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demand for commodity exchange: The
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Mekelle and Himora**

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10 September 2010

Online at <https://mpra.ub.uni-muenchen.de/24901/>
MPRA Paper No. 24901, posted 11 Sep 2010 09:57 UTC

***Structure, conduct and performance
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***The case Maychew, Mokone, Alemata Mekelle and
Himora***

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September 9, 2010

Abstract

Grain markets of Alemata, Maychew, Mokone, Mekelle and Himora are observed to operate in highly inefficient market structure, with very low level of trust at meso and macro level. As result the marking system is less developed and less efficient in terms of creating space and time utility. In which lack of finance is the most critical problem. Under such reality warehouse receipt system with receipts that can be used as collateral for loan are critical first stage needed to get the market right. If ECX's exchange service has to be introduced it has to be low cost and low value added service, if not it may not find significant demand among grain traders.

Structure, conduct and performance of grain trading in Tigray and its impact on demand for commodity exchange

The case Maychew, Mokone, Alemata, Mekelle and Himora

Introduction and methodology

Introduction

Back ground of the study

In the myth of perfect market hypothesis, with perfect information, perfect mobility of factors of production, large number of buyers and sellers, free entry and exit and fixed technology, market is the only institution that is needed to attain Pareto optimal or the best possible resource allocation (Stiglitz, 2001). However perfect market is a unicorn of economists than what is really found in real world of developing economies. Fortunately, perfect market theory by creating an ideal, but hypothetical condition, was able to show how self interested action of individuals can be coordinated to attain Pareto optimal out come. Such approach is used in geometry, mathematics and other fields of study, which use axiomatic approach to their analysis (Allen, 2002). The problem is that the economic reality is far from the neoclassical economic theory, compared to the reality studied by other field of studies and their theory.

In one side, since some developing economies markets are highly imperfect and large number of them are missing (Stiglitz, 2001 and Sadoulet and Janvry, 1995), the mathematically consistent neoclassical conclusion, which assumes market allocation is the best possible allocation, is found to be in shaky ground. In other side, empirical and historical observation will make it clear that market based institutions are much better than other alternative institutions observed in human history. It is clear by now that market may not be perfect, but it is functional. The success of South Korea, Taiwan, China and Japan in last century, however, will give us clue where the inconsistency, between historical and theoretical knowledge, can be reconciled. If the assumptions of perfect market are some how approximated, we know where we are going. The problem with dependence on none market institution is that we didn't have any clue where alternative institutions can take us. That is why, given our state of knowledge, it is advisable that countries should follow a market as main institution; while correcting the impact of market failures and missing markets through incorporation of alternative institutions in to marketing system. The idea is to take the out come of highly imperfect market closer to the out come that can be expected, if market were perfect. This may not be the only way or the best way, but given our state of knowledge on out come of different institutions, at micro and macro level, this is the best we can hope for¹.

One important institution to deal with market failures and missing markets is the development of commodity exchange. Commodity exchange, as complex matrix of institutions, is an integrated solution to many market failures observed in developing and

¹ Theoretical work in regional integration of trade can show us that such assumption is not always warranted, though. Regional integration can create trade diversion which can over weight trade creation. Means the move to ward market oriented structure may not generate positive out come in all cases. However given it is easy to build regional integration as stepping stone for global integration than directly pushing for global integration, the assumption is true if we take a longer horizon of development.

developed economies (Gabre-Madhin and Goggin, 2005). That is why the rural development strategy of the country was able to conclude that the long term solution to market failures is to be found in the development of commodity exchange (MoI, 2001). In line with this strategy, the Ethiopian Commodity Exchange (ECX) has been established having head office and trading floor in Addis Ababa and warehouse facilities in different parts of the country. At this point ECX is mainly trading in coffee and sesame. Other commodities are expected to be integrated in to the system in the near future.

Statement of problem and significance of the study

It is well know fact that commodity exchange is an integrated solution to market failures observed in developing economies. The problem is that there are conditions that have to be satisfied before commodity exchange can be viable. In simple words commodity exchange is viable, if and only if it can generate significant reeducation in transaction cost compared to normal way of doing business.

This is so because empirical evidence on performance of commodity exchange is mixed. In one side, out of the 20 best future trading commodity exchanges in the world 9 are located in developing economies (UNCTAD, 2007). These success stories are found in middle income countries, though (ibid). In other side, more than 20 initiatives to develop commodity exchange with in African countries between 1995 and 2005 are observed to collapse one after the other (UNCTAD, 2005). Low level of market development, observed in low income countries, is crating ‘an egg and chicken’ problem. The reason why we need commodity exchanges is to mitigate the impact of market failure. The problem is that commodity exchanges are highly functional, when the market failures are not that serious (Gabre-Madhin and Goggin, 2005). Fortunately, there is a glimpse of hope coming from the fact that: if commodity exchanges are tailored to the local needs of low income countries, they have a good odd of success (UNCTAD, 2007; Gabre-Madhin and Goggin, 2005 and Santana-Boado and Brading, 2000).

That is why before ECX’s services are extended to more grains and more market locations, with huge fixed cost, there is a need to understand: how the normal marketing system is working and what are the gaps that can be filled by ECX. Additionally understanding what factors are contributing for higher preference of traders to use ECX’s services is fundamental for developing appropriate recommendations. Unfortunately, not a single study is done to fill this knowledge gap in Ethiopia. Such study is critically needed to save ECX from becoming another failure statistics from low income economies. This paper will try to fill part of the gap by focusing on markets located in surplus producing part of Tigray regional state.

Research objectives

This research has a one general objective of assessing the viability of services expected to be offered by ECX in surplus producing zones of Tigray region. Moreover it also has the following specific objectives.

1. To make cost and benefit analysis of expected use of ECX services
2. To assess the willingness to pay of traders for future use of ECX's services
3. To study structure, conduct and performance (SCP) of grain trading
4. To identify determinants of traders' willingness to pay for ECX's services, based on SCP of the grain markets
5. To recommend ways to make commodity exchange more viable based on research result, experience of other countries and critical thinking.

Description of the study area

The study area includes two surplus producing Southern and Northwest Zones of Tigray regional state and the capital city of the state i.e. Mekelle. From Northwest Himora and from South Alemata, Maychew and Mokone are selected. Himora is known for its best quality sesame product, which is becoming an important source of foreign exchange for the country. Southern zone is known for its surplus production of basic cereals. A higher flow of commodities is needed for ECX services to be more viable. That is why the study is mainly focusing in surplus producing zones of Tigray region. Mekelle is selected for its large population concentration and possibility of serving as regional hub for grain market of the region². Means the study is done in part of Tigray region where the services of ECX can be feasible.

Methodology

Data collection methodology

The initial idea was to select 40 wholesalers from each zone based on systematic random sampling. However some unexpected constraints are observed in the research sites that lead to modification of the sampling process. In Himora even though there were 207 licensed traders, licensed as wholesaler, more than half of the traders were not actual traders. It is observed that to access bank credit what traders need is personal asset, like home, and wholesale license. As result large portion of licensed traders were getting license just to access loan than to use it for trade. To deal with this problem a large amount of replacement is done while preserving the systematic nature of the data collection process. 123 traders are randomly selected³ and 39 active traders are used in the study. The identification of operational traders is done through labors and continues consultancy with grain brokers located in two locations, government officials and residents of the city. To add to this problem some enumerators were observed to produce suspicious and inconsistent data and all enumerators were not observed to collect accurate contingency data. That is why a second survey was done to correct the problem that resulted in loss of 12 traders. Since wholesale trade is done by the owner and these traders are highly mobile, contingency data was not collected from 12 traders. Means 39 observations are available for most variables and contingency data is available only for 27 traders.

² Unfortunately, observation of the study areas and study result reveals that Mekelle is not central hub for grain market of the state. However Mekelle can create adequate demand to make commodity exchange viable in serving the customers of the city and resident traders.

³ They are not selected at once but as replacement as a trader is not found

The data collection problem in Mekelle was also constrained by three problems. First, significant proportion of traders rejected to participate in the data collection⁴. Second, even though many traders insist that there are 40 to 50 active traders in the market, there were 100 licensed traders in government record. This fact made the sampling process highly unsystematic and the project is not able to find more than 30 traders with license and who are willing to participate in the survey. Data was collected from the 30 traders. Unfortunately 10 questioners collected by one enumerator were found to be inconsistent and are rejected; making the effective sample in Mekelle grain market to just 20 traders. In South a complete census of wholesalers located in three market location of Alemata, Maychew⁵ and Mokone is done to have 49 observations from south. In general a complete data is collected from 96 traders and excluding contingency data complete data is collected from 108 traders. Since the replacement is done with out leaving systematic random sampling procedure and identification is done by using all possible source, it is expected the sample to be representative of Himora and of course Southern markets. However the result of this analysis should be accepted with grain of salt in case of Mekelle, since the sample may not be representative.

Econometric methodology

The Econometric methodology is focused in estimating the determinants of two ECX services i.e. warehouse receipt and exchange service of ECX. For the contingent value given to different warehouse receipt services (**WR**) which are having none zero value, except for 6 observations, a simple OLS model is used in the following form.

$$WR = \beta X_i + \varepsilon_i \dots\dots\dots 1$$

Where the error term (ε_i) is normally and independently distributed with constant variance or $\varepsilon_i \sim NID(0, \sigma^2)$. Given for most observations the latent variable is observed and given the alternative models will normally impose some distribution on the error term that may not be true, this approach is justified (Maddala, 1983)

For determinants of contingent value attached to exchange service of ECX Tobit and Probit models are used. A given trader will be willing to pay for commodity exchange’s exchange service, if the benefit is higher than the cost. The benefit of commodity exchange, at maximum, is equal to the implicit and explicit transaction cost faced by traders in normal way of doing business. However there are both implicit and explicit costs that can be faced by using exchange service of ECX. First, traders may not able to benefit from their long term investment on social capital, if more impersonal exchange is introduced. Second a significant portion of any abnormal profit earned by networked traders can be lost, if transparent price discovery is introduced by exchange. Third traders

⁴ Mostly low income traders and traders who experience legal litigation by government officials who accuse them for unlawful trading practice for simple storage of grain in face of sharp inflation observed in the country. However the rejection is mostly among low capital traders.

⁵ In May Chew 10 traders out of 14, which are involved in spatial arbitration are taken as whole sellers though they are having retailing license

have to learn new trading pattern, abandoning traditional trading practice learned over years. Let assume this transaction costs of normal way of doing business, represented by T , are function of different factors, represented by X_t .

$$T = f(X_t) + \varepsilon_t \dots\dots\dots 2$$

If the unobserved cost is S and which is function different factors, represented by X_s , it will be given us

$$S = f(X_s) + \varepsilon_s \dots\dots\dots 3$$

Assuming both are linear in parameters, the unobserved willingness to pay function will be

$$T - S = f(X_t) - f(X_s) = \beta_t X_t - \beta_s X_s + \varepsilon_t - \varepsilon_s = \beta X + \varepsilon \dots\dots\dots 4$$

The willingness to pay is observed only if $T - S$ is positive. As result, simple regression analysis or OLS of equation 4 will introduce estimation bias in to the parameters (Tobin, 1958). To solve the problem, Tobit model of Tobin (1958) will have to be used to have unbiased estimation of the parameters. Lets define observed willingness to pay as W . So

$$\begin{aligned} W &= T - S = \beta X + \varepsilon && \text{if } T - S > 0 \\ W &= 0 && \text{if } T - S \leq 0 \dots\dots\dots 5 \end{aligned}$$

And this will be related to the following fact in terms of probability distribution.

$$\begin{aligned} W &= T - S = \beta X + \varepsilon && \text{With probability of } \Omega(\beta X) \\ W &= 0 && \text{With probability of } 1 - \Omega(\beta X) \dots\dots\dots 6 \end{aligned}$$

Given the above fact the coefficient of the independent variables can be estimated by maximizing the following Tobit log likelihood function, assuming the error term (ε) is white noise or is having independently and identically distributed normal distribution. Formally $\varepsilon \sim NID(0, \sigma^2)$

$$LL = \left[\sum_{i \in I_0} \log \Phi \left(\frac{-\beta X}{\sigma} \right) + \sum_{i \in I \neq 0} \log \phi \left(\frac{W - \beta X}{\sigma} \right) \right] \dots\dots\dots 7$$

For some types of exchange services (if exchange is completed with in one hour or less), it observed that few traders (7) are having zero contingent value. So in line with recommendation of Maddala (1983) a simple OLS model given in equation 1 is used. To have clear idea, who is willing to pay and who is not willing to pay could be also very important in addition how much they are willing to pay. So Probit model of Bliss (1934) will be used to answer this question. From equation 4 we can drive the following fact

$$\begin{aligned} W_D &= 1 && \text{if } T - S > 0 \\ W_D &= 0 && \text{if } T - S \leq 0 \dots\dots\dots 8 \end{aligned}$$

Where $\mathbf{W}_D = 0$ is dummy, taking value of one for those who are willing to pay some amount. The associated probability, therefore, will be

$$\begin{aligned} \mathbf{W}_D = 1 & \quad \text{With probability of } \Omega(\boldsymbol{\beta}\mathbf{X}) \\ \mathbf{W}_D = 0 & \quad \text{With probability of } 1 - \Omega(\boldsymbol{\beta}\mathbf{X}) \dots\dots\dots 9 \end{aligned}$$

Assuming the error term is white noise, the related Probit log likelihood function will be

$$LL = \left[\sum_{i \in I_0}^n \log \Phi(-\boldsymbol{\beta}\mathbf{X}) + \sum_{i \in I \neq 0}^n \log \Phi(1 - \boldsymbol{\beta}\mathbf{X}) \right] \dots\dots\dots 10$$

The problem with Probit model given in equation 10 is that the distributional assumptions imposed in to equation 9 may not be right, as found to be the case in this paper. That is why maximum score estimator of Manski (1975, 1985) is also used. With out imposing any distributional assumptions in to the model, this model will try to estimate the parameters semi-parametrically. Taking the distribution function in equation 9 as unknown, the procedure will maximize the following score function to estimate the parameters($\boldsymbol{\beta}$).

$$\mathbf{S}_{Na}(\boldsymbol{\beta}) = \frac{1}{n} \sum_{i \in I_0}^n \left[2\mathbf{W}_D - 1 - (1 - 2\alpha) \right] \text{sign}(\boldsymbol{\beta}\mathbf{X}) \dots\dots\dots 11$$

The $\mathbf{S}_{Na}(\boldsymbol{\beta})$ is score, α is taken to be $\frac{1}{2}$ to make the model consistence with Pseudo R^2 or to select the parameters in way that predicts the observed events accurately. The problem with maximum score is that at this time it is not possible to estimate more than 15 parameters due to computational complexity (Green, 2000), despite the fact that the effect of omitted variables on the model is unknown (Manski, 1975, 1985). To deal with this problem a linear probability model (LPM) which uses weighted least square (WLS) assuming linear probability function (see Gujarati, 2003) is used as complementary. LPM uses the following form

$$\begin{aligned} \mathbf{P}(\mathbf{W}) = \mathbf{P} &= w_i \boldsymbol{\beta}\mathbf{X}_i + \boldsymbol{\varepsilon}_i \dots\dots\dots 12 \\ \mathbf{w} &= (\mathbf{P} (1 - \mathbf{P}))^{-0.5} \end{aligned}$$

Where the difference between equation 1 and equation 12 is related to the use of weights presented by \mathbf{W} , in equation 12. \mathbf{W} is introduced to eliminate binominal distribution related heteroskedasticity from the data.

In all cases test for distributional assumptions are done to make sure the model result are estimated from appropriately specified model. For OLS the most important testes are related to omitted variable, multicollinearity, normality and heteroskedasticity. To test multicollinearity variance inflating factor is used and to test heteroskedasticity Breusch-Pagan / Cook-Weisberg test for heteroskedasticity is used. When heteroskedasticity is not

rejected robust standard errors are reported. Omitted variable are tested by using Ramsey's reset test. Normality test is done by using information matrix test or Cameron & Trivedi's decomposition of IM-test. For Tobit and Probit models Lagrange Multiplier (LM) score testes are used to test for heteroskedasticity, omitted variables and normality (see Green, 2000 and Verbeek, 2006). Score testes use generalized residuals and artificial regression to fit LM test.

Limitation of the study

The main limitation of the study is related to the data collection process followed and associated problems observed. This problem in turn is caused by institutional failure of the University, lack of reliable list of traders and rejection of some traders to participate in the study, mainly in Mekelle. The low allowance of 50 birr allocated to enumerators by the University for Data Collection was observed to create serious adverse selection and moral hazard problem among enumerators. It was not possible to get best enumerators and the survey demanded huge supervision cost to collect reliable data. When enumerator has to spend 40 to 45 birr for mere survival every day in sample sites, 50 birr allowance was not adequate to have the best and brightest enumerators in the business. Unless the university is willing to change this Stone Age institution, it is believe of the researchers any significant result can't be expected in future researches endeavor of the university. Lack of reliable list of traders is another challenge that needs to be addressed by concerned bodies. Third some Mekelle traders' rejection to participate in the survey was caused by lack of time, lack of understanding about importance of such research and unnecessary intervention of government in to grain trade in the past. Traders were accused for uncompetitive behavior, for simply storing grain expecting higher price in the future, which is normal activity in grain market⁶. Officials which were not willing to support the data collection process with in the city was observed to intervene in normal trading activity behind their legal mandate, which is very puzzling to the researcher. It is necessary to put right regulatory service and man power to facilitate market development than putting unqualified staff, which does not understand the role of regulation and market, to regulate grain market. One way or another the main problems in this study are mostly caused by malfunctioning state services and institutions and over ambitions focus on collection of complete 41 page data by the researchers.

Secondary, limitations are related to failure of both Tobit and Probit model to be appropriate to the data, even when heteroskedasticity in exponential form is allowed in the model. For Probit maximum score and LPM are used to solve the problem. The Tobit model is left for appendix, since there is no logical reason to accept it as true.

Organization of the paper

After the introductory and methodology part given above, theoretical back ground will be given in next section. Discussion and analysis will be given in third section to be followed by conclusion and policy recommendation in last section.

⁶ This action of local authority is found to be unlawful in court of law

Theoretical back ground

The role of grain trade in economic development

The role of trade in economic development is related to the creation of time, space and form utility. The first problem in distribution of goods and services is related to the fact that time of production and time of consumption of a good may not be the same. Most grain in Ethiopia is often produced around September to January; but it is consumed all year round. This fact will create seasonal surplus, around pick season, and seasonal shortage, around slack season. In pick season grain price will be very low given, first, most of the grain that can be used for year consumption is damped in this season and, second, price elasticity of demand for most agricultural products is very low⁷. This will discourage farmers from being innovator, risk taker, adopter of advanced technology or in short this will discourage them from developing behavior which is pro-development. In slack season again the shortage of agricultural products and the high quantity elasticity of demand for agricultural products will result in sharp increase in grain prices. This in turn will create budget crises for poor consumers to reduce their level of food security. In short it can increase transitory poverty for poor consumers.

That is why traders' temporal arbitration of grain price will generate positive contribution to economic development and welfare of citizens. Traders by buying grain in pick season and selling at slack season will reduce the temporal price margin. This is called the creation of time utility, in terms of economic jargon. It is creation of utility, because, first, the welfare of producers at pick season and customers at slack season is improved. Second the reduced risk will encourage the development of pro-development behavior among economic agents (mainly farmers) to promote higher growth and ever increasing production of agricultural products.

Another problem in economic development is that place of production and place of consumption are often different, if we use national or regional telescope. This will create fragmentation of trade or surplus of grain in some locations, to reduce price and discourage producers, and shortage of grain in deficit locations, to create serious food insecurity among the poor. That is why grain traders' creation of space utility is very productive activity. Traders, by buying grain from surplus areas and transporting it to sale in deficit areas, will improve incentive of producers in food surplus areas and will reduce food insecurity of poor customers in food deficit areas.

A third problem in distribution economics is that the form of grains supplied by producers and the form of consumption item demanded by customers may not be the same. Farmers may be supplying raw coffee but customers are looking for processed coffee, for example. That is why unless traders are able to process raw coffee in to ready to use processed coffee; there may not be significant transaction in coffee market.

⁷ If price elasticity of demand is less than one, then quantity elasticity of demand will be greater than one. Means one percent increase in quantity supplied will generate more than one percent decline in price. To use simple words, it means since food items are necessity, people have maximum limit on the amount food they can consume. Under such reality increase in supply will result on sharp decline in price.

Therefore traders will add value, through processing, of agricultural products and by doing so they will expand the level of demand for agricultural products.

In general if traders are given the freedom to store, transport and process agriculture products, they will create time, space and form utility to promote fast economic development.

Market failures or the constrains faced by traders in creation of time, space and form utility

In perfect market the creation of time, space and form utility is not that much complicated business. When there are large number of buyers and sellers, everyone will end up being price taker. When there is free entry and exit, everyone will earn normal profit. There is no product differentiation and trade is done under perfect information. Means there is no need for grade and standard and there is no risk or unanticipated event. What is planned before hand will actually happen, nothing is unexpected and what is planned will unfold in the future as it is planned (Stiglitz, 2001). There is perfect factor mobility. Any investment done in one sector can be moved to another sector without any additional cost, in case the first sector is overcrowded (Subramaniam and Panth, 1996). Under such reality trading is a very simple task done based on mere analysis of prices. The simple and single rule for success in grain trade is: Buy grain, whenever and wherever price is low; and sale it whenever and wherever price is high. Under such reality, as long as the price is right, market allocation among ego centric economic agents will create Pareto optimal space, time and form utility.

The problem is that the reality that we face and the reality assumed or imposed in neo-classical market are completely different (Stiglitz, 2001). Traders operating in highly dysfunctional and incomplete markets need to find appropriate solution for ever emanating challenges in grain trade to stay in business. The problems observed in grain trade are related to high transaction cost which can result on dysfunctional and missing markets. High transaction cost can result from one or many of the following problems observed in developing economies market

1. Lack of appropriate grades and standards (Fafchamps and Minten, 1996b, 1999a; Gabre-Madhin, 2001b and Gabre-Madhin et al, 2003)
2. Lack of adequate information and high risk (Bryceson, 1994; Fafchamps and Minten, 1999a; Gabre-Madhin, 2001b; Gabre-Madhin et al, 2003; Newbery and Stiglitz, 1981 and Stiglitz, 2001)
3. Lack of access to finance (Barrett, 1997; Fafchamps, 1997a; Gabre-Madhin et al, 2003; Jayne et al, 2002; Johnson et al, 1999 and McMillan and Woodruff, 1998)
4. Lack of appropriate marketing infrastructure (Bryceson, 1994; Gabre-Madhin, 2001b; Gabre-Madhin et al, 2003; Jayne et al, 2002 and Rapsomanikis and Panayiotis, 2007)
5. Inefficient enforcement of contract (Bigsten et al, 1998; Fafchamps, 1996; Fafchamps and Minten, 1996b, 1999a; Gabre-Madhin, 2001b; Gabre-Madhin et al, 2003; Jayne et al, 2002 and WB, 2002)

6. High search cost (Gabre-Madhin, 2001a; McMillan and Woodruff, 1998 and Minten and Kyle, 1999)

Lack of appropriate grade and standards is the norm than an exception in grain markets of developing economies. Under such reality, assuming the only institution at work are market and state, it could be very expensive and sluggish to make transaction with in grain market. The buyer of grain has to check each and every sack of grain. And in order to make sure that each sack is containing homogenous grain, it has to check different parts of each sack. Furthermore, if agreement is not reached on the terms of the contract, the process has to restart all over again. As result the trading process in market where tones of grain are coming and going will be very slow and very costly. This will increase transaction cost related to opportunity cost of time used in screening process. Since most of the inspection is done by the main trader himself the opportunity cost of screening will be very high.

Lack of appropriate grade and standard is related to lack of information on the product quality. But lack of information can take different form. Lack of information can be related to spot prices discovered on different locations, expected price dynamics of prices in different locations, current and expected production and expected and historic weather conditions of different locations. This will create serious risk on creation of both temporal and spatial arbitrage. If prices are erratic and can expose traders to high level of risk, they may rationally reject to create either time or space utility, despite positive expected profit of temporal and spatial arbitrage. Risk can have direct effect on transaction cost from two directions. In one side traders may try to use resource on information collection and making predication of future events. This will have direct impact on transaction cost. In other side, for given level risk, people will demand some risk premium to assume the risk. So risk premium will have implicit impact on transaction cost. So the existence of risk by increasing transaction cost can either reduce or eliminate trading all in all. In general theoretical analysis did clearly show that market will supply less than optimal information, but also it will result on increased distortion of existing information (Stiglitz, 2001). That is why market allocation with less than adequate information will be Pareto optimal only by chance not by default (ibid).

In face of serious lack of adequate information and lack of proper grade and standards, the search process between buyers and sellers will be very costly. Note that it is not only about finding a buyer or seller, but to find a buyer or seller with right price, quantity and quality. Under imperfect information and lack of clearly defined grade and standards, the search process will be very sluggish and very costly. This will result on high search cost or high transaction cost (Gabre-Madhin, 2001a).

Lack of finance is another serious problem. Grain trading deals with biological products or product in which their out put is significant function of random natural factors. Random environmental and climatic changes will introduce random fluctuation on grain production. Such random variation in output in turn will introduce much higher fluctuation in grain price, due to low price elasticity of demand (high quantity elasticity of demand). In short, grain trading is done in face of serious quantity and price related

risks. That is why financial institutions are not willing to lend for grain trade, unless the trader can provide marketable collateral. Unfortunately, the concentration of grain traders' capital on working capital will further limit their access to finance. Since most of grain trading capital is concentrated in form of working capital, traders can't provide marketable collateral to lending financial institutions (Gabre-Madhin, 2001b). The lack of collateral will increase both moral hazard and adverse selection problem, to make the risk faced by lenders much higher than the already high average risk found in the market. Under such reality, unless high risk premium is allocated to lending financial institutions, formal institutions may not be willing to lend to grain traders. At the same time grain trading with its seasonal and random variation will demand very flexible access to finance, and provision of such flexible access to finance will further increase the transaction cost of lending to grain traders. That is why grain trading is facing missing credit market as part of the credit market gap observed in developing economies. As is stated by Ageba (2006) the very rich have formal banks and the poor have MFIs, but there is credit market gap in serving the need of middle income bracket. This group includes most grain traders operating in Ethiopian grain markets. Under such reality the expected lack of finance will limit traders' capacity to store, transport and process grain for profit or it will limit their capacity to create time, space and form utility.

Lack of marketing infrastructure like roads, information communication technology (ICT), storage facility, transportation facility and soon will also increase the transaction cost of creating time, space and form utility (Jayne et al, 2002 and Rapsomanikis and Panayiotis, 2007). To make things worst, lack of cost effective and efficient contract enforcement mechanism by the judicial system of developing economies will further increase the expected transaction cost of any contract (Jayne et al, 2002). If there is breach of contract with in grain trade or any related contract, they have to use the less efficient, less predictable, sluggish and very costly legal system. This is not an ideal situation to bet on your and your family future!

In general high transaction cost can result on trade fragmentation and less efficient trading. This will limit traders' activity to short term and short distance arbitration without any significant processing of products. This is observed to be the case for Ethiopia grain market according to Gabre-Madhin et al (2003).

Market failure that constrain producers' capability to contribute to economic development

The above market failures will also constrain small scale farmers' capacity to benefit from market transaction, specialization and commercialization. This is because the level of market failure and observed transaction cost have tendency to increase with decline in size of the firm (Barrett, 1997; Bigsten et al, 1998; Fafchamps, 1997a; Fafchamps and Minten, 1999a; Gabre-Madhin et al, 2003 and UNCTAD, 2007). To understand this fact lets start from an average farmer found in developing economies. Average farmer in developing economies will face the following serious problems in producing agricultural products for the market.

1. High production and marketing risk (Sadoulet and Janvry, 1995; Stiglitz, 2001; UNCTAD, 2007 and Von Braun and Kennedy, 1994)
2. Lack of adequate information (Gabre-Madhin et al, 2003; Newbery and Stiglitz, 1981; Sadoulet and Janvry, 1995; Stiglitz, 2001; Sadhu and Singh, 2002 and UNCTAD, 2007)
3. Lack of adequate and quality storage facility (Gabre-Madhin and Goggin, 2005; Sadhu and Singh, 2002 and UNCTAD, 2007)
4. High financial stress (Gabre-Madhin et al, 2003; Sadoulet and Janvry, 1995; Sadhu and Singh, 2002 and UNCTAD, 2007)
5. Manipulative middle man (Sadhu and Singh, 2002)

Given high dependence of farming on random natural events and high quantity elasticity of demand for most agricultural products, farmers will expose themselves to high level of risk; if they try to commercialize and specialize on few high priced but risky products (Sadoulet and Janvry, 1995; UNCTAD, 2007 and Von Braun and Kennedy, 1994). Lacking adequate information about expected production and price, farmers can easily expose themselves to huge amount risk, if they focus on commercialized farming (Sadoulet and Janvry, 1995 and Von Braun and Kennedy, 1994). It is irrational to assume that what ever rational decision done by small scale farmers under imperfect information is Pareto optimal (Stiglitz, 2001). To make things worst, the level of information available in the market is not only sup optimal, but also small scale farmers access to such incomplete information is very limited (Lovelace, 1998). Small scale farmers lack both capacity to invest on information and capacity to make large scale use of any information. That is why, small scale farmers working under highly risky environment with very limited information will demand high amount of risk premium to take any risky activity (Sadoulet and Janvry, 1995 and Von Braun and Kennedy, 1994).

The lack of access to finance and modern storage facility will create stress sell among small scale farmers to result on impoverishing growth. Small scale rural farmers in addition to the high risk they are exposed, they can't provide marketable collateral to access formal loan. This will increase the level of risk that has to be assumed by banks due to increase in adverse selection and moral hazard problems. Moreover the low population density in rural areas and smallness of the amount of money demanded by small scale farmers will increase the transaction cost of banking the rural small scale poor farmer. As result formal banks are not in position to bank the rural poor small scale farmer. This fact will create a vicious circle of poverty, where due to lack of finance poor farmers will not participate on rewarding activates and as result will remain poor to preserve their financial constrain. Moreover the lack of modern and large scale storage facility will result on huge crop damage and high storage cost. Under such reality if small scale farmers are forced to use modern inputs on credit or are forced to commercialize, it may result on impoverishing growth (Sadoulet and Janvry, 1995 and Von Braun and Kennedy, 1994).

After investing on risky activity, if they fail, they have to face serious decline on their welfare and consumption. If they succeed, they can't store the grain for long and at the same time they have to raise finance to pay for different financial obligations they have

(Sadoulet and Janvry, 1995). This will create stress among small scale farmers to dispose their output just after harvest (Gabre-Madhin et al, 2003). When large number of farmers dump their output, there will sharp decline in price, demanding more dumping to satisfy the financial obligation of the farmers. This will push the price farther and the cycle is self preserving. This fact will discourage farmers from taking risk, adopting modern technology, specialization and commercialization; even though that is what is expected from them.

Last but not least is related to behavior of manipulative middle man. Given in most cases large number of farmers will deal with small number of traders which possess better information, better bargaining power, less transaction cost and lower stress, these facts will expose the army of small scale farmers to suffer in the hand of manipulative middle man. The manipulative middle man by using their better market power and better access to information can fix unfavorable terms of trade against small scale farmers to discourage them from developing pro development behavior (Sadhu and Singh, 2002).

Under the above stated reality, small scale farmers left to some times invisible and some times non-existence hand of the market will fail to contribute to economic development of the nation. That is why we need alternative institutions to fill the gap of imperfect market outcome and to make it closer to the outcome expected under perfect market.

Networks, brokers and agents as alternative institutions to mitigate the impact of dysfunctional or missing formal institutions

Facing poor marketing infrastructure, highly inadequate information, highly limited access to financial resource, high risk, lack of proper grade and standard and highly inefficient legal enforcement, it is not naive to expect missing large scale grain market in developing economies. If the only institution in developing economies were market and state only, which are highly dysfunctional most often, then expecting some form of sustained large scale grain trade will be too optimistic (Fafchamps and Minten, 1999a⁸). However due to the existence of informal networks, brokers and agents, part of the market failure problem of grain market is mitigated to make large scale trading possible.

When the market and the state are not in position to supply macro level trust or trust on the system, traders will depend on micro level trust or meso level trust⁹ (Fafchamps, 2002; Guiso et al, 2000; Humphrey, 1998; McMillan and Woodruff, 2000 and Moore, 1999). In perfectly functioning macro level trust exchange is anonymous. This is because traders' trust is not based on other traders' good will to be honest, but on the system to supply them cost effective information, risk management capacity, infrastructure, contract enforcement and soon. But when the market and state are not in position to supply macro level trust, transactions have to be personal and reputation based to improve efficiency (Fafchamps and Minten, 1999a). Personal transaction is manifested in form of networks, use of brokers and agents. Let's start from networks.

⁸ This is in line with flea market concept of Fafchamps and Minten (1999a)

⁹ When formal institutions are functional but not perfect trust is needed since every contingency can't be controlled by contract and there is some risk involved in any contract

Networks

Networks are based on social capital built out of trust or/and sanction (Humphrey, 1998). “Situations in which individual agents only trust a limited number of agents they know individually can be described as a network” (Fafchamps, 2006, 1183). In such case through long term personal and business related relationship, one agent can predict the expected action of another agent without having adequate information on his/her actual action (Hayami, 1997; Glaeser et al, 2000 and Platteau, 1994a). In practical terms without having properly defined grade and standards, one trader can have good prediction about expected quality of grain that is going to be supplied by another trader (Fafchamps and Minten, 2002). Those traders which can trust each other to supply good quality grain will be part of the network, excluding others which are not trustworthy. Means the transaction cost of inspection to ensure appropriate quality can be avoided by exchanging grain among trusted network members (Fafchamps, 2002 and Fafchamps and Minten, 2002).

Another problem of dysfunctional or highly imperfect credit market is that trades may not have flexible access to finance. However given the existence of long term personal and business related relationship traders can easily predict the expected credit worthiness and trust worthiness of other trader. Number of credit worthy and trust worthy traders will be able to create networks and will lend and borrow from each other (Fafchamps, 1997a and Schmid and Robison, 1995), mostly with verbal agreement and without using any formal papers or without expecting to use third party enforcement. This will enable traders to easily handle any short term liquidity problem and will improve the mobility of the limited financial resource at their disposal (Fafchamps et al, 1994, 2002 and Fafchamps and Minten, 1996b, 1999a, 2002).

The cost of collecting information from different locations can be very expensive for traders which have to hire people to collect price, output and climatic information from different locations. But if traders can create network of traders, they can easily exchange different information from one location to another location without a need to pay for information collection process (Coleman, 1988; Rauch and Casella, 1998; Fafchamps and Minten, 1999a, 2002; Grootaert, 1998; Lyon, 2000 and WB, 2002).

In face of highly unpredictable and risk environment and highly inefficient, unpredictable and sluggish legal enforcement, there is need for flexible approach to contract enforcement. Unfortunately, short term flexibility which can improve not only financial viability of traders with short term liquidity problem, but also can avoid the need to use the inefficient legal system, is mixed blessing. Despite the above stated advantage contract flexibility can increase the level of risk faced by traders taking open position. That is why efficiency of contract flexibility demands it to be done among trustworthy network of traders. So the development of networks will improve the effectiveness of contract flexibility by avoiding the inefficient third party enforcement (Bigsten et al, 1998; Fafchamps, 1996; Fafchamps and Minten, 2002; Grootaert, 1998; Lyon, 2000 and McMillan and Woodruff, 2000).

However when people are trusted there is tendency to develop moral hazard and to breach contract. Trusted traders can supply poor quality grain, distorted information, fail to honor contract terms, fail to repay debt and soon to maximize short term benefit. To avoid such moral hazard some form of bilateral or collective sanction is needed to be used (Coleman, 1988; Fafchamps, 1996; Fafchamps and Minten, 1999a; Ghosh and Ray, 1996; Greif, 1993; Grootaert, 1998; Kranton, 1996; Lyon, 2000; Platteau, 1994b; McMillan and Woodruff, 1998, 2000; Moore, 1999 and WB, 2002). Bilateral sanction by reducing the net present value of moral hazard, it can minimize the incentive to breach contract (Greif, 1993). Net present value of contract embracement is the net present value of current breach of contract minus the present value of all expected future benefit from such bilateral long term trading. When the net present value is negative, rational ego centric individuals will have incentive to honor contract. The problem with bilateral sanction is that the net present value of all future benefits expected to be generated from long term relationship with one trader can be very small, in comparison to expected benefit of a single breach of contract. That is why, collective sanction, by all trustworthy traders, is needed to increase the expected opportunity cost of contract embracement by any one. By rejecting to trade, lend and trust anyone with history of dishonest behavior traders, as collective, can easily avoid or reduce the occurrence of moral hazard.

However if the market is not very thick, such exclusion may reduce the number of traders in network and it may have serious negative consequence in the future benefit of trustworthy network of traders (Fafchamps, 2002 and McMillan and Woodruff, 1998, 2000). So exclusion can be replaced or can be complemented by demand for compensation (Harbord, 2006). A trader who defaulted in past transactions can be only allowed to participate in future transactions, if and only if he/she is able to pay compensation. Additionally if bilateral sanction is used and a trader is going to face serious decline in future income, he/she may try to do careful transaction with untrustworthy traders facing high transaction cost than using sanction (Fafchamps, 2002). If a trader supply him/her poor quality grain in the past, than avoiding trading with the trader all in all, he/she may end up making detail inspection of all future supply of grain. This will increase transaction cost faced by the honest trader and as result will reduce the benefit of future trade. But it will not reduce the expected future benefit to the trustworthy trader it to zero. If there is large number of honest traders, however, he/she can afford to exclude dishonest traders and still can make decent profit in the future.

In general, moral hazard and other market failures can be solved by investing scare resource on information collection, legal enforcement, high search and screening cost. This will reduce the level of economic efficiency in the system. Fortunately, Trust based networks, backed by sanction and compensation to avoid the need for such transaction cost, can push market allocation to ward Pareto optimal level. In short, large trade volume under highly dysfunctional and missing markets is made possible due to existence of social capital among traders (Kranton and Minehart, 2000). In other words, the development of long term personal relationship is what moves inefficient flee market to ward relatively more efficient and large scale networked market (Fafchamps and Minten, 1999a).

Statistical discrimination

Trust can be developed through reputation to generate micro level trust and development of personal networks (Fafchamps and Lund, 2003; Fafchamps and Minten, 1999a, 2001; McMillan and Woodruff, 2000; Palaskas and Harriss-white, 1993; Platteau, 1994a and Stiglitz, 2000), as stated above. However trust can be also defined in some socio economic dimension (Fafchamps and Minten, 2001; Fafchamps, 1996, 2002; Humphrey, 1998; Platteau, 1994a, 1994b and WB, 2002). If some socio economic group behave trustworthy for long or if the average honest behavior of some socio economic group is significantly higher than others, in both numeric and statistical terms, then more trust can be built to ward such socio economic group. As result people who belong to such socio economic group will simply exchange private property based on trust without the need for huge transaction cost. Here trust is not earned through reputation, but inherited by belonging to trusted socio economic group (Alesina and Ferrara, 2002; Coleman, 1988; Fafchamps, 1996, 1997a, 2002; Greif, 1993; Humphrey, 1998; Lyon, 2000; Moore, 1999; Overa, 2006 and Palaskas and Harriss-white, 1993) .

However when people are trusted, ego centric individuals have an inherent tendency to develop moral hazard. That is why bilateral and collective sanctions and compensation are needed to keep the integrity of the trusted socio economic group intact. In such meso level socio capital initial trust is inherited, but the preservation of trust is ensured through good reputation (Fafchamps, 1996, 1997a; Fafchamps and Minten, 2001; Greif, 1993; Humphrey, 1998; Overa, 2006 and McMillan and Woodruff, 2000).

There is ample evidence in literature about the prevalence of meso level trust in economic activity. Just to give a bird's eye view to the literature, the following evidences are useful. Historically the expansion of Maghribi trade by Jew traders in 11th century (Greif, 1993) and the expansion of Islam in East Africa (Fafchamps, 2000 and Platteau, 1994a) are related to the use of meso level trust to reduce transaction cost in face of serious missing and dysfunctional markets. Maghribi¹⁰ traders which represent network of Jew traders with trust inherited from generation to generation and preserved through reputation, sanction or/and compensation were able to facilitate effective trade in western Mediterranean in face of huge market failures, highly backward marketing infrastructure and extremely high risks. Similarly Arab traders were more willing to trust other Muslims from local community of eastern Africa than others to make transaction (Fafchamps, 2000 and Platteau, 1994a). Under such reality, the only way local traders can participate in highly beneficial exchange with Arab traders was by accepting Islam as their religion. This fact resulted on historically unique expansion of Islam in east Africa without the occurrence of serious wares.

To use contemporary examples the domination of business in some African countries by Asian and European origin Africans (Bryceson, 1994; Coleman, 1988 and Fafchamps,

¹⁰ The actual nature of Maghribi traders presented by Greif (1993) is questioned by Edwards and Ogilvie (2009) and by Harbord (2006). However either it was exclusive Jews group or not, either it was based on sanction or compensation; either it was substitute for the formal system or complementary for it, it is clear there was some level of trust defined in ethnic lines.

1997a, 1999, 2002) the domination of Chinese traders in most part of East Asia (Platteau, 1994a, 1994b), the concentration of diamond trade in hand of Jew traders (Coleman, 1988) and concentration of different industries among few ethnic lines with in Ethiopia are classic examples¹¹.

Brokers

Even though in perfect market perfect information is assumed in to the market model, in the real world perfect information is a unicorn. Or it is something fantasized in micro economic models of neoclassical economics and is never been observed in real world. Under highly imperfect information about supply of grain, price quoted by different traders and quality of grain supplied by each trader, traders will face high transaction cost in form of high search cost (Gabre-Madhin, 2001a, 2001b).

However the existence of brokers will have significantly positive impact on reducing the search cost of grain trade (Gabre-Madhin, 2001a, 2001b). Than searching each other, number of traders can easily contact small number of brokers; which in turn have to search each other to clear the market. The existence of brokers will not only reduce transaction cost to increase volume of trade, it also have significant positive impact on welfare of the society (Gabre-Madhin, 2001a).

Social capital among traders and brokers is also fundamental in sustaining beneficial bulky trade among large number of anonymous traders (Gabre-Madhin and Goggin, 2005). The need to preserve beneficial long term relationship in face of serious sanction and demand for compensation, it is at best interest of the traders and brokers to avoid moral hazard in their trust based dealing (Fafchamps and Minten, 1999a; Kranton, 1996 and Gabre-Madhin, 2001a, 2001b).

Imperfection of alternative institutions

The problem with micro and meso level trust is related to the fact that trust of some group implies mistrust of another group. In short, in micro and meso trust exclusion is a norm (Fafchamps, 2000, 2002, 2003; Fafchamps and Minten, 1999a, 2002; Greif, 1993; Grootaert, 1998; Kranton, 1996; Lyon, 2000; McMillan and Woodruff, 2000; Palaskas and Harriss-white, 1993; Platteau, 1994a, 1994b; Stiglitz, 2000 and WB, 2002). Traders with capital, trading skill and other resources can be easily excluded from trade because they did not belong to the trusted socio economic group or network of traders. Moreover the need to reduce the impact of gossip will push out side traders from the system until they are proven trustworthy, making networks exclusive groups (Greif, 1993). This has both efficiency and distributional side effects.

Resource and knowhow of trade which is possessed by outsiders will not be utilized in the resource allocation coordinated by alternative institutions like networks. This will

¹¹ With in Ethiopia some businesses are more or less exclusively concentrated in hand of some ethnic groups. To give another example there is clear ethnic concentration with Ethiopian financial institutions which is generated due to existence of statistical discrimination based on meso level trust.

reduce the efficiency of networks. In addition to the above fact Platteau (1994b) did insist that meso trust, by creating fragmentation in market, will kill the development much efficient market. This is backed by analysis of Arnott and Stiglitz (1988) and Kranton (1996) which show that the efficiency consequence of alternative institutions is much serious. Institutions are not only result of the socio-economic structure of the society, but they are also means to preserve the existing socio-economic structure of the society, how imperfect and dysfunctional it is. If informal local institutions are well established, the development much efficient market (and state) institutions will be very hard business. Means not only they will generate less efficient allocation of resource, but also they will kill the development potential of much efficient institutions. Such result is widely documented in both theoretical analysis (Durlauf and Fafchamps, 2004, 2006; Grootaert, 1998; Kranton, 1996; Kranton and Minehart, 2000; Lyon, 2000; Platteau, 1994a, 1994b; Rauch and Casella, 1998; Stiglitz, 2000 and World Bank, 2002) and empirical studies (Barr, 2000; Barrett, 1997; Fafchamps, 1996, 1999; Fafchamps and Gubert, 2007; Fafchamps and Lund, 2003; Fafchamps and Minten, 1999a; Gabre-Madhin, 2001b; Gabre-Madhin et al, 2003; Guiso et al, 2000; Palaskas and Harriss-white, 1993; McMillan and Woodruff, 1998, 2000 and Weerdt and Dercon, 2006) focusing in all informal institutions in general and networks in particular.

Even if the efficiency side effect is less significant, the distributional impact of such networks can not only lead to highly unfair distribution of economic development (Fafchamps, 2002, 2003, 2006; Fafchamps and Minten, 2002; McMillan and Woodruff, 2000 and Rauch and Casella, 1998), but can also result on highly destabilizing social tension (McMillan and Woodruff, 2000). If economic agents which do not belong to some socio economic group or network are excluded from participating in mutually beneficial exchange of private property, they will share much lower portion of the developmental pie. This is the reason why there is high social tension in many African and Asian countries facing extreme statistical discrimination and network based traders. What makes such trade hard to break is because such discrimination and networking is self-fulfilling prophecy. Outsiders facing high transaction cost have to compete with networked traders facing low transaction cost. As result they have higher chance of failing and breaching contract, reinforcing the existing believe that they can't be trusted (Fafchamps et al, 1994, 1999, 2002).

To add to the problem, given social capital has a public good character (Barr, 2000 and Coleman, 1988), there is a tendency to under invest on social capital. This is the main reason why networks and meso level trusted groups may not generate macro trust and optimal efficiency (Coleman, 1988).

If we focus on brokers, brokers which use social capital to facilitate their business will also face all of the above stated side effects of social capital, which can reduce their efficiency. Unfortunately, their efficiency will also emanate from other direction, too. This is related to information theory mostly propagated by Stiglitz and nicely presented in his Nobel Prize acceptance speech in 2001 (see Stiglitz, 2001), which can be explained in relation to brokers as follows. Brokers' purpose in the market is simply related to information collection, information processing and contract enforcement. Given the fact

that self interest motivated information collection is neither Pareto optimal nor constrained Pareto optimal, brokers activity is not Pareto or constrained Pareto optimal. Information is a public good which is communicated either through intentional communication or behavior (action). Information is none rival but costly, so the only way a broker can benefit from his/her information is either by hiding the information or by giving wrong information. To benefit from some important information that is collected at some cost, a broker can hide it resulting in sup optimal information to be supplied in to the market. Let say a broker knows that there is higher probability that grain price will decline in the afternoon. If the buyer is none network member, it is at the best interest of the broker to hide the information and facilitate trade at higher price. As result less information will end up supplied to the market. Given the fact that the brokers cost and benefit analysis on information collection is based only on private benefit than the social benefit, sup optimal information will be collected and supplied by all traders. In practical terms it means the broker may not contact all traders or brokers to know that right price. He/she will stop at point where private marginal benefit is equal to the marginal cost of additional information. To make things worst some of the information will not be made public, farther reducing the level of information circulating in the marketing system.

Furthermore, since information is also communicated by action or behavior, brokers can alter their behavior to hide information creating more distortion of information¹². If a broker knows after noon price is more probable to be lower than spot price at this time, he/she can push network members to sell their grain now (at spot). This will communicate to other traders his expectation of lower price in the afternoon. If all other traders and brokers follow his lead, grain price will go down and the broker will fail to benefit from his information. The only way a broker can gain is that not only by hiding information but also by altering his behavior. The broker may start buying in the market while facilitating the shipment of network members' grain to other locations. This will farther distort the information available in the market. That is why self interest motivated information collection, which is the norm of broker business, will never be Pareto optimal. For none network traders and brokers, it is often a case brokers are observed to disseminate distorted information intentionally. Study by Overa (2006) in Ghana did found that networks are also used to distribute roomers (false information) against competitors, supporting the above view that networked brokers can intentionally crate imperfect information in the market to benefit their network and hurt competitors.

In short local institutions are the reason why the marketing system is functioning, despite high market failures and missing markets (Fafchamps, 1997b). However local institutions are not Pareto optimal. Means they are functional not necessarily optimal. This is why the development of some form of Macro trust, trust on the system, in integrated manner is a necessary condition for high economic development of a nation (Humphrey, 1998). What is interest about commodity exchange is that under right pre-conditions, it is an integrated solution to develop macro trust in face of serious market failures and missing markets.

¹² Practical example about exchange brokers hiding information can be found in UNCTAD (1998, 15) document in saying "In general, trading houses which have their own brokers on the floor spread out their orders over a large number of brokers not related to their firm so as not to broadcast their intentions."

Commodity exchange as integrated solution to develop macro trust

A commodity exchange can have different characteristics and structure as observed in many countries. This observation is nicely summarized in United Nations Conference on Trade and Development (UNCTED) document in saying

“Commodity exchanges are defined in many different ways. For many observers in developed countries, a commodity exchange is a platform for the trade in futures contracts any other form of trade would not classify. In Turkey a commodity exchange could be a place where transaction are registered, for tax purpose – no actual trade needs to takes place on such exchange. In Latin America, a commodity exchange can be a place where credits from institutional investors to producers are facilitated – spot or future trade is not the object. In many countries in Eastern Europe and former Soviet Union, a commodity exchange is like an auction floor, where any one can sell and buy what ever commodities or manufactured products he has available. In some cases traders have set up institutions that they call commodity exchange, which in effect acts as trading or brokerage operations.”
(UNCTAD, 2005, 4)

As workable definition we can take the definition given by UNCTAD and WB (1993) as organized or semi organized meeting place where various goods are bought and sold. This could include physical commodities, futures contracts or financial instruments. Or we can take UNCTAD (2007, 19) definition as “A commodity exchange is a market in which multiple buyers and sellers trade commodity-linked contracts on the basis of rules and procedures laid down by the exchange.” As alternative we can take Gabre-Madhin and Goggin (2005, 4) definition as “A commodity exchange is any organized market place where trade, with or without the physical commodities, is funneled through a single mechanism, allowing for maximum effective competition among buyers and among sellers.”

The main focus of this part of this paper is not to define commodity exchange, but to show under some conditions commodity exchange is an integrated solution to most market failures observed in grain market of developing economies. So let's focus on it. Commodity exchange is not only effective solution to the side effects of micro and meso level social capital, but also to the problems that lead to dependence on micro and meso level social capital. That is why commodity exchange is taken as an integrated solution to market failure problems widely observed in developing economies. The idea is explained in some detail below.

Commodity exchange will develop grade and standard that has to be used by participating traders. Having clearly defined grade and standards, the exchange will facilitate the screening process. By doing so it will avoid traders' risk of buying poor quality grain (UNCTAD, 2005). Since grade and standard are public good like any information, it is very cost effective, if they are supplied by central institution, like commodity exchange. Once grains are screened for their quality and appropriate quality tag is given to them, they will be stored in certified and modern warehouses to reduce storage cost and crop damage (Gabre-Madhin et al, 2003 and UNCTAD, 2005). Due to existence of dimensional economics and use of modern storage facility, there will be significant reduction in storage cost and crop damage, in short transaction cost of storage.

Depositing their grain in warehouse farmers and traders will get warehouse receipts (Gabre-Madhin and Goggin, 2005 and Rutten, 2001). The receipt can be used for exchange specification within the commodity exchange or outside the commodity exchange or it can be used as collateral for loan¹³ (Gabre-Madhin et al, 2003 and Gabre-Madhin and Goggin, 2005). The use of quantity and quality of grain specified in warehouse receipt as base of exchange will facilitate the transaction process (Rutten, 2001; Gabre-Madhin et al, 2003; Gabre-Madhin and Goggin, 2005). The above fact coupled with the fact that exchange within commodity exchange is done on standardized contracts, there will be very low transaction cost, in general, and very low search cost, in particular (Gabre-Madhin et al, 2003, Gabre-Madhin and Goggin, 2005 and UNCTAD, 1998a). Moreover the receipt can be used as collateral to have flexible access to credit needed by traders (Gabre-Madhin and Goggin, 2005 and Rutten, 2001). Considering the price risk involved in holding grain as collateral, the loan by financial institutions will be provided in discount bases, though (Gabre-Madhin et al, 2003).

This system in addition to its provision of flexible access of credit to traders can also solve the stress sell that can be faced by farmers. If farmers expect price increase in future which is greater than the storage and interest cost of using warehouse based loan, they can deposit their grain with in warehouse at much lower cost and can borrow from banks to cover their short term financial needs. Means warehouse receipt system will reduce both stress sell faced by farmers and will improve financial flexibility of traders. At the same time better storage facility will be provided to farmers.

The most important advantage of commodity exchange is related to its institutions which enable the development of macro trust without using the less efficient, less predictable and costly legal system. These institutions are required margin, limit in daily variability of price, minimum deposit requirement and mark to market settlement (Gabre-Madhin et al, 2003 and UNCTAD, 1998b). The focus at this time is on required margin and control on daily price variability. The other two will be explained once future and option trading are introduced.

To stabilize the market and to give traders enough time to process information in face of group thinking, which is widely observed in exchanges (Smith, 1991), commodity exchange will normally limit the maximum amount of change allowed in price of grain in one day. If grain price show dramatic decline or rise, which is above acceptable limit, the commodity exchange will stop trading and will start it next work day. Fortunately, this has positive effect on reducing the risk exposed by commodity exchange. If the maximum change in price that can be allowed in one day is, say, 200 birr and trade transaction will take 1 day to complete, commodity exchange can demand required margin of, say, 300 birr. If a trader after depositing 300 is able to buy teff for 1000 birr. But before the transaction is completed teff price turn out to be 800 birr, he/she can easily breach contract to save 200 birr. In such case the initial contract will end up cancelled, the grain will be sold at 800 birr and 200 birr from the deposit will be used to pay the seller 1000 birr. By breaching contract the defaulting side will not able to gain but will

¹³ It is preferable to have two receipts one that can be used for loan and another for quality specification in exchange.

lose future right to use commodity exchange services (Smith, 1991). Assuming commodity exchange has strong advantage over the next best alternative, the breaching trader will have to face high transaction cost which can push him out of market in face of serious competition. In short with in commodity exchange it is at best interest of participating bodies to honor contract. Anyone who wants to buy or sell with in commodity exchange can buy and sell without belonging to specific network or social group. In short it will build macro level social capital. Within meso and micro¹⁴ level social capital you are guilty until proven innocent, but with in macro level social capital you are innocent until proven guilty.

Farther cohesion in to the system can be introduced by limiting trade between char owning brokers, which buy and sell grains for themselves and as agent of others (Gabre-Madhin and Goggin, 2005). Share owning or chair owning brokers are ultimate owners of the commodity exchange. As result profitability and integrity of the commodity exchange is a very important corner stone for gaiting fair return on their investment (Lovelace, 1998).

Another problem of grain market is related to high output and price risk in face of missing risk management institutions and highly imperfect information. There must be a mechanism to increase the availability of reliable information and to efficiently manage the risk found within grain trading system. Future and option trading will introduce efficient risk management capacity among traders¹⁵ (Newbery and Stiglitz, 1981 and UNCTAD, 1998a, 1998b). Such products not only will improve risk hedging capacity of traders by transferring risk from risk averse individuals to ward risk takers, for price (Newbery and Stiglitz, 1981 and Smith, 1991), but also will introduce efficient future price and risk premium discovery mechanism (Gabre-Madhin et al, 2003; Newbery and Stiglitz, 1981; Smith, 1991 and UNCTAD, 1998b, 2007)¹⁶. In order to beat the market prediction and make profit, economic agents will have incentive to supply whatever important information found at their disposal (Smith, 1991). So spot and future prices and risk premiums discovered in spot, future and option markets are optimal prices discovered after considering all important information found in the system (Newbery and Stiglitz, 1981 and Smith, 1991). Assuming there is adequate information within the marketing system in first hand, much efficient information processing, risk management and constrained Pareto optimal resource allocation will result from the existence of commodity exchange with spot, future and option trading (Newbery and Stiglitz, 1981 and Stiglitz, 2001).

¹⁴ This is completely right for micro level social capital but for meso level social capital the reverse is the case for trusted socio economic group members.

¹⁵ Newbery and Stiglitz (1981) argue that for continuously stored commodities, like grains, the risk management capacity of future markets is not better than simple temporal arbitration by using storage. To back this they show the empirical fact that for such commodity, future price is as volatile as spot price. However in imperfect market with limited storage facility and imperfect future price discovery, it can't be denied future market is fundamental for risk management, if it is viable.

¹⁶ The most important advantage of market over planned economy is its capacity to summarize most of important information found in the system in to few prices (Hayek, 1945). Under risk a market economy needs option and future trading to efficiently manage risk and put right price on risk, too (Newbery and Stiglitz, 1981).

Even with in future and option trading, the existence of required margin, minimum margin and mark to market settlement will create an incentive mechanism for participating economic agents to honor contract and avoid moral hazard (Smith, 1991 and UNCTAD, 1998b, 2007). To avoid accumulation of lose over long period of time, every gain and loss observed every day will be marked to the deposit kept in hand of commodity exchange or required margin. If the required margin or deposit is below the minimum margin needed to offset maximum lose expected in one day the trader or broker have to put additional deposit to keep the future or option contract intact. If not the contract will end up canceled and new contract will be issued using the new price and the difference in value will be compensated by using the deposit of the trader facing loss (Smith, 1991). This is why commodity exchange can enforce future and option contracts without depending on less efficient legal enforcement mechanism. Moreover the possibility of temporary and permanent exclusion of contract breaching agents from future engagement with in the commodity exchange will farther discourage the development of moral hazard.

Another advantage of commodity exchange is related to its capacity to serve as information hub (Gabre-Madhin and Goggin, 2005 and UNCTAD, 2007). Since information is a public good, its efficient provision demands central supplier and commodity exchange can be efficient investor for grain trade related information. Information collected from wider economy and different prices discovered with in the exchange can be supplied at much lower cost to the general public and traders to improve allocative efficiency (Gabre-Madhin and Goggin, 2005 and UNCTAD, 2007). Small scale farmers in both China and India, for example, are observed to benefit and make much better allocative decision by using future prices discovered in exchange and broadcasted for them, though they are not participating in one (UNCTAD, 1998b, 2007)¹⁷.

Possible commodity exchange failures

Commodity exchange is an integrated solution to most market failures, missing markets and dysfunctional formal institutions observed in developing economies' market (Gabre-Madhin and Goggin, 2005). However commodity exchange experience in developing economies, if not a complete failure is observed to be a rare success. A survey by Santana-Boado and Brading (2000) did conclude that at 2000 there were over 20 countries with major commodity exchanges. And in the last decade many new exchanges has appeared in developing countries but most of them did disappear in failure. Similar conclusion is reached by UNCTAD (2005) in concluding that in African countries excluding SAFEX (South African Exchange) although some initiatives are still ongoing and it is perhaps too early for definitive judgments, in the last 10 years 20 initiatives to run commodity exchange at national or regional level have been failed. So commodity exchange how romantic it sounds to the reader is not panache for success.

There are critical problems that need to be addressed for successful implementation of commodity exchange. First we need to understand market as complex matrix of

¹⁷ But education on how to use such information was also fundamental in their success (UNCTAD, 2007)

institutions that guide the behavior of economic agents in given direction by using material reward as incentive (Reinert, 2009). So what are looking is to complement the dysfunctional institutions, which are giving suboptimal incentive, by alternative functional institutions that can be enforced in cost effective manner. So in line with induced institutions theory (Hayami, 1997) not only the benefit but also the cost of enforcement has to taken in to account.

What commodity exchange is trying to doing is to change (or complement) some of the formal and informal institutions to reduce transaction cost. So commodity exchange as market based institution need to have transaction cost advantage over the normal way of doing business, to be viable. This is in line with reflection by Santana-Boado which state that in general a “commodity exchanges can play many different roles, and which roles it needs to play will depend on specific conditions –indeed, an exchange that does not meet the specific needs of the market has little or no chance of survival. This underlines the fact that copying existing models, however successful they may be, is not a recipe for success. Much can be learnt from the existing exchanges, from their history, their success and their failures, but they do not provide a blueprint for new exchange initiatives.....therefore... the decision to start a new commodity exchange should be guided by certain prerequisites, among them: ...do the conditions exist for the creation of the commodity exchange? ... and ... will the commodity exchange play a relevant role in economic development of the country?” This is because if there are needs, organizing an exchange to serve these needs has proven very difficult in the past century. And many exchanges have gone out of business even those which were successful for some time (Santana-Boado, 1998, 46). It is important to know that exchanges are versatile and are useful on different locations (UNCTAD, 2007), but to be useful they need to serve specific local needs. Moreover there are important challenges expected in establishment and sustenance of any commodity exchange. These are dealt, below.

If social capital was able to reduce some of the transaction cost for insiders and to some extent to outsiders, commodity exchange need to have comparative advantage in transaction cost related to normal way of doing business based on trust. In other words, the benefit of commodity exchange for both insiders and outsiders need to overweight the cost of using commodity exchange. However in case of insiders the benefit needs to be not only higher than the normal transaction cost faced with in the exchange, but also the implicit opportunity costs expected to be faced by insiders¹⁸.

This problem is farther complicated by following facts. First, most of the cost of commodity exchange is fixed in nature. So there is need for critical flow of goods to break even with fixed cost of commodity exchange. In other words commodity exchange is viable only in areas where adequately large flow of trade is available (Santana-Boado, 2001 and UNCTAD and WB, 1993). The Kenya agriculture commodity exchange limited (KACE) for example was not able to break even with its cost, at late 1990's, due low trade volume that it was experiencing (Mukhebi, 1998). Trade volume is also critical to avoid extreme volatility in prices discovered with in commodity exchange (UNCTAD, 2007)

¹⁸ This costs are explained in methodology part

Moreover variable cost is function of number of transactions not volume of transaction. As result small scale participants like outsider traders and small scale farmers may face high cost of using commodity exchange (UNCTAD, 2007). Following the KACE example small scale farmers were not able to participate in KACE exchange (Mukhebi, 1998), until they were organized in to cooperatives to rip economic of scale advantage in exchange (Mandl and Mukhebi, 2002). So unless there is huge transaction cost advantages for both networked and un-networked traders and farmers, commodity exchange may fail to attract adequate volume of trade to be financially viable. Fortunately, part of the problem faced by small scale farmers can be solved by organizing them under cooperatives (Gabre-Madhin et al, 2003).

Another problem is the use of warehouse without clearly defined grade and standards can result in accumulation of poor quality grain in warehouse and this may create moral hazard of supplying lower quality grain. This can kill buyers' incentive of using commodity exchange. In short for having functional warehouse system properly defined grade and standard is fundamental (Gabre-Madhin et al, 2003 and Gabre-Madhin and Goggin, 2005)

Additional problem is related to the fact that: if there is less than adequate or distorted information in the system, whatever information that is summarized in spot, future and option prices will end up being distorted and unreliable (Gabre-Madhin et al, 2003; Newbery and Stiglitz, 1981; Stiglitz, 2001 and UNCTAD, 2007). That is why commodity exchange operating with less than optimal information may fail to generate efficient price discovery. Commodity exchange is efficient processor of information and if it is feed garbage, the output will be nothing but efficiently processed garbage. This is partial reason why future and option prices, in many exchanges around the world, are observed to have high volatility (Stiglitz, 2001 and UNCTAD, 2007)¹⁹. Means spot, future and option prices may fail to give reliable prediction of marketing clearing prices at different period of times. That is why adequate and reliable information need to exist in the system first hand for prices discovered within the commodity exchange to be efficient shooting stars resulting on efficient resource allocation within the economic system.

Moreover under pricing in future and option markets under adequate information can be efficient mechanism to communicate information about grains expected to have lower price on the future. However, under exchange operating with less than adequate information, under pricing can be used by dominant (price leader) agents to influence grain prices²⁰. If there is adequate information in the system and some price leader is under pricing future price of a given grain, others, having better prediction, will bet against him to keep the system efficient. However in less the optimal information market, other traders will not have the capacity to have better prediction than price leaders. In such reality others will normally follow the tendency of price leader. This can create mass psychology (Smith, 1991) to distort grain prices.

¹⁹ High volatility in south African future market was partially related to lack of adequate information in the system for example (UNCTAD, 2007)

²⁰ Index trading can also inject such problem (UNCTAD, 2007)

Moreover optimal storage decision can be done by warehouse users, if and only if there is optimal information in the system (Gabre-Madhin et al, 2003). For practical impact of asymmetric and sub optimal information on price discovery with in commodity exchanges see UNCTAD (2009) document. For theoretical analysis of future trading with less than optimal information see Newbery and Stiglitz (1981). In short commodity exchange having less than optimal information will introduce basis risk²¹ in place of spot risk (Smith, 1991).

There are other ways in which commodity exchange can also increase the level of risk observed in the market. To participate in future and option trading what is needed is to put some deposit in form of deposit margin. As result economic agents will have capacity to take positions on capital which is many folds of their own capital. Means they can take risk on money that they did not posses and this can increase the risk injected in to the system (Smith, 1991). This is why commodity exchanges without adequate and effective state over sight to control excessive risk taking by traders, public information collection and distribution, and efficient and functional antitrust laws can be recipe for disaster than success (UNCTAD, 2007)²².

In conclusion it is true commodity exchange is an integrated solution to most of the market failures and missing markets observed in developing economies' market as stated bt Gabre-Madhin and Goggin (2005). Commodity exchange is also functional and useful in many developing economies as 9 out of 20 top future exchanges are located in developing economies (UNCTAD, 2007). However it is not a recipe for success everywhere. It needs to address serious short coming of the local marketing system to generate significant reduction on transaction cost. Moreover clearly defined and transparently enforced state institutions are needed to keep it intact.

Discussion and analysis

Structure, conduct and performance of grain trading in the study sites

If some of the necessary precondition for success of commodity exchange are related to its capacity to reduce transaction cost compared to normal way of doing business based on social capital, it needs to address major short comings of the normal way of doing business. That is why the study of structure, conduct and performance of current way of doing business is very fundamental, for future success of commodity exchange.

Market structure and conduct from new institutional economics prospective

Market structure and associated conducted, which are codependent on each other, will determine out come of the market. Than assuming and trying to analyze the codependence and interaction between structure and conduct as often is case in SCP studies, the focus here is to analyze their combined effect on performance. With

²¹ Basis risk is related to volatility of future price or difference between future price fixed not and spot price discovered in maturity or strike date (Smith, 1991).

²² However state regulation needs to be principle based than ad hock, for effectiveness (UNCTAD, 2007)

institutional economics the market structure will affect the conduct of traders and conducted of traders and the spontaneous evolution of institutions in turn will modify market structure. This is why both structure and conduct of traders are presented together below.

Capital and working capital

Important variables which can determine the structure and conduct of traders are the level of working capital, specifically, and capital, in general, available at disposal of traders. The first and important assumption in perfect market model is that there are large number of buyers and sellers. So the concentration of capital would be an important indicator of level of competition in grain market. Market concentration can be analyzed by concentration index (C) which shows the market share of ‘N’ largest firms or by Herfindahl index of market concentration (H). Herfindahl index of market concentration (H) has an advantage of being dependent on all observations than ‘N’ largest firms in the industry. Herfindahl index of market concentration (H) is calculated as sum of the square of each and every firm’s market share. The largest the value the higher will be the concentration and the less competitive the industry will be.

Table 1 Concentration index (C) by location

Location	Over all Capital		Working Capital	
	5 firms C index	4 firms C index	5 firms C index	4 firms C index
Alemata	0.86	0.24	0.91	0.12
Himora	0.71	0.17	0.59	0.23
Maychew	0.72	0.55	0.71	0.53
Mekelle	0.9	0.3	0.88	0.34
Mokone	0.64	0.47	0.58	0.41
All	0.64		0.6	

Given grain trade is a high turnover industry over all capital, in general, and working capital, in particular, is an important indicator of market power²³. To analyze the concentration of market power, 5 firms concentration index is given in second column of table 1, above. As can be seen from the table over all concentration of market power is very high in all markets as more than 64% of the capital is owned by the top 5 traders. However there is significant variation from location to location. The highest concentration index is observed in Mekelle with value close to 90%. Means the rich 5 traders did own close to 90% of the capital owned by all traders. The next highest concentration is observed in Alemata with C index of more than 85%. However if the richest trader is taken out of picture, the concentration index of Mekelle and Alemata will decline to less than 30% and less than 25%, respectively. Given the fact that C index of 50% and more is used as rule of thumb of high market concentration, the above result

²³ Many studies found that most of traders’ capital is found in form of working capital. As example we can take Fafchamps and Minten (1999a, 2001) studies of grain market in Madagascar , Malawi and Benin;

shows that, if the richest trader is excluded from the picture, market power of the other four next rich traders is not that high and the markets are competitive enough.

Relatively the least concentration of market power is observed in Mokone, Himora and Maychew with C index of 64%, 71% and 72%, respectively. Still these results show high market concentration within these markets too. However, again, when the top firm is taken out of the picture, while market concentration of both Mokone and Maychew is observed to remain around 50%, market concentration of Mekelle is observed to decline to less than 18%. Taken at its face value this result means there are few or one trader/s which can have more than proportional influence in the market allocation, while there is more or less balanced distribution of power among other traders. In simple words there is higher chance that a single rich trader will have higher influence in market allocation decision of both markets.

Unfortunately there are critical short coming in the above analysis. Given high inflationary tendency observed in the country from 2006 to 2009, price of fixed assets like storage facility and shops are observed to increase at much faster rate. Second some assets may be in form of tracks, which can't offer that much significant advantage to the traders. As long as you can use service of tracking service providers, the amount of capital represented by track ownership may not be proportional to generated market power. That is why the analysis has to be done not only based on over all capital but also on working capital, the most of important asset in grain trade. However the C index given in table 1 above for working capital is numerically different from result observed based on over all capital, but is showing the same trend.

In general, based on distribution of overall capital and working capital there is clear evidence for market concentration in all sites. This is consistent with finding in Madagascar, Malawi and Benin grain markets by Fafchamps and Minten (2001). However while Alemata, Mekelle and Himora are evolving toward monopolistic competition with single dominant trader having huge market power (possibly can act as price leader); in case of Mokone and Maychew the market is evolving to ward monopolistic competition with out price leader.

Table 2 Herfindahl index of market concentration (H)

Location	Capital	Working Capital
Alemata	0.4	0.64
Himora	0.3	0.16
Maychew	0.12	0.13
Mekelle	0.4	0.33
Mokone	0.1	0.09
All	0.12	0.1

Another indicator of market concentration is Herfindahl index of market concentration (H) which is given for both working capital and over all capital in table 2, above. With H index Mekelle and Alemata are showing high level of market concentration, followed by Himora. The lowest market concentration is found in Mokone and Maychew,

respectively. For all sites the H index is very low (0.12) but there is high concentration at local level and some markets.

However the possibility high level of competition on low priced grains is possible despite high concentration of capital at market level. Transaction cost data collected from sites show that except in rare cases and coffee, transaction cost does not show significant variation from grain to grain. As result it is observed that rich traders tend to concentrate on grains which demand more capital like teff, coffee and sesame, leaving normal and inferior grains like wheat, maize and barley to small traders. By doing so large traders can generate more profit from luxury and export grains, while small traders are left to serious competition on other grains with low level of profit. So if we take grain by grain, market structure in surplus producing zones of Tigray, the market seems to take two different structures. While markets on export grains and luxury grains are tending toward oligopoly market structure, other grains are evolving to ward monopolistic competition market structure. This is not farther dealt her given it will take us behind the scope of the paper.

Business fixed assets

Most business assets can be rented or hired in the market. So assuming perfect competition, it does not matter who owns what in terms of business asset. However in imperfect market that we face in real world, asset ownership will have significant impact on competitive edge of traders. Important business assets include storage facility, weighting scale, trucks, and Information communication technologies (ICT).

Weighting scale is found to be owned by 78% of the traders in all study areas (see table 3 below). 90% of traders in Homera and 94% of traders in Mekelle are found to own weighting scale. Except in Mokone and to some Extent Maychew most traders in other locations did own their own weighting scale. Another important business asset is storage facility which is found to be owned by 57% of traders. However most of the storage facility is found in Himora and Mekelle with 81% and & 75% of traders, respectively, having their own storage facility. Serious lack of storage is observed in Maychew and Alemata followed by Mokone. In general, the average availability of storage facility is better in sampled Tigray markets compared to the national average presented by Gabre-Madhin (2001b). With in sampled sites southern Tigray is observed to be the worst effected part of the markets, in terms of lack of access to proper storage.

Table 3 Percentage of traders with different business assets

Fixed Asset	Alemata	Himora	Maychew	Mekelle	Mokone	All
Weighting Scale	0.82	0.9	0.69	0.94	0.36	0.78
Storage	0.35	0.81	0.23	0.75	0.43	0.57
Truck	0	0.48	0.08	0.13	0	0.2
Mobile phone	1	1	1	0.94	1	0.99
Fixed line phone	0.47	0.39	0.23	0.44	0.64	0.43
Fax	0	0	0	0	0	0

The most abundant marketing infrastructure is mobile phone in which 99% of traders are observed to have a mobile phone. Except for few traders with in Mekelle all traders in all locations are found to own their own mobile phone. Moreover close to 43% of all traders are observed to own fixed line phone in which most are located at Mokone (64%), Alemata (47%) and Mekelle (44%), respectively. The lowest use of fixed line phone is observed in Maychew and Himora with 23% and 39% of traders, respectively, using fixed line phone. Unfortunately, in all locations and sampled traders not a single trader was found to have access to Fax.

In terms of trucks 20% of the traders are observed to own track but most of the traders are observed to own truck are located in Himora and Mekelle only. Given the fact that there is large scale expansion of ICT technology in the country, the availability of mobile and fixed line phone may not give us clear guide to grain market structure. What can be said is that contemporary traders have more access to information that can be collected either by mobile or fixed lone phone compared to what it use to be the case (see Gabre-Madhin, 2001b for early years access to mobile phones) . Similarly weighting scale is found to be widely possessed by most traders. However when fixed assets which demand huge investment like trucks and storage facility are involved, only traders located in Himora and Mekelle are observed to afford them. For most traders located in other markets access to such assets is found to be very restricted. So unless there is easy and efficient access to rentable storage and transportation facility, it is logical to expect better temporal and spatial arbitration in Mekelle and Himora compared to southern markets.

Education of the owner

Some form of education at least capacity to read and write, to count and keep accounting records is fundamental for doing effective business in grain market. Moreover higher education could be very important catalyst for modernization of grain market, which we hope to see in the future. Holding other things constant, educated individuals are expected to have competitive edge over others.

As can be seen from table 4, below, 80 – 90% of the traders in each location are either elementary school or junior high school complete. In general the education level achieved by the traders may not be adequate for modern trade, but is more or less adequate for traditional trading business done in the country and region. So it seems in all locations grain trade is rarely done by both illiterate and highly educated individuals.

Table 4 distribution of education among traders in percentage

Location	Illiterate	Elementary	junior and high	Post high	informally literate and calculator literate
Alemata	0.06	0.78	0.11	0.06	0
Maychew	0	0.31	0.62	0	0.08
Mokone	0.07	0.57	0.29	0	0.07
Mekelle	0	0.56	0.28	0.06	0.11
Himora	0.03	0.22	0.59	0.06	0.09
All	0.03	0.45	0.4	0.04	0.07

The modal trader in Alemata, Mokone and Mekelle is at elementary level but the modal trader in Himora and Maychew is at junior high and high school level. Since Himora is very dynamic city with a lot of employment and business opportunity, it is logical to conclude that relatively better educated individuals are pulled by better opportunity found in grain trade. Maychew is not that dynamic city due to two factors. In one side a national high way that connects Tigray to the rest of the country, that use to pass through Maychew, is diverted to ward other short distance high way that passes through Mokone. This will cause significant reduction in business activity with in the city. Second the level of agricultural production around Maychew is very low compared to neighboring market towns. Consultancy, traders in the market made it clear that Maychew is net buyer than seller in most grains. As result it is logical to expect that low alternative opportunity in the town. The implication for this study is that relatively better educated individuals are pushed to ward grain trade by lack opportunity in Maychew city. In other locations grain trade is not found to be an occupation for relatively better educated one.

Religion and language spoken

Some times meso level social capital can be defined in religious dimensions, as was the case in early days of Islam expansion in Eastern Africa. Understanding the religious composition of the traders is very fundamental for understanding the impact of religious values in creating meso level trust or social capital. In all locations more than 92% of traders included in the sample are Orthodox christen and what is left are Muslims. There is no any evidence of involvement by other religious groups and the trade seems to be more or less dominated by Orthodox christens with in the markets studied in this paper.

Table 5 distribution of religion in percentage

Religion	Alemata	Maychew	Mokone	Mekelle	Himora	All
Orthodox	1	1	0.928571	0.944444	0.969697	0.96875
Muslim	0	0	0.071429	0.055556	0.030303	0.03125

Language can be a very critical barrier for cross ethnic group trade for country like Ethiopia with very diverse ethnic composition. That is why traders' capacity to speak and communicate in different languages is very critical for successful trading. Table 6, below, shows most of traders in all locations did speak the regional official language of Tigrigna and the official national language of Amharic. What is surprising is that more than 50% of traders in Maychew claim to speak English. This is very questionable and it is possible that the traders' capacity to use few words of English learned in junior and high school can be claimed as speaking English. So it is not logical to accept the above result at its face value.

Excluding Maychew, traders' capacity to communicate in English is very limited. The implication is that given Amharic is widely spoken in most part of the country, these traders can easily communicate and do business everywhere in the country. However traders' capacity to penetrate international market can be somehow constrained by their incapacity to communicate in international language of business, i.e. English.

Table 6 number and distribution of languages used by traders

Location	average number of languages spoken	Percentage of traders who speak			
		Tigrigna	Amharic	English	Arabic
Alemata	2.11	1	1	0	0
Maychew	2.69	1	1	0.54	0.08
Mokone	2.07	1	0.93	0	0
Mekelle	2.18	1	1	0.06	0.12
Himora	2.94	1	0.97	0.09	0.88
All	2.48	1	0.98	0.12	0.34

Fortunately 88% of traders in Homera and 34% of all traders in the sites did speak Arabic of Sudan version. Given Arabic is the second widely spoken language in the world, penetrating middle east, north Africa and some East Asian countries' may not be that tough or at least will not be constrained by language. In general religion and language did not seem to be important differencing characteristics of traders.

Social capital

Social capital as an important factor of conduct will not only be influenced by market structure but also is a fundamental influence on market structure. The over all market will achieve better efficiency, under imperfect market, by institutions directly or indirectly related to social capital. That is why there is need to asses the level of social capital for clear understanding of market structure and conduct.

Studies use the question “do you think most traders in local (distance) market can be trusted?” to measure the existence of meso trust defined in terms of being trader. This answer to this question is used in this paper to identify the level of meso level trust found among traders and to ward the general public. The result is given in table 7, below.

Table 7 Meso level social capital for traders located in the same market

Location	Level of trust on local traders	Level of trust on local residents	Difference on trust (traders – residents)
Alemata	0.33	0.58	-0.25
Maychew	0.15	0.85	-0.7
Mokone	0.5	0.9	-0.4
Mekelle	0.6	0.93	-0.33
Homera	0.12	0.77	-0.65
All	0.31	0.8	-0.49

From table 7 above it can be observed that there is serious miss trust among traders which is much higher compared to miss trust observed to ward none traders. 80% of all traders believe that most people in the sample sites are trust worthy, but only 31% of them believe most traders are trust worthy. The highest mistrust of trades relative to none traders is observed in both Maychew and Homera. Better meso level social capital development potential is observed in Alemata, Mekelle and Mokone, respectively. In

general, however, there is no strong meso level social capital defined in terms of belonging to trading group. If there is any social capital with in grain market, it has to be defined in terms of micro network level social capital²⁴.

In literature micro social capital is grossly measured by number of traders that a trader knows, share information and have business related relationship. This is defined as gross social capital in this paper. In this paper farther refinement is done by collecting information on number of traders that a trader collects information (information network) and can borrow in kind or cash for one day (loan network)²⁵.

On average one trader is observed to know more than 26 traders in own market. However, a trader will share market information with only 10 traders and will only able to borrow for one day from less than 6 traders only (see table 8, below). This clear indication that gross network is very vague to be a precise measure of social capital.

Table 8 Mean number of networks by nature of network

Location	Own market			Other market		
	Gross	Information	Loan	Gross	Information	Loan
Alemata	20.75	10.5	5.25	13.42	6.33	2.42
Maychew	16.15	4.23	3.92	16.85	5.62	4.46
Mokone	14.8	8.9	5.2	17.7	10.3	5.5
Mekelle	34.63	10.38	7.38	13.06	7.81	2.69
Homera	32.54	10.52	5.74	10.29	7.32	2.43
All	26.23	9.23	5.63	13.34	7.37	3.2

Traders located in Mekelle, Himora and Alemata are found to be more networked with in own market than traders located in either Maychew or Mokone. However the numeric difference is more reflected in gross measure of network, i.e. number of traders known by the trader. When more precise measures of social capital are used the numeric difference is not that big. When social capital on other markets is considered now Traders in Maychew and Mokone are observed to have more gross-network than other markets. When information sharing networks are considered, however, Maychew traders are observed to have the lowest information sharing networks than other market locations. Once again Maychew is observed to have more micro informal lending networks next to Mokone. As before there is huge diversity among locations in terms of gross and information network than in terms of one day loan network. The implication is that having 2 to 5 traders which can lend you in kind or cash in different locations and 5 to 9 traders which can share information with you are fundamental for having functional business.

Since capital is the most important asset among grain traders, it can have far reaching impact on structure of grain trade. For given capital, social capital is also an important conduct parameter which can have significant influence on structure. That is why their

²⁴ Study in Ghana by Overa (2006) did found that due to erosion of macro and meso level trust traders are observed to be highly dependent on micro networks and this is found to be the case in this study.

²⁵ More refinement and variables are developed but will not be reported in this paper for brevity

interaction is analyzed using simple correlation coefficient given below. Studies did find that the relationship between social capital and wealth is complex and is dependent on local realities. In simple words there can be positive association in some locations (Fafchamps and Gubert, 2007; Fafchamps and Minten, 1999a and Glaeser et al, 1999, 2000) and negative association in other locations (Barr, 2000 and McMillan and Woodruff, 1998). If all traders in all locations are considered together the association between any network measure and capital is less than 4% and none of the correlations are significant at 10% level (see table 9, below). So capital does not seem to be a very important factor for development of social capital.

Table 9 Simple correlation (r) between current capital and different measures of social capital

Variable	Alemata	Maychew	Mokone	Mekelle	Homera	All
Information own	-0.28	0.4	0.3	-0.02	0.13	0.09
Information other	0.17	0.68**	-0.29	-0.01	0.1	0.04
loan own	-0.55*	0.33	0.65**	0.04	-0.03	0.03
loan other	-0.33	0.34	0.15	-0.22	-0.07	-0.18
Gross own	-0.24	0.58**	0.26	-0.15	0.18	0.08
Gross other	-0.05	0.45	-0.21	0.09	0.72***	0.18

Note - * = significant at 10%, ** = significant at 5% and *** = significant at 1%

If there were meso level trust among the rich traders we could expect capital to be positively associated with social capital at market level. However at market level such development is not observed with some noticeable exceptions. The exceptions are the following. In Maychew rich traders seem to have more information network in other markets and tend to know more people in own market. But this is not observed to generate them any preferential access to loan. In Himora the only advantage rich trader has is simply related to his/her capacity to know more people in distance market, which is not translated toward better access to credit or information. And in Alemata actually the poor trader has better access to short term loan than rich trader. The only visible some form of concentration of power is observed in Mokone. In this market rich traders have more loan networks than poor traders. In general capital by itself does not seem to be a very important variable in explaining the development of social capital, with out controlling other variables.

Entry, experience and inter generational links in grain trade

Experience in grain trade is very fundamental for success. Through long years of experience not only trading skills are learned but also reputation is built to have low transaction cost based on trust or social capital. Moreover social capital can be inherited from generation to generation, if there is strong meso level social capital. As can be seen from figure 1, below, most of the traders have experience of 10 and less years. Means most business are established after the establishment of the Transactional Government of Ethiopia in 1991.

However some traders did have more than 40 years of experience as can be shown from the positively skewed bar graph and Kernal density given in figure 1, above. So lets use

median and mode in addition to mean to have clear picture of the average experience observed in each market (see table 10, below).

Figure 1 Distribution of experience

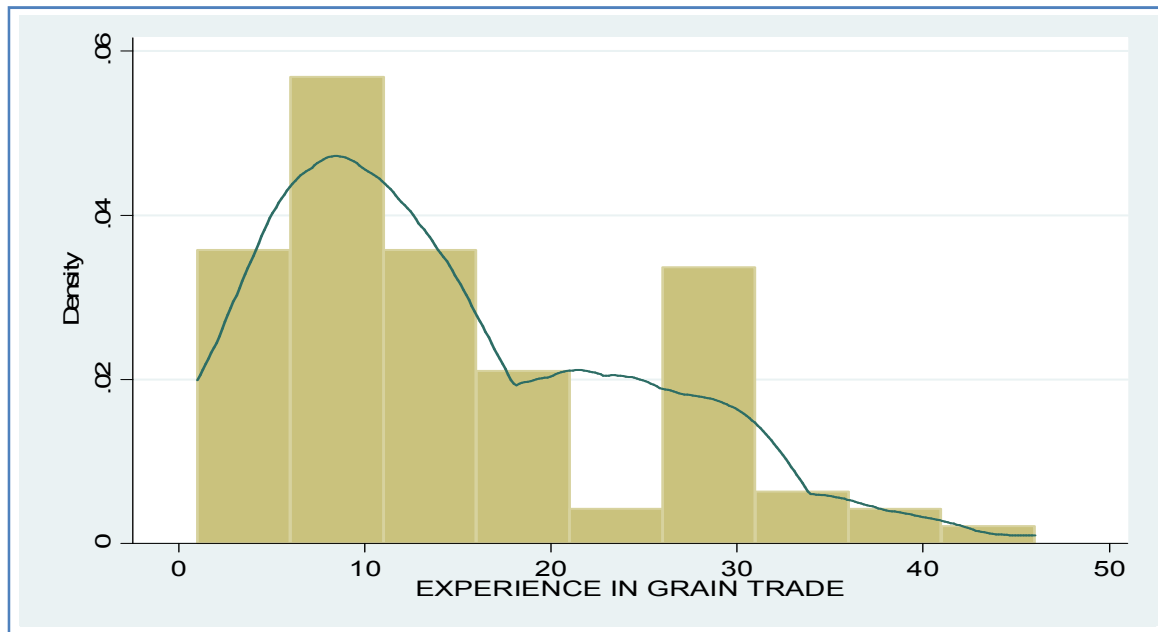


Table 10 Summary measures of experience in grain trade

Location	Mean	Median	mode	Absolute measure of skewness
Alemata	14.83333	10	10	4.833333
Maychew	8.153846	6	6	2.153846
Mokone	13.35714	10.5	10	2.857143
Mekelle	13.27778	12	12	1.277778
Himora	18.3125	23	26	-4.6875
All	14.57895	11	26	3.578947

The southern markets of Maychew, Mokone and Alemata on average are observed to have the least experienced traders. A location with least experienced traders is Maychew. In Alemata and Mokone the modal trader is working in grain trade for the last 10 years. The relative figure for trader from Maychew is just 6 years. Mekelle traders on average tend to have 12 to 13 years of experience. In case of Himora on average traders have an experience ranging from 23 to 26 years. However the mean is affected by entry of new traders to decline to ward 18 years. So only in Himora are traders found with experience of working in more than one regime. Other important factor about Himora is that new traders seem to have strong entry, in to this market; which backs the above conclusion that there is strong pull factor working in Himora.

Table 11, below, shows the fact that almost all traders are first generation traders, in contrary to findings in other markets of developing economies (Fafchamps and Minten, 1999a) and Ethiopia (Gabre-Madhin, 2001b; Gabre-Madhin et al, 2003). Means trading

business is not something inherited from generation to generation in Tigray grain market. This is clear evidence for absence social capital at meso level.

Table 11 Proportion of first generation traders and traders who start their business legally

Location	First generation traders	Traders who start with license
Alemata	0.94	0.18
Maychew	1	0.46
Mokone	1	0.21
Mekelle	1	0.61
Himora	0.97	0.68
All	0.98	0.47

Focusing on legal entry most traders, 53%, actually start without license and will slowly establish their business to have license. Most of the informal starters are located in Southern surplus producing part of Tigray. As was stated above most none grain traders are observed even to have grain trading license to access bank credit. This is clear indication of easy entry to grain market widely observed in many studies, though easy entry is highly the case for traders located in Southern Tigray. We can take Minten and Kyle (1999) study of former Zaire grain market, Barrett (1997) study of Madagascar grain market and Gabre-Madhin (2001b) study of Ethiopia grain market, as good examples. However this does not take effective entry in to grain market and study by Barrett (1997) did show that even though there is easy entry in Madagascar grain market, entry to the profitable niche market is constrained by lack of social networks and capital. The same finding is observed in Ethiopia grain market by Gabre-Madhin (2001b). So mere entry and effective entry need to be taken differently. It may be easy to inter in to grain market; but it will take years before they can build their own micro network and develop experience to be competitive.

Table 12 Percentage of trades with family tradition of engaging in grain trade

location	Traders who have family or friend engaged in grain trade before them	Traders who work as family worker in trade	Those who think it is vital
Alemata	0.17	0.17	0.44
Maychew	0.15	0.15	0.23
Mokone	0.21	0.07	0.57
Mekelle	0.28	0.28	0.56
Himora	0.5	0.44	0.86
All	0.31	0.26	0.58

As can be seen from table 12, above, most traders, except those located in Maychew and Alemata, did think that having friend and family working in grain trade is vital for success at the start. This is in line with theoretical and empirical conclusion Fafchamps and Minten (1999a) and Greif (1993). That is why analyzing engagement of relatives and friends in grain trade will help us to understand enter-generational dynamics of social capital and experience. More than 30% of the traders, which mostly are located in Himora and to some extent in Mekelle and Mokone, did have family and friend before them engaged in grain trade. Actually 26% of all traders, mostly located in Himora and

Mekelle, use to work as family worker in grain trade before they start their own business. So even though inter generational social capital and trading experience was not inherited from one generation to another within the same generation social capital and trading skills were transmitted from one family member to another, to some extent. This is mainly the case in Himora and Mekelle and to some extent in Mokone, too.

Source of information and level of risk taking

The efficiency of marketing system is related to its decentralized and efficient information processing capacity (Hayek, 1945). That is why reliable source of information is fundamental for efficiency of market economy. Stiglitz, 2001 did clearly summarize result of decades work with in information economics by saying that market allocation under imperfect information can be Pareto optimal not by default, but only by chance. One way or another, adequate information is necessary for efficiency of the marketing system. At this point sources of different information will be identified and their quality will be dealt in next sup section.

The most important source of information about own market price is own observation (68.6%) and other traders (22.9%). Other source of information including brokers are not that mach important for collecting information on own market. However for distance market locations price information is mainly discovered from brokers (40%) followed by distant traders (34.12%). This is consistence with Fafchamps and Minten (1999a) finding in Madagascar and Gabre-Madhin et al (2003) finding in Ethiopia. In both studies the most important source of information is found to be traders' network than the mass media.

Table 13 Main source of information on different market parameters

Source of information	Price in own market	Price in other markets	production at national level	Government policy and regulation	International grain price
Traders in own market	22.09	5.88	5.88	3.53	1.18
Traders in other market	0	34.12	7.06	7.06	0
Brokers in own market	6.98	0	1.18	0	0
Brokers in other market	0	40	4.71	2.35	0
Mass media	0	7.06	55.29	50.59	35.29
own observation	68.6	5.88	9.41	0	4.71
Other	2.33	2.35	3.53	7.06	1.18
I don't have any source	0	4.71	12.94	29.41	57.64

For production at national level and government policy and regulation more than 50% of all the traders are primarily informed by the mass media. The rest of the traders are either observed to collect information form fragmented source or are not observed to have any information source. The least available information is international grain price in which more than 57% of traders did claim they did not have any source of information on international grain price. However more than 35% of the traders, which are mostly coffee and sesame traders, are using mass media as source of international price information.

Even though the qualities of information provided by different sources have to be evaluated below, there is clear evidence showing the existence of serious lack of information in some parameters. Information on international grain price, government policy and regulation, national production data and other market locations price are not accessed by 58%, 29%, 13% and 5% of traders, respectively.

Facing the above structure, an important behavior of traders is reflected in their willingness to take risk as reflected in relative risk premium given in table 14 and 15, below. To get result given in table 14, traders are asked how much they will expect to get in order to invest 10 000 birr for 3 months in their current situation. The risk premium is calculated as the difference between expected value minus 10 000 and the relative risk premium is calculated as ratio of the above difference to 10000. For three months to take risk most of the traders (68% of all traders) demanded 50% to 100% risk premium. Highest risk taking behavior is observed in Mokeone and Alemata, where 58% and 35% of the traders, respectively, were willing to assume the risk for risk premium less than 25 to 10% of the value. The most risk averse individuals are observed in Maychew, Himora and Mekelle, respectively, in which only less than 8% of traders in each market are observed to assume risk for risk premium of less than or equal to 25%.

Table 14 Percentage of traders who demand a given amount of risk premium to take risk for 3 months

Location	Relative risk premium rate for 3 months				
	10%	25%	50%	100%	200%
Alemata	0.35	0	0.41	0.18	0.06
Maychew	0	0	0.69	0.23	0.08
Mokone	0.33	0.25	0.17	0.17	0.08
Mekelle	0.07	0	0.4	0.33	0.2
Homera	0	0.04	0.29	0.46	0.21
All	0.14	0.05	0.38	0.3	0.14

When the time period is extended into two years 65% of all traders are not willing to assume the risk for what ever premium. Most of these traders are located in Maychew (100%), Homera (96%) and Mekelle (67%). Again Alemata and Mokeone traders are observed to take more risk than traders in other locations.

Table 15 Percentage of traders who demand a given amount of risk premium to take risk for 2 years

Location	Relative risk premium rate for 2 years				
	25%	50%	100%	200%	Never
Alemata	0.06	0.06	0.35	0.35	0.18
Maychew	0	0	0	0	1
Mokone	0	0.08	0.17	0.42	0.33
Mekelle	0	0	0.2	0.13	0.67
Homera	0	0	0.04	0	0.96
All	0.01	0.02	0.15	0.16	0.65

So for most traders, grain trading is high turn over business. This is because it is highly risky to contemplate about grain price behind few months²⁶. This is clear indication of high variability of grain price from time to time and from year to year. This is in sharp contrast to finding of Gabre-Madhin (2001b)²⁷ in Ethiopian grain market. But it is consistent with conclusion of Gabre-Madhin et al (2003). In short grain trading in surplus producing zone of Tigray is risky, indeed. Given the above structure and associated conduct of traders, it is time to focus on the performance of the market.

Market performance

The basic assumption in institutional economics is that unless the market is right, getting price to suboptimal ‘right’ level is fatal activity. Before price can get right, the market itself needs to get right (Gabre-Madhin et al, 2003). That is why performance is measured here by both quality of market inputs and market out comes. Means part of the performance is related to market structure and conduct, which can have serious effect on market development.

Service of brokers

An important institutional development to deal with high search cost and contract enforcement is the development of brokers. Traders are asked if the service provided by brokers is adequate to their need. The result is given in table 16, below. If traders are not using service provided by broker the assumption is that they don’t need broker service, given the broker charge they have to pay. To such traders zero value is given. If they are using broker service, they are asked to rank the quality of service in range of 0 to 10.

Table 16 Proportion of traders who are satisfied with service provided by brokers

Location	In own market	in other market
Alemata	0.375	1
Maychew	0	1
Mokone	0.133333	0.8
Mekelle	0.272727	0.846154
Homera	0.807692	0.923077
All	0.463768	0.910448

Significant majority of traders (more than 91% of the traders) are satisfied with service provided by brokers in distance markets. The least satisfied traders are located in Mokone (20%), Mekelle (15%) and Homera (8%). In Alemata and Maychew not a single trader was founded to be dissatisfied with service provided by broker in distance market. However when we come to local markets most trades, except in Homera, are found to be dissatisfied with service provided by brokers. In Maychew not a single trader is found to

²⁶ This is the most common answer observed when personal discussion are done with grain traders in location

²⁷ Based on this study grain trading is neither risky nor rewarding activity.

use the service of brokers. In both Mokone and Mekelle only 13% and 27% of the traders, respectively, are found to be satisfied with service provided by the broker. In Alemata 37.5% of the traders are satisfied with service of local brokers, which is close to the average satisfaction probability of 46% observed among all traders. However this average is mainly affected by extremely higher satisfaction observed among Himora traders. So in Ethiopian grain market and excluding Himora the most important service of traders is in facilitating distance trade. This is in line with aforementioned fact that most traders did not use brokers for price information in own market, but only in distance market. This is consistent with low level of meso trust found in Homera and Maychew. But in Maychew lack of strong and vibrant grain market is behind the low use of broker service in own market. Since the number of traders is small and they are concentrated in small market place, the use of broker to reduce search cost is not economic. Quality here has to be understood in terms of value added that can be generated by using broker.

More than lack of satisfaction, it is important to understand which areas are brokers being very useful and in which areas they are becoming less functional. The result of such analysis is given in table 17 below. The search service provided by brokers is the one area which is provided more or less adequately by brokers in all locations with average satisfaction of 79.5%. The next services of brokers which are ranked the next good service provided are enforcement of agreed contract (75.6%) and identifying trust worthy traders to have contract with (66.4%).

Table 17 Traders average grade given to different service of Brokers (10 is the best and 0 the worst)

Brokers service	Alemata	Maychew	Mokone	Mekelle	Himora	all
Searching a buyer or a seller	8.71	7.31	8.87	7.6	7.46	7.95
Enforcing contract between contracting parties	7.65	6.62	7.8	8.47	7.31	7.56
Identify trustworthy grain traders	7.12	6.31	7.07	6.53	6.73	6.77
Being reliable witness on contract dispute	6.94	6.08	6.07	7.4	6.62	6.64
Disperse reliable information	6.18	6	5.8	7.53	6	6.27
Collection of adequate price and quantity information	5.71	6	6	7.13	6.31	6.23
Being reliable	5.65	6.38	6	7.07	5.96	6.16
Charging fair fee	3.88	6.31	5.13	8.87	5.85	5.93
Facilitating good storage facility in other locations	4	5.77	4.13	3.2	3.42	3.98
Providing short term credit	2.47	0	3.8	2.6	3.69	2.72
Buying and/or selling as your representative on other market locations	4.06	0	3.87	0.27	1.38	1.94
Buying and/or selling as your representative on own market	3.18	0	2.4	0.53	1.15	1.49

On average the least quality services provided by brokers is related to their incapability to serve as the traders' agent in local and distance market. This is clear indication that the level of trust that exists among traders and brokers is very low. Traders may try to use the service of brokers but they will not trust them to make decisions on their behalf or as

their agents. Moreover the brokers are either having access to less capital or having less trust on their client traders to provide adequate short term credit to the traders²⁸. In general it is clear from the above result that most serious challenge of the trader and broker relationship is that the lack of mutual trust among them. In the middle of the two extremes the medium quality service provided by brokers is related to collection and dissemination of information, charging fair fee, being reliable on doing business and facilitating storage facility in other locations. Again some of these variables are somehow related to public good of information. Information collection can be much efficient, if there were strong social capital, which can reduce the negative effect of moral hazard to be free rider. The result shows that even though the collection and distribution of reliable information is not done perfectly, but it is not one of the worst services provided by the brokers. This can explain why traders use brokers for information in distance but not local market, where the opportunity cost of information collection is relatively low.

In general brokers are good in searching buyer or seller in short time, facilitating and enforcing contracts. However this is done in low trust environment. There are some variations on the ranking of these services from location to location. But the general trend is the same in most locations (see table 17 above).

Storage service

Another important service that traders need to function properly is that good storage facility. 60% of the traders think that the storage service provided in their market is having acceptable quality to their need. The exception traders are found in Alemata and Mokone, in which only less than 27% of their traders think they have good quality and adequate storage service at their market. In other markets 80% or more of traders in each location do think they have good storage facility in their market which is adequate to their need.

Table 18 Proportion of traders who are satisfied with storage service

Location	In own market	in other market
Alemata	0.235294	0.470588
Maychew	0.846154	1
Mokone	0.266667	0.666667
Mekelle	0.8	0.769231
Homera	0.807692	1
All	0.604651	0.75

Even if we take storage facility provided in other locations less traders located in Alemata (47%) and Mokone (67%) are satisfied with storage service provided in other locations. Higher satisfaction is observed Maychew and Homera, in which 100 % of the traders are satisfied with storage service provided in distance locations. Mekelle's distance market's storage service satisfaction rate is around average or 77% when the average of all

²⁸ This is clear contradiction to Gabre-Madhin et al (2003) finding in Addis Ababa grain market

locations satisfaction rate is 75%. This is in line with poor storage facility available in these locations as mentioned above. The exception being Maychew while large number of traders did not own storage facility, the availability of few rentable good storage facilities in the market to serve the few available traders was generating this result. Consultancy with Maychew traders did make it clear than lack of access to finance and storage (see table 19) are the most serious problems to market development in the city.

Again the important question is: which part of the storage service is having serious problem. Lack of access to land to build storage facility and lack of own storage facility are the most two serious problems faced by traders in all locations (see table 19, below). Lack of access to land is the most serious problem in Mekelle, Alemata and Maychew, respectively. It is less serious in both Himora and Mokone, respectively. Lack of own storage is not serious problem in Mekelle and Homera, but it is somehow serious in other markets located in South surplus producing zone of Tigray.

Table 19 Traders average grade given to different storage related services (10 is the best and 0 the worst)

Kind of service	Alemata	Maychew	Mokone	Mekelle	Himora	all
Low spoilage of grain	5.8	9.23	6.4	8.67	8.5	7.79
Good quality rentable storage	6	8.77	5.6	8.73	8.54	7.63
Reliable supply of storage facility	6.07	8.77	5.93	8.87	8.04	7.57
Fair charge for using storage	5.67	8.77	5.33	8.33	7.31	7.07
Adequate own storage	4.67	1.92	3.87	8.13	8.31	5.85
Easy access to land to build storage	1.67	2.15	3.07	0.47	5	2.81

The good side of current storage facility is that there is low spoilage of grain which can be partially related to high turnover of grain than good quality storage as such. And traders in most location agree that there is good quality rentable storage and its supply is adequate to their demand. It is important to note that the expectation of traders is shaped by their constraints and their action is modified by the expectations. So their expectation can be very low that is leading to satisfaction on current level of poor storage and contemporary way of doing business, i.e. low temporal arbitration.

Unfair storage charges are not found to be serious problem in Mekelle and Maychew²⁹ but are the next serious problem observed in other markets. In general the most serious problem of traders is related to lack of access to build own storage or buy own storage facility. However most traders seem to think the quality and quantity of current storage service supplied in the market is adequate to their current need.

Quality of Information

The next focus of analysis is the quality of information available to micro decision makers in each market. The most reliable information found in the hand of traders is local

²⁹ This can explain higher satisfaction of traders in May Chew despite their lack of own storage facility

market grain price which is mostly discovered by traders own observation and through information sharing between other local traders (See table 20, above). The next reliable information is grain price discovered in distance market locations. This information is mainly shared by distance information network of traders and distant brokers.

Table 20 Traders average grade given to different type of information (10 is the best and 0 the worst)

Information type	Alemata	Maychew	Mokone	Mekelle	Homera	All	only users
Price in own market	9.41	9.23	9.6	9.71	8.85	9.29	9.29
Price in other markets	8.35	8.15	8.8	8.64	8.27	8.42	8.84
production at national level	2.94	8	2.4	7.36	7.62	5.78	6.64
Government policy and regulation	1.82	6.62	2.8	6.57	5.5	4.64	6.57
International grain price	0.35	0.69	2	6	3.85	2.69	6.35

Information which is shared by mass media and other minor sources like production information at national level, government policy and regulation and international grain price are areas where there is serious information problem. These problems are very serious in Alemata and Mokone. However in Maychew and Homera lack of access to international price is the only most serious problem and the other two are not that serious. In case of Mekelle the information problem in all dimensions is not as serious as other markets. In general the most serious problem is related to national and international public goods and the distribution of such information by mass media is not found to be adequate and reliable in mind of most traders in the region. This is consistent with finding by Gabre-Madhin et al (2003) for most Ethiopian grain markets.

Compound growth rate of capital

The performance of grain markets can be also analyzed using average compound annual growth rate of traders' capital as given in table 21, below. Since the distribution of growth rate is observed to be positively skewed, it is better to use median than mean growth as measure of average. The highest annual nominal growth rate was observed in Mokone which is as high as 49% per annum. This is followed by Alemata (35%) and Maychew (33%), which are markets located in surplus producing part of Southern Tigray. Not only traders in Southern part of Tigray are having high profit, but also in two out of the three markets all traders were having 13% or more compound growth rate of capital per annum. The exception being in Alemata where some traders experienced decline in nominal capital.

Table 21 summery statistics of nominal compound growth rate of capital for different markets

location	mean	median	Absolute skewness	Maximum	Minimum
Alemata	0.43	0.35	0.08	1.25	-0.06
Maychew	0.7	0.33	0.37	2.13	0.13
Mokone	0.53	0.49	0.04	1.53	0.25
Mekelle	0.27	0.21	0.06	0.62	0.05
Himora	0.27	0.16	0.11	1.29	0.05
all	0.4	0.31	0.09	2.13	-0.06

The worst compound growth rate is observed in Himora with 16% per annum and Mekelle with 21% per annum. In both markets the lowest growth rate experienced by any trader is 5% per annum. On average the median growth rate for all location is 31% per annum, in which some traders did face a decline of 6% per annum and some did experience annual growth of 213%. This can give us an impression that Southern markets are more profitable and attractive markets than other locations and trades are having very high profit, if taken at face value. But there are two important issues that need to be understood to understand the real picture.

Table 22 Average statistics on capital and year in business

location	Mean			Median		
	Initial capital	Current capital	Year in business	Initial capital	Current capital	Year in business
Alemata	19375.88	714539.2	14.41	3000	201200	10
Maychew	16123.08	230800	8.23	6000	158800	6
Mokone	4042.86	188852.9	12.5	1250	117185	11
Mekelle	91973.33	2760227	12	95000	600270	11
Himora	106333.9	1202371	13.23	139500	527000	16

First, table 22, above, clearly shows that average initial capital needed to start business in Southern markets is very low compared to Mekelle and Himora. Ignoring the mean which is sensitive to extreme values (which is also showing the same result as median), an average trader needs 1250 to 6000 birr to start grain trade in Southern Tigray. Means the traders are starting as retailers and slowly growing in to whole sellers. But once they have adequate capital they can establish their business as whole seller either in their own market or in other important regional markets like Mekelle and Himora. More over the absolute growth of capital is very large in Mekelle and Himora than other markets. So the reason why there is high compound growth rate in Southern markets is because they are starting from very low initial level not because these markets are more successful than other markets. Actually traders from Sothern markets will only have chance to participate in the lucrative Mekelle and Himora market, if they become successful in their Southern trade, which demands less initial capital.

Second, compared to result from many countries the above growth rate is very high. This may give us a wrong impression that grain trade is very lucrative business. However this is wrong due to two reasons. First there is sample selection bias. If a trader is facing loss, there is high chance he/she will exit and will not be included in the sample. However this is common bias to all studies, which can result on over estimation of capital growth rate among traders in all studies. The second important factor is the impact of unprecedented high inflation observed between 2006 and 2009. Just to give a birds eye view of the inflation, just imagine teff which is use to be sold for 300 birr before 2006 is now sold around 1000 to 1200 birr. It is 200 to 300% growth in Teff price. The implication is that to buy 100 quintal Teff you need 30, 000 birr at 2005 but at 2010 you will need 100, 000 to 120, 000 birr. In short 100, 000 to 120, 000 in 2010 is equal in real value to 30, 000 birr in 2005. However if we take nominal growth rate of the same purchasing power, it will turn out to be 27 to 32% annual growth rate. In short the high growth rate observed

among grain trader is related to high inflation and decline in purchasing power than fast growth of real capital of traders³⁰.

If there were fast growth of traders' capital we should observed intergenerational inheritance of trading business and social capital, which is not observed in the study sites. Moreover most grain traders may be using relatives to help them with trade; but only very small minorities are allowing their nuclear family to participate in grain trade. This another indirect indicator that grain trading business is not taken as important future occupation of the family by many traders or its not that profitable compared to the next best alternative. This is consistent with finding by Gabre-Madhin (2001b) which shows grain trading is not that rewarding activity.

Dimension of temporal Arbitration

The focus on above mentioned parameters is to measure the development of market it self and to see how much the market needed to get right. The performance of grain trade can be also, however, analyzed by the period of time in which traders are willing and able to arbitrate price differentials. The longer is the span of temporal arbitration the more efficient the market will be. In Table 23, below, for each trader a maximum amount of days that any grain can be hold for temporal arbitration is requested and the summery statistics at market level is given. Since the data is skewed mostly to the right and some times to the left, it is better to use median as measure of central tendency than mean. So the focus will be on median than mean, though any one interested can find the mean given in the table.

Table 23 Period of temporal Arbitration among grain traders

Location	mean	median	Absolute Skewness	maximum	minimum
Alemata	54	30	14	120	21
Maychew	23	30	-7	60	0
Mokone	52	45	7	120	1
Mekelle	79	30	49	800	0
Himora	70	60	10	200	0
all	58	30	28	800	0

The longest temporal arbitration is observed in Himora with Median arbitration period of 60 days or 2 months. The next location with longer span of arbitration is found to be Mokone with period of 1 month and 15 days, while the median temporal arbitration in other locations is extended only to one month. It is true some traders are storing grain up 800 days which is close to 3 years. But these are exceptions while most traders are concentrating in short term trade with high turn over. Similar results are observed by

³⁰ It would be informative, if the analysis is done on real capital but it was not possible to find reliable inflation data extending 30 to 40 years.

Fafchamps and Hill (2008) in their study of Uganda coffee market, Fafchamps and Minten (1996b) study of Madagascar grain market and Gabre-Madhin et al (2003) study of Ethiopian grain market. This is consistent with high risk aversion observed among traders and serious market failures that they face in doing their business.

However a word of caution is in order in interpreting the above result. Before few months some traders were accused of holding grain to manipulate grain prices. Temporal arbitrage is a natural activity of traders, which is taken as some thing evil by the authorities. So some traders were intentionally biasing the period of their temporal arbitrage, to avoid possible future action by the authority. The logical conclusion is that there is tendency for down ward bias on the period of temporal arbitrage due to fear of misguided state action in grain market; however given the high risk aversion observed among traders, before hand, the bias is not expected to be that big. One way or another, the grain market is not that efficient in creating time utility.

Dimension of spatial Arbitration

Another important service provided by grain traders is the creation of space utility. One way to crudely measure the efficiency of such activity is to consider how many kilometers are traders moving to arbitrate price differential in space or to create space utility.

Table 24 Span (distance) of space utility created by traders

Location	mean		Median		maximum	
	Demand market	Supply market	Demand market	Supply market	Demand market	Supply market
Alemata	166	525	183	492	570	842
Maychew	1	375	0	512	18	632
Mokone	183	332	139	500	1084	620
Mekelle	14	537	0	708	115	1025
Himora	201	80	0	0	991	253
all	133	319	0	253	1084	1025

On average sampled traders are observed to travel 133 Km to sell grain and 319 KM to buy grain (see table 24, above). Maychew and Mekelle traders which are located in net importer market are absorbed to be the least important traders in arbitrating price differential between their own market and other deficit markets. The maximum distance traveled by Mekelle traders to sell their grain is toward Adigrat (115 KM) and the relative figure with in Maychew is just 18 KM to ward Mokone. In both markets the average or median trader is not expected to travel out of the city to sell grain. However traders in Himora, Mokone and Alemata are observed to travel longer mean distance of 201, 183 and 166, respectively. However a median trader is more probable to move longer distance in Alemata than Mokone and Himora. In both markets and mainly in Himora the average is affected by few traders' very long distance trade. In case of Himora a median trader is not expected to move out of Himora to sell grain. This can be because the most important

grain in the market, sesame, is sold to exporters with in Himora as facilitated by ECX. In Mokone the average (median) trader is observed to travel just 139 KMs. The relatively lower figure for Mokone is partially related to longer drought observed for the last 2 to 3 years which was able to reduce the level of grain produced in the area.

In general even though an average Trader is not expected to move out of its market town to sell grain with in Tigray, due to high mobility of some traders which can range up to 1084 KM the average trader is having a mobility of 133 KMs. So spatial arbitrage to create space utility between own market and distance demand market is not a primary task among grain traders with in Tigray.

When we observe traders creation of space utility between surplus markets and own market all traders in most markets seem to travel much longer distance. The exception is Himora traders, in which an average trade is not expected to have any mobility out of market though the mean distance travelled to buy grain is 80 KM. In case of other markets higher median mobility which is extended from 492 to 708 Km is observed. The mean distance is affected by few traders' low mobility to be in range of 332 to 537 KMs. However still traders seem to have better capacity to arbitrate price differential observed between other surplus markets and their own market than their own market and other deficit markets. An average (median) trader in all markets is expected to travel 253 KM to buy grain against 0 Km to sell grain.

So traders in sampled part of Tigray are travelling longer distance to buy grain than to sell grain and this is clear indication that spatial arbitrage has improved over time, if we take the result by Gabre-Madhin et al (2003) as bench mark.

One important point is that sampled markets do not seem to evolve to ward radial market structure proposed as possible structure by Ravallion (1986) or completely integrated markets expected in micro theory. It seems traders in each market are travelling to surplus or deficit market directly than depending on any central hub say Mekelle. This is again a reflection low level of market integration. Even if there is market integration, each trader is not adjusting to price differential at each market. Each trader is acting only on given space and the over all integration is created at system level by over all structure of the system. The practical implication is that price adjustment in such system will be some how less optimal.

Main challenges of grain markets

Before this part is concluded it is important to identify the challenges identified by traders themselves in facilitating their activity. A challenge which is stated to be the most important one by 44% of all traders is lack of access to finance (see table 25, below). This is clear indication that the formal and informal financial markets are not providing adequate and cost effective financial liquidity to most traders. This is observed to be a much serious problem in Mekelle and Maychew, in which 80% and 67% of traders, respectively, stated that the most important challenge in doing their business is lack of finance. This is consistent with early comprehensive study done in Ethiopia by Gabre-

Madhin et al (2003). In the other three sites lack of finance as the most important challenge is identified by 23 to 40% of the traders.

The second important challenge identified is activity of unlicensed traders which are having competitive edge over licensed traders, since they can under cut price to push legal traders out of business. Even though 18% of all traders pick this as the most important challenge, most of these traders are located in Southern Tigray of Alemata (59%), Mokone (20%) and Maychew (8%). This problem is not that serious in Mekelle and to some extent in Himora. Another serious challenge identified as the most important challenge by 13% of traders is demand uncertainty. This is clear indication of the high price uncertainty that traders are exposed on. However this is a serious problem to Himora (31%), Mokone (13) and Mekelle (7%) traders, only.

Table 25 the first most important problem raised by traders for doing their business as percentage of all traders

challenge	Alemata	Maychew	Mokone	Mekelle	Homera	All
lack of finance	0.29	0.67	0.4	0.8	0.23	0.44
lack of storage facility	0.06	0.08	0.2	0	0.04	0.07
High tax	0	0.08	0.07	0.07	0.19	0.09
Demand uncertainty	0	0	0.13	0.07	0.31	0.13
Lack of adequate information	0	0	0	0.07	0.04	0.02
poor quality roads	0	0	0	0	0.08	0.02
Unlicensed traders	0.59	0.08	0.2	0	0.04	0.18
policy uncertainty	0.06	0.08	0	0	0	0.02
Government bureaucracy	0	0	0	0	0.04	0.01
Shortage of clean water	0	0	0	0	0.04	0.01
Total	1	1	1	1	1	1

The remaining challenges which are identified as most important by 7% and 9% of traders are lack of storage facility and unfairly fixed high taxes, respectively. The highest complain on taxes are observed in Homera (by 19% of traders) and the lowest is in Alemata (by 0% of all traders). In other markets 7 to 8% of the traders were complaining about unfairly high taxes laid on them. Serious storage problem is observed among Mokone traders, in which for 20% of them lack of good quality storage. In terms of storage facility none of the Mekelle traders identify it as the most important challenges for doing their business. In other locations 4% to 8% of the traders take lack of appropriate storage as the most important problem.

In general, for most traders the most important problems that have to be addressed first are related to lack of adequate finance, unfair license and tax policy of government, demand uncertainty and lack of storage facility, respectively. Excluding lack of access to finance the relative importance each problem is found to be market specific. The implication is that each market can't follow the same market development policy, unless it is related to finance. The priorities are different in different areas. To improve our understanding of the marketing system and its challenges, traders are also allowed to

identify second, third and so forth, problems to have a complete menu of the challenges observed in each market.

Table 26 Proportion of traders who identify a given challenge as a problem to them

challenge	Alemata	Maychew	Mokone	Mekelle	Homera	All
lack of finance	0.88	1	0.93	1	0.73	0.88
lack of storage facility	0.59	0.75	0.93	0.47	0.35	0.58
Demand uncertainty	0.59	0.5	0.53	0.73	0.54	0.58
Lack of adequate information	0.24	0.67	0.4	0.67	0.65	0.53
High tax	0.12	0.67	0.4	0.6	0.73	0.52
Unlicensed traders	0.82	0.5	0.73	0.07	0.31	0.47
poor quality roads	0.12	0.08	0.4	0.2	0.69	0.35
policy uncertainty	0.29	0.08	0.4	0.07	0.04	0.16
Government bureaucracy	0.06	0	0.27	0.2	0.19	0.15
Collusion by few traders	0.06	0.08	0.33	0.13	0.15	0.15
Shortage of electric power	0	0	0	0	0.12	0.04
Shortage of clean water	0	0	0	0	0.08	0.02
shortage of grain	0	0	0.07	0	0.04	0.02

Even though the priority of each market was found to be different as was stated above, table 26, above, clearly show that most of the problems are commonly faced by all traders, of course to different extent. The three most important challenges are lack of finance, lack of storage facility and Demand uncertainty, which are nominated by 88%, 58% and 58% of traders to be a problem of the marketing system. The least serious three problems identified and which are not actually directly related to the marketing system are shortage of water, electric power and grains. These challenges are identified only in two markets. 4 to 12% of traders in Himora stated the above three problems and only 7% of grain traders in Mokone identified shortage of grain to exchange as a serious problem. Following the top three challenges stated above lack of adequate information, unfairly high taxes, lack of control on activity of unlicensed traders and poor quality roads are identified as a problem by 35% to 53% of all traders. Sluggish and inefficient bureaucracy, policy uncertainty and collusion among few dominant traders are not found to be the most important challenges as only 15 to 16% of traders were identifying this parameters as challenge.

In general most of the challenges stated above are commonly observed in different locations reflecting the low level of marketing development achieved in all the sites. However due to scarcity of resource, simulations intervention in holistic manner is not an option and market development have to be approached in integrated manner. The basic idea of integrated development is that: all things that have to be done and can be done have to be done simultaneously to achieve success; but every thing can't be done at the same time. So priority areas in each market have to identified and the above result clearly shows that the first priority in each market is found to be very different from other market, means one shoe may not feet every feet!

Cost benefit analysis of services provided or expected to provided by Ethiopian Commodity Exchange (ECX)

ECX standard contracts

The Ethiopian Commodity Exchange has developed standard contracts for number of commodities. The commodities with well developed contract with in ECX are Coffee (ECX, 2009), Sesame (ECX, undated -a), Red Kidney Beans (ECX, undated -b), white pea beans (ECX, undated -c) and Wheat (ECX, undated -d). In this study contracts of three commodities will be taken as basis of analysis. This commodities are coffee (to represent it self), sesame (to represent it self) and Wheat (to represent food grains).

For coffee a standard contract includes 30 bags in which each bag of washed coffee is equal to 60 KG and for unwashed coffee it is equal to 85 KG. Means one contract represent 18 quintal of washed coffee and 25.5 quintal of unwashed coffee. For wheat and Sesame one contract is equal to 50 quintals.

For all commodities the Exchange transaction fee is 0.2% of transaction value. However there are important differences on the contract specification and costs. The warehouse storage charge for wheat is 0.04 birr per quintal per day but grace period is not given. Means payment will start at the first data of deposit. For Sesame and Coffee the storage cost is 0.16 birr per bag. For sesame one bag is equal to one quintal but for coffee it ranges from 60 KG (for washed coffee) to 85 KG (for unwashed coffee). The implication is that for coffee the storage cost per quintal can range from 19 cents per day for unwashed to 27 cents per day for washed. For both Coffee and Sesame there is three days of grace period.

Another transaction cost is related to handling and product certification fee, which includes sampling and grading, weighting, loading and unloading fees. For wheat the handling cost to both buyer and seller are 1.45 birr per quintal. These rates are higher for Export commodity like coffee and sesame. For sesame buyer will pay 2.6 birr per quintal and seller will pay 2.7 birr per quintal. For coffee bag seller is expected to pay 2.7 birr and buyer 2.1 birr. Since one coffee bag is 0.6 quintal of washed coffee, for quintal of washed coffee a buyer and seller are paying 3.5 and 4.5 birr, respectively. Coffee traded in domestic economy is the lowest quality unwashed coffee and for such coffee handling cost for buyer and seller are 3.18 birr per quintal and 2.47 birr per quintal, respectively.

For wheat payment is withdrawn from buyer account at trading date and is transferred to the seller account next day. Assuming wheat is deposited in warehouse and warehouse is issued one day before trading date, it will take 3 working days to sell wheat in ECX. One day after trading date, delivery notice will be given to the buyer giving him/her instruction how to pick the grain for transportation. After giving pick up notice the grain have to be with drawn with in 10 days from trading date. In other words it will take 2 working days to buy wheat in ECX. The only difference for coffee and Sesame from wheat is that payment from buyer account is done one day after trading date than in

trading date. So again seller needs minimum of three days and buyer needs minimum of two days to complete transaction, according to the contract specification of ECX.

Cost and benefit analysis on ECX transaction service

Search for contracting trader in own market is mostly done by the owner himself or trusted and experienced worker. For distance market and some times in own market search process is facilitated by using brokers. Traders do not seem to be highly dependent on other workers in the search process³¹. When other workers are used, the workers have to be highly trusted by the owner and have to be experienced. This is a reflection of low trust in the market or low meso trust. That is why in this study the implicit opportunity cost of trusted and experienced worker is taken to be equal to contingent wage attached by the owner. The owner is asked: “if some one as experienced and as trust worthy as you is to do your job, how much will you pay?” This can serve as implicit wage of trusted and experienced workers time. To calculate implicit cost of the owner, weekly working hours of the owner and expected working hours of the above stated working hours of experienced and trusted manager is used. If owner is working 30 hours per week but expect others to work 40 hours, it means there are some important qualities owned by him that can't be found in market. That is why the owner's implicit wage will be 33% more than the manager's salary. In this study the minimum standard contracts fixed by ECX are used. A single standard contract is related to 50 quintal of all commodities except coffee. For unwashed coffee a standard contract is related to 25.5 quintal. For ECX the costs are related to, both, exchange cost and handling cost. The relative cost and benefit of using ECX's exchange service are calculated and the associated proportions are given below.

Table 27 Proportion of traders who will face high exchange cost than search cost of normal way of doing business as buyer

grain	Alemata	Maychew	Mokone	Mekelle	Homera	All
Teff	0.75	0	0.75	0.5	1	0.59
Barley	0.71	1	0.88	0.33	.	0.76
Wheat	.	0.8	1	1	.	0.9
Sorghum	0.45	0	0.57	1	0.2	0.41
maize	0.11	0	0.2	0.67	0	0.21
Chickpea	.	.	0	.	.	0
Horse Beans	.	.	1	0	0	0.33
Lentils	.	1	.	.	0	0.17
Sesame	.	.	.	.	0.83	0.83
Millet	.	0	1	0	0	0.25
All	0.51	0.31	0.69	0.44	0.5	0.51

As can be seen from table 27, above, 51% of grains³² traded by different traders are having low search cost in normal way of doing business than the search cost expected to

³¹ The same observation is done in Madagascar grain market by Fafchamps and Minten (1996b)

³² This is related to simple proportion with out taking how many quintal the trader is trading

be faced in ECX. The worst effect is expected in Mokone followed by Alemata and Homera in which 69%, 51% and 50% of the grains are expected to have high search cost, if traded with in ECX. Traders and grains in Maychew and Mekelle are expected to have more chance of improvement in transaction cost related to search by joining ECX. 69% of grains in Maychew and 56% of grains in Mekelle will have low transaction cost by being traded in ECX. So most traders in surplus producing markets will face high search cost but not most traders in customer centers, if they are traded with in ECX³³.

Since coffee is traded mostly by traders using ECX and since spatial arbitrage behind licensed single market is not allowed by law, coffee is omitted in this analysis. Commodities which will face serious increase in search cost are Wheat, sesame, Barley and Teff, in which 90%, 83%, 76% and 59% of traders, respectively, will face high search cost by using ECX. So the most important grains in the regional economy will fail to benefit from the transaction service provided by ECX's. The problem is related to ECX's fee fixation method, which makes fees proportional to value of transaction. As result luxury commodities and export items will be charged higher than other commodities, for the same transaction service provided by ECX. Moreover export commodities like coffee and sesame will face higher handling cost than others, as was stated above.

However ECX has some additional advantage that can improve transaction cost. To give one example, if traders are buying in ECX, they can have low handling cost. This is because of properly defined grade and standards and efficient enforcement of these standards with in ECX. To calculate total cost faced in buying grain with in normal way of doing business handling cost (cleaning, sacking, loading, unloading and sack cost) and transpiration cost are added to search cost. Some traders claim to have zero sack cost. However it is more logical that the sack cost is imputed in the grain price. So the average sack cost in the market is used to impute the sack cost for those with zero sack cost. If new sack is purchased for 5 to 7 birr, they tend to sell the second hand sack for 2 to 3 birr. As result sack cost normally will range from 3 to 4 birr. Other costs are taken as reported by the buyer.

For ECX the exchange cost, handling cost and storage cost (paid by seller) are taken at face value based on ECX contract. The grain is assumed to be deposited at one day before trade date (T-1) and the contract will be completed in one day after trade date (T +1). However grains have to be transported from warehouse to the traders' storage or vice versa. To deal with this fact, average transportation cost (among traders who use transportation) is found for each market. Then this average transportation cost is added to ECX other costs. In Mekelle some traders, for example, buy grain at their storage facility and trucks will unload their grain in their store. But if they have to use ECX, they have to transport it from warehouse to their storage and this will add to cost. This is why transportation cost is taken in to account.

³³ May Chew is deficit market located in surplus producing zone

Table 28 Proportion of traders who will face high transaction cost by using ECX than depending on normal way of doing business as buyer

Grain	Alemata	Maychew	Mokone	Mekelle	Homera	All
Teff	0.25	1	0.67	0.25	0.67	0.56
Barley	0.14	0	0.5	0	.	0.24
Wheat	.	0	0.25	0	.	0.1
Sorghum	0.27	1	0.43	0.67	0	0.24
Maize	0.11	1	0.2	0.17	0	0.34
Chickpea	.	.	0	.	.	0
Horse Beans	.	.	1	0	0	0.33
Lentils	.	0	.	.	0	0
Sesame	.	.	.	.	0.22	0.22
Millet	.	1	1	0	0	0.5
All	0.21	0.65	0.49	0.22	0.14	0.31

When all costs are taken in to account only 31% of the grains are expected to have high transaction cost by using the exchange service of ECX. The least benefit is expected in Maychew and Mokone with 65% and 49% of grains, respectively, are expected to face high transaction cost after using ECX. Other markets will have fair number of grains which will face reduction in transaction cost after using ECX.

In terms of grain excluding Teff and millet large number of traders will have low transaction cost by using ECX. The proportion of traders which are going to benefit from ECX exchange service range from 66% to 100%, but this does not mean most traders will demand ECX exchange service. There are important problems in creating such link. First when exchange is turned from personal based on micro trust to ward impersonal based on macro trust insiders will have to give up the benefit expected from years of investment on networks. Means traders can't have inside information, cheap and flexible access to credit and so on. This will reduce the benefit enjoyed by traders. Second if traders were earning abnormal profit with in micro trust, the development of macro trust will erode such benefits. Third trading skill learned over years will become less useful and they have to learn new way of doing business. This is why low transaction cost of single trading in static manner may not be a good indicator of trader acceptance of ECX trading service. To deal with this problems contingent values are collected in form of traders willingness to pay for using services expected to be supplied by ECX.

Since buyers are not paying storage cost the number of days taken to complete transaction with in ECX will not affect the cost they have to face with in ECX. However, the contingent price they are willing to pay will decline with increase in duration of transaction. If the current process of facilitating exchange in 2 to 3 days for buyers is followed only 14% and 26% of traders trading in different grains are willing to pay the rate demand for ECX or more (see table, 29 below). If exchange duration is reduced to half day or one day, more than 60% of the grains will not be able to trade with in ECX. To attract more than 60% of the grains there is need to introduce an exchange system which can be completed with in half to one hour. Means than focusing on sophisticated

exchange it may be conducive to introduce auction centers, where large number of buyers, sellers and brokers are buying and selling based on open outcry. Since most traders are satisfied with service provided by the broker and the use of networks can counter the expansion of commodity exchange, it is not advisable to start advanced commodity exchange with its huge over head costs. The main problem of traditional exchange is related to low trust, in adequate information, high risk and high search cost. So there is a need for efficient price discovery with low search cost. There is a need to inject trust on the system and there is a need to introduce public dissemination of efficiently discovered prices. This needs a simple and centralized auction floor as was the case in most Central and Eastern Europe commodity exchanges at the start (UNCTAD, 2005).

Table 29 Sensitivity of proportion of trader as buyers who are expected to lose from ECX for duration of transaction by location

Location	3 days	2 days	1 day	1/2 day	1 hour	1/2 hour
Alemata	0.85	0.74	0.64	0.62	0.08	0.13
Maychew	0.58	0.35	0.19	0.15	0	0
Mokone	0.97	0.97	0.97	0.79	0.74	0.72
Mekelle	0.85	0.7	0.7	0.59	0.41	0.37
Homera	0.94	0.78	0.78	0.76	0.56	0.56
All	0.86	0.74	0.7	0.62	0.39	0.39

Better demand for such commodity exchange is expected in Maychew, Alemata and Mekelle, respectively, but not in Mokone and Himora. Coffee, Sesame and Teff traders which are trading in export and luxury commodities will face the highest transaction cost since these commodities will end up being charged higher. However normal and inferior commodities will have higher demand, unless the exchange institutions and rates are altered (see table 30, below). That is why it is advisable that the current rates used in ECX need to be modified, if they are to attract luxury items like white teff. In normal way of doing business flat rates are used for most grains that make rich traders activity in luxury and high priced commodities very profitable. So some middle rate between ECX rates and normal practice need to be developed for luxury items.

Table 30 Sensitivity of proportion of trader as buyer who are expected to lose from ECX for duration of transaction by grain

grain	3 days	2 days	1 day	1/2 day	1 hour	1/2 hour
Teff	0.87	0.77	0.72	0.64	0.46	0.46
Barley	0.81	0.71	0.67	0.57	0.38	0.38
Wheat	0.8	0.7	0.7	0.6	0.4	0.4
Sorghum	0.86	0.7	0.65	0.65	0.24	0.27
Maize	0.79	0.55	0.48	0.38	0.07	0.07
Chickpea	1	1	1	0	0	0
Horse Beans	0.67	0.67	0.67	0.33	0	0
Lentils	1	1	0.83	0.83	0.17	0.17
Sesame	0.96	0.91	0.91	0.87	0.91	0.91
Coffee	1	1	1	1	1	0.88
Millet	0.75	0.5	0.5	0.25	0	0
All	0.86	0.74	0.7	0.62	0.39	0.39

The logical conclusion is that: first, if traders are given the current exchange products related to transaction as it is, they may not have large demand for service that can be provided by ECX. However, if the products of ECX are able to take a middle ground, where the personal exchange and network efficiency is improved by introducing simple auction centers which can facilitate exchange with in ½ to 1 hour, there could be significant improvement on current marketing system.

Cost and benefit analysis expected warehouse receipt service of ECX

Now let’s focus on warehouse receipt system that is expected to be extended to grain trade. For food grains the monthly storage cost with in ECX is 0.04 per month per quintal or 1.2 birr per month. However an average trader is willing to pay 2.5 birr to 5.84 birr per month per quintal to store grain in modern storage of ECX. However the relative figure for unwashed coffee is 5.7 birr and for sesame it is 4.8 birr. This may reduce the demand of modern warehouse by coffee and sesame traders operating in domestic economy than internal market.

Table 31 summery statistics of contingent willingness to pay for monthly use of ECX warehouse

Contingent statistics	mean	median
Payment for Simple storage service	5.84	2.5
Payment for storage service with tradable receipt	6.95	3
Payment for storage service with credit and tradable receipt	11.01	4

If the warehouse receipt can be used as unit of account in exchange determining the quantity and quality of grain stored in certified warehouse that can be exchanged, the average traders is willing to pay 3 birr 6.95 birr per month to deposit one quintal in warehouse (see table 31, above). When the were house receipt can be also used to access warehouse receipt based loan on discount bases, there is dramatic increase in storage cost traders are willing to pay to 4 to 11 birr per quintal on average. This is highly consistent with the two most important problems raised by traders i.e. lack of access to finance and lack of modern storage facility. However coffee and sesame marketed for domestic economy may need to have lower price tags compared to their export counter parts, if large numbers of traders are going to be attracted to ECX warehouse and related services (see table 32, below).

As can be seen from table 32, below, except for coffee and Sesame most of traders will be willing to pay the current rate fixed by ECX to use the modern warehouse service. 88% of coffee traders in Mekelle and 52% of Sesame traders in Himora are not willing to use the simple warehouse service that can be provided by ECX. In terms of location 49% of grain in Mokone may not use the warehouse service that can be provided by ECX. This is consistent with low level of storage problem observed in this market. In Mekelle except coffee traders all other traders are willing to use the simple modern storage service that can be provided by ECX. In Himora close to 40% of the grain which are mostly Sesame, Teff and Sorghum may not be able to use the warehouse service provided by

ECX. This is partially related to relatively better storage facility in the city and high rate fixed against sesame, in case of sesame.

Table 32 Proportion of grain traders which are not willing to pay the storage cost fixed by ECX when the use of warehouse receipt is used as receipt of deposit only

grain	Alemata	Maychew	Mokone	Mekelle	Homera	All
Teff	0.08	0.13	0.42	0	0.33	0.21
Barley	0	0	0.63	0	.	0.24
Wheat	.	0.2	0.75	0	.	0.4
Sorghum	0.18	0	0.43	0	0.33	0.27
Maize	0.22	0	0.2	0	0	0.1
Chickpea	.	.	0	.	.	0
Horse Beans	.	.	1	0	0	0.33
Lentils	.	0	.	.	0.2	0.17
Sesame	.	.	.	.	0.52	0.52
Coffee	.	.	.	0.88	.	0.88
Millet	.	0	1	0	0	0.25
All	0.13	0.08	0.49	0.26	0.38	0.29

In over all more than 70 of the grain traded in these markets can be stored in modern warehouse receipt as the traders are willing to pay more than what is demanded by ECX. If the warehouse receipt can be used as unit of account in transaction or can be used as collateral to access bank credit, this will increase to more than 80% (see table 33, below).

Table 33 Proportion of grain traders which are not willing to pay the storage cost fixed by ECX when storage receipt can be used for transaction or accessing bank credit or both*

grain	Alemata	Maychew	Mokone	Mekelle	Homera	All
Teff	0.08	0.13	0.25	0	0	0.13
Barley	0	0	0.25	0.33	.	0.14
Wheat	.	0.2	0.25	0	.	0.2
Sorghum	0.09	0	0.43	0.33	0.07	0.16
Maize	0.11	0	0.2	0.17	0	0.1
Chickpea	.	.	0	.	.	0
Horse Beans	.	.	0	0	0	0
Lentils	.	0	.	.	0	0
Sesame	.	.	.	.	0.43	0.43
Coffee	.	.	.	0.63	.	0.63
Millet	.	0	0	0	0	0
All	0.08	0.08	0.26	0.3	0.22	0.19

* – even though there is decrease in contingent payment when access to credit is taken away it failed to change the proportion

This is clear indication that what the domestic commodity traders are looking is not modern western style exchange, but some highbred of modern and traditional practice where traders can have better access to credit, modern storage, information and low transaction cost over normal way of ding business in general. To understand this fact we

can take the experience of the Budapest Commodity Exchange of Hungary, which is one of the most successful commodity exchanges in Eastern and Central Europe. In this exchange a very simple auction center was first established and the exchange is up graded over time by using the exchange fee (UNCTAD, 2005).

Conclusion of cost and benefit analysis

In general there are four models of commodity exchanges. The first one is that low cost, low service open outcry exchange; the second one is low cost low service electronic exchange; the third is high service open outcry exchange and finally high service electronic exchange. The first one has been tried in many African countries. But only in few case (the coffee and tea auction in east Africa and for some time the Zimbabwe Agriculture Commodity Exchange, ZIMACE) have show some success. But even this success does not generate enough surpluses to invest on system up grade. The second one is also tried by Africanlion, an online coffee exchange in east Africa, which has not yet found the path to sustainability. Both are low cost and low service facilities means low value added and low fees, which hinder their survival and reach full potential. Model three is tried in Alexandria Cotton exchange (Egypt) which is closed 40 years ago, but was successful with global participants. Model 4 is used by SAFEX with strong financial back up and it is a success story (UNCTAD, 2005). However the researcher believes that market development is an important public good that has to be facilitated by government intervention. So than starting a complex model 4 type exchange which will not be sustainable, it is important to start with model 1 and then up grade it in to 3, 2 and the 4 with government support. To do that introduction of certified warehouse receipt system with credit facility and introduction of semi modern and semi traditional exchange centers where grain auction are done may be the right first step to develop modern and advanced commodity exchange in the future.

The critical challenge in such process is lack of consistency between modern or international grade and standards used in ECX and traditional grade and standards used by traders³⁴. Since one can't be imposed on the other and it may take time to integrate the best of both ways. In mean time it may not be wise to use clearing house or grade wise storage facility to combine similarly graded grains. Under asymmetric information and such inconsistency it is not hard to show that such practice will bankrupt the warehouse facility in medium and long run. The logical step seems to be to use the structure that has been used in old coffee auction. After grade and standard is given for grain of each trader, each trader's grain has to be presented as separate contract in auction and buyers have to see and check the sample first hand. So what the exchange is granting is consistency of what is sampled and what is in all sacks and is also giving grade and standards as base of analysis. The final decision on quality is left on the hand of the buyer who has to see the screen the sample before auction. The same applies for using warehouse receipt system. With out developing proper grade and standards, the use of warehouse clearing system is recipe for disaster. That is why first, traders need to store each grain separately; second, banks need to check the quality of grain before hand before giving a discount loan. This

³⁴ Such in consistency between formal grades used by different organizations and actual grade and standard by traders is well documented in Gabre-Madhin et al (2003) study.

can create some delay in warehouse receipt system, but it is the only way to avoid disaster in face of high inconsistency between domestic informal grades and standard and formal grades and standards. This conclusion is inline with observation and believe of Gabre-Madhin and Goggin (2005, 12) in saying “There is **no blueprint** for commodity exchange development. They are useful and viable only when **tailored** to the real needs of the country.” In this paper the same cloth is not assumed to fit every one, *after measuring the dimensions of the market, we are proposing a cloth that can fit.*

Determinants of willingness to pay for different services offered or expected to be offered by ECX

Determinants of willingness to pay for using warehouse receipt system

Warehouse receipt, which is found to be highly demanded by traders in the site, can have three advantages over normal way of doing business. First, it can serve as simple storage facility to provide modern and cost effective storage to traders (simple storage service). Second, the receipt can serve as unit of account or it can facilitate trade based on specification of warehouse receipt (transaction service). This can reduce search cost, in particular, and transaction cost, in general. Third the receipt can be used as collateral to access short term credit (credit service). In these subsection determinants of traders’ willingness to pay for different warehouse related services is analyzed by using simple OLS model. In each independent variable 8 observations, 6 from Homera and 2 from southern markets, were observed to have zero value. Following the recommendation of Maddala (1983) OLS model was fitted, but the observations are found to be outlier in many dimensions. So they are excluded from the analysis. One additional outlier is also excluded from transaction model to make the observations 84.

Table 34 specification testes to warehouse service related products regressed in OLS

Parameter/ test	Simple storage		transaction		credit	
	statistics	probability	statistics	probability	statistics	probability
Ramsey reset	1.49	0.227	0.39	0.76	1.64	0.19
Breusch-Pagan	9.99	0.002	7.16	0.008	0.61	0.43
IM normality	29.32	0.136	12.33	0.83	18.88	0.399
F-value	3.49	0.000	113.52	0	337.71	0
max VIF	4.19		6.12		2.85	
R2	0.54		0.47		0.44	
n	85		84		85	

As can be seen from table 34, above, all models are appropriately specified, except for heteroskedasticity problem observed in two models and it is dealt by using robust standard errors. For brevity, the focus of following analysis will be on model result given in table 35, below, than on specification test result, give above, which are easily understood by any economist. The variables in table 35, below, are selected based on theoretical and statistical bases, though all variables given below and other more are first

fitted in all the models. Insignificant variables which are not theoretically fundamental are dropped, if they did not effect specification of the model.

Table 35 Determinants of willingness to pay for different warehouse receipt system products in log form

Independent variable	Simple storage		Transaction		Credit	
	Coef.	Prob.	Coef.	Prob.	Coef.	Prob.
Inage	0.702	0.193	-0.063	0.568	-0.06	0.556
Alemata	0.452	0.14	-0.248**	0.035	-0.216**	0.011
Maychew	1.347***	0.001	-0.02	0.881	-0.039	0.638
Mokone	0.001	0.997	-0.236*	0.06	-0.152*	0.054
Mekelle	0.754	0.169	-0.442***	0.001	-0.181	0.019
Less than Grade 3	0.498	0.269	-0.078	0.292	0.056	0.398
Grade 7 - 8	0.181	0.529	-0.013	0.863	0.055	0.418
Grade 9 -12	0.274	0.325	0.028	0.696	0.026	0.689
Post high	0.375	0.237	-0.082	0.325	0.13*	0.076
Log quality of own storage	0.007	0.759				
Log quality of rentable storage	-0.032	0.635				
Log access to land	0.018	0.621				
Log of fair charge	0.191**	0.02				
Log of average easiness to own storage			-0.004	0.632	0.039	0.14
Log of average easiness to rent good quality at fair rate			-0.043	0.118	-0.092**	0.035
Log of current capital	0.1	0.14				
Log of experience	-0.303*	0.08				
Log of gross network in own market	-0.345**	0.028	0.085**	0.036		
Log of storage cost	0.064	0.737				
Log of maximum storage	0.083**	0.01			-0.008	0.328
Log of information network in own market			-0.13**	0.025	0.089**	0.03
Log of loan network in own market			0.11*	0.05	0.027**	0.025
Log of search cost			0.009	0.803		
Log of buying cost			-0.032	0.843		
Log of fair charge for none owners	-0.133	0.173				
Lack of storage facility	-0.558***	0.005				
High tax					0.082	0.101
Unlicensed traders	-0.395*	0.086			0.082	0.143
Constant	-0.715	0.692	0.829	0.189	0.696	0.072

When simple storage model is considered, traders located in Maychew are observed to have higher demand for storage service of modern warehouse provider, than others. In other locations, the level of demand for modern storage facility is not that significantly different from Himora, the control site. It is possible to expect that experienced and well connected trader may have less interest in using simple storage service that can be

provided by certified warehouse provider. Storage cost does not seem to be an important factor in determining traders' willingness to pay for modern storage service; however traders which are having longer span of temporal arbitration are more willing to pay more to have access to modern storage. Since storage cost does not show wide variation from trader to trader with in the same market, it is not illogical to have positive but insignificant effect coming from storage cost. Traders which are engaged in longer temporal arbitration are more in need of storage facility than traders engaged in high turn over trade, so it is logical if they are willing to pay more.

Traders which are complaining about activity of unlicensed traders are less willing to pay for commodity exchange service than others. This may be reflecting their fear that: if warehouse is used they may be forced to pay more tax. As result they can lose whatever competitive edge they have on unlicensed traders. This is clear indication that introduction of warehouse receipt need to be integrated with imposition of fair tax rates and crack down on unlicensed traders. Traders which are observed to complain about lack of appropriate storage are observed to be less willing to pay for modern storage facility. This seems paradoxical on its face value, but if we consider the personal observation and informal discussion made with grain traders, it will become clear that there is very logical explanation for this observation. When traders complain about storage, most of their explanation revolves around high storage rent that they are paying and how they are forced to pay for month when they are even using the storage facility for one day. Means their complaints are not on lack of acceptable storage facility to their current need, but on unfair charges that they are facing. So what traders are looking is fair charge on use of storage facility. It is true that for having better temporal arbitration not only cost but quality of storage facilities have to be improved, but it is also important to note that fair balance need to be stroke between cost and modernity of the storage facility to attract large number of traders.

Another paradoxical result is observed when the fairness of current storage charges are considered. Traders which think the current rates are fair are willing to pay more than traders which are complaining about the charges. At face value this result may seem paradoxical; but if the above explanation is taken in to account, it is consistent with the observation of the researcher that cost sensitive traders may not be willing to pay more. In general traders located in Maychew, who are less cost sensitive, less connected, less experienced and having longer span of temporal arbitration are willing to pay for using storage service that can be provided by modern warehouse provider.

When the warehouse receipt can serve as unit of account to facilitate exchange location parameters, social capital and experience seem to be important determinant factors; while costs do not seem to matter. Before this result is explained it is important to note that willingness to pay for simple storage is introduced as independent variable in order to focus on the marginal payment for using the receipt in exchange. This will improve the result in two ways. First the effect and co-variation of errors will be controlled, in order to focus on the marginal willingness and to avoid any omitted variable bias³⁵. Second if

³⁵ Omitted variable is expected since there are many variables which can affect the three models simultaneously. The estimation of simultaneously tobit models or probit models is very complex, which

the marginal values are generated from the data, there is a need for using limited dependent variable and censored models, which are observed to be highly inappropriate for other contingency data collected in this paper. The same is done on credit model which is having transaction variable as independent variable. Now let's focus on the results.

Traders located in Maychew and Himora are willing to pay more than other sites, if the warehouse receipt by serving as unit of account can facilitate exchange and reduce transaction cost. However different networks may contradict this move in all locations. Traders which are having better information network, that can easily use their information networks to facilitate transaction are not willing to pay for the use of such service. However controlling for information networks traders who have more contact on market and who can easily borrow from large number of traders to solve their short term liquidity problem will be willing to pay more. This is clear indication that the change in grain structure that can be generated after such changes can have complex interaction with existing social capital. In our case information networks will be easily replaced over long run by such formal institutions in which gross networks and loan networks will be a catalyst of such change. In the mean time well connected traders which can collect large information from information networks may not be easily attracted to such changes.

If credit service is taken at a margin Alemata and Mokone traders are willing to pay less than others. It can imply that there is less need for credit in these markets, which is not the case. As was analyzed in SCP part, it was clear lack of finance is serious problem in all locations. And this is more the case in Southern part of Tigray where access to formal bank loan, other than MFI, is virtually absent in the last few years. The main point is that traders in these markets are looking for cheaper credit than other traders located in other markets. Note that traders often start as unlicensed traders in south, will accumulate capital and then will move to Mekelle and Himora. So the main point seems that traders in Maychew are highly desperate for any finance and traders in Alemata and Mokone are looking access to cheap finance. But it is clear that warehouse receipt that can serve as collateral needs to be started in both Mekelle and Himora first. This is because traders in these locations are willing to pay higher rate that can be expected at the start. Maychew, given its small market size, may not have adequate flow to make it feasible in short run. Once experience is gained and costs are able to be reduced, the services need to be extended at lower rate to southern markets.

For all locations post high level traders, which are very small in number, are observed to have more demand for such service than others. This is clear indication that modern value and better information and education are fundamental for success of such service. Social capital does not seem to be an obstacle for expansion of such services. Traders which are having large information and loan networks in their own market are more willing to pay than others. This will show us two facts. First, expansion warehouse loan service will not face resistance from trader networks and second, networks are not able to provide

can be avoided by the above procedure, given the nature of the variables on hand. See Perali and Chavas (2000) for complexity of such approach

adequate liquidity for networked traders. This is in line with high compliant of traders observed in relation to lack of finance. Networks may be functioning more or less efficiently in dissemination of information; their efficiency in provision of short term loan is very limited. Traders which are less satisfied with current storage service provided for rent are willing to pay more than others. This is an indication that dissatisfied traders payment on storage will also increase, if traders are provided with modern storage service supplemented with warehouse receipt that can be used as collateral. In short than focusing on simple storage service, it is much needed that the warehouse receipts to be integrated with access to short term loan.

In general in order to make sure that the informal structure is supplementing market development than being fetter of change, it is important that introduction modern warehouse service need to be integrated with provision of loan. The process need to be started in Himora and Mekelle, while other short term solutions are provided to solve storage and liquidity problems of southern markets, in general, and Maychew, in particular. Once the necessary experience is gained and ways to cut cost are developed, it needs to be extended in to southern Tigray markets. In the due process introduction of fair tax assessment, crack down on illegal traders and education on such services is fundamental. Moreover there must be a mechanism found to encourage highly educated individuals, at least at post high level, to join grain trading, if the grain markets are going to evolve to ward modern grain markets. In doing so there must be clear understanding about the role of experience and informal institutions in facilitating grain trade under highly dysfunctional market structure. In short it must be about integrating the best of both worlds, i.e. more educated and less educated, than imposing one over the other.

Determinants of willing to use ECX Exchange service

ECX exchange with gestation period of three days

In this subpart of the paper, determinant of traders' willingness to pay for ECX exchange service, which can take three day to complete is taken in to account. The analysis was initiated assuming the error term will have identically and independently distributed normal distribution. Unfortunately when Probit model is fitted two serious problems are encountered. In one side convergence was not possible unless some variables are excluded. The excluded variable are education and total transaction cost in buying grain. In other side the distributional assumptions imposed on the data in estimation process are found to be in appropriate (see table 36, below). In short the Probit model is miss specified and, unlike OLS version models, the effect of such specification will have unknown bias on both the parameter and standard errors (Green, 2000; Maddala, 1983 and Verbeek, 2004). In short the Probit estimate given in table 37, below, are both biased and inconsistent. Excluding the above variables the fitted Probit model, given in table 37 below, is found to have omitted variables, variable variance and none normal distribution. To solve these problems variables are added and dropped iteratively and heteroskedasticity Probit model is tired, but the problem was not able to be solved. That is why the Probit result will not be taken seriously and the analysis will focus on alternative models.

Table 36 Specification test for Probit and WLS model with 92 observations

Parameter	Probit			Parameter	LPM1		LPM2	
	Statistics	df.	Prob.		Stat.	Prob.	Stat.	Prob.
omitted variable	24.822	8	0.002	Ramsey RESET test	0.46	0.709	1.95	0.135
heteroskedasticity	35.55	20	0.017	Breusch-Pagan	3.92	0.048	5.60	0.0180
normality	25.271	2	0	IM test for normality	20.81	0.53	5.60	0.035
LR	91.14	15	0	VIF MAX (OLS)	6.65		6.19	

To deal with this problem, one option is to use Maximum score model of Manski (1975, 1985). Maximum score model has advantage of being semi parametric in which it will not impose any distributional assumptions on the data. However the model has its own short comings. First, given the high computational requirement of the model, it was not possible to fit all variables in to the model. The Limdep software can fit up to 14 independent variables, only (Green, 2000). Second, under such restrictions omitted variables are expected, but the effect of omitted variable on performance of the model is not clear (Manski, 1975, 1985). Given the model is trying to predict the actual probabilities; the Pseudo R^2 is used to select the right specification of the model. The 'unrestricted' model is given under Maximum score 1. This model is excluding education and search cost. The exclusion of these variables is based on the maximum limit of 14 independent variables imposed by the software and Pseudo R^2 observed from different combination of variables. But this general model is having insignificant parameters for all variables. So based on their significance level, variables are dropped one by one until the maximum Pseudo R^2 of 93.5% is achieved (see table 37, below). Means the best model is given under Maximum Score model 2.

A third option is to use linear probability model which imposes linear relationship between probability of willingness to pay and independent variables. The advantage of this model is that even though it is not best unbiased Estimator (BUE), given probabilities does not have linear relation with variables, it best linear unbiased estimator (BLUE), given the error terms are white noise. Moreover large number of variables can be used to avoid omitted variable bias due to its computational simplicity. To find BLUE result, the errors have to be white noise and as can be seen from table 36, above, the unrestricted model (LPM1) is not having omitted variables, none normal distribution and multicollinearity problem. Unfortunately the heteroskedasticity problem is not solved by using weighted least square. That is why robust standard errors are used to deal with heteroskedasticity problem. The restricted version of the model (LPM2) is not observed to affect the result significantly than to introduce excess skewness and kurtosis in to the model (see table 36, above and table 37, below)

Given the restricted maximum score model or model 2 is having best fit, the unrestricted model 1 will be ignored for brevity. Based on the best fit model (Max. score2) determinants of the incidence of willingness to pay are related to level of satisfaction with brokers, the transaction cost faced by traders in current way of doing business and size of information network they have. When traders are less satisfied with current efficiency of brokers, when they are having less information network and when they are facing high

transaction cost they are observed to be willing to pay for ECX exchange service, which can take up to three days to finish the transaction process. The problem with this conclusion is that the variables are significant at 10% level, not at conventional 5% level, and the impact of omitted variables is unknown. So let's see the LPM result, below.

Table 37 Determinants of incidence of payment for using ECX exchange service which can take 3 days

Variable	Probit		Max. score 1		Max. score 2		LPM1		LPM2	
	Coeff.	Prob.	Coeff.	Prob.	Coeff.	Coeff.	Prob.	Prob.	Coeff.	Prob.
<i>Log of age</i>	-6.181	0.056					-0.225	0.219	-0.036	0.828
Log of average satisfaction with broker	0.994	0.038	-0.214	0.513	-0.474	0.09	0.069	0.008	0.044	0.012
Alemata	-14.181	0.014	-0.207	0.485	-0.155	0.561	-0.461	0.03	-0.497	0.009
Maychew	-1.463	0.643	0.521	0.303	-0.048	0.846	0.482	0.034	0.42	0.011
Mokone	-10.703	0.021	-0.01	0.971	-0.284	0.267	-0.461	0.091	-0.457	0.065
Mekelle			0.365	0.22	0.508	0.115	0.594	0.02	0.508	0.016
Log of working capital	-26.706	0.028	0.369	0.319			-0.236	0.356	-0.291	0.149
Log of experience	2.733	0.064	-0.004	0.982			0.127	0.078	0.106	0.03
Log of gross network in own market	-1.673	0.267	0.071	0.732	0.144	0.16	0.021	0.656		
Log of information network in own market	-5.11	0.039	-0.288	0.341	-0.243	0.081	-0.081	0.452		
Log of gross network in own market	4.92	0.062	-0.131	0.641			0.11	0.288		
Log of search cost	0.445	0.511					-0.185	0.024	-0.078	0.009
Log of buying cost			-0.142	0.361	0.34	0.068	0.813	0.014	0.695	0.029
Log of maximum distance traveled	0.16	0.035	-0.035	0.566			0	0.998	0.004	0.599
Log of loan network in distant market	-0.494	0.08	0.362	0.133			-0.009	0.649		
Log of information network in distant market	0.333	0.393	-0.287	0.17			0.003	0.929		
Risk aversion parameter	1.912	0.068					0.153	0.268		
Less than 3							0.17	0.454	0.223	0.338
Grade 7 - 8							0.114	0.154	0.088	0.208
Grade 9 -12							0.375	0.033	0.203	0.065
Post high							0.254	0.027	0.176	0.062
Constant	133.473	0.017	-0.173	0.613	0.463	0.395	0.181	0.44	0.335	0.145
Pseudo R ² or R ²	0.7454		0.902		0.935					

LPM1, which is having better specification from LPM models, is used as base of alternative analysis. This is unrestricted weighted least square model and its conclusions are stable whether variables are dropped or not. The effect of omitted variable and computational restrictions of maximum score method are obvious in table 37, above. Education and locational parameters are observed to be important determinants of incidence of willingness to pay. In terms of education high school and post high level traders are observe to be more willing to pay for using ECX service than others. In terms

of location, it seems the incidence of payment is high in deficit market of Maychew and Mekelle than others. Traders in both Alemata and Mokone are observed to be less willing to use ECX service than others. The control variable of Himora is observed to be in middle of both extremes.

When education is taken in to account the effect of networks or level of social capital that a trader has is having insignificant impact on probability of payment. Since we are not sure if OLS model is better than the semi parametric maximum score model, it is not logical to reject the importance of networks. But it is highly rational to have reasonable reservation about the effectiveness of networks to create barrier of entry in grain trade. This is fact is more true, given the following paradoxical results observed, which can question the specification of LPM or WLS model. First, with in the LPM models more experienced traders are observed to be more willing to pay for ECX transaction service, which can take three days to complete. More experienced traders are expected to have better knowledge of doing things now and it is logical to expect resistance to change from their corner. But the model is not showing this result.

Second, when buying cost increase by one percent the probability of paying for ECX service, which can take 3 days to complete, will increase by 81%, however if the increase is coming from search cost, which account for 20% of buying cost on average, search cost will farther reduce probability of payment by more than 18%. So if search cost is 20 birr then buying cost will be 100 birr. So if search cost increase by one birr, it is 5% increase and this will generate more than 90% decline in probability of payment. However it will also cause 1% increase in buying cost generating close to 81% increase in willing to pay. On average there will be a marginal decline of close to 9% on willingness to pay for using ECX exchange service which can take 3 days. It is theoretical clear why traders with large transaction cost are more willing to pay, but it is not clear why traders are less willing, when the increase is coming from transaction cost. The logical conclusion is that search cost, after controlling total transaction cost, is serving as proxy for other unobserved variables and model miss specification. Another paradoxical result is observed when satisfaction with current service of brokers is observed. The LPM is showing that when traders are more satisfied with the brokers' service they are more willing to pay for ECX exchange service than when they are less satisfied. This is another theoretically unsound result observed from LPM.

In general the educated guess that can be done based on the above less than ideal models and logical reflection is that traders located in deficit market of Maychew and Mekelle, which are facing high transaction cost, which are more educated compared to most traders and are less satisfied with service provided by brokers are more probable to be willing to pay for ECX service that can take up to three days to complete. There are high chances that experienced and traders with small information network will pay less. Unfortunately the effect of experience and information network is model specific so it is hardly possible to analyze their effect from current data set and models used.

It would be more informative, if not only determinants of incidence of willingness to pay for ECX exchange service, which can take up to three days, but also determinants of

willingness to pay are analyzed. Given the error is white noise, this can be done by using Tobit model. Unfortunately the same specification problems observed in Probit model and also observed in the Tobit model. Even logarithmic transformation and heteroskedasticity model were not able to solve the problem. Since Tobit model with out appropriate specification is both biased and inconsistent (Green, 2000; Maddala, 1983 and Verbeek, 2004), the result are given in appendix, but will not be discussed here.

Alternatively if ECX was able to reduce the duration of the transaction to just 1 hour, only 7 traders are observed to reject the use of exchange service of ECX. As result, following the recommendation of Maddala (1983) simple OLS model is used to identify determinants of willingness to pay minus unobserved transaction cost. To estimate the model either dropping the 7 observations or introducing dummy for zero values is observed to generate independently, identically and normally distributed error term. In order to avoid the unnecessary loss of observations, introduction of dummy variables for missing values is preferred in this paper. All the specifications selected are not having any serious omitted variable, Skewness, heteroskedasticity and multicollinearity problems (see table, 38, below). One exception is that the null of excess kurtosis is rejected at 9% level for the last model (not reported for brevity). For other models the null of excess kurtosis is rejected even when 10% level type 2 errors is allowed. Since OLS version models are asymptotically robust for none normal distribution (see Verbeek, 2004) and the parameters are stable from model to model, it is logical to accept the model result at their face value.

Table 38 Specification test for regression in table 39 with 92 observations

Parameter	full model		best based on restricted R2		best based on normality	
	Statistics	Probability	Statistics	Probability	Statistics	Probability
R2	0.9579		0.9547		0.9532	
Adj R2	0.9445		0.9503		0.9498	
Ramsey RESET	1.16	0.3334	218.67	0.2549	0.11	0.9532
MAX VIF	6.38		1.87		1.52	
Breusch-Pagan	1.72	0.1898	1.8	0.1802	1.57	0.2104
F statistics	71.42	0	218.67	0	288.25	0
IM test for normality	21.44	0.554236	14.3	0.112047	6	0.539749
observations	92		92		92	

If exchange service of ECX is adjusted to be completed in short period of time, traders located mainly in Maychew, but also in Mekelle, are willing to pay more (see table 39, below). In general traders located in deficit markets are more willing to pay than traders located in surplus markets. Traders which are located in Mokone, who were having serious shortage of marketable output due to extended drought observed for last three years, were less willing to pay for using modern and fast exchange that can be provided by ECX. All other parameters, except one, are insignificant despite high R² and low multicollinearity problem; implying that if the service is able to modified to the need of traders, in terms of short gestation of transaction, it will not be constrained by lack of

capital, education, social resistance and others. The exception is that as the trader is able to create long dimension spatial arbitrage the more he/she is willing to pay for using ECX exchange service that can only take one hour.

Table 39 determinants of willingness to pay for using ECX exchange service which can end in 1 hour, dependent variable log of contingent payment

Independent Variable (dependent variable log of payment)	full model		best based on restricted R2		best based on normality	
	Coff.	Prob.	Coff.	Prob.	Coff.	Prob.
Log of age	0.318	0.385				
Log of average satisfaction with broker	-0.063	0.208				
Less than 3 rd grade	-0.114	0.546				
Grade 7 - 8	-0.19	0.295				
Grade 9 -12	0.041	0.838				
Post high	-0.121	0.572				
Alemata	0.142	0.572	0.123	0.498	0.028	0.866
Maychew	0.439	0.049	0.421	0.017	0.383	0.028
Mokone	-0.451	0.046	-0.478	0.006	-0.519	0.002
Mekelle	0.295	0.215	0.316	0.069	0.279	0.088
Log of working capital	0.6	0.308	0.52	0.268		
Log of experience	-0.057	0.604				
Log of gross network in own market	-0.128	0.25	-0.093	0.232		
Log of information network in own market	0.018	0.906				
Log of gross network in own market	0.035	0.813				
Log of search cost	0.054	0.338				
Log of maximum distance traveled	0.036	0.036	0.036	0.003	0.035	0.003
Log of maximum duration of storage	0.008	0.753				
Log of gross network in distant market	-0.014	0.598				
Log of information network in distant market	0.024	0.637				
Risk aversion	0	0.697				
Zero	7.404	0	7.469	0	7.553	0
Constant	-9.712	0.001	-8.427	0	-6.651	0

Personal observation of the trader reveals that the dynamic, well capitalized and well connected traders are the one engaged in long distance trade. In this study positive and significant correlation is observed between long distance trade and capital. Study by Gabre-Madhin et al. (2003) found that less capitalized traders in Ethiopia are virtually absent from distance trade. Moreover when traders, which are not creating space utility, are asked “If they are transporting grain from one location to another for profit”, the common answer were not yes or no. Traders were reporting their health status, capital, connection and others to say that they are only buying from local traders. Given this facts it is more logical to conclude that more connected, well capitalized, health and young

traders, which are able to engage on long distance trader, are more willing to pay than others.

In general unless the gestation period is reduced, ECX may not be able to attract most traders except those which are more educated, which are facing high transaction cost and which are highly dissatisfied with current service provided by brokers. However when the gestation period of transaction is reduced to half or one hour, it will attract most of the traders and more than others, dynamic and vibrant traders which are engaged in long distance trade will be attracted more. In terms of location traders located in deficit market of Maychew and Mekelle seem to be more willing to pay to use the modern exchange service that can be facilitated by ECX than others. The opposite is the case for traders located in Mokone, while Himora and Alemata traders are found in the middle. Since the service of ECX is more viable in surplus producing than deficit markets it is important to give due attention to market failures that can constrain the participation of potential ECX customers from surplus producing markets.

Conclusion and recommendation

Grain trade is financial capital intensive business and traders who can have preferential access to such resources can have competitive edge over others. In the study sites there is high concentration of capital among few traders, but with fairly strong competition among most traders. Rich traders seem to concentrate on luxury, export and high margin grains like coffee, Sesame and Teff, leaving other traders to face serious competition on what is left over. Traders studied in the sites seem to have better business assets endowment compared to traders found in many developing countries. But this does not mean traders are not facing serious asset related constraints. This is observed on the fact that significant majority of traders identify lack of finance and good quality storage facility as important problems in their market. In short grain market in studied sites is far from being highly efficient and functional.

In terms of education, grain trade is not often done by either illiterate or highly educated individuals. Most traders speak Amharic and Tigrigna, as result they may not face serious problem in penetrating most part of Ethiopia grain market. However, given low educational attainment of most traders and their incapability to communicate in foreign languages, they may not be able to penetrate international grain markets, except Middle East countries. Some traders in Himora did have capacity to communicate in Arabic, so they will have competitive edge over other traders to penetrate Arabic speaking countries. In general there is a need to facilitate the participation of educated individuals in grain trade, without ignoring the importance of experience and informal institutions.

Most traders are Orthodox Christians and first generation traders, with less experience and low level of meso trust, but with large sized micro networks. Traders actually trust none traders over other traders and brokers, which reflects the inefficient coordination and allocation process found in the market. In simple words, the most serious challenge in the market seems to be the existence of very low trust in face of dysfunctional market and state. Moreover, collusion among rich traders or meso trust defined in capital dimensions does not exist in most markets, except Mokone. So the problem of grain market, in the sites, is not none proportional distribution of trust or collusion, but lack of trust in the first place. That is why serious work needs to be done to improve both meso and macro trust; in which commodity exchange is one important component of it, but not the only component. There is a need to facilitate the development of trade associations to create trust, refine gossip and facilitate the emergence of informal developmental values. The sole purpose of such institution should be to facilitate the development of meso level trust, as stepping stone to the creation of macro trust. In doing so, transparent work needs to be done to avoid any political interference in the process. Unfortunately, meso trust can be a fetter of change to ward macro trust once it takes root. That is why some work needs to be done to make sure that there is easy entry to such associations. This will make them inclusive than exclusive groups.

There is easy entry in to grain market, in which traders don't even need license or large capital to start business, especially in southern Tigray. Unfortunately, effective entry is constrained by lack of micro network and capital. That is why the development of trade

associations that can facilitate the expansion inclusive groups is critically needed to improve dynamics of grain market.

Networks are found to be efficient price information distributors among networked members; while the mass media is found to be the least used and the least reliable source of information with in the grain market. This is in line with early study of Gabre-Madhin et al. (2003). Mass media is used to access information on international prices, government policy and output at national level. However the level of grade, given by traders, to the information collected from mass media on these variables is very low. This is clear indication that traders are not working in vacuum of misinformation and they are using alternative sources to weight, each and every information, for its reliability. So, if mass media is going to be an important source information, ECX needs to give due emphasis to the reliability of the data and a lot of work is needs to be done to convince traders that such reliable data is actually reliable. This is so since grain trade is very risky activity any misinformation, by any one, can easily jeopardize the future of the trader. Under such reality huge resource needs to be allocated to facilitate collection of reliable information and to changing traders' perception to ward such information.

Brokers are used in distance markets, but not in own market, and traders are satisfied with current exchange facilitating role of brokers. But this satisfaction has to be taken with grain of salt, as it will be clear below. The problem is that they seem to be operating in low trust environment, which can put huge penalty on market efficiency. Network of traders are the most important source of information and they seem to do it much efficiently than brokers. But lack of trust on brokers than lack of reliable information seems to be the main problem found in the relationship between brokers and traders. Even though most traders seem to be some how satisfied with current storage service, it is hard to take this result at its face value. This is because expectation is function of current challenges. If they are having many serious challenges as lack of finance, it is natural that they will accept some miner challenges as normal. This is the well known concept of revisable nature of utility advocated by Sen (1984). This is also the case given the fact that lack of storage is raised by many traders as one of the series problems of grain trade.

In terms of capital growth, southern markets are sites where traders can start business with less capital and with out licensee to accumulate minimum capital that they need to enter the lucrative business of Mekelle and Himora. Even though there is no direct evidence in the study, grain trade is highly risky, less rewarding and is not an occupation that most grain traders are pushing their children to work on. That is why if well educated individuals are going to start grain trading business, it is more rational if they start in surplus food grain producing part of the region. Once they accumulate the necessary capital, experience and connection, they can easily penetrate other markets.

Even though the priority of each market, except the most serious problem of lack of finance, is different from market to market, implying single strategy can't followed in each and every market development process; lack of finance, activity of illegal traders and demand uncertainty are the three most often mentioned problems of all markets. Given the above structure, conduct and level of market development most grain traders

are observed to have low dimension of temporal and spatial arbitrage. Means traders are not efficiently arbitrating spatial and temporal price differentials. Or the market is highly inefficient. It is clear that work needs to be done on improving traders' access to finance through warehouse receipt or other institutions in all markets. However, different approaches needed to be followed in different markets, if the efficiency of the grain market is going to be improved in sustainable manner. Let's remember one shoe can not fit every feet and one medicine can not heal every sickness!

If ECX or other institution is able to provide modern warehouse service, it can easily find huge demand among traders. Additionally, the current rates fixed by ECX for storing wheat can be easily paid by most traders. This is more so, if the receipt can be used in transaction and especially to access bank credit. However work is need to be done in finding middle ground between modern grade and standards fixed (or expected to be fixed) by ECX and traditional grade and standards that are been in use now. In mean time, it is not wise to use clearing house facility and each trader's grain needs to be stored separately, as was the case for Coffee market before establishment of ECX. One final point in relation to warehouse is that proper balance between quality and storage charges need to be stroked, if there is going to be adequate demand for warehouse service.

Traders are looking for some form of improved exchange service, which does not demand long time to complete and does not demand huge cost. There is need to develop an auction market as stepping stone to ward advanced commodity exchange than pushing highly modern exchange service that can't cover its cost. This was the case in early years of Eastern and central European commodity exchanges including the most successful exchange in that area, Budapest Commodity Exchange of Hungary. Since market development is a public good, government should facilitate and subsidize the up grading process. This is so, since such low cost low service exchange may not be able to up grade themselves, in the long run. Traders are looking for exchange service that can be completed with in half to one hour, not a current practice which can take 2 to 3 days. Moreover coffee, sesame and other luxury and export commodities marketed to the domestic economy needs to be treated differently than their export counter part, if better to do traders are going to be attracted to the exchange.

In order to make sure that the informal structure is supplementing market development than being fetter of change, it is important that introduction modern warehouse service need to be integrated with provision of loan. The process need to be started in Himora and Mekelle, while other short term solutions are provided to solve storage and liquidity problems of southern markets, in general, and Maychew, in particular. Once the necessary experience is gained and ways to cut cost are developed, it needs to be extended in to southern Tigray markets. In the due process introduction of fair tax assessment, crack down on illegal traders and education on such services is fundamental. Moreover there must be a mechanism found to encourage highly educated individuals, at least at post high level, to join grain trading, if the grain markets are going to evolve to ward modern grain markets. In doing so there must be clear understanding about the role of experience and informal institutions in facilitating grain trade under highly dysfunctional market structure. In short it must be about integrating the best of both

worlds, i.e. more educated but less connected and less educated but more connected, than imposing one over the other.

For ECX service that can take up to three days, traders located in deficit market of Maychew and Mekelle, which are facing high transaction cost, which are more educated compared to most traders and are less satisfied with service provided by brokers are more probable to be willing to pay for using ECX exchange service. There are high chances that experienced traders and traders with small information network will pay less. The effect of experience and information network is found to be model specific, though. Fortunately, if ECX exchange service is facilitated to be completed in half to one hour, whatever resistance that can be expected from current structure will evaporate and most traders will be willing to use it. Additionally, dynamic traders, which are normally well connected, well capitalized and innovative, will be attracted more than others in to the exchange service of ECX. In simple words the only way to facilitate the transformation of the market is not found in one time revolution toward modern market, but in finding middle ground between current and modern structure, which can have least cost in terms of money, time and other resources. Modernization is not some thing that can be dressed like fashion cloth, when you need it. It is some thing that evolves out of complex institutional structure, when necessary conducive environment is created. This includes the development of auction centers, imposition of fair taxes, crack down on illegal traders, development of independent trade associations and development of credible, reliable and trustworthy market information system.

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Appendix
Tobit model

Table 40 Determinants of willingness to pay for using ECX exchange service which can take 3 days

Variable	Coef.	Std.	t- value	Prob.
Log of age	-1.976	1.255	-1.57	0.12
Log of average satisfaction with broker	0.027	0.083	0.33	0.746
Less than 3	0.34	0.605	0.56	0.576
Grade 7 - 8	0.285	0.581	0.49	0.626
Grade 9 -12	0.582	0.612	0.95	0.345
Post high	0.018	0.736	0.02	0.98
Alemata	-3.168	1.061	-2.99	0.004
Maychew	0.06	1.024	0.06	0.953
Mokone	-2.803	1.003	-2.8	0.007
Mekelle	0.45	1.018	0.44	0.66
Log of working capital	-2.426	1.839	-1.32	0.192
Log of experience	0.811	0.36	2.25	0.028
Log of gross network in own market	-0.169	0.364	-0.46	0.644
Log of information network in own market	-0.513	0.491	-1.04	0.301
Log of loan network in own market	0.821	0.485	1.69	0.095
Log of search cost	0.022	0.29	0.08	0.939
Log of buying cost	-0.31	1.317	-0.24	0.814
Log of maximum distance traveled	0.018	0.053	0.34	0.738
Log of loan network in distant market	-0.153	0.084	-1.81	0.075
Log of information network in distant market	0.193	0.151	1.28	0.206
Risk aversion parameter	0.256	0.381	0.67	0.504
Constant	17.362	9.346	1.86	0.068
sigma	1.495	0.142		

Table 41 Specification test for Tobit model based OPG or score test

Parameter	Probit		
	Statistics	df.	Prob.
omitted variable	61.5932	3	0
heteroskedasticity	71.6294	24	0
normality	68.929	2	0
LR	54.34	21	0