Smallholder Commercialization in Ethiopia: Market Orientation and Participation

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Abstract

The commercialization of smallholder agriculture entails that farmers become market-oriented and base their production decisions on market signals, as well as selling a significant proportion of their produce in market. However, previous research has focused almost exclusively on market participation and ignored market orientation. We examine the impact of market orientation on the market participation of smallholder cereal farmers in Ethiopia, drawing on data from the latest 2009 round of the Ethiopian Rural Household Survey (ERHS). Heckman's two-stage model and IV regressions are employed. Market orientation was found to strongly enhance market participation. Moreover, higher level of crop production, land size, access to credit and all-weather roads enhanced market participation while age of household head and family size reduced participation.

Introduction

Commercialization in agriculture refers to the progressive shift from household production for auto-consumption to production for sale in the market. This shift entails that production and input decisions are based on profit maximization, reinforcing vertical linkages between input and output markets (Olwande *et al*., 2015). Historically, this has typically been a lengthy process of transformation from subsistence to semi-commercial farming, and then to fully commercialized agriculture (Pingali and Rosegrant, 1995). In the context of a wider market economy and economic development, commercialization results in welfare gains for farmers through comparative advantage and increased total factor productivity growth (Johnston and Mellor, 1961).

Increasing the extent of commercialization among Sub-Saharan Africa's generally semi-subsistence, low-input, low-productivity smallholder famers is seen as playing a crucial role in poverty alleviation (Olwande *et al*., 2015). The majority of people living in absolute poverty are small farmers (Hazell *et al*., 2007). Commercializing smallholder agriculture is seen as a means to bring the welfare benefits of market-based exchange economies to this group, and is central to an inclusive development process (WDR, 2008; Arias *et al*., 2013). Smallholder commercialization is seen as preferable to relying on migration to urban centers where employment growth remains low. Focusing on smallholders also promises to deliver more equitable rural economic growth than commercialization strategies that focus on large farms, with small farms typically employing more labor per unit area compared to large farms, and small-farm household expenditure patterns bring greater benefits to local economies (Hazell *et al*., 2007).

Understanding the extent of smallholder commercialization and its contributing factors, therefore, has important policy implications. Commercialization has been advanced as a means of improving smallholder farmers' income and reducing rural poverty in many developing countries (Pingali and Rosegrant, 1995; Timmer, 1997; WDR, 2008). It has also been considered as a major strategy of ensuring household food security (Pingali, 1997). Choices may need to be made between adopting changes to top-down policy such as trade and price-based macro instruments and interventions aimed at smallholders such as collective action mechanisms, reducing the costs of intermarket commerce, improved service delivery and extending improved technologies and productive assets to poor households (Barrett, 2008; Gebremedhin *et al*., 2009).

Previous studies have examined factors

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influencing smallholder commercialization. However, most of the literature on Ethiopia has been largely crop-specific (focusing on a single crop in most cases) and based on narrow samples drawn from one or two districts that do not allow generalization. Moreover, there are issues related to how commercialization is conceptually defined and measured. Typically, commercialization is measured at household level as either in terms of gross or net sales measured as the ratio of percentage value of gross marketed output to total farm production (Jaleta *et al.*, 2009; Omiti *et al.*, 2009; Otieno *et al.*, 2009; Mather *et al.*, 2013). However, there would always be some amount of output that even a basically subsistence farmer would sell. This points to the need to classify marketed output beyond a certain minimum threshold in analyzing commercialization behaviors of smallholder agriculture.

Moreover, commercialization is assumed to be synonymous with output market participation in most of the existing literature. Treating market orientation as equal to participation is problematic as there are clear conceptual differences between the two. In fact, selling into the market is just one part of the picture. Conceptually, commercialization entails increasingly market-oriented patterns of production and input use, and the separation of household production and consumption decisions. In practice, however, market orientation may not necessarily imply market participation as in the case where households utilize marketable commodities for own consumption. Likewise, households may sell products originally intended for consumption due to surplus production resulting from favorable conditions. Thus, empirically testing whether market orientation translates into market participation would be useful to achieve commercial transformation of smallholders. In particular, examining whether improvements in market orientation could result in enhanced market participation would be helpful from a policy-making perspective.

While no prior study has directly addressed the issue, the study conducted by Gebremedhin and Jaleta (2010) is a partial exception. In this study, we address such gaps in the literature. In particular, we draw on and refine Gebremedhin and Jaleta's (2010) approach, and consider a significantly larger and more diverse dataset: the latest round of the Ethiopian Rural Household Survey (ERHS) collected in 2009. We extend prior work through employing Heckman's two-stage approach and Instrumental Variable (IV) regressions to examine the influence of market orientation on smallholder farming households' market participation. We find that market orientation

strongly improved market participation. Moreover, higher level of crop production, land size, access to credit and all-weather roads enhanced market participation while age of household head and family size reduced participation.

The article proceeds as follows. The next section provides a brief summary of existing literature on smallholder market participation and commercialization with emphasis on staple food grains. This is followed by a discussion of the context of agriculture in Ethiopia and the data. Next, the methodology of the study is outlined. Section four presents the results and discussions of the study. The final section concludes.

Determinants of smallholder commercialization

Factors determining smallholder commercialization can be broadly categorized as external and internal. External factors are beyond the smallholder's control. They include population growth and demographic change, technological change and introduction of new commodities, development of infrastructure, market institutions and regulations, and institutions such as property rights and land tenure, cultural and social factors affecting consumption preferences, agro-climatic conditions, development of the non-farm sector and the broader economy, rising labor opportunity costs, macroeconomic, trade and sectoral policies affecting prices and other driving forces (von Braun *et al.*, 1994; Pingali and Rosegrant, 1995; Pender *et al.*, 2006). On the other hand, factors like smallholder resource endowments including land and other natural capital, labor, physical capital, human capital and so on are household specific and considered to be internal determinants (Jaleta *et al.*, 2009).

Transaction costs often result in access barriers to smallholders' market participation (Goetz, 1992; Key *et al.*, 2000). Moreover, the majority of smallholder farmers are located in remote areas with poor transport and market infrastructure, contributing to high transaction costs. They also lack reliable market information as well as information on potential trade partners. In some cases, such costs tend to be so high that markets can be said to be "missing" (de Janvry *et al.*, 1991; Fafchamps and Hill, 2005).

Leavy and Poulton (2007) identified access to staple foods and asset accumulation as critical factors determining the success of agricultural commercialization among smallholders. Mahelet (2007) found several factors that can either facilitate or constrain the commercialization of smallholder farming in Ethiopia. These factors included, among others, distance to the market, access to transportation

services and roads; availability of credit, extension services and market information; output, input and factor prices; land size, access to modern inputs and storage facilities; and integration into output markets.

In his review of smallholder participation in cereal markets in eastern and southern Africa, Barrett (2008) notes that the share of producers who sell staple food grains are relatively small both in terms of gross as well as net sales. He also notes the presence of strong associations between household asset holdings, especially of land, and geographic factors such as market access and agro-ecological zone and household-level market participation patterns. Generally, the degree of market participation is higher for wealthier households and those cultivating in favorable agro-ecological areas. Furthermore, transaction costs associated with weak institutional and physical infrastructure are substantial and exert significant influence on crop marketing patterns.

Bellemare and Barrett (2006) investigated pastoralists' market participation in livestock markets in Ethiopia and Kenya by applying an ordered Tobit model to assess whether market participation and volume decisions are made simultaneously or sequentially. A number of other studies on cereal markets in Africa and Latin America apply Probit models as well as structural models to determine producers' market participation patterns (Goetz, 1992; Key *et al.*, 2000; Alene *et al.*, 2008).

While the available empirical evidence sheds light on the possible factors that determine the marketing behavior of smallholders, there is considerable variation in terms of analytical methods employed, data coverage, and crops considered, among others. In terms of data coverage, there are studies that collect survey data from a nationally representative sample of all rural households, while most others primarily focus on purposive samples (Barrett, 2008). Most studies provide crop-specific analyses, focusing on a single crop. In particular, the majority of the existing studies on Ethiopia were largely based on crop-specific and area-specific estimates (for instance Gebreselassie and Sharp 2008). Such analyses not only fail to capture the variability across regions (geographic and agro-ecological), but more importantly, they limit the generalizability of the findings at the national level.

A small but crucial element in mapping and understanding smallholder commercialization is the decision on how to measure it. As mentioned in the previous section, commercialization is typically measured either in terms of gross or net sales measured as the ratio of percentage value of gross marketed output to total farm production (von Braun *et al.*

1994; Govereh *et al.,* 1999; Jaleta *et al.*, 2009; Omiti *et al.*, 2009; Otieno *et al.*, 2009; Mather *et al.*, 2013). In particular, von Braun (1994) explains that the proportion of sales out of the total value of agricultural production is the most commonly used indicator for measuring the degree of commercialization at the household level. However, households may sell products that are not intended for markets. In fact, there would always be some amount of output that even a basically subsistence farmer would offer to the market in exchange for basic essential goods. The implication of this is that only the ratio of marketed output beyond a certain minimum level should be taken as a measure of commercialization.

Besides, such a measure only captures the revealed marketing decisions of households while totally ignoring production decisions primarily meant for sale (Jaleta *et al.*, 2009). This is particularly the case for agricultural commodities that are meant for sale and household consumption as is the case with the majority of smallholder farmers. Consequently, commercialization has been taken as synonymous with market-oriented production decisions in most previous studies despite the clear conceptual differences between the two. Commercialization entails increasingly market-oriented patterns of production and input use, and the separation of household production and consumption decisions. However, households may actually produce marketable products but use them for own consumption in which case market orientation may not necessarily translate into improved market participation. On the other hand, households who enjoy surplus production originally intended for household consumption due to favorable conditions could participate in markets despite lack of market orientation. Thus, market orientation reflects a production decision based on market signals, while market participation is a decision to sell produce into the market. Consequently, it would be of interest to explore the implication of such a distinction. Specifically, examining whether improvements in market orientation could result in enhanced market participation would be helpful from a policy-making perspective.

With the exception of Gebremedhin and Jaleta (2010), no prior study has made such a distinction. Despite the merit of their work, however, their analysis was based on only 168 households drawn from three districts. Moreover, the authors fail to address the problem of selectivity bias arising from the fact that the extent of sales as a proportion value produced is only observed for participating households. In this study, we address these

limitations. We do so by considering a significantly larger and more diverse dataset from the latest round of the Ethiopian Rural Household Survey (ERHS) that is nationally representative. We also employ Heckman's two-stage approach and Instrumental Variable (IV) regressions to address sample selection bias and the possible endogeneity between market orientation and participation. More specifically, we examine the influence of market orientation on smallholder farmers' market participation.

Context and data

Agriculture in Ethiopia remains one of the most important sectors. It accounts for over 40% of GDP, over 80% of employment, and 90% of foreign exchange earnings (Diao, 2010). The majority of farmers in Ethiopia are subsistence smallholders, with little separability between production and consumption decisions (Muller, 2014). They are mostly dependent on the cultivation of cereals (Mahelet, 2007; Salami *et al.*, 2010; CSA, 2011; Tafesse *et al.*, 2011). They cultivate about 95% of the total cropped land and over 90% of the country's grain produced, mostly for own consumption with only a small marketed surplus (Chanyalew *et al.*, 2010). Five major cereals (teff, wheat, maize, sorghum, and barley) account for almost three-quarters of the total area cultivated, 29% of agricultural GDP (2005/06) and 64% of calories consumed (Rashid, 2010; EEA, 2011; Tafesse *et al.*, 2011; Minten *et al.*, 2012).

The commercial transformation of subsistence farming is crucial for ensuring sustainable household food security and welfare and is an important pathway to economic growth and development for Ethiopia. The Ethiopian government has promoted smallholder commercialization as a key policy agenda since 2005 as stipulated in the government's second Poverty Reduction Strategy Paper (PRSP) (Sharp *et al.*, 2007). The strategy sought to achieve commercial production through supporting the intensification of marketable farm products (both for domestic and export markets) and through promoting rapid non-farm private sector growth (MoFED, 2006).

The data used for this study comes from the Ethiopian Rural Household Survey (ERHS) conducted by Addis Ababa University in collaboration with the International Food Policy Research Institute (IFPRI) and the Center for the Study of African Economies (CSAE) of Oxford University. Surveys were conducted in selected rural peasant associations of Ethiopia in 15 villages for seven rounds between 1994 and 2009, the most recent two occurring in 2004 and 2009. The 15 included villages are representative of the diverse farming systems practiced in rural Ethiopia including the grain-plough areas of the Northern and Central highlands, the ensete-growing areas and the sorghum-hoe areas (Dercon *et al.*, 2009).

In this study, data from the 7th round of the ERHS conducted in 2009 were used. Our sample consists of 1157 farm households coming from 18 districts representing the various agro-ecological and farming systems in Ethiopia. Both household and plot level information were used for analysis. Production and plot characteristics were obtained from 9153 plots operated by the sampled households. Six crops, namely, white teff, black teff, barley, wheat, maize and sorghum are considered.

Methods

Empirical procedure

Following the analytical framework employed in Goetz (1992), we model the household decision to participate in a crop market as a two-stage decision. In the first stage, households are assumed to make a participation decision regarding crop sale (a binary choice). In the second stage, they decide on the extent of their participation (a decision regarding volume of crops they are going to sell). Since the amount of crop sold is observed only for households that participate in the crop market, there is going to be selectivity bias. So, we use Heckman's two stage approach to address this issue.

Apart from selectivity bias, our estimation is likely to also suffer from endogeniety specifically as market orientation and value of crop produced could be endogenously determined with extent of market participation (quantity sold). We use instrumental variable regression to address endogeniety.

Econometric specification

There are different methods for measuring the extent of participation. Von Braun *et al.* (1994) compute what they call a crop market participation index as a continuous variable based on the ratio of values of crops sold to that of crops produced weighted by an average community level price. We employ the same procedure to calculate our household level crop market participation index as inEquation 1.

$$MP_i = \frac{\sum_1^C \bar{P}_j S_{ji}}{\sum_1^C \bar{P}_j Q_{ji}} \qquad (1)$$

Where MP_i is the crop market participation index; S_{ji} is the amount of crop j sold by household i; Q_{ji} is the total amount of crop j produced by household i; $\bar{P}$ is the average price at community level; and C is the number of crops grown by the household.

Unlike a number of previous studies, our dependent variable is constructed on the basis of the aggregate values of all the six crops considered in our study. According to Heltberg and Tarp (2002), such an approach maximizes the use of available information. Moreover, it facilitates substitution among crops due to some exogenous variables that may increase participation in the sale of an individual crop at the expense of another.

Our market participation model is specified as a function of household characteristics (H), access to markets and roads, and ownership of transport equine *(M)*; access to institutional services such as extension and credit provision *(I)*; and value of annual crop production *(V)*. The selection of the explanatory variables is guided by previous literature. Household characteristics such as age, sex and education of the head are key determinants of many subjects including market participation (Muyanga and Musyoka 2014). They capture differences in experience, production efficiency and skills respectively, which are key in determining participation in market (Gebremedhin and Jaleta, 2010). Several studies have also indicated that access to markets and roads and ownership of transport equine are expected to reduce marketing costs, thereby encouraging market participation (Key *et al*., 2000; Pender *et al*., 2006).

Past studies also document the positive impact of access to institutional services in terms of enhancing farmer skills and knowledge, linking farmers with modern technology and markets, and easing liquidity and input supply constraints, all of which help strengthen smallholders' ability to increase productivity (Gebremedhin and Jaleta, 2010), thereby inducing market participation. Finally, we include market orientation index *(moi)* as an explanatory variable in the crop output market participation model in order to test whether market orientation translates into higher market participation (Equation 2). Past studies have also indicated that the profit motive underlying market orientation would have a positive impact on market participation since profits are realized from revenues to be obtained from markets (Pingali and Rosegrant, 1995; Gebremedhin and Jaleta, 2010).

$$mp_i = f(H_i, M_i, I_i, V_i, moi_i, \varepsilon_{mp}) \quad (2)$$

Since the amount of crop sold is observed only for households that participate in the crop market, we use Heckman's two stage approach to address selectivity bias. Moreover, market orientation is likely to be endogenous in this specification. Market orientation is captured using an index calculated from the household level marketability of the crop portfolio produced. We define that a smallholder household is market oriented if its production plan follows market signals to produce commodities that are more marketable. Under a semi-commercial system, where both market and home consumption are playing a central role in production decisions, 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, labor and capital) to the more marketable commodities. Based on the proportion of total amount sold to total production at farming system level, a crop specific marketability index (φ_j) is computed for each crop produced at farming system level as follows (Equation 3):

$$\varphi_j = \frac{\sum_1^N S_{ji}}{\sum_1^N Q_{ji}} \quad (3)$$

where φ_j is the marketability index; S_{ji} is the amount of crop j sold by household i; Q_{ji} is the total amount of crop j produced by household i; and N is the number of the sample households. φ_j is aggregated over all the sample households in district (woreda) and takes values between 0 and 1, inclusive. Crops meant for market usually have values closer to 1 on the index, while those meant for consumption tend to have values closer to 0. Using this crop-specific marketability index we can now construct households' market orientation index in terms of land allocation pattern of the households weighted by the marketability index of each crop as follows (Equation 4):

$$moi_i = \frac{\sum_1^j \varphi_j L_{ij}}{TL_i} \quad (4)$$

where *moi*$_i$ is market orientation index of household *i*, L$_{ij}$ is amount of land allocated to crop *j* by household *i*, and TL$_i$ 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 (Gebremedhin and Jaleta, 2010).

As mentioned above, household level market orientation could be endogenous in our specification for market participation. To address this concern, we employ a land fragmentation index as an instrumental variable. Land fragmentation is expected to be highly correlated with market orientation as it is a major decision variable in determining the land allocation to crop portfolio the household plans to achieve. However, we do not expect it to have a direct bearing on whether the household would actually be able to participate in the market or not.

For this purpose, we employ the Januszewki index (JI) for measuring land fragmentation. This

Table 1. Definition and descriptive statistics on variables used in the analyses

Variable	Obs	Mean	Std. dev.	Min	Max
Market orientation index (with values ranging between 0 to 1)	1027	0.30	0.25	0	0.84
Crop market participation index (with values ranging between 0 to 100)	1157	24.25	35.27	0	100
Did household sell any crop? (Yes = 1, No = 0)	1157	0.37	0.48	0	1
Extent of market participation (Dummies)					
Subsistence level	1157	0.64	0.48	0	1
Moderately commercialized (transitory)	1157	0.11	0.30	0	1
Sufficiently commercialized	1157	0.25	0.43	0	1
Land fragmentation (with values ranging between 0 to 1)	1157	0.51	0.15	0.23	1
Value of crop produced (birr/household)[1]	1157	5263.42	6940.48	0	96645
Value of crop sold (birr/household)	1157	1025.63	3541.34	0	69900
Did household sell crop output? (Yes = 1, No = 0)	1157	0.37	0.48	0	1
Age of household head (years)	1157	52.86	14.64	18	90
Sex of household head (Male = 1, female = 0)	1157	0.64	0.48	0	1
Head's education (literate = 1, illiterate = 0)	1156	0.52	0.50	0	1
Family labor (no. of adult family members)	1157	2.91	1.33	1	9
Family size (head count)	1157	5.84	2.52	1	16
Farmland size (ha)	1157	1.44	1.21	0	5
Any oxen? (Yes = 1, No = 0)	1157	0.55	0.50	0	1
Equine possession (Yes = 1, No = 0)	1157	0.43	0.50	0	1
Access to extension services (Yes = 1, No = 0)	1152	0.49	0.50	0	1
Access to credit (Yes = 1, No = 0)	1157	0.65	0.48	0	1
Did household use fertilizer? (Yes = 1, No = 0)	1157	0.71	0.45	0	1
Distance to nearest town (market place) (km)	1157	10.35	6.71	3	25
Access to all-weather road (Yes = 1, No = 0)	1157	0.59	0.42	0	1

[1] ETB is roughly equivalent to 0.05 USD in July 2015

index takes on values within the range of 0 to 1. The smaller the JI value, the higher the degree of land fragmentation. The JI value combines information on the number of plots, average plot size and the size distribution of the plots (Jha *et al.*, 2005). It divides the square root of the total area of the farmland to the sum of square roots of the plot's dimensions. A feature of this indicator is that land fragmentation decreases when larger lots are relatively more, and smaller ones less, numerous. This indicator has three properties: the degree of land fragmentation increases with the number of plots, the degree of fragmentation increases when the dimension of the plots are lower, and the degree of fragmentation decreases when the area or the number of large lots increases and the number of small lots decrease. Also, this indicator can be used to point out the degree of land fragmentation of agricultural crops within a farm or a region. The index is computed as:

$$JI = \frac{\sqrt[n]{\sum a_i}}{\sum \sqrt{a_i}} \qquad (5)$$

Where a_i is the area of each plot i owned by each household; $i = 1, 2, …, n$; and n is the number of plots operated by each household.

Value of crops produced, a major determinant of market participation, may also be endogenous as indicated by past research. We have tested the endogeniety of this variable and confirmed that this was not the case as shown in the econometric analysis section.

Results and Discussion

Descriptive statistics

The summary statistics for the variables considered in our study are given in table 1 above. Our results reveal that 37% of the sample's households have participated in food crop sales. However, on average only 24% of the annual crop produced was marketed as measured by the crop market participation index, indicating moderate market participation on average. This level of market participation is lower than the national average reported to have been 33-36% (Gebreselassie and Sharp, 2007). A majority (64%) of farmers were categorized as subsistence (non-commercialized) farmers, whereas transitory (moderately commercialized) and commercial (highly commercialized) farmers constituted respectively 11% and 25% of the total farm households. The average value of annual crop produced and sold per household were respectively ETB 5263 and 1026.

About 36% of households in the sample are female headed. The average household size is about 6, with an average family labor supply of 2.91 persons per household. On average, a household cultivates about 1.44 ha of land. About 52% of household heads were literate. About 65% of the sampled households had

Table 2. Regression results

Variables	Heckman's Model		IV model
	Selection (1st stage)	Quantity (2nd stage)	Quantity
Age of head	-0.0122***	-0.2195***	-0.2434***
	(0.003)	(0.075)	(0.086)
Head is male	0.0845	2.0507	2.4966
	(0.124)	(2.183)	(2.503)
Head is literate	-0.0291	-1.0728	-1.2089
	(0.121)	(2.221)	(2.518)
Family size	-0.0891***	-1.6009***	-1.7116***
	(0.030)	(0.561)	(0.640)
Value of crop produced	0.0001***	0.0002**	0.0002**
	(0.00002)	(0.00009)	(0.00009)
Ownership of equines	-0.0411	-0.5249	-0.4007
	(0.145)	(2.381)	(2.853)
Any ox?	0.2653*	4.7301*	4.9603
	(0.145)	(2.805)	(3.348)
Land	0.0844	2.2802*	2.3678*
	(0.065)	(1.261)	(1.312)
Number of adult family members	0.0934*	1.4463	1.5831
	(0.074)	(0.950)	(1.113)
Distance to nearest town	-0.0374	0.4007	0.2212
	(0.074)	(0.284)	(1.021)
All-weather road	1.5033***	16.8608**	16.2380**
	(0.579)	(6.757)	(7.818)
Access to extension services	-0.1387	-4.1037	-4.5481
	(0.118)	(3.061)	(3.393)
Access to credit	0.2788**	3.7594*	4.3838*
	(0.123)	(2.107)	(2.486
Fertilizer use	0.3304**	4.6944*	5.3241
	(0.153)	(2.794)	(3.498)
Market orientation (index)	2.0504***	80.4871***	93.8682***
	(0.384)	(9.443)	(10.843)
Cooperatives in PA	1.7257**		
	(0.785)		
Telephone service in PA	0.6873		
	(0.881)		
Constant	-3.5840**	-13.0497 (10.049)	-12.7989
	(1.665)		(12.0781)
No. of observations		959	959
Rho		0.223	
Lambda		202.45	
Sigma		398.89	

Note: ***p<0.01, **p<0.05, *p<0.10. Included but not reported are PA level dummies.

access to credit sources, while only 49% had access to extension services. The nearest market place is on average 10.35 km away and over 40% of the sampled households do not have access to all-weather roads.

Results from econometric analysis

Table 2 below reports the results of our econometric analysis. As mentioned above, household market participation is modeled as a two stage decision process. In the first stage, we estimated a probit model on the latent binary decision variable of whether or not a household has participated in the market as a seller (selection equation). In constructing the dependent variable (whether or not the household has participated in sale of crops), households at a subsistence level of participation (proportion of sale less than 25%) were excluded. The results from this estimation are presented in column 1. Next, we estimated the extent of participation (measured by quantity of sale) for the subset of the sample households that have participated in the market as sellers. We have included the inverse mills ratio (IMR) to adjust for the selection bias. These results are reported in column 2. Finally, the estimates from

the instrumental variable (IV) regression carried out to control for endogeniety are reported in column 3.

We checked for the endogeniety of both market orientation and value of crops produced. Only market orientation was found to be endogenous. As explained in the methods section, we instrumented market orientation by household land fragmentation index. Endogeneity was confirmed using Durbin and Wu-Hausman tests. The value of the F-statistic from the first stage was 13.95 (i.e., greater than 10) showing that the instrument was sufficiently robust.

The Heckman model estimates reveal that market orientation strongly and positively influences both the probability of market participation (whether to sell or not) as well as intensity of participation (quantity of sale). The implication is that market-oriented households are more likely to make not only production but also marketing decisions that enable them to attain surplus production and sell more. Likewise, the value of crops produced also had a significant positive impact on both aspects of crop market participation. This implies that households with higher crop value are not only more likely to participate in market, but also sell a higher proportion of their output.

Table 3. Marginal effects for estimates of the probability of market participation

Variable	Marginal effect	S.E
Age of head	-0.0048599***	0.00157
Head is male	0.0334753	0.04908
Head is literate	-0.0115653	0.04805
Family size	-0.0353696***	0.01210
Value of crop produced	0.000023***	0.00001
Ownership of equines	-0.0163235	0.05771
Any ox?	0.1044901*	0.05670
land	0.0334788	0.02571
Number of adult family members	0.0370695*	0.02013
Distance to nearest town	-0.0148577	0.02933
All-weather road	0.5409281***	0.17077
Access to extension services	-0.0550343	0.04689
Access to credit	0.1097241**	0.04778
Fertilizer use	0.1289702**	0.05815
Market orientation (index)	0.8136475***	0.15251
Cooperatives in PA	0.5048077***	0.12455
Telephone service in PA	0.2681132	0.33090

Among the factors related to crop production, fertilizer use and ownership of traction power (oxen) were also found to significantly influence both aspects of market participation. On the other hand, while number of adult family members (a proxy for labor availability) significantly increased the likelihood of market participation, land size had a significant positive effect on value of crops sold. Among institutional services and infrastructure, distance to the nearest town did not have any significant effect on market participation, while access to all-weather roads and credit services significantly enhanced both aspects of marketing decisions. Family size and age of household head were found to negatively influence both aspects of marketing decisions. This implies that younger and larger households are less likely to participate in selling crops, and sell lower amounts when they do participate.

Variables like possession of equines (proxy for means of transportation in rural Ethiopia), gender and education of heads, distance to nearest towns, and access to extension services were all found to be insignificant. Overall, with the exception of labor availability and land size, factors affecting market participation decisions are largely the same as those affecting extent of participation. These findings are in sharp contrast to Gebremedhin *et al.* (2009), who reported an almost totally different set of factors determining the two aspects.

The marginal effects estimates reported in Table 3 reveal that the largest increase to participation decision is associated with market orientation (as measured by the moi-index). More specifically, a unit increase in market orientation is associated with

an 81.4% increase in the probability of marketing, controlling for all other factors. With regard to the crop production variable, a 1000 Birr increase in value of crop produced results in only a 2.3% increase in sale participation on average. On the other hand, an additional year of age for the head is associated with a 0.5% decrease in the likelihood of marketing, while an additional one family member reduces the same by 3.5%.

Access to credit enhances the probability of market participation but not intensity of participation. These findings indicate that factors influence market participation are not necessarily those that affect intensity of participation (like access to credit and distance to nearest town). On the other hand, access to extension services did not influencing any of the outcomes considered here (market orientation, participation and intensity of participation). Whether this indicates weaknesses in agricultural extension service delivery requires further investigation.

Younger households are generally more likely to participate in selling than their older counterparts. They also tend to sell more when they participate. The presence of agricultural cooperatives in the PA (peasant association), which was included as an indicator variable for selection, was found to enhance the probability of market participation as expected. Access to all weather roads was also another significant factor affecting both aspects of crop market participation. Family size had the expected negative sign in both equations but was not significant.

After controlling for endogeneity, market orientation, value of crop produced, land size, access

to credit services and all-weather roads, family size and age of household head still continue to be significant in terms of their influence on amount of sale. However, fertilizer use, and possession of traction animals (oxen) lose their significance. Overall, the extent of market participation increases with better market orientation, value of production, access to credit and all-weather roads, while it declines with household head age and family size.

Summary and policy implication

The commercial transformation of smallholder agriculture entails that smallholders both base their production decisions on market signals thus becoming market-oriented producers as well as actually selling a significant proportion of their produce at market. However, there has been little attempt to make a distinction between the two. In this study, we have attempted to address this major concern.

The results from our descriptive analysis revealed that only 31% of annual crop produce is sold. A majority (55%) of farmers were categorized as subsistence farmers, whereas transitory and commercial farmers constituted respectively 12% and 33% of the total farm households. The average value of annual crop produced and sold per household were respectively ETB 6159 and 1057.

Our econometric results indicate that market orientation strongly and positively influences both aspects of market participation. The implication of this is that interventions aimed at improving market orientation of households at the production stage would have significant influence in terms of promoting market participation. Our results also revealed that higher levels of crop production enhanced smallholders' market participation, implying that strategies that aim at improving household capacity to produce surplus production through enhancing productivity could have high returns in promoting smallholders' commercial transformation. Other factors that enhanced market participation were land size, access to credit and all-weather roads. The implication of these findings is that promotion of better access to infrastructure and institutional services may significantly contribute to promoting market participation and hence commercialization of smallholders.

Acknowledgement

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