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E-commerce in oligopsonistic and relational markets – An empirical investigation of transaction costs in agricultural e-markets in India from farmers' perspective

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Abstract

Some important benefits of electronic marketplaces, especially in agriculture, include improved coordination, better and transparent price discovery, and reduced transaction costs. Agricultural markets in India have often been associated with high transaction costs and low returns to farmers. The government proposed, among different measures to overcome these challenges, creation of e-markets in agriculture. In this paper, we made an attempt to compare transaction costs incurred in marketing farm produce under non-electronic and electronic marketplace conditions in Karnataka, a state in India that pioneered reforms in agricultural marketing. To set the context of relational marketing, farmers' perception of their relation with traders was surveyed. Exploratory factor analysis using polychoric correlations revealed the prevalence of relational marketing, as a mix of economic and non-economic items seemed to dictate farmer-trader relations. Transaction cost analysis was carried out and median transaction costs in e-marketplaces were not found to be significantly lower than those in in regular marketplaces. Investigations revealed that non-participation of substantial numbers farmers in actual electronic transaction process resulted in a perception among farmers that there was no discernible change in transaction costs. Synthesizing results of transaction cost analysis under prevalent conditions of relational marketing, we discuss the challenges that could prevent e-markets in delivering their objective of transparency, better price discovery and lower transaction costs. Policy implications and suggestions are discussed.

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1. Introduction

Although electronic markets were conceptualized as early as the 1940s (Henderson, 1984 as cited in Fong, Chin, Fowler, & Swatman, 1997), it gained tremendous pace in the 1990s and further in 2000s, supported by access to internet through broadband, followed by mobile communication in the second decade of the present millennium (Adamson, 2016). E-commerce has spawned a variety of business models such as e-procurement, e-auction, third party marketplace, virtual communities, value chain integrators and so on (Timmers, 2006). It has found application in industries as diverse as automobiles to agribusiness. Though infrastructure and institutions played a decisive role, acceptance and growth of e-commerce can be traced to its impact on reducing transaction costs, particularly information and search costs; addressing issues of information asymmetry; enhancing transparency in price discovery; and changing market structures, often through disintermediation (J. Y. Bakos, 1997; Y. Bakos, 1998; Lee & Clark, 1996; Strader & Shaw, 1997). Therefore, where market structures lead to high transaction costs and information asymmetry, e-commerce could hold a key as game-changer.

Sporleder (1984) argued that agricultural markets are practically spatially disaggregated, leading to situations where "competitive sellers facing oligopsonistic buyers" tend to lose out as buyers enjoy market power due to asymmetrically held information. Electronic trading systems were identified as means to overcome these challenges, as they facilitated information exchange that could lead to arbitrage between spatially separated markets, and thus creating "an efficient centralized market" (p. 861). In 2016, the Government of India launched the electronic National Agriculture Market – eNAM – which envisaged the development of a nationally unified market for agricultural commodities. The web portal of the national agriculture market identifies lowering transaction costs and information asymmetry as the benefits of the online marketplace (Department of Agriculture Cooperation & Farmers' Welfare, n.d.). Karnataka, a state in the southern part of India, had rolled out its version of e-marketplace for agricultural commodities and effected online trade in 2014-15, under the Unified Market Platform (UMP) initiative (REMS Pvt Ltd, 2016).

E-commerce in agriculture and agribusiness has attracted academic interest and research in the past. Agricultural setting gives e-commerce an entirely different flavor due to peculiarities such as a high degree of trust, personal relationships and personal interactions that influence transactions (Leroux, Wortman, & Mathias, 2001). However, most studies of e-commerce have studied agribusiness firms (Cloete & Doens, 2008; Henderson, Dooley, & Akridge, 2004; Manouselis, Konstantas, Palavitsinis,

Costopoulou, & Sideridis, 2009; Montealegre, Thompson, & Eales, 2004), whereas it is producers – smallholder farmers – who face oligopsonistic buyer conditions in agricultural markets. If e-commerce could influence information flows, market structures and cost structures in such markets, the ramifications might be greater and even developmental in nature, particularly in developing countries. While there are several studies that estimate transaction costs in different agricultural markets (such as Hobbs, 1997; Ndoro, Mudhara, & Chimonyo, 2015), studies analyzing transaction costs in agricultural e-marketplaces in comparison to conventional marketplaces are difficult to come by. This paper attempts to empirically verify the impact of e-marketplace in agriculture on transaction costs as compared to a conventional or non-electronic marketplace. The article also gauges farmer-trader relations to evaluate the likely influence of personalized interactions and relations on adoption of e-marketplace initiatives and its perceived benefits.

This paper has been arranged along the following lines. The next section reviews literature on transaction costs in general and in the context of e-commerce, followed by a brief discussion on the conceptualization and initiation of e-marketplaces in Indian agriculture. The third section outlines the hypotheses, research design and analytical methods. Findings, their implications and limitations of the study are discussed in the fourth section, followed by concluding remarks.

2. Transaction Costs, Conventional and Electronic Marketplaces, and Agricultural Counterparts

The foundations of transaction cost economics were laid by Coase (1937), and further reinforced by Williamson (1989). When transactions are taken as a unit of analysis, economizing transactions becomes pivot of organizational activities. North and Wallis (1994) described transaction costs as "the costs of land, labour, capital, and entrepreneurial skill required to transfer property rights from one person to another" (p. 612), which well fits the phenomenon of economic exchange taking place between buyers and sellers. Dahlman (1979) elaborated the components of transaction costs as costs of searching or finding information, costs of bargaining or decision making, and costs of policing or enforcing the transaction. Transaction cost analysis deals with comparing "costs of planning, adapting and monitoring task completion under alternative governance structures" (Williamson, 1989, p. 141). In this paper, the two alternative governance structures refer to market transactions between sellers and buyers in physical, off-line or conventional conditions and electronic or online conditions.

Studies comparing transaction costs in physical markets or marketplaces with electronic marketplaces have often been emphatic that the electronic medium has had a lowering effect on transaction costs. Lee and Clark (1996) studied the impact of electronic brokerages and electronic auctions on

transaction costs and found that while electronic brokerages helped lower search costs, electronic auctions helped lower price discovery as well. Similarly, web auctions were found to bring down entry barriers for auctioneers, sellers and customers, lowered transaction fees and commissions, greater transparency in trading and product information (Klein & O'Keefe, 1999). Other empirical studies also supported such findings. Garicano and Kaplan (2001) analyzed costs of business processes, marketplace benefits (cost of searching and matching buyers and sellers), and adverse selection costs in the context of used car auction market. The study indicated that Internet-based auctions lowered business process costs and gave higher marketplace benefits, even as there was no evidence to suggest increased cost of adverse selection due to Internet auctions, which was anticipated since buyers would not be able to see the cars physically. Benslimane, Plaisent and Bernard (2007) found that online procurement led to reduction in search costs, as corporate buyers could identify potential suppliers easily and fast due to the communication and brokerage effects of the electronic medium. A greater effect of electronic interventions in economic exchange was predicted as shift towards markets than hierarchies (Malone, Yates, & Benjamin, 1987). Elucidating the concepts of markets and hierarchies, Malone et al., (1987) established that high costs of collecting information, negotiating exchange contracts and opportunistic behavior of trading partners encourage hierarchies. On the other hand, by bringing down the costs of gathering and transmitting information, besides efficiencies created due to electronic brokerage and electronic integration electronic commerce helps participants deal more efficiently in markets. Thus, e-commerce can also potentially alter market structures.

Agricultural markets, particularly in developing countries, are characterized by a large number of small buyers and sellers, who effect economic exchange of agricultural commodities through negotiated pricing arrangements, and in the absence of formal contracts, social networks are employed for enforcing informal contracts (Fafchamps, 2004 as cited in Barrett & Mutambatsere, 2008). High transaction costs and information asymmetries are commonplace when mechanism of contract enforcement are not robust (Fafchamps, 2004). Gomez et al., (2011) argued the necessity to lower costs of marketing and intermediation so that producers profit even as food costs are economized for consumers. Similar considerations seem to have influenced policymakers in India when reforms in agricultural marketing were introduced first in 2003, through the proposed Model APMC Act (Chand, 2012). Reforms were necessitated in the sector for several reasons including qualitative and quantitative changes in agricultural production, little value-addition at the farm level (Acharya, 2006), a large number of intermediaries in the supply chain leading to inefficiencies, high cost to consumers and poor returns to producers (Chand, 2012), rampant information asymmetry (Vadivelu & Kiran, 2013), and so on. One of the various reforms measures suggested was creation of

e-markets or connecting the thousands of disparate, small agricultural marketplaces electronically to create a nation-wide common market. Although some initiatives about incorporating certain elements of e-commerce were tried sporadically, they were mostly pilot studies. A large-scale initiative was launched in 2016, when the Government of India started the electronic national agriculture market (eNAM), which envisaged electronically connecting the wholesale markets for agricultural commodities, called "Agricultural Produce Market Committee (APMC) *mandis"* to create a pan-Indian common market. Some of the intended objectives of these initiatives were to reduce information asymmetry and transaction costs. The eNAM, as mentioned on its website, described its intent by stating that a nation-wide electronic market "promotes uniformity, streamlining of procedures across the integrated markets, removes information asymmetry between buyers and sellers and promotes real time price discovery, based on actual demand and supply, promotes transparency in auction process, and access to a nationwide market for the farmer, with prices commensurate with quality of his produce and online payment and availability of better quality produce and at more reasonable prices to the consumer" (Department of Agriculture Cooperation & Farmers' Welfare, n.d.). A similar project was started in 2014 by the Government of Karnataka, a state in south India, under the "Unified Market Platform" (UMP) initiative. By May 2016, nearly 105 APMC *mandis* were integrated electronically under UMP. Thus, UMP initiative of Karnataka provided a good example to conduct an analysis on transaction costs these e-markets. Broadly, e-*mandis* were supposed to operate along the following lines. When a farmer arrived at the marketplace – the APMC *mandi* – to sell a farm commodity, the produce would be given a lot number, tested for certain specified quality parameters, after which it could be put up for sale. The lot number would be displayed on computer terminals in an online trading screen, and details of quality could be ascertained from the lot number by the buyer. An auction would then be initiated and buyers from different locations would bid for the produce. The highest bidder would get the title to the produce. The buyer would then transfer the funds electronically to the APMC, which would then transfer the amount electronically to the farmer's account, thus concluding the exchange process. The buyer would have to appoint a person at the marketplace to physical take possession of the goods. In a physical *mandi*, the farmer would take his produce to a commission agent, who would canvass among traders to bring them to bid for the produce. Open call auctions would be conducted, after traders made a visual observation of the quality of produce. The highest bidder would then pay the price to the commission agent, who passes on the amount to the farmer. Quite often, the commission agent and the trader would be the same entity, operating under two different firm names.

Based on the above discussion, we assume that farmers would face lower transaction costs due to shorter auction time and prompt payment after the sale in an electronic medium. Further, online

auction was expected to widen the buyer universe; accordingly buyer search costs would also be low. Thus we framed the following hypothesis:

> $H1_0$: Median transaction costs incurred in marketing of farm produce in an electronic marketplace are equal to or greater than in a non-electronic or physical marketplace.
> $H1_a$: Median transaction costs incurred in marketing of farm produce in an electronic marketplace are lower than those in a non-electronic or physical marketplace.

However, there is also a possibility of the transaction costs to rise due to quality testing procedures, which we assume might be offset by better price for the commodity as a result of participation of a larger number of buyers in the online format. In other words, the efficiency of marketing process could be higher. Different methods of estimating marketing efficiency in agriculture exist, and we adopted Shepherd's method since marketing costs in this method were similar to transaction costs (Acharya & Agarwal, 2011). Building on this argument, we hypothesize as below:

> $H2_0$: Marketing efficiency in electronic agricultural marketplace is equal to or lower than in a physical marketplace
> $H2_a$: Marketing efficiency in electronic agricultural marketplace is higher than in a physical marketplace.

Even as the above hypotheses are framed, it is important to remember that unlike other B2B e-marketplaces, the agricultural marketplace is unique. Agricultural markets, especially in countries such as India, are characterized by interlocked labor, land lease, input or credit markets. Relations of farmers with traders may extend beyond the commercial aspect with traditional networks, neighbourhood effects, and kinship influencing market transactions (Subramanian & Qaim, 2011). Credit (Pradhan, 2013) and price information (Mittal, Gandhi, & Tripathi, 2010) may also decide why farmers sell to particular traders. Traders often draw bargaining power by virtue of possessing greater market information, even as a large number of farmers deal with a relatively much smaller number of traders in the marketplace (Sporleder, 1984). Hence, it is important to understand farmer-trader relations as a contextual backdrop in which the e-marketplace unfolds. However, unavailability of common instances of e-markets for farmers renders it difficult to hypothesize the impact of electronic intervention on oligopsonistic markets.

3. Data and Methods

The research objective was to understand transaction costs from the perspective of a producer under conditions of a traditional APMC *mandi* system and an electronic APMC, to verify if there is any reduction in transaction costs or increase in marketing efficiency in the e-marketplace vis-à-vis its non-electronic counterpart. After an initial round of exploratory study, a survey was conducted in August 2016. Ranebennur APMC (e-marketplace) had been functioning online since November 2014, and hence it was assumed that most farmers must have experienced the electronic platform. Raichur APMC for cotton had been functioning in its conventional, non-electronic format. Thus, Raichur was identified as the non-electronic marketplace and Ranebennur as the electronic one. The major commodity traded in these two *mandis* was cotton. Based on inputs gathered from the market officials and knowledgeable farmers, cotton-growing villages were identified within a distance of 30 km from the *mandi*. A little over 100 farmers were chosen at random in the identified villages as respondents. Questionnaires were administered by trained investigators. Responses were elicited for farmer-trader relations and transaction cost components. The relations part has been discussed first to describe the market structure that forms the background, and then transaction costs are analyzed.

3.1 Oligopsonistic agricultural market – farmer-trader relations

Questions related to farmer-trader relations were drawn from a literature on prior literature on the topic, besides studies on dependence in marketing channels. Early research on dependence in marketing channels of manufactured goods identified factors such as channel member's sales and profits due to a manufacturer or supplier, trust, commitment, role performance of channel member and so on (Frazier, Gill, & Kale, 1989; Geyskens, Steenkamp, Scheer, & Kumar, 1996). More specific to the present context, farmer-trader relations were found to be influenced by moral norms (Lyon & Porter, 2009), social elements such as kinship, reciprocity, neighbourhood effect (Subramanian & Qaim, 2011), exclusivity or partnership (Hingley & Lindgreen, 2002), besides credit, price and market information as discussed previously. Drawing from prior research and insights gathered during the exploratory survey, we identified major determinants of farmer-trader relations as trust, commitment, informational and marketing support services provided by traders, credit, kinship and reciprocity. These determinants were operationalized and measurement variables developed based on earlier studies, with suitable modification to suit the context of this research. The relationship determinants and the variables have been presented in Table 1.

Table 1

Determinants of Dependence and Measurement Variables

Relationship determinants		Measurement variables
Information services		Trader provides information of current and future prices Provides information on market requirements Provides information on crop cultivation / technology
Marketing support		Facilitates sorting / grading Provides packing material if and when required Arranges for transport when asked
Credit		Provides credit for agricultural purposes Provides credit for personal use Interest rates lower than other informal sources Does not ask for collateral / pledge Lends money in emergency situations
Kinship	Ethnicity Communal / caste preferences	Belongs to same village / region Belongs to same caste / community
Reciprocity	Political influence Assistance with government work	A member of local elected body such as panchayat Helps in accessing government schemes Helps with documentation for governmental and other works
Trust	Honesty	Does not cheat with quality assessment of produce Does not cheat with weighment Makes prompt payment Does not cheat on subsequent payments
	Benevolence	Helps to get best possible price Feels that the farmer and his family should prosper
Commitment		Wants to maintain relationship for mutual benefit in future

Responses of around 200 farmers were recorded in five, three and two-point Likert scale against the variables to rate assessment of their relation with traders. Inferential statistics of the responses have been presented in Table 2. Data revealed that farmers largely obtained information on prices and current market trends from traders, and believed that the trader helped them to get best possible prices. They also felt that traders cared for the farmer's family and wanted to have long-term association with the farmer for mutual benefit. Credit turned out to be an important factor, with majority farmers saying that they had availed loans for personal use as well as for cultivation, and traders had also obliged with credit under situations of urgency. Although loans were never provided without collateral, which in most cases implicitly meant that farmers would sell their produce to the same trader, there was also an opinion that the trader charged a lower rate of interest than the moneylender. Parameters related to kinship or reciprocity did not play a major role.

Table 2

Farmers' response to their perception of relations with traders

Variable	Never / No / Strongly Disagree	Disagree	Indifferent	Sometimes / Agree	Always / Yes / Strongly Agree
Trader provides reliable price information	0	0	41	136	24
Provides information on market requirements	0	10	65	94	32
Information on cropping and marketing technology	21	75	78	26	1
Information on future market trends	11	60	76	50	4
Provides packing material	48	53	14	72	14
Arranges for transport	77	76	30	18	0
Provides grading/sorting facility	76	103	9	13	0
Does not cheat on quality estimation	8	38	88	67	0
Does not cheat on weighment	2	19	81	82	17
Makes prompt payment	0	93	108	0	0
Does not cheat on subsequent payments	58	134	9	0	0
Helps to get best possible price	2	2	30	128	39
Feels farmer and his family should prosper	0	0	73	96	32
Wants to maintain long term relationship for mutual benefit	0	2	42	134	23
Provides loans for agriculture	2	0	0	41	158
Loans for personal purpose	19	0	0	113	69
Loans at lower interest rates	68	0	0	108	25
Loan without collateral	128	0	0	59	14
Loan in case of emergency	18	0	0	71	112
Helps avail govt. schemes	156	0	0	43	2
Helps with govt. documentation	182	0	0	18	1
Helps with political influence	192	0	0	8	1
Member of local elected body	198	0	0	0	3
Belongs to same village	140	0	0	0	61
Belongs to same community/caste	182	0	0	0	19

To analyze interplay among the variables, an exploratory factor analysis (EFA), based on polychoric correlations, was conducted. Such analysis has been found to provide better fit with the theoretical models than those using Pearson correlation, and measurement models for EFA were found to be more robust using polychoric correlation (Holgado-Tello, Chacón-Moscoso, Barbero-García, & Vila-Abad, 2009). Kaiser Meyer Olkin (KMO) value of 0.602 indicated "mediocre" common variance among the variables, which meant that it was "fair" for factoring (Comrey & Lee, 1992, as cited in Henson & Roberts, 2006). Chi-square value of 850.6, df=300 and p-value of 0.000 (less than p=0.05) implied compliance with assumption of equal variances across the sample. Thus, the sample was suitable for EFA. Varimax rotated three-factor loaded EFA output has been presented in Table 3. As

anticipated, variables for different constructs used previously did show an intermingling, leading to identification of three factors, which were labelled "concern for well-being", "sense of reliability", and commercial support and facilitation".

Table 3

Factor Analysis Output: 3-factor Loadings

S. No.	Variable	Factor 1	Factor 2	Factor 3
1	Trader provides reliable price information	0.468	0.369	
2	Provides information on market requirements	0.364		
3	Information on cropping and marketing technology			
4	Information on future market trends	0.323		
5	Provides packing material			0.423
6	Arranges for transport			0.441
7	Provides grading/sorting facility			
8	Does not cheat on quality estimation			
9	Does not cheat on weighment			
10	Makes prompt payment		0.597	
11	Does not cheat on subsequent payments			0.392
12	Helps to get best possible price	0.426		
13	Feels farmer and his family should prosper	0.591		-0.413
14	Wants to maintain long term relationship for mutual benefit	0.769		
15	Provides loans for agriculture	0.401		0.442
16	Loans for personal purpose	0.537		
17	Loans at lower interest rates			0.570
18	Loan without collateral			
19	Loan in case of emergency			
20	Helps avail govt. schemes			
21	Helps with govt. documentation			0.347
22	Helps with political influence			
23	Member of local elected body		0.825	
24	Belongs to same village		0.634	
25	Belongs to same community/caste		0.706	
Percentage of total variance		14.1	15.5	11.1

"Concern for well-being" shows a mix of variables that influence dependence of farmer on the trader for credit, market information, commitment and benevolence. This reinforces arguments of information asymmetry with traders by Sporleder (1984), and elements of trust and benevolence seen in members of marketing channels. Thus, the agricultural marketplace is characterized by a "transaction plus" association between farmers and traders, unlike several other markets. In the next sub-section, we analyze the transaction costs in a regular and electronic agricultural marketplace against this background.

3.2 Transaction Cost Analysis

Hobbs' (1997) paper on transaction costs in cattle marketing had operationalized transaction costs into information, negotiation, and monitoring costs. Information or search costs were those incurred before the transaction, and included costs to find information about product, price and trading partner. Costs involved during the actual transaction were included as negotiation costs. Monitoring costs were those incurred after the transaction, and included those involving enforcement of the terms of transaction. Several studies in the wider domain of agriculture adopted Hobbs' method of analyzing components of transaction costs (for instance, Gong, Parton, Zhou, & Cox, 2006; Ndoro et al., 2015). Whereas Hobbs considered economic and financial costs along with perceptual inputs in the context of vertical integration, our study has only considered economic and financial costs incurred in marketing of agricultural produce. Search costs included time spent on finding price and buyer information. It was found during the exploratory phase, that farmers obtained price information informally from other farmers, by making phone calls to traders. As such costs were minuscule, they were dropped from analysis. Buyer search cost included time spent in meeting buyers, and the commission agent's charges, since the commission agent would canvass among traders on behalf of the farmer. Negotiation costs covered all expenses in packing, transporting, handling, quality assessment, weighing, wastage and time taken for the auction process. Monitoring costs covered the cost of time gap between auction process and payment, interest cost of unpaid amount if partial payment was made, and post-sale quality mark-downs. These cost components have been summarized in Table 4.

Table 4

Classification and Measurement of Transaction Cost Components

Type of transaction cost	Operationalization	Measurement variable
Information search	Buyer information	Time spent in meeting buyers at APMC Commission agent's charges
Negotiation costs	Packing cost	Cost incurred for bags / sacks / packing material
		Wages paid for sorting and packing
	Loading costs	Wages for loading
	Transportation costs	Cost incurred for transporting
	Unloading costs	Wages paid for unloading
	Primary processing costs at APMC	Costs incurred on cleaning / grading
	Assaying costs	Expenses on scientific quality tests
	Weighing costs	Weighing cost at APMC
	Wastage	Standard deduction adopted at APMC
	Transaction time	Time taken for auction
Monitoring costs	Time gap between auction and receipt of payment	Opportunity cost of the time gap

	In case of partial payment, cost of balance payment	Interest cost of unpaid amount
	Post-sale quality mark downs	Cost of quality or quantity deductions after sale

We hypothesized that median transaction costs in e-*mandi* would be lower than those in a regular one. Median transaction costs of a regular *mandi* were compared with those in an e-*mandi* using Wilcoxon-Mann-Whitney test. Wilcoxon W of 11545 was obtained which was higher than critical value of 10302, and hence the null hypothesis could not be rejected. The test was conducted at 95% confidence interval. Marketing efficiency was calculated for the two marketplaces using Shepherd's method and it was hypothesized that marketing efficiency in case of e-*mandi* would be higher. Marketing efficiency, according to Shepherd's method, is the ratio of price received to the marketing cost. Median efficiency values were compared using Wilcoxon-Mann-Whitney test, and Wilcoxon's W of 10302 from the sample was higher than 9613, the critical value. As such, the null hypothesis could not be rejected. Thus, we inferred that transaction costs were not significantly lower in the e-*mandi* and marketing efficiency in the e-*mandi* was not significantly higher than the regular mandi. Findings, including the median values, observed Wilcoxon values, and critical values at 95% level of confidence have been presented in Table 5.

Table 5

Median Transaction Cost and Marketing Efficiency Values

	Regular *mandi*	e-*mandi*	Statistical significance (95% CI)
Median Transaction Cost (Rs./quintal)	247.55	279.18	Not significant
Marketing efficiency (Median value)	18.312	15.644	Not significant

4. Discussion, Implications and Limitations

We first set out to understand the context of farmer-trader relations, as perceived by farmers. We found that variables related to credit for agricultural and personal purposes, crop output as collateral, and a sense of commitment and benevolence was what the farmer perceived as influencing his relation with traders. An exploratory factor analysis of the variables indicated an overlap between variables belonging to previously defined constructs, and as such farmers seemed to enjoy a "commerce plus" relationship with trader. The new dominant factor the emerged, was labelled "concern for well-being", which was a mix of economic and social aspects. We then assessed the implications of e-marketplace on transaction costs, and against our hypothesis, did not find any

reduction in transaction costs or gain in marketing efficiency in the e-marketplace compared to the regular marketplace.

We identified a few plausible reasons for such contrarian findings in the transaction costs. Where it is necessary for an e-market for agricultural commodities to have supporting infrastructure for quality testing and certification as enablers, unavailability of such infrastructure reduced the e-market at best to an e-auction platform. We were expecting such processes to lead to rise in costs, but also participation of buyers across geographies, leading to better prices, and hence greater marketing efficiency. However, that did not seem to happen. E-auctions were expected to lower search costs and cost of price discovery. However, since farmers did not participate in the actual auction process, they could not perceive reduction in time taken for online auction, nor the scope of expanding market boundary beyond the *mandi*. Further, settlement of trade was also offline. Hence, no substantial effect of the electronic initiative was not discernible. Additionally, it was found that packing and transportation were the major cost components, which were outside the purview of electronic intervention. This is another major reason for the transaction costs in e-marketplaces for not being significantly lower than in the regular marketplace. It would be worthwhile to add a caveat that reduction in transaction costs in this case is from the producers' perspective; therefore generalizing this to the system as a whole would be improper.

Reliance of farmer on the trader becomes very evident in the above case. Most of the farmers sold to the same trader year after year. In the entire survey, we found only one farmer who had sold to a different trader. When findings of transaction costs are observed against farmer-trader relations as observed above, it raises questions on how far the e-marketplace might help in lowering transaction costs for farmers. Dependence of farmers on traders was linked to credit and output markets, but were also underlined by mutual goodwill and personal ties. Dependency, trust, commitment and exclusivity of relation between buyers are sellers are important aspects of relational marketing, and have been observed between suppliers and buyers of farm products in other studies (Hingley & Lindgreen, 2002). Our findings seem to corroborate such arguments. And if relational marketing defines farmer-trader relations, expecting farmers to sell online, by-passing the trader, might be a distant reality.

These findings could have an impact on reforms being pursued in the Indian agricultural marketing system. One of the critical factors in the success of e-marketplaces is the presence of active sellers and buyers. Motivation for buyers and sellers to participate in e-marketplaces can be quite different, despite a few overlapping factors (Rask & Kragh, 2004). There could be drivers of participation that may be internal or external to the buying or selling entity, and decision of participation could be

planned or a reaction to situations. In the context under study, we found that from the traders' end, participation in e-markets is mostly a reaction to the reform measure being implemented. Resistance of traders to transparency in trade processes, especially in oligopsonistic markets, is understandable. However, electronic integration of *mandis* has the potential to alter market structure, expand scope of marketplace beyond physical boundary of the *mandi*, and lead to better prices for farmers. Hence, it is important to ensure that farmers become drivers of the selling activity. Creation of awareness among farmers about e-markets and making available supporting infrastructure is one of the necessary conditions for e-markets to succeed. While transaction costs might be lowered systemically in e-markets, it may not be the appropriate parameter to focus on while selling the concept to farmers. Producers might value "visible" changes such as standardized and mechanized quality testing and certification processes than economic reduction in buyer search costs. Communication messages may be developed accordingly.

Our study faced limitations imposed due to sample size, self-reported nature of data, cross-sectional nature of the study, and challenges in identifying transaction cost components. Complexity of transaction cost components can be gauged from the study by Chintagunta, Chu and Cebollada (2012) which investigated the subject in case of online versus offline grocery stores. Although our sample size could be considered too small for developing constructs, the Minitab output indicates adequacy and meets other necessities of an exploratory factor analysis. Given the tremendous customization that occurs at the grassroots, generalizing studies in agricultural marketing becomes difficult. This study provides a base and direction for future research at greater depth on transaction cost analysis and analyzing farmer-trader relations in agricultural commodity markets. Longitudinal studies might be more conducive to assess gains in prices for farm produce due to adoption of digital technology in markets.

5. Conclusion

Electronic commerce and electronic markets bring in several advantages, especially in reducing search costs for geographically dispersed sellers and buyers, transparency of trade and market information, and better price discovery. Agricultural e-markets were especially theorized to be amenable to improvements by influencing price discovery, market information and market structure. E-markets for agriculture were being piloted and scaled up to achieve these benefits. However, agricultural markets are characterized by peculiarities of interlocked markets of output, credit and laobur, which could moderate the effect of e-markets. In this research, we studied the effect on transaction costs due to electronic integration of *mandis* against the background of farmer-trader relations. Findings indicated that farmers did not perceive any statistically significant reduction in

transaction costs or improvement in marketing efficiency in e-*mandis* compared to regular *mandis*. Farmers' reliance on traders, and perception of commitment, trust and benevolence overlapped interlocked credit and output markets, indicative of some form of relational marketing. However, these findings do not negate potential systemic reduction of transaction costs and transparency due to e-auctions. To encourage farmer participation in e-markets, it is essential to highlight advantages that might be more perceptible to farmers than reduction in economic costs. Given the vast geographical expanse of India, and the scope of operations involved in developing a full-fledged e-market for agricultural commodities, this research presents findings at a very early stage of implementation. Hence the findings may be construed more exploratory and prescriptive of future course of action than a conclusive assessment of efficacy of e-markets in agriculture.

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