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Commercialization of smallholders: Does market orientation translate into market participation?

Improving Productivity and Market Success of Ethiopian Farmers

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Commercialization of smallholders: Does market orientation translate into market participation?

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Abstract

The literature on commercial transformation of smallholders make little distinction between market orientation (production decision based on market signals) and market participation (sale of output). This paper analyses the determinants of market orientation and market participation in Ethiopia separately and examines if market orientation translates into market participation. Empirical results show that market orientation translates strongly into market participation. The key implication of this study is that policy, technological, organizational and institutional interventions aimed at promoting commercial transformation of subsistence agriculture should follow two-pronged approach: improving market orientation of smallholders at production level, and facilitating market entry and participation of households in output and input markets. Focusing on either may not be as effective in achieving the transformation.

Key words: commercialization, smallholders, market orientation, market participation.
JEL Classification: C21, C24, Q12, Q13

1 Introduction

Commercial transformation of subsistence agriculture is an indispensable pathway towards economic growth and development for many agriculture dependent developing countries (von Braun 1994; Pingali and Rosegrant 1995; Timmer 1997; World Bank 2008). Sustainable household food security and welfare also requires commercial transformation of subsistence agriculture (Pingali 1997). Commercial agricultural production is likely to result in welfare gains through the realization of comparative advantages, economies of scale, and from dynamic technological, organizational and institutional change effects that arise from the flow of ideas due to exchange-based interactions (Romer 1993, 1994). Commercialization enhances the links between the input and output sides of agricultural markets.

Commercialization entails market orientation (agricultural production decision destined for market based on market signals) and market participation (produce offered for sale and use of purchased inputs). However, the literature on commercialization of smallholders make little distinction between market orientation and market participation of smallholders. In fact, most of the literature consider market orientation and market participation as synonymous, and thus most of the analysis of the determinants of smallholder commercialization is based on the analysis of the determinants of output market participation (von Braun et al. 1994; Jaleta et al. 2009; Otieno et al. 2009). However, policy implications to enhance commercial transformation of subsistence agriculture drawn from the analysis of the determinants of household market participation alone could be inadequate, if in fact, the determinants of market orientation and market participation are not the same.

Most of the literature on smallholder commercialization deal only with the output side of commercialization. However, sustainable commercialization of smallholders also requires integration into the input markets (Pingali and Rosegrant 1995). To contribute to redressing the gap in the commercialization literature on the determinants of crop input market participation of households, we analyse determinants of household participation in input markets.

The primary objectives of the paper, therefore, are (1) to analyse the determinants of market orientation and market participation separately, and investigate whether higher market orientation is translated into higher output market participation, and (2) to analyse determinants of the intensity of use of purchased inputs for annual crop production, as a measure of household commercialization from the input side.

In addition to informing Ethiopian policymakers to facilitate the transformation of subsistence agriculture into commercial orientation, this paper is hoped to contribute to the smallholder commercialization literature by analysing the determinants of market orientation and market participation separately, and determining if market orientation translates into higher market participation.

The paper is organized as follows. The next section gives the context of the study in brief. Section three presents the conceptual framework. Section four deals with empirical models, methods and hypotheses. Section five presents results, while section six concludes the paper and draws implications.

2 Context

Ethiopia has adopted commercialization of smallholder agriculture as a strategy for its economic transformation. The agricultural services of extension, credit and input supply are expanding significantly to support commercial transformation, although the dominant player in these services still remains to be the public sector. A recent study by Gebremedhin et al. (2009) showed that the expansion of the agricultural services had significant impact on the intensity of input use, agricultural productivity and market participation of Ethiopian smallholders.

Results in this paper are based on household and plot level data collected from annual crop based farming systems of three Ethiopian districts (Bure, Goma and Mieso), thought to represent the major annual crop production systems in the country in terms of agricultural and market infrastructure characteristics.[1] Bure district receives adequate rainfall (about 1600 mm per year) and has relatively well developed road and market networks. Goma district receives abundant rainfall (about 1860 mm per year and lasting for about 8 months in a year), with less developed road networks and markets. Mieso is characterized as drought prone with rainfall (about 800 mm per year) as the most important constraint of crop production, but with well developed road networks and market places. Annual crops (cereals, pulses, oil crops, and vegetables) cover about 93% of cultivated land in the study areas. Hence, commercialization is analysed in terms of annual crop production.

1. Bure is located in northwestern Ethiopia in the Amhara region, at about 400 km north of the capital, Addis Ababa; Goma is located in southwestern Ethiopia, in the Oromia region, at about 400 km south of the capital; and Mieso is located in eastern Ethiopia in the Oromia region, at about 300 km east of the capital.

3 Conceptual framework

Our overall conceptual framework given in Figure 1 is based on the literature on firm and farm market orientation (Hinderink and Sterkenburg 1987; Kohli and Jaworski 1990; Immink and Alarcon 1993; Jaworski and Kohli 1993; Fritz 1996; Selnes et al. 1996; Jaworski and Kohli 1996), and household market participation (Goetz 1992; Pingali and Rosegrant 1995; Pingali 1997; Lapar et al. 2003; Bellemare and Barrett 2006; Rios et al. 2008; Omiti 2009).

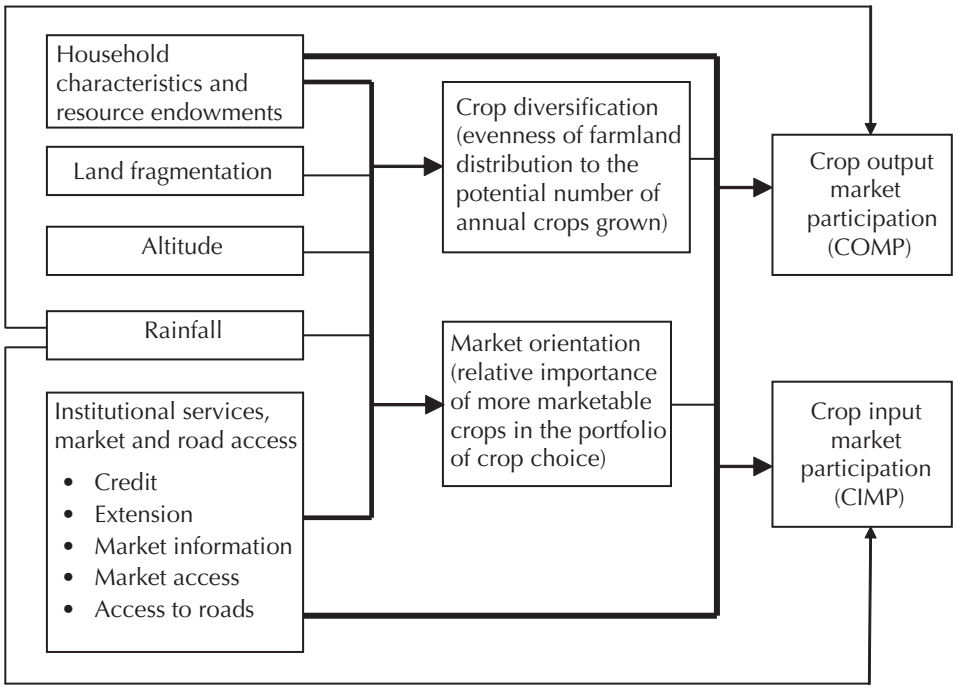

Figure 1. *Conceptual framework of the determinants of household level market orientation, and crop input and output market participation.*

In developing our conceptual framework, first we make the distinction between market orientation and market participation. The concept of market orientation has been used more widely in the manufacturing sector (e.g. the food industry) to refer to the extent to which a producer uses knowledge about the market (esp. customers and prices), as a basis to make decisions on the three basic economic questions of what to produce, how to produce and how to market[2] (Kohli and Jaworski 1990; Jaworski and Kohli 1993,

2. Kohli and Jaworski (1990) defined market orientation as 'the organization-wide generation of market intelligence pertaining to current and future customer needs, dissemination of the intelligence across departments, and organization wide responsiveness to it.'

1996). Several studies have also demonstrated that the degree of market orientation is a major determinant of competitive advantage (Fritz 1996; Selnes et al. 1996). Market orientation in agriculture is basically a production decision issue as influenced both by production conditions and market signals.

We define market orientation in agriculture as the degree of allocation of resources (land, labour and capital) to the production of agricultural produce that are meant for exchange or sale (Hinderink and Sterkenburg 1987; Immink and Alarcon 1993). Hence, in this study, we measure market orientation as the extent to which a household's crop portfolio includes crops that are relatively more marketed[3] evaluated at district level. On the other hand, market participation in crop production is measured by the proportion of crop output sold.

The determinants of market orientation and market participation may not be the same because a household may produce marketable commodities but use them for home consumption if the household specific endogenous prices lie between the mark-up selling and buying prices. This situation is more common when there are high transaction costs and the price band is wide (Key et al. 2000). A household could also have high market participation because of surplus production due to various reasons, including favourable weather conditions, although it may not be market oriented.

The basis for our conceptual framework, therefore, is our assumption that while market orientation and household participation in input markets are influenced by factors related to household and household head characteristics, production and market related factors, and institutional support service, household market participation in crop output markets is determined by the level of crop production, household and household head characteristics, market related factors and institutional services. We hypothesize that production related factors affect market participation in no way other than through their effect on crop production. Hence, once we control for level of crop production, the excluded factors become irrelevant variables in the model for household crop output market participation.

3. In this study, we do not make the distinction between cash crops and staple crops, since market orientation is measured in terms of the relative importance of more market oriented crops in the household crop portfolio.

4 Empirical model, methods and hypotheses

4.1 Empirical model

Our specification of empirical model is based on our conceptual framework described earlier and is divided into three parts, (1) the determinants of market orientation of households in crop choices, (2) the determinants of household participation in crop output as seller, and (3) the determinants of household participation in input markets as buyer.

4.2 Market orientation

Household level market orientation index (MOI) is modelled as a function of household and household head characteristics (HH) (age, sex, literacy of household head, and household size); household endowment of crop production factors (HR) (labour supply, land, and farm equipment); ownership of livestock (LVSTK); access to markets and roads and ownership of transport equine (MKTac) (distance to nearest market and nearest all-weather road, and ownership of equine); access to institutional services (extension (EXT), credit (CRD)); agro-ecological factors affecting production (rainfall (RF) and altitude (ALT)); and land fragmentation (SI) (see equation 1).

$$MOI_i = f(HH, HR, LVSTK, MKTac, EXT, CRD, RF, ALT, SI, u_{MOI_i}) \quad (1)$$

where u_{MOI_i} is an error term assumed to be independently and identically distributed with zero mean and constant variance.

4.3 Crop output market participation (COMP)

Crop output market participation (COMP) is modelled as a function of household and household head characteristics (HH); ownership of livestock (LVSTK); access to markets and roads, and ownership of transport equine (MKTac); access to institutional services (extension (EXT), credit (CRD)); and value of annual crop production (CRVP). In order to test whether market orientation translates into higher market participation, we also include market orientation index (MOI) as a right hand side variable in the crop output market participation model (see equation 2).[4]

4. We were not able to include crop price as right hand side variable, because the dependent variable is the summation of all annual crop values and it was difficult to come up with a representative price at household level.

$$COMP_i = f(HH, LVSTK, MKTac, EXT, CRD, CRVP, MOI, u_{COMP_i}) \quad (2)$$

where u_{COMP_i} is an error term assumed to be independently and identically distributed with zero mean and constant variance.

However, market orientation decision can be endogenous variable in this specification, if the realized level of market participation was envisioned during production decision. To account for this possible specification problem, we have used household endowment of crop production factors, agro-ecological factors, and land fragmentation (factors expected to affect market participation only through affecting crop production) to test for possible endogeneity of MOI in the model for crop output market participation. An F-test confirmed that these variables are significantly correlated with MOI but not with COMP, once we control for value of crop production.

4.4 Crop input market participation (CIMP)

Crop input market participation (CIMP) is modelled as a function of household and household head characteristics (HH); household endowment of crop production factors (HR); ownership of livestock (LVSTK); access to markets and roads and ownership of transport equine (MKTac); access to institutional services (extension (EXT), credit (CRD)); agro-ecological factors affecting production (rainfall (RF) and altitude (ALT)); and land fragmentation (SI) (see equation 3).

$$CIMP_i = f(HH, HR, LVSTK, MKTac, EXT, CRD, RF, ALT, SI, u_{CIMPi}) \quad (3)$$

where u_{CIMP_i} is an error term assumed to be independently and identically distributed with zero mean and constant variance.

4.5 Methods

4.5.1 Data sources

Results are based on a survey of 168 households and all plots operated by the households, and 53 communities (peasant associations (PAs)) in the three districts in 2007/08. Farming systems were stratified into PAs and households in each PA were selected randomly based on proportion to size sampling. Village level data on rainfall, altitude, distance to nearest market and all-weather road were collected at community level. Indices of land fragmentation, market orientation, and crop output and crop input market participation in annual crops were computed using the household, plot and community level data. Below, we briefly present the computation of these indices.

4.5.2 Land fragmentation

Land fragmentation can be measured either in single dimension or in integrated indicators. Among the integrated indicators, Simpson index (SI) and Januszewski index (K) are the most common (Blarel et al. 1992; Wu et al. 2005). We use the Simpson index to measure the degree of land fragmentation of households as defined below (equation 4).

$$SI_i = 1 - \frac{\sum_{j=1}^{J} a_{ij}^2}{A_i^2} \quad , \quad 0 \le SI \le 1 \qquad (4)$$

where a_{ij} is area of the j[th] plot and A_i is the total area of annual crop land operated by a household. We chose the Simpson index because the Januszewski index does not take farm size into account.[5] Zero value of *SI* indicates complete land consolidation (one parcel only), while the value closer to one indicates numerous parcels of equal size.

4.5.3 Market orientation index (MOI)

We define that a smallholder is market oriented if its production plan follows market signals and produce commodities that are more marketable. Under a semi-commercial system, where both market and home consumption are playing a central role in production decision, all crops produced by a household may not be marketable in the same proportion. Thus, households could differ in their market orientation depending on their resource allocation (land, labour and capital) to the more marketable commodities. Marketability of annual crops was computed at the district level since districts are the closest representatives of the farming systems included in the study. Hence, based on the proportion of total amount sold to total production at district level, a crop specific marketability index (α_k) is computed for each crop produced at district level as follows (equation 5):

$$\alpha_k = \frac{\sum_{i=1}^{N} S_{ki}}{\sum_{i=1}^{N} Q_{ki}} \quad ; \quad Q_{ki} \ge S_{ki} \quad \text{and} \quad 0 \le \alpha_k \le 1 \qquad (5)$$

5. Januszewski index $K = \frac{\sqrt{\sum_{a=1}^{n} a_i}}{\sum_{a=1}^{n} \sqrt{a_i}}$, where *n* is the number of plots, and a_i is the area of each plot.

where α_k is the proportion of crop *k* sold (S_{ki}) to the total amount produced (Q_{ki}) aggregated over the total sample households in a district. α_k takes a value between 0 and 1, inclusive. Crops mainly produced for markets usually have α_k values closer to 1.

Once the crop specific marketability index is computed, household's market orientation index in land allocation (MOI_i) is computed from the land allocation pattern of the household weighted by the marketability index of each crop (α_k) derived from equation 5 as follows (equation 6).

$$MOI_i = \frac{\sum_{k=1}^{K} \alpha_k L_{ik}}{L_i^T} \quad ; \quad L_i^T > 0 \quad \text{and} \quad 0 < MOI_i \leq 1 \tag{6}$$

where MOI_i is market orientation index of household i, L_{ik} is amount of land allocated to crop k, and L_i^T is the total crop land operated by household i. The higher proportion of land a household allocates to the more marketable crops, the more the household is market oriented.

4.5.4 Crop output market participation

Following von Braun et al. (1994), we computed household crop output market participation in annual crops as the proportion of the value of crop sales to total value of crop production, which we refer to in this paper as crop-output market participation (COMP) index, computed as follows (see equation 7):

$$COMP_i = \frac{\sum_{k=1}^{K} \overline{P}_k S_{ik}}{\sum_{k=1}^{K} \overline{P}_k Q_{ik}} \tag{7}$$

where S_{ik} is quantity of output k sold by household i evaluated at an average community level price ($\overline{P}_k$), Q_{ik} is total quantity of output k produced by household i.

4.5.5 Crop input market participation

Household commercialization from the input side is commonly computed as the proportion of the value of purchased inputs to total value of crop production. However, different crops may have different input requirements, which may have implications for the need to purchase external inputs. Hence, we compute household participation in input markets as the proportion of the value of purchased crop inputs to total crop input

used, which we refer to in this paper as crop-input market participation (CIMP) index (see equation 8).

$$CIMP_i = \frac{\sum_{r=1}^{R} \overline{w}_r X_{ir}^{p}}{\sum_{r=1}^{R} \overline{w}_r X_{ir}^{T}} \quad (8)$$

where X_{ir}^{p} is the amount of input r purchased by the household at the average input price $\overline{w_r}$, and X_{ir}^{T} is the total amount of input r used in the production of annual crops.

4.5.6 Econometric approach

The dependent variables analysed in this paper are market orientation, crop output market participation, and crop input market participation of households in annual crop production. The econometric model used depends on the nature of the dependent variable. For the determinants of household market orientation we use ordinary least squares (OLS) model, since the dependent variable is continuous. Summary of descriptive statistics of variables used in the regression models are given in Table 1. For household participation in crop output market as seller, and the household participation in crop input markets as buyer, we use Tobit models, since these variables are lower censored at zero. All coefficients and standard errors are adjusted for sampling weights, clustering, and stratification using the SVY command (STATACorp 2008).

Market orientation is potentially endogenous variable in the models for crop output and input market participation. Since standard Tobit model is more efficient than IV Tobit when the explanatory variables are exogenous (Wooldridge 2003), we first tested for endogeneity of MOI in the COMP model. We used household labour supply, ownership of land and farm equipment, rainfall, altitude and land fragmentation as instruments to check for endogeneity, since we do not expect these variables to affect market participation once we control for value of crop production. The Wald test provides sufficient information to reject the null hypothesis of no endogeneity (see Appendix I for the IV test of endogeneity). High mutlicollinearity among the dependent variables inflates standard errors and may render important determinants insignificant. We checked for multicolliearity and found no evidence of serious multicololinearity problem as all variance inflation factors were below 10.

4.5.7 Hypotheses

In setting our hypotheses, our main interests are in analysing the determinants of households crop output and input market participation, and in testing whether market orientation translates into higher crop output market participation. We present our key hypotheses about the effect of explanatory variables below.

4.5.8 Household characteristics

Age of household head can be considered as a measure of experience in farming. We expect older households to be more market oriented and have higher market participation. Male headed households, due to their potential crop production efficiency advantages over female headed households, are expected to be more market oriented, and have higher participation in output and input markets.

Literate households are expected to have better skills, and better access to information and ability to process information, and thus may be positively associated with market orientation and market participation. Household size increases domestic consumption requirements and may render households more risk averse. Hence, controlling for labour supply, larger households are expected to have lower market orientation and market participation.

4.5.9 Household endowment of crop production factors

When agricultural factor markets are imperfect, ownership of the factors matters for efficiency and productivity (Sadulet and de Janvry 1995). For example, when land markets are imperfect, households with larger farm holdings may be more likely to be more market oriented and have higher market participation (von Braun and Immink 1994). Hence, household endowments of labour, land, and farm equipment are expected to be positively associated with market orientation. We expect ownership of livestock to be negatively associated with crop market orientation and market participation, since they offer alternative cash income sources. To the extent that owned production factors are complementary with external inputs, we expect household resource endowment to be positively correlated with participation in crop input markets.

4.5.10 Access to markets and roads, and transport equine

The role of marketing costs in completely hindering or limiting the level of smallholder market participation has been examined by several authors (de Janvry et al. 1991; Sadoulet and de Janvry 1995; Key et al. 2000; Gabre-Madhin 2001; Barrett 2007;

Pender and Alemu 2007; Alene et al. 2008). Access to markets and roads and ownership of transport equine are expected to reduce marketing costs, thus encourage market orientation and market participation.

4.5.11 Institutional services

Agricultural services (extension, credit) are expected to enhance farmer skills and knowledge, link farmers with modern technology and markets, and ease liquidity and input supply constraints (Lerman 2004), thus are expected to induce market orientation and market participation.

4.5.12 Rainfall and altitude

Rainfall may increase farm productivity, thus encouraging market orientation. Altitude determines the type of crops grown. High altitude areas are expected to have wider crop choice than low altitude areas, because of the more varied and more favourable climatic conditions. However, the effect of altitude on market orientation is indeterminate. Rainfall is expected to be complementary with external inputs, thus positively correlated with crop input market participation, although the effect of altitude is indeterminate.

4.5.13 Market orientation

We defined market orientation in terms of the relative importance of more marketable crops in the crop mix of the household. Underlying market orientation is the profit motive of households (Pingali and Rosegrant 1995; Pingali 2001). The realization of profit depends on market revenues. Hence, we expect that market orientation will be positively associated with household participation in crop output market as seller.

5 Results

5.1 Descriptive information

Descriptive statistics of variables used in the regression analysis are given in Table 1. The average market orientation index is about 0.29, indicating moderate market orientation of smallholders in the study area, while the average crop output and crop input market participation are 25% and 20%, respectively, also indicating moderate market participation.

Table 1. *Descriptive statistics for variables used in econometrics*

Variables	No.	Mean	Std. Dev.	Min	Max
Market orientation index	168	0.29	0.088	0.07	0.59
Crop input market participation index	165	20.38	19.231	0	87.81
Crop output market participation index	167	25.29	19.875	0	86.60
Land fragmentation index (Simpson index)	168	0.58	0.207	0	0.85
Age of household head (year)	168	43.32	11.884	20	78.00
Sex of household head (male = 1, female = 0)	168	0.89	0.310	0	1
Education of household head (literate = 1, illiterate = 0)	168	0.49	0.501	0	1
Family size (no.)	168	6.44	2.434	2	14
Available family labour (persons)	168	3.38	1.405	1	7
Farmland owned (ha)	168	1.33	0.717	0.07	4.0
Value of farm equipment (ETB)	168	217.48	166.681	0	1150
Value of annual crop produced (ETB)	168	3874.12	3840.096	100	25600
Value of crop inputs used (ETB)	168	2604.015	1844.186	0	9690.05
Value of purchased crop inputs used (ETB)	168	583.357	805.762	0	4248.00
Equine owned (no.)	168	0.57	1.076	0	11
Livestock owned (TLU)	168	4.25	3.300		22.3
Distance from settlement centre to nearest market place (km)	168	5.04	3.30	0	18
Distance from settlement centre to all-weather road (km)	168	6.75	7.073	0	2
Involvement in extension program previous year (2005/06) (yes = 1, no = 0)	168	0.49	0.501	0	1
Access to credit previous year (2005/06) (yes = 1, no = 0)	168	0.61	0.490	0	1
Rainfall (mm)	168	1518.49	388.332	757	1956
Altitude (m above sea level)	168	1945.67	369.147	1207	2414

The average value of annual crop produced per household is Ethiopian birr (ETB)[6] 3874, of which ETB 1468 worth of produce is sold. The average input value used for annual crop production is also ETB 2604, of which about ETB 520 is purchased input. These results indicate that the average return to land per household is about ETB 977. Households in the study area get about ETB 530 income from non-farm and off-farm employment and remittances.

About 11% of households in the sample are female headed. The average household size is about 6.44, with family labour supply of 3.4 persons per household, figures which are close to the national average. Livestock owned, excluding transport equine, averages 4.25 TLU. A household on average operates about 1.33 ha, a result also quite close to the national average. Almost 50% of household heads are literate. The average population density in the study area is about 347 persons/km^2.

5.2 Results of econometric analysis

5.2.1 Market orientation

Household size, labour supply of household, ownership of equine, access to all-weather road, involvement in extension the previous year, rainfall, altitude, and land fragmentation are significant correlates with market orientation, all with expected signs except land fragmentation (Table 2). Household size detracts from household market orientation due to its effect on increasing household domestic consumption needs, as expected. Household labour supply is associated positively with market orientation. Factor markets in rural Ethiopia are far from being perfect and so ownership of resources matters for efficiency (thus profitability) of agricultural production, all else equal.

Ownership of equines and proximity to all-weather road encourage market orientation due to their effect of reducing marketing costs, thus improving profitability. The Ethiopian agricultural extension service appears effective in inducing market orientation. While higher rainfall is associated with higher market orientation (perhaps due to its effect on profitability), higher altitude appears to detract from it. It may be that the higher altitude areas of Ethiopia are more subsistence oriented due to higher population pressure and higher risk due to land degradation. Contrary to our expectation, land fragmentation is positively associated with market orientation. It may be that fragmented land offers the possibility to grow diversified crops and thus the possibility of inclusion of market oriented crops in the crop portfolio of the household.

6. At the time of the survey, USD 1 = ETB 9.5.

Table 2. *Estimation results for market orientation index (MOI) (OLS)*

Explanatory variables	Coef.	Std. Err.
Age of household head (year)	–0.00017	0.00065
Sex of household head (male = 1, female = 0)	–0.01837	0.03217
Education of household head (literate = 1, illiterate = 0)	0.01925	0.01492
Family size (no.)	–0.00842**	0.00416
Available family labour (persons)	0.01534**	0.00664
Farmland size owned (ha)	–0.00015	0.01242
Equine owned (no.)	0.01674**	0.00670
Livestock owned (TLU)	–0.00062	0.00236
Distance from settlement centre to nearest market place (km)	0.00096	0.00233
Distance from settlement centre to nearest all weather road (km)	–0.00201*	0.00118
Involvement in extension program previous year (2005/06) (yes = 1, no = 0)	0.02333*	0.01387
Access to credit previous year (2005/06) (yes = 1, no = 0)	–0.00536	0.01857
Rainfall (mm)	0.00018***	0.00003
Altitude (m above sea level)	–0.00019***	0.00004
Value of farm equipment (ETB)	–0.00001	0.00005
Land fragmentation index (Simpson index)	0.10785***	0.03098
Constant	0.33980***	0.07569
Number of strata	4	
Number of observations	168	
Population size	45,162.56	
Design df	164	
F(16, 149)	7.25	
Prob > F	0.0000	
R-squared	0.4018	

***, **, and * are significant at 1%, 5%, and 10% significant levels, respectively.

5.2.2 Crop output market participation

Distance to nearest market place, value of crop production, and market orientation of households significantly correlate with household participation in crop markets as seller, all with expected signs (Table 3). Of the significant variables, market orientation has the highest explanatory power, both statistically and numerically.

Households further away from market places have lower market participation as expected. Households with higher crop value produced sell higher proportion of their produce, implying that building the capacity of households to produce surplus production is critical to improve market participation in the Ethiopian context, consistent with several prior findings in other places (Barrett 2007; Rios et al. 2008; Omiti et al. 2009). Market orientation translates strongly into market participation indicating the strong need to intervene on improving household market orientation at the production level in order to promote commercial transformation of subsistence agriculture.

Table 3. *Tobit estimation results for crop output market participation index (COMPI)*

Explanatory variables	Coef.	Std. Err.
Age of household head (year)	0.11342	0.14897
Sex of household head (male = 1, female = 0)	–7.96514	6.69545
Education of household head (literate = 1, illiterate = 0)	5.51307	3.73682
Family size (no.)	–0.13758	0.93732
Equine owned (no.)	–0.37408	0.92860
Livestock owned (TLU)	0.42166	0.58726
Distance from settlement centre to nearest market place (km)	–1.27939***	0.44094
Distance from settlement centre to nearest all weather road (km)	–0.21658	0.24781
Involvement in extension program previous year (2005/06) (yes = 1, no = 0)	–1.34539	4.29224
Access to credit previous year (2005/06) (yes = 1, no = 0)	5.27043	3.83174
Value of annual crop produced (ETB)	0.00098**	0.00042
Market orientation index	127.94640***	19.60405
Constant	–13.03145	10.34841
Number of strata	4	
Number of observations	157	
Population size	42,124.81	
Design df	153	
F(12, 142)	8.98	
Prob > F	0.0000	

***, **, and * are significant at 1%, 5%, and 10% significance levels, respectively.

Comparisons between the determinants of market orientation, and household market participation in crop output markets show that production related factors affect market participation only through their effect on market orientation and crop production, implying that analysis of commercial transformation of households should also address determinants of market orientation, and not be limited to the analysis of market participation only. The extension service, while effective in promoting market orientation, failed to have significant effect on market participation, indicating the weak component of marketing extension in the extension service.

5.2.3 Crop input market participation

Household participation in annual crop inputs market as buyer is influenced by family labour supply, ownership of equines, nearness to market place, access to all-weather road, rainfall, and land fragmentation (Table 4). All significant variables have the expected signs.

Household labour supply is positively associated with household participation in crop input markets as buyer, since labour is likely to be a complementary input to external inputs under the Ethiopian condition. Ownership of equines is also positively associated

with crop input market participation due its effect of reducing marketing costs and increasing farm profitability.

Table 4. *Tobit estimation results for crop input market participation (CIMP)*

Explanatory variables	Coef.	Std. Err.
Age of household head (year)	–0.17598	0.14998
Sex of household head (male = 1, female = 0)	0.79306	5.65942
Education of household head (literate = 1, illiterate = 0)	–0.51990	3.21573
Family size (no.)	–0.98426	1.03190
Available family labour (persons)	3.18318**	1.59790
Farmland size owned (ha)	0.20761	2.47446
Equine owned (no.)	2.30658***	0.71762
Livestock owned (TLU)	–0.00433	0.50612
Distance from settlement centre to nearest market place (km)	–0.89836*	0.50636
Distance from settlement centre to nearest all weather road (km)	–1.08752***	0.26559
Involvement in extension program previous year (2005/06) (yes = 1, no = 0)	3.25665	3.58712
Access to credit previous year (2005/06) (yes = 1, no = 0)	5.99165	4.27269
Rainfall (mm)	0.03799***	0.00924
Altitude (m above sea level)	–0.00027	0.00894
Value of farm equipment (ETB)	–0.00412	0.00916
Land fragmentation index (Simpson index)	–21.55678*	12.45973
Constant	–17.22956	13.93732
Number of strata	4	
Number of observations	157	
Population size	42,138.34	
Design df	153	
F(16, 138)	8.29	
Prob > F	0.000	

***, **, and * are significant at 1%, 5%, and 10% significance levels, respectively.

Distance to nearest market and all-weather road detract from crop input market participation due to its effect on increasing marketing costs of both inputs and outputs. Rainfall has positive effect on crop input market participation since external inputs are likely to be complementary to soil moisture. Land fragmentation, due to its effect on reducing the efficiency of farm operation, detracts from market participation in the input market.

6 Conclusions and implications

Commercial transformation of smallholder agriculture entails production decisions based on market signals (market orientation) and significant participation in input and output markets (market participation). However, the literature on commercialization of smallholders rarely make the distinction between market orientation and market participation. This study is an attempt to fill this gap of knowledge in the commercialization literature.

Market orientation of smallholders in the study area is found to be moderate, with an average market orientation index of 0.30 (out of 1). Only about 25% of annual crop produce is sold, while only about 20% of total annual crop input used is purchased. The average value of annual crop produced per household is ETB 3874, and the average input value used for annual crop production is ETB 2604.

We find that the significant correlates with market orientation are factors related to household characteristics, nearness to road and ownership of means of transportation, technical support by the extension service, soil moisture, and fragmentation of land.

Consistent with the findings of Heltberg and Tarp (2001), Lapar et al. (2003) and Edmeades (2006), on the negative effect of household size on market participation, we find household size to be negatively correlated with market orientation. This result implies interventions aimed at promoting family planning amongst farm communities can contribute to commercial transformation of subsistence agriculture.

Household labour supply is positively associated with market orientation, consistent with the findings of Barrett (2007) on the positive association between household human capital and market participation. Market transportation cost considerations are important deterrents from market orientation of households, implying that improving market and transport infrastructure are important for commercial transformation.

We also find that distance to market place and value of crop production are important determinants of market participation, and that market orientation translates strongly into market participation. These results imply that interventions aimed at promoting market orientation of households are likely to promote market participation. Improving household capacity to produce surplus production stands out as critical to improve household participation in output markets, consistent with several findings in other places (Barrett 2007; Rios et al. 2008; Omiti et al. 2009).

Availability of adequate soil moisture improves market orientation of households, perhaps due to its effect on crop productivity, consistent with the findings of Barrett (2007) on the

positive association between favourable agro-ecological factors and surplus production for sale. This implies that improved availability of soil moisture through various means help farmers choose market oriented crops, perhaps because of higher productivity and reduced risks.

The extension service in the study area appears effective in promoting market orientation, although it failed to have significant effect on market participation. Agricultural extension services are instrumental in promoting improved technologies, and improving farmer skills. Agricultural extension services are also expected to facilitate market entry through facilitation of farmer linkages with buyers and the supply of market information. The insignificant effect of extension service on market participation implies that a successful commercial transformation of smallholder agriculture in Ethiopia will need the strengthening of marketing extension service in the country.

Determinants of household participation in crop input as buyer appear to be those factors that have complementarity with external inputs, market transportation cost considerations. These results imply that interventions to improve household's ownership of farm assets, improved agricultural water management and development of irrigation infrastructure, and the development of market and transport infrastructure are needed to improve the use of purchased inputs.

The key implication of this study is that policy, technological, organizational and institutional interventions aimed at promoting commercial transformation of subsistence agriculture should follow two-pronged approach: improving market orientation of smallholders at production level, and facilitation of market entry and participation of households in output and input markets. Focusing on either may not be as effective in achieving the transformation.

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Appendix I: IV Tobit estimation results testing endogeneity of MOI

Tobit model with endogenous regressors — Number of obs = 157
Wald chi2(12) = 71.17
Log pseudolikelihood = -364.30482 — Prob > chi2 = 0.0000

	Coef.	Robust Std. Err.	z	P>|z|	[95% Conf.	Interval]
coc100o						
moi_iw	73.31954	31.2455	2.35	0.019	12.07948	134.5596
hhage	-.0032396	.1519852	-0.02	0.983	-.3011251	.294646
hhsex	-7.725813	6.921463	-1.12	0.264	-21.29163	5.840006
literate	2.709466	3.646384	0.74	0.457	-4.437316	9.856247
hhsize	-.2271849	.9359024	-0.24	0.808	-2.06152	1.60715
equine	-.1769605	1.472542	-0.12	0.904	-3.06309	2.709168
tluox	.1314061	.5223707	0.25	0.801	-.8924216	1.155234
dscnmpkm	-1.507046	.4740068	-3.18	0.001	-2.436083	-.5780102
dscnawrkm	.0849125	.2301754	0.37	0.712	-.3662231	.5360481
hhiepy	-3.867087	3.749974	-1.03	0.302	-11.2169	3.482726
dhhacrpy	5.611121	4.191703	1.34	0.181	-2.604465	13.82671
acvprod	.0015941	.0004423	3.60	0.000	.0007272	.0024609
_cons	8.114209	13.45325	0.60	0.546	-18.25368	34.48209
moi_iw						
hhage	-.0003433	.0004966	-0.69	0.489	-.0013166	.0006299
hhsex	-.0143138	.0237348	-0.60	0.546	-.0608331	.0322055
literate	.0171515	.0122317	1.40	0.161	-.0068222	.0411252
hhsize	-.006105	.0031803	-1.92	0.055	-.0123383	.0001282
equine	.011776	.0091829	1.28	0.200	-.0062222	.0297741
tluox	-.0015131	.0021471	-0.70	0.481	-.0057213	.0026952
dscnmpkm	-.0007842	.0018473	-0.42	0.671	-.0044048	.0028364
dscnawrkm	-.0008496	.0009895	-0.86	0.391	-.002789	.0010899
hhiepy	.013387	.0103941	1.29	0.198	-.0069851	.033759
dhhacrpy	-.0078738	.0137725	-0.57	0.568	-.0348674	.0191197
acvprod	7.55e-07	1.80e-06	0.42	0.674	-2.77e-06	4.27e-06
labsuply	.0132148	.0047397	2.79	0.005	.0039251	.0225045
landown	.0014069	.0086063	0.16	0.870	-.0154612	.0182749
rainfall	.0001659	.0000255	6.50	0.000	.0001158	.0002159
altitude	-.0001918	.0000266	-7.21	0.000	-.0002439	-.0001397
farmequiptv	.0000166	.0000461	0.36	0.720	-.0000739	.000107
sindex	.1636137	.0306655	5.34	0.000	.1035105	.223717
_cons	.3250523	.0563596	5.77	0.000	.2145896	.4355151
/alpha	72.91519	45.13702	1.62	0.106	-15.55175	161.3821
/lns	2.870433	.0708317	40.52	0.000	2.731605	3.009261
/lnv	-2.801678	.0545773	-51.33	0.000	-2.908648	-2.694708
s	17.64466	1.249801			15.35752	20.2724
v	.0607081	.0033133			.0545494	.0675621

Instrumented: moi_iw
Instruments: hhage hhsex literate hhsize equine tluox dscnmpkm dscnawrkm hhiepy dhhacrpy acvprod labsuply landown rainfall altitude farmequiptv sindex

Wald test of exogeneity (/alpha = 0): chi2(1) = 2.61 Prob > chi2 = 0.1062

Obs. summary: 27 left-censored observations at coc100o<=0
130 uncensored observations
0 right-censored observations

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