount of maize harvested (Kg)	0.000***	0.000	0.011	1.000
Average maize price (Tshs/Kg)	0.026**	0.009	0.003	1.026
Value of livestock (Tshs)	0.198*	0.091	0.029	1.219
Ownership of Motorbike by household (Yes=1 No = 0)	0.678	0.742	0.361	1.971
Distance to district market(Km)	-0.088*	0.067	0.119	1.092
Gender of the head of household (Male = 1 Female = 0)	-0.193	0.830	0.816	1.213
Experience in maize marketing (Years)	0.032*	0.037	0.082	0.968
Ownership of bicycle by household (Yes = 1 No = 0)	0.065	0.349	0.853	1.067
Age of households' head (Years)	-0.002	0.029	0.933	0.998
Constant	-12.97***	3.916	0.001	0.000

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

(Momba and Mbozi).

The coefficient of education level for household's head were positive with coefficient value of 0.239 for education and significant at 5% level (P = 009). The positive coefficient on education implies that, increase in the number of years that households spent in school will increase their likelihood to participate in the market. This also was mirrored by the odd ratio value of 1.269 which implies that, the likelihood of farmer to participate in the markets will increase by 1.27 if education level has to increase by one unit *ceteris paribus*. Therefore, high education level empowers farmers to access more information and new existing opportunities from various markets. Access to market information makes a farmer to be more informed on market requirements in terms of price, quality, and right quantity of maize needed by buyers (Bwalya et al., 2013). These findings are consistence to those of Sabatta et al. (214) who found that, smallholder farmers with high level of education were more involved in selling their produce to market in Nigeria. Similarly, the findings agree with those of Odulaja and Kiros (1996) and Ohajianya and Ugochukwu (2011) who argued that, farmer's ability to produce and sell more output to market was positively related to their education levels. But they contradict with those of Musah et al. (2014) who found that, increase in education level of household was negatively related to farmers' decision to participate in the market in Ghana.

Results in Table 2 further indicate that, price of maize had a positive influence on farmers' decision to participate in the maize market with a value of 0.026 and significant at 5% level. This implies that farmers in most case respond quickly to high price due to the fact that, high price increases their income from maize selling and thus enable them to enquire more resources for production activities. Therefore, farmers will be more likely to participate into market if the effective price received by a farmer is higher than costs of production. This argument confirms the assertion from economic theory that output price is an incentive for farm household to supply more produce for sale (Musah et al., 2014). Also the probability of farmers to participate in the market is indicated by the odd ratio of 1.245 which implies that market participation will increase by that factor for a unit increase in education level attainable by a household. However, respondents interviewed during the survey reported that, before the ban of maize export in the year 2008 and 20011, quantities of maize sold were high as compared to the current period. These findings are consistence with those of Omit et al. (2009) and Enete and Igbokwe (2009) who claimed that, better output price was the key incentive for farmers to participate in the market. Similar results were obtained by Olwande and Mathenge (2012) in Kenya that, farmers sold more maize during the period of higher market prices. Also findings from the study by Sabatta et al. (2014) indicated that, price had a positive relationship with the decision of households to participate in the market.

In addition, households who own more livestock were found to be more involved in selling their maize to market than those who own less livestock. The positive coefficient and odd ratio of 0.0198 and 1.219 for value of livestock shows how the ownership of cattle and other animals could facilitate the probability of farmers to participate in the market. This is because cattle as domestic animals were used in moving ox-carts of maize to markets as major means of transport for majority smallholder farmers in the two districts. Therefore, ownership of these assets could reduce to some extent the transportation costs from farm to market and thus raises the ability of a farmer to participate in the market. These findings agree with that of Ohajianya and Ugochukwu (2011) in Nigeria, that farmers who own large number of livestock were more likely to participate in the

market as sellers and not autarkic. Also the findings are in line with that of Randela et al. (2008) who claimed that households with own means of transport are likely to transport their agricultural product on time to the market before losing value and earn more income. In contrast to this, Jaleta et al. (2009) found negative relationship between asset ownership by households and market participation by cassava smallholder farmers in Mozambique.

The coefficient of family size was valued at 0.218 and significant at 10% (P= 08) implying that the probability of farmers to participate in the market could increase by 22% with the addition of one adult person at the family. This is because households with more adult people have high ability to produce more maize and thus can sell more surpluses to the market. This argument concur with the results of Makhura et al. (2001) and Bwalya et al. (2013) who found that, the likelihood to sell and participate in the market by a farmer increases with the number of person at the family. Also the findings are in line with the theory of labour supply which state that, supply of labour will increase with the increase in the number of adult person at the household.

Market experience of farmers also showed a positive with coefficient value of 0.239 for market experience influence on farmers' decision to participate in the market (Table 2). This implies that, as households have more marketing experiences, it becomes more likely for them decide to inter into 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 trust gained through repeated exchange with the same parties at the market which enable him to reduce fixed transaction costs on searching and bargaining with potential traders.

In contrast, distance to market for famers showed a negative effect to households' decision to participate in the market with a coefficient of - 0.088. This can be explained by the fact that those smallholder farmers who are located far away from the market place they have to incur more transaction costs in delivering products to market. These findings concur 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 with the farmers' decision to participate in the maize and potato markets. On the other hand, short distance from farmers' premises will imply less transaction costs to smallholder farmers and therefore encourage more market participation. In this case for farmers who stay far from markets, it becomes very difficult for them to access better price from the buyers due to high transaction costs. This is because of the existence of transaction costs which lowers the effective price received by a farmer (seller), thus discouraging him/her to participate in the market. For example, farmers from Itepula village (15 km from Mlowo maize market) in Mbozi district reported to incur Tshs 3,000 per bag of 100 kg (equivalent to $2.00) to reach the town market at Mlowo. These costs are too high for poor smallholder farmers like those of Mbozi and Momba districts to overcome and access markets for their produces.

Size of the harvest was also found to be significantly increases household's probability of maize marketing in the two districts. This has been explained by the fact that those smallholder farmers with more harvest were in the better position to sell surpluses maize to market. Similar results have been reported in South Africa and Nigeria by Makhura et al. (2001) and Belaya et al. (2013) where households with larger maize harvests were likely to have more surpluses for sale. Age and sex of households were negatively related with the decision of farmers to participate in the market though they were insignificant.

Effects of NTBs and other factors on quantity of maize sold by households

In the second stage of Heckman model analysis, the ordered Probit regressions was run to estimate the effects of NTBs on the quantity of maize sold to the market by households. The ordered probit model was considered suitable for this study because the dependent variable (Si) was categorical and binary in which a normal OLS does not fit since it omit none market participation farmers from the equation estimation.

The results from Table 3 indicate that, NTBs had a negative effect on the amount of maize sold to the market and was significant at 5% (P = 002). The possible explanation for the negativity could be because of the increased transaction costs which farmers incur to reach markets resulted from the imposed NTBs such as road blocks and weighing bridges along the supply chain of maize. High transaction costs had high probability of reducing farmers' ability to transport their produce to suitable markets where they could fetch a better price. During the interview with farmers it was reported that, farmers were required to pay Tshs.1, 000 per bag per trip when crossing any road block in Momba and Mbozi districts. These costs are too high for farmers who are facing high prices of inputs and low farm-gate prices from traders which in year 2013 and 2014 were averaged at Tshs. 250/kg in the two districts. These findings conform to those of Mbise et al. (2010) who found that, in Tanzania NTBs are said to be major contributors of transaction costs in the exchange process at a particular market. Also the findings are in line with those of Porteous (2012) and Karugia et al. (2009) in Tanzania that, NTBs policy increases the total costs involved in

Table 3. Factors determining the quantity of maize sold by smallholder farmers.

Household characteristics (Variables)	Coefficients	Std. error	Wald	Sig.
Constant	-8.764**	2.902	9.123	.003
Age of households' head (Years)	0.008	0.015	0.287	.592
Experience in maize marketing (Years)	0.027*	0.016	2.941	0.086
Education level of household (No. of year in school)	-0.085*	0.034	6.131	0.013
Family size (No of adult person)	-0.039	0.051	0.595	0.441
Total amount of maize produced (Kg)	0.002***	0.000	21.256	0.000
Average maize price (Tshs/Kg)	0.004*	0.002	2.513	0.013
Average distance to district market (Km)	-0.042**	0.025	2.685	0.101
Ownership of bicycle by household (Yes = 1 No = 0)	0.068	0.173	0.155	0.694
Amount of maize consumed at home (Kg)	-0.001***	0.000	14.431	0.000
Number of livestock owned by household (Number)	0.040*	0.053	0.448	0.023
NTBs equivalent (Tshs)	-0.770**	0.388	6.239	0.002
Sex of households' head (Male= 1 Female = 2)	-0.231	0.239	0.935	0.334
Pseudo R^2		38%		.000
Chi- Square		58. 478		

Dependent variable: Quantity of maize sold by a farmer in year 2013 (Kg), *, **and *** significant level at 10, 5 and 1% respectively.

getting maize produce to markets by 13 and 34% in Kenya. Therefore, NTBs in this respect will act as impediments for smallholder farmers especially in the rural area to access different market both in the local and across country borders. Moreover, the findings were supported by majority of farmers (81) who claimed to conclude their transaction at home in Mbozi and Momba districts due to high transaction costs. The negative coefficient of NTBs (-0.77) further indicate that, NTBs cost will reduce the likelihood of farmers to sell more maize to the market by 77% due to increased cost of transportation from the farm to markets.

Additionally, coefficient of distance to market showed a negative effects (-0.042) on the quantity of maize sold by households and significant at P≤05 level (Table 3). The coefficient indicates that, the ability and likelihood of smallholder farmers to participate and sell more quantity of maize could decrease by 4.2% for the unit increase in distance to market from household's premises. These findings are in line with that of Sabatta et al. (2014) in Nigeria who found that, distance to market was negatively related with the amount of potato farmers wish to sell to markets. Distance to market was reported by farmers from Isanga village in Momba district (40 km to Tuduma maize market) as reason for why trader offers low farm-gate prices for their maize. This is because of the fact that transaction costs incurred by traders in actual sense are transferred to or paid by farmers in terms of low farm gate prices they receive.

Amount of maize consumed at home also showed negative effects on the quantity of maize sold by households and was significant at p≤000 level (Table 3). This implies that farmers who keep more maize for home consumption, they are likely to sell a little to markets than those who are consuming fewer amounts. These findings are in line with those of Musah et al. (2014) who found that about 73% of farmers in the two districts produce maize for home consumption. On the other hand, increase in the number of person at the household (family size) had a negative effect on the quantity of maize sold, indicating that having more people at the family will imply more demand for food for home consumption. This could reduce the surpluses that households are able to sell to the market. This situation was also explained by the negative coefficient of family size (-0.039) on the quantity of maize sold by households (Table 3). Similar results were obtained by Makhura et al. (2001), Okoye et al. (2010), Bwalya et al. (2013) and Musah et al. (2014) in South Africa, Zambia, Nigeria and Ghana who found that, households with larger family size fail to produce marketable surplus beyond their consumption need. On the other hand increase in the size of households will imply more demand for food for home consumption and thus the ability of the household to sell more surpluses to market is reduced. This becomes however contrary to economic theory on the supply of labour that, large family size also implies increased labor supply and production (Makhura et al., 2001; Bwalya et al., 2013). But this situation can also be explained by the behavior of poor rural farmers in developing country who are net buyers and not net sellers of their products.

Education level of a household head also showed a negative effect on the quantity of maize sold. This implies that even though farmers with higher level of education are more likely to participate in market as sellers, but they are also easily to diverge to more profitable off-farm ventures or being employed in the formal sectors if price of output is low. This is contrary to pre-expected sign of

positive relationship between education and quantity of maize sold. This also can be explained by majority of farmers in the two districts being standard seven (71%) and only 0.8% attained college/university education (Table 1). The few percent of farmer with high level of education could imply that, when farmers attain higher education level, they consider agriculture as a tedious activity which is supposed to be done by unskilled person. These findings concurs with that of Ohajianya and Ugochukwu (2011) and Musah et al. (2014), who argue that, sweet potatoes and maize farmers who were more educated were more likely to be buyers than to sellers in the Southern Eastern of Nigeria and Ghana.

On the other hand, ownership of livestock such as oxen and donkey had a positive effect on the quantity of maize sold by households. This implies that a farmer with such assets incur relatively low transaction costs in moving maize to markets than those who does not own. This is because domestic animals like oxen and donkeys were used as means of transport to move ox-carts with maize from production areas to markets. Also having more person assets such as motorbike, car and ox-carts could contribute in reducing the transaction costs arises from the imposed NTBs such as road blocks, weighing bridges and corruption. These findings concur with those of Pravakar et al. (2010) who found that, households with larger livestock endowments such as cattle produced and sold more maize to the market. And similar to that of Boughton et al. (2007) in Mozambique that private ownership of assets especially livestock and farm equipment were positively affecting amount of grain crops marketed. Moreover, ownership of person means of transports such as bicycle motorbike and car will increase the number of households who participate in selling maize due to reduced transaction costs. 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 to the market.

Additionally, amount of harvest had also shown a positive effect on quantity of maize sold by households. This can be explained 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 sell lager volume of maize than in the deficit areas. Also, marketing experience coefficient was positively significant in explaining the relationship between market experience and quantity of maize sold by farmers. A possible explanation that can be advanced for this is that, older and more experienced household heads tend to have more personal contacts allowing discovery of trading opportunities at low cost (Musah et al., 2014). Moreover, Makhura (2001) argued that being older also assists farmers to overcome fixed transaction costs since some experiences about the market have been accumulated overtime.

CONCLUSIONS AND RECOMMENDATIONS

Results from both logistic and ordinal regression shows that, existence of high transaction cost reduces the ability of smallholder farmers to participate in the market and sell more maize. These arguments are implied by a negative coefficient (-.77) of NTBs and (-.042) market distance from farmers' premises. However, access to market by households was explained by ownership of assets such livestock, motorbike, and amount of harvests farmers can produce in a given season. Moreover, the opposite direction of NTBs on quantity of maize sold carries policy implication to governments in Developing Countries that use NTBs as tools for price stabilization and food security does not always improve prices in surplus regions and lower in deficit areas. Therefore, the introduction of NTBs would neither improve the food situation in the country nor assure the smallholder farmers of good prices in the local markets. In this regard, we recommend formulation and implementation of policies which will reduce transaction costs through elimination of NTBs such as road blocks, weighing bridges, complicated export permits for trader and other obstacles. Also improvement of feeder roads and highways which links smallholder farmers with major markets will reduce much the transfer costs which farmers incur in moving their produce to markets. This could encourage private sector to invest in market infrastructures such as warehousing and transportation services. Also employment of more agricultural extensions and establishment of market collection centre will motivate more smallholder farmers' participation in the market and thus improvement in food security in the country will be achieved. Further research is recommended on the effectiveness of NTBs strategies in improving prices and poverty reduction among rural people.

Conflict of Interest

The authors have not declared any conflict of interest.

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APPENDIX 1

Theoretical framework

Agricultural household model under transaction costs

Most of rural households in Tanzania are typically located in a situation characterized with a number of market failures (Taylor and Adelman, 2003; KI, 2011). Under the imperfect market situation, households' production decisions are not separated from the consumption decisions. Therefore, the household jointly makes its production, consumption and market participation decision subject to a number of constraints (that is, income, technology and resource constraints) (Makhura et al., 2001). However, this study focuses mainly on the situation whereby market failure is caused by government intervention through food trade restriction polices (that is, NTBs strategies). A situation in which decisions made by households on market participations are determined by the shadow price (P_i) they receive after correcting the effects of transaction costs on the market price.

Moreover, the decision price (P_i) received by smallholder farmer may differ from the observed market price (P_m), due to the existence of such transaction costs. These costs according to Makhura et al. (2001) and Key et al. (2000) can be observable although in most cases are generally unobservable, but can be explained by certain factors that can be observed (household characteristics). These costs include those vary with production (TVC) and those which does not change with production (TFC). Fixed costs are incurred by all households regardless of their participation on the market or not. On the other hand variable transaction costs are only incurred when smallholder farmers participates in the market exchange. However, under the situation where government intervention in term of food restriction policies (NTBs policy in this case), NTBs could be the main cause of market failure. Therefore, costs from NTBs will explain the difference between the observable market price and the actual price received by smallholder farmers. Bwalya et al. (2013) claimed that, existence of transaction costs will lower the price effectively received by a seller, thus discouraging market participation on the one hand and raise the effective value of production consumed by the household and a lower level of market participation on the other hand.

To analyze the household decisional behavior under the situation of transaction costs, the Agricultural Household Model (AHM) was extended to incorporate the effects of these costs. However, Bwalya et al. (2013) and Key et al. (2000) suggested that, it is also expedient to consider market participation as choice variables for a household. Therefore, in this study qs were used as choice variable for market supply and participation for a household.

If the households have to make their decision without considering transaction costs, then household's objective would be to maximize the utility function as:

$$MaxU = u(C_i Z_i; H_u) \quad (1)$$

That is, a household can either consume what it produces (c) or gain revenue to purchase other goods (Z), given household characteristics (H_u). Where H_u represents a set of factors shifting the utility function.

Thus the household utility function will be maximized subject to:

$$\sum_{i=1}^{n}[P_m C_i + Z_i] \leq \sum_{i=1}^{n}[P_m(q_i - S_i) + TE] \quad \text{(Cash constrain)} \quad (2)$$

This implies that, expenditures on all purchased goods must not exceed the revenue from sales (S_i) and transfers (TE) (e.g. Remittances).

And to:

$$P_i C_i + P_i S_i + P_i X_i \leq P_i q_i + Z_i + TE_i \quad \text{(Resource balances)} \quad (3)$$

Implying that, the amount consumed for commodity i, used as inputs and that were sold must be equal to what is produced and bought by a household plus the endowment of a good (TE).

or

$$G = g(q_i, X_i : H_q) \quad \text{(Production technology constrain)} \quad (4)$$

That is, production technology related to input use (X_i) and to output produced (q_i), given the set of households' characteristics (H_q).

Given that, $C_i, q_i, S_i, Z_i \geq 0$ (None negativity condition), whereby

$$Z_i = P_i S_i$$

and

$$S_i = f(C_i, q_i; H_q : H_u, TE_i) \quad (5)$$

Pi is market prices for good i and purchases of input i respectively.

Basing on the transaction theory, transaction costs are costs paid by buyers but not received by sellers, and/or the costs paid by sellers but not received by buyers (Kissel, 2006; Olwande et al., 2009). Thus they raise the effective price paid by a buyer and lower the price

received by a seller (Mbise et al., 2011). Then the decision price for household will be given as:

$$P_i = P_m - t^s \quad \text{(As a seller)} \tag{6}$$

and

$$P_i = P_m + t^b \quad \text{(As a buyer)} \tag{7}$$

However, as mentioned early that household under market failure their decisions on market participation are influenced by transaction costs. Then introducing transaction costs on the household utility objective function (1), the function becomes:

$$Max U_t = U_t(C^t, Z^t : H_u) \tag{8}$$

Subject to full income constrain under transaction costs:

$$\sum \delta_i^s [P_m - t_{vc}^s(h_t)](q_i - S_i) - \delta^c Z^t - \delta^c [P_m + t_{vc}^c(h_t)]C_i - \delta^s t_{fc}(h_t) - \delta^c t_{fc}(h_t) + TE_i \geq 0 \tag{9}$$

Whereby, $\delta_i^s = 1$ if $S_i > 1$ and $\delta_i = 0$ if $S_i = 0$ where δ_i^s is the revenue gained by the householder under the transaction costs and S_i is the amount sold.

Given that, $Z^t = 0$ when $S_i = 0$; $Z^t > Z$ Also $\delta^c = 1$ if $C_i > 0$ and $\delta^c = 0$ if $C_i = 0$

Therefore, from the Equation (9), supply and demand equations can be derived given that the household is facing both fixed and variable transaction costs. Thus the Langrangian equation is given as:

$$\begin{aligned} &Max\, L_t = U_t(C^t, Z^t : H_u) + \\ &\mu \sum \delta_i^s [P_m - t_{vc}^s(h_t)](q_i - S_i) - \delta^c Z^t - \delta^c [P_m + t_{vc}^c(h_t)]C_i - \delta^s t_{fc}(h_t) - \delta^c t_{fc}(h_t) + TE_i \geq 0 + \\ &\lambda [P_i(q_i - S_i) - P_i C_i - P_i X_i + Z_i + TE_i] + \omega G(q_i, X_i : H_q) \end{aligned} \tag{10}$$

Where, μ,ϖ, 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 exist. Then the fixed transaction costs (t_{fc}) will determine whether the household decides to supply and participates in the market or not (Makhura et al., 2001).

Since the inclusion of transaction costs in the Langrangian equation will create discontinuities, and then the optimal solution cannot be found by simply solving the first order conditions (FOC) (Key et al., 2000). The solution has to be decomposed in two steps as postulated by Makhura et al. (2001) and Bwalya et al. (2013). Solving first for the optimal solution conditional on the market participation regime (as a seller or buyer), and then choosing the market participation regime that leads to the highest level of utility. Then, using the optimum condition on market participation for a household facing transaction costs in equation (10), supply and demand equations can be derived by solving the first order condition as follows:

For consumption of own production:

$$\frac{\partial u^t}{\partial C^t} = \mu \delta^c (P_m + t(h_t)) + \lambda \delta^c (P_m + t\ (h_t)) \tag{11}$$

For consumption of purchased goods:

$$\frac{\partial u}{\partial Z_i} = \mu \delta^c (P_m + t(h_t)) - \lambda \delta^c (P_m + t\ (h_t)) \tag{12}$$

For output produced:

$$\omega \frac{\partial G}{\partial q_c} = -\mu \delta^s (P_m - t\ (h_t)) - \lambda \delta^c (P_m - t\ (h_t)) \tag{13}$$

For inputs used in production

$$\omega \frac{\partial G}{\partial X_i} = -\lambda \delta^s (P^m - t\ (h_t)) \tag{14}$$

For marketed goods (Sold goods)

$$\omega \frac{\partial G}{\partial S_i} = -\mu \delta_i^s (P_m - t\ (h_t)) - \lambda \delta_i^s (P_m - t\ (h_t)) \tag{15}$$

Then, the decision price (shadow price) for household to participate in market as a seller is $P_i = P_m - t^s$ if $S_i > 0$ and as a buyer is given as:

$$P_i = P_m + t^b \text{ if } S_i < 0 \tag{16}$$

Using the decision prices *pi* and the first order conditions,

utility maximization subject to the technological constraint leads to a system of output supply equations *q(p, hq)* and input demand equations *x(p, hq).* And utility maximization subject to the income constraint leads to a system of demand equations for consumer goods *c (p, I, hu).* Then the demand and supply equations for household participating into market will be given as:

The system of demand equation

$$C_i^t = C^t\left(P_m + t; I, h_u\right) \quad (17)$$

$$Z_i^t = Z^t\left(P_m + t; I, h_u\right) \quad (18)$$

The supply equation:

$$q_i^t = q^t\left(P_m - t; h_q\right) \quad (19)$$

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 (20)

These equations show that, transaction costs will shift the supply upward for seller and downward for a buyer.

However, NTBs costs as proposed by Mbise *et al*. (2010) and Karfakis and Rapsomanikis (2008) are explained as the main contributor of unobservable variable transaction costs particularly in the situation where government intervention is the main source of market failure. The same authors ascertained that, NTBs costs will also determine the decision smallholder farmers of to participate in market and supply the right quantity of their produce. Since the focus of this study is to analyze empirically the effects of NTBs on the supply and market participation, it is necessary to isolate them from other transaction costs such as transport, taxes and other costs. In order to separate NTBs from other transaction costs; the study has adopted Dean et al. (2008) methods of NTBs measurement. Under this method NTBs costs were measured as NTBs equivalent which was estimated as a residue when the price wedge between traders and farmers is corrected for tariff/levy, trade profit margin and transport costs (Dean et al., 2008). Thus, the NTB equivalent (Q) was estimated using the following equation:

$$Q_i = (P^S - P^{fg}) - \left(d_i^S - d_i^f\right) - \left(t_i^S - t_i^f\right) - \left(\mu_i^S - \mu_i^f\right) \quad (21)$$

Whereby; superscript ***S*** and ***f*** indicates the market transaction costs at wholesale and farm level, ***d,*** μ and ***t*** represent transport costs, profit markup per bag and tariffs.

Model specification

Assuming a linear relationship of expression for equation (19 and 20), the supply and market participation function will be given as:

$$S\left(P_m; h_q h_u\right) = \beta_i P_m + \beta_i h_q + \beta_i h_t \quad (22)$$

In this study, transaction costs are expressed in term of households' demographic and location characteristics and stated as:

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

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

This leads to linear expression of the market participation function of the farmer as a seller:

$$S^s = \beta_m P_m + \beta_t^s h_t^s + \beta_q h_q \quad (23)$$

And for a buyer will be:

$$S^b = \beta_m P^m + \beta_t^b h_t^b + \beta_q h_q \quad (24)$$

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

$$S^s = \beta_m P^m + \beta_t^s h_t^s + \beta_q h_q + \mu_i \quad (25)$$

$$\equiv \beta_i X_i + \mu_i \quad (26)$$

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

The quantity sold (S^s) was used as an indicator variable for households' supply and market participation for the

commodity and is defined as:

$S^s = 1$ if $P_m \geq P_i + t^s_{fc}$ or $P_m \leq P_i - t^s_{fc}$ (for household to sell to market)

and

$S^s = 0$, if $p_i - t^s_{fc} \leq P_m < P_i + t^s_{fc}$ (If a household does not sell to market).

Then, the market participation equation was expanded to include NTBs costs (Q_i) as separate part from other transaction costs and it is given as:

$$S^s = \beta_m P_m + \beta^s_t h^s_t + \beta_q h_q + \beta_t Q_t + \mu_i \quad (27)$$