

Governance structure and incentives in the wheat industry of Ethiopia

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Abstract

The purpose of this paper is to investigate the effects of governance structures on incentives in different functional nodes of the wheat value chain. This study used personal interview survey to collect primary data from relevant actors. The data used in analysis came from input suppliers, wheat producers, wholesalers, wheat processors and support institutions. Mixed sampling techniques (random, census and purposive) were applied to select sampling units. Data analysis: qualitative analysis, descriptive statistics and regression model were used to analyze the data. This paper found that the governance structure, transaction risks, asymmetric information and trust influence actors' incentives in each functional node of the wheat value chain (WVC). Specifically, wheat producers' incentive significantly increases with extension service, governance structure, power relation and price information. The study provides pioneering evidence on the effects of governance structure on incentives in each functional node of the value chain. The study adds new knowledge to the existing empirical knowledge. It shows the effects of coordination failures on actor's incentives. Coordination failures in the first node decrease incentives of actors which subsequently triggers unattractive incentives in subsequent nodes.

Keywords: Incentives, Spot market, Hybrid governance structure, Coordination failures, Wheat value chain

1. Introduction

For many economists, economics is to an large extent a consequence of incentives in order to supply more volume and quality products and invest in technology (Laffont and Martimort, 2002). In economics, incentives is defined as a reward or cost that motivates an economic action. For example, possible incentive mechanisms in agricultural markets are supervision of farmers

during the production period, quality measurement before purchase (Hueth *et al.*, 1999; Wolf *et al.*, 2001), and payment of price premiums in certification schemes (Dörr and Grote, 2009).

Incentives in value chains are highly associated with governance structures (Wolf *et al.*, 2001; Dekker, 2003). The intensity of incentives varies across governance structures which range from spot market to hierarchy (Williamson, 1985, 1999); hybrid governance structure lies between the extremes of the continuum. Particularly, incentive systems are linked with transaction attributes and behavioral attributes (Williamson, 1999). High uncertainty of the transactions and asset specificity aggravate the level of transaction costs which adversely influence incentives (Williamson, 1996).

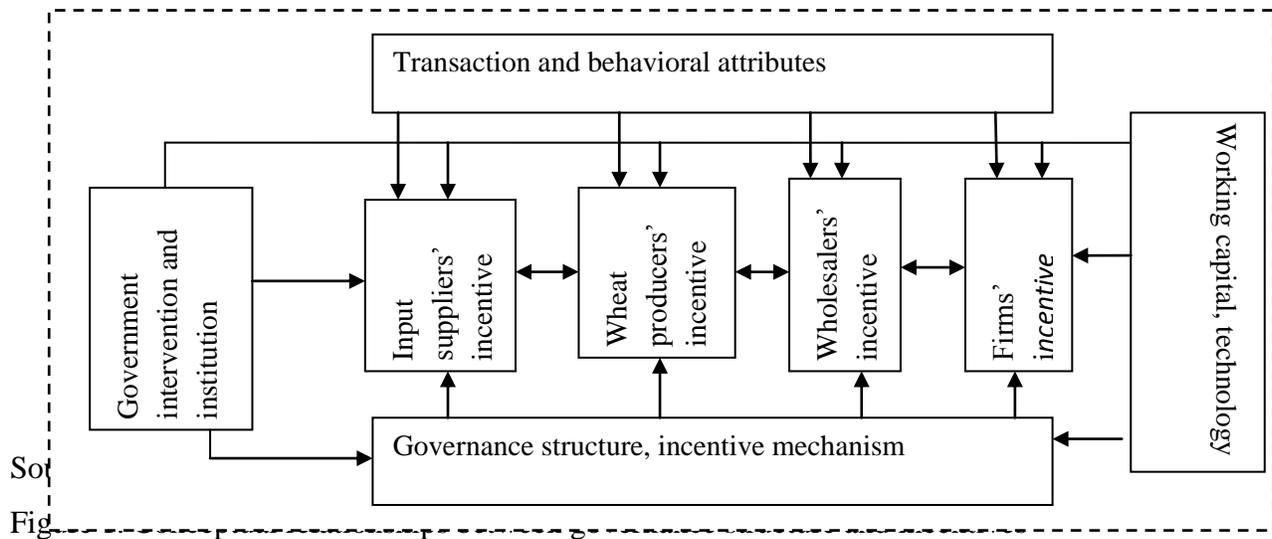
Frequent transactions between upstream and downstream actors decrease the incentives to behave opportunistically and take advantage of informational asymmetries (Hobbs, 1996; Williamson, 1999). Spot market transaction in less industrialized countries tends to reduce rewards and/or increase risks for producers because it is characterized by high physical marketing cost per unit, high uncertainty of price, poor quality grades and standards specification and lack of means of quality control which may constrain value addition (DIIDRC, 2011).

Hybrid governance structure provides more incentives because it reduces the costs of transaction, boosts bargaining power and mitigates individual risks (DIIDRC, 2011). Incentives that exist under non-spot markets are higher than those under spot markets (Kifle, 2013). Also, output price supports and input price subsidies give price and non-price incentives to actors in the value chain (Narayanan and Gulati, 2003), provide high returns and financial incentives to all value chain actors (UNIDO, 2009). Demand has tighter linkage with price incentive which motivates actors to use technology intensively in order to achieve better yield (Tefera *et al.*, 2003). However, Wheat Value Chain (WVC) is subjected to a number of challenges; among them, low incentives are the major problems which result in poor WVC function in Ethiopia (Mohammed, 2009). Various authors argued that value chain governance structure as responsible factor for low incentives (Wolf *et al.*, 2001; Dekker, 2003; FAO, 2013; Kifle, 2013). This study hypothesizes that non-spot market governance structure has better links with incentives as compared with spot market. Furthermore, there are no empirical studies on the relationship between value chain governance structure and the WVC actors' incentives in Ethiopia. Therefore, the objectives of

this study are to describe governance structure and assess the effects of transaction attributes and asymmetric information on actors' incentives. It also investigates the relationship between governance structure and wheat producers' incentive.

2. Conceptual framework

Governance structure is often used to explain transaction and behavioral characteristics which are strongly interconnected with incentives and transaction costs in each functional node of the WVC. Institutional environment has tighter links with the costs of transactions and input quality and price uncertainty in different functional nodes of the WVC. It reduces the opportunistic behavior and asymmetric information in order to increase the incentives of actors. Incentives are to a large extent a matter of social networks and trust. This study describes conceptual relationships between governance structure and incentives which are proposed for the first time in an Ethiopian context. The conceptual relationships are clearly depicted in Figure 1.



3. Methods

3.1. Data collection

This study used personal interview survey to collect the research data. It allows collecting more and deeper information. It enables enumerators to inform the respondents about the objectives and benefits of the survey so that it could increase the willingness of the respondents to provide genuine data. Prior to final data collection, a preliminary survey was carried out to make appropriate modifications in the interview schedules. This study thus targeted input suppliers, wheat producers, wheat wholesalers, wheat processors and support institutions. A separate

interview schedules consisting of detailed questions were administered to collect data from each actor. Data were gathered from wheat producers with the help of interview schedules.

We visited all wholesalers at the spot and non-spot markets and input suppliers at small retail shops and the spot markets at different times of the day to interview all present in three districts. Wholesale input suppliers were interviewed in Addis Ababa. All bakeries, flour and food complex industries were visited in each district. In addition, we visited traders and firms in Adama, Assela and Bishoftu towns as well as Addis Ababa. At last, we also visited all indirect actors to collect research data.

3.2. Sampling techniques

This study used a multi-stage sampling technique to select sampling units. Two major wheat producing zones were purposely selected and further streamlined them into major and minor wheat producing districts. We randomly chose three districts, Gimbichu district from East Shewa zone and Hetosa and Tiyo districts from Arsi zone of major wheat producing districts. Again, we demarcated these 3 randomly selected districts into major and minor wheat producing villages. From major wheat producing villages of the 3 districts, we selected 2 villages at random from each district (i.e., a total of 6 villages). Finally, data used in this paper were randomly collected from 220 wheat producers from 6 villages in probability proportional to their size. The total sample size was determined on the basis of 10 or more times a number of relevant independent variables in the given model which is recommended by most statisticians and econometricians (Edriss, 2013).

A sampling frame contains the list of names of all towns in the zones, and agro-processing firms and other firms of selected towns from which the samples are drawn. Three district towns were purposely selected from the study zones. Then after, all firms were selected from identified towns. In addition, Adama, Assela, Bishoftu and Addis Ababa cities were purposely selected to collect data from firms and traders. Census method was used to collect research data from bakeries, flour and food complex firms and indirect actors as their number of population were few. Actors were purposely selected from large towns. Sample size for these actors was determined on the basis of their numbers. Therefore, the total sample size of actors excluding wheat producers was few because the size of their populations was small. As well, 50 wholesalers, 30 wheat processors and 25 support institutions were selected from the districts.

Moreover, data were gathered from 20 input suppliers and 5 wholesale input suppliers. Finally, we purposely chose 20 traders and 15 wheat processing firms from above mentioned big towns.

3.3. Data analysis

Data reduction and display, percentage, mean, independent t-test and ordered logit were employed to analyze the data. Ordered logit model was used to test the causal relationship between governance structure and price incentive. Average wheat price, which was received by wheat producers, was taken as a proxy variable for wheat producers' incentive. Average wheat prices were equally divided into three groups since they were not normally distributed. Maximum likelihood is the most efficient means to estimate the parameters of specifications that involve limited dependent variables (Davidson and MacKinnon, 1993). Parallel regression assumption test was conducted to make sure appropriateness of the model.

4. Results

4.1. Governance structures and incentives

Two types of governance structure are distinguished, namely spot market and hybrid governance structure. Wheat transaction takes place three days per week at the spot market whereas it operates on a daily basis at non-spot market (i.e., warehouses). Wheat transaction at warehouses enables wheat producers to access price information using their mobile phones. The hybrid governance structure or non-spot market is streamlined into three forms of contractual relationships. These are: 1) relational contract, 2) relational farm gate transaction and 3) cooperative governance structure.

Average wheat price, which was received by wheat producers at the spot market, was 8444.50 Ethiopian Birr (ETB) per ton and the lowest. It ranged from 6800.00 to 9250.00 ETB per ton. Average price was 9367.00 ETB per ton at farm gate transaction which ranged from 7700.00 to 11000.00 ETB per ton, which was the highest. It was 8865.00 ETB per ton at warehouse which ranged from 7200.00 to 9650.00 ETB per ton. Nearly all wheat producers in Gimbichu district sold their wheat to wholesalers at the spot market. On the contrary, almost all wheat producers sold their wheat at the non-spot markets in Hetosa and Tiyo districts.

Table 1: Frequency distribution of the important attributes in wheat market

Characteristics	Study districts			
	Gimbichu	Hetosa	Tiyo	Average
	%	%	%	%
Governance structure				
Spot market transaction	96.88	0.00	2.33	29.09
Relational contract	1.56	60.00	63.95	44.55
Farm gate transaction	1.56	40.00	33.72	26.36
Perceived wheat quality				
Low	0.00	0.00	1.16	0.90
Medium	14.06	38.57	27.91	26.82
High	85.94	61.43	70.93	72.27
Checking price information with mobile phone				
No	95.31	18.57	22.09	42.27
Some time	0.00	0.00	1.16	0.45
Always	4.69	81.43	76.74	57.27
Power relation				
Low	31.25	2.86	6.98	12.73
Medium	53.13	42.86	52.33	49.55
High	15.63	54.29	40.70	37.73

Source: Authors' estimation based on 2016 survey data

About 97 per cent of wheat producers in Gimbichu district sold their wheat to the wholesalers at the spot market. About 60 per cent of wheat producers in Hetosa district sold their wheat to the wholesalers at warehouses. The remaining 40 per cent of them sold their wheat to the wholesalers at the farm gate in Hetosa district which invites the wheat producers who can supply a minimum of 5 tons of wheat at a time. Whereas 64 per cent of wheat producers sold their wheat to the wholesalers at the warehouses, the remaining 34 per cent of them sold their wheat to wholesalers at the farm gate in Tiyo district (Table 1). About 95 per cent of whole sampled wheat producers have mobile phones. However, about 95 per cent of wheat producers do not use their mobile phones to check prices in Gimbichu district since they use their friends and neighbors to get wheat price information and therefore have a weaker relationship with traders.

About 13 per cent of the wheat producers perceived that they had low bargaining power regarding the price of wheat. Approximately 50 per cent and 38 per cent of wheat producers recognized that they had medium and high bargaining power respectively during wheat transaction. The highest producers' bargaining power was observed in Hetosa district and the lowest was in Gimbichu district.

Table 2. Frequency distribution of the important dummy variables

Dummy variables	Gimbichu		Hetosa		Tiyo		Total	
	yes	No	Yes	No	Yes	no	yes	no
	%	%	%	%	%	%	%	%
Mobile phone ownership	95.31	4.69	92.86	7.14	97.67	2.33	95.45	4.55
Co-operative membership	79.69	20.31	71.43	28.57	63.95	36.05	70.91	29.09
Opportunistic behavior	37.50	62.50	67.14	32.86	81.40	18.60	64.10	35.90

Source: Authors' estimation based on 2016 survey data.

4.1.1. Hybrid governance structures and incentives

Relational contract: there is informal contract between upstream and downstream actors in the wheat industry. Verbal agreements are made regarding the wheat supply when farmers or traders require supplying or processors require demanding, regardless of delivery time, frequency, quality and quantity per transaction. The wheat producers have made agreements with two or more customers on the price before transactions with mobile phones or through face to face communication at non-spot markets. Similarly, agreements have been made between traders and wheat processors. However, traders could break the contracts if they were charged a price premium by alternative customer. Macaulay (1963) argues that formal contracts are unnecessary because such relationships show an absence of trust between actors.

The relational contract decreased transaction costs. About 70 per cent of traders had strong long-term relationships with the wheat processors. Relational contract with price premium was commonly practiced by 63 per cent of wheat processors in order to ensure reliable wheat supply. About 75 per cent of traders had two or more customers so that they could sell wheat to

processors who offered them a better price. This verbal binding agreement between the wholesalers and wheat processors is built on the basis of trust and long-term business relations.

Trust: around 90 per cent of wheat transactions between the wholesalers and wheat processors are built on the basis of trust. It maintained more significant mutual co-operation, co-ordination and short-term credit. It also extended the length of the relationships and transactions, and maintained a more frequent information flow between actors. It reduced the cost of searching price information and partners, quality and quantity uncertainty and opportunistic behavior.

Farm gate transaction and bargaining power: the result indicates that 26 per cent of farmers carried out wheat transaction at the farm gate. They could also manage opportunistic behavior of the traders since most of them had their own weighing scales with knowledge and skills. Buyers covered the costs of physical marketing, such as transport, loading and unloading costs. They also provided a price premium for higher quality wheat per ton as compared with other markets. The study indicates that the farmers' bargaining power associated with price was the highest under the farm gate transactions and the lowest was under arm-length transactions. A bulk volume (i.e. above 5 tons) of wheat supply enabled them to exert influence over buyers. Bulk wheat purchase by processors and wholesalers retained higher quality and reduced physical marketing costs as evidenced by DIIDRC, 2011.

Co-operative governance structure is one of hybrid governance structures which partly combines both backward and forward activities. It makes to reap economies of scale, improve bargaining power and reduce transaction and physical marketing costs as observed by DIIDRC, 2011. It purchases wheat at a yearly average price during trough season for two months. It provides a relatively moderate price incentive to wheat producers as compared with peak season price incentive. Birr is Ethiopian currency; 23.00 ETB is approximately equal to 1.00 US dollar.

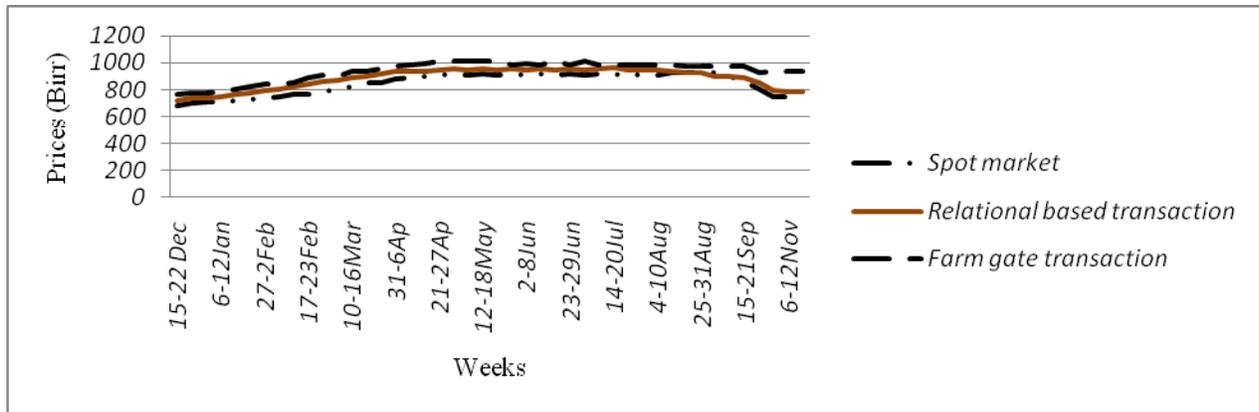


Figure 2. Effect of governance structure on wheat price

Source: Survey data and district municipal (2015/16)

Moreover, the result in Figure 2 indicates that the wheat price had an upward trend which benefited resource rich farmers who could then speculatively withhold wheat and wait for a higher price during the peak season. This situation was disadvantageous to resource poor farmers who sold wheat during trough season. That is, the farmers received a lower price for their product when they sold it immediately after harvest because the quantity supplied in the market exceeded the quantity demanded.

4.1.2. Spot market and incentives

The input suppliers highly manifested their opportunistic behaviors at the spot markets by distorting information and cheating on quality and brands. Weighing scale was absent at the spot markets because producers used sack which often contains 7.5-8.0 tons of wheat depending on compactness and the size of wheat. However, wheat producers were paid for only 7.5 tons per sack. The spot markets provided a higher incentive for wholesalers. This is because they take advantage of the absence of weighing scales.

The average cost was 10,559.00 ETB per hectare (ha) for rented tractor users and 10,907.00 ETB per ha for non-users, but mean difference was found to be insignificant. Combine harvesters made significant decline in the costs of production at 1 per cent probability level between two group mean scores (t-value= 2.86, p-value= 0.000). The combine harvesters and tractors in the input markets deliver a better harvesting and tilling services to wheat producers, respectively. It also helps in decreasing the costs of production by 30 per cent. Thus, incentives provide motives

to wheat producers to use more inputs and realize higher productivity per unit area. The effect of input market on the cost of wheat production is presented in Figure 3.

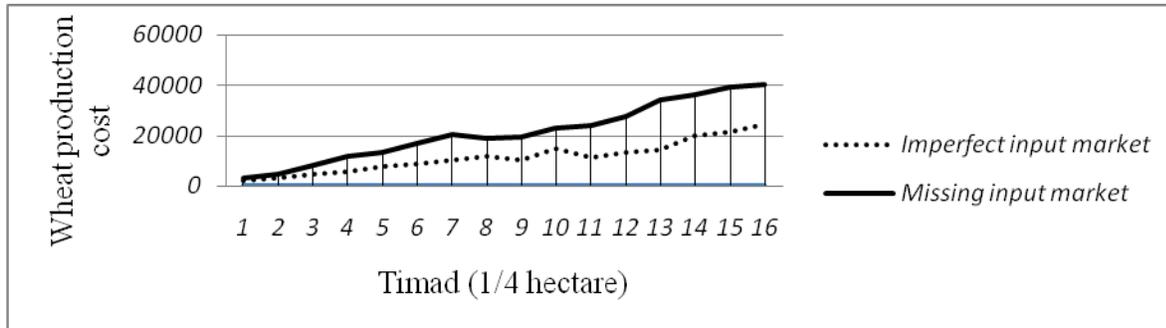
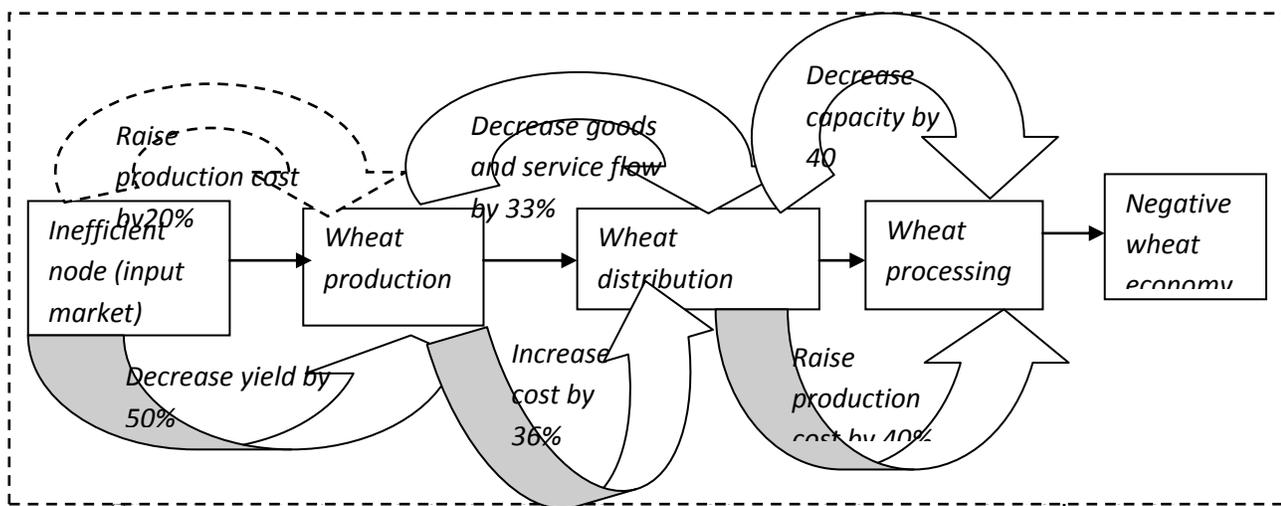


Figure 3. The effect of input market on wheat production cost

Source: Survey data (2015/16)

Market failures result in non-optimal yields and higher costs of production. Co-ordination failures in the first node cause the costs of production to increase by 20 per cent and decrease yield by 50 per cent in the next node. The second node decreases goods and services flows by 33 per cent and raises the costs of services by 36 per cent in the third node. The effects are extended further to the wheat processing factories and final consumers (Figure 4). Finally, co-ordination failures in each functional node of the WVC result in a negative wheat economy.



Source: combination of survey data (2015/16) and CSA

4.1.3. Transaction attributes and incentive

A. Transaction risks in the wheat value chain

Frequency: although wheat is a one season crop, buyers and sellers transact, on average 4 times throughout the year at non-spot markets. They meet once in a year if transaction is carried out at the farm gate. Traders supply four times per month at least for three wheat processing factories. More frequent transactions can build trustworthy relationship between actors.

Uncertainty: it was higher in the input markets as compared to output markets in the study area. Farmers faced high uncertainty regarding the quality and the price of seeds, pesticides and herbicides. The existence of uncertainty increased transaction risks and associated costs, which in turn contributed to a decline in productivity and incentives. These situations affected other actors in the next nodes because their incentives were conditional upon the volume of wheat supplied. About 36 per cent of farmers said that traders behaved opportunistically to maximize their own incentives at the cost of farmers' incentives.

B. Information asymmetry

Information asymmetry regarding herbicide and pesticide quality was extensive among wheat producers in the study area as evidenced by Hueth *et al.*, 1999; Kherallah and Kirsten, 2002. Farming transactions suffer seriously from unsecured quality (Wolf *et al.*, 2001). Relational contracts did not exist in input markets which were highly characterized by opportunistic behavior. Buyers did not have information on the quality of pesticides and herbicides. Sellers exploited this informational asymmetry, and requested a higher price for a lower quality item. Uncertainty of input quality and prices raised the costs of production and it reduced wheat yield.

Furthermore, about 30 per cent of farmers who used low quality pesticides and herbicides harvested, on average, 1.7 tons per ha, which was lower than that of total sampled farmers who obtained, on average, 4 tons per ha. It subsequently caused about 57 per cent a decline in the wheat yield of the affected group. Input retailers gained more incentives at the cost of wheat producers due to an absence of laboratory tests or third parties in the market. Spot market is more reasonable for value chain actors when the uncertainty regarding quality is a serious challenge and a formal quality control instrument like third party certification is accessible (Raynaud *et al.*, 2005). In agreement with the claim of North (1990), a poor institution allows the existence of

low quality inputs in the market, which therefore results in low wheat productivity and profitability.

Incentive problems affected the quality of agricultural commodities, input control and quality measurements (Hueth *et al.*, 1999). General price increment is one of the best institutional mechanisms that co-ordinates the interaction between actors to ensure quality (Holmstrom and Milgrom, 1994; Laffont and Martimort, 2002). Some authors propose third-party certification to tackle the information asymmetry problems more efficiently and effectively in agricultural markets (Wimmer and Chezum, 2003). However, these incentive mechanisms were absent in both input and output markets in the study areas.

About 90 per cent of wholesalers paid an equal price to farmers with higher and lower quality wheat, which caused an adverse selection problem. They mixed high and low quality wheat and supplied to wheat processors since they did not pay the highest price for the highest quality of wheat. Opportunistic behaviors such as these discourage agents to put forth their efforts to improve wheat quality. On the contrary, 80 per cent of wholesalers paid a price premium for quality wheat on the basis of physical parameters, such as weight, grain filling and the admixtures in large towns including Assela, Adama and Bishoftu. This is because they sold to end consumers who paid a higher price for a higher quality. Information economics theories suggest that buyers may design incentive mechanisms, which motivate farmers to enhance the quality of their produce (Stiglitz, 1987; Maskin, 2008). However, wheat transaction missed incentive mechanisms that encourage agents to supply quality wheat at the district level.

4.1.4. Incentive mechanism and incentives

A. Quality and quantity measurement and price incentive

There was no policy environment that facilitates implementation of wheat and wheat product quality standards. It led to a weak quality-based pricing system. The quality of pesticides and herbicides could not be easily checked because laboratory tests and/or third party verifications were absent in the study areas.

B. Supervision of production and farmers' training

Agricultural extension service offers an incentive that encourages the farmers to use accurate rates of pesticides and herbicides at the appropriate time. The extension services provide trainings and advices for wheat producers on the management of wheat production in order to increase wheat yield and reduce wheat production costs per ha. These incentives are offered to the wheat producers free of costs by governmental organizations (GOs) and non-governmental organizations (NGOs). But it could not reach the majority of farmers because of a lack of extension agents' commitment and technical knowledge.

4.1.5. The Governance structure and wheat producers' incentives

Parallel regression assumption was tested (Brant test $\chi^2 = P > \chi^2 = 0.127$), which indicates that ordered logit was the appropriate choice. The assumption of equality of the parameters across different categories or cut-off points was held true. The likelihood ratio test was conducted to attest the validity of the proportional odd model and found statistically significant ($P > \chi^2 = 0.000$).

Table 3. Effect of governance structure and related variables on wheat producers' price incentive

Dependent variable: incentive	Ordered logit, number of observations (220)			
	dy/dx	Std. Err.	Z	P> t
Governance structure	0.36***	0.07	4.93	0.000
Trust	0.04 ^{ns}	0.08	0.56	0.58
Perceived opportunistic buyer behavior	0.04 ^{ns}	0.24	0.18	0.86
Price information checking	0.11***	0.04	3.11	0.002
Perceived power relation	0.20***	0.05	3.85	0.00
Perceived wheat quality	0.03 ^{ns}	0.06	0.50	0.62
Co-operative membership	-0.08 ^{ns}	0.06	-1.29	0.2
Participation in extension service	0.03***	0.01	3.03	0.00
Distance to flour factory	-0.10**	0.04	-2.51	0.01
Combine harvester	0.10 ^{ns}	0.10	1.00	0.32

Authors' estimation based on 2016 survey data.

*** and ** are statistically significant at 1 per cent and 5 per cent, respectively, ns=non significant at 10 per cent level.

The results are provided in Table 3. Out of 10 variables, 5 variables are significant either at 1 per cent or 5 per cent level of significance. Governance structure was found to be significantly and positively correlated with wheat producers' price incentive at 1 per cent level of significance. Power relations have significantly increased farmers' price incentive at 1 per cent level of significance. Price information checking and price incentive were found to be positively and significantly correlated at 1 per cent level of significance. This is because intensive knowledge of price information and market arbitrages increased the bargaining power and helped them to exploit price differences across the wholesalers as evidenced by Getaw and Gahiigwa, 2015. Wheat producers' participation in extension service was positively and significantly correlated with their price incentive at 1 per cent level of significance. This is because farmers' exposure to extension agents and experts help take advantage of price information.

5. Summary and policy implications

This study supports the new institutional economics assumptions. It is against the neo-classical economic view that argues economic actors operate under a frictionless market setting. Input markets suffered from opportunistic behavior, high transaction risks and associated costs which remarkably increase the costs of production and decline productivity. The result of the study shows that intensity of incentives increased from spot markets to hybrid governance structure. Incentives associated with relational based transactions were higher than that of the spot market transactions, but a lower than that of relational based farm gate transactions. The governance structure, power relations, participation in extension services, checking price information and distance from wheat processing factory had significant effects on wheat producers' price incentive. NGOs and GOs should work intensively on the betterment of input markets for WVC.

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