Governance structures and incentives in the wheat value chain in Ethiopia

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Abstract

Empirical studies on the effects of governance structures on incentives have still received little attention in the wheat value chain research of developing countries. The purpose of this paper is to investigate the effects of governance structures on actors' incentives in different functional nodes of the wheat value chain. This study used personal interviews to collect primary data from input suppliers, wheat producers, wholesalers, wheat processors and co-operatives. Mixed sampling techniques (i.e. random, census and purposive) were applied to select sampling units. Descriptive statistics and the ordered logit model were used to analyse the data. This paper found that governance structures, opportunistic behaviour, asymmetric information and trust influence actors' incentives in each functional node of the wheat value chain. Specifically, extension services, governance structures, power relations and price information have significant and positive effects on producers' price incentives. The study provides pioneering evidence of the effects of governance structures on incentives in each functional node of the value chain. The study adds new knowledge to the existing empirical knowledge. The results recommend government to use effective policy interventions to reduce opportunistic behaviours and asymmetric information, and to adopt incentive strategies to encourage investment, and increase productivity and profitability.

Key words: incentives; spot markets; hybrid governance structures; opportunistic behaviour; wheat value chain

1. Introduction

For many economists, economics is to a large extent a consequence of incentives in order to supply a greater volume and quality products, and to invest in technologies (Laffont & Martimort 2002). The utilisation of the technologies affects actors' incentives by influencing production costs and outputs. In contrast, disincentives can be one of the causes of the low investment, productivity and profitability of producers (Clay *et al*. 2018). In economics, an incentive is defined as a benefit,

reward or cost that motivates the economic actors to perform 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 the payment of price premiums in certification schemes (Dörr & Grote 2009). Value chain governance structures have effects on actors' incentives (Wolf *et al*. 2001; Dekker 2003; Kifle 2013). The level of incentives varies across governance structures, ranging from spot markets to hierarchy (Williamson 1985, 1999). Hybrid governance structures lie between the two extremes of the continuum. Formal contracts, relational contracts, co-operatives and vertical co-ordination are components of hybrid governance structures (Merlin 2005).

Spot market transactions have many buyers and sellers, who are characterised by a series of short-term, once-off, self-preservation, adversarial and distrusting relationships with very little information exchange. The spot markets affect economic incentives, such as prices and costs (Gereffi *et al*. 2005). The spot market transactions can reduce producers' price incentives, and/or increase producers' risks in less-industrialised countries. Since these transactions are characterised by high physical marketing costs per unit, there are high uncertainties of prices, poor-quality grades, a lack of standards specifications, and a lack of means of quality control. These characteristics may affect value addition adversely (Mitchell & Coles 2011). For instance, the high uncertainties of the transactions adversely affect incentives by increasing transaction costs (Williamson 1996). The main source of transaction uncertainties is opportunistic behaviour and information asymmetries that influence incentives negatively. Opportunistic behaviour refers to the possibility that agents act out of self-interest (Williamson 1996). Actors can experience adverse selection due to ex-ante opportunism, which arises from hidden information. They also face the risk of moral hazard due to ex-post opportunism, which emanates from the hidden actions of agents (Williamson 1999).

Some authors argue that the spot markets provide lower actors with greater incentives compared to hybrid governance structures (e.g. Wolf *et al*. 2001; Wubalem & Fufa 2007; Kifle 2013). The hybrid governance structures can increase incentives by reducing the costs of the transactions, increasing bargaining power, mitigating individual risks (Mitchell & Coles 2011), and reducing asymmetric information (Alemu *et al*. 2012, 2016). These governance structures increase trust between actors, and this has an adverse effect on opportunistic behaviour and asymmetric information (Gereffi *et al*. 2005). Trust increases access to information and knowledge transfer between suppliers and buyers (Coleman 1990; Burt 1997; Humphrey & Schmitz 2002) that lead to higher incentives for the actors. Frequent transactions cause strong trust between upstream and downstream actors that decrease the incentives to behave opportunistically and take advantage of the information asymmetries (Hobbs 1996; Williamson 1999). Relational governance structures protect actors from opportunism (Baker et al. 2002). The co-operatives provide a higher incentive to members by enabling their members to receive more incentives from the input and product markets (Staatz 1987).

The non-spot market types of governance structures are means to ensure higher incentives for a superior quality product (Goodhue 2011). The quality-based pricing systems, regulatory mechanisms, laboratory tests and/or third-party verifications are the incentive mechanisms that could have an impact on price incentives, input quality, price uncertainty, and the costs of transactions (Krueger *et al*. 1988). However, there is poor information exchange among actors (Kaleb 2008), weak co-ordination and an imperfect pricing system (Bezabih 2008) in the Ethiopian agricultural food value chains, which highly determine economic incentives. Specifically, there is weak vertical co-ordination and a poor quality-based pricing system, as well as an absence of quality and standard control services (Hassena 2009). There also are producer disincentives in the wheat value chain, which are associated with a low level of farm-gate prices and unbalanced bargaining power (Dias 2013). The findings of Dendena (2009) and Hassena (2009) indicate that

economic incentives are low in the Ethiopian wheat value chain, because low economic incentives are caused by spot markets (Gereffi *et al*. 2005).

In sum, no empirical studies have been conducted that uncover the determinants of actors' incentives. Knowledge gaps still exist regarding the question whether governance structures affect the incentives for actors in the wheat value chain. This paper provides a new application that relates particularly to the case of Ethiopia's wheat value chain regarding the effect of governance structures on producers' incentives. The explanation of the findings thus provides some theoretical underpinnings for the use of wheat value chain analysis to study the effects of governance structures on wheat producers' incentives. Using data from the major wheat-growing areas of the Oromia region, the objectives of this paper were to study the effects of the transaction and behavioural attributes on the incentives of actors in the wheat value chain, and to investigate the effects of governance structures on wheat producers' price incentives in the wheat value chain. The rest of the paper is organised as follows. Section 2 presents theoretical perspectives on the actors' incentives. Section 3 discusses the research methodology of the study. Section 4 presents the results of the study, and Section 5 concludes and draws policy implications from the findings

2. Theory of new institutional economics

New institutional economics (NIE) deals with the most favourable governance structures (GS), ranging from the spot market to unified governance structures. The GS approach is often used to explain transaction attributes, such as asset specificity, uncertainty and frequency, and behavioural attributes such as bounded rationality and opportunism (Williamson 1996). NIE can be streamlined into two branches, namely transaction cost economics, and agency theory. Transaction cost economics focuses on three types of GS, namely spot market, hybrid and hierarchy (Williamson 1985). Transaction attributes and behavioural attributes have an impact on incentive systems (Williamson 1985, 1999). The magnitudes of incentives vary across governance structures, ranging from the spot market to hierarchy (Williamson 1999). Many scholars argue that governance structures play a central role in determining actors' incentives in value chains (e.g. Wolf *et al*. 2001; Dekker 2003; Kifle 2013).

2.1 Incentive theory

The theory of incentives centres on circumstances under which supervision is costly for the firm. So, the firm arranges incentives to stimulate producers to invest in it and devote more effort (Holmstrom & Milgrom 1994). For many economists, economics is to a large extent a matter of incentive to produce a quality product and greater volumes of it, and to invest in technologies (Laffont & Martimort 2002). Incentives motivate suppliers to supply quality products, which give rise to more efficient production and distribution processes, thus leading to a sufficient supply of inputs (Gereffi *et al*. 2005), the production of quality products (Laffont & Martimort 2002), and an improvement in consistent behaviour in the value chain through formal contract (Dekker 2003).

2.2 Mechanism design theory

Mechanism design theory recommends alternative incentive mechanisms that can increase the actor's effort (Maskin 2008). This theory suggests that buyers with market imperfection should arrange alternative governance structures that fit the interests of actors, and also encourage them to supply a quality product (Laffont & Martimort 2002). On the other hand, potential incentive mechanisms in agricultural markets include the supervision of farmers during the production period, quality measurement before purchase, and the use of price premiums (Hueth *et al*. 1999; Wolf *et al*. 2001), the use of price premiums in certification schemes, farmer training, supervision of production, and social control through farmer organisations (Dörr & Grote 2009).

The reviews indicate that all theories have common characteristics. For instance, incentive theory and mechanism design theory are similar in the aspect that both have more interest in incentive mechanism arrangements. However, they are also dissimilar in some respects. The latter arranges alternative governance mechanisms for producers to choose the best one that fits their interest to supply quality product to the principal. Although new institutional economics (NIE) theory has concepts that overlap with other incentive theories, it encompasses relatively broader concepts. Thus, this study adopted NIE as the underpinning theory to study the driving forces of actors' incentives, as other theories are subsets of NIE. Moreover, NIE is arguably the best theory compared to other theories, since it has large explanatory power and wide feasibility under wide-ranging conditions.

3. Research methodology

3.1 Description of the study areas

3.1.1 Arsi zone

The Arsi zone is located within a total area of 21 008 km^2 in Oromia region. The study area is grouped into four agroclimatic zones, viz. lowland ('kola') (20.12%), midland ('weyna dega') (50.72%), highland ('dega') (27.32%), and cool ('wurch') (1.84%). It is also distinguished by four seasons, namely summer ('Bega'), autumn ('Belg'), winter ('Kiremt'), and spring ('Tedey'). The altitude ranges from 805 m to 4 195 m above sea level. The average annual temperature ranges from 10°C to 25°C and the zone has two rainfall seasons, with an average annual rainfall of 1 020 mm (OFEDB 2014).

Land is a key input for agricultural activities, which are covered by crops, forest, woodlands, shrub, bush, grassland, swampy and marshland. Crop production shares a large proportion of land area in the zone. However, there is a great variation in landholding among rural households. Of 232 980 rural households in the zone, 55 972 (24.02%) of them had less than 1 hectare (ha) of land, 90 546 (38.86%) had 1 ha to 2 ha, 50 885 (21.84%) of them had 2 ha to 3 ha, while 26 641 (11.43%) had 3 ha to 4 ha. The remaining households (i.e. 4.22%) had more than 4 ha (OFEDB 2014).

Land use is dynamic due to population pressure and socio-economic changes. Of the total land use (791 471 ha), all cropped areas comprise 494 538 ha, of which annual crop area has a share of 483 287 ha (97.72%), while perennial crop area has a share of 11 251 ha (2.28%). The remaining land area (37.52%) is allocated for forest, woodlands, shrub, bush, grasslands and other uses. Wheat is one of the leading crops in the area in terms of total production (viz. 582 3930 quintals in 2014), and area of wheat land coverage (viz. 39% of total crop area of the zone) (CSA 2014).

Wheat is produced for home consumption, the market, wage payment in kind, seed and other purposes. From total wheat production, home consumption takes a lion's share, at 50.44%. About 24% and 21% of wheat production are allocated to market supply and seeds respectively. The remaining quantity of wheat output is allocated for wage payment in kind and other purposes (CSA 2014). Wheat production is a fountainhead of livelihood for wheat-producing farmers and a source of raw material for flour and food-complex factories. The manufacturing sector is small and medium-scale industries (e.g. the Chilalo and Beherawi Food Complex factories), which are liked to wheat production.

3.1.2 East Shewa zone

East Shewa zone is located in the central part of the region connecting the western part to the eastern part, and has an area of 9 546 km^2. On the basis of traditional agroecology, the agroclimatic

zone consists of 24.66% of lowland, 74.58% of midland and 0.76% of highland. The mean annual temperature and rainfall vary between 18°C and 30°C, and 410 mm and 820 mm respectively (OFEDB 2014).

As in the Arsi zone, there are great variations among households in East Shewa zone in terms of landholding. About 18.4% of households own less than 1 ha, 38.4% of have 1 ha to 2 ha, 24.5% have 2 ha to 3 ha, and 15% have 3 ha to 4 ha. About 3.57% of households have more than 4 ha of land (OFEDB 2014). In East Shewa zone, land is allotted for different uses, including crop production, fallow land, grazing land, wood land and other land uses. The estimated total land used is 1 019 296 hectares, of which 88.1% and 0.17% of land areas are covered with annual crops and perennial crops respectively. The remaining land area is allocated to fallowing, grazing land, wood land and other land-use types. Of the total crop area, 7.18% of land area is allocated to wheat production.

The recorded total wheat production in the 2013/2014 production year was 1 983 995 quintals in East Shewa zone, and this was allocated for home consumption, market and other purposes (CSA 2014). Home consumption shares the largest share of the total wheat production, which is 54.70 per cent. About 28.48% and 16% of produced wheat are allocated for market supply and seeds, respectively. The remaining amount of the output is allocated for other purposes (CSA 2014).

Wheat producers produce wheat and sell their produce to downstream actors in the wheat value chain. They also purchase inputs and industrial products from traders. Flour and food-complex factories purchase wheat from the traders and sell their products to downstream actors and end users. Wheat produced by the wheat producers goes through different sectors, with significant value addition. Costs are incurred at the different stages of the value chain, which is at different production levels for the input, distribution and marketing levels for transportation, storage and transaction.

3.2 Sampling frame and techniques

The sampling frame contained a list of names of districts – *kebeles* – and wheat producers of selected *kebeles* from which the samples were drawn. The sampling frame was a list of all wheat producers who comprised the source information from which the sample was drawn. A list of all wheat producers, or a sampling frame, was obtained from each *kebele*. The sampling frame contained the list of names of all towns in the zones, and of agro-processing firms and other firms in selected towns. The districts were considered as the primary sampling units. The *kebeles* were taken as the secondary sampling units. Actors in the wheat value chain were taken as the tertiary sampling units.

A multistage sampling procedure was employed to select the representative wheat producers in the study area. The Arsi and East Shewa zones were selected purposively, as they are known for wheat production in terms of area of wheat land coverage and total wheat production in Oromia region. In both zones, the major wheat-producing districts were identified based on the list of all districts acquired from the Zonal Agricultural and Rural Development departments. All major wheat-producing districts were distinguished from the minor wheat-producing districts using the list of all districts, along with the proportion of the total area of wheat land coverage in terms of the total land area of each district. In this regard, eight out of 24 districts were distinguished as the major wheat-producing districts in the Arsi zone, whereas three of 10 districts were found to be the major wheat-producing districts in the East Shewa zone. The major wheat-producing districts were selected at random; Gimbichu district was selected out of three major wheat-producing districts in East Shewa zone, and Hetosa and Tiyo districts were selected out of eight major wheat-producing districts in Arsi zone. Likewise, the major wheat-producing *kebeles* (villages) were identified from the

randomly selected three major wheat-producing districts using information obtained from the district offices. For instance, out of 32 *kebeles*, only 12 were found to be the major wheat-producing *kebeles* in Gimbichu district. Of 18 *kebeles* in Tiyo district, nine were the major wheat-producing *kebeles* in the district, whereas 11 of 23 *kebeles* were marked as the major wheat-producing *kebeles* in Hetosa district. The major wheat-producing *kebeles* were drawn randomly from each randomly selected major wheat-producing district in proportion to their size (viz. two *kebeles* from each district), giving a total of six major wheat-producing *kebeles*. Finally, with the help of simple random sampling, wheat producers were randomly selected from each randomly selected *kebele*, based on the probability proportional to their total size.

The survey was also conducted on the spot input and output markets in Gimbichu district, and the spot input and non-spot output markets in the Hetosa and Tiyo districts. Criteria for the selection of these targeted markets included the physical proximity of wheat producers to these markets in these districts. The spot input and output and non-spot output markets were purposively selected from three randomly selected major wheat-producing districts. A census survey was conducted to collect research data from wholesalers from four purposively selected markets, and flour and food complex factories in major wheat producing districts.

3.3 Determination of sample size

There is no consensus on the formula that gives the optimal sample size to run a regression model, and this controversy is still unsettled. Scholars have failed to reach a consensus, which has led various researchers to use different methods to determine the sample size. However, the sample size of this survey was determined as 10 or more times the number of relevant independent variables in the given model, which is recommended by most statisticians and econometricians (Edriss 2013). A sample size of wheat producers was determined based on a rule of thumb (i.e. a principle with broad application), which was not expected to be exactly reliable for every population type. Based on the rule of thumb, the sample size for this study was 220 wheat producers.

A census survey was conducted to collect research data from wheat processors in the major wheat-producing districts. The sample size of wheat value chain actors in the three randomly selected major wheat- producing districts was 20 retail input suppliers in the spot markets, 21 wheat wholesalers in the spot markets, and 29 wheat wholesalers in the non-spot markets. The total sample size of wheat processors was 30 in the major wheat-producing districts. This study purposively chose 13 co-operatives (viz. a total of 26 experts from 13 co-operatives) to collect data in these three districts.

3.4 Data collection methods

This study used a personal interview survey to collect the research data. Prior to the final data collection, a preliminary survey, and informal group discussions, were carried out to make appropriate modifications to the interview schedules. Enumerators were recruited on the basis of their level of education and knowledge of the local language. They were trained in the techniques of data collection, the contents of the interview schedule, the ways of approaching and convincing actors, and in conducting the interviews.

This study targeted the input suppliers, wheat producers, wheat wholesalers, wheat processors, co-operatives and support institutions. Therefore, separate interview schedules, consisting of detailed questions, were administered to collect data from each actor in the wheat value chain. Data was gathered from wheat producers with the help of an interview schedule. Wholesalers in the spot and non-spot markets, and input suppliers at small retail shops and in spot markets, were visited at different times of the day to be interviewed. This took place in the three districts, namely Gimbichu,

Hetosa and Tiyo, and interviews were held with wheat producers and other actors in the study districts from August 2015 to September 2016. In addition, wheat-processing factories were visited in each district, and informal discussions were held with the experts on input transactions, wheat transactions and challenges in the co-operatives.

3.5 Data analysis

Descriptive statistics and the ordered logit model were employed to analyse the data. Qualitative analysis was applied to describe a set of qualitative data. Qualitative response models are models in which the observed dependent variable takes on discrete values. Various scholars have suggested different econometric models to examine the relationships between explanatory variables and qualitative response-dependent variables. For example, scholars recommend multinomial logit and probit models to investigate the relationships between three or more choice outcomes and independent variables (e.g. Kmenta 1986; Maddala 1989). Multinomial logit and probit models are used to investigate the effect of explanatory variables on a categorical dependent variable, but they were not the appropriate models to estimate the effect of independent variables on the ordered dependent variable (Greene 2000). A multivariate ordinal probit regression model is used to examine the relationship between explanatory variables and the categorical response variable, with ordered categories that are measured repeatedly over time (or space) on the experimental or sampling units (Li & Schafer 2008). The response of each experimental unit or subject is observed on multiple occasions to record the presence/absence level of a specific event. These kinds of responses are called multivariate or correlated categorical responses.

This model therefore is not suitable to estimate the relationship between an ordered dependent variable and independent variables. The ordered probit and logit models are more appropriate to study the effect of explanatory variables on ordered dependent variable than on unordered multinomial logit and probit models. In practice, ordered probit and logit models yield similar results, but their coefficients differ by a scale factor. The ordered probit models' error term requires a normal distribution, whereas the error term of ordered logit models requires logistic distribution. Thus, the ordered logit model is used to analyse determinants of wheat producers' price incentives due to its extremely flexible and practicable nature from a mathematical point of view. Maximum likelihood is the most efficient means to estimate the parameters of specifications that involve limited dependent variables (Davidson & MacKinnon 1993). A parallel regression assumption test was conducted to ensure the appropriateness of the model. The result indicated that the ordered logit model was the appropriate choice for the analysis of determinants of wheat producers' price incentive (Brant test: $Chi^2 = P > Chi^2 = 0.127$). The assumption of equality of the parameters across different categories or cut-off points held to be true. The likelihood ratio test was conducted to test the validity of the proportional odd model and was found to be statistically significant ($P > Chi^2 = 0.000$) at the 1% level of significance. Following Liao (1994), the functional form of the ordered logit model is presented as follows:

$$y^{*} = \sum_{k=1}^{k} \beta_k X_k + \varepsilon \qquad (1)$$

where y* is an unobserved variable, β_k are parameters to be estimated, X_k are explanatory variables, and ε is the error term.

The equation above is assumed to have a definite symmetric distribution with zero mean, such as a normal or logistic distribution. It is explained below:

$y = 1$ if $y^* \leq \mu_1 (= 0)$
$y = 2$ if $\mu_1 < y^* \leq \mu_2$
$y = j$ if $\mu_{i-1} < y^*$, (2)

where y is an observed dependent variable in j ordered categories, and μ_i are unknown threshold parameters separating the adjacent categories to be estimated with β_k. The ordered logit model is described as follows:

$$\text{Prob}(y = j) = 1 - L\left(\mu_{j-1} - \sum_{k=1}^{k} \beta_k X_k\right), \quad (3)$$

where L (·) is a cumulative logistic distribution.

Marginal effects on the probabilities of each wheat producers' price incentive are calculated by:

$$\frac{\partial \text{Prob}(y = j)}{\partial X_k} = \left[f\left(\mu_{j-1} - \sum_{k=1}^{k} \beta_k X_k\right) - f\left(\mu_k - \sum_{k=1}^{k} \beta_k X_k\right)\right]\beta_k, \quad (4)$$

where f (·) represents the probability density function.

3.6 Variable definitions and hypotheses

3.6.1 Dependent variable

The dependent variable is the price incentive for wheat producers which is captured through average wheat price as a proxy variable. In other words, the average wheat prices received by wheat producers are the wheat producers' price incentive or dependent variable. For instance, the dependent variable is the price incentive for wheat producers that is captured through the average wheat price as a proxy variable. The average wheat price is classified into three levels: low (< $39.25), medium ($39.35 to $45) and high ($45 to $55), since the average wheat producers' prices are not normally distributed.

3.6.2 Explanatory variables used in the model

The explanatory variables used in the model are hypothesised as factors affecting the dependent variable. Wheat producers' price incentive is affected by a number of explanatory variables, including governance structure, economies of scale (i.e. landholding, output), trust, information flow, quality, the power relation, etc. A definition of selected variables and their hypothesised relationships with the dependent variable are given below.

Governance structures are defined in this study as selling wheat on the spot market or at the warehouse or farm gate. It is scaled as follows: 1 = if a wheat producer sells his/her product on the spot market, 2 = if a wheat producer sells his/her product at the warehouse; and 3 = if a wheat producer sells his/her product at the farm gate. Incentives increase from the spot market to non-spot markets (Williamson 1999; Mitchell & Coles 2011; Kifle 2013). The non-spot markets were expected to have a higher positive effect on wheat producers' price incentive compared to the spot market.

3.6.3 Power relation

The power relation is the perception of wheat producers about their relative bargaining power to exert influence over wholesalers during wheat price negotiations. The power relation is ranked from 1 to 3, based on wheat producers' general understanding of their bargaining power, viz. 1 = low, 2 = medium, 3 = high. Price negotiations can help producers secure a fair share of price (Clay *et al*. 2018). It was assumed that a high bargaining power of wheat producers is largely associated with high price incentives, following what has seen in Mitchell and Coles (2011).

3.6.4 Trust

Trust is a kind of acquiring confidence in a partner on the basis of experience and repeated interaction, or a kind of expectation and judgment that a partner will not pursue opportunistic behaviour. It is a binary variable assuming a value of 1 if a wheat producer trusts a wholesaler, and 0 otherwise. Trust enhances considerable mutual co-operation and co-ordination between suppliers and buyers (Mitchell & Coles 2011), which are associated with incentives. Thus, it was assumed that trust would have a positive impact on wheat producers' price incentive.

3.6.5 Extension service

Agricultural extension services render an incentive to wheat producers and enable them to use the correct rates of pesticides and herbicides at the appropriate time. There are governmental organisations (GOs) and nongovernmental organisations (NGOs) that provide training and extension service advice to wheat producers on the management of wheat production in order to increase wheat yield and reduce production cost of wheat per hectare. These incentives are given to the wheat producers free of cost by GOs and NGOs. However, this service does not reach the majority of wheat producers because of a lack of commitment among extension agents. Therefore, this study hypothesised that extension service influences wheat producers' price incentives positively.

3.6.6 Landholding size

Wheat producers with a bigger landholding size can supply a bulk volume of wheat to the market at a time, which allows them to exert an influence over wholesalers through bargaining. Bulked wheat purchased by wholesalers usually has higher wheat quality and reduced physical marketing costs, as pointed out by Mitchell and Coles (2011). Thus, this study hypothesised that landholding size positively affects wheat producers' price incentives.

3.6.7 Utilisation of a combine harvester

Using a combine harvester refers to the use of a rented combine harvester by wheat producers to harvest wheat. It is a dummy variable that is equal to 1 if a wheat producer uses a rented combine harvester, and 0 otherwise. It is a general truth that using a combine harvester avoids wastage and maintains product quality. It thus was hypothesised that the utilisation of a combine harvester may increase wheat producers' price incentives.

3.6.8 Wheat producers' perceived wheat quality

Perceived wheat quality refers to the general understanding of wheat producers about the quality of the wheat they sold to traders. Perceived wheat quality is rated according to a three-scale system, as 1 = low, 2 = medium and 3 =high. Suppliers with higher product quality receive a greater incentive

than suppliers with lower product quality (Goodhue 2011; Yoo & Cheong 2018). So, it was hypothesised that wheat producers with higher wheat quality earn a higher price in the market.

3.6.9 Member of co-operative

Being a member of a co-operative is a dummy variable that takes a value of 1 if a wheat producer is a member of a co-operative, and 0 otherwise. Co-operatives increase their members' incentives because of low transaction costs, higher bargaining power and more reliable market access. Co-operative membership helps the members exploit the merits of forward and backward integration. It also minimises adverse selection problems. Thus, it was hypothesised that co-operative membership would have a positive impact on price incentives.

3.6.10 Price information from a mobile phone

This point refers to searching for wheat price information from wholesalers, local and central markets using a mobile phone. It is a categorical variable (if a wheat producer checks the price of wheat always = 3, sometimes = 2, and not at all before sale = 1). Wheat producers who check wholesalers' and market wheat price information using a mobile phone receive higher prices for their product, as illustrated by Tadesse and Bahiigwa (2015). Thus, it was hypothesised that searching for wholesalers' wheat price information would increase wheat producers' price incentive.

3.6.11 Distance to flour factory

The distance to the flour factory is defined in terms of the distance in kilometres from the wheat producer's home to the nearest flour factory. If a wheat producer is closer to the flour factory, he/she receives a relatively higher price due to low transportation costs. Therefore, it was assumed that road distance would have a negative effect on wheat producers' price incentives.

3.6.12 Economies of scale

Economies of scale are the cost and price incentive advantages that producers obtain due to size, output or scale of operation. In this study, total wheat output was taken as a proxy variable for economies of scale, which are measured in quintal. Economies of scale have a positive effect on the wheat producers' price incentives and a negative effect on the costs of production and transportation. Moreover, wheat producers make the largest investment in technologies that lead them to incur the lowest cost for inputs and gain the highest profit for their wheat. Therefore, the economies of scale were expected to have a positive effect on wheat producers' price incentives.

Table 1 summarises the effect of each explanatory variable on the dependent variable.

Table 1: Measurement of explanatory variables and their effects on the dependent variable

Independent variable	Effect of explanatory variables on dependent variable	
	Measurement	Incentives
Landholding size	Continuous (ha)	+
Extension service	Frequency in a year	+
Economies of scale	Continuous (quintal)	+
Co-operative membership	Binary (yes/no)	+
Trust	Binary (yes/no)	+
Governance structure	Categorical (Likert scale)	+
Perceived wheat quality	Categorical (Likert scale)	+
Distance to flour factory	Continuous (km)	-
Perceived power relation	Categorical (Likert scale)	+
Price information	Categorical (Likert scale)	+
Combine harvester use	Binary (yes/no)	+

4. Results and discussion

4.1 Governance structures and incentives

Generally, this study distinguishes two types of governance structures in the wheat value chain, namely spot markets and hybrid governance structures. The hybrid governance structures are further divided into three forms of contractual relationships. These are 1) relational contracts, 2) relational farm-gate transactions and 3) co-operative governance structures. This study uses the governance structure approach to explain transaction attributes, such as uncertainty and frequency, and behavioural attributes such as opportunistic behaviour, following the work of Williamson (1996). The findings support the argument that governance structures have a positive effect on actors' incentives in the wheat value chain, and this is supported by Wolf *et al*. (2001) and Dekker (2003). The intensity of incentives varies across governance structures. Wheat producers and other actors receive better incentives under hybrid governance structures than on sport markets. The findings support the work of Williamson (1999). According to the survey results, transaction attributes such as frequency and uncertainty influence actors' incentives in the wheat value chain, and this supports the theory of Williamson (1979).

4.2 Transaction attributes and incentives

According to the surveys, the quality of input uncertainty is high due to information asymmetry in the study areas. Uncertainty in the study areas increases transaction risks and adversely affects actors' incentives across wheat value chains, which is consistent with the findings of Wolf *et al*. (2001). According to the surveys, the level of transaction costs increases with uncertainty (increase) and frequency (decrease), which supports traditional wisdom (Williamson, 1979).

4.2.1 Frequency

Although wheat is a one-season crop, wheat producers and wholesalers transact with wheat on average four times throughout the year in non-spot markets. They meet once in a year if the wheat transaction is carried out at the farm gate. Wholesalers supply wheat four times per month to at least three wheat-processing factories. More frequent transactions could build the relationship of trustworthiness between the actors. About 95% of wheat producers in the study districts had mobile phones (Table 3), and the findings indicate that using a mobile phone has a positive effect on the frequency of selling wheat (Table 4) (Tadesse & Bahiigwa 2015). However, about 95% of wheat producers in the Gimbichu district did not use their mobile phones to search for wholesalers and other market wheat price information, because they obtained it from friends and neighbours, and therefore have the weakest relationships with wholesalers in the district (Table 2). Less frequent

transactions can increase the incentive of wholesalers to act opportunistically, and to exploit information asymmetries (Hobbs 1996).

A total of only 10.45% of wheat producers in the study districts trust wholesalers, while 89.55% distrust wholesalers. In particular, 15.62%, 11.43% and 5.81% of wheat producers trust wholesalers in the Gimbichu, Hetosa and Tiyo districts respectively (Table 3). According to the survey results, around 90% of wheat transactions are carried out between wheat wholesalers and wheat processors, built on a basis of trust. This maintains more significant mutual co-operation, co-ordination and short-term credit. It also extends the length of the relationship and continued wheat transactions, and maintains a more frequent flow of wheat price information between them. It reduces the costs of searching for wheat price information and partners. Both actors do not want to damage their long-term business relations and reputation, because a bad reputation affects their future incentives and quantity of wheat supply. In the case where wholesalers sell the lowest quality wheat to wheat processors, they break their long-term business relations with the wholesalers. Observations show that two in 10 customers (wheat producers) receive credit from wholesalers in the Hetosa and Tiyo districts. Wholesalers also purchase wheat from their customers without checking the quality of the wheat and visit their customers for wedding and funeral ceremonies to maintain their business relationships with their customers.

4.2.2 Uncertainty

According to the surveys, sources of uncertainty are the opportunistic behaviour of actors and information asymmetry. The results indicate that the uncertainty relating to input quality and price is extensive in the spot input markets. These markets are characterised by high information asymmetry, a lack of means of quality control and no other bonds existing between the actors before or after the transactions. This is consistent with the findings of Dwyer *et al*. (1987). For instance, wheat producers face high uncertainty regarding the quality and prices of wheat seeds, pesticides and herbicides, which increase transaction risks and the associated costs, which in turn decrease productivity and incentives. The findings support the research result of Wolf *et al*. (2001) and show that farming transactions suffer seriously from the unsecured quality of the inputs. The findings support arguments that information asymmetry regarding herbicide and pesticide quality lead to high transaction risks in the study areas, as also found by Hueth *et al*. (1999) and Kherallah and Kirsten (2002). The input retailers conceal information about input quality from wheat producers at the small retail shops and spot markets in the villages and towns. The information asymmetry among suppliers and buyers makes it difficult to know the quality of the product transacted (Akerlof 1970).

According to the survey results, the input retailers in the spot markets readily manifested their opportunistic behaviours, exploited asymmetric information on prices and quality of inputs, and sold adulterated or low-quality input to the wheat producers. As a result, about 30% of wheat producers used low-quality pesticides and herbicides and then harvested, on average, 17 quintals per hectare, which was lower than the wheat yield of the 70% of other producers (39.64 quintals per hectare on average) (Habte *et al*. 2020). Wheat producers who used lower quality input obtained a wheat yield that was about 57% lower than what could be obtained from higher quality input. This result validates the claim of North (1990), namely that an ineffective institution allows the existence of low-quality inputs in the markets, which therefore results in low wheat productivity and high production cost per unit.

4.3 Incentive mechanisms and price incentives

The present study indicates that incentive mechanisms are absent in both the input and output markets in the study areas. An aspect of the inputs, namely the quality of pesticides and herbicides,

could not be checked easily because laboratory tests and/or third-party verifications were absent in the study areas. This has to do with the absence of a regulatory mechanism on the part of the federal and regional governments. Subsequently, input retailers gain more incentives at the cost of wheat producers due to an absence of laboratory tests or third parties in the input markets.

Regarding output markets, the wheat transaction was devoid of incentive mechanisms that discourage wheat producers from supplying high-quality wheat in the study districts. There were no scales to weigh the wheat in the spot markets, which meant that the wholesalers gained and wheat producers lost about 0.05 quintals of wheat per sack. Wheat producers are accustomed to using a sack as a weighing scale, which contains 0.75 to 0.80 quintals of wheat, depending on the compactness and grain size. The spot markets provide higher incentives for wholesalers to be opportunistic. This is because they take advantage of the absence of the weighing scale.

In the study areas, about 90% of wholesalers paid an equal price to wheat producers for higher and lower quality wheat, which cause an adverse selection problem (i.e. wholesalers pay low prices for high-quality wheat). Wholesalers mix high- and low-quality wheat and supply mixed high- and low-quality wheat to the processors because they do not pay the highest price for the highest quality wheat. In general, about 1%, 27% and 72% of wheat producers understood that the quality of wheat they sold was of low, medium and high quality respectively (Table 2). In particular, about 14% and 86% of wheat producers in Gimbichu district perceived that the quality of wheat they sold was of medium and high quality respectively. Almost 39% and 61% of wheat producers in Hetosa district perceived the quality of wheat they sold as medium and high respectively (Table 2). Wheat producers in Gimbichu district perceived that the quality of wheat they sold was of the highest quality.

The absence of quality standards and measurements led to a weak quality-based pricing system (Hassena 2009). Some authors propose a third-party certification to tackle the information asymmetry problems more efficiently and effectively in agricultural markets (Wimmer & Chezum 2003). The 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).

4.4 Spot markets and price incentives

Input spot market transactions are distinguished by a series of short-term, once-off, distrusting relationships in which little information is exchanged and behaviour is uncertain and opportunistic. The spot market transactions in the study areas increase input quality uncertainty and risks, along with wheat yield risk because the herbicide and pesticide transactions were not subjected to quality grading, standards specifications and other means of quality control (Mitchell & Coles 2011). In the spot markets, wheat value chain actors do not have a close relationship with each other and have little or no formal co-operation, which results in opportunistic behaviour. They transact inputs or wheat once a year. Value chain actors at the spot markets transact wheat with each other at a certain place, date and time. A wheat transaction in Gimbichu district takes place three days per week: on Saturday, Monday and Thursday. Nearly all wheat producers in the Gimbichu district sold their wheat at a spot market. About 97% of wheat producers in the Gimbichu district sold their wheat to the wholesalers in the spot market (Table 2).

Table 2: Frequency distribution of important attributes in wheat markets

Characteristics	Study districts			
	Gimbichu	Hetosa	Tiyo	Total
	%	%	%	%
Governance structures				
Spot market	96.88	0.00	2.33	29.09
Warehouse transaction	1.56	60.00	63.95	44.55
Farm-gate transaction	1.56	40.00	33.72	26.36
Producers' perceptions of wheat quality				
Low wheat quality	0.00	0.00	1.16	0.90
Medium wheat quality	14.06	38.57	27.91	26.82
High wheat quality	85.94	61.43	70.93	72.27
Producers' searching for price information				
No	95.31	18.57	22.09	42.27
Sometimes	0.00	0.00	1.16	0.45
Always	4.69	81.43	76.74	57.27
Producers' bargaining power over buyers				
Low bargaining power	31.25	2.86	6.98	12.73
Medium bargaining power	53.13	42.86	52.33	49.55
High bargaining power	15.63	54.29	40.70	37.73

Source: Own computation based on survey data (2015/2016)

The annual average wheat price received by wheat producers in spot markets was $42.23 per quintal and was the lowest of the three wheat markets. Wheat prices in the spot market ranged from $34.00 to $46.25 per quintal. Wheat producers' prices ranged from $38.50 to $55.00 per quintal. The annual average wheat price received by wheat producers in farm-gate transactions was $46.85 per quintal, which was the highest of the three wheat markets. The annual average wheat price was $44.35 per quintal at the warehouse, and ranged from $36.00 to $48.25 per quintal. Figure 1 indicates that the farm-gate and warehouse transactions could enable wheat producers to get a higher price incentive or income compared with the spot market (Bellemare 2012). Moreover, the results in Figure 1 indicate that an upward trend in wheat price benefits wheat producers, who can then speculatively withhold their product and wait for higher prices during the peak season (viz. May to June). This situation puts wheat producers with 0.5 ha or less of land at a disadvantage, as they sell their entire product in the harvesting season. That is, these wheat producers receive a lower price for their product when they sell it immediately after harvest (Gilbert *et al*. 2017) because the quantity of wheat supplied exceeds the quantity of wheat demanded in the market.

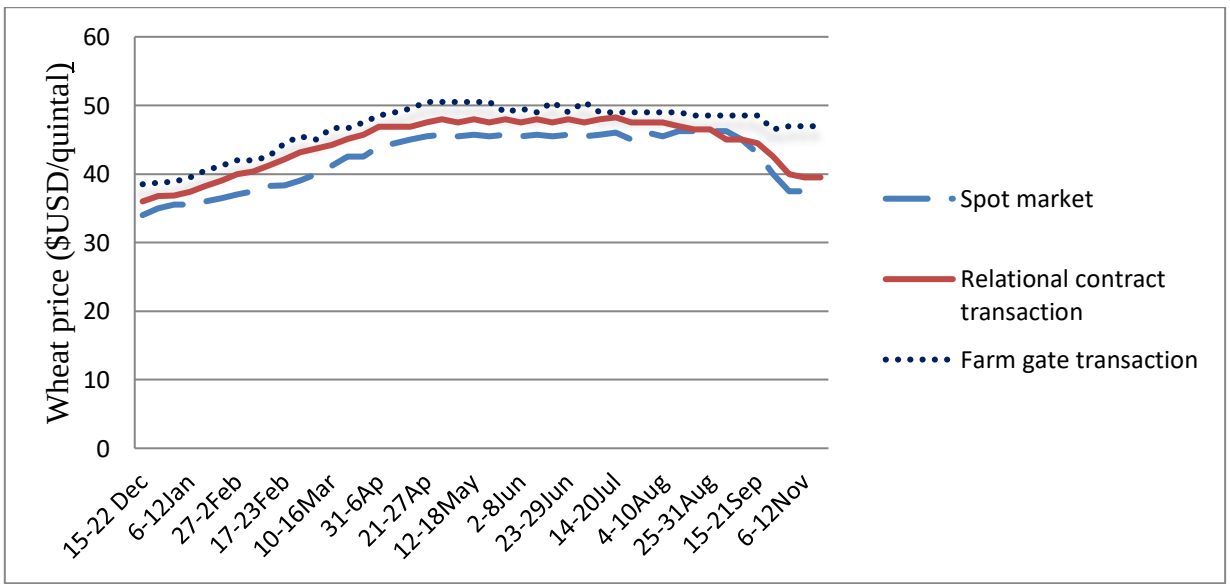

Figure 1: The effects of governance structures and selling time on wheat prices

Source: Survey data and district municipal data (2015/2016)

4.5 Hybrid governance structures and price incentives

Under the hybrid governance structures, the wheat value chain actors have more frequent transactions and better relationships with each other because they understand the advantage of co-ordination and information sharing for better incentives. Almost all the wheat producers in the Hetosa and Tiyo districts sold their wheat to wholesalers at non-spot markets. Sixty percent of wheat producers in Hetosa district sold their wheat to wholesalers at warehouses. The remaining 40% sold their wheat to wholesalers at the farm gate in Hetosa district; here, only wheat producers who could supply a minimum of 50 quintals of wheat at a time were invited. Approximately 64% of wheat producers sold their wheat to wholesalers at warehouses and 34% sold their wheat to wholesalers at the farm gate in Tiyo district (Table 2). Around 2% of wheat producers in Tiyo district sold their wheat to the ultimate consumers in the spot market. They or their family engaged in selling wheat to end consumers at the retail spot wheat market because this market provided a higher price incentive compared with selling wheat to wholesalers.

4.5.1 Relational contracts

A relational contract is an informal contract that exists between wheat value chain actors. Verbal agreements are made between the wheat value chain actors regarding wheat supply. Wheat producers supply wheat to wholesalers regardless of delivery time and frequency. Similarly, when wheat processors demand wheat, they negotiate with wholesalers on the price via mobile phones. Then the wholesalers supply wheat to them as per the quantity demanded. Macaulay (1963) argues that formal contracts are unnecessary because they would reflect an absence of trust between the actors. These verbal, binding agreements between the wholesalers and wheat processors are built on the basis of trust and long-term business relations. About 70% of wholesalers have strong long-term relationships with the wheat processors. Relational contracts with a price premium for wheat were commonly practiced by 63% of wheat processors in order to ensure a reliable wheat supply. About 75% of wholesalers had two or more wheat processors as customers. The wheat producers undertook negotiations with two or more wholesalers on the price of wheat via their mobile phones or during face-to-face communication at non-spot markets before the wheat transaction. Relational contracts between actors did not exist in input markets, which were characterised by highly opportunistic behaviour. As a consequence, input suppliers exploited this information asymmetry and requested wheat producers to pay a higher price for inferior input quality.

4.5.2 Farm-gate transactions

The results of the survey indicate that about 26% of wheat producers carried out their wheat transaction at the farm gate in the study areas (Table 2). They could also manage the opportunistic behaviour of the wholesalers since most of them had their own weighing scale and knowledge and skills how to use it. Wheat wholesalers covered the costs of physical marketing such as transport, loading and unloading costs, while they bought wheat from wheat producers at the farm gate. They also pay a price premium for higher quality wheat per quintal compared with other markets. The study indicates that the wheat producers' bargaining power associated with the wheat price was the highest under the farm gate transactions and the lowest under spot market transactions. A bulk volume (i.e. above 50 quintals) of wheat supply enabled wheat producers to exert influence over wholesalers. Bulk wheat purchased by wholesalers retained the higher quality wheat and reduced physical marketing costs as evidenced by Mitchell and Coles (2011). About 13 per cent of the wheat producers perceived that they had low bargaining power regarding the price of wheat, and approximately 50 per cent and 38 per cent of wheat producers recognised their bargaining power regarding wheat price over buyer as medium and high respectively in the study areas (Table 2). The highest wheat producers' bargaining power was observed in Hetosa district and the lowest was observed in Gimbichu district.

4.5.3 Co-operative governance structures

About 71% of the wheat producers were members of primary co-operatives. In particular, 80%, 71% and 64% of wheat producers were members of primary co-operatives in Gimbichu, Hetosa and Tiyo districts respectively (Table 3). The primary co-operatives supply the required inputs for wheat producers at lower prices. However, about 65% of members of the co-operatives claimed that the primary co-operatives could not supply newly introduced inputs to wheat producers adequately and on time. This situation creates an opportunity for private chemical input retailers to increase the prices of the newly introduced chemical inputs by $2.50 to $10.00 per litre when these inputs are not available in the stores of the primary co-operatives. In contrast, if the chemical inputs are available at the stores, input retailers decrease the prices of chemical inputs by $2.50 to $5.00 per litre. This strategy creates unsold or surplus chemical input inventories in the co-operatives' stores. This strategy of the retailers leads to higher costs, and expired or adulterated pesticide and herbicide in the input markets.

Although the co-operatives in the study areas also have the potential to reduce information asymmetries and transaction costs and create better input and output market conditions, they are not successful in doing so, likely because of problems with management and producer incentives (Alemu *et al*. 2016). Following this, only a few wheat producers sell wheat to the primary co-operatives. Unions provide a limited amount of money to the primary co-operatives in the form of credit. The primary co-operatives purchase wheat from wheat producers with the help of this credit in only two months (December and January). They resell the collected wheat to the union for profit, on average $1.75 per quintal, and then the unions sell it to potential actors in peak time through auctions. The primary co-operatives do not have the self-governing authority to rotate money, cannot resell wheat to any actors and cannot purchase inputs directly from companies. As a result, they stick to a blueprint approach which takes away their input and output market decision power.

Table 3: Frequency distribution of some 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	63.950	36.05	70.91	29.09
Wheat producers' trust	15.62	84.38	11.43	88.57	5.81	94.19	10.45	89.55

Source: Own computations based on 2015/2016 survey data.

4.6 Determinants of wheat producers' price incentives

Price incentives ensure more efficient production and distribution processes and a sufficient supply of inputs (Gereffi *et al*. 2005). Price incentives also motivate producers to supply quality products (Laffont & Martimort 2002) and improve consistency in behaviour in the value chain (Dekker 2003). Food price incentives play an important role in distributing resources efficiently and signalling shortages and surpluses, which help farmers to respond to changing market conditions. Food prices affect political stability and the welfare of producers as well as consumers (Bellemare 2014). Food prices are associated more with dietary intake and nutritional outcomes, which have implications for cognitive development and future earnings (Dercon & Portner 2014). In particular, the price incentive motivates wheat producers to adopt wheat technologies that lead to higher productivity and production. The price of wheat plays a significant role in influencing wheat producers' welfare. In this study, wheat producers' price incentives were expected to be affected by governance structures, price information, landholding, output and other explanatory variables.

The results on the determinants of price incentives are provided in Table 4. Out of 11 variables, four were found to be significant, at the 1% and 5% level of significance. The governance structures

were found to be significantly and positively related to wheat producers' price incentives at the 1% level of significance. These findings validate the theory of new institutional economics (NIE) (i.e. proposing that the price incentive increases from the spot market to the non-spot market). Price information and price incentives were found to be positively and significantly related to each other at the 1% level of significance (Table 4). This finding validates the earlier argument (Williamson 1996, 1999), in which it is assumed that sharing information increases incentives. This result also corroborates the findings of Tadesse and Bahiigwa (2015). This is because adequate wheat price information increases the bargaining power of wheat producers by allowing them to exploit wheat price differences across wholesalers. Wheat producers' participation in extension services is significantly related to price incentives at the 5% level of significance (Table 4). The model result shows that the volume of output significantly and positively increases wheat producers' price incentives. Selling bulk volume at a time could lower physical marketing costs by enabling wheat producers to exert an influence over buyers during price negotiations and also influence the opportunistic behaviour of the buyers. This finding supports the work of the International Research Development Centre (Mitchell & Coles 2011). Trust, producers' power relations, producers' perceptions of wheat quality and co-operative membership affect wheat producers' price incentives positively, but it is not significant at the 10% level. Distance to flour factory influences wheat producers' price incentive negatively, but it is not significant at the 10% level of significance (Table 4).

Table 4: Determinants of wheat producers' price incentive

Independent variables	**Ordered logit, number of observations (220)**	
	dy/dx	**Standard error**
Governance structures (categorical)	2.31***	0.36
Wheat producer's trust in wholesalers (binary)	0.29^{ns}	0.39
Producers' price information (Likert scale)	0.66***	0.19
Producers' power relations (Likert scale)	0.05 ^{ns}	0.33
Producers' perceptions of wheat quality (Likert scale)	0.04 ^{ns}	0.29
Co-operative membership (binary)	0.27 ^{ns}	0.36
Extension service (frequency in a year)	0.13**	0.05
Distance to flour factory (km)	-0.01 ^{ns}	0.01
Combine harvester use (binary)	0.87 ^{ns}	0.56
Landholding (hectare)	0.06 ^{ns}	0.05
Output (quintal)	0.04***	0.01
Cut1	3.78	1.76
Cut2	6.34	1.81
Log likelihood = -161.60		
LR chi^2 (11) = 157.99, Prob > chi^2 = 0.00		

Source: Own computation result based on 2015/2016 survey data.

Note: ***, ** and * imply statistical significance at the 1% level, 5% level and 10% level respectively; ns = not significant at the 10% level

5. Conclusions and policy implications

5.1 Conclusions

The survey indicated that input markets and output markets suffer from an absence of incentive mechanisms and an information market, weak co-ordination, and a poor quality-based pricing system. Actors in the wheat value chain have also faced opportunistic behaviour, high transaction risks and associated costs, which remarkably increase the costs of production and reduce productivity. This paper found that governance structures, transaction risks, asymmetric information and trust influence actors' incentives in each functional node of the wheat value chain. Trust provides a higher price incentive for both wheat processors and wholesalers. The governance structure, landholding, extension services, price information and output have a significant and

positive effect on wheat producers' price incentives. In this study, other explanatory variables have a positive impact on wheat producers' price incentives, except for distance to flour factory.

5.2 Policy implications

The results imply that governance structures can ensure more efficient production and distribution processes, and a sufficient supply of input. They also encourage producers to produce quality products and to behave consistently in the value chain. Governance structures have implications for political stability and the welfare of both producers and consumers. Governance structures also have implications for the adoption of technologies. For instance, the price incentive motivates wheat producers to adopt wheat technologies that help them to increase wheat productivity and production. Increased productivity can also reduce wheat prices, which in turn, increase the purchasing power and real income of urban consumers as well as rural poor consumers. The implications may extend to other sectors. For instance, this increased productivity will reduce the shortage of raw materials in wheat-processing industries. From a policy perspective, productivity secures adequate wheat and wheat product supplies, thus results in lower prices and higher consumption for rural and urban poor people, enabling them to earn enough money to invest in new technologies. It leads to an increase in income for all labour types and in consumption for urban and rural households. As prime beneficiaries, the actors in the wheat value chain may benefit to a great extent from higher price incentives, a reduction in input quality uncertainty and information asymmetry. As a result, governance structures reduce the costs of wheat production, increase actors' wheat productivity and enhance their income, which, in turn, greatly improves household food security. If they are net buyers of wheat (i.e. actors whose consumption exceeds their production of that wheat), an increase in the incentives may decrease the welfare of the wheat value chain actors.

It is essential to promote warehouse and farm-gate transactions, at least in the long run, to ensure higher price incentives for wheat producers in the districts. It may be advisable to make efforts to promote the utilisation of information obtained via mobile phones to increase wheat producers' price incentives. The government should provide an agricultural extension service to wheat producers in order to increase wheat producers' price incentive. Governments use regulations such as standardisation, certification, labelling, guaranteeing etc. to reduce the opportunistic behaviours of input sellers that arise from such market failures. NGOs and GOs should work jointly to encourage and support the private sectors in order to provide services such as laboratory tests and third-party certification to tackle the information asymmetry problem in input markets, the weak pricing system, and the risk and uncertainty regarding the quality of inputs.

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