Bargaining Problem of Small Farmer and Large Trader and the Model of Vertical Restraints in Indian Agriculture

Dr. Dipankar Das
Assistant Professor
Symbiosis School of Economics, Faculty of Humanities and Social Sciences
Symbiosis International University

ABSTRACT
The present study is in the context of the new Model Agricultural Produce Market Committee (APMC) Act 2003, which aims at freedom of farmers to sell their products to the large private firms and bringing reforms in the wholesale Cash and Carry and retail markets in India. The most important suggestions have remarked in the Economic survey 2014-15 and outlined that state governments should be specially persuaded by the central government to provide policy support for alternative or special markets in the large private sector. Many states, including West Bengal, accepted the proposal and have opened the market of agricultural commodities for the large private sector. In this paper we study a model of vertical restraints in the case of India considering multilayer of fixed costs and monopoly power of the small as well as large traders in the vertical structure. We are also interested to find the conditions of small farmer's gain and possible strategy impacts in the cost of cultivation and consumer expenditure.

Here we first study the bargaining problem between small farmers and large traders. It has been shown that, the small farmers or the producers tended to reject large traders (LT) including retailers and wholesalers as new bulk buyers. Thereafter, we consider a model of vertical restraints where downstream firms (viz. Retail traders, Cash and Carry traders) purchase agricultural food products from the consolidators, where the consolidator buys their saleable commodities from the small farmers. We explain how the presence of the LT is affecting the wholesale market prices and retail prices. Thus we can easily understand the competition between the small and large retailers in agricultural food commodities retail market in India. Moreover, we study a model of vertical restraints in the case of India considering multilayer of fixed costs and monopoly power of the small as well as large traders in the vertical structure. We are also interested to find the conditions of small farmer's gain and possible strategy impacts in the cost of cultivation and consumer expenditure.

Key words: BARGAINING PROBLEM, BUYER MARKET POWER, VERTICAL COMPETITION, AGRICULTURAL MARKET, SMALL FARMERS, LARGE CAPITAL TRADERS, CONSOLIDATORS, PRICE BEHAVIOUR, NON-LINEAR PRICING STRATEGIES.

1. INTRODUCTION
In this paper we study a model of vertical restraints in the case of India considering multilayer of fixed costs and monopoly power of the small (i.e. intermediaries) as well as large traders in the vertical structure. We are also interested to find the conditions of small farmer's gain and possible strategy impacts in the cost of cultivation and consumer expenditure.

Here we consider two types of fixed costs, viz. transportation cost and grading cost. Grading cost (using Labour) in the collection centre, managerial efficiency in the production process, Training and fixed cost to certify as quality. Transportation cost needs to incur to carry to the local wholesale market and to the large traders. Here fixed transportation cost imposes two times, one by the small competitive sub consolidators two, consolidator. Grading cost imposes three times, one by the small competitive sub consolidators two, consolidator and the large traders in their collection centre.
Here we consider transportation cost that needs to incur to carry from small farmers to the large trader’s collection centre. We ignore the transportation cost to carry from the collection centre to the retail market and the wholesale market to the retail market.

If small competitive farmers would able to bear grading costs then it would be variable. On the other hand when traders bear these costs then it is fixed. We show this with the help of complete the vertical model below.

The term “buyer market power” denotes here the ability to lower the wholesale prices. Here, we consider a good example of vertical competition where, downstream firms (viz. Retailers, Cash and Carry traders) purchase agricultural food products from the consolidators\(^1\)(i.e., small traders) and the consolidators buy their saleable commodities from the small farmers.Chambolle and Villas-Boas(2007) find that retailers may choose to offer products differentiated in quality to consumers, not to relax downstream competition, but to improve their buyer power in the negotiation with their supplier.

In relation to buyer market power the present study is in the context of the new “Model Agricultural Produce Market Committee (APMC) Act, 2003” that aims at freedom of farmers to sell their products to the large private firms. Moreover, we also consider the reforms in the wholesale Cash and Carry and retail markets in India. The regulations of hundred per cent Foreign Direct Investments (FDI) in Cash and Carry markets have been enforced in 2006 with an automatic route and FDI in the single-brand retail market in 2012. In India, large retail traders as well as cash and carry (wholesaler) traders are either involved in single or multi brand trade. These traders exist in organized as well as unorganized sectors.

Organized retailing, in India, refers to trading activities undertaken by licensed retailers. This means retailers register for sales tax and income tax. These include the publicly traded supermarkets, corporate-backed hypermarkets and retail chains, and also the privately owned large retail businesses.

On the other hand, unorganized retail traders are the small retail traders involve in conventional format of low cost retailing. These include the local corner shops, owner operated general store, convenience stores, handcart and pavement vendors, geographically gathered small competitive retail shops etc.

Single-brand retail implies a retail store selling goods under a single brand name. At single brand retail outlet, products are selling under the same brand internationally. Single-brand products include only those identified during manufacturing. Any additional product categories to be sold under single-brand retail must first receive additional government approval. Multi-brand retail refers to selling multi-brands under one roof.

Here we denote organized single and multi-brand retailers and cash and carry wholesale traders as “Large Traders” (i.e.LT)

A report by Global AgriSystems of fruits and vegetables supply chain in four metros in India-Delhi, Mumbai, Bangalore and Kolkata shows that there are at least five to six intermediaries operating between primary producer and consumer. The intermediaries are, Primary producers, transportation cost, village level trader, aggregator, sub wholesaler, retailer. The study shows that, the total margin by all these intermediaries are, retailers-25 per cent, sub wholesaler-6 per cent, wholesaler-10 per cent, aggregator-8 per cent, village level trader-10 percent, transportation cost-10 percent and primary producer or grower-25 per cent respectively. The

\(^1\)Consolidator includes the small traders or intermediaries predominantly present in the rural wholesale market in India. The intermediaries are, transportation cost, village level trader, aggregator, sub wholesaler, retailer. These small traders are now acting as an aggregator or consolidator and collect high quality products from the small farmers and sell to the newly arrived large traders. These small traders actually participate in the rural wholesale markets. In presence of the large traders they are now acting as a consolidator and also participate in the rural wholesale market. Due to the problem of collection from the small farmers they have been used by the large traders. Therefore, now in the rural wholesale market we have three types of agents; one, small traders who deal with the average quality products and act as a wholesaler, two, large traders who collect only high quality products and act as a wholesaler and three, consolidator, who participates both in the rural wholesale markets and deals with the average quality products, also collects high quality products from the farmers and sells to the large traders.
study shows that a primary producer gets only 20 per cent to 25 per cent of the consumer price\(^2\). These intermediaries are the examples of “Small Traders” (ST) in the rural wholesale market. A section of these “Small Traders” are acting as consolidators.

Here, we first study the bargaining problem between small farmers and large traders. We first show that the small farmers tended to reject large traders as new bulk buyers. We also provide two field cases to explain the issue empirically. The LT depends along the ST (together with small intermediaries and wholesalers) to buy the high quality agricultural food products.

Here, we explain an actual vertical model used by the LT to collect the agricultural food products in India. We explain in particular, that how the LT is collecting agricultural food products. Moreover, we try to resolve the question whether it is possible to collect agricultural food products at lower prices or not. We also explain how the collection of high quality products is affecting the retail prices set by the LT. Thus we can easily be able to understand the competition between the small and large retailers in agricultural food commodities retail market in India.

2.INTERACTION BETWEEN SMALL FARMERS AND LARGE TRADERS

To understand the interaction between small farmers and the large traders, first it is required to understand the preferences of the LT and the ST. The LT always tries to maintain collecting high quality products from the farmer and pays a higher price for that. On the other hand, the ST does not maintain any such quality constraints in the rural wholesale markets. Hence, we assume that the LT is more risk taker than the ST is, as LT is able to determine the qualitative and technological constraints in the time of purchase from the small farmers.

We need to understand the original lineages of the need for the quality attributes. The components which influence the qualities are: - (i) a farm-to-retail marketing margin. This is the difference between the implicit values of an agricultural commodity when sold at the retail level in processed form versus the explicit value of the unprocessed commodity at the farm level. Actually the degree of product differentiation is a determination of the size of the marketing margin. The idea is that a processed firm or LT that sell a more differentiated product will have more market power and so will enjoy a higher marketing margin. (Azzam, 1999; Dixit and Stiglitz, 1977; Keller, 1976; Tomek and Robinson, 2003; and Wohleganant, 1999, 2001). (ii) “The Agreement on the Application of Sanitary and Phytosanitary Measures” also known as the “SPS Agreement”, and “Traceability” in an international treaty of the “World Trade Organization”. (iii) The US-India knowledge initiative on agriculture education, research, services and commercial linkages (KIA) and after the three-year “Work Plan” of the KIA ended in 2009 the US-India engagement now goes by the name of “Agriculture Dialogue”. Both in terms of their motives as well as their design, the KIA and the “Agriculture Dialogue” threaten to undermine Indian food security and national sovereignty. It has been proposed to train Indians in the drafting of contracts, and even suggested that Indian cultivators on a contract would need to shift to crops that were suitable for processing (Sridhar, 2014). The food quality and Sanitary and Phytosanitary (SPS) requirements can impede trade, particularly in the case of developing countries (Henson and Loader, 2001). It is widely acknowledged that the SPS measures can act to impede trade in agricultural and food products (Digges, et al., 1997; Hillman, 1997; Jaffee, 1999; National Research Council, 1995; Ndayisenga & Kinsey, 1994; Petrey & Johnson, 1993; Sykes, A.O., 1995; Thilmany & Barrett, 1997; Unnevehr, 1999). The food safety issues are gradually becoming more important in international trade (WHO, 1998). The fresh products are shipped and consumed in the fresh form. Therefore, handling at all points of the food chain can influence food safety and quality (Zepp et al., 1998). These fresh commodities are subject to increasing scrutiny and regulation in Developed countries (DCs) as food safety hazards are best understood and most often traced to their sources. Unnevehr (2000) explains how SPS agreement and traceability conditions are creating a barrier.

\(^2\) A study by global AgriSystems of fruits and vegetables supply chains in four metros-Delhi, Mumbai, Bangalore and Kolkata, published at the newspaper, The Times of India, Kolkata under the article named “Direct sourcing thrives in Bengal”, dated, Wednesday, September 11, 2013.
of fresh agricultural food products export from the LDCs to the DCs. Now food safety regulations, labelling requirements, and quality, compositional standards play the important role besides tariff and non-tariff restrictions. Traceability could also reassure food quality and safety and at the same time be used as a tool to control the production process (Chryssochoidis et al., 2006). According to Chryssochoidis et al. (2006), Bernues et al., (2003) and Hobbs et al..(2005), the quality of a product cannot be guaranteed through traceability, but when bundled with such quality guarantees then it seems to add more value. There are relevant literatures on some important discussion papers of the Department of Industrial Policy and Promotion, Government of India (DIPP) and others on FDI in retail (Shelthi Research Group, 2008). The challenges faced by the small-scale producers engaged in “High Value Agricultural Crops” are the evaluation of supermarkets and retailers as the major buying force, as a result side-lining small-scale producers and traders (Temu and Temu, 2005). The participation of small producers in global fruit and vegetable trade is also affected by the increasing attention that food quality and safety are receiving in food trade. Weinberger and Lumpkin(2005) find that “Traceability”, “Phytosanitary”, infrastructure and productivity issues will continue to be a barrier for participation in the fruit and vegetable trade for most of the developing world.Wahida et al. (2013) find in a study in Indonesia that for all High Value Agricultural (HVA) Products, almost fifty percent of consumers are willing to pay at least 10 per cent more for organic products. Gulati et al. (2005) explain in their paper “Growth in high-value agriculture in Asia and the emergence of vertical links with farmers” that changes in income and consumption patterns along with urbanization affect the consumption of food consumption. The change of food preference towards HVA is related to the greater variety of food available and perhaps the higher opportunity cost of time for the household members. In practice, supermarkets rarely buy directly from small farmers, with or without contracts, but rather procure goods through commissioned agents or assemblers. Thus, modern retail chains have started relying on the consolidator. This new form of vertical linkages, especially in Southeast Asia is allowing small holders to participate in the supply chain. The notion of labour wage bargaining problem and theory of individual risk attitude in the market have been used to understand interaction between small farmer and large trader related to agricultural commodity. Pal and Rathore; (2014), estimate workers’ bargaining power and firms’ mark-up simultaneously using a comprehensive panel data on Indian manufacturing industries for the period of 1981-2007.Avinash K. Dixit, (2009); Arrow, (1970);Macho-Stadler et al., (1995);Nash, (1950a);Osborne and Rubinstein, (2005) have worked in the field of bargaining and markets, economics of risk and information and the related fields. We have taken notions from them. We explain the interaction mainly with the help of Nash bargaining theory.

2.1.1 BARGAINING PROBLEM IN BETWEEN SMALL FARMERS AND LARGE TRADERS
Let three representative agents be there in the market which can be identified as N= (123). Here player 1 is the “Large Traders” (LT), player 2 is the “Small Farmers” (F) and player 3 is the “Small Traders’ (ST). Here, we set, ρ = the relative bargaining power of the farmer, e = the relative bargaining power of ST & ω = the relative bargaining power of LT. When just the farmer (F) and ST are in the market, then ρ + (1−ρ) = 1, where, (1−ρ) = ε. Here μ (where, 0 ≤ μ ≤ 1) and (1−μ) denote the portion of high quality products and portion of low quality products respectively. The variable λ is the actual portion of μ which the LT is ready to buy. This means λμ portion is the actual demand out of the total product 1 at price PLT per unit of high quality products. The variable π is the probability that the rest 1−λμ portion (i.e. after selling λμ proportion to the LT out of total product 1) will be sold at the prevailing price W in the rural wholesale market. T(1−λμ) is the further constant transportation cost needs to incur to sell rest 1−λμ portion. Here we show first, F bargains separately with the LT and then with the ST. Thereafter, we distinguish the possible alterations. In this special segment, we have attempted to show first that how F now bargains with the LT in setting price i.e. P_LT for the high quality portion. Thereafter, we show the possible impacts on W if F bargains with ST in setting price i.e. W for the average quality products in the rural wholesale market in presence of the LT.
Here, in the post production scenario, F and LT enter into bargaining to determine $P_{LT}$ for the high quality products. Here, we have examined the state of affairs where, all the agents (viz. F, ST and LT) are fully informed about their preferences.

The interaction between F and LT develops the following propositions$^3$. These are helpful to understand the possible impacts in the rural wholesale market operation.

**PROPOSITION: 1**
Higher is the probability i.e. $\pi$, that the rest low graded portion of total products will be sold at a price $W$ in the rural wholesale market, lower will be the risk of loss for low graded portion and that will reduce the price $P_{LT}$ for the high quality products.

**PROPOSITION: 2**
If there is a regular demand from the LT and if $P_{LT}$ is lower than $W$, then if bargaining power of LT increases, the price for the high quality products will also increase only for a lower $\pi$.

**PROPOSITION: 3**
An inverse relationship exists between the price for the high quality products i.e. $P_{LT}$ and $\mu$ as well as $\lambda$ when F bargains with LT.

These propositions help to identify problem of bargaining between small farmers and large traders.

### 2.1.2 IDENTIFIED PROBLEMS OF BARGAINING BETWEEN SMALL FARMERS AND LARGE TRADERS:

(i) LT prefers to collect only high quality products and refuses to accept non-standard products. It is hard to sell for the small farmers the rest in the market by bearing extra transportation cost. As after selling only high quality products, farmers have to extend further into the other market to sell the rest incurring extra transportation cost. Moreover, the chances are very low that the rest would be sold.

(ii) Payment to the small farmers is not immediate.

(iii) Demand from the LT is erratic.

(iv) Actual purchase is not equal to the actual proportion of the high quality products. This means demand is more depressed.

Now we are interested to show the interaction between F and ST in the rural wholesale market. We also explain the matter with the help of field cases.

### 2.1.3 BARGAINING PROBLEM IN BETWEEN SMALL FARMERS AND SMALL TRADERS

The interaction between F and ST also develops the following propositions$^4$. These are helpful to understand the possible impacts in the rural wholesale market operation.

**PROPOSITION: 4**
For a higher portion of high quality products i.e.$\mu$ and higher demand for the high quality products from the LT i.e. $\lambda$, higher will be the change in the rural wholesale market price positively.

---

$^3$See appendix (B) for detail derivation
PROPOSITION: 5
A positive relationship exists between bargaining power of the ST and the rural wholesale market price of the average quality products i.e. $W$ while $F$ bargains with the ST. This is true only when sale price per unit of high quality products is higher than the selling price per unit of average quality products in the rural wholesale market. The condition that needs to fulfil for small farmer to make more returns with the increase in the relative bargaining power of the ST in the bearing of the LT, is mathematically derived as bellow:\(^4\)
\[
\lambda \mu > \frac{W}{P_{LT}}, \text{ with } P_{LT} > W
\]
This condition explains that if it fulfils then, $F$ gains more in the rural wholesale market in the presence of the LT. However, it is not happening in reality. That is why farmers have rejected LT to sell them directly at price $P_{LT}$ per unit for higher quality products. The following cases help to understand the matter in detail.

2.2 EMPIRICAL EVIDENCES WITH THE HELP OF FIELD CASES
We surveyed in the district of North 24 Parganas, West Bengal, India. Four identified corporate firms are operating in this district. These are Reliance Fresh, Keventer Agro, Aditya Birla Group and Metro Cash and Carry. Metro Cash and Carry is the only hundred per cent FDI in West Bengal in the wholesale market and others are domestic and working in partnership with foreign firms through indirect control. Now we give detail of the issue that have explained so far with the help of some field cases and try to justify the theoretical condition for farmer’s gain.

Case: 1
The table showing the production and marketing details of a farmer (producer), who is a minority APL category, by occupation running a Stationary shop (His father and grandpa was a farmer), residing in the Palpakuria Village of North 24 Parganas district of West Bengal:\(^5\)

<table>
<thead>
<tr>
<th>Time</th>
<th>Crops (Fruits)</th>
<th>Total number of trees</th>
<th>Quantity produced (in kg &amp; Piece)</th>
<th>Quantity sold to the LT</th>
<th>Quantity sold to the ST in the local wholesale market</th>
<th>Price per unit offered by the LT (in Rs.)</th>
<th>Price per unit offered by ST in the local wholesale market (in Rs.)</th>
<th>Portion of quality produce ($\mu$)</th>
</tr>
</thead>
<tbody>
<tr>
<td>2014</td>
<td>Mango</td>
<td>55</td>
<td>4800 kg</td>
<td>1600 kg</td>
<td>3200 kg</td>
<td>9Rs.16</td>
<td>Rs.15</td>
<td>0.60</td>
</tr>
</tbody>
</table>

(Source: Field survey in North 24 Parganas district, West Bengal, in the year 2015)
From the Case: 1 above, we can easily check that, though $\mu$ is 0.60, but consolidator buys only 0.56 of $\mu$. This means the actual purchase proportion is $\lambda \mu = 0.34$. Here, $\lambda = 0.56, \mu = 0.60, \frac{W}{P_{LT}} = 0.94$. Therefore, $\lambda \mu (=0.34) < \frac{W}{P_{LT}} (= 0.94)$. As demand from the consolidator is lower, consequently, it is difficult for the farmers to get more gain when bargain with the ST in the rural wholesale market in presence of the LT.

}\(^4\)See appendix (C) and (D) for detail derivation
\(^5\)Indian Rupee (Rs.) per 1 US Dollar in the month of August Rs.67 (Average)
\(^6\)Indian Rupee (Rs.) per 1 US Dollar in the month of August, 2016 Rs.67 (Average)
Nevertheless offer price per unit by the LT is more that rural wholesale price per unit i.e. $P_{LT} > W$.

**Case:2**

The table showing the production and marketing details of a farmer (producer), who is a minority, APL category, by occupation a farmer (His father and grandpa was a farmer), residing in Jaipur Village and sold to the LT firm Reliance at Mathura (Santoshpur village) of North 24 Parganas district of West Bengal

<table>
<thead>
<tr>
<th>Time</th>
<th>2014</th>
</tr>
</thead>
<tbody>
<tr>
<td>Crops (Vegetables)</td>
<td>Brinjal</td>
</tr>
<tr>
<td>Actual land used</td>
<td>2 Bigha</td>
</tr>
<tr>
<td>Quantity produced (in kg &amp; Piece)</td>
<td>4000 kg</td>
</tr>
<tr>
<td>Price per unit offered by the LT (in Rs.)</td>
<td>8</td>
</tr>
<tr>
<td>Price per unit offered by ST in the Local wholesale market (in Rs.)</td>
<td>8</td>
</tr>
<tr>
<td>Ratio of local market price to LT’s price</td>
<td>1</td>
</tr>
<tr>
<td>Quantity sold to the LT</td>
<td>---</td>
</tr>
<tr>
<td>Quantity sold to the ST in the Local wholesale market</td>
<td>---</td>
</tr>
<tr>
<td>Portion of quality produce ($\mu$)</td>
<td>0.80</td>
</tr>
</tbody>
</table>

(Source: Field survey in North 24 Parganas district, West Bengal, in the year 2015)

From Case: 2 it is clear that the representative farmer has sold Cauliflower and Cabbage to the consolidator at a higher price. The quality constraint is lower i.e. 0.80 for both the products. This is because Reliance Fresh though depends on the consolidator, but still maintains their own collection centre, from where farmers can get the true information and can compare with the consolidator’s information. In the presence of the LT’s own

---

7A *katha* (also spelled *kattha* or *cottah*) is a unit of area in *Bangladesh* and *India* approximately equal to 1/20 of a *bigha* (also formerly *beegah*) = 720 square feet and 1 *Acre* = 3 bigha.
collection centre, if consolidator keeps $W > P_{LT}$ then the condition $\lambda \mu < \frac{W}{P_{LT}}$ will be fulfilled and farmers can gain by selling to the LT’s own collection centre. Another reason is irregular demand by the LT. Here, for Cauliflower, $\lambda = 0.83, \mu=0.80$, $\frac{W}{P_{LT}} = 0.80$. Therefore, $\lambda \mu (=0.67) < \frac{W}{P_{LT}} (= 0.80)$. For Cabbage, $\lambda = 0.75, \mu=0.80$, $\frac{W}{P_{LT}} = 0.75$. Therefore, $\lambda \mu (=0.60) < \frac{W}{P_{LT}} (= 0.75)$. If demand from the consolidator or LT is high or if $\lambda = 1$, then, the representative farmers can gain more in the rural wholesale market for $W$.

Therefore, it is not possible to collect directly from the small farmers by the LT. Steady and high demand with lower quality constraints from the LT help to make a long run relationship between the farmers and the LT. Long run relationship between farmers and the LT helps to arrange a higher support level in the determination of wholesale prices in the rural wholesale market. If LT buys regularly from the small farmers without maintaining any quality constraint then, the LT would be an alternative of the rural wholesale market.

2.3 IDENTIFICATION OF TRUE MODEL AND IMPORTANT VARIABLES THROUGH FIELD SURVEY

We find that the mechanism of direct collection from the small farmers often fails due to higher transaction cost (including extra transportation cost) for both the small farmers and the LT. Now the question is how the LT is collecting high quality products from the small farmers. We explain in particular how the LT collects and try to resolve the question whether it is possible to collect agricultural food products at lower prices or not. At this moment, we are proceeding to explicate the issue in detail.

Before construction of a formal model and searching for empirical evidences we submit relevant information has collected from our field experience. This field information helps in the construction of the model.

It is clear from the previous sections that it is not possible to collect high quality products directly from the small farmers. Therefore, LT depends on two other modes of collection: (i) collection through the local agent or ST. ST also participates in the rural wholesale market. ST denotes here consolidator\(^8\). (ii) Participation in the rural wholesale market (or, Mandi). The LT depends heavily on the consolidator. A consolidator collects at a lowest possible transaction cost from the small farmers. Moreover, consolidator does the first level grading at a lowest cost. By using consolidator, LT can diversify their risk of not having high quality products and reduce extra transaction costs. Consolidator also reduces the transaction cost of small farmers. Now we need to understand that why the ST is acting as consolidator. Having collected from the F, ST first segregates the products according to different gradation. Thenceforth, it sells the high quality portion to the LT at a price congruent with the high quality and sells the rest combining with their old quality stock at a lower monetary value in the rural wholesale market (Das, 2016a,2016b). We sketch the theoretical framework first, thereafter substantiating our claims with evidentiary support.

Here, we see a model of vertical competition where, downstream firms (viz. Retailers, Cash and Carry traders) purchase agricultural food products from the consolidators (i.e., Small Traders) where the consolidators buy

\(^8\)Consolidator includes the small traders or intermediaries predominantly were present in the rural wholesale market in India. The intermediaries are, transportation cost, village level trader, aggregator, sub wholesaler, retailer. These small traders are now acting as aggregator or consolidator and collect high quality products from the small farmers and sell to the newly arrived large traders. These small traders actually participate in the rural wholesale markets. In presence of the large traders they are now acting as a consolidator and also participate in the rural wholesale market. Due to the problem of collection from the small farmers they have been used by the large traders. Therefore, now in the rural wholesale market we have three types of agents; one, small traders dealt with the average quality products and act as a wholesaler, two, large traders collect only high quality products and act as a wholesaler and three, consolidator, who participates both in the rural wholesale markets and dealt with the average quality products. Moreover, collects high quality products from the farmers and sell to the large traders.
their saleable commodities from the small farmers. Consolidators are divided into two classes’ viz. “Principal Consolidator” and “Sub-Consolidator”.
If small competitive farmers would able to bear grading costs then it would be variable. On the other hand when traders bear these costs then it is fixed. We show this with the help of complete the vertical model below.
In figure 1 we identify different types of fixed costs that small farmers are not able to bear. These fixed costs create the supply side imperfect.

\[ TSCF = \text{Transportation cost incurs by sub-consolidator to collect from the small farmers.} \]
\[ \text{GST} = \text{Grading cost incurs by the sub-consolidator.} \]
\[ \text{TPC} = \text{Transportation cost incurs by the principal consolidator.} \]
\[ \text{GPC} = \text{Grading cost incurs by the principal consolidator.} \]
\[ \text{TSCST} = \text{Transportation cost incurs by the sub-consolidator to sell to the ST in the rural (local) wholesale market.} \]
\[ \text{TPCST} = \text{Transportation cost incurs by the principal consolidator to sell to the ST in the rural (local) wholesale market.} \]
\[ \text{TF} = \text{Transportation cost incurs by the farmer to sell to the ST.} \]

**Figure: 1a**

**The Model of Vertical Restraints in India: A Case of Small Farmers**
(Source: Field survey in North 24 Parganas district, West Bengal, in the year 2016)
Consider a set of perfectly competitive upstream small producers (farmers), which produce a homogeneous
good and denote as industry and two sets of differentiated retailers. One set of retailers’ sale only high quality products and another set of retailers which sale average quality products. Here, first set of retail industry is oligopolistic in their intra brand competition. The second set of retail industry is a competitive fringe. Upstream small producers produce at a constant marginal cost $C_0 \geq 0$. They use a fixed transportation cost to sell the produce. They are not able to bear extra transportation cost. Here, we consider two types of fixed costs; one transportation cost (TC) and another is grading cost (GC). If production actually takes place then these fixed costs are to be incurred i.e. $TC \geq 0$ and $GC \geq 0$. These fixed costs are not scale dependent but retailer specific. Here we also consider two types of consolidators’ viz. “Sub consolidators” and “Principal consolidator”. Sub consolidators are small in sized and linked with the principal consolidator. Principal consolidator is a monopolist.

We consider a five stage game. In the first stage, farms make a simultaneous contract offer to the sub consolidators and the ST in the rural (local wholesale market), where they are allowed to discriminate between the sub consolidators and the ST. In this stage farms incur fixed transportation cost to sell to the ST only i.e. TF. Sub consolidators have to bear transportation cost, i.e. TSCF to collect from the farms. In the second stage, sub consolidator and the ST observe all the contract offers and decide from which farms they will exclusively buy. Thirdly, Sub consolidator sells to the principal consolidator with a margin (contract should be specified). Therefore, sub consolidator has to incur three types of transportation costs viz. TSCF, TSCPC, TSCST and grading costs i.e. GSC. In the fourth stage the principal consolidator sells the high quality products to the collection centre and low quality products (almost average, because first level grading has been gone by the sub consolidator) to the ST in the rural wholesale market. Principal consolidator has to incur two types of transportation costs viz. TPC and TPCST and one type of grading cost i.e. GPC. In the fifth stage, LT grades the collected products again using fixed grading cost, i.e. GC and sells in the retail market to the ultimate consumer. The ST in the rural wholesale market collects average quality products by incurring three types of transportation costs viz. TF, TSCST, TPCST which ST could have got only incurring one type of TC. This means the presence of these extra TCs will create the rural wholesale market price stickiness. We explain the wholesale price behaviour later on in this paper. Moreover, the presence of three types of fixed costs for the sub consolidator, two types of fixed costs for principal consolidator and one type of fixed cost at the collection centers has created the market for the high quality products imperfect. Therefore, small farmers are not able to extract any extra earning from the high quality products because; small farmers are not able to bear extra TC to sell the average quality and high quality products. Caprice, Schlippen-bach, & Wey, find that fixed costs affect both input market contracting and final goods prices (2014). Moreover, fixed costs help to monopolize an imperfectly competitive downstream market and thus translate into higher consumer prices (Caprice, Schlippen-bach, & Wey, 2014).

Now we consider the partial model only in figure 1b, where we consider the vertical model of large traders only.

![Figure:1b- The Model of Vertical RestraintsofLarge Traders](image-url)
(Source: Field survey in North 24 Parganas district, West Bengal, in the year 2016)

From figure-1b, it is clear that the LT collects directly from the “Principal Consolidator” and “Principal Consolidator” depends on the “Sub Consolidator” to assemble the high quality products spreading in different neighbourhoods or regions of special area. After accumulating all the products, the principal consolidator sale the products to the LT’s collection centre and the LT further grade those by incurring certain labour costs. The high quality products are dispatched to sell in the retail store. If the Principal Consolidator collects products from the local wholesale market, then they will have to suffer a loss on rejection of low quality goods. Average rejection of low quality products is 20%. If they accumulate by using sub-consolidator, then they can cut back the rejection to average 2% to 3% from 20%. The Principal Consolidator here acts as a monopoly supplier to the LT firm. Equally, we have set up that each LT is largely hooked on a single large principal consolidator.

The different cost components and margin breakup from sub-consolidator to the collection centre per unit of high quality agricultural food products represent as follows:

Collection price per unit pays to the Principal Consolidator = Price per unit of average quality product + (Price per unit of high quality product - Price per unit of average quality product) + (Price per unit of high quality product - Price per unit of average quality product) * 5% + Carrying Cost + (Initial offer price per unit by the LT in the collection centre X percentage of rejection calculated by the LT in the collection centre) + Price for the weight loose + a profit margin for the principal consolidator except covering all other costs and possible losses.

Here it should be mentioned that the most significant part is the part of the sub-consolidator. The share is dependent on the difference between “Price per unit of high quality product” and “Price per unit of average quality product in the local wholesale market”. The reason is that if all the products are of high quality, then there is no need to employ sub-consolidators. The principal consolidators could collect directly from the local wholesale markets. Moreover, it is difficult to collect only high quality products from the local wholesale markets.

Again, the amount of “Initial offer price per unit by the LT in the collection centre multiplied by the percentage of rejection, calculated by the LT in the collection centre” is paid to the principal consolidator. If the principal consolidator has borne the cost of grading and loss due to rejection, then the principal consolidator has needed to incur the additional carrying cost to sell further the rejected products. According to the collection centre of Reliance, the grading cost of employing labour is entirely borne by the LT. If a consolidator sale the products to the LT, then the LT has to grade that with their own cost and return the rotten one to the principal consolidator. In the collection Centre of Metro Cash and Carry, after piling up from the consolidator, the Metro Cash and Carry again make grading that and then sell the remains to a contractor who dumps the low graded products after incurring the dumping costs.

From the field data in the district of North 24 Parganas, West Bengal, now we are going to discuss the different costs and the margins that are involved to collect high quality products from the small farmers.

For Potato, the margin of principal consolidator is 10% to 20%. This margin includes other costs and losses mentioned above. The detail is given below:

Collection price per unit pays to the Principal Consolidator for potato = Price per unit of average quality product + (Price per unit of high quality product - Price per unit of average quality product) + (Price per unit of high quality product - Price per unit of average quality product) * 5% + {Price per unit of average quality product + (Price per unit of high quality product - Price per unit of average quality product) * 5%} * 10% to 20%.

Let, A = Price per unit of average quality product, B = Price per unit of high quality product

Or, [A + (B - A) 5% + {A + (B - A) * 5%} * 10% to 20%]  
Or, [B + (B - A) 5% + {B + (B - A) 5%} * 10% to 20%]

For Onion, the margin of principal consolidator is 17%. This margin includes other costs and losses mentioned above. More detail is given below:

Collection price per unit pays to the Principal Consolidator for onion = Price per unit of average quality product + (Price per unit of high quality product - Price per unit of average quality product) + (Price per unit of high quality product - Price per unit of average quality product) * 5% + Carrying Cost + (Initial offer price per unit by the LT in the collection centre X percentage of rejection calculated by the LT in the collection centre) + Price for the weight loose + a profit margin for the principal consolidator except covering all other costs and possible losses.

Let, A = Price per unit of average quality product, B = Price per unit of high quality product

Or, [A + (B - A) 5% + {A + (B - A) * 5%} * 10% to 20%]  
Or, [B + (B - A) 5% + {B + (B - A) 5%} * 10% to 20%]

For Onion, the margin of principal consolidator is 17%. This margin includes other costs and losses mentioned above. More detail is given below:
product+ (Price per unit of high quality product- Price per unit of average quality product) + (Price per unit of high quality product- Price per unit of average quality product) *5% + (Price per unit of average quality product+ (Price per unit of high quality product- Price per unit of average quality product) *5%) *17%
Or, [B+ (B-A) 5%+ {B+ (B-A) 5%} 17%]

According to a principal consolidator residing in Barasat, North 24 Parganas, and West Bengal explained that for other vegetables it varies in between 20% to 30%.

It is clear that when B=A then sub-consolidator will not be practiced. Therefore, the collection cost of the high quality products will abridge. Here, we should mention that, B > A, because it is difficult to form a direct relationship in between small farmers and the large traders to collect only high quality products only. Here, we accept that sub-consolidator gets all the information about the large traders and principal consolidator.

So far, we have been able to explain in detail the consolidator’s margin using field data. Apart from consolidator’s margin, another important cost element is also present. This is grading cost. We explain this with the help of field data in table-1.

Table: 1-Statement of Labour cost in the Collection Centre in North 24 Parganas district of West Bengal

<table>
<thead>
<tr>
<th>LT name</th>
<th>Labour types</th>
<th>Working hours per day</th>
<th>No. of labour unit</th>
<th>No. of months works per labour per year</th>
<th>No. of labour days available including Sunday and Saturday and holidays</th>
<th>Wage payment scheme</th>
<th>Wage per month per labour</th>
<th>Total area of the collection Centre(including roofed and walled facility warehouse and with different grading and shorting units)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Reliance</td>
<td>Regular</td>
<td>8-9hrs</td>
<td>7</td>
<td>12months</td>
<td>30 days</td>
<td>Monthly</td>
<td>Rs.5000-Rs.7000</td>
<td>1-1.5 Bigha</td>
</tr>
<tr>
<td>Metro Cash and Carry</td>
<td>Regular</td>
<td>9 to 10hrs</td>
<td>5</td>
<td>12months</td>
<td>30days</td>
<td>Monthly</td>
<td>Rs.5000-Rs.6000</td>
<td>5 Kathas</td>
</tr>
</tbody>
</table>

(Source: Field survey in North 24 Parganas district, West Bengal, in the year 2016)

The working wages vary in between Rs.5000-Rs.7000 for Reliance and Rs.5000-Rs.6000 for Metro Cash and Carry, depending on the actual days a labour worked. The procedure of recruiting labour into a collection centre is significant here. A labour contractor is there. The contractor supplies labour to the collection centre. LT pays the total salary payments to the contractor on the 10th day of the month. The LT pays the total amount including labour salary and contractor’s commission to the labour contractor. After keeping a commission per labour, the rest is paid to the labour. LT pays the total amount including labour salary and contractor’s commission to the labour contractor. The charge of the contractor varies from Rs.300 to Rs.500 per labour. This implies if we add this charge to the above wage, then the payment for labour will increase further.

Except these costs, we also present another cost element that is present if the consolidator sale to the exporter. We explain in relation to this in the following section using table-2.

2.4 DATA ON COSTS INCURRED FOR QUALITY CHECKING WHEN A CONSOLIDATOR SALE TO THE EXPORTER

An experience of a consolidator in North 24 Parganas shows that due to SPS agreement (The Agreement on the Application of Sanitary and Phytosanitary Measures) of the WTO, quality checking is hard. The export of ladies finger or Okra failed due to of having insect on a single ladies finger. The entire field data related to the

\[\text{Indian Rupee (Rs.) per 1 US Dollar in the month of August Rs.67 (Average)}\]
quality checking is given below.

**Table: 2-Showing the data on cost of quality checking in North 24 Parganas district of West Bengal**

<table>
<thead>
<tr>
<th>Vegetables</th>
<th>Total amount in kg</th>
<th>Laboratory cost (For 2.5 kg)</th>
<th>Exporter</th>
<th>Local Quality Checker</th>
<th>Consolidator’s place</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ladies finger</td>
<td>1350</td>
<td>Rs.9000</td>
<td>Jigna Enterprises</td>
<td>Keventer Agro</td>
<td>Joypur village, North 24 Parganas</td>
</tr>
</tbody>
</table>

(Source: Field survey in North 24 Parganas district, West Bengal, in the year 2016)

### For Green Chili Export

<table>
<thead>
<tr>
<th>Vegetables</th>
<th>Total amount in kg</th>
<th>Local Quality Checker</th>
<th>Labour cost for grading at Keventer Agro(For 20 Labour)</th>
<th>Local Quality Checker charge</th>
</tr>
</thead>
<tbody>
<tr>
<td>Green Chili</td>
<td>1000</td>
<td>Keventer Agro</td>
<td>Rs.4000</td>
<td>Rs.40 per 5kg</td>
</tr>
</tbody>
</table>

(Source: Field survey in North 24 Parganas district, West Bengal, in the year 2016)

**2.5THE IDENTIFIED IMPORTANT VARIABLES**

Based on the field data we have identified two important variables. These are, Consolidator’s margin (together with sub-consolidator’s and the principal consolidator’s margin) for the collection of the highly graded products and grading cost using skilled labour at the collection centre. These two costs per unit of high quality products will be used to construct a formal theoretical model.

### 3. THEORETICAL ANALYSIS

The two important costs viz. grading cost and consolidator’s margin with higher transaction cost, carrying cost, warehousing costs, and possible losses, etc., divide the market for agriculture food products in the rural wholesale market into two divisions. The first part is (1) market for high quality products and second part is (2) market for average quality products. The marketplace for low graded products is lacking (Due to field information). This means that the presence of the large traders divides the retail markets into two parts one of the average quality products and second for the high quality products. Large traders are collecting and selling only high quality products. This means they are applying “Blue Ocean Strategy”. They want to create new demand in an uncontest market space, or a “Blue Ocean”, rather than compete head-to-head with other small retailers in an existing industry (Kim & Maubargne, 1999, 2005). As a result, the collection cost for high quality products is high (Das D., 2015a, 2015b, 2015d, 2016). Therefore, there are two sets of traders attending the two sets of consumers. There are two types of retailers. They are Small Traders for average quality products and Large Traders for high quality products. All the traders under the ST are same preference group and all the traders under the LT are same preference group. The cost-quality bundles are different for the two sets of traders’ viz. the ST and the LT. At present, the research question is whether with the bearing of the LT in the food retail market, the ST will be pushed out from the markets or not. To resolve this inquiry, we need to seek for the strategy adopted by the LT to enter into the marketplace. We know the Michael Porter’s “Three Generic Strategies” where he identified the strategies that are used to enter into the marketplace. These are, “Cost Leadership Strategy”, “Differentiation Strategy”, “Focus Strategies” (Porter, 1980). Michael Treacy and Fred Wiersema (1995) have modified Porter's three strategies to identify three basic “value disciplines” in their book “The Discipline of Market Leaders” that can create customer value and provide a competitive advantage. They are operational excellence, product leadership and customer intimacy. W. Chan Kim and Renée Mauborgne (1999) introduce a popular Post-Porter model in their Harvard Business Review article “Creating New Market Space”. In their article, they report a “value innovation” model in which companies must see outside their present paradigms to discover new value propositions. Their approach complements
most of Porter’s thinking, particularly the concept of specialization. They later introduce their ideas in the book Blue Ocean Strategy (Kim & Maubargne, 2005). Therefore, it is hard, but not impossible to topple a house that has built a predominant criterion. From the market observations and studying data, we have found that, the LT has adopted Blue Ocean Strategy. They are really attempting to differentiate products from the existing ST. They usually do not desire to argue with the ST and setting different price-quality combinations. Maintaining high quality product is costly and needed some skill. That is difficult to maintain by the ST.

4. EMPIRICAL ANALYSIS
The entire empirical studies have been done in two ways; one, impact in the rural wholesale market price behaviour of average quality products, and two, impacts in the urban retail market prices of high quality products.

4.1 EMPIRICAL EVIDENCES OF THE IMPACT ON THE WHOLESALE PRICES OF AGRICULTURAL FOOD PRODUCTS
The entire study has been done based on the experiences in the state of West Bengal and experiences in other states in India, where farmers are small sized in nature, in terms of land use. Based on the theoretical overview we analyze the matter empirically here. To show the empirical evidences and the impact of the two important variables viz. consolidator’s margin and grading cost on the price behaviour and riskiness we have taken the vegetables price data. Large traders mainly collect vegetables. In West Bengal the LT collects mainly potato throughout the year from the consolidator. West Bengal is the second largest potato producing state in India (see table: 3). We surveyed in the districts of North 24 Parganas and Nadia, West Bengal, India. Corporate firms are operating in these two districts. We study the wholesale price behaviour of potato in these two districts and compare with the other districts in West Bengal. It was difficult to get price data for all the vegetables that are produced and traded every week and/or month in all the 19 districts of West Bengal. The data for potato for all the weeks and months are available. Therefore, under vegetables we use wholesale price data of potato. There are special characteristics of potato. It is used as a regular diet and also as an input by the food processing firms. In the market of agricultural food grains, the government intervention is there through the presence of minimum support prices. Therefore, we have not considered other food grains here.

<table>
<thead>
<tr>
<th>Rank</th>
<th>State Name</th>
<th>Area</th>
<th>Production</th>
<th>Yield</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Uttar Pradesh</td>
<td>603.76</td>
<td>14430.28</td>
<td>23901</td>
</tr>
<tr>
<td>2</td>
<td>West Bengal</td>
<td>386.61</td>
<td>11591.30</td>
<td>29982</td>
</tr>
<tr>
<td>3</td>
<td>Bihar</td>
<td>322.5</td>
<td>6640.60</td>
<td>20593</td>
</tr>
<tr>
<td>4</td>
<td>Gujarat</td>
<td>81.27</td>
<td>2499.73</td>
<td>30758</td>
</tr>
<tr>
<td>5</td>
<td>Madhya Pradesh</td>
<td>108.87</td>
<td>2299.00</td>
<td>21117</td>
</tr>
<tr>
<td>6</td>
<td>Punjab</td>
<td>85.25</td>
<td>2132.31</td>
<td>25012</td>
</tr>
<tr>
<td>7</td>
<td>Assam</td>
<td>99.77</td>
<td>975.27</td>
<td>9775</td>
</tr>
<tr>
<td>8</td>
<td>Karnataka</td>
<td>44.4</td>
<td>698.30</td>
<td>15727</td>
</tr>
<tr>
<td>9</td>
<td>Haryana</td>
<td>29.47</td>
<td>676.01</td>
<td>22939</td>
</tr>
<tr>
<td>10</td>
<td>Jharkhand</td>
<td>47.21</td>
<td>659.61</td>
<td>13972</td>
</tr>
</tbody>
</table>
Area-000' Hectares, Production- 000'Tonnes, Yield-Kg/Hectare

Source: Department of Agriculture and Cooperation (Horticulture Division) http://eands.dacnet.nic.in/Publication12-12-2013/Agricultureat%20a%20Glance2013/page128-185.pdf

Below we explain the changes in the potato price behaviour in presence of the LT.

Figure: 2-The behaviour of Field price (Field Price (Rs./Qtl.)) of potato in the year 2014 of some selected districts of West Bengal

Source: Directorate of marketing, Government of West Bengal

Figure: 3-The behaviour of Field price (Field Price (Rs./Qtl.)) of potato in the year 2015 of some selected districts of West Bengal

Source: Directorate of marketing, Government of West Bengal

Figure: 2, 3 explain three months (from January to February) field potato price behaviour. In districts Nadia and North 24 Parganas large traders are present. Here the field prices are higher.
Figure: 4 - The behaviour of daily Wholesale price (Rs./Qtl.) of potato in the year 2014-15 of some selected districts of West Bengal

Source: Directorate of marketing, Government of West Bengal

Figure 4 explain the daily wholesale potato price behaviour in four districts of West Bengal in the year 2014-15. It finds that wholesale price starts increasing from March and starts decreasing from the month of December.

Wholesale price behaviour

Table: 4 - Summary Statistics

A table showing the summary statistics of natural log of weekly wholesale price behaviour of the potato in the districts of the south region of West Bengal for the year 2006 to 2013

<table>
<thead>
<tr>
<th>Districts (Variable: Natural log of wholesale price)</th>
<th>Observations</th>
<th>Mean</th>
<th>Standard deviation(Std. Dev.)</th>
<th>Coefficient of variations (In %)</th>
<th>Min</th>
<th>Max</th>
</tr>
</thead>
<tbody>
<tr>
<td>NORTH-24PARGANAS</td>
<td>282</td>
<td>6.380438</td>
<td>0.4020353</td>
<td>6.301061</td>
<td>5.501891</td>
<td>7.536364</td>
</tr>
<tr>
<td>HOOGHLY</td>
<td>374</td>
<td>6.381245</td>
<td>0.459002</td>
<td>7.192985</td>
<td>5.307822</td>
<td>7.449288</td>
</tr>
<tr>
<td>BAKURA</td>
<td>371</td>
<td>6.341125</td>
<td>0.4697921</td>
<td>7.408655</td>
<td>5.303504</td>
<td>7.46158</td>
</tr>
<tr>
<td>NADIA</td>
<td>362</td>
<td>6.444118</td>
<td>0.4339366</td>
<td>6.73384</td>
<td>5.500047</td>
<td>7.524292</td>
</tr>
<tr>
<td>BIRBHUM</td>
<td>358</td>
<td>6.363926</td>
<td>0.4676784</td>
<td>7.348898</td>
<td>5.347107</td>
<td>7.438384</td>
</tr>
<tr>
<td>BURDWAN</td>
<td>376</td>
<td>6.367923</td>
<td>0.4683454</td>
<td>7.354759</td>
<td>5.393593</td>
<td>7.450812</td>
</tr>
<tr>
<td>MIDNAPUREEAST</td>
<td>291</td>
<td>6.364584</td>
<td>0.4742073</td>
<td>7.450719</td>
<td>5.251462</td>
<td>7.495542</td>
</tr>
<tr>
<td>MIDNAPURE WEST</td>
<td>239</td>
<td>6.500382</td>
<td>0.4538229</td>
<td>6.98148</td>
<td>5.57973</td>
<td>7.561444</td>
</tr>
<tr>
<td>PURULIA</td>
<td>368</td>
<td>6.324311</td>
<td>0.4533098</td>
<td>7.167734</td>
<td>5.306633</td>
<td>7.418127</td>
</tr>
<tr>
<td>COMBINED WEST BENGALAVERAGE</td>
<td>376</td>
<td>6.41262</td>
<td>0.4330483</td>
<td>6.753063</td>
<td>5.520496</td>
<td>7.46398</td>
</tr>
</tbody>
</table>

(Source: Agricultural Marketing Information Network-AGMARKNET. The statistics calculated by the author)
Table 4 explains natural log of weekly wholesale price behaviour of the potato in the south region districts of West Bengal for the year 2006 to 2013. It is clear that standard deviation (Std. Dev.) and coefficient of variations in North 24 Parganas is lower than others. The next lower place is in the Nadia district. The mean prices of these two districts are not higher than other districts. From Table 4, we find that price of the representative crop is stable in terms of lower C.V. (Coefficient of variations) in those districts (here, North 24 Parganas and Nadia) where the LT is operating with high investment compared to others.

We also find that at Midnapure West mean price i.e. 6.500382 is higher than all the south region districts of West Bengal with high S.D. and C.V. Conceding to the data collected from the Department of Agriculture Marketing, Directorate of Agriculture Marketing, Government of West Bengal, that Midnapure West is a corridor of interstate trade from West Bengal to other states for example, Jharkhand, Bihar etc... Local demand is too high. This is the reason of higher mean value than other districts.

Figure 5A-NORTH-24 PARGANAS
Figure 5B- WEST BENGAL

Figure 6A-ΔNORTH-24 PARGANAS
Figure 6B- ΔWEST BENGAL AVERAGE

Figure 6 Calculation of Kernel density function of natural log of weekly wholesale price of potato of North 24 Pargana district and West Bengal from the year 2006 to 2013 on absolute difference of the original data.
We use Kernel density functions to explain the rural wholesale market price behaviour of potato. We use Kernel density functions because it is nonparametric and we can easily compare with the Normal and t distributions. From the figures-5A, we see that at North-24 Parganas district, the kernel density curve departs significantly at a little bit higher price point 6 and density is close to 1. At a price point 6.5 the density is very close to 1.5 and departs highly significantly from the red and gold normal and t curve. On the other hands for other districts (from figure-5B) the density at price point 6.5 is lower than 1.5 and below 1. Here normal and t curves are same. We know that for a higher degree of freedom the t distribution approach towards normal distribution. From figure-5B, we discover that if we take combined of all the districts in West Bengal then this behaviour is not present. Consequently, the data also hold that the market wholesale price of potato at the North-24 Parganas district has a high density at a mode price point and farmers are selling products at the mode price to the small traders. The kernel density function (blue curve from figure-5A) of North 24 Parganas district shows that after price point 7 the curve is also departing significantly from the normal and t curve (the red and gold deep line). Therefore, the likelihood of higher price is also high.
According to Paul A. Samuelson (1972), the stable prices is definitely better than any feasible unstable ones, if the unstable prices average out so high compared to the stable prices. Samuelson studied in terms of consumer surplus.

If we consider the distribution of change (∆) of log average wholesale price of potato in figure-6A&6B, of North 24 Parganas district & West Bengal average, then we ascertain that price behaviour is more interesting. For the sake of our study, here we have taken modal (positive) value of sequential change of wholesale prices. From figure-6A, we see that there is a single pick at the zero mode and uniform for the range 2 to 6. Still, for West Bengal average, (from figure-6B) we realize that there are more than one picks in between zero to 0.25. For West Bengal the change in price ranges from zero to 0.25 and for the North 24 Parganas district the change in price ranges from zero to 6. Therefore, from the above study, we conclude that sellers are getting more by selling at the prevailing prices at North 24 Parganas district than West Bengal average prices. After surveying at the North 24 Parganas district we find that LT is collecting only high quality products. Farm produce are not always up to the standard set by these large traders. For example, to produce potato chips the chips making firms use a standard size of potato which can be used in machine, this is a technological constraint. Moreover large firms push the farmer to use the specified quality seed in producing potato and that is required more caution at the time of cultivation. This is quality constraint. Here, we ignore the condition of seed supply by the LT. Thus, many times farmers are not being able to meet this technical and / or quality measure set by the corporate traders. Farmers are able to trade a very negligible amount of agricultural food products with the large traders. As per survey data in the North-24 Parganas district, West Bengal and from figure5A to 6A, it is clear that the quality constraint is present. After having compiled the consolidators sell to the corporate traders with accepting some margin. The corporate traders pay a much higher price for the high quality produce, but the farmers prefer to choose to sell the total produce at a time if they would get a moderate price for the entire produce. Therefore, farmers prefer to sell to the consolidators at a moderate price, which is higher than before when corporate traders were not present. Moreover, in the state of West Bengal, India, contract farming is not allowed and has not yet enacted in the APMC Act. In recent future, The Government of West Bengal is going to allow contract farming. This is the reason; we have not studied the matter of contract farming in our present article.

It is also clear that before and after deseasonalization, the behaviour of Kernel density curves of North 24 Parganas district and West Bengal are same. From the figures above it is clear that the figure-5A, 7A, figure-5B, 7B, figure-6A, 8A, figures, 6B, 8B, all are pair wise equal shaped, or equal patterned. Hence we can state that, deseasonalization did not alter the shape of kernel density curves.

Then, the next question is that it is possible to sell high quality products at a lower price in the retail market or not by the LT. These queries have been studied in our two previous papers (Das, 2015(b);2015(d)) and (Toiba, Umberger, Wahida, Minot, & Stringer, October, 2013). In addition the answer is no. It is not possible to sell agricultural food products at a lower price than the small retailers do. We explain the latest improvement in this quarry with the help of new field data in the following section.

4.2 EMPIRICAL EVIDENCES OF THE IMPACT ON THE RETAIL PRICES OF AGRICULTURAL FOOD PRODUCTS

We find that both grading cost and consolidator’s margin per unit of high quality products are positively related with the retail price for the high quality products. In support of these theoretical findings here we show that the retail price for the high quality products is higher and follow nonlinear pricing strategies in setting retail prices. We have identified two important strategies, viz. Tying and Bundling.

Tying refers to a situation where a consumer can buy one good only by purchasing another commodity as well. According to The Competition Act, 2002 (of India) any agreement amongst enterprises or persons at different stages or levels of the production chain in different markets, in respect of production, supply, distribution, storage, sale or price of, or trade in goods or provision of services, with all others including tie-in arrangement shall be an agreement in contravention of sub-section “Anti-competitive agreements” of “Prohibition of agreements”, if such agreement causes or is likely to cause an appreciable adverse effect on competition in India. For the purposes of this sub-section, — “tie-in arrangement” includes any agreement requiring a purchaser of goods, as a condition of such purchase, to purchase some other goods. Large traders...
follow this tying strategy in setting prices for food products in a different way. We explain the strategy with the help of some field data.

Bundling is a special case of tying in which two or more commodities are sold only in fixed proportions. Bundling may be either pure or mixed. Pure bundling occurs when a firm sells two or more products only in a bundle and not individually. Mixed bundling occurs when the commodities are made available both in bundles and individually. Mixed homogeneous bundling can be a situation where for example the price of two units of a good is lower than twice the price of one unit. Mixed heterogeneous bundling is a situation where commodity bundling can also affect several commodities, for instance, a restaurant ties the consumption of several dishes into a menu or in other words, offers several items in a menu box. Bundling is inefficient by Pareto standards: it can lead to the oversupply or under supply of particular goods, and it can lead to the wrong people consuming each good (Adams and Yellen, 1976). Bundling is a credible tool to protect a multi-good monopolist against entry. It can actually raise profits absent entry (Nalebuff February, 2004). In India at present newly arrived large traders are using bundling strategy in selling agricultural food products, and use a new attribute to it i.e. quality standard.

Now we are going to show some data supporting that the LT is collection high quality products. Table 5 to 7 explain in detail the quality preferences by the LT (large traders) when they are collecting from the small farmers.

**Table: 5-Average portion of quality products collected by the large traders in West Bengal in the year 2014 (Example-1)**

<table>
<thead>
<tr>
<th>Year</th>
<th>Crops (Fruits &amp; Vegetables)</th>
<th>2014</th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Brinjal</td>
<td>Lady’s Fingers</td>
<td>Ridge Gourd/Chinese Okra</td>
<td>Water Spinach</td>
<td>Potato</td>
<td>Pointed Gourd</td>
<td>Ceylon spinach</td>
</tr>
<tr>
<td></td>
<td>70%</td>
<td>60%</td>
<td>65%</td>
<td>80%</td>
<td>77%</td>
<td>80%</td>
<td>80%</td>
</tr>
<tr>
<td>The average proportion of quality products</td>
<td>10 katha to 2 bigha&lt;sup&gt;10&lt;/sup&gt;</td>
<td>8 katha to 1.5 bigha</td>
<td>8 katha to 1 bigha</td>
<td>10 katha</td>
<td>10 katha to 3 bigha</td>
<td>5 katha to 10 katha</td>
<td>5 katha to 10 katha</td>
</tr>
<tr>
<td>The range of average land used by a farmer</td>
<td>10 katha to 1 bigha</td>
<td>1.5 bigha</td>
<td>5 to 7 bigha</td>
<td>10 katha</td>
<td>10 katha</td>
<td>50 to 55 trees</td>
<td>5 katha to 10 katha</td>
</tr>
</tbody>
</table>

(Here proportion of quality is based on especial size, colour, freshness, etc. For example, in the case of potato quality means especial size, for Lady’s Fingers the special size is 3 to 4 inches, etc.)

**Table: 6-Table of the average portion of quality products collected by the large traders in West Bengal in the year 2014 (Example-2)**

<table>
<thead>
<tr>
<th>Year</th>
<th>Crops (Vegetables)</th>
<th>2014</th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Bottle Gourd/Calabash</td>
<td>Cauliflower</td>
<td>Cabbage</td>
<td>String Beans</td>
<td>Mango</td>
<td>Turnip</td>
<td>Broad Beans</td>
</tr>
<tr>
<td></td>
<td>60%</td>
<td>80%</td>
<td>80%</td>
<td>20%</td>
<td>60%</td>
<td>87.5%</td>
<td>87.5%</td>
</tr>
<tr>
<td>The average proportion of quality products</td>
<td>10 katha to 1 bigha</td>
<td>1.5 bigha</td>
<td>10 katha to 7 bigha</td>
<td>10 katha to 12 katha</td>
<td>50 to 55 trees</td>
<td>5 katha to 10 katha</td>
<td>3 katha to 4 katha</td>
</tr>
</tbody>
</table>

<sup>10</sup>A katha (also spelled kattha or cottah) is a unit of area in Bangladesh and India approximately equal to 1/20 of a bigha(also formerly beegah) = 720 square feet and 1 Acre = 3 bigha.
(Here proportion of quality is based on especial size, colour, freshness, etc. For example, in case of potato quality means especial size, for Lady’s Fingers the special size is 3 to 4 inches, etc.)

Table: 7-Table of the average portion of quality products collected by the large traders in West Bengal in the year 2014 (Example-3)

<table>
<thead>
<tr>
<th>Year</th>
<th>Crops (Vegetables)</th>
<th>The average proportion of quality products</th>
<th>Range of low quality products</th>
<th>The range of average land used by a farmer</th>
</tr>
</thead>
<tbody>
<tr>
<td>2014</td>
<td>Bitter Gourd</td>
<td>85%-90%</td>
<td>10% to 15%</td>
<td>3 katha to 4 katha</td>
</tr>
</tbody>
</table>

(Here, proportion of quality is based on especial size, colour, freshness, etc. for example, in the case of potato quality means especial size, for Lady’s Fingers the special size is 3 to 4 inches, etc.)

Table 5 to 7 find that large firms are collecting with maintaining some quality norms. Third row of table 5 and 6 explain the percentage of quality proportion on total production for different vegetables. Table 7 also explain the same for Bitter Gourd. Fourth row of table 5 and 6 explain the land use for the production of different vegetables. Fifth column explains that for the Bitter Gourd. The land use data explain that the farmers are small in size.

We understand the original lineages of the need for the quality attributes in the previous section. Here, we have tried to identify the strategies adopted by the LT in setting prices of these high quality agricultural-food products in the retail market in India. Based on the field data we have found that the LT adopted non-linear pricing strategies. We have explained in detail below.

4.2 TYING AND BUNDLING STRATEGY AND PER UNIT PRICE BEHAVIOURS

Our former studies (Das, 2015a, 2015b, 2015d, 2016a, 2016b) we explain in detail about the nonlinear pricing strategies (including tying and bundling). The studies show that large traders do not offer agricultural commodities or food products at lower prices, but sell with non-linear pricing strategies. Moreover, from one of our present studies (2016c)11, we find that quantity discount is not independent and the quantity discount of agricultural food items is dependent on tying expenditure in food and non-food items. These strategies raise consumer expenditure. In addition, small retail traders still are in a good position in terms of ability to offer agricultural food products at a lower price than large retailers in the retail markets. Hence, it is observed that market interaction between the small and large retailers, and consumers with their rational behaviours ensure the existence of small retailers in the retail markets even when the large retailers are present. Nevertheless, the market shares of small retailers may decrease. But they will not exit from the market; they can remain in the markets even with their limited capacity.

5. ANALYTICAL FINDINGS AND CONCLUSION OF THE SURVEY

One of the prime targets of the government considering the new model APMC Act 2003 is to create an alternative opportunity for the small farmers, so that they can reach in the rural wholesale market by enhancing their bargaining power. Through our various interactions with the local small farmers and the LT we find that, the small farmers or the producers tended to reject the LT as an alternative buyer with good prices. The major causes are:

(i) The LT prefers to collect only quality products and rejects to accept non-standard merchandise. It is hard to sell the balance amount in the market bearing extra transportation cost. After selling only the quality products, farmers require to carry the unsold products to other appropriate markets to sell the balance amount.

(ii) The LT does not pay immediately to the producers. Only most of the farmers in West Bengal are

---

small sized (small in terms of land usage) in nature. They want to accept an immediate cash payment for their endurance.

(iii) Again the requirement from the LT is erratic in nature.

(iv) The actual purchases are not equal to the genuine quantity of quality products, actually coming to the marketplace, as the requirement for quality products are frequently depressed.

Here $W$ is the price per unit of average quality products in the rural wholesale market for fruits and vegetables. Actually, two new prices are available now in the rural wholesale market in India for the high quality fruits and vegetables, one, $P_{LT}$ is the price per unit for higher graded products that is paid by the LT to the small farmers (without using consolidator) and two, collection cost per unit of high quality products using consolidator, $P_{LTC}$ is not attracting the small farmers but $P_{LT}$ is attracting to the small traders (or consolidators).

In addition, $P_{LTC} > P_{LT}$, but LT is not ready to pay $P_{LTC}$ to the small farmers. Farmers are rejecting due to the above reasons. Therefore, ability to reduce wholesale price is lower by the LT. Thus, the mechanisms of direct collection from the farmers often fail owing to the high transaction cost (including extra transportation cost) involved for both the producers and the LT. Again the LT uses to depend on two other modes of collections: (i) collection through the local agents or ST or consolidators, who participate in the local markets and (ii) collect by directly taking part in the local wholesale market. It is set up that the LT depends heavily on the consolidators, because collection from the consolidator reduces the rejection of below standard products or in other words it confirms the high quality products. A consolidator or the ST can collect at a lowest possible transaction cost from the producers. Moreover, ST does the first level grading at a lower cost. By using the knowledge of the consolidator, the LT can diversify their risk of not having quality products and transaction cost. A consolidator can help to cut the transaction cost of farmers.

From our earlier study and findings, we have found that at the presence of the LT the condition to increase the rural wholesale prices of agricultural food products depends on certain conditions.

We find that, if the bargaining ability of small traders (i.e. ST) increases, then with the increasing bargaining power of the ST, the rural wholesale market price of the products will increase, provided the per unit selling prices of the high quality products to the LT are higher than the per unit selling prices in the rural wholesale market.

Mathematically, we can write the term needs to fulfil to make more with the increase in the relative bargaining power of the ST, in the bearing of the LT is

\[(i)\lambda \mu > \frac{W}{P_{LT}}, \text{ with } P_{LT} > W\]

Where, $\mu (0 \leq \mu \leq 1)$ is the portion of high quality products that LT prefers. The variable $\lambda$ is the actual portion of that the LT is ready to buy. $P_{LT}$ is the price per unit for high quality products paid by the LT to the farmers (without using consolidator) and $W$ is the price per unit that the rural wholesale market is ready to yield to the farmers for the average graded products.

The LT buys only a fraction of the total high quality products. Therefore, the condition can be written every bit,

“Actual proportion of high quality products purchase by the LT should be greater than the price ratio of medium quality and high quality products”.

---

The LT tries to formulate the strategy in such a manner so that this condition must fail. Then there will be a state of affairs where the small farmers will be able to sell the products to the consolidator. The ST works as a consolidator and sells high quality products to the LT. To obey the condition as \( \lambda \mu < \frac{W}{P_{LT}} \), the only variable that the LT can alter is \( P_{LT} \). \( \lambda, \mu \) are exogenous of control. In this paper we study a model of vertical restraints in the case of India considering multilayer of fixed costs and monopoly power of the small as well as large traders in the vertical structure. We are also interested to find the conditions of small farmer’s gain and possible strategy impacts in the cost of cultivation and consumer expenditure. Thereafter, we consider a partial analysis.

It is clear from our study that the bearing of the LT divides the wholesale as well as retail markets into two divisions; one of the average quality products and second for the high quality products. This is because the LT applies “Blue Ocean Strategy”. They require creating fresh demand in an uncontested market space, or a “Blue Ocean”, rather than competing head-to-head with other suppliers in an existing industry. It is likewise clear that the comportment of the LT in the rural wholesale market influences the wholesale prices positively and reduces inconsistencies. Further presence of two important new variables viz. “Consolidator’s margin” and ‘Grading cost” again raises the collection cost of the high quality products by the LT. “Consolidator’s margin” and ‘Grading cost” affect positively to the rural wholesale prices of average quality agricultural food commodities. Retail prices of high quality and average quality products are positively associated to two variables viz. “Consolidator’s margin” and ‘Grading cost” per unit of high quality products. These are the grounds why the non-linear pricing strategies are used in the retail markets. So the situation actually ensures the existence of the small retailers in the retail marketplace.

From our study, it is clear that large traders do not offer agricultural food products at lower prices, but sell with non-linear pricing strategies. Large number literatures have found that a relationship exists between product quality and nonlinearity in pricing. The “Quantity discount” is available at the LT store if the consumer spends a certain amount of that commodity or other commodities. This means “Quantity discount” is not independent and the quantity discount on agricultural food products is dependent on tying expenditure in food and/or non-food items. This behaviour raises consumer expenditure. This means large retailers are selling to a section of the consumer group, who are able to spend more to get quantity discount leaving the rest market share for the small retailers. In addition, small retail traders still are in a good position in terms of ability to offer agricultural food products at a lower price than large retailers in the retail markets.

Considering the model of vertical restraints the policies were intended to create competition among the traders in the rural wholesale market that will help to gain more to the small farmers. We find that due to the preference of high quality products by the LT, small farmers are unable to bear the extra fixed costs need to incur for grading. We have identified multilayers of fixed costs are there in between small farmers and the large retail store. Therefore, these fixed costs create market imperfect for both; the high quality products and the average quality products in the rural wholesale market. More important fact is that, now to carry average quality products to the rural wholesale market fixed cost becomes three times more than before when LT was not present for the same quantity of agricultural commodities. Therefore, rural wholesale market price becomes more sticky. We find this in our empirical study.

6. POLICY IMPLICATION

Policies are needed to encourage competition among the large traders. If it happens then the quality constraints will reduce to some extent. This will actually create a higher support price for the fruits and vegetables in the rural wholesale market (i.e. mandi). The mean price will also increase with lower inconsistency.

The most significant thing is that, policies are required to reach in the equilibrium, so that revenue by selling only high quality products is equal to the revenue by selling total products in the rural wholesale market. If it happens then the large traders will be a perfect substitute of the rural wholesale market.
Two factors are significant, one extra transportation costs and two, there must be a market for the non-graded products after selling high quality products to the large traders.
Policies are needed to encourage business of aggregation or consolidation, which will collect directly from the small farmers without grading and sell the products to two different market forms. So that the transaction cost can be minimized and both the players can stay in the market with their own competitive strength. The consolidators can reduce the extra transportation cost. Moreover, consolidators can act as a link between small farmers and the large traders and also, between small farmers and non-graded products market.

MATHMATICAl APPENDIX
Appendix (A): Maximization problem when F bargains for $P_{LT}$ with the LT,
The net utility function of F when bargains with LT,
$$U_f = \{ P_{LT} \lambda \mu q + \pi (1 - \lambda \mu) q W - T_{(1 - \lambda \mu)} - Wq \}$$
The net utility function of LT, $U_{LT} = \{ R_L (\lambda \mu q ) - P_{LT} \lambda \mu q \}$
Now maximization problem when F bargains for $P_{LT}$ with the LT,
$$\max_{P_{LT}} \{ P_{LT} \lambda \mu q + \pi (1 - \lambda \mu) Wq - T_{(1 - \lambda \mu)} - Wq \}^\omega \{ R_L (\lambda \mu q ) - P_{LT} \lambda \mu q \}$$
$$\text{or}, \ P_{LT} \lambda \mu q = Wq [1 - \pi (1 - \lambda \mu)] + T_{(1 - \lambda \mu)} + \frac{\rho}{\omega + \rho} \{ R_L (\lambda \mu q ) - P_{LT} \lambda \mu q \}$$
From equation (2) we have price equation,
$$\text{Or}, \ P_{LT} = \frac{\omega}{(\omega + \rho)} \{ W (1 - \pi (1 - \lambda \mu)) + T_{(1 - \lambda \mu)} \lambda \mu q \} + \frac{\rho}{\omega + \rho} \frac{R_L (\lambda \mu q )}{\lambda \mu q}$$
$$\text{Or}, \ P_{LT} = \frac{W (1 - \pi (1 - \lambda \mu)) + T_{(1 - \lambda \mu)} \lambda \mu q}{\lambda \mu q} + \frac{\rho}{\omega + \rho} P_{KL}$$
Appendix (B): Comparative static analysis with respect to the price equation (3):
Let $Z = P_{LT} \lambda \mu q (\omega + \rho) - \omega Wq (1 - \pi (1 - \lambda \mu)) + T_{(1 - \lambda \mu)} - \rho R_L (\lambda \mu q ) = 0$
$$(v) \frac{\partial P_{LT}}{\partial \pi} = - \frac{\partial}{\partial \pi} P_{LT} = - \frac{Wq (1 - \pi (1 - \lambda \mu))}{\lambda \mu q (\omega + \rho)} - \frac{\omega}{\omega + \rho} \frac{W (1 - \pi (1 - \lambda \mu))}{\lambda \mu q (\omega + \rho)}$$
$$(vi) \frac{\partial P_{LT}}{\partial \omega} = - \frac{\partial}{\partial \omega} P_{LT} = - \frac{Wq (1 - \pi (1 - \lambda \mu))}{\lambda \mu q (\omega + \rho)} - \frac{\omega}{\omega + \rho} \frac{W (1 - \pi (1 - \lambda \mu))}{\lambda \mu q (\omega + \rho)}$$
\[ P_{LT}(\omega + \rho) - \omega \frac{W}{\lambda \mu} \{1 - \pi (1 - \lambda \mu)\} + \frac{T_{(1-\lambda \mu)}}{\lambda \mu q} \geq 0 \]
\[
\frac{\partial P_{LT}}{\partial \mu} = -\frac{\omega W}{\lambda \mu} \left( \frac{\omega W}{\lambda \mu} + \frac{\omega T}{\omega + \rho} \right) > 0 \text{if } \pi > \frac{Wq + T(1-\lambda \mu)}{Wq}
\] (8)

Where, \( P_{RL} = \frac{R_L(\lambda \mu q)}{\lambda \mu q} \), is the per unit selling price in the retail market by the LT, \( \mu \) (0 \( \leq \mu \leq 1 \)) and (1-\( \mu \)) denote the proportion of high quality products and low quality products respectively, \( \lambda \) is the actual portion of \( \mu \) which the LT is ready to buy, \( \pi \) is the probability that the rest (1-\( \lambda \mu \)) portion will be sold at the prevailing price, \( T(1-\lambda \mu) \) is the further constant transportation cost incurred to sell rest (1-\( \lambda \mu \)) portion, \( P_{LT} \) is the price for higher quality products that the LT is ready to pay and \( W \) is the price that the market is ready to pay to the farmer for the average quality products. The farmer does not know how the LT grades the products, so they expect \( P_{LT} \) prices for high quality products and \( W \) prices for average quality products. \( Wq \) is the opportunity cost (or loss) to the farmer, in that sense if LT was not in the market, then F could get revenue at most \( Wq \) from the ST. \( P_{LT} \lambda \mu q \), is the total receipt by selling a \( \lambda \) portion of the highly graded products \( \mu q \). Here, one thing is important to tell, that the farmer does not know at the time of first interaction with LT that after selling \( \lambda \mu \) portion of quality produce to LT the rest (1-\( \lambda \mu \)) portion will be unsold, or price for low graded produce is much less than \( W \) or in some cases less than the cost of production and \( P_{LT} > W \).

\( R_L(\lambda \mu q) \), denotes the revenue of the LT firm and depends on (\( \lambda \mu q \)) and is based on the global price. From Equation (3) we can say that, after the first interaction of F with LT they come to know that F can sell to the LT, only quality portion and after selling only quality portion to them left will be unsold. This is the reason \( \{ Wq \} \) come into existence with factor \( \{ 1-\pi(1-\lambda \mu) \} \). This mean in the first interaction F was not informed that LT would buy only high quality portion of the products, and now after getting information in the next interaction F now bargain with LT keeping in mind the forgone opportunity from ST i.e. the utility for the portion of loss in revenue \( Wq(1-\lambda \mu) \) due to not having quality products and the extra transaction cost i.e. \( T(1-\lambda \mu) \). In reality the Equation is \( P_{LT} \lambda \mu q < Wq[1-\pi(1-\lambda \mu)] + T(1-\lambda \mu) + \frac{\rho}{\omega} \{ R_L(\lambda \mu q) - P_{LT} \lambda \mu q \} \). Alternatively, ST prefers average quality and pay market average price \( W \). This is the reason; F does not prefer to sell to LT. Here the theory of the role of risk-aversion plays an important role in the bargaining process. If Player 2 (here, Farmers) becomes more risk-averse, then Player 1’s (here, LT) share in the Nash solution increases. If Player 2 is more risk-averse than Player 1, then Player 1’s share in the Nash solution exceeds 50 per cent(Osborne and Rubinstein, 2005). LT is more risk-taker than F, because they are able to maintain a quality constraints, which is absent in the mandi. The actual or real interaction is still happening with ST because ST prefers without maintaining any such quality constraints. This will be clear with the help of the following analysis.

Appendix (C): Maximization problem when F bargains with the ST for \( W \), in presence of LT in the rural wholesale market

Let the net utility functions of the F, ST given below:

The net utility function of F when bargains with ST, 
\[ U'_F = \{ Wq - P_{LT} \lambda \mu q \} \]
The net utility function of ST, \( U_S = \{ R_S(q) - Wq \} \)

Where, \( P_{rs} = \frac{R_S(q)}{q} \), is per unit selling price by the ST and Moreover \( R_S(q) \), denotes the revenue of the ST firm and depends on \( q \). Here, we set, \( \rho = \) the relative bargaining power of the farmer, \( \varepsilon = \) the relative bargaining power of ST. When just the farmer (F) and ST are in the market, then \( \rho + (1-\rho) = 1 \), where, \( (1-\rho) = \varepsilon \). Here, \( \mu \ (0 \leq \mu \leq 1) \) is the portion of high quality products which LT prefers, \( \lambda \) is the actual portion of \( \mu \) which the LT is ready to buy, \( P_{LT} \) is the price per unit for higher graded produce paid by the LT to the farmers (without using consolidator) and \( W \) is the price that the rural wholesale market is ready to pay to the farmers for the average quality products per unit in the rural wholesale markets.

And maximization problem when F bargain with the ST for \( W \).

\[
\max_w \{ Wq - p_{LT} \lambda \mu q \}^{\varepsilon} \{ R_S(q) - Wq \}^\varepsilon
\]

or, \( \frac{\rho \{ Wq - p_{LT} \lambda \mu q \}^{\varepsilon-1}}{\{ Wq - p_{LT} \lambda \mu q \}^\varepsilon} = \frac{\varepsilon \{ R_S(q) - Wq \}^{\varepsilon-1}}{\{ R_S(q) - Wq \}^\varepsilon} \)

\[
W = \frac{\varepsilon}{\rho + \varepsilon} \{ P_{LT} \lambda \mu + \frac{\rho}{\varepsilon} \{ p_{rs} \} \}
\]

Where, \( P_{rs} = \frac{R_S(q)}{q} \), is per unit selling price by the SCT and Moreover \( R_S(q) \), denotes the revenue of the SCT firm and depends on \( q \).

Appendix (D): Comparative static analysis with respect to the price equation (2):

Let, \( Z = Wq - p_{LT} \lambda \mu q - \frac{\rho}{\varepsilon} \{ R_S(q) - Wq \} = 0 \)

\[
(i) \quad \frac{\partial W}{\partial \mu} = -f_w = -p_{LT} \lambda q \frac{\rho + \varepsilon}{q(\rho + \varepsilon)} = \frac{p_{LT} \lambda q}{q(\rho + \varepsilon)} = \frac{p_{LT} \lambda}{q(\rho + \varepsilon)}
\]

\[
\therefore \frac{\partial W}{\partial \mu} = \frac{\varepsilon \lambda}{\rho + \varepsilon} P_{LT} > 0 \quad \text{-----------------------}(4)
\]

\[
(ii) \quad \frac{\partial W}{\partial \rho} = -f_w = -p_{LT} \lambda q \frac{\rho + \varepsilon}{q(\rho + \varepsilon)} = \frac{R_S(q) - Wq}{q(\rho + \varepsilon)} = \frac{R_S(q) - Wq}{q(\rho + \varepsilon)}
\]

\[
\therefore \frac{\partial W}{\partial \rho} = \frac{p_{rs} - W}{\rho + \varepsilon} > 0 \quad \text{-----------------------}(5)
\]
Where, 
\[ P_{s} = \frac{R_{s}}{q} \text{ Or, } R_{s} = P_{s} q \]

\[
(iii) \frac{\partial W}{\partial \lambda} = \frac{f_{s}}{f_{w}} = \frac{-P_{LT} \mu q}{q + \frac{\rho}{\varepsilon} q} = \frac{P_{LT} \mu q}{q(1 + \frac{\rho}{\varepsilon})} = \frac{P_{LT} \mu}{(\rho + \varepsilon)}
\]

\[
\therefore \frac{\partial W}{\partial \lambda} = \frac{\varepsilon \mu}{\rho + \varepsilon} P_{LT} > 0 \quad \text{-----------------------------------(6)}
\]

Let, 
\[ Z = Wq - P_{LT} \lambda \mu q - \frac{\rho}{\varepsilon} \{ R_{s} (q) - Wq \} = 0 \]

Or, 
\[ Z - \varepsilon Wq - \frac{\rho}{\varepsilon} P_{LT} \lambda \mu q - \rho \{ R_{s} (q) - Wq \} = 0 \]

\[
(iv) \frac{\partial W}{\partial \varepsilon} = \frac{f_{s}}{f_{w}} = \frac{-Wq - P_{LT} \lambda \mu q}{q \varepsilon + q \rho} = \frac{q(W - P_{LT} \lambda \mu)}{q(\rho + \varepsilon)} = \frac{(W - P_{LT} \lambda \mu)}{(\rho + \varepsilon)}
\]

\[
\therefore \frac{\partial W}{\partial \varepsilon} = \frac{(W - P_{LT} \lambda \mu)}{(\rho + \varepsilon)} \quad \text{-----------------------------------(7)}
\]

\[
\frac{\partial W}{\partial \varepsilon} > 0, \text{ when } \lambda \mu > \frac{W}{P_{LT}}, \text{ with } P_{LT} > W
\]

From Equation (7), we can say that the farmers to get greater benefit with the change in \( \varepsilon \), the term \( \frac{\partial W}{\partial \varepsilon} \) must be greater than zero, i.e.

\[
\frac{\partial W}{\partial \varepsilon} \neq 0. \text{ From Equation (7) it is clear that the sign of } \frac{\partial W}{\partial \varepsilon} \text{ is dependent on the sign of } W - P_{LT} \lambda \mu.
\]

The different possible conditions are:

**Condition (i):**

When \( W - P_{LT} \lambda \mu = 0 \) & \( \frac{\partial W}{\partial \varepsilon} = 0 \)

Then, \( W - P_{LT} \lambda \mu = 0 \), Or, \( \frac{W}{P_{LT}} = \lambda \mu \) (As, \( \lambda, \mu = 1 \))

**Condition (ii):**

When \( W - P_{LT} \lambda \mu > 0 \) & \( \frac{\partial W}{\partial \varepsilon} < 0 \)

Then, \( W - P_{LT} \lambda \mu > 0 \), Or, \( \frac{W}{P_{LT}} > \lambda \mu \) (As, \( 0 < \lambda, \mu < 1 \))

**Condition (iii):**

When \( W - P_{LT} \lambda \mu < 0 \) & \( \frac{\partial W}{\partial \varepsilon} > 0 \)

Then, \( W - P_{LT} \lambda \mu < 0 \), Or, \( \frac{W}{P_{LT}} < \lambda \mu \) (As, \( 0 < \lambda, \mu < 1 \))
Hence, we can reason out that the producer could not lose under conditions (i) and (iii), as summarised below:

\[ \frac{\partial W}{\partial \varepsilon} \geq 0, \text{ when } \lambda \mu \geq \frac{W}{P_{LT}}, \text{ with } P_{LT} > W \]

It is also clear that, if LT buys a higher quantity then, wholesale market price, i.e. \( W \) will increase. Therefore, it is clear that, when \( \mu \) and \( \lambda \) both are increasing then \( W \) will increase but \( P_{LT} \) will decrease. This is the reason why farmers prefer to trade in the rural wholesale market and avoid spending more on transportation cost.

REFERENCES


Commodities in Indonesia, International Food Policy Research Institute.


