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Full Length Research Paper

Household production, home consumption and market supply in peasant economies: The case of Ethiopia

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Peasant households still play a significant role in terms of production and factor supply in most developing countries. Nevertheless, these households consume a considerable proportion of what they produce supplying only a small part, if any, to the market. These roles of peasant households as producers (both for own consumption and for sale), suppliers of factors (both for household and non-household enterprises), and consumers (of own produced and marketed commodities) are shown using a conceptual framework. Later, using a district level panel data derived principally from series of agricultural sample surveys in Ethiopia, a typical peasant economy, this article examines the utilization of cereal production by farming households and identifies factors that influence the allocation of output to alternative uses (home consumption and market supply). The descriptive analysis shows that farming households in Ethiopia consume at home 67 percent of their cereal production, marketing only 15 percent, with great disparity across administrative zones. On the other hand, the panel data model adapted indicates that the size of farming population, agricultural land availability, road density, urbanization, and livestock capital significantly affect the share of output consumed at home, while farming population, road density, urbanization, and livestock capital are strong predictors of the proportion of output supplied to the market.

Key words: Household enterprises, farming, own consumption, market supply, household production.

INTRODUCTION

The rural economy still assumes a significant position in the overall economic performance of most developing countries in the world. It constitutes 11 and 17 percent of total output in sub-Saharan Africa and South Asia, respectively, with considerable disparity across countries. The share of agriculture in total value added is, for example, as high as 57, 53 and 46 percent in Sierra Leone, Liberia and Ethiopia, respectively (World Bank, 2013) as compared to less than 2 percent in most advanced economies. Moreover, a significant proportion of the population in most low-income countries is still living in rural areas, principally engaging in the agricultural sector. The statistics show that 63 and 69 percent of the people in sub-Saharan Africa and South Asia, respectively, are rural residents (World Bank, 2013) once again depicting the relevance of the rural sector. While it can be generalised at the national level, the rural economy in most of these countries is particularly characterised by dualities in production where a large traditional sector exists side-by-side with a small but growing modern, non-household sector.

At the global level, peasant farm households account for no less than a quarter of the world"s population (Mendola, 2007). This should be considerably higher in Africa and other developing regions of the world. Moreover, semi-subsistence farming is the main source of employment, production, incomes and supply of commodities in rural areas and to the wider economies in countries dominated by traditional farming. Specifically, semi-subsistence farming contributes about 90 percent of agricultural output in sub-Saharan Africa (Torero, 2011) and 75 percent of total agricultural production in East Africa (Salami *et al.*, 2010). In Ethiopia, peasant households contribute about 95.6 percent of total grain production and 96.7 percent of cereal production, the balance being contributed by commercial farms (CSA, 2011). These households are engaged in small-scale farming due to constrained access to farm lands. For example, more than two-thirds and 59 percent, respectively, of the holdings in sub-Saharan Africa (Torero, 2011) and Ethiopia (CSA, 2011) have average sizes of less than one hectare.

Peasant farmers in low-income countries are characterised by low production and productivity (Azam *et al.*, 2012). As a result, production is primarily for self-consumption (Orden *et al.*, 2004) with a possibility of supplying only a small part of total output to the local markets. Lack of access to markets and constrained access to agricultural capital also limit these farmers to operate at subsistence levels restricting their capacity to be market oriented. Due to their semi-subsistence nature, they also depend on the local commodity market to satisfy part of their consumption needs as, in most cases, they are not self-sufficient. To satisfy part of their cash requirements, members of the agricultural households also participate in non-farm employment activities.

Owing to the fact that the peasant economy accounts a significant percent of employment and production, understanding its mode of production, output utilization and the relationship it has with the other sectors of the economy should be the starting point for any food security and poverty alleviation strategy. Among the features of semi-subsistence economies that require continued understanding are the allocation of factors for production and the distribution of output to competing uses. The knowledge of how and to what extent peasant holders consume their outputs and sale to the market is desirable for couple of reasons: First, this will help see how households enterprises are supporting households demand for food and contribute to food security at the household level, and second, knowing the amount of output produced and supplied to the market would help understand the level of market supply and the socio-economic factors that can influence the market orientation of farming households.

There have been several attempts to understand market participation by households. For example, Geberemedhin and Jaleta (2010) studied the impact of market orientation on market participation in Ethiopia and observed that market orientation strongly translates to market participation. Gebremedhin and Hoekstra (2007) analysed households‟ participation in cereal markets in selected villages in Ethiopia and identified land availability and households‟ own labour supply as important predictors of market participation. Kuma *et al.* (2011), on the other hand, investigated the determinants of the decisions and levels of market participation in farm level milk value addition by smallholder farmers in Ethiopia. Olwande and Mathenge (2012) and Adejoobi and Babatunde (2010) also examined market participation by farming households in the case of Kenya and Northern Nigeria, respectively. Barrett (2008) provided an account of the concepts and evidence on smallholder market participation with a focus on eastern and southern Africa. The author observed that improving smallholders‟ access to technologies and productive assets could stimulate their market participation. Using a selectivity model, Goetz (1992) examined households‟ food marketing behaviour in sub-Saharan Africa and showed that increased market information could lead to increased market participation. Kan *et al.* (2006) studied farm output, non-farm income and commercialisation in rural Georgia and observed that while farm output affects market participation positively, non-farm income affects participation negatively.

These studies focus mainly on market supply and farmers marketing behaviour without providing a due focus on the proportion of output retained at home for own consumption and trying to explain factors that influence such decisions. Own supply of food commodities also has serious implications on households‟ food security as it evidently constitutes a greater share of food expenditures in rural areas. Although it might seem clear at the first instance, the issue of production for own consumption is so complex and that it affects directly and indirectly the other policy interest variables such as market production and commercialization of semi-subsistence households. Among the very few studies that have touched the issue of production for home consumption in one or the other way in the context considered here include (Baiphethi and Jacobs, 2009; PROVIDE, 2006 and Omotesho *et al.,* 2006). Baiphethi and Jacobs (2009) provide a non-technical discussion on the food security implication of subsistence farming in South Africa and PROVIDE (2006) examined the economic contribution of home production for home consumption in that country. Omotesho *et al.* (2006) examined the role of households‟ farm size and farm output for food security among rural farming households in Kwara State of Nigeria. None of these works, however, provide technical analysis on home production for home consumption in peasant economies.

This paper aims at contributing to the empirical literature related to food production in semi-subsistence economies by examining the scale of home production for own consumption and investigating the factors that influence this decision and the decision to supply to the market. In analysing production, home consumption and market participation by these households, the study takes the case of Ethiopia, a predominantly peasant economy. The study uses zone level panel data.

To lay the foundation for the study, a theoretical model that captures production and consumption relationships in a dual economic setting where a traditional, household, sector co-exists with a modern sector is constructed. The model illustrates production, consumption and labour allocation in such economies. The traditional sector is further segmented to production for own consumption and production for the market that closely characterises most economies in the developing world. This is then followed by an investigation of the factors that are perceived to closely influence the proportion of output that is consumed at home and supplied to the market. This would provide key issues for policy intervention related to food security at the farm household level and improving market supply to national food self-sufficient.

By revisiting these important issues and examining the concepts on the case of Ethiopia, the study also aims at improving our understanding of the extent to which farming households are engaging themselves to produce for their own consumption and the level of their market participation.

Previous attempts on the issue of farm households‟ market participation in the case of Ethiopia, such as Kuma *et al.* (2011) and Gebremedhin and Hoekstra (2007), focused on selected villages and lack the capacity to reflect the wider picture at the national level. On the other hand, this study uses locality level panel data with national coverage where 69 rural zones of the country are represented. More importantly, none of the previous attempts take household production for own consumption at the centre of analysis.

PRODUCTION AND CONSUMPTION IN A SEMI-SUBSISTENCE ECONOMY: A CONCEPTUAL FRAMEWORK

As introduced above, a typical peasant economy can be viewed as a three-sector economy: a home production for home consumption (HPHC) household sector, a market oriented household sector and a market oriented non-household sector. The first two constitute households productive activities where the HPHC one produces commodities for home consumption by the household only. HPHC activities use labour supplied only by the household which consumes the outputs. The other component of the household sector is similar to the non-household sector as it supplies the output to the market. Alike the non-household sector, market oriented household sector can hire-in labour from other households (the labour market) paying market wage rate. The two market oriented sectors are different; however, as production in the former case is organised by households as compared to enterprises in the non-household sector where modern ways of organising production are adapted. Moreover, there is strong empirical evidence that marketed commodities produced by semi-subsistence households are limited to local commodity markets (Martinez *et al*., 2010; Admassie, 2013; Sharma, 2011) vis-a-vis commodities produced and supplied by modern enterprises; these are normally tradable regionally, nationally and internationally. This is guaranteed sometimes using national level policies in most developing countries that restrict the export of non-commercial output (Admassie, 2013). This is particularly the case in situations of local food scarcity.

Following Frederiksen (2006), a non-overlapping generations‟ mode with perfect competition in segmented markets is adapted here. The non-overlapping nature of the generations in the model implies that household members live only for one period. For simplicity, assume that all households supply a positive level of labour (defined in units or hours), and that, following Frederiksen (2006), the number of households remains constant, and households are identical. Also, the number of households normalised to equal one. Assume also that all households are endowed with similar type of labour.

Production Behaviour

Household production

Peasant households are still the main producing units in most low-income countries of Africa and Asia. These households engage in production for own consumption and production for the market. The household is not in a position to differentiate between factors it owns when making factor allocation decisions between these activities. It uses part of its labour ( ) and a set of fixed inputs in the production process. For simplicity, consider a constant returns-to-scale production function. Let denote output in sectors at time . Hence,

$$x_{1t} = H_{1t} l_{1t}^{\alpha} \quad [1]$$

$$x_{2t} = H_{2t} l_{2t}^{\beta} \quad [2]$$

where is household production for home consumption, is household production for the market, are positive productivity term which can vary between the two household activities, are labour used in production, and $0 \leq \alpha, \beta \leq 1$ are labour shares in production in the two activities. It could be assumed that $L \geq (l_{1t} + l_{2t})$ where an amount of l_{3t} supplied to the labour market outside the household. Total production by the household is given by $(x_{1t} + x_{2t})$ and the proportion of output consumed at home is $x_{1t}/(x_{1t} + x_{2t})$.

Apart from the simplicity it offers to the model, assuming at this point that household market production relies entirely on the household‟s labour endowment makes sense as in peasant economies like Ethiopia, paid employment in rural areas is as small as 3.6 percent (CSA, 2007) which implies that paid employment in the household sector is rather limited. In the whole of rural Ethiopia, about 95.6 percent of individuals are either self-employed or unpaid family workers. Paid employment in rural Tanzania was only 3.3 percent in 2000/01 (Mduma and Wobst, 2005). Fontana and Paciello (2009) reported that as few as 0.4 and 1.6 percent of female and male labourers, respectively, were wage workers in rural Tanzania in 2005. Similar evidences were identified by Oya (2010) and Fontana and Paciello (2009) in selected African countries and in most developing regions, respectively, although these

studies also show increasing dynamics of paid rural labour markets.Due to the interlinkages between these two household sectors, a positive inter-sectoral spillover effect is assumed to exist and that it exists on both directions, i.e., technical progress in the household market oriented activities can positively affect production for home consumption, and vice versa. Let g_{st} denote growth rates of productivity in the sector; then,

$$\frac{H_{1t}}{H_{1t}} = g_{1t} = l_{1t} + \delta l_{2t} \quad [3]$$

$$\frac{H_{2t}}{H_{2t}} = g_{2t} = \delta l_{1t} + l_{2t} \quad [4]$$

where $0 \leq \delta \leq 1$ is the spillover rate between the two household activities. If , there is perfect spillover effect moving either direction, i.e., any progress in ways of doing things in one of the sectors affect the other by the same level. Since these two household sectors are closely related, it is convincing to assume perfect spillover effects as the techniques of production are closely identical.

As noted above, the pricing mechanism in these two sectors is different where home consumed commodities are implicitly priced at farm-get levels which exclude trade and transport margins while marketed outputs of households are valued at market prices. Even though these two outputs from the two sectors are identical, their prices are different. Home consumed commodities are valued at shadow prices, which is also the return to factors used to produce these commodities as the implicit revenue from HPHC activities will have to be exhausted through factor payments in equilibrium.

The standard profit maximisation motive for the firm also holds for the producing household. Under a competitive setting, the representative producer aims at maximising profit subject to input and output prices. This is so for x_{2t} for which commodity and input prices are market determined. Considering x_{2t} as *numeraire,* the profit maximisation leads to

$$\frac{\partial \pi_{1t}}{\partial l_{1t}} = p_{1t}\beta\frac{x_{1t}}{l_{1t}} - w_{1t} = 0 \quad [5]$$

$$\frac{\partial \pi_{2t}}{\partial l_{2t}} = \alpha\frac{x_{2t}}{l_{2t}} - w_{2t} = 0 \quad [6]$$

where p_{1t} is the shadow price of the HPHC commodity**,** w_{1t} is the shadow wage rate in the HPHC sector, and w_{2t} is market wage rate in the market oriented household sector. The first condition states that the marginal value product of the labour in HPHC equals the opportunity cost, the shadow wage rate, in optimum. On the other hand, the profit maximisation condition in the household‟s market oriented activities is achieved when marginal product of labour equal to the market wage rate.

It is underlined in the farm household literature (Barrett *et al.*, 2007; Lamb and Worthington, 2003; Lambert and Magnac, 1998) that risk, search and transaction costs, and the peculiarity (imperfect substitutability) of household labour derives a wedge between the market wage rate, evaluated at the level of marginal product of labour and the wage rate for labour engaged in HPHC activities, making the households decisions non-separable. Following Barrett *et al*. (2007), the shadow wage rate w_{1t} bounded from below by the market wage rate $w = w_{2t}$ is given by

$$w_{1t} = w_{2t} * (\mu_{1t} - \eta_{1t} + 1) \quad [7]$$

where μ_{1t} is the share of HPHC in consumption, given the utility function, and η_{1t} is the share of HPHC in labour time allocation. $0 \leq \mu_{1t}, \eta_{1t} \leq 1.$ If the shares of HPHC in total consumption and time budgets (η_{1t}) are equal, the efficiency levels of labour used in HPHC and „wage‟ labour are identical, hence $w_{1t} = w_{2t} = w.$ A restriction on $\mu_{1t} > \eta_{1t}$ might be needed to assure that $w_{1t} > w_{2t}$.

In the same fashion as shadow wage rate determination, shadow product price in the HPHC activities p_{1t} is linked to market price through

$$p_{1t} = p_{2t} * (\mu_{1t} - \eta_{1t} + 1) \quad [8]$$

Non-household production

Production by the non-household sector differs from production by the household sector in that it is managed by non-household enterprises and produces purely for the market. Mainly, unlike HPHC activities, it uses hired labour. Also, unlike household activities which employ traditional ways of production, non-household enterprises are modern. Apart from the technological duality between rural economies (i.e., agriculture) and urban activities (i.e., industry) which has normally been recognised (Egbe *et al*., 2008), there is also a strong evidence of duality within the rural economy alone (Kumar, 1970; Stifel and Thorbecke): traditional agriculture co-exists with modern commercial farms.

Assuming a similar production function as presented above

and letting x_{3t} to denote output in the modern non-household sector, it follows that

$$x_{3t} = H_{3t} l_{3t}^{\tau} \quad [9]$$

where H_{3t} and l_{3t} are productivity term and labour used in the production process, respectively. Unlike the market oriented household production, x_{3t} is tradable both domestically and internationally. It is assumed that there is a loose interaction between productivity in the non-household sector and productivity in the household sector; the interaction propagating through the household market oriented activities. Hence, the rates of growth of productivity (technological progress) in the market oriented sectors are liked by

$$\frac{H_{2t}}{H_{2t}} = g_{2t} = l_{2t} + \rho l_{3t} \quad [10]$$

$$\frac{H_{3t}}{H_{3t}} = g_{3t} = \rho l_{2t} + l_{3t} \quad [11]$$

where $0 \leq \rho \leq 1$ is the spillover rate between the two market oriented activities and g_{3t} is the growth rate of productivity in the non-household sector.

It is convincing to assume that technological innovation and progress is markedly higher in the modern sector outside the household due to the elastic nature of labour supply and research and development in this sector. Convincingly, productivity growth and innovation in the traditional household sectors are slow.

Under perfect competition, the producer chooses optimum level of labour that maximises profit and produces at a point where

$$\frac{\partial \pi_{3t}}{\partial l_{3t}} = p_{3t} \tau \frac{x_{3t}}{l_{3t}} - w_{3t} = 0 \quad [12]$$

where the other variables and parameters are as defined above and w_{3t} is market determined wage rate for labour used by non-household enterprises.

Consumption Behaviour

The household is assumed to maximise utility from the consumption of commodities obtained from three sources: commodities produced for home consumption, c_{1t}; locally traded commodities, c_{2t}; and regionally and internationally traded commodities, c_{3t}. Consider a simple *addi-log* utility function, , of the form

$$u(c_{1t}, c_{2t}, c_{3t}) = \mu_{1t} ln(c_{1t}) + \mu_{2t} ln(c_{2t}) + \mu_{3t} ln(c_{3t} \quad [13]$$

where $0 \leq \mu_{it} \leq 1$ such that $\sum_i \mu_{it} = 1$ are consumption shares. Assume the household consumption equal household income at any period. The household financial income is the sum of labour income from own market activities and employment outside the household enterprise. This is assumed to be spent fully on market commodities c_{2t} and c_{3t}. The household maximises utility given in [13] subject to its income (in kind and in cash) and time constraints:

$$c_{2t} + p_{3t} c_{3t} = x_{2t} + p_{3t} x_{3t} \quad [14]$$

$$p_{1t} c_{1t} = p_{1t} x_{1t} \quad [15]$$

$$l_{1t} + l_{2t} + l_{3t} = L, \text{ with } l_{1t}, l_{2t}, l_{3t} \geq 0 \text{ and } \sum_i l_{it} = L \quad [16]$$

The constraint in [14] equates the household"s financial income to expenditures on marketed consumption. The constraint in [15] says that the household consumes the entire HPHC commodity it produces. Note that the gains in earnings from labour engaged in HPHC activities is the same as values of outputs from these activities. The last constraint shows that total labour used in the three activities sums up to total labour supply at the household level.

The utility maximisation conditions, given the constraints facing a typical household, are derived from the first order conditions of the household"s utility maximisation problem:

$$\frac{\mu_{1t} c_{2t}}{\mu_{2t} c_{1t}} = p_{1t} \quad [17]$$

$$\frac{\mu_{1t} c_{3t}}{\mu_{3t} c_{1t}} = \frac{p_{1t}}{p_{3t}} \quad [18]$$

$$\frac{\mu_{2t} c_{3t}}{\mu_{3t} c_{2t}} = \frac{1}{p_{3t}} \quad [19]$$

since $p_{2t} = 1.$ These three utility maximisation conditions ensure that the marginal rate of transformation between any two goods equals the marginal rate of substitution between the same two goods. For example, the first condition links marginal rate of transformation and substitution between c_{1t} and c_{2t}.

TECHNIQUE OF ANALYSIS AND DATA

The preceding section lays the context of the economy being studied. This section provides the empirical strategy used to examine the factors that predict the proportion of output consumed at home and supplied to the market by semi-subsistence farming households in a typical low-income country, Ethiopia. The discussion will be followed by a detailed presentation of the data used for the study.

Empirical Model

Peasant households in low-income countries play dual roles as producers and consumers where they allocate factors of production to produce commodities for own use and for market supply. While factors that predict market supply by peasant households have usually been points of discussion in the empirical literature related to agricultural production and market supply, production for own consumption has not received adequate treatment. The role of production for own consumption as a means of assuring at least part of peasant households" food requirements does not seem to be recognised. The aim of this study is to try and understand the extent to which production by semi-subsistence farmers are consumed at home and explain factors that determine the share of output consumed at home and the part marketed.

As pointed out above, studies on farmers supply behaviour focuses on their market participation. The most common approaches applied by studies that attempted to explain households" market participation are the Hickman selection (Azam *et al.*, 2012) and the double-hurdle model (Olwande and Mathenge). Nevertheless, these two-step models are applied in situations where households decisions to participate in the market follow steps: where first they determine whether to participate in production, and later, they decide how much to trade. In our case, all representative households (of all zones) participate in markets, selling some proportion of their produce. Hence, the first step of these two-step models given the zone level panel data is effectively answered (not an issue). It is more of an issue in situations where some of the representative household groups (RHGs) do not produce the commodity at all (such as in household level analysis in which some of the households are not participating in production). The same analogy holds for the study in this paper related to own consumption.

The second stage of the two-step models could take a censored or a continuous variable depending on the choice of the outcome variable. In a situation where the dependant variable is censored (if percent or ratio values are taken), censored regression will have to be followed; and in a situation where the variable is continuous (such as values consumed or traded) linear regression procedures such as ordinary least squares (OLS) can be undertaken. The interest variables that this study would like to explain, i.e., the proportion of output consumed and proportion of output sold, range between 0 and 100 in percent or 0 to 1 in ratio. Given the discussion above, the appropriate econometric framework is some variant of censored regression. Since the database constructed is panel data, a panel data censored regression framework of the form in [20] is followed

$$y_{it}^{*} = \alpha_i + \beta' x_{it} + \mu_{it} \qquad i = 1, \ldots, N, t = 1, \ldots, T$$
$$y_{it} = [0, \ldots, 1] \quad [20]$$

where i denotes each zone represented by a single average or representative household and t denotes the years in the panel data. y_{it} is the endogenous variable (proportion of consumption in the „consumption" model and proportion of sales in the „sales" model) to be explained, x_{it} is a vector of covariates, α_i is the individual effect, μ_{it} is an error term, y_{it}^{*} it is an underlying latent variable (for the respective models), and β is the unknown parameter vector of interest. Note that the interpretation of β is similar to OLS and it measures the effect of x on the latent variable y^{*} α_i .is assumed to be independent of x_{it} and μ_{it} . Since the dependant variable y_{it} takes values only between 0-1, the outcome variable is both left and right censored, i.e., $y_{it} = [0, \ldots, 1]$.

Data

This study uses a three-year panel data for the years 2010/11, 2011/12 and 2012/13 on 69 rural zones of Ethiopia stretching across 10 regional states. The main sources of data for the study are the country"s agricultural sample surveys for the corresponding years. Details on data sources are discussed below together with data definitions.

The production, consumption and sale of cereals are considered in this study as cereals constitute the main staple food crops widely grown and consumed in Ethiopia across various ago-ecological zones. Cereal production accounts for 85.0, 91.2 and 64.7 percent of total grains produced, consumed at home and marketed (in quantity terms), respectively, according to the 2012/13 agricultural sample survey.

As the study seeks to explain the factors that determine the proportion of production by a typical RHG consumed at home or supplied to the market, the interest variables here are the percentage of cereals consumed and percentage sold. The data are obtained from the peasant household agricultural sample surveys by Central Statistical Agency (CSA) of Ethiopia (CSA, 2011, 2012, 2013). The households" decisions on how much to produce for own consumption and how much to supply for the market are expected to depend on several factors. Based on the literature (Gebremedhin and Hoekstra, 2007; Kan *et al.*, 2006; Adejobi and Babatunde, 2010; Olwande and Mathenge, 2012; among others.) and the prevailing situation in Ethiopia, the following factors are identified and their relative importance in governing i) households production for own consumption and ii) their participation in the market by supplying part of their output are tested.

***Farming population*:** Since each zone is considered as a RHG, the household size equivalent in this study is the farming population in each zone. It is hypothesised that the larger the size of the farming population in a zone, the larger the proportion of output consumed at the farming

Table 1. Agricultural output utilization in Ethiopia and producing regions (percent).

Crop types	Country		Regional States													
			Tigray		Amhara		Oromia		Somali		SNNP		Benishan.		Gambela	
	HC	Sale	HC	Sale	HC	Sale	HC	Sale	HC	Sale	HC	Sale	HC	Sale	HC	Sale
Cereals	67.0	15.3	69.1	10.0	68.8	12.5	66.5	15.4	79.7	6.2	59.9	23.3	73.6	13.2	76.1	9.0
Pulses	60.1	21.9	67.5	16.6	55.6	23.2	58.9	23.3	78.3	11.9	63.9	20.2	62.7	24.7	91	2.7
Oilseeds	37.7	47.5	30.9	55.7	45.4	40.8	33.6	51.1	20.5	66.4	49.7	30.6	28.3	58.5	61.9	13.2
Vegetables	78.3	18.9	81.4	14.0	83.0	14.3	76.4	21.1	35.1	59.5	78.6	18.8	82.0	15.4	83.9	13.8
Root crops	70.7	17.2	54.6	34.6	65.5	21.3	68.4	19.4	26.3	68.6	75.0	12.5	79.3	17.9	84.8	8.6
Tree crops	55.8	40.2	53.7	42.1	58.9	38.5	55.9	39.7	27.4	65.3	56.7	39.7	49.0	47.8	80.9	12.8
Beef	47.4	32.4	32.5	52.0	49.0	32.7	51.3	30.9	47.7	3.6	65.7	27.9	63.9	29.7	43.2	26.4

Source: CSA (2013).

level and the lower the proportion supplied to the market. Note that, this variable is different from rural population. Farming population is derived by multiplying farming land holders for cereal production by each zone‟s average household size. While the data on size of farming holders are obtained from the agricultural sample surveys, the corresponding figures for average household size by zone are obtained from the 2007 housing and population census of the country (CSA, 2007).

***Area in hectares*:** This variable captures the importance of the availability of cultivated land for cereal production. Zones with more land allocated to cereal production are expected to supply more of their produces to the market as compared to zones that allocate less land for cereal production. Area in hectares allocated for cereal production by each rural zone is obtained from the agricultural sample surveys.

***Road density*:** Households decision to market part of their produce depends on access to transportation systems and market networks. Thus, zones with higher road density are expected to be more market oriented than others. The data on road density by zone are obtained mainly from World Bank (2004).

***Literacy rate*:** Zones with higher rate of literacy are hypothesised to be more market oriented as they will be more efficient in production and analysis of market conditions. Literacy rate by zone is obtained from the 2007 housing and population census of Ethiopia.

***Activity rate*:** It is expected that zones with high activity rate would be able to produce for the market over and above their own consumption as compared to zones with less active population, which typically have higher dependency ratio. The data on activity rate are also obtained from the housing and population census.

***Agro-ecological variable*:** This is a dummy variable for whether a zone is moist or dry indicating the production potential of each zone. The identification of a zone‟s agro-ecology is based on information in the 2010/11 household consumption expenditure (HCE) survey.

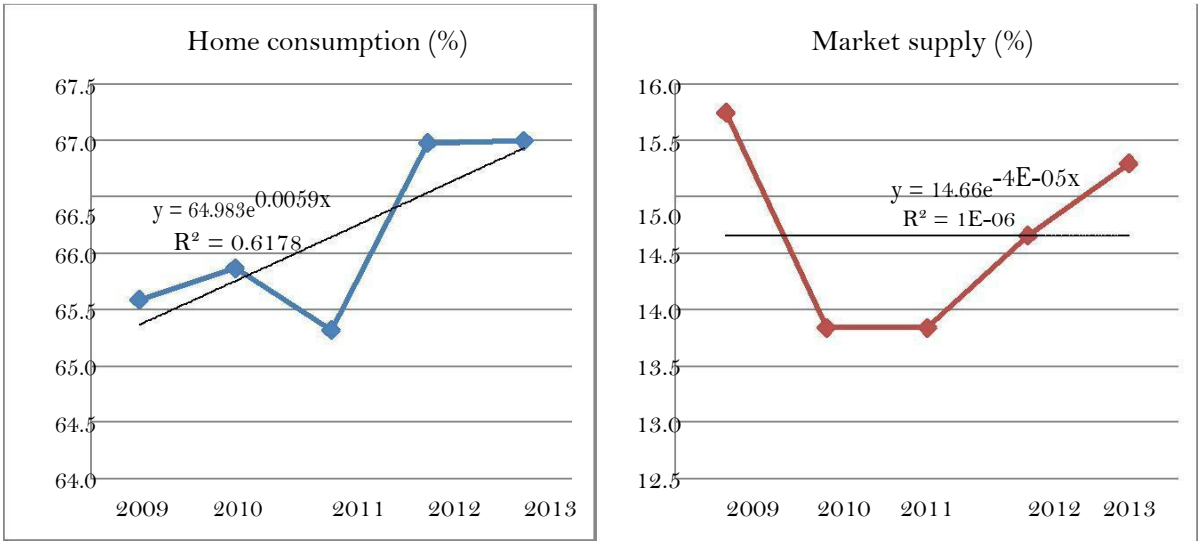
***Urbanization*:** This variable captures the relative urbanization of an administrative zone thereby measuring the availability of demand for market supply by producers in their vicinity. It is calculated by dividing a zone‟s urban population by its total population. The variable is generated by using zone-level data from the 2007 census.

***Fertilizer use (hectares covered)*:** Fertilizer use is expected to boost production thereby allowing a zone to supply more of what it produces to the market. The data are obtained from the agricultural sample surveys.

***Extension services (hectares covered)*:** The size of hectares used for cereal production which has been covered by extension services is expected to affect the proportion of output consumed at home and supplied to the market. The size of hectares of land used for cereal production covered by extension services is obtained from the country‟s agricultural sample surveys.

***Livestock capital*:** Livestock is the main agricultural capital for semi-subsistence farming households. Those households with adequate livestock capital are expected to be able to market an increasing proportion of what they produce as they will be able to satisfy own consumption needs easily. The data are also obtained from CSA‟s agricultural sample surveys.

Figure 1. Trends in cereal consumption and sale by peasant households in Ethiopia.



Source: Own computation based on CSA (2009, 2010, 2011, 2012, and 2013).

RESULT AND DISCUSSIONS

Allocation of Agricultural Output by Peasant Households in Ethiopia

The shares of various agricultural commodities produced by Ethiopian farming households consumed at home and supplied to the market for the year 2012/13 are shown in Table 1. It can be noted that production for own consumption constitutes the lion"s share for most of the commodity groups. Data based on the 2012/13 Ethiopian agriculture sample survey show that over 67 percent of cereal production by the farming households are consumed at home while only just about 15 percent is marketed. Likewise, about 60 percent of pulses produced by Ethiopian households are consumed at home. Despite the limited share of vegetables from total agricultural output, about 78 percent of vegetables produced in the country are consumed at home while only 19 percent is marketed. On the other hand, oilseeds are produced mainly for the market (38 percent is consumed at home) showing the cash crop nature of oil seeds. Patterns on livestock consumption can be reflected through households" consumption decision of beef. The agricultural sample survey shows that about 47 percent of total beef produced is consumed at home. Only 32 percent is marketed while the residual is used for wages in kind and for other uses.

The pattern of HPHC at the regional level clearly depicts some disparities although the overall picture is consistent to the national level observation. Home consumption of cereals ranges from 60 percent of total production in SNNP to 76 percent in Gambela. Significant regional disparity is observed in relation to home consumption of pulses. It is as high as 91 percent in Gambela and as low as just 55 percent of total output in Amhara region. The consumption of root crops at home ranges from 26 percent in Somali region to 85 percent in Gambela. Likewise, home consumption of beef ranges from 32 percent in Tigray to 66 percent in SNNP region. The breakdown of production by semi-subsistent households indicates that households engage themselves mainly with production for own consumption selling only a small fraction of their total output.

The national-level trends in own account consumption and market supply of cereal output by peasant households are indicated in Figure 1 for the period 2009-2013 for which complete data are obtained. The trend analysis on the percentage of home consumption shows that peasant households are consuming at home an increasing proportion of their cereal production over time. Home consumption of cereal production increased by 1.4 percentage points over the five years considered. The overall escalating national food prices over the period could explain part of the story. Market supply shows no clear trend.

Analysis of Determinants of Own Consumption and Market Participation

Results of the censored random effect panel data model shows that the shares of peasant households output consumed at home and supplied to the market are explained by different sets of predictors (Table 2). The

„consumption" and „sales" models are well specified as indicated by the log likelihood ratio chi-square tests. The test statistics reject the null hypothesis that all coefficients

Table 2. Results of censored panel data models.

Model	% consumed			% sold		
Variables	**Coefficient**	**Z**	**p>/z/**	**Coefficient**	**z**	**p>/z/**
Farming population	1.1E-05***	4.160	0.000	-8.0E-06***	-3.460	0.001
Area in hectares	-2.3E-05*	-1.770	0.077	6.6E-06	0.570	0.569
Road density	-0.050**	-1.970	0.049	0.050**	2.220	0.027
Literacy rate	-0.097	-0.910	0.364	0.074	0.790	0.432
Activity rate	-0.067	-0.510	0.609	0.072	0.620	0.536
Moist lands	-0.788	-0.350	0.726	0.924	0.460	0.645
Urbanization	37.092***	3.810	0.000	-30.169***	-3.490	0.000
Fertilizer use (hectares)	1.3E-05	1.210	0.228	-8.6E-06	-0.880	0.381
Extension cover (hectares)	-7.7E-06	-0.390	0.696	1.1E-05	0.620	0.536
Livestock capital (cattle)	-9.8E-06***	-3.250	0.001	8.5E-06***	3.180	0.001
Constant term	72.500	6.790	0.000	9.474	1.000	0.318
Number of observations	207			207		
Log likelihood (Prob > chi2)	-655.785(0.000)			-631.251 (0.000)		
LR chi2(10)	36.54			30.62		

Source: Estimation result
***, **, and * shows a 1%, 5% and 10% significance levels.

in the respective models are jointly zero at 1 percent confidence level confirming the overall joint goodness of fit of the models. Another test was also run to see how well the models fit. This is done by comparing the predicted values based on the censored Tobit models to the observed values in the datasets. The test for the predictive power of the models indicate that the

„consumption" censored Tobit model successfully predicts about 58 percent of the cases, i.e., the percentage of own consumption of household farm output. The test on the predictive power of the „sales" model indicates that the model predicts 56 percent of the proportion of output marketed correctly. Note that the coefficients of the panel data model are interpreted as those of an OLS model, but they show the impact of the explanatory variables on unobserved outcome variable.

Looking at the home consumption model (% consumed), the size of the farming population, area of land used for cereal production, road density, urbanization, and availability of livestock capital are significant determinants. Specifically, it is observed that the proportion of home consumption is higher in zones with higher farming population showing that farming households make production decisions partly to satisfy domestic demand, which is proportional to the number of farming people. On the other hand, area allotted for cereal production is negatively and statistically significantly related to share of output consumed at home. This could be because of the case that zones with large hectares of land allocated for cereal production can produce larger amount that the proportion of their total output consumed at home is lower. Road density is significantly and negatively related to home consumption signifying that localities with higher road networks tend to consume less proportion of their outputs as compared to localities with low road networks. While urbanization tends to positively and significantly influence the proportion of output consumed at home, availability of livestock capital is observed to reduce the share of output consumed at home. The positive relationship between urbanization and the proportion of output consumed at home could be because of a possibly high commodity prices if the peasant household would like to buy the commodities from the market, forcing them to focus rather on self-sufficiency. On the other hand, availability of livestock capital can dampen the proportion of output consumed at home by allowing households to produce a lot, easily satisfying their own consumption needs.

The „sales" model shows that the proportion of output marketed is negatively and significantly influenced by the number of farming population and the level of urbanization. The size of farming population can reduce market surplus by increasing consumption of output at home. Why urbanization (which is a proxy for demand) is negatively associated with market supply might not be immediately clear; it could be associated to the higher market price for food items in more urbanised zones forcing semi-subsistence households to focus more on self-sufficiency. The share of output sold is positively and significantly related to the size of livestock capital. While

land cultivated is not a significant predictor of the proportion of output marketed, road density positively and significantly influences market participation.

CONCLUDING REMARKS

The distribution of production by farming households in Ethiopia revels that a significant share of agricultural output is consumed at home signifying that peasant households produce agricultural products principally for own consumption with the option of marketing only a small part of it. This could be due to lack of or at least imperfections in the factor and product markets forcing the farmers to concentrate on being self-sufficient, or that the volume of food they produce is limited due to technological reasons restricting their capacity to supply a significant portion of their output to the market. It is surprising to notice that a considerable proportion of cash crops such as oil seeds produced by farming households are consumed at home. The prevalence of HPHC has several implications: while it might, on the one hand, contribute positively to food security at the household level in rural areas where poverty is prevalent, it, on the other hand, restricts national level food availability by limiting the amount of market supply. This could also harm any attempt to transform the economy to a modern and commercial system.

The zone level panel data model shows that shares of output consumed at home and supplied to the market are explained by different sets of variables: while farming population (+vely), agricultural land availability (-vely), road density (-vely), urbanization (+vely) and livestock capital (-vely) significantly predict the percentage of agricultural output consumed at home by farming households, farming population (-vely), road density (+vely), urbanization (-vely) and livestock capital (+vely) affect their market participation. Effective population policy that controls the rural population and expansion of agricultural capital could help achieve increased market supply. While this study properly unveils the extent to which production for home consumption is a dominant phenomenon in peasant economic setting using zone level analysis, a more close investigation of the issue of food production, consumption and market supply would be possible using countrywide household level surveys where the relative contribution of market consumption can be compared against own account consumption and where the role of several sociodemographic elements on households market participation (both as sellers and buys) can be examined. Motivated by the study at hand, this will be an area of research for the near future.

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