Trader-supplier Coordination in the Agrifood Supply Chains in Northern Ethiopia

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Abstract
There exists a huge agrifood potential in Ethiopia. However, the country's agrifood supply chains are underdeveloped to deliver quality supply to traders and supplement household livelihoods from the sector. The key factors that determine the proper functioning of supplier-trader chains were not rigorously investigated, at least in the case study area. This paper aims at examining the key determinants in choosing vertical coordination for agrifood products in Tigray, Northern Ethiopia. Structured questionnaires were administered to 247 traders in 10 towns in Tigray. Probit model was employed to identify the key determinants of vertical coordination. Model results show that market information, product characteristics, firm characteristics, and product quality were found significant factors in determining the adoption of vertical coordination. An interesting finding is that traders tend to vertically coordinate so as to get credit from suppliers. Based on our findings we suggest that strengthening quality assurance and contract enforcement institutions appears to be an important intervention area to improve the agrifood chain in the study area. Moreover, providing financial support to encourage the private sector to operate in agro-processing is among the efforts that need to be focused so that it facilitates the rural development process in the region.
Key Words: vertical coordination, trader, supplier, agrifood, supply chain, Probit Model.

1. Introduction

Trading and processing firms use a continuum of vertical coordination (VC) mechanisms to acquire agrifood products. The VC continuum comprises of spot markets, contracts and vertical integration. VC in agrifood supply chains creates market linkages between traders and agricultural producers who suffer from market failures in many developing countries. In doing so VC facilitates integration of agricultural producers to the domestic and international markets.

The agrifood chains enable traders and supermarket chains to acquire agrifood products for processing or reselling. Due to the perishable nature of agricultural products, intermediation of traders and processors is necessary to get these products at consumers table. The existence of traders and processors in the chain facilitates investment in processing and preservation technologies which many of the rural producers are deprived of due to their poor financial circumstances. Traders in the chain have taken the risk and invest in those technologies and fill the missing gap in both technology and financial constraints prevailing in the rural areas.

Nevertheless, weak or absent vertical coordination between producers and traders/processors for agrifood products in rural Ethiopia results in lower market participation of smallholders and large amount of the produce remain at farm gate. Hitherto, producers who are largely smallholders have not been able to generate sufficient income from their produce. It has also been a disincentive to improve production and productivity.

Ethiopia has huge potential in the production of several agrifood products. The potential for dairy, honey and fruit production is very large but meager amount has been put for markets due to poor coordination of agrifood supply chain. The Ethiopian livestock population is the largest in Africa and 80% of the rural population possesses livestock (FAO 2010). However, its contribution to the nation's economy is limited as the number of livestock is generally regarded as a sign of wealth, rather than as an asset generating

income. As a result, most livestock products have not yet been channeled to the market system. And in case they are marketed, they rarely meet minimum quality and safety standards due to adulteration, poor storage and processing conditions. Honey production is expected to be higher due to the large number of bee colonies. In 2009, Ethiopia was the largest honey producers in Africa, producing 42,000 tons of honey (FAO, 2010). The honey export trade was 28 tones in 2005, 415 tones in 2006 and 242 tones in 2007. Bees wax export grows from 253 tones in 2005 to 422 tones in 2007. Despite the increasing trend in honey and beeswax export, it still accounts for less than 1 % of the total honey production (Gezahegne, 2006).

Ethiopia's diverse agro-ecology can support production of temperate, sub-tropical and tropical fruits. Production of fruits has been in the hands of smallholder farmers who perform subsistence agriculture. Among the total fruit produced in the country, only 1.68% was exported in 2003 (Kahsay et al, 2008). More than 47 thousand hectares of land was under fruit crops in Ethiopia and 350,000 tones of fruits were produced in the country (CSA, 2008). The production and the marketing performance of fruit have been weak due to the poor coordination in the supply chain where the government solely holds the input distribution. Lack of private sector participation in the production, processing and distribution of inputs contributes to the poor production and market performance of fruit in Ethiopia (Kahsay et al, 2008).

In Ethiopia the market is imperfect due to poor infrastructure, high transaction costs and weak institutions (Gebre-Medhin, 2001) and weak private sector and trader involvement. Traders conduct personalized trade and rarely use contracts to obtain required supply of agricultural products. The major coordination mechanism employed in crop market is direct purchase from the spot market, followed by purchasing through agents and collectors. Cooperatives as a supply source are also employed (Gebre-Medhin, 2001). However, no rigorous study has been made on determinants of the vertical coordination of agrifood products such as dairy, honey and fruit in Ethiopia. This study, therefore, aims at answering the question: "What factors determine the trader-suppler coordination in agrifood products in Tigray, Northern Ethiopia?"

The remaining part of the paper is organized as follows: the next section briefly reviews the literature and theoretical framework; section three gives a brief description on the methodology; the fourth section presents the results; section five presents the discussion and the last section concludes the paper with some policy implications.

2. Conceptual Framework

2.1. Literature

Vertical coordination is the process of harmonizing or synchronizing several interrelated and sequential decisions involved in efficiently producing and marketing the food supply (Branson and Norvell, 1983). VC can be thought of as an institutional arrangement between two extremes of spot market and full ownership. Within the interval, there are contracts and alliances of which contracting takes the lion's share in agrifood coordination in the developed and the developing world. The degree of control of the integrator increases when one moves along from the spot market to full vertical integration (Peterson, Wysocki and Harsh, 2002:152). VC may occur at various stages in a supply chain.

The main motivation of actors to engage in vertical coordination is to minimize transaction costs (Williamson, 1979). Transaction costs are the costs of making an exchange and comprise of information, negotiation and monitoring costs. Transaction costs are a result of the opportunistic behavior of economic agents assuming that opportunistic behavior leads partners not to share information, specifically in the open market. VC mitigates against opportunistic behavior because mutual interest guides the exchange relationships (Peterson, Wysocki and Harsh 2001). Traders prefer contracts to open market transactions in case where sellers demonstrate a high tendency of self interest and opportunistic behavior. Such opportunistic behavior depends on the characteristics of transactions which include (1) the uncertainty about product characteristics such as price, supply and quality, (2) the high dependency on specific suppliers due to relation-specific investments, and (3) the low frequency of transactions:

- First, the degree of quality uncertainty forces firms to have commitments with members in the supply chain. Uncertainty over product quality or reliability of supplies drives channel members to contract as a warranty to quality and supply. If product characteristics are easily observed which do not require detailed inspection at the time of delivery, open markets may work well compared to contracting (Hobbs and Young 2000). However, for milk products in rural markets, the product quality cannot be easily observed and it demands much time to inspect and check the quality. Hence, closer coordination may be preferred to open markets.

- Second, investments in specific assets (both human and equipment) will lead to have consistent supplier for the processor that may expose the firm to opportunistic suppliers. Transactions that involve asset specificity do not give room for the investor to use the asset alternatively that drive the investor to commit to the partner through vertical coordination rather than relying on spot markets. Asset specificity involves ex ante investment that are specific to the transaction (Williamson, 1979). The investor wants to make sure that the transaction is certain that encourages vertical coordination. This lead to closer coordination to mitigate against opportunistic supplier behavior and when there is risk to rely on the open market (Hobbs and Young, 2000; Williamson 1979).

- Third, frequency of transactions also characterizes transactions; transactions can be frequent or rare depending on the nature of the product. When transactions are frequent, it allows better information exchange, build up of trust and lower costs of non-compliance (Williamson 1979).

These transaction characteristics are in turn determined by product characteristics such as the perishability of products that force traders and producers to look for quick transportation, movement and secured market that drives them to closely coordinate (Hobbs and Young 2000). However, negotiation costs tend to be high since products like milk and honey are easily adulterated in rural markets. Hence, adulteration of quality forces traders to vertically coordinate so as to guarantee quality.

In the context of substantial market imperfections, additional drivers but also barriers exist influencing the propensity to vertically coordinate. Additional drivers include access to technology, information or credit (Singh, 2002). Barriers can be related to individual factors such as gender, age, education, experience and the wealth situation of actors, as demonstrated by Abdulai and Birachi (2009), Hobbs and Young (2000), Davis and Gillespie (2007); Franken et al., (2009), and Key and McBride(2003).

2.2. Model

The decision whether to vertically coordinate is a discrete choice; and agents prefer vertical coordination to open markets if the net cost of making transactions is lower using VC than in open markets (Key and McBride, 2003). In addition, Key et al. (2000) identified both fixed and proportional transaction costs. For example, if there are several smallholder sellers in the market and the firm wants to buy large volume, the searching and inspection time will vary. Hence, if searching cost is high, traders may prefer vertical coordination to open markets. Time spent to reach to the market is fixed transaction cost and if they are higher, vertical coordination will be the likely coordination mechanism. Formally, traders seek to minimize total costs (TC) of the products they procure which are represented as:

$$TC = Q(P + PTC) + FTC \quad \ldots(1)$$

where Q is the quantity to be procured, P is the purchasing price of the product, FTC is fixed transaction cost that includes search costs, and PTC is proportional transaction costs such as transportation costs and inspection costs that vary with the volume of purchase (Q). Traders choose a coordination mechanism 'v' to 's' if the former minimizes net costs for the transaction which is represented as:

$$TC_v < TC_s, \quad \text{for all } v \neq s \quad \ldots(2)$$

Hence, the objective function is to minimize the total cost by choosing a coordination mechanism v from alternative coordination mechanisms c.:

$$v = \min\{TC = Q(P + PTC) + FTC, c = 1,2,\ldots n\} \quad \ldots(3)$$

s.t.

$$TCv - TCs < 0, \quad \text{for all } v \neq s \quad \ldots(4)$$

As transaction cost is one of the components of total cost, factors affecting transaction cost also affect the amount of total cost and the profit maximizing behavior. However, the net cost saved in each coordination mechanism may not be directly observed but can be represented by their latent net costs saved TC*, such that the observed coordination mechanism represents one and zero otherwise, the threshold for all v and s can be formulated as

$$TC_c = \begin{cases} 1 \text{ if } TC_v^* < TC_s^* \\ 0 \, if \, TC_v^* \geq TC_s^* \end{cases}, \quad \text{for all } v \neq s \quad \ldots(5)$$

v and s represent two different coordination mechanisms. Then, the equation to choose vertical coordination can be specified as:

$$v = \min\{TC^* = X_c\beta + Z_c\varphi + \varepsilon_c\} \quad \ldots(6)$$

where represents a vector of variables affecting transaction costs such as sales volume, capital, specialization of firms, difficulty of getting market information, location and product characteristics; represents other variables determining the choice of vertical coordination that are related to credit need of the trader; and β and are parameter coefficients to be estimated and are i.i.d error term. Hence, the main driver of vertical coordination includes transaction costs emanating from the need of firms to get market information, better quality, and secured supply. Moreover, transaction costs are resulted from the capacity of firms explained in terms of their sales volume and capital. Therefore, from this, we can develop the following a priori expectations on the size and direction of the influence of explanatory variables on one's choice of vertical integration.

1. Absence of quality assuring mechanism exposes traders to quality adulteration and forces them to vertically coordinate so as to guard risk of poor quality. Thus, firms specializing in trading particular agrifood product may face high degree of quality adulteration if they acquire the product from several smallholder farmers in open markets.
2. The larger the size of firms, the huge the volume of products required and the greater will be the market risk they face in terms of shortages and searching costs. Thus, larger firms prefer vertical coordination to open markets.
3. Location of traders is associated with the presence of institutions to enforce agreements. Traders in large towns (zonal towns) are with better institutions to reduce ex post monitoring costs.
4. Perishable products with high degree of quality adulteration increase the propensity to vertically coordination.
5. Experienced traders are well informed about the market and are less vulnerable to the opportunistic supplier behavior and prefer open markets to vertical coordination.
6. Traders favor vertical coordination as sources of credit. Credit payments give traders time to sale and settle payment and this motivates firms to prefer closer coordination to open markets.

3. Data and Methodology

3.1 Description of the study area

The Tigray Region has an estimated total population of 4,314,456; among which 19.5% are urban inhabitants (CSA, 2008). The region is primarily agricultural and more than 80% of the population is employed in the sector though agriculture is dependent on unreliable rainfall. Livestock also play significant role in the rural economy of Tigray. They are sources of draft power for tillage and transportation, cash income from sale of livestock and livestock products, food such as milk and honey for household consumption and manure to maintain soil fertility. A survey study which is embedded in the case area of Geba catchments (5200 km^2) was set up. The catchment represents the main agro-ecological zones of the Northern Ethiopian Highlands. Ten towns comprising of diary, honey and fruit traders and processors were selected considering them as traders located in the towns where producers regard them as their nearest market.

3.2 The data

The data used in this study were collected from primary sources. A structured questionnaire was administered in May 2009 in 10 towns of Tigray to a sample of 247 dairy, honey and fruit traders and processors (i.e., 90 dairy related traders, 103 honey traders, and 54 fruit traders). We selected sample traders from 10 towns located within the Geba catchment. Using a systematic random sampling technique sample observations were drawn from the 2007 business census of the Tigray Regional Bureau Trade and Industry. Replacements were made in case the trader was no longer active in the business. As all the towns within the catchment were included, the data well represent the circumstances under study.

3.3 The Probit Model

In remote rural markets in Ethiopia, cooperatives are popular that involve contracting and commitment of its members to supply fresh milk or honey via the marketing cooperative. Thus, spot markets and vertical coordination (largely contracting) are the most common methods of coordination mechanisms practiced in rural Ethiopia. Thus, one's decision to get involved or not in one of these coordination mechanisms is a discrete choice. This can

be specified as a choice model (equation 7) and the parameters can be estimated using a Probit model (Green 2002).

$$\Pr(Y = 1/X) = \Phi(X'\beta) \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots (7)$$

where $'\beta$ is the coefficient of the unknown parameter and X is a vector of explanatory variables and (.) represents the standard normal distribution function. Parameters are estimated using maximum likelihood estimation technique.

4. Results and Discussion

4.1 The Dairy Supply Chain

The survey revealed that traders often got supply of fresh milk from the smallholder farmers producing milk at the household level. Most of the smallholder farmers produced and distributed fresh milk and butter through the open market and contract. Marketing cooperatives were also serving as a selling point to the smallholder producers signing contracts with the cooperative. Producers acquired exotic breed cows mainly from the district Agriculture and Rural Development Office (ARDO). Furthermore, the Relief Society of Tigray (REST) – a local NGO, World Vision-International NGO, religious institutions (Catholic Church and the Ethiopian Orthodox Tewahido church) were supplying inputs to cooperatives and individual farmers.

Dairy traders were mainly holders of cafe and snack businesses that were selling boiled milk, yoghurt, and butter to consumers. No processor was operating in the region. There were also collectors who collected and distributed fresh milk to the cafes' and snacks. Dairy marketing cooperatives were also distributing to other traders in the chain. Such cooperatives were selling several dairy products (fresh milk, yoghurt) to consumers. Consumers could also acquire fresh milk and other dairy products from producers or cooperative shops. Consumers used to buy boiled milk, yoghurt and other forms mainly from café's and snacks. Hence, the chain is organized as depicted on fig. 1**:**

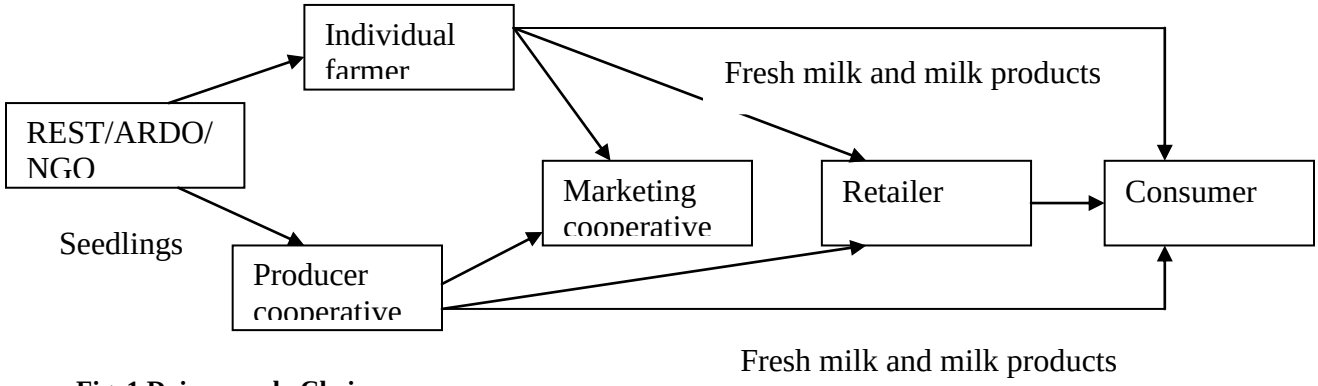

Fig. 1 Dairy supply Chain
Source: Authors' own mapping from survey and secondary sources

The coordination mechanisms employed for dairy products were the spot market, the marketing cooperatives and contracting. Traders of dairy products were cooperatives, collectors, café, pastry houses, and snacks. These traders got their fresh milk through contracts from suppliers. Marketing cooperatives were used as a selling point/collection centers and they were doing better as responded by the administrators and the cooperative chair persons except problem of demand. The main reason for their performance was their ability to meet buyers' requirement by supplying better quality as they have quality control mechanism. Moreover, they used to supply differentiated products and got trust from the buyer. Cooperatives also supplied medicine and feed for cattle to their members.

Dairy traders relied mainly on farmers who meet the requirements with respect to quality and quantity and delivering it to the place where traders need it. Hence, transportation and transaction costs of traders were minimized. 4.2 The Honey supply Chain

In all districts covered, honey has been supplied from farmers to traders. However, the survey revealed that sources of supply of input and technology were mainly from the Agriculture and Rural Development Offices, REST and other NGOs. The regional and district ARDOs emphasize on increasing production rather than value added activities and marketing. Traders in the channel rarely supply technology, input and credit to farmers. Dimma beekeeping and honey processing PLC had signed contract with 17 cooperatives in 2007 and provided beehives, honey extractor, protective clothes and honey container. However, a few of the cooperatives were successful to deliver honey back to Dimma complaining that the price offered was below the market.

As it is depicted on figure 2, the honey supply chain contains individual farmer receiving inputs from various government and development organizations; produce honey and sell it to the spot market or collectors, traders, or multipurpose cooperatives. Moreover the chain comprised of producer cooperatives that produced honey and supplied to processing companies or other traders.

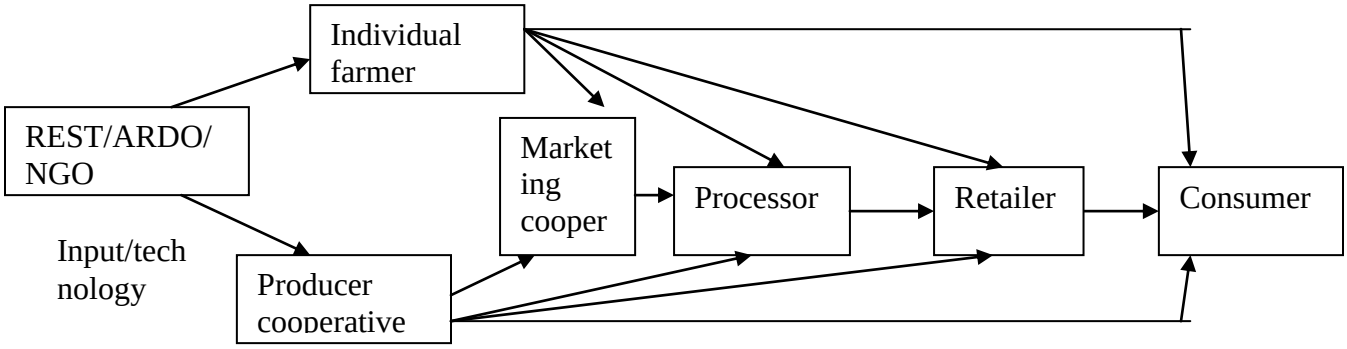

Fig. 2 Honey supply chain
Source: Authors' own mapping from survey and secondary sources

4.3 Fruit Supply Chain

The market participation of fruit producers has been weak due to small amount of production, poor preservation technologies and little support from the development agents and the government. Little participation has been observed from the private sector in input and technology distribution and fruit processing in the region. Thus, the fruit supply chain in the region is weak that lacks proper coordination. Production of fruit has not been in a stage to attract regional traders; and the traders mainly use wholesalers as the main supply source. In Tigray, the majority of the fruits are supplied from central and Southern parts of the country. Hence, the supply chain comprised of two major sources: the first chain was organized around producers within the region, for this chain, inputs were from development agents (government) and farmers are encouraged to produce fruit and they used to sell their product to the wholesaler, retailer or consumers directly. The second supply chain is organized through distributors from other regions; that is wholesalers transport from surplus producers of other regions and disseminate via retailers and supermarkets and then to consumers. The supply chain for fruit is presented in figure 3. Hitherto, locally produced fruits have not been in sufficient quantity to meet the demand

of traders in the region. As the volume of production is very small and the agricultural extension is at its infant stage, wholesalers and retailers in the region rely on other wholesalers. However, the demand for fruit is increasing triggering expansion of fruit production and trading in the region. Consequently, fruit trading becomes one of the major business activities conducted in Tigray.

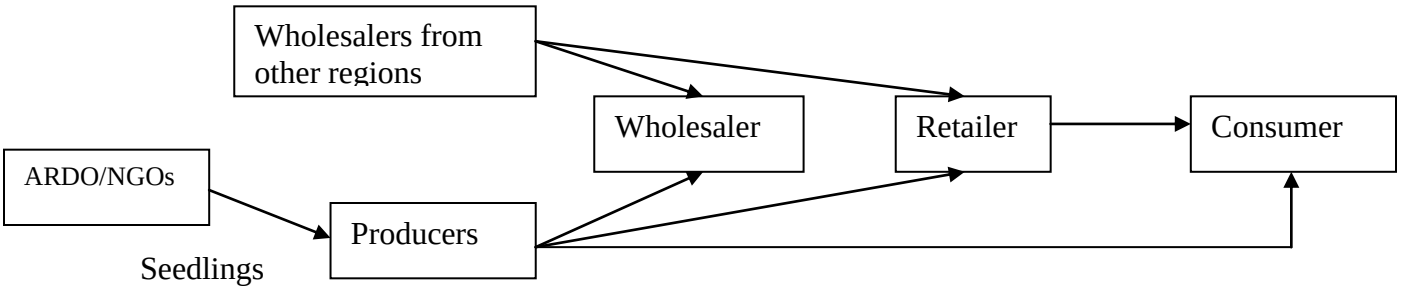

Fig.3. Fruit Supply Chain

Source: Authors' own mapping from survey and secondary sources

4.4 Descriptive statistics

The descriptive statistics indicate that 37 % of the respondents used vertical coordination (contracts and cooperatives) and the rest 63.5% relied on open markets. This implies that open markets are the most common coordination mechanism employed by traders in rural Tigray. Male headed traders account for 51% of the respondents with the remaining 49% female headed. The average level of education was six years of schooling. The business experience of traders' was on the average eight years of stay in business. The average starting capital was about USD 499.455 (ETB 8246.74)[1]. Traders perceived that getting market information was not so easy. The average annual volume of sales traders made was 10.851 tones. Nearly 54% of the traders specialized in one product carrying dairy, honey or fruit products. The rest 46 % used to sell variety of convenience products together with milk, honey or fruit. Nineteen % of the traders preferred to make payments on account. These traders might need suppliers to postpone payment. Thirty seven percent of the traders carried on dairy products, and the rest 42.3 % and 21.2 % were honey and fruit traders respectively. Regarding the location of traders, 45 % of the traders were located within the zonal towns with better institutions where as the rest 54 % were located within district towns. The summary statistics is presented on Table 3.

Table 3. Statistical summary of variables

Variable	Observation	Mean	Std. Dev.	Min	Max
Vertical coordination	241	.37	.4825	0	1
Gender	241	.51	.5009	0	1
education	241	6.41	4.4963	0	18
Starting capital	241	499.46	20017	0	9690.0
Experience	241	8.19	9.5045	.14	42.4
Difficulty of getting mkt information	241	2.0747	.6604	1	4
Sales volume	241	10.8514	60992.09	0.002	86.4
Credit payment	241	.186722	.3905	0	1
Specialization	241	.5394191	.4995	0	1

Source: Survey 2009

[1] 1USD=16.5118 ETB on December 14,2010

4.5 Results from the Probit model

The results from the Probit model are presented in Table 4. We preferred to run regression of the pooled data to capture product characteristics. Moreover, larger sample size also provides efficient estimation of unknown parameters since Maximum likelihood estimation is used in the Probit model. Furthermore, Chow test was conducted to reconfirm treatment of the pooled data together for the three products. The test indicated that running the pooled data would significantly reduce the residual sum of squares (The F-statistic $_{(11,216)}$ =1.58 that is far less than F-critical $_{(11,216)}$ =2.33 at 1 % significance level). To minimize potential endogeniety problem of VC on capital, we used beginning capital as lag variable.

Our interpretation of the model results takes several categories. The first category is related to information cost; i.e., the perception of traders regarding the difficulty of getting market information and it was found that those who perceived market information was hard to find favored vertical coordination and it was statistically significant at 5% significance level. The volume of sales was taken as an indicator for transaction costs in terms of searching buyers as the majority of suppliers were smallholder producers (Abdulai and Birachi, 2009). We anticipated that firms with large volume of sales would face high searching costs to buy huge volume from smallholders if it was made in open markets. Therefore, large volume of sales urged traders to vertical coordination so as to minimize searching costs. The model result revealed that large volume of sales triggered traders to adopt vertical coordination. Moreover, higher capital shows an investment on specific assets that might drive traders to vertical coordination. Hence, the model result revealed that those traders with big capital tend to favor vertical integration.

The other category is whether vertical coordination was driven by credit needs of traders. Model result revealed that traders regarded contracts as sources of finance for their operation. Those who preferred to pay on credit favored vertical coordination and it was statistically significant at 1 % significant level. Those traders who solely operate on single product (buy and sell only dairy, honey or fruit) might need uninterrupted supply to meet client requirements with the specific product (Key and McBride, 2003). Those specializing firms would need to maintain their reputation by supplying relatively standardized products to their clients. Therefore, firms specializing on particular agrifood product favored vertical coordination than open markets that would help them to create long term relationship with the suppliers to safeguard good quality agrifood product. If they bought from open market, traders would suffer from substandard products with high negotiation costs. These desires of the trader might trigger to vertically coordinate compared to those who sporadically buy and sell agrifood products. The empirical model result revealed that those traders operating in one product favored vertical coordination.

Coordination choice is also affected by the product characteristics since it affects transaction characteristics. Frequency, perishability and ease adulteration of products motivated traders to close coordination as market security and warranty to quality (Hobbs 2003). Milk and honey in rural Ethiopia were easily adulterated that demands traders to find mechanisms to safeguard good quality. Therefore, high negotiation costs spent in terms of quality inspection for dairy and honey products might urge traders to rely more on vertical coordination than open markets compared to fruit traders.

Furthermore, individual characteristics such as gender and experience of the trader were included in the model. The empirical model revealed that women traders favored vertical coordination as the coping mechanism for limited contact and lower economic condition women have within the community. Experience of traders was found negatively contributing to vertical coordination because experienced traders are expected to be well acquainted with the market and suppliers that enable them reduce the opportunistic supplier behavior. More experienced traders have better market knowledge that would help them reduce cost resulted from opportunistic trader behavior and hence favors open markets (Hobbs and Young 2000; Key and McBride, 2003).

Negative marginal effect of gender refers to that female headed trader would result in a rise in the probability of vertical coordination by 20.2 percent. Similarly, a year increase in the experience of the trader would result in one per cent fall in the probability of vertical coordination. If a trader perceived that market information was difficult to acquire, there would be 28.2 per cent increase in the probability of vertical coordination. One per cent change in the quantity of sales would result in 2.24 per cent increase in the likelihood of vertical coordination. Similarly, a one percent change in capital would result in 22.78 per cent increase in the likelihood of vertical coordination. If a trader specializes in one product, it would result in 21 per cent increase in the probability of VC. The need of the trader to pay on account would result in 71 per cent increase in the likelihood of VC. An entry of a dairy trader and honey trader would result in 56 per cent and 30 per cent increase in the probability of joining vertical coordination respectively but 28 percent decline in the probability of joining vertical coordination by fruit traders.

Table 4: Marginal effect (Probability of VC=1)

Independent variables	Parameter	Std. Err.	z
Gender	-0.2021**	.0866972	-2.28
Education	0.0078	.0109991	0.72
Experience	-0.0105**	.0048794	-2.15
Information is easy to get	-0.2824***	.0746094	-2.88
Information is Difficult to get	Base		
Need for Credit	0.7166***	.1150471	3.72
Location (Zone Town)	0.0947	.0871562	1.09
District Town	Base		
Specialization	0.3125***	.1060632	2.84
Dairy	0.5779***	.1161923	4.44
Fruit	-0.1992*	.0963063	-1.73
Honey	Base		
Starting capital	0.0278*	.027828	1.88
Sales volume	0.0224**	.0224536	2.09
Number of observations	241		
Wald chi2(11)	69.24***		
Pseudo R2	0.5490		
Percent correctly Predicted	87.14		

,,**,***, significant at the 10, 5, and 1 per cent significance levels*

5. Conclusion and Implications

The agrifood supply chain consisted of several actors who used to perform little value addition except making refinements and little processing. The actors in the agrifood supply chains composed of large number smallholder producers, retailers, cooperatives, wholesalers and consumers. Loose coordination prevailed among successive stages in the

chain. Thus, high transaction costs, risk of poor quality, and little input and technology support characterized the agrifood supply chain in Tigray. Open market mechanisms were found dominant though contracts and cooperatives are emerging. Vertical coordination has been dominantly practiced in the dairy supply chain as it is highly perishable and vulnerable for adulteration. Desire for secured supply source in terms of quality and quantity triggers traders to vertical coordination.

The study revealed that traditional spot markets are the popular methods for honey and fruit products traded in the region. As a coping mechanism to information asymmetry and to safeguard good quality, traders tend to vertically coordinate. Therefore, closer coordination would enable traders to reduce opportunistic behavior and information asymmetry and acquire credit services even from suppliers. Traders also tried to assure quality through closer coordination as a warranty to quality and consistent quantity delivery.

Policy makers need to focus on establishing quality assuring institutions and prepare a platform for private businesses to have closer trading relationship with suppliers. It is suggested that policy makers need to consider private sector as development partners so as to upgrade the supply chain that will in turn contribute to the improvement of production and quality of agrifood products. Concerned government organizations operating on rural development need to consider traders as partners for development and facilitate coordination between producers so that they can resolve input and credit market imperfection; they can also facilitate technology transfer to improve quality and quantity of agrifood products. It will also help them mitigate the market risk prevailing in rural Ethiopia.

Furthermore, strengthening marketing cooperatives should also be among the strategies to upgrade the supply chain because they perform collection and processing so as to improve the shelf life of agrifood products. Cooperatives also supply products that meet the quality and quantity requirements of other traders relieving traders from high transaction costs for searching buyers and quality inspection. Strengthening traders with better processing devices will enable them improve the shelf life of agrifood products; motivate them to invest in agro-processing industries should also be among the policy intervention recommended to upgrade the supply chain and to get smallholder producers connected with the global agrifood chains. Development and financial institutions need to consider building the capacity of these traders so as to strengthen and upgrade the agrifood supply chain in the region. This will play important role in improving the gains of traders and producers from the subsector and better living standards to the rural households.

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