

# Marketing Institutions and Food Price Volatility in Developing Countries: **Assessment of Competition in Sugar Market of Bangladesh**

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## **1. Introduction**

An increase in food prices and their volatility causes a substantial welfare loss for consumers whose budgets are dominated by food expenditure. The poorest in developing countries are likely to have been affected the most by high food prices and their volatility because they spend almost three quarters of their income on staple foods (Preckel, Cranfield and Hertel, 2007). The share of food in total expenditure is around 65% for the low income groups in Dhaka city while it is about 82% for the same groups in rural areas of Bangladesh (Raihan and Haque, 2007). Given the sheer dominance of food in the total expenditure of low income groups, it is necessary to work on the periodic upward spirals and persistent downward rigidity of the prices of essential commodities such as rice, potato, sugar, edible oil and so on. These prices are alleged to adjust quickly to an increase in world price, but not to show agility when adjusting to a decrease in world price. There seems to be a failure of inter-temporal arbitrage in Bangladesh, as prices increase substantially during the month of Ramadan every year.

Collusion in some layers of the supply chain and the resulting market power is believed to be responsible for such asymmetric price response, failure in inter-temporal arbitrage and other apparent price anomalies. Believing in such claims, the government of Bangladesh has banned delivery order (DO) layers for some of the essentials' supply chains alleging that speculative behavior in the DO market is the main culprit to price volatility in these markets. However, there are plausible alternative explanations based on non-collusive behavior for the observed price patterns. For example, bottlenecks in storage or transportation may also explain coexistence of upward price flexibility and downward price rigidity. We need to test the competing explanations to understand the price volatility for each of the essential commodities. Thus, exploring the market structure of essentials will be useful for policy making in Bangladesh and in other developing countries.

### **1.1 Literature review**

There are numerous investigative studies on this issue in the other countries. Whereas, there has only been few of such systematic efforts in Bangladesh; looking into the market structure and the competition issues for a commodity whose supply is almost entirely import-determined. Recently, **Helal and Taslim** (2010) assess competition in edible oil sector in Bangladesh. They have found concentration in the upper echelon of the supply chain, but no conclusive evidence in support of collusive behavior in any of the layers of the edible oil supply chain. In the context of Bangladesh, the recent trend in the price of soybean oil is also instructive. The domestic price of soybean oil increased during 2007 till the middle of 2008 in tandem with the increasing world market price for crude Soybean. But when the world price started to decline from August 2008, for about six months, the domestic price did not respond, the gap between the world price and domestic price increased substantially as a result (**Helal and Taslim**, 2010).

The Centre for Policy Dialogue (CPD) undertook a diagnostic study to find out the causes of the recent food inflation. It also provided recommendations for addressing the problem. The CPD study considered several factors such as increased production costs of commodities produced in Bangladesh, market concentration, collusion of market agents (both at importer and wholesaler level), a large number of market intermediaries, dislocation in the market due to the recent anti-corruption drive, relatively high costs of doing business and finally, inflationary expectations originating from the existing inflationary trends as responsible for the rise in essentials' prices. The CPD study attempted to trace the supply chain of different essential commodities as well as the market intermediaries who were assumed to play an important role in causing price inflation. The study asserted collusive behavior and syndication by importers even though it had no credible evidence of such behavior among the concerned firms.

The CPD study claimed collusive behavior on the basis of the small number of importers who operated in the essential commodities market of Bangladesh. It included all the agents in the market that were involved at various stages of supply chain; beginning from the importer/producer level and ending with the final consumers. It investigated the markets for several essential commodities, but it did not delve into the competition issues for any essential commodity market. The conclusions were mere assertions rather than derivation from credible evidence or data. To examine the more recent developments, **Rahman et al** of CPD conducted another study in 2008, as a follow-up of the aforesaid diagnostic study. This study traced more recent trends in aggregate inflation levels and analyzed movements in price levels of a number of essential food items.

A large number of studies have been performed on the food grain especially on rice which is almost entirely locally produced. Several studies have been performed on the effectiveness of rice procure by the government of Bangladesh (**Ali**, 2010; **Islam and Thomas**, 1996; **Ahmed and Bernard**, 1989). According to these studies, procurement tends to benefit the financially well-off farmers who have storage capacity. There are several other studies on rice which focused on rice market integration in Bangladesh (**Goletti, et al** 1995; **Goletti**, 1994). The studies conclude that the rice market in Bangladesh is integrated. Only a very few studies attempt to discuss the structure, conduct and performance of rice market in Bangladesh in a limited scope (**Naser and Rahman**, 2002; **Chowdhury**, 1992). Lack of competition in the rice market is asserted in these studies. However, to the best of my knowledge there is no systematic study relating the supply chain of a commodity beyond rice in Bangladesh.

## **1.2 Objective and Scope of the Study**

The objective of this study is to gather evidence on the nature of marketing institutions for sugar and to learn and assemble the relevant facts regarding this supply chain. We have chosen the sugar market because it is widely regarded as non-competitive. To assess competitiveness of the sugar sector of Bangladesh, it is necessary to identify the relevant markets in this sector, their structures and the way they are operating. It is also important to analyze the role of the various stakeholders involved in the entire production and marketing chain of sugar and thereby point toward policies that may effectively tackle the problem of anti-competitive practices, if any. The study looks into the relationship between prices and costs at different layers to see whether rising costs and capacity constraints of refiners and wholesalers can explain rising gaps between raw sugar prices and refined sugar prices when they arise. In case

of unexplainable rise in mark-ups in any of the layers, which cannot be explained by rising costs, the study assesses competition at that layer of the sugar supply chain.

The specific objectives of the study are to:

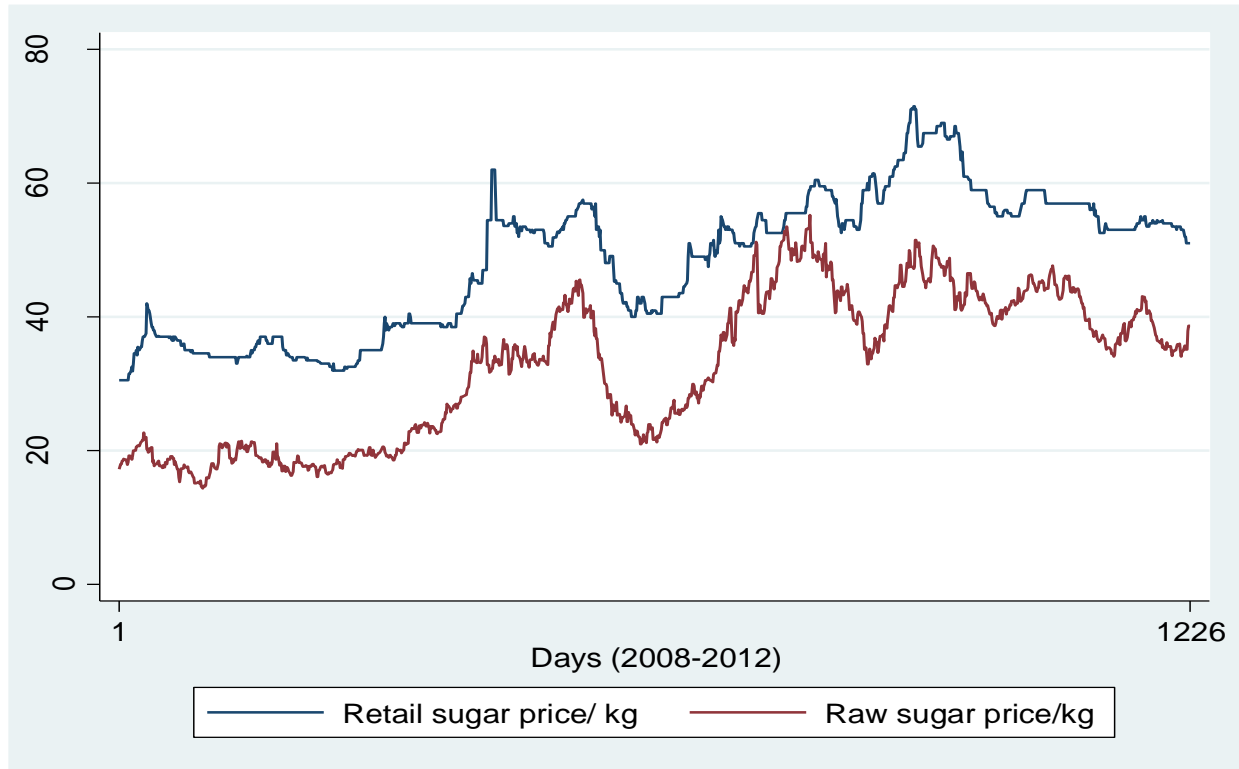
- Identify the entire supply chain of refined sugar
- Identify the role of the various stakeholders involved in the supply chain
- Explore the market structure of the industry and the factors behind
- Identify any anti-competitive practices in the supply chain that affect the final price formation
- Understand to what extent the sugar market is competitive,
- Assess alternative explanation of price volatility
- Identify factors which are important in the formation of final price paid by the consumers
- Recommend policies to enhance competition in this sector

Despite being a case study, the research should provide us a basis for informed policy making in Bangladesh food market. This will serve as a background work for other extensive studies in relevant sectors.

## **2. The Supply Chain of Sugar in Bangladesh**

It is obvious from graph 1 presented below that the retail prices of sugar exhibit periodic upward spirals. These prices seemed to adjust quickly to an increase in world prices, but not falling fast when adjusting to a decrease in world price. To understand this price volatility and to explain the asymmetric transmission of raw sugar prices into the domestic market, we need to explore the structure of the sugar industry in Bangladesh.

### **Graph 1: Movement of Raw and Retail sugar prices**



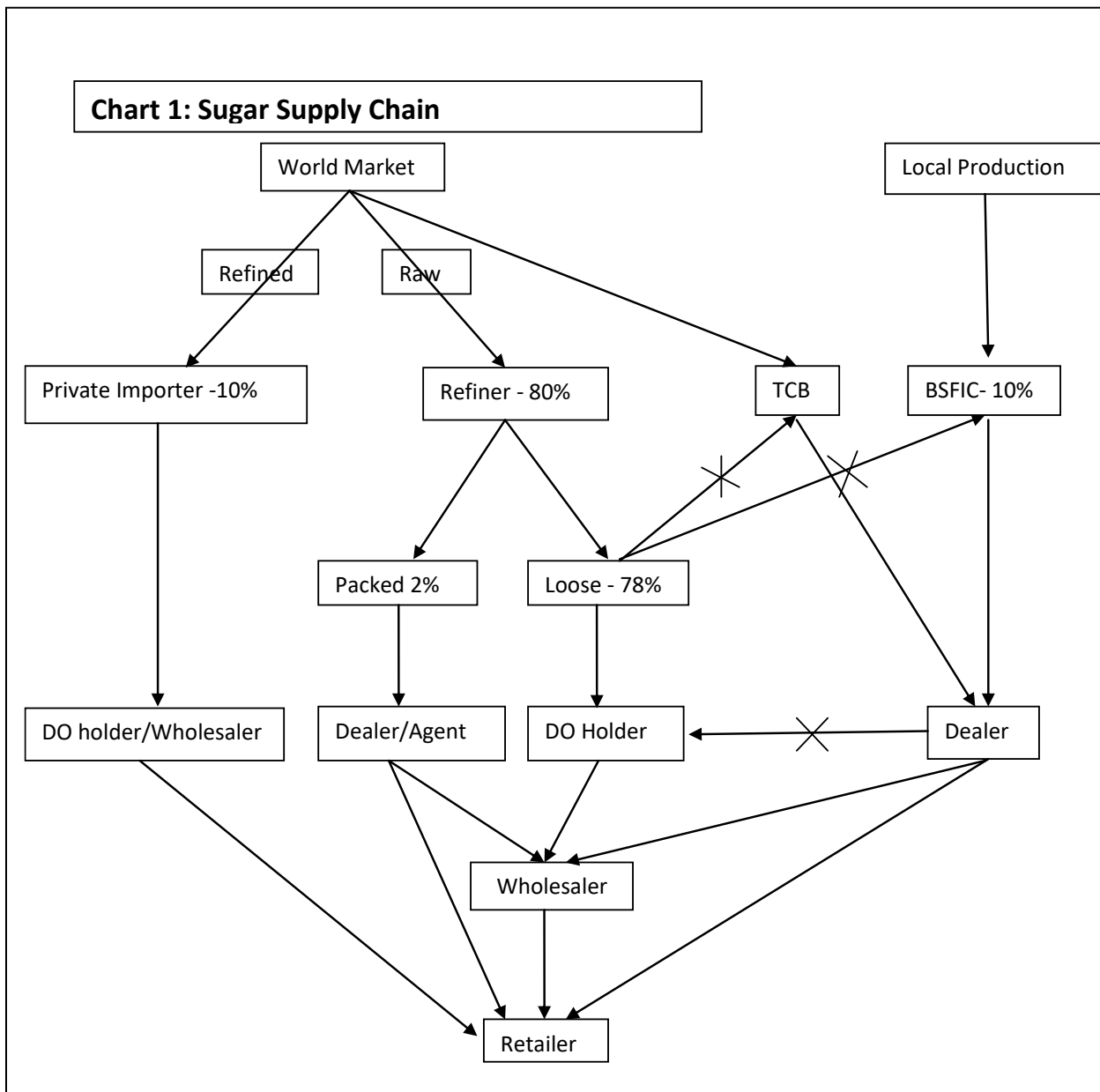
Before we start analyzing the structure of the industry, it will be helpful to describe the network among different market agents in Bangladesh sugar industry. Once the network or the supply chain is identified we can quantify mark-ups in different layers of the sugar supply chain and assess noncompetitive practices, if any. It is important to note that refined sugar is used in pharmaceutical and other industries beyond household consumption. The focus of this study is refined sugar consumed by households.

There are two key sources at the top layer who bring sugar in Bangladesh mainly from global market. They are private sector sugar refiners and importers of refined sugar. The private sector sugar refiners import raw sugar and then refine them. Private importers import refined sugar directly from the global market. Besides, Bangladesh Sugar and Food Industries Corporation (BSFIC) produces sugar from domestically produced sugarcane. BSFIC imports refined sugar from the world market when it seems to run low on supply. Trading Corporation of Bangladesh (TCB) also tries to import refined sugar from the world market. Currently, refiners serve about 80% of the total market demand for refined sugar. The BSFIC meets around 10% of the total demand by its own production whereas importers of refined sugar meet the remaining 10%. However, often the share of refined sugar supplied by refiners goes up when the share of sugar from other sources fall.

The segment of sugar supply chain tracing the route of raw sugar comprises several actors: refiners (who are also the raw sugar importers), DO holders, wholesalers and retailers. A DO is a delivery order issued by the refiner with the quantity of sugar specified on it. As depicted in the Chart, refiners are at the top of the loose sugar supply chain. They import raw sugar, refine them

and then market them in sacks and packs. The refiners distribute sugar through the following two channels:

(1) The refiners sell a document/contract, which is the DO, to the traders. Thereby, they do not exchange sugar physically, but a piece of paper saying they are selling a certain amount of sugar to the traders. These traders are locally known as DO holders. The DO holders sell these DOs to the wholesalers or groups of wholesalers. The wholesalers obtain sugar from the refinery and carry it by trucks. The wholesalers sell sugar to retailers who then sell it to the final consumers. However, a wholesaler can also buy a DO from a refiner directly. Widespread lateral transactions among these DO holders are also in place.



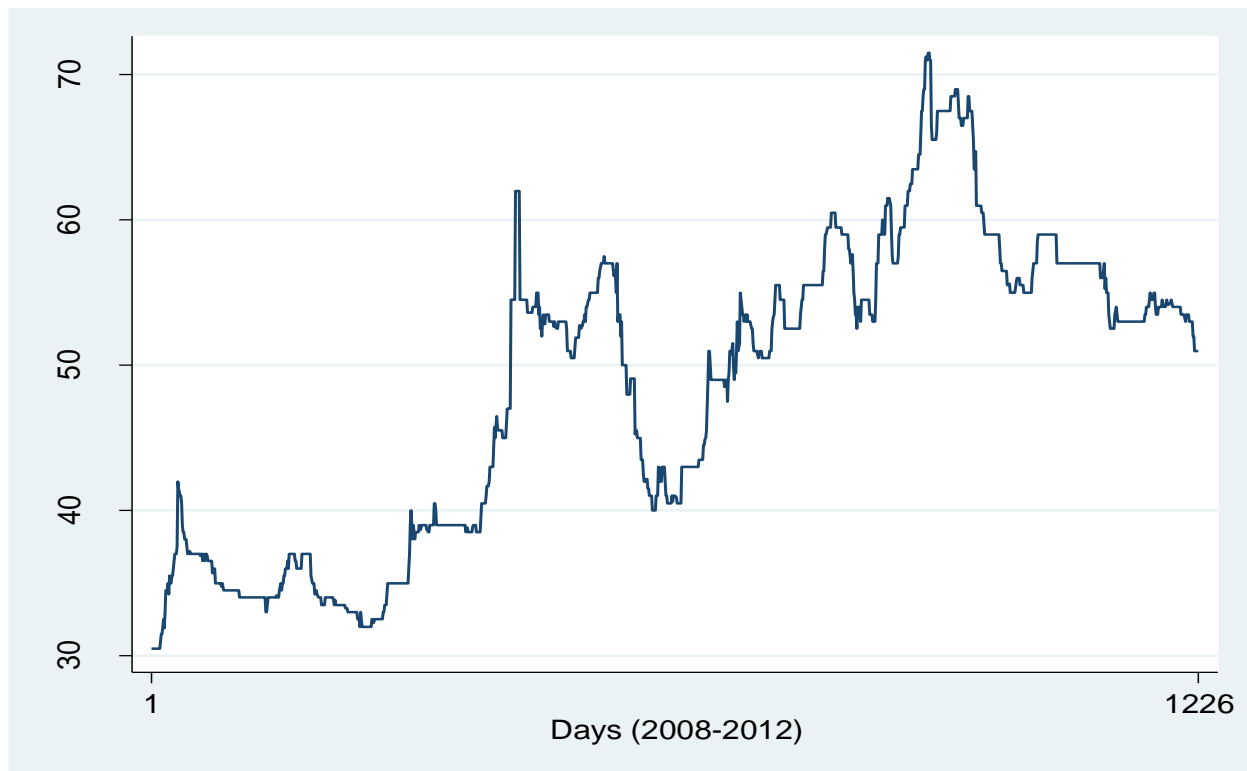
### 3. Retail layer

The government agencies have undertaken different regulatory policies to curb “extraordinary” profits by retailers and wholesalers of essentials such as sugar. One of the policies was to regulate gross margins charged by them. Among other policies, forcing retailers and wholesalers to post their price lists everyday was notable. The purpose of all these policies was to stabilize the prices of essentials to ease middle class lives. But the question to ask is if the undertaken policies were warranted. The noncompetitive price behavior is not expected from the retailers due to their sheer large number.

#### 3.1 Relationship between retail and wholesale prices

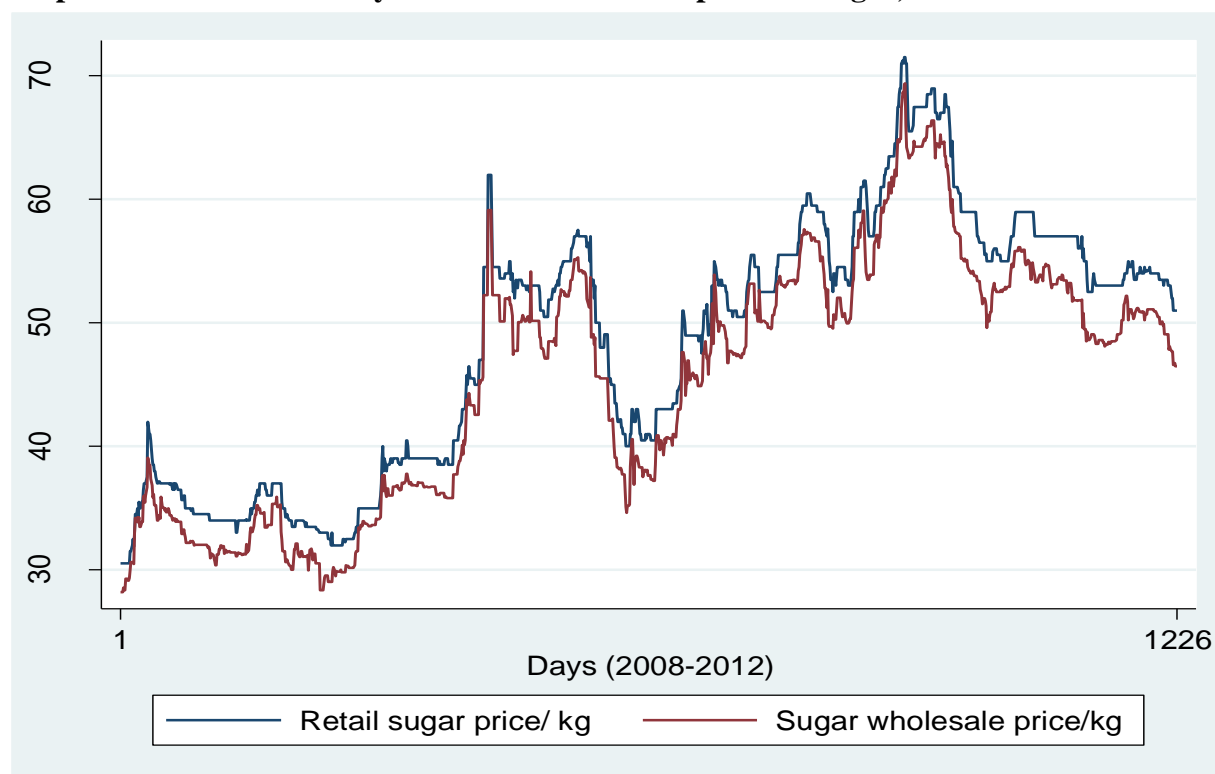
There is a huge variation in prices of sugar at retail level (Graph 2). Are these variations created by retailers or transmitted from wholesale level? If these variations come from wholesale prices then we need to focus on wholesale or upper layers to analyze these variations. It is obvious from the co-movement of daily retail prices and daily wholesale prices of sugar, as depicted in graph 3, that the retail price variations have their origin in wholesale price variations. The two prices are seen to always move together and they are found co-integrated at the 1% significance level. Transmission of wholesale prices in retail level is expected in a competitive market environment.

**Graph 2: Movement of daily retail prices of sugar, 2008-12**



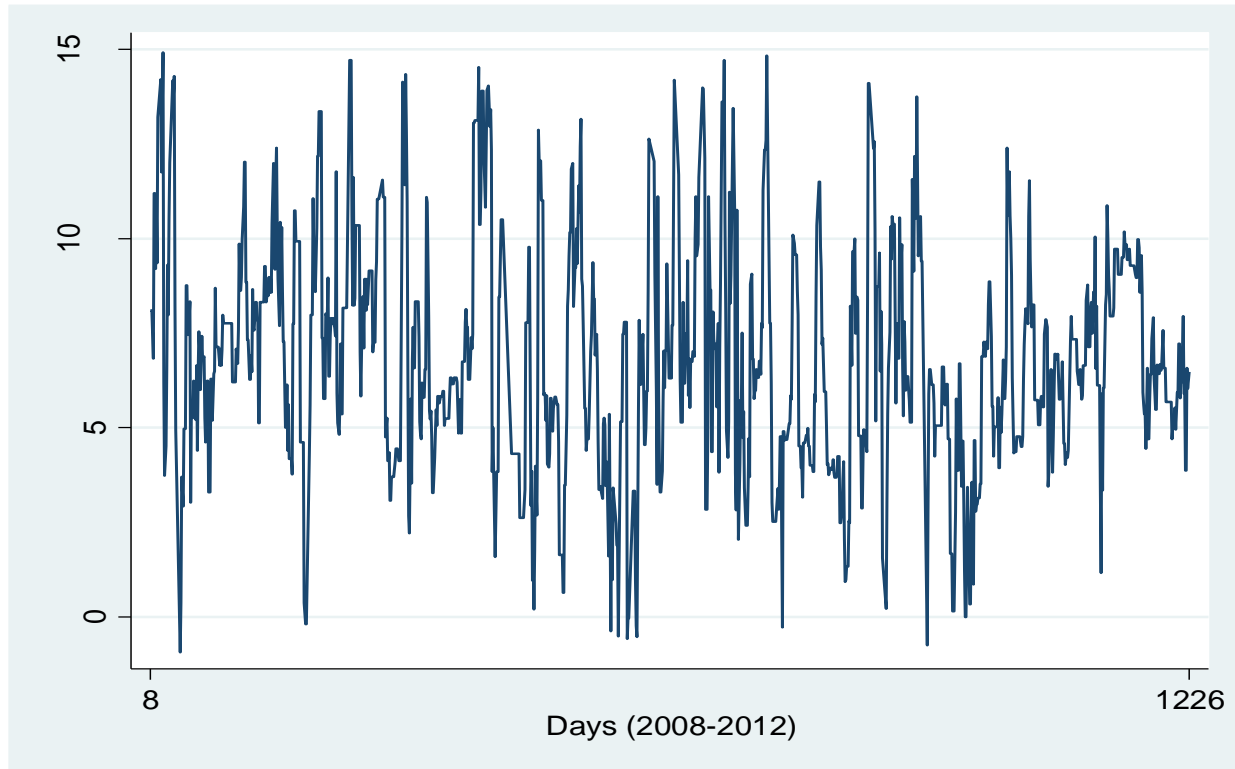
Since they are co-integrated, we need to look into the nature of transmission in detail. Is there any significant change in the mark-ups or spreads of retail and wholesale prices during certain period (such as Ramadan) suspected as collusive?

**Graph 3: Movement of daily Retail and Wholesale prices of sugar, 2008-12**



These retailers often sell edible oil at their stores too. The average mark-up for soybean oil received by the retailers over the wholesale price for the last five years is 4.8%. It is well below the average mark-up in sugar retailing. Mixing palm oil with soybean might be the reason for this lower mark-up in case of soybean oil. Actual mark-up is likely to be higher than what is estimated here, once mixing is considered. It is also well below the maximum limit of 10%, set by the Government before last Ramadan. There are only 8 instances of greater than 10% mark-up, none of which occurred during any of the Ramadan months.

**Graph 4: Gross mark-up of retailers over wholesale prices of sugar, 2008-12**



The average estimated (gross) mark-up received by the retailers over the wholesale prices for the last five years is 6.9% (Graph 4). On an average, retailers hold sugar in their store for a week before selling them to customers. Therefore, a 7 days' lagged price of wholesale layer is used in case of calculating margins here. The story of maximum 10% profit is binding only in case of 209 days out of total 1219 days. Only 20 of which were observed during any of the Ramadan, with 8 of them being within 2 weeks before Ramadan. The hypothesis of equal mark-ups across Ramadan and non Ramadan periods could not be rejected even at the 5% significance level.

### 3.2 Asymmetry in retail price transmission

An asymmetry in wholesale price transmission appears to exist in the retail prices of sugar. For the phase of increasing wholesale prices, the average spread was 8.1% whereas the spread was 6.3% for the phase of falling wholesale prices. For unchanged wholesale prices the spread was 6.9%. The average mark-up is different for the falling and rising phase of wholesale prices. This asymmetry in price transmission has been on the media focus for the last couple of years. This is not a statistical aberration at all.

When a retailer observes a decrease in wholesale price he sells sugar at a lower price than the previous day. If a retailer tries to charge the same price regardless, he would have to compete with the ones who will be charging a lower price on that day expecting lower retail price due to decrease in wholesale price. Thus, every retailer sells sugar at a lower price even though everyone's cost (i.e., purchase price) remains the same. As a result, their margin falls. When they observe rise in wholesale prices they increase their retail prices on the expectation that rising wholesale prices will push retail prices up soon despite their purchase price being the same. So this asymmetry in price transmission is logical and driven by profit maximizing behavior.



However, sugar prices did not show the extreme downward rigidity as claimed by many including the media. That is, the claim that once go up prices do not go down is not true for sugar. Persistent high prices of sugar during Ramadan were not also evident either.

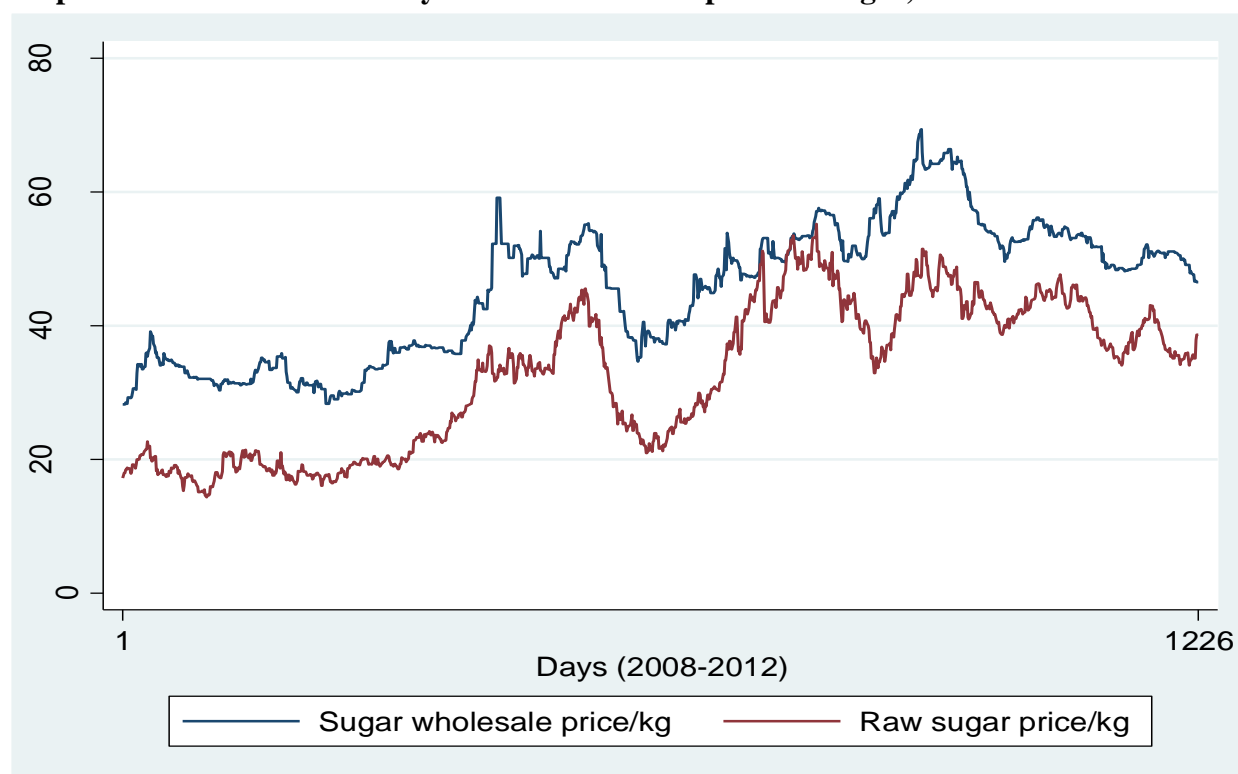
#### 4. Wholesale Layer

As described in earlier section, retail prices were found to follow wholesale prices very closely, eliminating any major wrongdoing by the retailers. We need to assess the nature and extent of transmission of DO prices into the wholesale layer. For this purpose, we need to know the purchase prices of the wholesalers. That is, we need to know the prices charged by DO holders. Information on the prices charged by the DO holders is not available. This missing data restricts us from analyzing the wholesale pricing behavior considerably.

##### 4.1 Price transmission in wholesale layer

Even though we cannot look into the transmission of prices from DO holders to wholesalers still we can look at the movement of the wholesale prices and raw sugar prices to conclude about the transmission of raw sugar prices into wholesale prices. It is obvious from graph 5 that the two price series (raw sugar prices and wholesale prices) are not showing a fitting close to what was observed between retail and wholesale price series. There is still co-integration between the series but not at the extent which was observed in the retail layer.

**Graph 5: Co-movement of daily raw and wholesale prices of sugar, 2008-12**



Thus, we cannot conclude about the behavior of wholesalers as well as all other players operating in the upper layers of the chain. Since transmission is not smooth then we will not be able to conclude about this wholesale layer. But still, it is hard to believe any kind of

noncompetitive behavior by thousands of wholesalers all over the country. In such cases, we will need to examine upper layers of the sugar supply chain for noncompetitive behavior.

#### **4.2 Price formation in wholesale layer**

Storage capacity at wholesale layer sometimes found to neutralize market power by the refiners, in case they might possess any. Storage by wholesalers appears to smooth transmissions of international prices into retail prices. However, when wholesalers face a down trend for a prolonged period they dry up their inventories and they do not replenish their stock until they expect to see the reverse trend. In this kind of situation, wholesalers play a tiny role with respect to retail price smoothing.

It appears from graph 5 that there is a decrease in spreads for a few months during the 1st and 2nd quarters of year 2011. It is the transitional period from DO to SO when the raw and wholesale sugar price spreads decreased. Uncertainty relating the transition may be the reason for such decrease in the spreads.

### **5. DO holders in the chain**

It is hard to believe any collusive behavior by DO holders since they are several hundred in number. But still this layer was banned on the suspicion that DO holders affected prices through speculation and certain type of manipulation. Thus, we need to see if there was any noncompetitive price behavior on their part or if they were influencing the wholesale prices through some competitive behavior. Wholesale traders used to buy sugar from DO holders and thus we need to quantify the mark-ups of DO holders above their purchasing prices from the refiners. But the problem is we cannot do it because of not having information on the prices charged by the refiners to DO holders. But still we need to assess their role in the supply chain to pin down their influence on the related prices. At this point, it might be useful to know why they are in this supply chain and what role they are playing in the chain.

#### **5.1 Existence of DO holders in the supply chain**

The question needed to be addressed is why DO holders exist in this supply chain. Refiners have a comparative advantage in importing raw sugar into the country and refining it. They find it too costly to maintain a distribution network or keep up with the details of local demand. Setting minimum purchase requirement for the next layer, refiners lower their transaction costs. This minimum purchase restriction creates space for the DO layer. Refiners collect working capital from DO holders and pass international price risks on to the DO holders through advance sale of sugar DOs to DO holders. Ultimately, DO holders face the default risk due to transactions based on suppliers' credit; it being a common form of sale in case of essential commodities such as sugar and edible oil. There are several reasons for that to happen.

First, there are hundreds of wholesalers all over the country. It is very costly for the refiners to distribute sugar and collect money from so many wholesalers across the country since suppliers' credit is a common form of sale. With this form of transactions there is a great risk of default which is borne by DO holders currently. They find it more profitable to specialize and expand refining operations horizontally leaving the distribution to others.

Second, the refiners use DO holders and large wholesalers to lower their transaction costs in distribution through dispensing sugar at a cheaper price. The refiners usually set the minimum purchase requirement. However, the financial requirement of such a transaction is beyond the capacity of most of the wholesalers, who are relatively small traders. The gap between the refiners' minimum requirement and what most of the wholesalers can finance creates space for the DO holders and large wholesalers to operate in the DO market. It is the DO holders' superior financial capacity that has given them an important place in the supply chain of sugar. Since the DO market is unregulated and based on reputations, the main players are likely to be large. So, commodities dominated by small traders are not traded on the DO market. Mainly imported commodities are traded on the DO market since many imported items are brought in by large players with strong reputations.

Third, the refiners find it cheaper to raise working capital from the DO holders. Often the refiners sell DOs to the DO holders even before they (refiners) open L/Cs for raw sugar that will be refined and delivered against these DOs. The refiners can, therefore, use the receipts from DO sale as working capital for their refining operations or meeting other business costs of their enterprises. This is another reason for the refiners to deal with the DO holders instead of wholesalers directly. As described in section 7.4.2 where cost components are analyzed, refiners were required to pay interest as high as 18% on their working capital borrowed from banks. This purpose cannot be served by the wholesalers because they purchase sugar *on suppliers' credit*, whereas DO holders pay *in advance* and take the actual delivery later. Sometimes, actual delivery is delayed even for a year or longer.

In fact, the refiners frequently sell DOs well above their delivery capacity over a short period of time; as they know that a stable demand curve for essential sugar will keep the effective average delivery close to their capacity over a longer period of time. Hence, they enable themselves to engage in excessive sales of DOs in the short term without much fear of default. Even if for some reasons DO holders want more than the normal delivery at any point in time, they can be held in check citing rules that their delivery has to be completed within certain days, which is frequently violated by the DO holders.

Thus refiners can finance part of their corporate group capital requirements without resorting to costly bank loans. Fourth, due to single exposure limit set by banks, financing the entire working capital need from formal channels may not be possible even at a high interest cost. The interest rates on DO loans are likely to be low or set low purposefully to obtain funds at low cost. However, during the second half of 2008 when the price of oil was falling rapidly, and most DO holders were trying to offload their DOs quickly, the refiners were unable to clear the unusually large number of DOs that were produced for redemption, within such a short time. This was the first time that the refiners failed to redeem the DOs they had sold. DO holders were greatly frustrated over the delay as they were losing money with falling prices. They complained bitterly against the refiners for failing to live up to their commitment of supply of oil. A similar problem was also observed in the case of sugar DOs.

Last but not the least, DO holders remove the risk of world price volatility from the refiners substantially. Refiners often sell their DOs immediately after their booking at the international market. It takes several weeks before the imported raw gets ready for final consumer. Often

refiners encounter a fall in prices during their final delivery of refined sugar. Since private importers can import refined sugar from India in a week or two, refiners face a risk of losing from price fall. Through their advance sale of sugar to DO holders, they eliminate their risks related to world price volatility.

### **5.2 Structure of the DO layer**

There are more than hundred DO holders in the sugar supply chain. This is not a small number if considered in terms of collusive behavior. But they run an association which may make a collusive behavior possible, if intended. Thus, this layer deserves attention while examining market power. We need to understand different type of contracts used in this layer. We need to understand price formation in this sector. We need to assess the possibility of market power practice in this layer in various forms.

### **5.3 Nature of transactions in the DO market**

Though DO holders are meant to sell DOs to wholesalers; the practice of reselling DOs by larger DO holders to the smaller ones is widespread. DO holders and wholesalers in the sugar and edible oil market have created an informal DO exchange floor in Moulovibazar and Khatunganj which in essence mimics a formal commodity exchange. The free play of business forces has given rise to an informal market that has substituted for the missing formal market as predicted by economic theory.

Transactions of DOs at Moulovibazar take place at the underground (basement) Gulbadan market. These transactions start at around 12:00 noon everyday with hundreds of brokers trading in DOs on the floor of the Gulbadan market. Majority of these brokers were previously DO holders, but lost their dealership for some reason or the other. They then took up brokerage to work as mediators among the DO holders and between the DO holders and the wholesalers. There are different types of transaction observed in DO market. These are bar to bar (date to date) sale, forward sale, future options and eating-fitting sale.

*Bar to bar sale:* Suppose a DO holder has some money but no DO in possession. He may buy some DOs with cash and sell them to the wholesalers on credit at a higher price. If the client is trustworthy he may give his DOs to him (the client) before the payment is made. He keeps a check from the wholesaler. is the actual payment is made from one date to another and usually the dates are 7 days apart. That is why such transactions are known as bar to bar sale. Some DO holders allow even more time for their trusted clients.

It seems that bar to bar sale is a regular business practice which involves not much expectation or speculation on future prices. The goal of the DO holders in this kind of transaction is to earn a reasonable margin on the money they are using for. They always opt for a fixed margin. Thus, there is a demand for DOs every day. Since most of the wholesalers dealt with are previously known, this type of transaction does not involve much default risks either. To continue with their clients almost every DO holders has to use bar to bar sale. This type of transaction ensures a continuous flow of supply to the market.

*Forward sale:* A DO holder who does not hold DOs currently, may nonetheless sell these on condition of delivery at a future date at a certain price. Thus, DOs will change hand at the future date. The seller starts searching for DOs at a lower price until the specified future date when the transaction has to be completed. This type of transaction is known as forward sale in the DO market.

*Future option:* A buyer (another DO holder, broker, occasional buyer) locks-in a rate with a DO holder, with a small margin of the sale paid in advance with the promise that he will come on a future date (within a week or month) and get the contracted DOs with the remainder of the balance paid. In this case, the buyer has the option of not showing up in the specified date. His advance will be forfeited in case of his failure to show up. This works just like buying an option.

*Eating-fitting sale:* On the day a DO holder purchases a DO, he also sells it to another buyer before he (DO holder) pays for it and gets a margin on this transaction. In this type of transactions, virtually no monetary investment needs to be made. In effect he is simply negotiating a sale of DOs between two parties for a commission. There are many instances of making money through such eating-fitting deals. According to the DO holders, eating-fitting sale is similar to bar to bar sale except that the dates are not 7 days apart.

*Cash sale:* When a DO holder has DOs in possession, he may sell them to wholesalers on credit or cash. Since DO holders are not large enough to affect market prices unilaterally, the decision on whether to sell today or not depends on their expectation about future prices and today's prices. If someone pays in cash for DOs, he/she gets a relatively lower price compared to bar to bar sale.

#### **5.4 Price formation in DO layer**

Expectation about the world market prices plays a crucial role in case of price formation. Current booking rates in the world market are extensively followed in DO market. Players (Brokers, DOTs and wholesale traders (WTs)) in the DO market keep track of the world market prices of raw sugar almost hourly. Depending on the changes of the booking rates in comparison with previous day or previous week, DOTs ask for certain prices in certain time of the day. The question is how do they fix their prices of refined sugar based on the booking rates in the world market of raw sugar? For the same changes in booking rates, the price asked may differ across sellers depending on their business conditions and cash obligations. For example, someone in need of a large amount of cash to meet his bank obligation may ask a relatively lower price than others. This will be pressing the prices downward.

Speculation seems to play a key role in the DO exchange floor. DO holders follow the world prices of raw sugar almost hourly. They are aware of the local market conditions. Based on all the available information, they seem to speculate on future prices. These speculations affect current prices. There are claims that both large and small DO holders sometimes hold on to the DOs for months speculating on future prices of sugar. This happens despite it being that, formally DOs are supposed to be cleared within 15 days. This DO holding likely happens based on expectation of higher future prices. Forward sale is conducted due to opposite expectation on future prices. However, since the number of DOs sold in the market outsize substantially the

number of DOs actually cleared at a time point; the supply of sugar is not likely to be affected by holding of some DOs by some DO holders.

If an unusually large number of DOs are held by some large DO holders, then there is a possibility of supply shortage of sugar unless refiners sell more DOs to clear their stocks. Refiners have to release a certain level of sugar periodically to create space for an incoming flow of raw sugar from imports. Thus, when the number of DOs cleared falls substantially below their usual level, the refiners are likely to face a shortage of storage space. This pressurizes them not to allow many DO holders holding their DOs beyond the set time limit.

There is an allegation that some influential DO holders in the market who buy DOs in large quantities influence the market. However, these players will not be capable of affecting the actual supply of sugar unless the refiners cooperate with them; by not selling new DOs to offset the effect of DO holding. Generally, the larger DO holders have better market information than the smaller DO holders and wholesalers; as they also speculate on the future price. Such speculation may influence the local price.

These DO holders have been in the system for many years. Even if we look at 10/12 years back, no one complained against them. The reason may be that, speculation did not take place widely before when the price was less volatile in the world market.

## **6. BSFIC, TCB and private importers in the supply chain**

As described in section 2, the main players at the top layer of sugar supply chain are the private sector sugar refiners. Then BSFIC plays a continuous but limited role at the top layer while private importers of refined sugar and TCB are found to play a limited role occasionally. The amount of sugar produced and supplied by the BSFIC is not substantial compared to the total demand. Despite its supply has the potential to make the government policy makers powerful in regulating the retail prices. This is why we need to look into the ways how this supply is channeled to the customers. For the similar ground, we need to evaluate the role played by TCB in regulating sugar prices during every Ramadan. Also important to look into the role of private importers of refined sugar on the relevant prices.

### **6.1 Role of BSFIC**

BSFIC has a capacity of around 125,000 tons per year, produced by 15 of its sugar mills. The capacity of each of these mills is 5 to 10 thousand tons per year. The actual production is much less than the installed capacity. Their total production was less than 80,000 tons in 2011 which was only 65,000 tons in 2010. Production phase of these mills start from November/February each year and ends around the month of March/April. They remain in operation for 3 months and idle for 9 months. There is a possibility of expansion of these mills to gain efficiency and refine imported raw sugar to serve the market.

The sugar from these sugar mills are distributed through government designated dealers all over the country. There are 4,500 dealers located all over Bangladesh. These dealers operate at upazila levels. Normally each of them gets 1-2 tons of sugar from BSFIC. This allocation even

comes down to 5 to 10 sacks (1 ton is equivalent of 20 sacks whereas 1 truck is equivalent of 15/16 tons of sugar) per dealer per month. Often when BSFIC is out of stock, they get no allotment at all. Often the dealers do not have incentive to draw allotted sugar because they (allotments) are too small to be picked up by a hired truck. They sell their small allotments to large wholesalers. Those wholesalers then withdraw sugar on behalf of many dealers. Thus, the dealers simply extract rents just because they have dealership license. As a result, this dealership should be cancelled and their role should be replaced by wholesalers.

## **6.2 Role of TCB**

Every time there is a price hike of essentials in Bangladesh, there is one government agency to blame for its failure in discharging its duties, and that is TCB. TCB attempts to contain price hike during every Ramadan through some supply enhancing measures. Often though, we find its measures futile. During the last couple of Ramadan especially during the penultimate one (i.e, Ramadan of 2001), TCB seriously failed to build up a sugar stock when needed.

A few refiners kept their operation closed during that time. There was a huge shortage of sugar in the market. TCB could not import sugar before Ramadan of 2011, and thus it built up a limited stock from domestic sources such as from refiners. As a result, overall stock remained the same. On the other hand, it takes a couple of week time to get that sugar back to the market through the TCB appointed dealers. As a consequence, TCB operation rather worsened the situation. It happened due to its limited autonomy, lack of funding and above all its lack of skill manpower.

## **6.3 Role of private importers**

Private importers do not always operate in the market. Neither do they operate every year. Of course, they follow the market and some of them are active in another segment of the supply chain. Their role as importers however goes off and on. Whenever there is a shock in the domestic and/or world market they become active as importers. Forecasting about the market leads them to import refined sugar. When they expect higher prices of locally refined sugar, they start importing refined sugar. The question is how do they forecast about the price of locally refined/produced sugar? When they realize that local producers have small compile of raw sugar from the world market for various reasons, they sense a potential crisis in the local market. Sensing this, they start importing white sugar directly (mostly from India) at lower prices. In that sense, they play a vital role in stabilizing the sugar market in Bangladesh.

There are many importers who import refined sugar directly. Among them, S. Alam (Chittagong), Masud Brothers (Chittagong), Aman Group (Sirajganj), and Nurul Alam Master (Chittagong) are big players. Private importers sell their imported refined sugar to large wholesalers who also buy DOs to draw sugar from private refiners and sell them to the downstream wholesalers. It is worth mentioning that locally refined sugar is a little bit more crystal clear than the imported one.

The total amount of import by the private importers is around 5-7% of the total sugar demand. As mentioned earlier, they do not import refined sugar every year. They have imported 120,000 tons in the last 5 months of 2011. The largest import by a single player, S. Alam, was 80,000 tons. There was no import of refined sugar in previous couple of years. Before 2011, the last

import of refined sugar was during 2007- 08. The imports of refined sugar in our country are mostly done from India; about 70% of total import. The rest comes from Brazil.

Apparently, these players, with a very small and occasional supply of sugar, are not expected to exert a significant influence on the relevant prices. It is the private refiners who are to play the major role in shaping the market with their sheer dominance of around 90 percent market shares. Finally we need to examine this refining segment of the industry.

## 7. Private Refinery

The refinery layer of the sugar supply chain appears to be characterized by a high degree of concentration. One would thus expect this layer to be potentially more susceptible to collusion. There are 6 private sugar refiners/importers in Bangladesh, all of whom are big conglomerates. Sugar is only one of their many products. The total refining capacity installed of the private refineries is around 4 million tons per year. Of this capacity, 3 million tons is in operation against the total local demand of 1.8 million tons per year. It is obvious from the capacity of the industry that there is no possibility of sudden surge in marginal cost due to its hitting capacity constraint.

**Table 1: Capacity of the Private Sugar Refiners**

Refinery	Capacity (in ton/day)	Capacity installed
City Sugar Industries Ltd.	3200	5000
United Sugar Mills Ltd.(Meghna)	1800-2000	2000
S. Alam Refined Sugar Industries Ltd.	1800	1800
Abdul Monem Sugar Refinery Ltd.	800	800
Deshbundhu Sugar Mills Ltd.	400-500	500
*Partex Group	300	1000
<b>Total</b>	8,300 - 8,600	11,100

\* This mill closed its business from market at some time in the last 5 years or so.

However, the capacity of a refinery does not speak for its market share always. Ideally market shares are measured by the quantity of sugar demand met by a refiner. Due to lack of information on quantity demanded, import will be used as proxy for demand since imported sugar correctly represents the bulk amount of sugar marketed in a considerable span of time. Import accounts for more than 90 percent of the domestic demand and firms do not differ very markedly in efficiency. This makes the import share a good approximation of the true market share.

**Table 2: Market shares of the private sugar refiners**

Import Share for the year 2012	
Refinery	Percentage
City Sugar Industries Ltd.	46%
Abdul Monem Sugar Refinery Ltd.	20%
S Alam Refined Sugar Industries Ltd.	16%
Deshbundhu Sugar Mills Ltd.	10%



United Sugar Mills Ltd.(Meghna)	8%
<b>Total</b>	<b>100%</b>

As presented in Table 2, the market share of sugar of the top-3 groups (C3) are 82 percent of the total sugar import in 2012. Another measure of market concentration is Herfindahl-Hirschman index (HHI). The HHI for the refining segment of the sugar supply chain is 2936. This implies a very large concentration. The HHI is widely used in the relevant literature as a measure of industry concentration, and it is preferred to concentration ratio above.

This high concentration has given the ground to the persistent claim by some quarters that a cartel of a small number of large importers controls the sugar market. For instance, the CPD study claimed collusive behavior by the small number of importers operating in sugar and other essential commodities market in Bangladesh. However, it must be emphasized that while a small number of players in the market makes it easier to form a cartel, this is not necessarily the inevitable market outcome. Concentration may not necessarily imply market power in an industry. It may be the consequence of competition or other related factors which lead to a small number of suppliers in an industry.

## **7.2 Reasons for only a few sugar refiners in the top layer**

Since private sugar refineries are the main players in the top layer of the sugar supply chain, we need to identify the factors behind their high concentration. This will help us understanding the conduct of the players operating in this layer. Thus, this will also help us assessing competition in this layer of the industry.

### *7.2.1 Economies of scale and scope*

A distinguishing feature of this industry is that most of these groups are involved also in the import/production and sale of other essential goods such as flour, oil, lentil, onion, mineral water, animal feeds etc. suggesting that there are opportunities for exploiting economies of scope. Economies of scope is said to exist when the average cost of producing any given product is reduced as a firm produces a variety of products rather than specializing in the production or delivery of a single product. Economies of scope arise from effectively sharing production facilities.

These conglomerates have access to well-established distribution network for essential products. They use this to economize on distribution costs related to sugar that they manufacture and/or process. Economies of scope in sugar production/processing, together with lower distribution and transportation costs when several essential commodities are sold through a common distribution network, explain why the same set of business groups dominate the markets for several essential commodities through imports/production/processing.

Another important feature of this refining industry is that there exist economies of scale in refining operation. Refining efficiency (refining loss) vary across refineries depending on their plant sizes. Generally it holds that the larger the refinery the greater their efficiency. As a result, there is a tendency toward building bigger size refineries reflecting in a small number of players in the industry.

### *7.2.2 Natural barriers to entry*

Only a few groups operate in this market because entry requires large sunk cost. Setting up of a standard size sugar refinery requires a huge cost and it does not have a significant alternative use value. Beside the setup cost, a sugar refinery requires a large investment in raw material (i.e., raw sugar) import. Due to the large sunk cost, it is difficult for new entrants to compete with incumbents who have an advantage of economies of scale. Along with the lumpy fixed cost in setting up a refinery, economies of scope may also discourage new entry into the industry. There are substantial economies of scope in sugar production. For instance, the City Group, one of the largest importers and refiners of sugar in Bangladesh, is also the supplier of 30 other consumer products. This group runs an integrated production facility for all these products, namely oil, salt, flour, soy products, mineral water, and many more in addition to sugar. Substantial product diversification has provided the City group a unique advantage to operate efficiently. Thus, almost all of the existing refining groups are reaping economies of scope in essential commodities production/processing.

For a new entrant to be successful, it is necessary that it uses the economies of scope in production and processing of essentials. Thus, not only fixed costs, economies of scope may also discourage new entry. In order to compete effectively with multi-product firms with economies of scope, new entrants will have to set up a multi-product firm requiring larger investment than what is required for a sugar refinery only.

### *7.2.3 Strategic barriers to entry*

As described in section 7.1, there is an excess capacity built-up in the refining industry. The presence of excess capacity may act as an entry barrier. Potential entrants may be concerned that, after their entry, the incumbents will flood the market with sugar consequently lowering the sugar price below their cost. Thus, the substantial excess capacity could create a strategic barrier for new entrants ensuring the uncontested market power of the few large refinery groups. However, there is a possibility that the growth of excess capacity was driven by the high effective protection and tax holiday policies of the government, and not by any ulterior motive of blocking new entrants. These policies of providing protection and tax holiday have the undesirable side-effects of encouraging a multiplicity of plants and the growth of excess capacity.

The discussion above only suggests the possibility of anti-competitive practice in the upper echelon of the supply chain. A large amount of advertising expenditure by incumbents may be an entry barrier for new entrants. As a result, if new entrants want to compete with the existing firms, they need more capital for advertisements. The existence of large sunk costs and advertisement costs make their profit margin lower. When the price falls, it may become difficult for them to operate in the market as they will incur large losses.

## **7.3 Detecting collusive behaviour in refining layer**

A small number of large importers' controlling the sugar market is alleged as a formation of cartel. However, it must be emphasized that while a small number of players in the market makes it easier to form a cartel, this is not necessarily the inevitable market outcome. For instance, when the demand is variable and changes sharply, cartels are unlikely even though there may be only a few firms operating in the industry (Grout and Sonderegger, 2005). The demand for sugar

in Bangladesh is stable. Therefore, by the above reasoning, it is likely to encourage the formation of a cartel. It is advisable to routinely investigate the industry for the existence of a cartel, even when there is no overt hint of collusion. One way of doing it is to look for certain markers that give revealing signs of collusion. Some of these markers are: co-integration of domestic and world prices or high price-cost correlation, low price variance, and so on.

### 7.3.2 *Co-integration of domestic and world prices*

In the absence of a cartel, the domestic sugar price ( $p_d$ ) as a whole should be co-integrated with the international raw sugar price ( $p_r$ ). The former should track the latter. To test for co-integration, each of the time series on the price variables was subjected to a unit root test. As confirmed by the tests (**Augmented Dickey- Fuller** test) both variables have unit roots, i.e. they are integrated of the order 1,  $I(1)$ . Thus, they are non-stationary variables. These series are found co-integrated. This suggests a long run relationship between sugar price movements in Bangladesh and that in the world market; such that, these two markets may be regarded as co-integrated. What co-integration means in this case is that, the two price series cannot wander off in opposite directions for very long without coming back to a mean distance eventually.

The trend of sugar price movements in the local and world markets presented earlier clearly shows a close relationship between the world and the domestic market prices. Fluctuation in the world price of raw sugar is soon transmitted to the domestic price in Bangladesh. But it does not mean that the two prices have to move together on a daily basis. Thus, co-integration suggests a long run pass-through between price cost series in this case, but it will not identify if the market is competitive or not. Co-integration can be observed in both competitive and suspected non-competitive regimes.

### 7.3.3 *Variance test*

In line with **Abrantes-Metz et al** (2005), a variance test as a screening device for detecting cartel is performed for this section of the market. Studies show that prices can be less responsive to cost when firms collude (**Athey et al**, 2004; **Harrington and Chen**, 2006). Thus, in periods of non-cartel activity, prices and costs tend to be correlated, in periods of cartel behavior they do not. Formation of a cartel by the only few importers/refiners is widely believed to be one of the main reasons for price hike in Bangladesh during Ramadan. Thus, tests have been performed using Ramadan period as suspected cartel period and the rest of the year as periods of non-cartel activity.

Imported raw sugar, the main input for the production of refined sugar, accounts for more than 87 percent of the cost of refined sugar. Thus, the variances of wholesale prices of refined sugar ( $\sigma_w^2$ ) and international prices of raw sugar ( $\sigma_r^2$ ) are expected to be of similar magnitude if there is no price manipulation in the domestic market. This means our null hypothesis is:  $H_0: \sigma_w^2 = \sigma_r^2$ . When equal variance test is performed for the entire 5 year period, the null hypothesis of equal variance is rejected at the 1% significance level. Equal variance hypothesis is rejected in favor of  $\sigma_w^2 < \sigma_r^2$ , which means domestic prices are less volatile than the raw sugar prices. Though the variance test does suggest the presence of a collusive behavior in this industry, this does not mean that there is no alternative explanation for this trend.

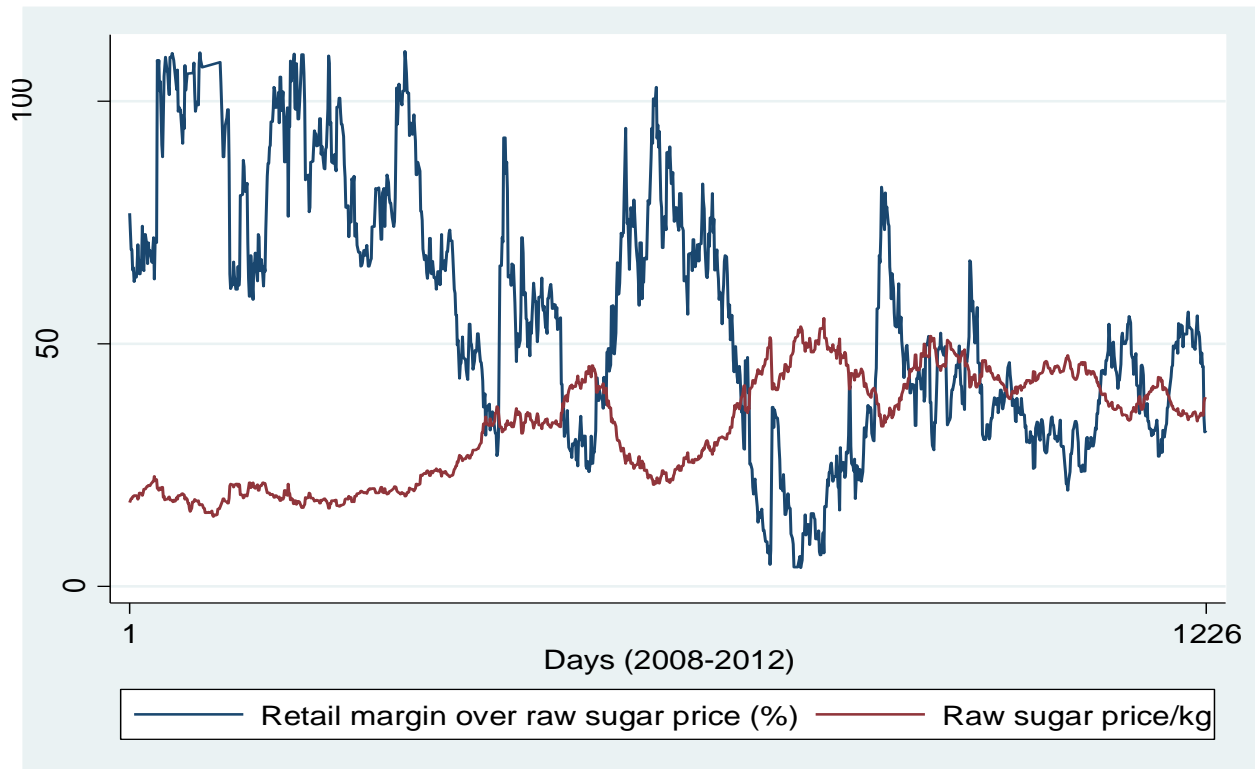
When this same test is performed for the two regimes - Ramadan versus non-Ramadan - the results become even more interesting. Equal variance is rejected for both the regimes, but it is rejected in favor of  $\sigma_w^2 < \sigma_r^2$  for the period when DO layer was active and rejected in favor of  $\sigma_w^2 > \sigma_r^2$  after DO was cancelled. This means the volatility in wholesale price increased relative to raw sugar price after the policy change. To put it differently, the policy change brings greater volatility in the wholesale prices compared with its cost variance. Manipulation of prices by DO holders is alleged to be one of the main reasons for price spiral of essential like sugar, edible oil and so on. But the allegation is found baseless here. However, a greater volatility in wholesale prices after DO cancellation might suggest collusive behavior during DO regime or some stabilization role played by DO holders.

But with respect to margins, no significant difference is observed between the two regimes. Obviously, this does not support a collusive behavior under DO regime. Rather a stabilization role by DO holders is likely to better explain the story. If such a stabilization role used to be played by DO holders then the cancellation of DO layer is likely to increase the volatility in the prices from then on. After the cancellation of DO layer, the volatility has increased. Existing SO system is claimed to be no different than the replaced DO layer in practice. If this is true, then the increased volatility under SO system is not expected. Thus, there has to be alternative explanations for the increased volatility under SO system.

#### *7.3.4 Margin Stability*

In case of a cartel formation by the leading firms who are engaged in joint profit maximization, it is the stability of the profit or price-cost margins that would be of greater analytical interest. A steady margin is expected to be observed in such a situation. A proxy of such a margin is calculated based on world and local prices. Here the margin is defined as local price of refined sugar minus world price of raw sugar divided by world price of raw sugar  $(p_w - p_r)/p_r$ . This margin is calculated based on the lagged world price as a proxy of the marginal cost. This provides us with the approximate trend of the price-cost margin, but not the actual margin.

#### **Graph 6: Margin based on local prices and world prices of raw sugar**



Obviously, fluctuating margins are more suggestive of a competitive behavior on the part of the industry operators than otherwise (Graph 6). Still one can have collusion where the refiners agree to charge a common mark-up over world price so they move in tandem with the  $(p_d - p_r)$  within given bounds. But this is not the case here. When the plots for the denominator  $p_r$  were superimposed on the same chart, the fluctuations of mark-up and world price did not imply such pattern.

#### 7.4 Assessing competition by price pass through

Screening tests did not provide any conclusive evidence on the existence of collusive behavior in refining layer of the sugar supply chain. However, if there is market power in any segment of the value chain, it has to be reflected as high markups at that layer; but it is tough to find a suitable and logical benchmark to compare with and conclude on high markup. One alternative way is to measure the extent of pass through of a shock on demand or supply of sugar and conclude from there if the market is competitive or not.

##### 7.4.1 Methodology

Collecting data on prices and costs at different layers of the distribution chain can help narrow down the location of mark-up increases. This would enable us to test for competing explanations of the dynamics taking place at that layer. The hypothesis of collusion among DO holders requires mark-ups to increase at the DO layer. This causes a disproportionate increase in the prices charged by DO holders to wholesalers; relative to the price at which they acquire sugar from refiners. When price and marginal cost are observable, we can directly determine whether a DO holder is exercising market power setting its price above its marginal cost as a firm can do in an industry. Unfortunately, we usually observe only price and factors that are associated with demand and with cost; we do not have explicit information on total or marginal cost.

One approach to overcoming the problem of not knowing marginal cost is to estimate the firm's behavior – or the average behavior of all firms within an industry and marginal cost simultaneously, using a structural model (**Perloff et al**, 2007). The main disadvantage of the structural approach is that the identification of the results depends critically on a variety of assumptions concerning functional form, distributions, and other facts that are not generally known to the econometrician. Alternative to this, there is a reduced-form or nonparametric approach based on comparative statics properties of structural models.

The alternative approach determines market power by seeing how price varies with shifts in cost (or factors that shift cost). To illustrate, suppose that firms face a constant marginal cost. A shock causes the marginal cost to rise. If the market is competitive, then the price will increase by the same amount as the marginal cost, because the price equals the marginal cost. However, if the market is not competitive, price may not change by the same amount as the marginal cost. Thus, we can test for noncompetitive behavior by checking if price moves disproportionately with marginal cost (**Perloff et al**, 2007). Typically, these models have fewer data requirements and require fewer assumptions than do the structural models. They can be used to test the hypothesis that a market is competitive. However, typically, they cannot be used to answer questions about the degree of market power.

Using the reduced-form approach this study will analyze the pattern of cost transmission following a discrete change in the world price of imported raw sugar.

#### *7.4.2 Cost of refined sugar at mill gates*

To measure the extent of transmission of the raw sugar price of the world market, it is necessary to understand the cost components of refined sugar first, especially the relative weights of different inputs. Roughly 90 percent of our sugar comes from the local refiners. They refine imported raw sugar. Looking into the breakdown of the total cost of refined sugar is an important factor to consider while analyzing sugar market. About 87 percent of the total cost of refined sugar is the cost of raw sugar which also includes the 10% VAT.

Other variable costs include insurance premium of 0.5% on the cost of importing raw sugar and a 15% VAT on that premium; L/C commission of 0.5% on the cost of raw sugar and a 15% VAT on that commission; and CRF of 1%. There are some other costs that are invariant, such as stamp fee, survey fee, port charge, radiation fee, IP fee, and stevedoring charge, rent for coaster freight, clearing commission, VAT and income tax at source and so on. Then there is transit loss of 0.25% on mother vessel, carrying loss of 0.25% from Chittagong to Dhaka (for refiners located in Dhaka). All of the above adds up to 2% of the total cost. That is, now we have the account of 87% of the total cost. It is the price of raw sugar at mill gate. However, this share fluctuates depending on the international prices of raw sugar and other input prices.

Now that raw sugar enters the refinery and it gets into the refining process. There is the cost of raw materials such as quick lime, costic soda, filter aid, iso propanol, sodium chloride, hydrochloride acid etc. for refining raw sugar. Salary, allowances and wages of the personnel of the mill are also there. There is a refining loss of 6.5% in this refining stage. Bank interest rate of 16% to 18% is paid on the loan taken to buy raw materials. Utility (electricity and gas) bills are

paid as well. Besides, there is the cost of factory and machinery maintenance and factory depreciation. Finally, there is the cost of sales and advertisement, and administrative cost. These items consist 13% of the total cost. This 13% added with the previous 87% of cost components makes the 100% of total cost. Revenue from the sale of molasses is added to this cost calculation.

#### *7.4.3 Pass through results*

This analysis uses information available from the Department of Agricultural Marketing (DAM), Ministry of Agriculture Tariff Commission of Bangladesh, Ministry of Commerce, Bangladesh Bureau of Statistics (BBS), and National Bureau of Revenue (NBR). Daily prices on sugar and other related commodities are available from DAM. However, price data is available for Dhaka City Corporation only. The daily international price of raw sugar is derived from the Chicago Board of Trading. Price data is available from January 24, 2008 to October 4, 2012. The size of the sample is thus 1226. To quantify the transmission of raw sugar prices into the wholesale prices, wholesale price was regressed on raw sugar price, wholesale price of wheat, Consumer Price Index (CPI) of food, VAT, energy and a dummy for Ramadan periods. Year dummies are not included in the regression due to the fact that several time variant included variables are likely to pick year effects.

Imported raw sugar accounts for about 87 percent of the total cost of refined sugar in Bangladesh, which makes such a test based on cost pass-through especially attractive in our case. However, this 87 percent cost is incurred to get the raw sugar to the refinery. If we consider only the international price of raw sugar then it will come down to 75 to 80 percent of the total cost due to the exclusion of 10 percent VAT here. The remainder 13 percent of the cost depends on many other factors as described in section 7.4.2, only few other time variant factors are considered here. Since direct import of refined sugar is in place, the pass-through of the fob prices of refined sugar should also be explored. But the tiny irregular import of refined sugar is not likely to affect market prices and hence the pass-through is not considered in this case.

Most of the coefficients estimated show the sign as expected. Positive sign on raw sugar price, wheat price, CPI food, Ramadan dummy are as expected. But the negative sign on VAT and energy are not apparently as expected. These variables are found highly correlated with the international price of raw sugar. VAT depends on the raw sugar price directly as it is the percentage of the later. Energy prices moved along with the raw sugar prices even though it is merely a coincidence. Due to these factors the coefficients of VAT and energy turned into negative.

**Table 3: Regressing wholesale price of sugar<sup>a</sup>**

Variables	Estimated coefficient	Standard error	<i>t</i> -ratios	<i>p</i> -values <sup>b</sup>	95% confidence interval	
ln(raw sugar price)	0.845	0.027	31.36	< 0.001	0.79	0.90
ln(wholesale price of wheat)	0.033	0.012	2.76	< 0.001	0.01	0.06
ln(VAT)	-0.365	0.024	-15.48	< 0.001	-0.41	-0.32
ln(energy)	-0.375	0.030	-12.41	< 0.001	-0.43	-0.32
ln(CPI food)	0.021	0.044	0.46	0.643	-0.07	0.11
Ramadan dummy	0.016	0.007	2.37	0.018	0.00	0.03
<i>constant</i>	2.658	0.192	13.88	< 0.001	2.28	3.03

<sup>a</sup> These results were produced with 1226 observations obtaining an F-statistic of 2238.80, an R2 of 0.9168, and an adjusted R2 of 0.9164, which corresponds to a p-value less than 0.0001. The dependent variable is the log of wholesale price of sugar.

<sup>b</sup> The *p*-values give probabilities of more extreme *t*-ratios for the hypothesis of a zero coefficient.

The magnitude of the pass through does not suggest a competitive behaviour on refiners' part. One percent increases in raw sugar price increases the wholesale price of sugar by is 0.845 percent. More than 0.75 to 0.80 percent pass-through raises question on the competitiveness of the players in this layer. Another result is the significant increase in wholesale prices during Ramadan. A magnified cost pass-through implies a non-competitive behaviour for another reason. There is an asymmetric transmission or pass-through. For example, we have observed asymmetric pass-through of wholesale prices to the retail layer. Refiners, DO holders or other middlemen with market power may exercise pricing strategies resulting in a slow and incomplete pass-through of decreases in the international prices and a fast and complete or augmented transmission of increases in the same prices.

However, there are alternative explanations to such asymmetric price response. A simple explanation of asymmetric price response in case of sugar can be based on the lags in imports. If the refiners build up the inventory of imported raw sugar in expectation of increasing prices in the world market, when prices start to fall, they are likely to find themselves loaded with substantial raw sugar bought at higher prices. They will not reduce refined sugar prices in the domestic market before the high cost inventory is sold out. This can create a downward rigidity in price adjustments at the refiner level.

It is also possible that Ramadan and other common signals about demand or cost conditions (such as widely reported information about international prices) work as a focal point for price speculation by market actors, and may result in overshooting in inventory and price adjustments.

#### 7.4.4 Impulse response function on wholesale price

The Structural vector autoregressive model (SVAR) is run to obtain the impulse response function. Let  $x_{1t}$  be the time series of refined sugar price (wholesale) and  $x_{2t}$  the time series of raw sugar prices; and  $X_{1t}$  be a vector containing  $x_{1t}$  and  $x_{2t}$  and  $C$  a vector of constants.

$$\Delta^d X_{1t} = C + \delta_1 \Delta^d X_{1t-1} + \delta_2 \Delta^d X_{1t-2} + \dots \delta_p \Delta^d X_{1t-p} + E_{1t} \dots \dots \dots (4)$$

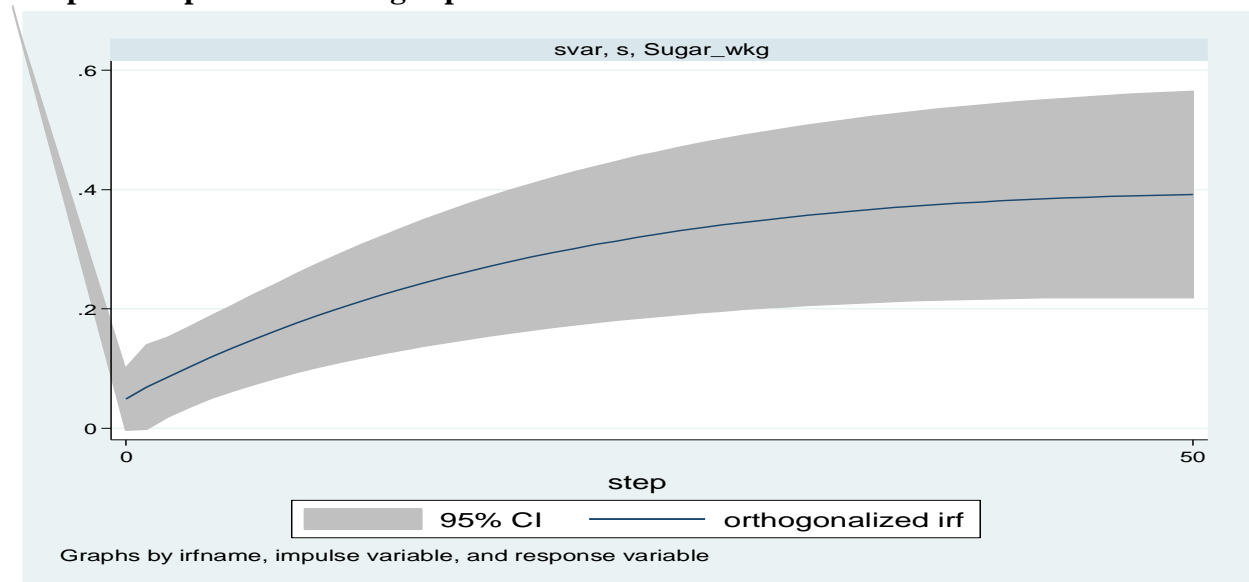


$$\delta_p = \begin{bmatrix} \delta_{11}^p & \delta\alpha_{12}^p \\ \delta_{21}^p & \delta_{22}^p \end{bmatrix} \quad E_{1t} = \begin{bmatrix} \epsilon_{1t} \\ \epsilon_{2t} \end{bmatrix}$$

Restriction imposed: Matrix A = (1, 0, 1)

It is obvious that any kind of shock on cost is intensified (Graph7). SVAR method is used to measure the impact of a shock on the response variable. Here the impact of change in raw sugar price on the local wholesale price is estimated. The impact of the shock is intensified over time which makes the short-run and long-run effect different. This result is not unexpected from a non-stationary time series of prices. However, it hints for a non-competitive behavior on the part of the refineries.

**Graph 7: Impulse to raw sugar price**



Graph 7 presented below measure the cumulative effects of raw sugar price shocks after many days and the corresponding 90 % confidence interval.

Alternatively, we can investigate the effects of monetary policy using a SVAR model, and obtain an impulse response function showing how output responds to a monetary policy shock. It is tempting to interpret impulse response functions in a similar manner as dynamic multipliers. In particular, we may be tempted to use impulse response analysis to shed some light on the issue of how long it takes until a change in the monetary policy stance reaches its full effect on output, which is an important issue in applied business cycle analysis.

## 8. Summary of findings and conclusions

It is always difficult to assess competition in any of the market in the real world. The difficulty arises from the fact that competition is a multi-dimensional concept characterized principally by variation in prices, entry and exit of firms, variation in market shares, changes in the ranks of the leading firms, frequent switching of purchases by major customers, sourcing of supplies from two or more providers, frequent advertising and sales promotions, offerings of higher quality and

innovative products and services among other factors. Some of them may move in opposite directions. Thus, conclusions based on a single dimension may be misleading in some cases. Still the findings from this research endeavor needs a summary and conclusion which is provided below.

1. The sugar industry is capital-intensive requiring very large investment in plant and equipment. It offers significant opportunities for economies of both scale and scope. These characteristics have shaped the market structure of the industry. Almost all of the existing refining groups are exploiting the economies of scope in the production/processing of many essential commodities. Since the essential commodity distribution channel is the same for all commodities, most of the sugar refineries are economizing on distribution costs by producing several of the essential commodities. For a new entrant to be successful in this market, it is necessary that it utilizes the economies of scope and saves on distributional costs. Thus, not only the fixed costs, but also economies of scope may discourage new entry. To compete effectively with multi-product firms with economies of scope new entrants will require far more investment than is required for a sugar refinery only.
2. There has been no new entry or exit in the refining end of the sugar industry during the last several years. However, the existing six refinery groups in this market are far too many relative to the total domestic demand for refined sugar. Volatility in prices due to capacity constraint is not expected as excess capacity is in built in this industry.
3. Refining segment of this industry is highly concentrated with the *Herfindahl-Hirschman* index, estimated for 2012, of 2936. However, a slightly increasing trend of concentration is hinted by the key people operating in this market, implying the possibility of further concentration in the future.
4. The complaint that the business people lose no time in raising prices when the international prices go up; but they do not show the same alacrity to reduce prices when the international prices go down is explained based on stocks, expectations and interdependent oligopoly.
5. Domestic prices of refined sugar and world prices of raw sugar are co-integrated. This means the domestic and world prices did not wander off from each other for very long without coming back to a mean distance eventually. However, this does not preclude the possibility of coordinated actions in the industry. The co-integration is likely to be observed even with a larger mean distance under a collusive agreement.
6. Systematic increase in sugar prices during Ramadan has not been observed for sugar for the considered time span. The gross profit margin is observed to be lower than the government set maximum of 10% for most of the time. However, asymmetric transmission of wholesale prices has been observed in case of retailers. Expectation played a vital role in the price formation of the retailers.
7. Equal variance of domestic and world prices hypothesis could not be rejected for the entire 5 years period under study. This means the fluctuations in the world price of raw sugar is soon transmitted to the domestic price in Bangladesh. Again this does not refute the possibility of

collusions in this industry. The equal variance of domestic and world prices possibly can hold even with a larger mean distance under a collusive agreement. However, equal variance of domestic and world prices hypothesis were rejected for the period since DO system were cancelled. This demands evaluation of the newly introduced dealership system in sugar and edible oil markets.

The most widely used instrument of ensuring competition in the marketplace is the Competition (Anti-Trust) Law. A competition law has been enacted; it is essential that the enacted law is properly implemented in dealing with the problems of anti-competitive behavior. However, the extreme downward rigidity as claimed by the media is not observed in sugar prices. That is, the claim that once go up prices do not go down is not true for sugar. Persistent high prices of sugar during Ramadan are not evident either.

8. For proper implementation of competition law, the case investigators, lawyers and judges will need to have a high degree of knowledge of the economics of market and competition such that they are able to distinguish between acceptable competitive market responses and non-competitive practices. Hence, before a competition law can become fully operational the country must have, or prepare, a group of highly qualified people who can undertake investigations of this type, and correctly establish the nature of the market and any unfair or non-competitive practices. There must be appropriate disclosure provisions in the law to enable the investigators and the judiciary access, without violating confidentiality, business information that is essential for the conduct of the investigation and trial.

The study finds a considerably more complex state of competitiveness in the sugar industry of Bangladesh than is commonly understood or believed. The quantitative data and tests from which these conclusions emerge are statistically robust. They are also consistent with the economic theories of the market structure and offer a remarkably coherent explanation of the behaviour of the sugar market in recent times.

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