Rural Infrastructure and Smallholders Commercialization: Analysis of Crop Input Market from Jimma Zone, South-West Ethiopia

[1]Minyahil Alemu and Amsalu Dachito

Jimma University, Ethiopia

***Abstract*:**

Commercial transformation of subsistence agriculture is vital towards transforming the sector, and the economy at large. Since agriculture accounts for the dominant role in terms of employment, foreign currency and source of staple food across developing countries, enhancing commercialization of smallholders' agriculture is compelling policy choice among them. In this paper we examined the effect of rural infrastructure on smallholders' crop input market participation with reference to Jimma zone. Censored Tobit approach was employed to model the relationships between degree of household market participation from input side and the provision of rural infrastructure. Distance to the nearest all-weather-road from the farm area was found important. Moreover, provision of rural credit services, communication services and rural market center have been significant contributors. Unfortunately, we estimated trivial coefficient for agricultural services in relation to rural commercialization. It seems surprising as various inadequacies in the provision of the services may be involved. The right approach for the future should consider efficiency as well as adequacy of the services being provided. It would be better to reach smallholders' with necessary hard and soft infrastructures towards realizing multidimensional growth and transformational targets. Besides, interventions intensifying rural access to information are vital.

Keywords: Censored Tobit, Infrastructure, Crop Input Market Index, Commercialization

1. *Introduction*

Commercial transformation of subsistence agriculture is an indispensable approach to ensure the transformation of overall economy and realize the leading objective of most developing economies; i.e., industrialization. Since the lion share of these countries economy in terms of employment, foreign currency and output is accounted for agricultural sector, economic transformation is hardly possible unless prior transformation is realized from the agriculture (Timmer, 1997; Pingali and Rosegrant, 1995). Besides maintaining an overall economic transformation and economic development at large, commercial transformation of subsistence agriculture is also vital towards insuring food security and peoples' welfare, especially among developing nations. According to Romer (1996), commercialization of subsistence agriculture is expected to bring comparative advantages, economies of scale and exchange of knowledge as

[1] PhD Candidates, Economics
Corresponding author: minale16@yahoo.com
Coauthor can be reached at dachinamo@gmail.com

well as facilitate innovation. These imported technologies and production ideas are further meant to significantly reduce average costs of production among recipient countries, increase gains from international trade and would result in overall economic growth and transformation. Romer pointed out that, since it is cheaper to copy knowledge than to create the marginal cost of production is likely to fall with new idea so that the rate of economic convergence would be higher among them (Romer, 1994; 1996). Thus, the development and advancement of institutions required for commercial transformation of farms across developing countries is an essential, more likely the leading strategy, if economic transformation is to be realized.

The development of infrastructure is vital towards enhancing smallholders' commercialization. Provision of rural infrastructure could be viewed as a priori to enhance the market participation of smallholders both from the input and output sides. These include rural all-weather roads, communication services, credit services, agricultural extension and the like. In contrast, developing countries are characterized by low or poor provision of the basic necessities for agricultural marketing, and it has been mentioned as among the constraints for the development of the sector among third-world countries (Chan *et al*., 2009; Stewart, 2010). Theoretically, infrastructure is expected to increase total output in two basic ways: (*i*) directly, own sectorial contribution to GDP and serving as an input in the production process of other sectors; and (*ii*) indirectly, nurturing total factor productivity by decreasing transaction and related costs, consequently allowing an efficient use of existing inputs. Infrastructure can be described as a complementary element for transformation of subsistence agriculture, and maintaining economic growth (Newbery, 2012; Rosewell, 2012). Asian Development Bank revealed that road accessibility gives access to market and integrates different market areas, lessens the risks for which the rural poor are often exposed to. Pervasive delivery of access to all-weather roads would grant generous benefits, bulk of them going to the poor on average (Barrett, 2014). How big is the contribution of rural infrastructure in the development of smallholders' commercialization from the input side? It is our driving motive in this paper, taking a random draw of households from rural Jimma.

Ethiopia has adopted smallholder agricultural commercialization as a scheme for agricultural transformation and development. Extension services, farm input and credit supply have been intensifying ominously to ensure sectorial transformation, while the government is the main actor in the provision of these services. A growing body of researches document that, without significant intervention from the private sector, the public sector alone couldn't realize efficiency and hence transformation in the agriculture, both in production and commercialization (Strasberg *et al*., 1999; Pender and Alemu, 2007; Pingali 1997). A recent work by G/Medhin *et al*. (2009) revealed that the development of agricultural services contributed significantly to the intensity of farm input adoption, productivity of agriculture and smallholder market participation across different regions of Ethiopia. We focus on the analysis of how infrastructure development affect smallholders market participation from the input side only employing household level data from rural Jimma.

Despite the recognized role of agricultural commercialization towards transformation of the sector in particular, and the economy at large, the topic of smallholder commercialization particularly from the input side has remained untouched in domestic literatures. Significant research attention examined productivity of the sector. Considering distribution is equally important deal if real transformation of the sector is to be tangible. Besides, even though the

topic is extensively talked in policy oriented scrutiny, the emphasis is inadequate in an evidence-based literature. Henceforth, here we aim to pave policy concern to that end.

The paper examines the impact of rural infrastructure on smallholders crop input market participation in Jimma zone of Oromia regional state.

1. *Methodology*

1.1. *Description of the Study Area: Jimma Zone*

Geographically, Jimma zone is situated at South-West Ethiopia. Jimma Zone administration is composed of twenty one sub-lower administrative units, locally named, *Woreda*. The total number of human population was reported to surge three million under 516, 321 households in general, according to the official report from culture and tourism department in 2016/17. Jimma Zone is characterized by an agro-ecological setting of highlands (15%), midlands (67%) and lowlands (18%). It is one among the major coffee growing areas in in Ethiopia, even claiming the legal recognition considering self being 'Land of Coffee Origin', though remained an issue of debate due to the same claim from other parts of the country. Jimma zone consistently receives favorable rains ranging from 1200-2800 mm per annum; this atmosphere is very comfortable to invest in the area of agro-industry as well as investments based on active community participation (UNDP, 2014).

1.2. *The Data: Type, Source, Nature*

We used both primary and secondary data types. Primary data were sourced from the individual respondents included in the survey. Besides, we obtained secondary data from Jimma zone agriculture department, Finance and Economic Development office, and Trade Departments of the zone and respective woreda offices. The analysis is based on cross-sectional observations of sample smallholder households during 2018/19 production year.

1.3. *Sampling: Size and Techniques*

Out of twenty one *woredas* we arbitrarily selected six: *Limmu Kossa, Gomma, Manna, Omo Nada, TiroAfeta and Setema*. Each *woreda* was further divided into sections based on *kebele* constituents, the lowest administrative unit. Random proportionate sample of *kebele* was selected from each *woreda*. Finally, households were proportionally randomly drawn from each *kebele* administration. Therefore, the sampling procedure has passed through multiple stages.

According to official record from Jimma zone administration in 2017/18, the respective household size each sample woreda is estimated at; 7,343; 4,540; 4,818; 28,574; 17,442 and 13,469, added to give a total of 76,186 households. The appropriate sample size was determined following Noel *et al*. (2012) indicated below; (for d = 0.05; Z =1.96)

$$n \geq \frac{N}{1+(N-1)\left(\frac{2d}{z}\right)2} = 398$$

The sample was proportionally distributed across six woredas included in the survey.

1.4. *Data Analysis*:

(a) Crop Input Market Participation Index

A conventional approach in measuring the household commercialization from input side is to take the ratio of the value of crop inputs purchased to the total value of crops produced in a particular production period (see for instance, Shively *et al*, 2009; FAO, 2012). We however argue such indexing is inappropriate from the computational as well as conceptual point of views. Berhanu and Moti have of course gone through their smallholder analysis in line with our indexation of the *CIMP* (details on Birhanu and Moti, 2010). It is extremely misleading to imagine that every input used comes from some external source. For instance, a typical rural household in Ethiopia retains some portion of crops cultivated at a given production season, that would serve as input for the next production season. He or she then fills the likely input gap from external sources in the form of input purchase. In the context of our survey we argue such indexation of crop input commercialization is highly weak. We then considered two aggregate values to index farmer's intensity of commercialization from the input side: value of crop inputs purchased and used. Our exposition here follows; households' obtain inputs from two sources; partly from their granary and the rest from market. Only the portion obtained from input market well explains the degree of market participation of the householders.

Following this conceptualization, we index the crop input market participation as the proportion of gross value of purchased inputs from the total value of crop inputs used in annual production. Therefore, we hoped our way best indexes the extent to crop input commercialization by smallholder households in Jimma Zone.

It is important to realize also that, a typical household may produce different types of crop, and hence use various combinations of crop inputs. Customarily it needs aggregation of values. We first need to value the total inputs used, both internal and external, by each household in annual crop production. Internal inputs could be valued at their current market prices. Besides, the amount of expenditure household incurred to buy different combination of external inputs in the annual crop production measures the total value of purchased crop inputs. This value can either be reported as final sum or we rather record individual figures and manipulate for aggregation. We expect market information on price and supply of relevant inputs from Jimma zone departments for trade and agricultural development.

Smallholders' agricultural commercialization from the input side is captured as the proportionate value of all crop inputs purchased to total values of crop inputs used in annual crop production season. Consequently, the crop-input market participation *(CIMP)* index to the present study is given by equation below;

$$CIMP_i = \frac{\sum_{k=1}^{K} \bar{P}_r L_{ik}^{P}}{\sum_{k=1}^{K} \bar{P}_k L_{ik}^{T}}$$

Where, *CIMP* is crop input market participation for i^{th} householder; L_{ir}^{P} is the amount of input k bought each household at an average input price of $\bar{P}_r$. L_{ik}^{T} is the total quantity of input r used by each household in annual crop production.

(b) Censored Tobit Specification

The CIMP index, the response variable of this particular analysis, is categorical in nature. Thus, we will be adapting a discrete choice dependent regression models to estimate the impact of rural

infrastructure on smallholder commercialization from the input side. Another thing to note is that, we cannot assume every sample observation to involve in the purchase of crop inputs during annual production. Its statistical implication follows that, information on the degree of input commercialization for some observation would be missing. It is actually empirical fact in Ethiopia to observe a weak or even no participation of most smallholders in crop input markets. Few of them used to purchase only crop inputs in case of inadequate reserves from previous harvest season. In case of adequate amount of stocks in their granary, they could no longer participate in the input market to purchase other farm inputs. Related to various socio-economic and other technical factors, most smallholders in Ethiopia are highly reluctant to adopting farm technologies. A case of fertilizer adoption best explains such phenomenon in the country. An important point here follows is, it makes no sense to expect entire set of information on CIMP by all sample observation while modeling its relationship with rural infrastructure. Data would be available only for some of the sample observation (households); hence, we have censored observation. This further necessitates estimation of censored regression model to quantify the impact of rural infrastructure on smallholders input market participation. Censored Tobit is suitable approach to appropriately model such relationships in the context of the present survey. Censored Tobit could be described as the expression:

$$y_i^* = x_i'\beta + \varepsilon_i$$

$$y_i = \begin{cases} 0, \text{ if } y_i^* \leq 0 \\ 1, \text{ if } y_i^* > 0 \end{cases}$$

Where N is the number of observations, y_i is the dependent variable (*proportion of crop input purchased by smallholder i in the observation period*); x_i is a vector of independent variables; β is a vector of estimable parameters, βx_i denotes the scalar product of two vectors, and ε_i is a normally and independently distributed error term with zero mean and constant variance σ^2, i.e. $\varepsilon \sim N(0, \sigma^2)$. It is assumed to be an implicit, stochastic index (latent variable) equal to y_i* which is observed only when positive.

Our empirical guideline is adapted from Taylor *et al* (2008). We model the relationships using Tobit framework accordingly. The model's likelihood function over zero observation (0) and positive observations (1) can be expressed as;

$$log\ L = \sum_{i=1}^{N} \left[I_i^a\ log\ \Phi\left(\frac{a - x_i'\beta}{\sigma}\right) + I_i^b\ log\ \Phi\left(\frac{x_i'\beta - b}{\sigma}\right) + \left(1 - I_i^a - I_i^b\right)\left(log\ \emptyset\left(\frac{y_i - x_i'\beta}{\sigma}\right) - log\sigma\right)\right]$$

Where ϕ (.) and Φ(.), respectively, represent the probability density function (pdf) and the cumulative distribution function of the standard normal distribution; $I_i^a and\ I_i^b$ are indicator functions each with:

$$I_i^a = \begin{cases} 1, & \text{if } y_i = a \\ 0, & \text{if } y_i > b \end{cases} \qquad I_i^b = \begin{cases} 1, & \text{if } y_i = b \\ 0, & \text{if } y_i > a \end{cases}$$

Maximum Likelihood (ML) approach for censored regression model is regarded as the Tobit model in the present analysis; and ML Tobit was analyzed using the software package for STATA version 14. The main benefit of using this model is that it produces consistent estimate

of standard errors and can easily be used to test statistical significance of the parameters (Florens *et al*, 2007; Gujarati, 2004; Wooldridge, 2003).

CIMP is modeled as a function of gender characteristics of the householder *(Sex)*, age of HH head *(Age)*, education of the householder *(Educ.)*, household labor *(Labor)*, non-farm income *(Income)*, radio-ownership *(radio)*, distance to nearest all-weather rad *(Road)*, access to credit *(Crdt)*, distance to nearest market (mkt), extension services *(Ext), livestock (livstk), and market orientation (mktornt)* as follows;

$CIMP_i = f$ *(sex, age, Educ, hh labor, non-farm income, radio, Road access, mkt access, credit, ext, livstk, mktornt,* u_i*)*

1.5. *Variables Definition and Expectations*

Table 1: *Description of Explanatory Variables and Expected Effect*

Variable/Attribute	Variable Type	Variable Measurement	Expectation
Sex of HH head	Dummy	1 if household head is male, otherwise 0	+/-
Age of HH head	Continuous	Age of the household head (years)	+
Level of Education	Continuous	Formal education of the household head (years of schooling)	+
Mkt distance	Continuous	Amount of land under cultivation of farm household	-
Household labor	Continuous	Number of active family members working on the family farm (aged 15–60yrs)	+
Non-farm income	Continuous	Total income earned from non-farm activities in the production year	+
Radio ownership	Dummy	1 if a household owns and 0 otherwise	+
Road distance	Continuous	Distance in kilometers from the nearest all-weather road	
Extension services	Dummy	1 if a household involved in extension services the last year, and 0 otherwise	+
Access to Credit	Continuous	Amount in birr of financial loan previous year	+
Livestock	Dummy	1 if a household also produce tropical livestock and 0 otherwise	+
Market orientation	Dummy	1 if the farmer's production is more of market oriented, and 0 otherwise	+

2. *Results and Discussion*

2.1. *Descriptive Information*

Here we present the descriptive statistics of variables used in the estimation of censored Tobit, and highlight the implication with each figure.

Table 2: *Descriptive information of the variables entered the Tobit regression*

Variables	Obs.	Mean	Std. Dev.	Min.	Max.
Crop input market participation index	398	10.29	14.694	0	87
Value of crop inputs used (ETB)	398	1234.215	725.245	0	4751.34
Value of crop inputs purchased (ETB)	398	253.106	521.214	0	3137.45
Age of the household head	398	46.82	11.814	26	82
Household labor supply	398	5.00	1.953	1	9
Non-farm income (1 = exists)	398	0.713	0.453	0	1

Radio ownership (1 = owns)	398	0.50	0.501	0	1
Distance to nearest all-weather road	398	4.39	5.131	0.1	8.5
Distance to nearest market place	398	4.24	5.899	0.02	9.8
Agricultural ext. (1= consulted last year)	398	0.93	0.257	0	1
Livestock production (1 = producing)	398	0.90	0.293	0	1
Market orientation (1 = Oriented)	398	0.91	0.282	0	1
Size of credit previous year	398	3714.27	1008.021	0	8000
Education (years of schooling)	398	3.45	4.760	0	12

Source: (Own Survey, 2018/19)

An average crop input market participation index is about 11 percent signifying low participation rate in the study area. The computed average index for crop input market participation by smallholder farming is 10.29, while the minimum and maximum indexes area 0 and 87 percentages, respectively. This huge difference implies considerable variability across individual farmers with regard to their status in involving in the crop input markets as purchasers. Overall, the calculated mean index shows the lowest degree of crop input market participation by the smallholder farmers around Jimma zone. This can farther be confirmed from the maximum and minimum values of crop inputs applied in the annual crop production, both from the external and internal sources.

The average value of crop input used for annual crop production is estimated at 1,234.215 birr, of which about 253.106 birr come from external markets in the form of purchased inputs. That is, on average value of about 20.51 per cent only is purchased input in the production of annual crop production in the study area, indicating a very low proportion of purchased crop inputs. These figures are obvious to Ethiopian agriculture, since most smallholder farmers rely more on the use of internal resources as own family labor, seeds reserves from previous harvest year for current production, home based composts and the like. Only relatively advanced farmers purchase improved seeds, chemical fertilizers on demand, and other sophisticated farm technologies. However, the proportion of purchased inputs appears to be very low, since majority are reluctant to purchase crop inputs considerably due to economic and technical as well as institutional reasons. The average household labor supply is about 5 persons per head, with a minimum of 1 and maximum of 9 workers each case, indicating moderate availability of workers actively serving own farm irrespective of to what extent the quality of labor supply is. Generally speaking, labor quality can be noted out in reference to the average years of schooling which is suggested to be about 3 years. However, the computed average years of school enrolment is very low compared to the country's minimum standard for basic education. Thus, the household labor supply though moderate in quantity, is less efficient due to inadequate education.

About 155 (38.94 percent) of the household in the study area is headed by female, indicating the paramount role of women in managing the household and making farming as well as marketing decisions. Though the proportion is less compared to their male counterparts, still the revealed share is considerable.

About 93 percent households in the sample involved in agricultural extension programs the previous year, indicating that they are better aware on the likely positive effect of general knowledge for farming practices. Besides, the agricultural service providers are effective in reaching more households, though the estimated impact of extension service on smallholder

commercialization was insignificant. This may, in turn, be due to service inefficiency, service inadequacy, or even inadequate factors from the users' side (Barrett, 2014; Sourovi *et al*, 2012; Mtigwe *et al*, 2013). This particular finding implies that, it is service quality that matters more in enhancing the commercial transformation of subsistence agriculture.

2.2. *Inferential Analysis: Censored Tobit Estimation*

Before we run regression on censored Tobit, we examined the validity and reliability conditions and none of them was suggested invalid. Below is the Stata 14 front page display for our regression for the censored Tobit:

Table 3: *Factors affecting smallholders' crop input market participation*

Explanatory Variables	*Coef.*	*Prob.*
Sex of household head (Female = 1)	-0.0470501	0.036
Age of household head	-0.0018209	0.174
Education of household head	0.0214895	0.000
Active household farm labor	0.0668203	0.000
Non-farm income	0.2302946	0.000
Radio ownership (1= ownership)	0.0461459	0.042
Distance from nearest all-weather road	-0.0374712	0.000
Agricultural extension (1=if consulted)	0.0213435	0.859
Livestock production (1 = produce)	-0.0102509	0.870
Orientation (1 = cash crop, 0 = non-cash)	0.1208748	0.108
Amount of financial credit previous year (ETB)	0.0000594	0.000
Distance from nearest town (market center)	-0.0328414	0.000
Number of obs. = 380	LR Chi2(12) = 872.49 (0.000)	

Source: Own survey, 2018/19

Evident from table 3 significant and relevant role of infrastructure services to intensifying smallholder commercialization. We see that, Household participation in yearly crop inputs purchase market is influenced by household heads' gender and education, family labor supply, participation in off-farm activities, market orientation, access to all-weather road, and access to finance. With exception to ambiguities in some variables, all others have expected signs.

Distance to nearest all-weather road lessens smallholder farmers' participation into the crop input market as buyer, due to its role in increasing transportation and related transactions costs. The left censored Tobit model estimation results in table 3 confirm that, for every km distance in the households' settlement area from the nearest all-weather roads, the household participation into the crop input market detracts on average by about 0.034 (0.000), which is found to be strongly significant response from the market side. Being far from the main road has negative effect on crop input market participation since transportation costs are likely to complement access to road. Distance from the transport facility, due to its unfavorable effect on decision of farm, influences producers consent to purchase farm inputs, and hinders them from involving into the market. Very large distance from the main road is likely associated with higher transport costs, which in turn, potentially reduces the efficiency of farm operation. Inefficient farm operations tend to be highly sensitive to potential risks involved, and farmers become reluctant of making risky decisions. As a result, the farmers' production will be limited to home consumption and

their participation into the market, both as sellers and buyers, will be very low (Janvry, 1995; Rosegrant, 1995; Janvry *et al*, 2003).

As expected, distance to the nearest physical market center from the farmer's settlement area detracts the household participation into the crop input markets as a buyer, since production decisions are highly determined by access to marketing signals. An additional kilometer distance to the nearest market area reduces the households crop input market participation by an average factor of 0.33(table 3); and that, the suggested market participation response was strongly significant too. Rational firms make efficiency analysis, both from production and distribution segments. Large distance to market center is more likely associated with higher transactional and distribution costs, which in turn, are reflected by higher product prices. This all has an important implication with the demand aspect of the market to the firm, and the welfare issue from the society. As the farmer's location is highly distant from the nearest market center, its participation into the crop market will be very low, as more distances are meant to increase the transport costs that would be borne to move the products to the market center. A firm may become reluctant of producing marketable goods fearing these and related firm-specific (subjective) costs, that could potentially influence its competitiveness in the markets. Firms with lower transport costs may charge lower prices and vice versa. As the production falls, firm's decision to purchase farm inputs will also fall, and hence its participation into the crop input market is low. Therefore, access to markets has an important implication with the smallholder farmer crop input market participation as a purchaser.

Loan services are also crucial for smallholder firms participating in the crop input markets as purchasers, since enhanced financial resources would have important implication with the farmers' purchasing power and buying decision. Other things constant, more financial resources are expected to increase the quantity and quality of inputs purchased (Goletti, 2015; Gebremedhin and Jaleta, 2010; Egbetokun and Monona, 2012). We put a caustion here that, farmer's buying decisions are not absolutely expounded by their fanacial competency, rather that, productions are subject to different natural as well as environmental shocks. Assuming normal stable system, buying decisions are positively interrelated with financial capacities; therefore, as firm's buy more inputs, their participation improves significantly. Finance is the most persecutor of Ethiopian agriculture. Rural households get cash only during hasrvest period, which in turn is to be consumed entirely, due to inadequate skills of resource utilization. Thus, they lack money to buy external farm inputs to complement internal resources. Provision of credit access together with agricultural extension services and enterprenuerial skills would be vital towards enhancing rural development.

Business and marketing information being provided thru radio channels for the study area were advocated effective. Evident from table 3 is the equitably significant and positive coefficient demonstrating the differential effect of owning radio on the households' participation into the crop input markets as buyers. Other things held constant, radio owners' involvement into the market mentioned is 0.046 times better than those who do not own, and the computed difference was economically eloquent. Households who own radio can access marketing information from different radio channels transmitted around the study area, of which the three come from the national radio service (Ethiopian radio services), FM 98.1 (Fana broadcasting corporation Jimma center), and Jimma University Community based radio services. These radio services provide regular marketing informations such as prices, innovations, demand and supply conditions as

well as other relevant issues. Access to the prevailing timely marketing informations is crucial to analyze the general business environment and improving the forecasting efficiency for the firms (Janvry, 1995; Hossain, 2007; Sourovi *et al*, 2012; Williamson, 1991). This particular finding validates theories favoring the relevance of information symettry for market efficiency.

As it can be seen above, household heads' education is significantly associated with household involvement in crop market as a purchaser. Besides, education is found to positively associate to households' market participation from the input side. Note that, this positive association between the two variables is expected (Ele *et al*, 2013; Chirwa, 2012; G/Medhin and Jaleta, 2010). With education peoples' analytical skill improves (Chirwa, 2012), forecasts appear to be near to perfect (Barrett, 2014), technical and allocative efficiencies are enhanced (Chirwa, 2012; Barrett, 2014). An implication therefore follows that, the household's participation to crop input commercialization as a buyer improves with better education, due to its positive impulses of which a little is as suggested by the above authors.

Actively available family labor is significantly linked with household involvement as a purchaser in the crop input market. For every additional active family labor supply, the household's degree of market involvement improves on average by a rate of 0.067 (table 3), which as indicated is a substantial contribution. This finding is more likely, especially to Ethiopia, where family labor is complementing external input. Due to the primitive technology in the Ethiopian agriculture, farm practices are based mostly on family labor, which in turn, is unskilled and less trained (G/Medhin and Jaleta, 2010; Getnet *et al*, 2013; Goshu *et al*, 2012; Pender, 2007). Citrus paribus, an additional person to a particular family's farm plot is expected to advance the family's degree of input commercialization, on average by about 6 per cent. Besides, an individual person's contribution in reference to family stands has been suggested economically meaningful too.

2.3. *Hard versus Soft Infrastructures: Comparative Statistics*

We do have basically two forms of investments with reference to agriculture (Ulimwengu *et al*, 2009; Porto *et al*, 2011; Egbetokun and Monona, 2012). These include investments for agriculture and investments in agriculture. While hard infrastructures constitute investments for agriculture, as for example, investments in rural roads, telecommunication, rural health and etc, soft infrastructures constitute investments in agriculture; like *R&D*, agricultural extension services, irrigation projects, policies related to product distribution, etc. Some authors claim that investments in hard infrastructure (roads, communication and energy supply) are necessary, but not sufficient for effective market amalgamation. They further attest for the stipulation of soft infrastructure as key not only to the lessening of costs, but also to the provision of quality products. Still some others favor more investments in hard infrastructures with reference to rural development and smallholder commercialization as well.

Table 4: *Left Censored Tobit Estimates: Hard versus Soft Infrastructures for CIMP*

Explanatory Variables	*Coef.*	*Prob.*
Distance from nearest all-weather roads	-0.0374712	0.000
Agricultural Extension	0.0213435	0.859

Source: (*Own Survey*, 2018/19)

While distance to nearest all-weather road from the smallholders settlement area is proxy to hard infrastructure (as it is potential candidate to investments for agriculture in most literatures), soft infrastructure has been represented by agricultural extension services. According to information in table 4, the estimated coefficient for distance to all-weather roads being -0.0374712 (0.000) is negative and considerable from the statistical point of view. It demonstrates that, access to road has meaningful implication with smallholders' decision to participate in the crop market from the input side. A negative association between road access and market participation describes that, smallholders far from the rural road are less likely to participate in the crop input market as buyers and vice versa. Thus, households' degree of commercialization varies inversely with their distance in kilometers from the nearest rural all-weather road. The positive impulse from road accessibility goes to smallholder commercialization in a number of ways. Access to road gives increases access to markets, integrates different market areas, alleviates risks for which the rural poor are often exposed to, and improves welfare arising from enhanced access to basic social services (AsDB, 2103; Kassa *et al*, 2013; Pingali, 2012).

Unfortunately, the coefficient for agricultural extension service is insignificant, implying that the service being actually provided in Jimma zone is not effective, or didn't hit the target. Yet, it doesn't necessarily imply that agricultural extension services are irrelevant to rural development, but the estimated insignificant coefficient may be due to inadequacy of the service, which may in turn be due to lack of adequate knowledge among service providers, low farmers' awareness, time and condition aspects of the service provision. Generally, efficient rural development services are argued to improve the production as well as managerial skills, which in turn more productions. As a result, more production demand more input usage and allows farmers to purchase more external farm inputs. Despite its suggested positive impulse, we estimated the insignificant impact of soft infrastructures on smallholder commercialization from the input side.

3. *Conclusion and Policy Implications*

Enhanced market for agriculture is crucial in ensuring the development needs of, particularly emerging economies, like Ethiopia. Commercial transformation of smallholder farming involves decisions based on market signals. Decisions regarding market signals are made in accordance with firm's production being market oriented. However, market orientation is not an end, but a necessary approach in the commercialization of agriculture. Crucial thing is on the farmers active participation in both the input and output markets for agriculture. Distance to the nearest all-weather road from the household settlement area was found to be a significant deterrent to smallholder participation to crop input markets as purchasers, due to its implication to high transportation costs for shipping the goods and services to reach users. This finding suggest for improved provision of transport facilities, including rural roads, for enhanced commercial transformation of the sector in the study area. Other things constant, input demand are directly related to the firms productive capacity, which in turn is influenced by availability of necessary infrastructures. Transport facilities are among the basic prerequisites in farm decisions. Due its important implication with increased transport costs, distance to the nearest market place is also a significant constraint to smallholder participation to crop input market as a buyer, implying also that enhanced access to markets, both inputs and output, enhanced the smallholder participation into the crop input market as well as commercial transformation of the sector. The effects of both distances (market and all-weather road) are reflected via their important implication with the cost of transportation. Therefore, improved access to transport facilities

would automatically solve the inadequate impulses from road and market accesses. It is necessary to look for alternative transportation that is efficient in serving the rural people.

Agricultural extension appears ineffective despite its conventional expectation. Due to its anticipated role in maintaining the attitude of commercialization among the smallholder farmers, extension services are expected to enable commercialization through easing of farmer-buyer linkages. The irrelevant effect of extension service calls for an effective and successful intervention to improve those extension services among the rural people in order to realize all of its positive impulses towards improving the smallholder crop input market participation in the study area. The differential effect of being radio owner was suggested favorable due to its important implication to information source. Interventions intensifying rural access to information are vital.

References

Barrett (2014), "Smallholder market participation: Concepts and Evidence from Eastern and Southern Africa", Food Policy, 299–317.

Chan C., Forwood D., Roper H, and Sayers C. (2009), "Public Infrastructure Financing: International Perspective", Staff Working Paper for Productivity Commission

Chirwa and Matita (2012), "From Subsistence to Smallholder Commercial Farming in Malawi: A Case of NASFAM Commercialization Initiatives", Brighton, UK, Working Paper

Egbetokun and Monona (2012), "Determinants of Farmers' Participation in Food Market in Ogun State", Global Journal of Science Frontier Research Agriculture and Veterinary Sciences, 12(1)

Eskola (2005), "Commercialization and Poverty in Tanzania: Household-Level Analysis", Discussion Paper, Department of Economics, University of Copenhagen, Copenhagen

Gebremedhin and Jaleta (2010), "Commercialization of Smallholders: Is Market Participation Enough?", Joint 3rd of AAAE and 48th AEASA Conference, Cape Town, South Africa

Gebremedhin B., Jaleta M. and Hoekstra D. (2009), "Smallholders, Institutional Services and Commercial transformation in Ethiopia", Agricultural Economics, 40(S)

Goletti (2015), "Agricultural Commercialization, Value Chains and Poverty Reduction, Making Markets World Better for the Poor", Discussion Paper, AsianDevelopment Bank.

Goshu, Kassa, Ketema (2012), "Measuring Smallholder Commercialization Decision and Interaction in Ethiopia", Journal of Economics and Sustainable Development, vol. 3,

Gujarati (2004), "Basic Econometrics", 4th Edition, Tata Mc-Graw-Hill Publishing Company Limited, New Delhi, India.

Newbery D. (2012), "Energy and Infrastructure", Working paper, LSE Growth Commission.

Pender J. and Alemu D. (2007), "Determinants of Smallholder Commercialization of Food Crops: Theory and Evidence from Ethiopia", Policy Paper, IFPRI, Washington D.C.

Pingali and Rosegrant (1995), "Agricultural commercialization and diversification: Process and polices" Food Policy, vol. 20, no. 3.

Romer P. (1994), "New Goods, Old Theory and the Welfare Cost of Trade Restrictions" Journal of Development Economics, 43(1)

Rosewell B. (2010), "Planning Curses: How to Deliver Long-term Investment in Infrastructure", Working Series, January 2010

Schively C. (2007), "Understanding the NIMBY and LULU Phenomena", Journal of Planning Literature, pp. 255-266.

Stewart J. (2010), ''UK National Infrastructure Plan 2010", Working Papers, European Investment Bank

Strasberg J, Yamano T, Jayne S, Nyoro J, Strauss J. and Karanja D. (1999), "Effects of Agricultural Commercialization on Food Crop Input Use and Productivity in Kenya", Working Papers No. 71. Michigan University, USA

Timmer C. (1997), “Farmers and Markets: The Political Economy of New Paradigms”, American Journal of Agricultural Economics, 79(2)

Vakis, Sadoulet and Janvry (2003), “Measuring Transactions Costs from Observed Behavior: Market Choices in Peru”, Working Paper, California University.

Williamson (1991), "Comparative economic organization: the analysis of discrete structural alternatives.", Administrative Science Quarterly

Wooldridge J., (2003), “Introductory Econometrics: A Modern Approach”, Mason, Ohio: South-Western.