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Distributional Impact of Political Violence: Evidence from Differential Impacts on Commodity Price

Kazi Iqbal[a], Kenmei Tsubota[b], Abu Shonchoy[c] and Mainul Hoque[d]

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Abstract

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Keywords: political strikes, commodity price, impact analysis

JEL classification: D24, D74, O14

[a] *Senior Research Fellow, Bangladesh Institute of Development Studies, Bangladesh*

[b] *Research Fellow, Institute of Developing Economies-JETRO, Japan*

[c] *Overseas Research Fellow, Institute of Developing Economies-JETRO, Japan*

[d] *Research Fellow, Bangladesh Institute of Development Studies, Bangladesh*

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INSTITUTE OF DEVELOPING ECONOMIES (IDE), JETRO
3-2-2, WAKABA, MIHAMA-KU, CHIBA-SHI
CHIBA 261-8545, JAPAN

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Kazi Iqbal	Kenmei Tsubota	Abu S. Shonchoy	Mainul Hoque
BIDS, Bangladesh	Institute of Development Economies	Institute of Development Economies	BIDS, Bangladesh
kiqbal@bids.org.bd	kenmei.tsubota@gmail.com	parves.shonchoy@gmail.com	mhoq@bids.org.bd

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The economic cost of political violence is well documented, studying its effect on a myriad of economic indicators such as manufacturing productivity, export performance, comparative advantage, cost of production, etc. While these are very important issues capturing largely long run effect of the political violence, short run welfare loss of the citizen due to political instability is mostly absent from the literature. One salient channel through which political instability impacts welfare is the price of essential food items. Our study uses political strikes of Bangladesh to examine its impact on rice price. We particularly use three types of rice – fine, medium and coarse to capture how the impact varies with the quality of rice and thus different income groups of buyers. We use daily retail and weekly wholesale price data of each district from Department of Agricultural Marketing (DAM) for the period 2010-2016 and pair them up with the incidence of strike data compiled by Ahsan and Iqbal (2016). The richness of this high frequency data allows us to control for all types of time and district invariant confounders using fixed effects. The results show that on the day of strike, rice price increases and this increase is higher for coarse rice. It indicates that the political strikes is costly for the ordinary citizen and the cost is disproportionately large on the poor more, who are the consumers of lower quality rice.

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1. Introduction

The extent of political unrest the world has seen over the last one decade or so is quite unprecedented. A large number of countries are involved in direct civil and military conflicts, and a larger number are exposed to political uncertainty (Economist Intelligence Unit, 2015). These conflicts and the associated uncertainty have taken a huge toll on the economies, both in short and long terms. While a thick volume of literature dwells on the economic cost of political violence, our study examines how the consumers are affected due to political event driven price shocks. We study the impact of political strike of Bangladesh on rice price. Since rice constitutes a large share of the consumers' spending, any shock to rice price has a huge implication for the wellbeing of the poor people. We also examine the distributional consequences – whether the impact varies with the quality of rice.

We have compiled a unique price data from Department of Agricultural Marketing (DAM), Ministry of Agriculture. To the best of our knowledge, this data has not been used by the researchers before. DAM collects daily retail price data and weekly wholesale price data from one sub-district (*Sadar* upazilla) of all districts and informs other government agencies. This high frequency nature of the data allows us to pair them up with the political strike data and examine the impact of political strike on three types of rice – fine, medium and coarse for the period 2010-2016.

The literature on political disturbance and price largely study the impact of the latter on the former – how high inflation leads to civil unrest and chaos (Arezki and Bruckner, 2014; Bellemare, 2015). On the contrary, our study examines the impact of political turmoil on rice price. The recurrent nature of the political strikes in Bangladesh allows us to move beyond typical 'event analysis' and isolate its impact on rice price, controlling for all possible confounders. Understanding of such impact on food price, particularly rice is important because of two reasons. First, well-being of general people is affected by such political unrest/violence, particularly the poor people, and this study highlights one such channel which is through price. Second, it also offers insight into how food price reacts to such shocks and its adjustment mechanism. The reaction of food market to such shocks also lends some insights about the market structure at different levels such as retail vs. wholesale.

Political strike which is locally known as '*hartal'* is called largely by the opposition political parties to press their demand. A typical strike in Bangladesh is characterized by little vehicular movement, shutting down of shops and sporadic violence involving law enforcing agencies and the opposition political parties. Since a political strike is largely a transportation shock, it raises the cost of transporting goods and tends to increases both wholesale and retail price. However, the extent of increase depends on the market structure of wholesale and retail rice markets as well as their ability to hoard rice, which in turn has bearing on market competiveness. If both wholesale and retail markets are perfectly competitive, the high price will simply reflect transportation costs. However, it is also important to note that political strike itself can change the market structure. Due to disruption of the transportation, local retail/wholesale markets can act as localized monopoly and charge higher price, depending on the price elasticity of the different types of rice.

Our baseline results show that on the day of *hartal* the price of rice increases by about 50-60 paisa per kilogram. This result is robust to severity of *hartal* and also inclusion of a host of dummies which capture both seasonality and unobserved heterogeneity. Next we address the adjustment process. Interestingly, price adjusts slowly and drops down to its pre-strike level in about 5 days after the strike. We did not find any change in price one day before strike, neither on the announcement date.

Since rice price and price elasticity vary substantially with quality, we consider three types of rice – fine, medium and coarse. On the day of *hartal*, retail prices of fine and medium quality rice increase by 44 paisa and 49 paisa respectively whereas the price of coarse rice increases by 62 paisa. The impact on price is found to amplify when the strikes are stretched over a few days. We find that if a strike is a part of multiple day strikes, the retail prices of fine, medium and coarse increase by 1.3, 1.4 and 1.7 taka respectively on that day.

Since price data is collected from all districts, it allows us to examine the price differential between Dhaka (the capital city) and other districts such as sourcing districts. Note that we conducted a small survey of the wholesalers in Dhaka to understand if the sourcing districts change during *hartal*. A wholesaler in Dhaka might prefer a sourcing district which is closer to minimize transportation costs. We find that retail price of fine rice did not increase in Dhaka while it increased in other divisional districts and all districts excluding divisional districts and sourcing districts, contrary to our popular belief. However, in case of medium and coarse rice, the retail

price increased in all regions. The magnitude of increase in coarse rice is very robust to regional differences.

In case of wholesale price, we also observe similar patterns – size of increase in price is higher for coarse rice. The coarse price becomes about 26 paisa costlier when the number of strike in a week increases by one day. These figures for medium quality rice and fine rice are and 15 paisa and 18 paisa respectively. It is interesting how the increase in wholesale price is transmitted to retail price, depending on the market structures and transportation costs. This is also more pronounced for coarse rice- the vertical gap between wholesale and retail price for all districts is about 11 paisa while it is mostly insignificant for medium and fine rice.

In essence, political strikes push rice price up in the whole country on average. It increases more in other districts than Dhaka. Political strikes have larger impact on coarse price than medium and fine quality rice. This has huge distributional consequences as the poor are the consumer of the coarse rice.

2. Literature Review

The literature on the relationship between political institutions and food price mostly looked into how food price inflation leads to political instability. Two such recent influential studies are Arezki and Bruckner (2014) and Bellemare (2015). Both of the studies conclude that rising food prices cause social and political unrest. The former study finds in a cross-country panel covering the period of 1970-2007 that higher international food prices significantly damages the quality of political institutions, increase the likelihood of frequent political demonstrations and food riots in low income countries. Bellemare (2015) exploited the link between natural disaster and food prices to identify the causal effect of high food prices on political instability while addressing that political instability is endogenous to food price. Arguing that global food markets are integrated and natural disaster in one place has spillover effects on other countries through higher food prices, the study showed that increased international food prices lead to increase the number of news on food riots and food related political conflicts. However, the study failed to show any such robust relationship between food price volatility and political conflicts.

The above studies show how an economic shock such as price hike can lead to political unrest. Our research question is the opposite one. To the best of our knowledge, thus it is the first study exploring how political conflict or violence causally affects food price. The two studies above employed either yearly or monthly data in a cross-country or global setting, while we utilize daily and weekly price data obtained from different markets covering all geographic variations within a country which is, by construction, better integrated compared to a global context. In addition, due to the high frequency data, the study is better able to capture the short-term impacts.

Although not related to food, we identify three recent studies on Bangladesh that empirically investigated how political conflicts affect manufacturing firms' productivity (Shonchoy and Tsubota, 2016; Ashraf et al., 2015) and exports (Iqbal and Ahsan, 2016). All these studies shed some light on how political strikes may disrupt the input supply and output delivery system, for example, exporting firms' transportation costs to port during the strikes increase by 69%. A number of studies documented that political conflict can affect production activity through several micro channels including a distorted input supply for efficient functioning of the firms (Collier et al. 2003; Blattman and Miguel 2010, Amodio and Maio, 2017, Macchiavello and Morjaria 2015). In fact, political conflicts does not let the market work properly as it disrupts input supply for production process by limiting firms' access to labor supply due to increased workers absence, access to capital due to heightened level of insecurity in the lender-borrower relationship, access to foreign inputs due to uncertainty regarding the sustainability.

The impact of *hartal* on food price is important to learn for several reasons including that of distributional implication. How higher food prices affect welfare is a relatively well-studied issue in the literature (Deaton, 1989; Ravallion, 1990; Barret and Dorosh, 1996; Ivanic and Martin, 2008; Vu and Glewwe, 2011; Bellemare, Barret and Just, 2013). The findings of these studies, in general, suggest that food price inflation is welfare reducing and the burden is mostly borne by the poor. When food price goes up, the net consumers lose while net-producers gain, and if the proportion of net consumers is higher in the economy, the overall welfare impact is supposed to be negative. Since in the urban areas, net-consumers are predominant, welfare is expected to fall in response to a food price hike. In the context of rice market in Bangladesh, as rice is a staple food, a price hike due to *hartal* would imply a negative first order welfare impact.

3. DATA

We compile rice market data from the Department of Agricultural Marketing (DAM), Ministry of Agriculture at the highest disaggregated level available from all districts on the following variables: daily retail price, weekly wholesale price of different varieties and quality of rice for the period 2010-2015. Note that although DAM collects daily retail and weekly wholesale price information of food items from major markets in each of the districts from 1980s, the presence of missing observations are quite extensive before 2010. Since we need to pair daily price data with the daily occurrence of strike, the price data before 2010 are too infrequent to use. The data is publicly available mostly at the aggregate level.[1]

The political strike data is taken from Ahsan and Iqbal (2016). This dataset have information on the date the strike actually occurred, the date of announcement, the name of the political party/non-political organization calling the strike, stated reasons for calling strike and the number of people killed and injured during strike. Since this dataset covers the period of 2005-2012, we updated this dataset up to 2015 to fit our study-period. The richness of these both dataset allows us to pair them at the daily level to study the impact of strike on rice prices. Most of the *hartal*s occurred in 2013-2015. Of 190 *hartal*s in our sample, this period saw about 86% of them. The year 2013 alone had 77 days of *hartals*. Note that there were only few *hartal* during the period 2009-2010. This was the period when the democratically elected government resumes power after 2-year long military backed caretaker government ruling. We observe strong seasonal pattern in the incidence of *hartal*. Within a year, about 61% *hartal*s occurred in winter during November-February. Political activities in Bangladesh, such as rallies, demonstrations, blockades, *hartal*s, etc. take place in winter when favorable weather remains for such outdoor activities unlike in monsoon.

DAM collects price information for a wide range of food grains including three main types of rice in Bangladesh -*Aus*, *Aman*, and *Boro*. As rice in the retail and wholesale markets are sold under different names, matching these two markets at the variety levels is very complex. Hence we rely on categorization of rice by quality which is available in both retail and wholesale levels. These three quality types are - fine, medium, and coarse. Although rice quality may depend on many

[1] We had to make special arrangement between BIDS and DAM to obtain the high frequency data. Currently the department has an ongoing project to make the data publicly available through its website.

factors including physical appearance, transparency, degree of milling, percent of brokenness, texture, aroma, and nutritional quality, the most widely used objective measure to assess the quality of rice in Bangladesh is size and shape of kernel: rice grain with width of less than 1.7 millimeters is considered as fine, 1.7-2.0 millimeters is considered as medium, and wider than 2.0 millimeter is considered as coarse(Rahman, 2004; Minten, Murshid, and Reardon, 2013).

Table 1: Descriptive Statistics on Prices

Variable	Observations	Mean	Std. Dev.
(a) Daily retail Price			
All Rice	72,468	35.9	4.0
Fine Quality	68,862	42.5	4.9
Medium Quality	72,167	34.6	4.1
Coarse Quality	58,110	29.5	4.2
(b) **Weekly Wholesale Price**			
All Rice	7,590	29.6	4.3
Fine	7,225	37.7	6.3
Medium	7,570	27.9	4.1
Coarse	6,978	22.8	4.6
(c) **Weekly retail Price**			
All Rice	7,567	36.1	3.8
Fine	7,111	43	4.7
Medium	7,513	35	3.9
Coarse	6,393	29.7	4
(d) **Horizontal Gap: Retail Price in Dhaka-Retail Price in Other Districts**			
All Rice	60,629	2.5	2.8
Fine	57,515	3.8	3.9
Medium	60,285	1.7	3.1
Coarse	42,624	2.4	3.2
(e) **Vertical Gap: Retail Price-Wholesale Price**			
All Rice	7,567	6.5	2.9
Fine	7,111	5.2	4.8
Medium	7,513	7.1	3.4
Coarse	6,393	6.7	2.9

The DAM food price database also contains information on rice price by identical quality categorization. We lump together all price information for all varieties within a specific quality category in a certain market to construct an average price measure for that specific quality-market combination. For illustration, on a certain date "*t*", in market "*m*", if "*n*" different varieties of fine quality rice is available with the retail prices of P_n, the average price of fine rice in market "m" on

date "*t*" can be expressed as $A_{m,t}^{fine} = \frac{\sum_1^n P_n}{n}$. This procedure is followed for all three quality categories across all 64 markets at the daily level to construct the measure on retail prices and at weekly-level to construct the measure on wholesale prices. Combining all varieties across qualities would yield an average price measure for all types of rice available in a market, which can be expressed as $A_{m,t} = \frac{\sum_{j=1}^3 \sum_1^n P_n}{n}$, where *j* =1(fine), 2(medium), and 3(coarse). Note that the average price measures are constructed on a daily basis for retail prices and on a weekly basis for wholesale prices.

We report descriptive statistics for various types of rice prices in Table 1. Since quality of rice may influence rice prices, we report all of the descriptive statistics on rice prices by quality type. The daily average retail price of rice during the sample period was 35.9 Taka/Kg. As expected, average price of fine rice is higher than medium and coarse quality rice by 7 Tk./Kg and 13 Tk./Kg respectively. Average weekly wholesale prices of fine rice are 35% higher than medium quality rice and 65% higher than coarse quality rice while the wholesale price of medium quality rice is 22% higher compared to coarse quality rice. The standard deviation of fine rice is higher compared to the rest for both wholesale and retail prices.

As the wholesale prices are available at the weekly level, to facilitate a comparison between the two, weekly retail prices are calculated as well. The average weekly wholesale prices are 6.5 Taka/Kg lower compared to weekly average of retail prices. Interestingly, this gap is larger for medium and coarse quality rice compared to that of fine quality rice. The spatial difference in rice price is examined through the difference in daily retail price between Dhaka and other districts. We pick Dhaka as the reference point because it is the capital and center of major economic activities of the country. It appears that daily retail price of rice in Dhaka is on average 2.5 Tk./Kg higher compared to the price in the rest of the country. The magnitude of the difference is largest for fine quality rice. It is interesting to note that this difference is larger for coarse quality rice relative to that for medium quality rice (2.4 Tk./Kg vs. 1.7 Tk./Kg).

As a first order check on how prices response to *hartal*, we plot incidence of *hartal* with average retail and wholesale prices for fine, medium and coarse quality rice by month of a year (Figure 1-Figure3). It is clearly evident form these plots that retail and wholesale prices of rice move together. Although the plots are on monthly prices, the gap between retail and wholesale prices is

lowest for fine quality rice. This is in line with the numbers reported for vertical gaps in Table 1. However, the co-movement between rice prices and incidence of *hartals* are not very clear. The average retail and wholesale rice prices exhibit an episode of rising trend during the period of 2011 and 2013-2014 that also observed *hartal* at higher frequencies. Note that during the first quarter of 2015, the country went through series of political turbulences and observed a large number of *hartals*. However, rice prices were actually exhibiting a falling trend then. This is consistent across all types of rice qualities. Combining these evidences, no clear pattern is obtained on the relationship between rice prices during *hartal*.

Figure 1: Average Monthly Price of Fine Quality Rice

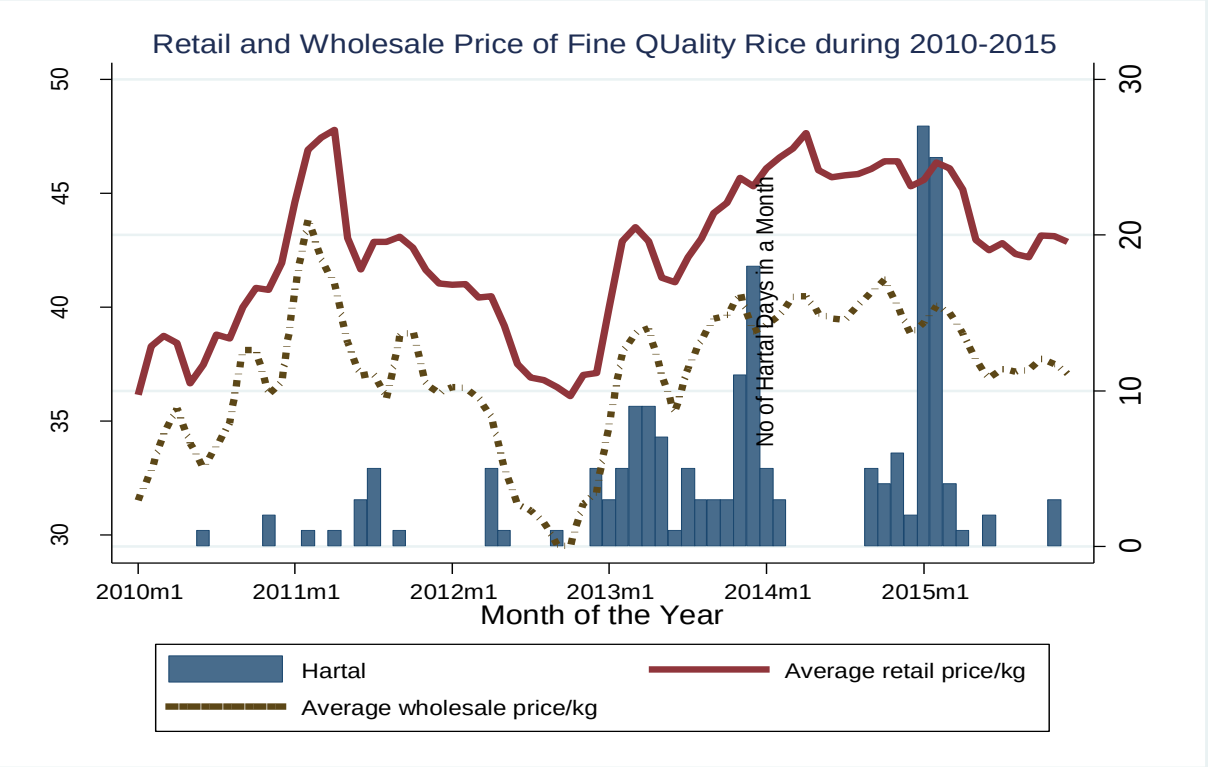


Figure 2: Average Monthly Price of Coarse Quality Rice

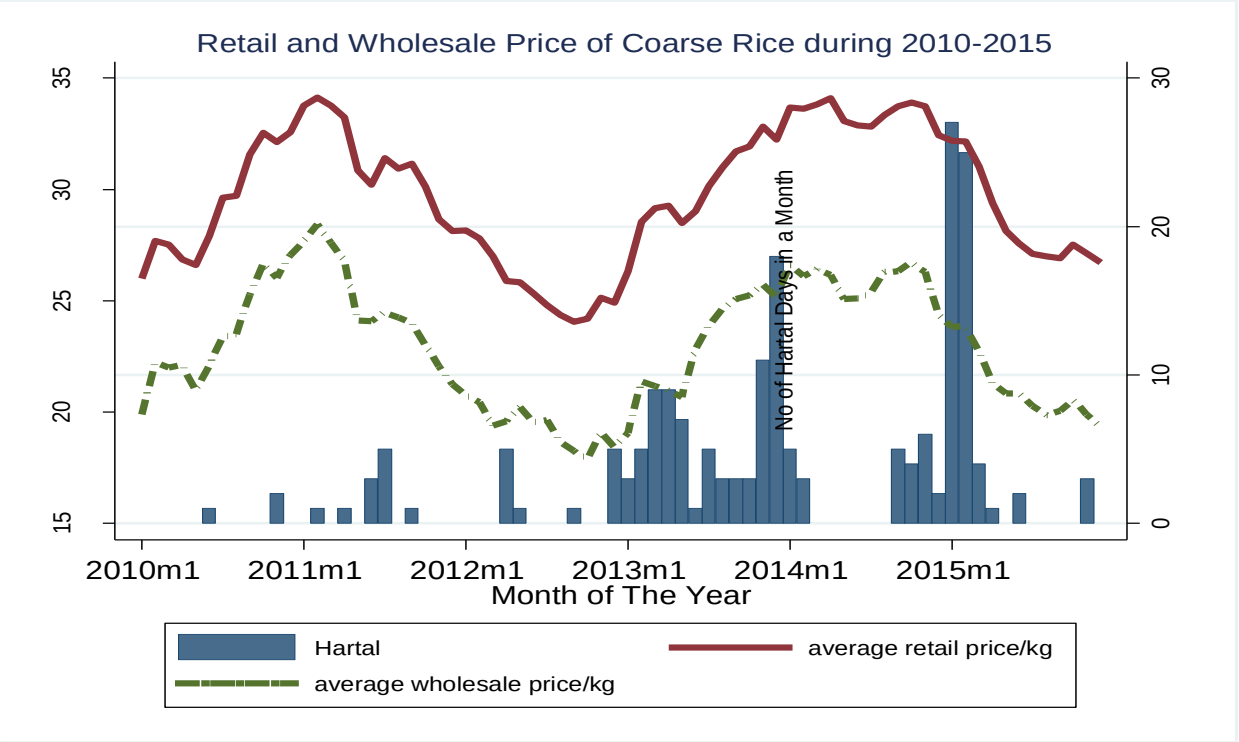
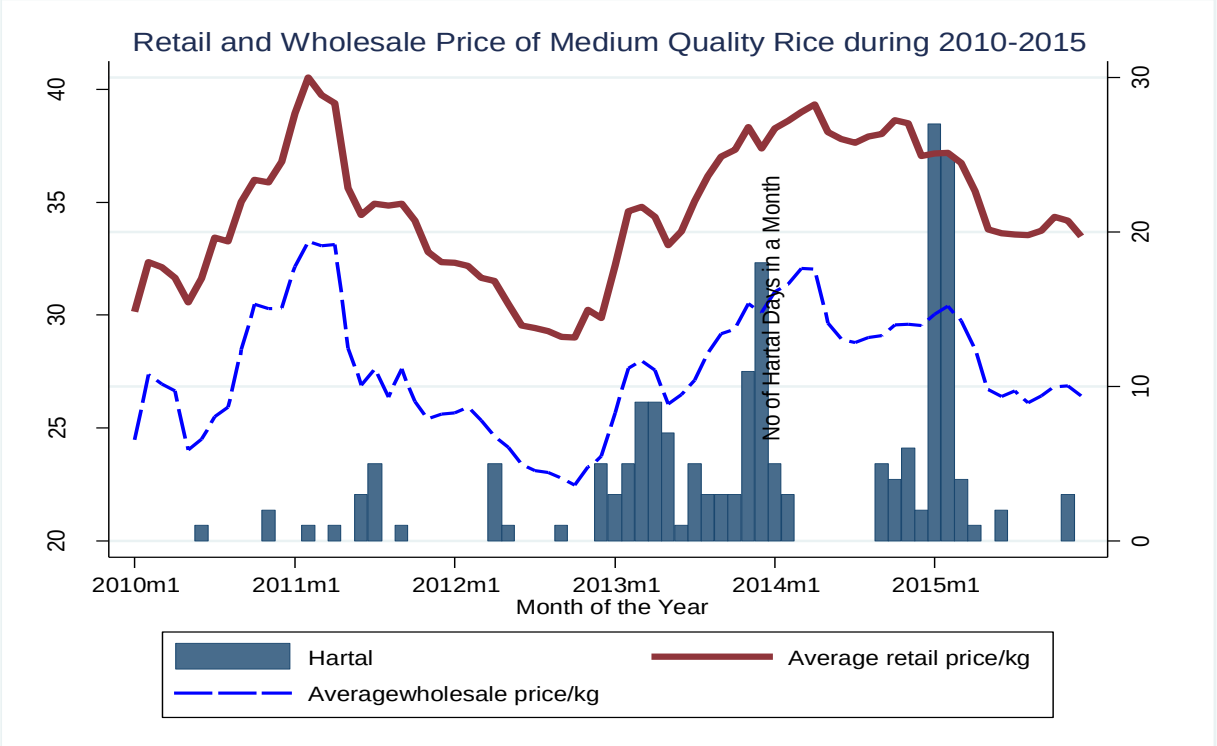
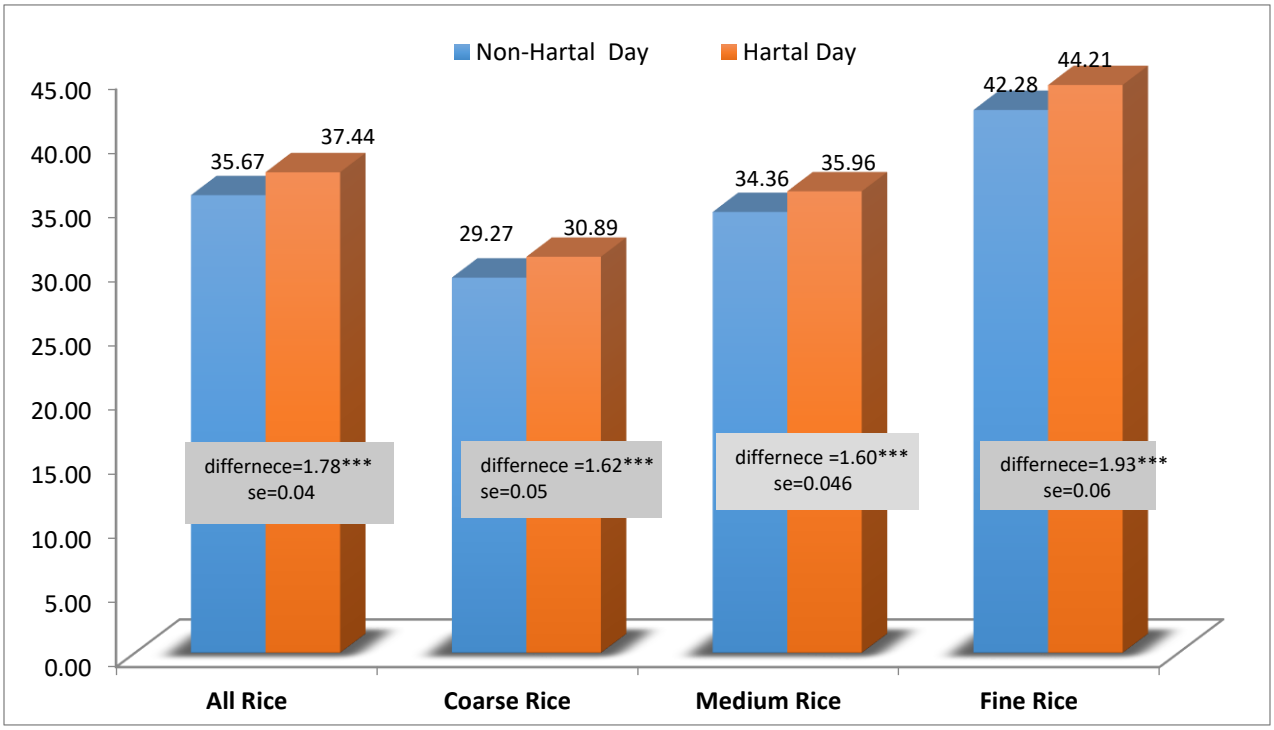


Figure 3: Average Monthly Price of Medium Quality Rice



An unconditional mean comparison between rice prices during *hartal* and non-*hartal* days would provide some preliminary idea on whether *hartal* and rice prices are correlated. As Figure 4 shows, daily retail prices of rice on *hartal* days are, in general, higher than that on non-*hartal* days, a pattern that exhibits statistical significance across all quality types. This price difference appears to be largest for fine quality rice (1.93 Tk./Kg) compared to medium(1.6 Tk./Kg) and coarse quality(1.62 Tk./Kg). However, this pattern of higher price on *hartal* days cannot be attributed to *hartal*, as many confounding factors might exist that can influence both of the variables. The following sections will elaborate on this.

Figure 4: Mean Comparison of Retail Rice Price between *Hartal* and non-*Hartal* Days



The growing districts may exhibit different dynamics over non-growing districts during any political shock that can potentially affect the commodity price. To incorporate this dimension into the analysis, the study finds out top rice growing regions in Bangladesh. Bangladesh Bureau of Statistics (BBS) reports periodic rice production data by crop-calendar and administrative districts. We calculate total rice production in each district by summing over all varieties produced, and then rank the districts to draw top 20 growing districts.

A wholesaler in any market would pick a sourcing district which is nearer to minimize transaction costs. Encountering a cost shock, such as rise in transportation costs due to *hartal*, a wholesaler may switch to a new source to minimize costs under the changing scenario. Alternatively, if such cost shocks are recurring, the wholesaler may incorporate such uncertainties into a dynamic cost minimization problem, in which case the sourcing markets may remain constant. This has important implication for our research question. If wholesalers alter their trading pattern in response to *hartal*, it would be difficult to disentangle the impact of *hartal* vs. that of changing sources-what is exactly causing the movement in rice price, if any.

In this context, we conducted a small survey of the wholesalers in Dhaka to understand if the sourcing districts change during *hartal*. The survey interviewed 18 wholesalers (*aratdars* as well, as they have private storage arrangement) in detail, who are drawn from 5 large well-known markets in Dhaka *Sadar* including *Badamtali and Wiseghat bazar, Shambazar, Karwan Bazar, Mohammadpur Krishi Market,* and *Babu Bazar*. Note that all wholesalers we surveyed buy, store and sell different varieties of rice. Their average year of experience in rice business is about 21 years. Approximately, 89% of these wholesalers mentioned procuring rice from rice millers or wholesalers in other districts. Their average rice storage capacity is 1658 *maunds*, ranging between 250 to 3000 *maunds*. The wholesalers mainly procure from Bogra, Chapai Nawabganj, Dinajpur, Naogaon, Kushtia, Mymensingh, Pabna, Sherpur, and Tangail, with an average monthly sourcing frequency of 6.3 times.

The market survey revealed that although sourcing districts vary across wholesalers, it has been a constant source over time for each wholesaler. The wholesalers of rice in Dhaka are not likely to change their procurement source even during regular and politically stable time, non-*hartal* period. When asked whether their souring pattern changes during politically turbulent time, none of them mentioned about taking such adaptation measure during any of the *hartals* that took place during last 7 years (Figure A1 in the *appendix*). Note that this pattern of sourcing is justifiable as searching involves transaction costs and forming long-term trading relationship may minimize such costs, especially during uncertain political environment. However, all of the respondents mentioned that the main shock in the upstream of their supply chain comes through higher transportation costs during the hartal. When asked to compare their transportation costs of sourcing by hartal period,

the wholesalers recalled that such costs went up, on average, by 16% during the year 2014-2015 (14,721 taka vs. 17,120 taka for one shipment of rice by truck from sourcing districts to Dhaka).

4. ESTIMATION STRATEGIES

The objective of this study is to identify the impact of political strikes on the price of rice, the staple food of the country. Accordingly, the emphasis will not direct toward modeling the pricing behavior of the rice market in Bangladesh. It would assume a reduced form specification with all sorts of controls to rule out spatial and temporal confounders.

4.1 Empirical Specification

The benchmark specification is

$$P^{i}{}_{dt} = \alpha_1 + \beta_H H_{dt} + \beta_K K_{dt} + \theta_d + \theta_m + \theta_t^w + \theta_w^y + \theta_y + \varphi_d^y + \epsilon_{dt}, \qquad (1)$$

where i=retail or wholesale. In the above specification, the key variables $P^{i}{}_{dt}$ is the price of rice at level *i* for district *d* on day *t*, H_{dt} is a binary variable which assumes one if district *d* observes a *hartal* on day *t* and zero otherwise, and K_{dt} denotes total number of people killed due to political violence during *hartal* observed on day *t*. Thus, β_H captures the key parameter of interest - the effect of strike in this case. Since H_{dt} is an indicator variable for *hartal*-days, K_{dt} would capture the severity of *hartal* or how intensely a *hartal* was demonstrated.

A set of fixed factors are included in specification 1 to control for spatial and temporal factors that can potentially contaminate β_H. The dummies for district fixed effects is denoted by θ_d, which capture the unobserved, time-invariant characteristics of districts/markets that might be correlated with both rice price and strike. We also include a set of time variables in our regression model to capture any seasonal pattern of the rice prices including a day-of-year trend (φ_d^y), month fixed effects (θ_m) and year fixed effect (θ_y). For instance, rice prices may exhibit strong systematic patterns due to growing season. We further control for low frequency seasonal patterns by including "day-of-the-week" fixed effect (θ_t^w) and "week-of-the-year" fixed effect (θ_w^y) to capture any systematic variations of rice prices by days during a week, and by weeks in a year. Finally, ϵ_{it}

is the error term that we assume to be orthogonal to H_{dt} once all of the above fixed factors are taken care of. We use robust standard errors that are clustered at the district and week level for retail prices.

Note that as wholesale prices are available only at the weekly level, in the case of weekly prices, H_{dt} is defined as the number of political strikes in a week. Accordingly, the set of seasonal controls for weekly return will be different from the daily one, specified as:

$$P^{i}{}_{dw} = \alpha_1 + \beta_H H_{dw} + \beta_K K_{dw} + \theta_d + \theta_m + \theta_w^y + \theta_y + \varphi_w^y + \epsilon_{dw}, \quad (2)$$

where w denotes week, φ_w^y is week-of-year trend, and all other variables and parameters denote the same as stated for specification 1. We use robust standard errors that are clustered at the district and week level for all weekly price analysis.

Cumulative Effect on Retail price

The adjustment process would look into the impact of *hartal* on rice prices within a window consisting the strike day. The following specification will be estimated separately by incorporating *hartal* windows (*hartal* and the following day, *hartal* and following two consecutive days, and it goes upto *hartal* and five consecutive days) into specification 1 in place of *hartal* indicator:

$$P_{dt} = \alpha_1 + \beta_H^n \sum_{n=H}^{H+5} I_{dt}^n + \beta_K K_{dt} + \theta_d + \theta_m + \theta_t^w + \theta_w^y + \theta_y + \varphi_d^y + \epsilon_{dt}, \quad (3)$$

where I_{dt}^n is the indicator variable that assumes a value of 1 starting from the day of *Hartal* to the 5th consecutive days after *hartal(H)*, and 0 for all other days. Thus, β_H^n would be interpreted as the *n*-days cumulative impact of *hartal.* All other variables and parameters would assume the same notations as stated for specification 1.

Effect on Horizontal Margin

For horizontal margin, retail prices of all districts are compared with that of Dhaka-the capital of the country that is predominantly a hub for both economic and political activity. The horizontal margin is thus defined as the difference between retail price of Dhaka and other districts.

$$D^{h}{}_{d\,t} = \alpha_1 + \beta_H H_{dt} + \beta_K K_{dt} + \theta_d + \theta_m + \theta_t^w + \theta_w^y + \theta_y + \varphi_d^y + \epsilon_{dt}, \quad (4)$$

where $D^h{}_{dt}$ is the difference in rice price between Dhaka and district *d* in period *t* All other variables and parameters would assume the same notations as stated for specification 1 except for θ_d, which is the district-pair fixed effect in the current specification, for example, distance.

Effect on Vertical Margin

The vertical margin is defined as the difference between retail price and wholesale price of each district.

$$\delta^v{}_{dw} = \alpha_1 + \beta_H H_{dw} + \beta_K K_{dw} + \theta_d + \theta_m + \theta_w^y + \theta_y + \varphi_w^y + \epsilon_{dw}, \quad (5)$$

where δ_{dw} is the weekly difference between retail and wholesale prices in district *d* in week *w*. All other variables would assume the same notations as stated for specification 2.

4.2 Econometric Issues

The identification strategy laid out above rule out several confounding scenarios. First, it could be the case that both the rice market and the decision to call a strike respond to a common factor such as an economic shock. Although the rice market in Bangladesh may respond to an economic shock, such as a sudden oil price spike, the calling of strikes due to such economic reasons is not common in Bangladesh. In their political strike database, Ahsan and Iqbal (2016) provides detail on the official reasons for calling strike, which reveals that the electoral reform has been the most common reasons for calling political strike(Figure A2 in the *appendix*). It appears that only about 3-4% of the strikes could be attributed to economic reasons. This evidence thus rule out the possibility of having an economic shock type third factor that is driving both announcement of strike and rice price movement.

Next, both the rice price spikes and strikes have propensity to occur during the same period, though possibly for different reasons. Drawing causal inference requires that our estimation strategy must cancel out all such effects. In order to probe this, we plot monthly average of wholesale and retail price of rice and number of political strikes in a month (Figure 5a and b).

Figure 5a and 5b shows strong indication of seasonality in political strike data– about 61 percentages of strikes occurred during the winter in the months from November to February. The average prices of rice, both wholesale and retail, tend to move upward during last two months of the year – November and December, and exhibit a steep increase up to February of the following

year. However, higher rice prices can be coincided with occurrence of greater number of strikes in winter due to completely different reasons. Economic activities tend to pick up during the winter, as November-December coincides with "*Aman*-rice" harvesting while November-January coincides with "*Boro*-rice" sowing seasons. Further, this is the time-period when festivities pick up and aggregate demand for rice rises. Political parties utilize the mild, favorable weather in the winter to stimulate political activities, and are thus more likely to call *hartal* during this time.

Figure 5a: Average Monthly Wholesale Price of Rice (Taka/Kg) and Number of *Hartals*

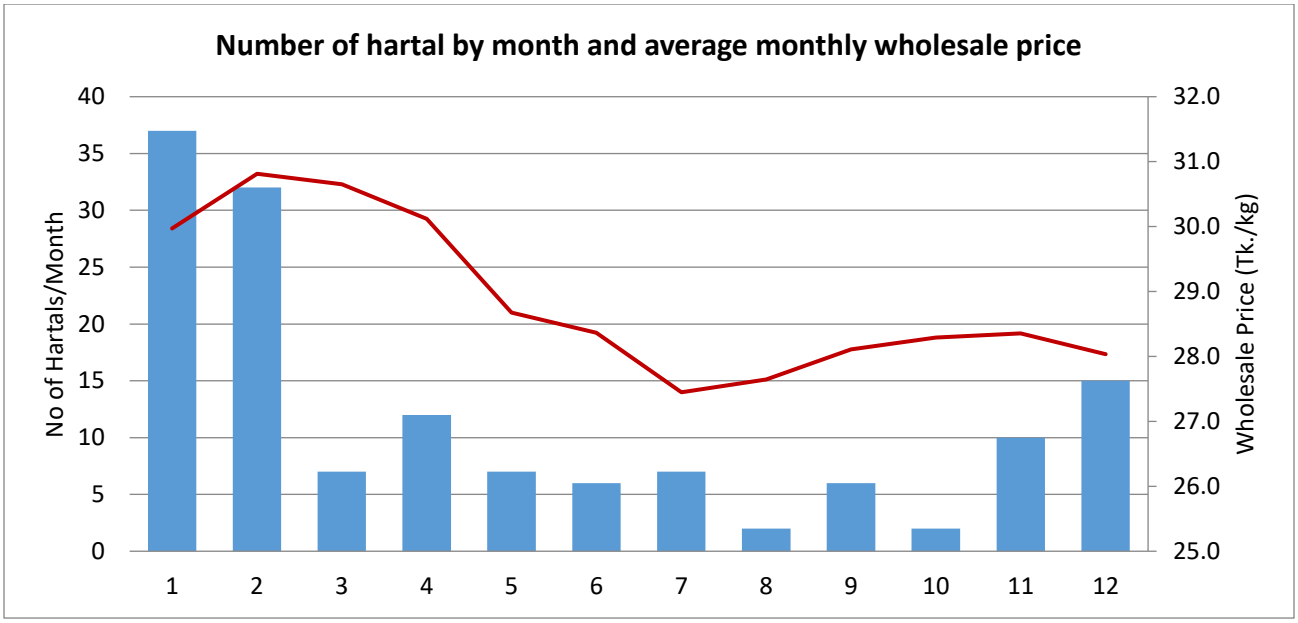
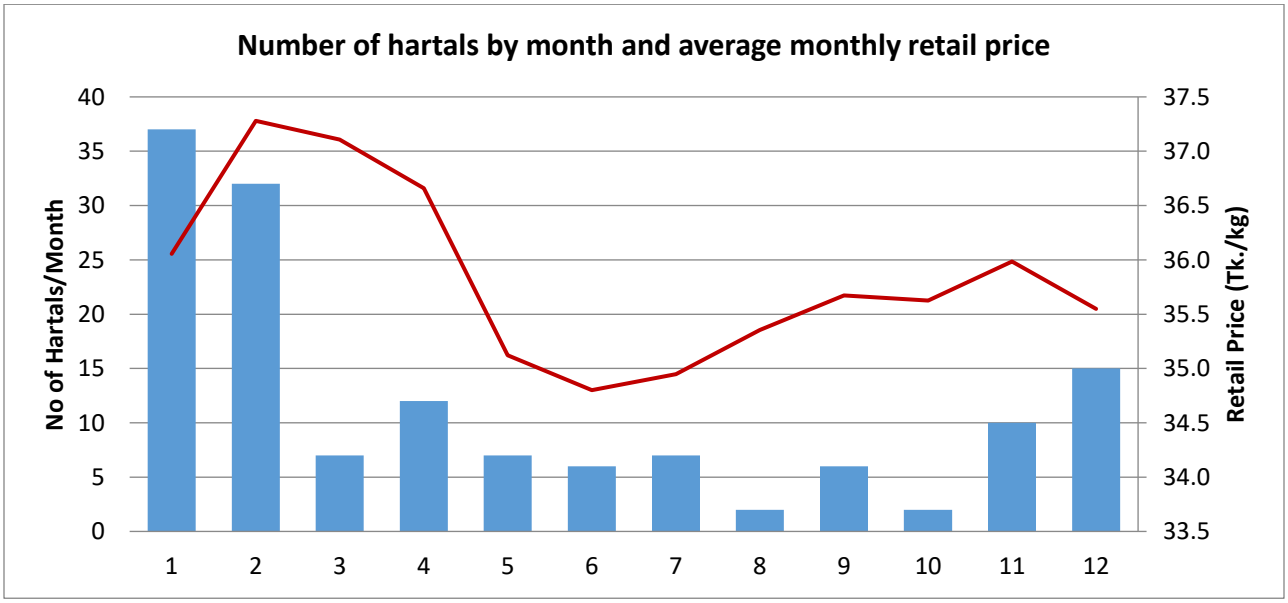


Figure 5b: Average Monthly Retail Price of Rice (Taka/Kg) and Number of *Hartals*



The low frequency seasonality can also affect both rice price and political strikes. For example, anticipation of a government policy change may generate widespread uncertainty among mass people for short-window of time, and perturb the rice market and political environment at the same time. The presence of such pattern is examined by plotting average retail price and frequency of *hartal* by week of the year, as depicted in Figure 6. During some of the weeks (week 3 to 8, week 27 to 29, week 39, week 46 to 52), some pattern between rice price and hartal is noticeable. Although not reported here, a similar pattern is observed for weekly wholesale prices as well. Similarly, we examine the issue of day-of-week effects by plotting average rice price and occurrence of strike on a day of a week (Figure 7). The figure shows a subtle pattern in that the first three week days (Sunday-Tuesday) are more likely to exhibit more strikes as well as higher price while the weekend (Friday-Saturday) is more likely to observe lower prices and less political strike. Therefore, if we do not control for day-of-week effect, the coefficients in regressions may pick up spurious correlations. In this backdrop, we include a host of fixed effects that would capture the effect of year, month, day-of-week, "week-of-year" as well as time trend in order to isolate the noises due to all sorts of possible seasonality.

Figure 6: Weekly Trend in Average Retail Prices (Taka/Kg) of Rice

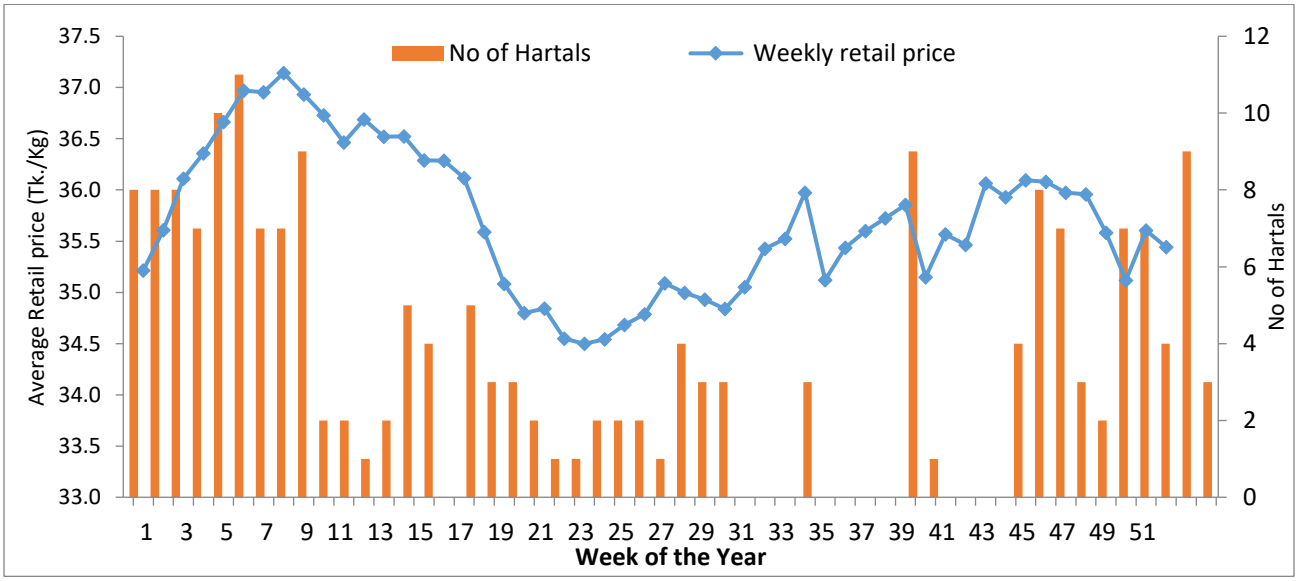
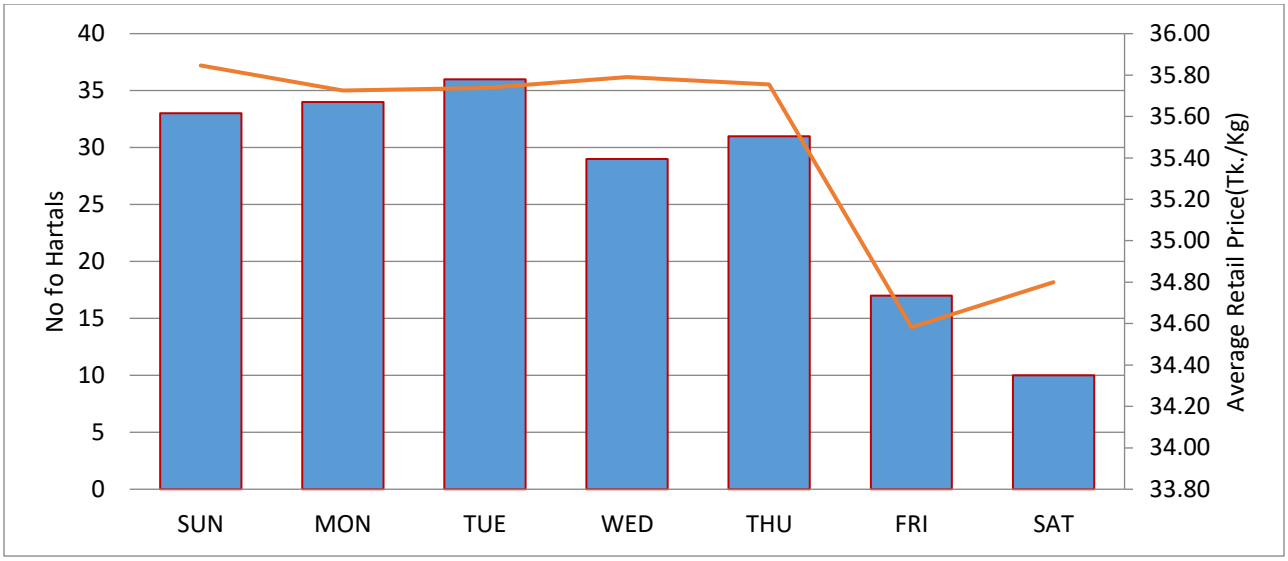


Figure 7: Number of *Hartals* and average of daily retail price by day of the week



Third, spatial *unobservables* may play confounding role as some unobserved characteristics of the district-level markets may be correlated with political strikes, particularly with the exposure to and severity of strike. The exposure heterogeneity across markets arise due to that different stages in the rice value chain may assume differentiated structure at different places and political parties may exhibit variation in popularity as well as organizational capacity across locations. That is, markets in different locations may be exposed to strikes at different intensities that may lead to identification problem for isolating the impact of *hartal* on rice prices. In order to capture all such spatial heterogeneity we include market-fixed effects that would also take care of all sorts of market-specific spatial factors that are invariant over time.

However, the location specific fixed factors along with all seasonal controls would not be adequate, if there exists market-specific fixed factors that vary over time. For example, input costs for rice may rise over time differentially across districts, or that natural disasters may not affect rice production areas in the same manner. To assess whether such possible confounders are contaminating our estimates, we include district-year specific fixed effects in some of the specifications. Finally, in our high frequency empirical setting, the errors may exhibit across time correlation within markets as well as across markets within time. To address such issues, we exploit two-way clustering-all of the standard errors are clustered over markets and time (days for retail prices and weeks for wholesale prices).The precision of the estimates from our model may therefore be interpreted as conservative.

5. Estimation and Results

A. Effect on Rice Price

The impact of *hartal* on rice price is reported in Table 1. Specification I does not include any controls other than *hartal* variable. The coefficient of *hartal* thus suggests that rice price and *hartals* exhibit a positive and statistically significant association, which means that rice prices are higher during *hartal* compared to non-*hartal* period. However, since this positive association is nothing but mere correlation, specification II-IV control for various trend and fixed factors which may be correlated both with rice price and *hartal* in a number of ways as described in previous sections. Specification III controls for stricter district-year specific unobserved fixed factors instead of individual district and year fixed factors while specification IV includes an indicator for the announcement day of the *hartal* in place of a *hartal* dummy.

Table 1: Impact of *Hartal* on Rice Price

	I	II	III	IV
Hartal dummy	**0.643*** **	**0.543*** **	**0.536*** **	
	[0.049]	[0.164]	[0.162]	
Announcement Dummy				-0.274
				[0.262]
Total Killed	0.063***	0.028***	0.028***	0.036***
	[0.001]	[0.007]	[0.007]	[0.006]
Constant	35.567***			
	[0.016]			
N	72472	72472	72472	72472
Adj. R-sq.	0.042	0.712	0.773	0.711
Quadratic Trend		YES	YES	YES
District Fixed Effect		YES		YES
Year Fixed Effect		YES		YES
District-Year Fixed Effect			YES	
Day of Week Fixed Effect		YES	YES	YES
Week of Year Fixed Effect		YES	YES	YES

*Note: Significance level can be read as * p<0.1, ** p<0.05, *** p<0.01.Standard Errors are reported in parentheses. Standard errors are clustered at the district and daily level.*

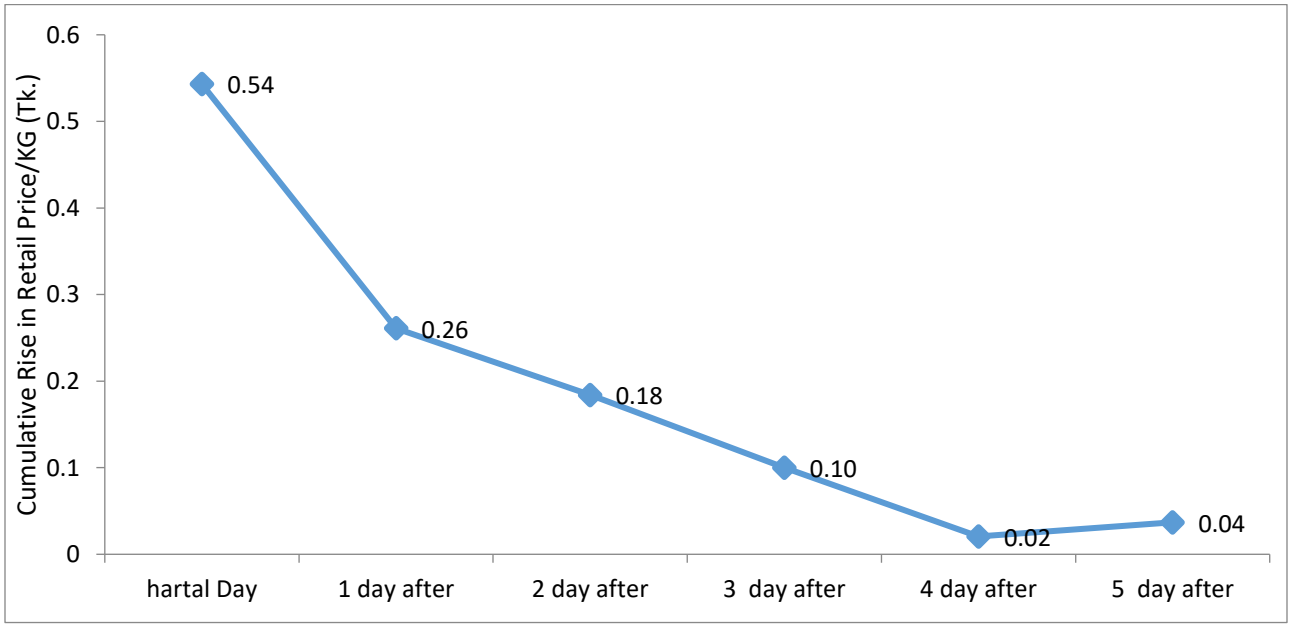
The coefficient of *hartal* in specifications II and III suggest that rice prices increase during the *hartal* days in a statistically significant manner, and the impact of *hartal* on rice prices is approximately 0.54 taka/Kg. Invariability of the coefficient of *hartal* across specification II and III reveal that time-variant *unobservables* do not exhibit differentiated spatial variation that can affect prices across districts differentially. As the announcement indicator turns out to be statistically insignificant, it appears that the announcement of *hartal* does not have any impact on

rice prices. The coefficient of "Total Killed", which captures the severity of *hartals*, turns out to be positive and statistically significant in a consistent way. Although the coefficient is of smaller magnitude (in the range 0.03-0.06), its consistent statistical significance imply that inclusion of this variable is critical for a meaningful interpretation of the coefficient of *hartal*s net of severity.

B. Adjustment Process of Rice Price after *Hartal*

Given the evidence that rice prices increase due to *hartals*, the immediate question that follows is how long the impact persists, or how long it takes for prices to return to pre-*hartal* level. This section expands on this analysis. Following the days after *hartal*, five consecutive windows are constructed to examine the cumulative impact of *hartals*. For example, "*hartal* and 1 day after" is the 2-day window that will reveal the cumulative impact of *hartal* on rice price on *hartal* day and 1 day after *hartal*. The specification with full set of controls (specification II in Table 1) is estimated and the results are presented in Table 2. The estimates suggest that the impact of *hartal* persists up to second day of *hartal*. Due to *hartal*, the rice price increases by 0.54 Tk./Kg but it starts to fall from the following day. The 2-day cumulative impact of *hartal* on rice price is 0.26 Tk./Kg which is statistically significant at less than 10 percent level. The cumulative impact shrinks in a consistent manner as the *hartal*-window widens. The pattern is clearly evident in Figure 8. Similar pattern was not observed when impacts were checked on the day before *hartal*.

Figure 8: Adjustment Process of Rice Price after Hartal



The cumulative impact of *hartal* thus persists beyond the *hartal*-day though for a short period of time. The price level returns to the pre-*hartal* level on the second day following a *hartal* as the statistical significance of cumulative impact suggests. This is consistent if rice is storable and the disruption in the supply chain that *hartal* creates does not persist beyond the *hartal* day. Similar patterns were not observed when impacts were checked on the day before *hartal*. Irrespective of quality of rice, the retail price of rice remains largely unchanged on the eve of *hartal*.[2]

Table 2: Impact of *Hartal* on Rice Price-Adjustment Process

	I	II	III	IV	V	VI
Hartal dummy	**0.543*** **					
	[0.164]					
Hartal and 1 day after		**0.261***				
		[0.145]				
Hartal and 2 days after			0.184			
			[0.137]			
Hartal and 3 days after				0.100		
				[0.127]		
Hartal and 4 days after					0.0206	
					[0.121]	
Hartal and 5 days after						0.0369
						[0.119]
Total Killed	0.0278***	0.0320***	0.0330***	0.0343***	0.0355***	0.0353***
	[0.007]	[0.007]	[0.007]	[0.007]	[0.007]	[0.007]
N	72472	72472	72472	72472	72472	72472
Adj. R-sq.	0.712	0.711	0.711	0.711	0.711	0.711
Quadratic Trend	YES	YES	YES	YES	YES	YES
District Fixed Effect	YES	YES	YES	YES	YES	YES
Year Fixed Effect	YES	YES	YES	YES	YES	YES
Day of Week Fixed Effect	YES	YES	YES	YES	YES	YES
Week of Year Fixed Effect	YES	YES	YES	YES	YES	YES

*Note: Significance level can be read as * p<0.1, ** p<0.05, *** p<0.01.Standard Errors are reported in parentheses. Standard errors are clustered at the district and daily level.*

If *hartal* disturbs the transportation system which induces retailers to incur higher costs to obtain the supply from the upstream, this will be reflected through higher retail prices of rice. Again, though *hartal* is a recurring political event, it creates uncertainty about the political and economic environment of the country. As such uncertainty may give rise to expectation induced shock among the consumers and retailers, price of rice may increase depending on the expectation and elasticity parameters of demand and supply. However, when the *hartal* ends, such uncertainty dissipates, agents update information set, market adjusts in a day or two, and price level returns to normal level consequently.

[2] The empirical exercise is conducted because political parties may demonstrate for building support in favor of *harta*l, the disruption of the supply chain may thus sets in ahead of the *hartal*-day.

C. Heterogeneity in the Impact of *Hartal*

The heterogeneity of *hartal's* impact on rice price is examined by incorporating the quality of rice, length of *hartal*, and spatial variation into the analysis. Panel (a) in Table 3 presents rice-quality specific estimates while panel(b) presents the estimates by length of *hartal* (single day vs. multiple days). On the days of *hartal*, rice price increases across the quality types-fine, medium, and coarse. However, the price of coarse rice, which is of relatively lower quality, increases by the larger magnitude (0.62 Tk./Kg higher compared to 0.44-0.48 Tk./Kg for fine and medium rice). Note that the difference in the coefficient of *hartal* between coarse and fine, and coarse and medium varieties turn out to be statistically significant. All of the estimates in panel (b) reveal that it is primarily multiple-day *hartals* that affect the rice price. When a *hartal* spans over multiple days, rice price, on average, goes up by 1.5Tk./Kg compared to non-*hartal* days. Being consistent with the pattern noted in panel (a), the largest price increase is observed for coarse rice (1.7 Tk./Kg), by 0.3-0.4 Tk./Kg more compared to fine and medium rice.

Table 3: Impact of *Hartal* on Rice Price, Quality Heterogeneity and Length of *Hartal*

	(a) Variety of Rice			
	All Rice	Fine Rice	Medium Rice	Coarse Rice
	I	II	III	IV
Hartal dummy	**0.543*** **	**0.444*** **	**0.488*** **	**0.622*** **
	[0.164]	[0.154]	[0.168]	[0.181]
Total killed	0.028***	0.030***	0.024***	0.036***
	[0.007]	[0.007]	[0.007]	[0.008]
Adj. R-sq.	0.712	0.642	0.639	0.719
	(b) Single day vs. Multiple day *Hartals*			
	I	II	III	IV
Single Day Hartal	0.156	0.103	0.115	0.178
	[0.166]	[0.155]	[0.169]	[0.184]
Multiple Day Hartal	**1.496*** **	**1.287*** **	**1.403*** **	**1.692*** **
	[0.256]	[0.247]	[0.270]	[0.278]
Total killed	0.020***	0.022***	0.016**	0.026***
	[0.007]	[0.007]	[0.007]	[0.008]
N	72472	68864	72168	58111
Adj. R-sq.	0.236	0.643	0.641	0.722
Quadratic Trend	YES	YES	YES	YES
District Fixed Effect	YES	YES	YES	YES
Year Fixed Effect	YES	YES	YES	YES
Day of Week Fixed Effect	YES	YES	YES	YES
Week of Year Fixed Effect	YES	YES	YES	YES

*Note: Significance level can be read as * p<0.1, ** p<0.05, *** p<0.01. Standard Errors are reported in parentheses. Standard errors are clustered at the district and daily level. The difference in the coefficient of hartal between fine and coarse varieties exhibit statistical significance at less than 1 percent level while that between medium and coarse quality at less than five percent level.*

The estimates in Table 3 further suggests that retail prices of rice increase during hartal and such price hike would affect the coarse rice market mostly. Similar to the analysis in Table 2, the adjustment process of retail prices is examined by rice varieties as well, as presented in Figure A3 in the *appendix*. The impact of *hartal* on fine and medium rice prices is not observed beyond the *hartal* day. In contrast, the impact persists for coarse rice for one additional day after *hartal* ends. Thus, the persistence of high price beyond the *hartal* day, as observed in Figure 8 as well, is mainly driven by coarse quality rice varieties. Once the *hartal* event is over, prices of all varieties return to pre-*hartal* level within 1-2 days.

The spatial heterogeneity in the impact of hartal on rice prices worth investigation due to differences in terms of rice productivity, market size, and regional variation in relative strength of the political parties. While examining the regional variation, the whole country is split into four parts: (a) Dhaka only, (b) 8 Divisional administrative districts (Headquarters),[3] (c) Non-divisional districts, and (d) Major rice growing districts. Dhaka is the most populated district consisting of the capital of the country, which is the center of economic and political activities. The divisional districts and non-divisional districts are grouped separately as major economic and political activities of the respective divisions are concentrated and organized in divisional district headquarters. The rice growing districts are grouped together to examine if the production channel plays any differentiated role there.

The estimates reported in Table 4 suggest that in response to *hartal*, retail prices of rice exhibit differential impact across regions. *Hartal* has no impact on rice price in Dhaka (specification I, panel a) and relatively smaller impact in divisional headquarter districts (0.43 Tk./Kg) compared to other districts and rice growing districts (0.56 Tk./Kg). The disaggregated estimates by quality of rice varieties reveal that the market for best quality rice in Dhaka does not respond to *hartal*. In contrast, price of medium and coarse quality rice does, but by a smaller magnitude relative to other divisional districts, non-divisional districts, or procurement districts (0.29-0.30 Tk./Kg vs. 0.42-0.64 Tk./Kg). Again, similar to the findings presented in Table 2, the impact of *hartal* appears to be largest on the prices of coarse rice relative to others across all of the regions.

[3] The divisional districts include Dhaka, Chittagong, Rajshahi, Khulna, Barisal, Mymensingh, Sylhet and Rangpur

Table 4: Impact of Hartal on Rice Price, Regional Heterogeneity

	I	II	III	IV
	(a) All Rice			
	Dhaka Only	Divisional HQ Districts	Excluding Divisional HQs	Growing Districts
Hartal Dummy	0.066	**0.431****	**0.561*****	**0.572****
	[0.181]	[0.165]	[0.166]	[0.191]
Total Number Killed	0.038***	0.033***	0.028***	0.023**
	[0.009]	[0.007]	[0.007]	[0.007]
N	3587	27736	171407	30340
Adj. R-sq	0.138	0.179	0.243	0.215
	(b) FINE			
	Dhaka Only	Divisional HQ Districts	Excluding Divisional HQs	Growing Districts
Hartal Dummy	0.272	**0.497****	**0.434*****	**0.385****
	[0.221]	[0.153]	[0.156]	[0.139]
Total Number Killed	0.060***	0.030***	0.030***	0.024**
	[0.012]	[0.008]	[0.007]	[0.008]
N	1280	9468	59396	10408
Adj. R-sq	0.794	0.729	0.63	0.656
	(c) MEDIUM			
	Dhaka Only	Divisional HQ Districts	Excluding Divisional HQs	Growing Districts
Hartal Dummy	**0.294****	**0.419****	**0.496*****	**0.484****
	[0.150]	[0.168]	[0.174]	[0.178]
Total Number Killed	0.048***	0.029**	0.024***	0.016**
	[0.007]	[0.009]	[0.007]	[0.006]
N	1276	9561	62607	10464
Adj. R-sq	0.744	0.602	0.642	0.684
	(d) COARSE			
	I	II	III	IV
	Dhaka Only	Divisional HQ Districts	Excluding Divisional HQs	Growing Districts
Hartal Dummy	**0.298****	**0.508****	**0.640*****	**0.538****
	[0.131]	[0.192]	[0.183]	[0.168]
Total Number Killed	0.048***	0.044***	0.035***	0.032***
	[0.008]	[0.009]	[0.008]	[0.009]
N	1030	8707	49404	9468
Adj. R-sq	0.812	0.596	0.736	0.694
Quadratic Trend	YES	YES	YES	YES
District Fixed Effect	YES	YES	YES	YES
Year Fixed Effect	YES	YES	YES	YES
Day of Week Fixed Effect	YES	YES	YES	YES
Week of Year Fixed Effect	YES	YES	YES	YES

*Note: Significance level can be read as * p<0.1, ** p<0.05, *** p<0.01.Standard Errors are reported in parentheses. Standard errors are clustered at the district and daily level.*

D. *Hartal* and Horizontal Gap in Retail Price

The difference in the prices of fine and medium quality rice between Dhaka and other places do not exhibit any statistical significance. It means that fine and medium quality rice prices are affected in the same manner in Dhaka and other districts of Bangladesh. However, for coarse varieties, the differential impact between Dhaka and other places is statistically significantly evident in most of the cases. Compared to Dhaka, retail price of coarse rice increases by 0.34 Tk./Kg more in 63 other districts, 0.35 Tk./Kg more in non-divisional districts, and 0.32 Tk./Kg more in growing districts. In contrast, there is no horizontal gap in retail coarse rice price between Dhaka and other divisional-districts. The estimates suggest that coarse rice market in Dhaka behaves differently during *hartal* compared to rest of the country.

Table 5: Retail Price Gap Between Dhaka and Other Regions (Horizontal Gap), by Quality of Rice

FINE				
	All Districts Excluding Dhaka	Divisional HQ Districts	Excluding Divisional HQs	Growing Districts
Hartal Dummy	-0.065	-0.175	-0.047	0.054
	[0.113]	[0.091]	[0.115]	[0.152]
Total Killed	0.028***	0.030***	0.027***	0.028**
	[0.007]	[0.008]	[0.007]	[0.010]
N	57515	6970	50545	8858
Adj. R-sq	0.47	0.512	0.464	0.356
MEDIUM				
	All Districts Excluding Dhaka	Divisional HQ Districts	Excluding Divisional HQs	Growing Districts
Hartal Dummy	-0.113	-0.057	-0.119	-0.102
	[0.134]	[0.164]	[0.140]	[0.145]
Total Killed	0.023***	0.019*	0.023***	0.026***
	[0.004]	[0.008]	[0.005]	[0.005]
N	60285	7068	53217	8898
Adj. R-sq	0.445	0.376	0.445	0.385
COARSE				
	All Districts Excluding Dhaka	Divisional HQ Districts	Excluding Divisional HQs	Growing Districts
Hartal Dummy	**-0.341*** **	-0.281	**-0.346*** **	**-0.316** **
	[0.115]	[0.164]	[0.115]	[0.115]
Total Killed	-0.005	-0.018*	-0.003	-0.007
	[0.005]	[0.008]	[0.005]	[0.007]
N	42624	5664	36960	7003
Adj. R-sq	0.662	0.374	0.688	0.532
Quad Trend	YES	YES	YES	YES
Day of Week FE	Yes	Yes	Yes	Yes
Week of Year	Yes	Yes	Yes	Yes
Month	Yes	Yes	Yes	Yes
Year	Yes	Yes	Yes	Yes
District	Yes	Yes	Yes	Yes

*Note: Significance level can be read as * p<0.1, ** p<0.05, *** p<0.01. Standard Errors are reported in parentheses. Standard errors are clustered at the district and daily level.*

E. *Hartal*, Wholesale Price, and Vertical Price Gap

Besides knowing the response of retailers, it is pertinent to learn how the wholesalers, another key agent in the rice value chain, respond to political conflicts and violence. Combining wholesalers' and retailers' responses to *hartal* would inform better regarding the price transmission in the downstream of the value chain. Table 6 presents the estimates on the impact of *hartal* on weekly wholesale price, retail price, and the gap between the two.

The weekly wholesale prices respond to *hartals* in a consistent manner across quality types of rice. For one additional day of *hartal* in a week, weekly wholesale price of fine and medium quality rice goes up by 0.18 Tk./Kg and 0.15 Tk./Kg respectively while that of coarse rice rise by 0.26 Tk./Kg. The price hike is larger in markets from divisional districts compared to those in non-divisional districts (0.10 Tk./Kg higher for fine and coarse, 0.29 Tk./Kg higher for medium rice). Note that these weekly estimates are not directly comparable with the impacts reported for retail price in Table 3. Because the later utilized the daily level price variation and compare the average prices between *hartal* and non-*hartal* days to identify the impact on rice prices on *hartal* days whereas the former identifies the impact of one additional *hartal* day. To make the analysis consistent, consequently, a measure on weekly average retail prices are constructed for each market by taking the mean of the daily retail prices within a week. As Table 6 shows, for one additional day of *hartal* within a week, average weekly retail prices of all varieties of rice increase consistently, with the largest increase observed for low quality (0.16, 0.22, and 0.32 Tk./Kg for fine, medium, and coarse quality respectively). The steady pattern of high wholesale prices in divisional districts compared to non-divisional districts is not observed in the case of weekly retail prices.

The vertical price gap, the difference between retail and wholesale prices, reflects to what extent the rise in weekly wholesale rice prices due to the political shock is transmitted to weekly average retail rice prices. The statistical insignificance of vertical price gap for fine quality rice implies that retailers in the fine rice market completely pass-through the *hartal*-effect to retail prices. In contrast, for medium and coarse quality rice varieties, the vertical price gap is positive and statistically significant, which suggests that weekly retail prices of relatively low quality rice increase more compared to their wholesale prices. Further, the retailers of medium and coarse quality rice are able to transmit to consumers more than that they absorb through a higher

wholesale price. However, this more than proportional price transmission is evident only in non-divisional districts, which indicates to possibly different market structure in divisional districts.

Table 6: Retail-Wholesale Price Gap (Vertical Gap), by Regions and Quality of Rice

	Weekly wholesale			**Weekly Retail**			**Vertical Gap: Retail-wholesale**		
	All districts	Divisional Districts	Non Divisional Districts	All districts	Divisional Districts	Non Divisional Districts	All districts	Divisional Districts	Non Divisional Districts
	(a) FINE								
Number of Hartals in a Week	**0.177*** **	**0.266** **	**0.167** **	**0.160** **	**0.249** **	**0.146***	0.019	-0.013	0.022
	[0.061]	[0.093]	[0.065]	[0.076]	[0.076]	[0.078]	[0.055]	[0.096]	[0.060]
Total Killed	0.001	0.004	0.001	0.004**	0.004*	0.004**	0.001	-0.001**	0.001
	[0.001]	[0.003]	[0.001]	[0.002]	[0.002]	[0.002]	[0.001]	[0.000]	[0.001]
N	7225	621	6604	15434	2116	13318	7111	607	6504
Adj. R-sq.	0.666	0.802	0.654	0.646	0.74	0.633	0.516	0.877	0.479
(b) MEDIUM									
	All districts	Divisional Districts	Non Divisional Districts	All districts	Divisional Districts	Non Divisional Districts	All districts	Divisional Districts	Non Divisional Districts
Number of Hartals in a Week	**0.151** **	**0.407** **	**0.121***	**0.221*** **	**0.204** **	**0.224*** **	**0.062***	-0.188	**0.089** **
	[0.070]	[0.144]	[0.072]	[0.080]	[0.071]	[0.082]	[0.036]	[0.188]	[0.035]
injured	0.003*	-0.002	0.004**	0.003	0.004*	0.003	-0.001	0.006***	-0.002*
Total Killed	[0.002]	[0.007]	[0.002]	[0.002]	[0.002]	[0.002]	[0.001]	[0.001]	[0.001]
N	7570	618	6952	16,185	2,139	14046	7513	618	6895
Adj. R-sq.	0.619	0.554	0.628	0.648	0.613	0.651	0.521	0.416	0.536
	(c) COARSE								
	All districts	Divisional Districts	Non Divisional Districts	All districts	Divisional Districts	Non Divisional Districts	All districts	Divisional Districts	Non Divisional Districts
Number of Hartals in a Week	**0.255*** **	**0.349** **	**0.248*** **	**0.316*** **	**0.273** **	**0.321*** **	**0.113*** **	-0.036	**0.123** **
	[0.080]	[0.126]	[0.083]	[0.088]	[0.086]	[0.088]	[0.035]	[0.038]	[0.052]
Total Killed	0.003*	0.006***	0.003	0.005**	0.006**	0.004**	0.001	0.001	0.001
	[0.002]	[0.001]	[0.002]	[0.002]	[0.002]	[0.002]	[0.001]	[0.001]	[0.002]
N	6978	618	6360	6393	1950	5822	6393	571	5822
Adj. R-sq.	0.677	0.713	0.681	0.722	0.613	0.736	0.47	0.543	0.478
Quadratic Trend	YES	YES	YES	YES	YES	YES	YES	YES	YES
District Fixed Effect	YES	YES	YES	YES	YES	YES	YES	YES	YES
Year Fixed Effect	YES	YES	YES	YES	YES	YES	YES	YES	YES
Day of Week Fixed Effect	YES	YES	YES	YES	YES	YES	YES	YES	YES
Week of Year Fixed Effect	YES	YES	YES	YES	YES	YES	YES	YES	YES

*Note: Significance level can be read as * p<0.1, ** p<0.05, *** p<0.01.Standard Errors are reported in parentheses. Standard errors are clustered at the district and daily level.*

5. Conclusion

The aim of this study was to systematically measure the impact of political protests on ordinary citizen. One way to measure the impact of political strike on the welfare of the people is through the general price level of staples, mainly rice. Rice is a daily consumable item in Bangladesh, an essential commodity of the food basket and the main source of carbohydrate and energy. Political strikes can affect the food price by disrupting both supply and demand linkage. On the supply side, each stage of the supply chain can be affected including production which will have the bearing as a price hike on the end consumer. Under supply of inputs (absenteeism of the workers, absence of transportation and other logistics, difficulties in accessing finance), at each stage of supply chain will push the price level towards ascending direction. Therefore, it is imperative to understand how the players of the supply chain (growers, small and large traders, commission agent, urban wholesalers, urban retailers) behave in the face of general strikes.

Department of Agricultural Marketing (DAM), under Ministry of Agriculture of Bangladesh has been collecting price information of various commodities at the regional level for decades. The retail and wholesale prices of 15 commodities are available from DAM, which collects daily retail price data and weekly wholesale price data from one sub-district of all districts and informs other government agencies. This high frequency nature of the data allows us to pair them up with the political strike data and examine the impact of political strike on three types of rice – fine, medium and coarse for the period 2010-2016.

We find that on the day of *hartal* the price of rice increases by about 0.02 percent per kilogram, this is lower for finer and medium quality and higher for the coarse variety rice. This result is robust to severity of *hartal* and also inclusion of a host of dummies which capture both seasonality and unobserved heterogeneity. The impact on price is found to amplify when the strikes are stretched over a few days. We find that if a strike is a part of multiple day strikes, the retail prices of fine, medium and coarse increase by 1.3, 1.4 and 1.7 taka respectively on that day. We found that the rise in rice price adjusts back to pre-hartal level within 5 days after the strike. We did not find any change in price one day before strike, neither on the day of hartal announcement.

In terms of horizontal price gap, we find some evidence in case of medium and coarse rice, except in the capital city, which is the premium market of rice purchase. The magnitude of increase in coarse rice is very robust to regional differences.

In case of vertical price gap, we also observe similar patterns – size of increase in price is higher for coarse rice. This vertical price gap is also more pronounced for the coarse rice but statistically insignificant for medium and fine rice.

These analysis and findings confirm the fact that political unrest and strikes are costly not only for the business and trade, it also has negative bearing on citizens. Interestingly this is more for the economically disadvantageous population of the society. Poor population consumes more rice, more of the type of coarse variety and buys frequently due to the lack of storage. A rise in rice price due to strikes creates a dent in poor' consumption basket, at the cost of opposition political parties desire to press their demands.

6. References

Ahasan, N. R., and Iqbal, K. (2016) "How Do Exporters Cope With Violence? Evidence from Political Strikes in Banglades". International Growth Centre working Paper.

Amodio, F. and Di Maio, M., 2017. "Making Do with What You Have: Conflict, Input Misallocation and Firm Performance". Economic Journal, *forthcoming*.

Acemoglu, D. and J. Robinson (2001). "A Theory of Political Transitions." *American Economic Review* 91: 938-963.

Arezki, R. & M. Brueckner, Markus (2014). "Effects of International Food Price Shocks on Political Institutions in Low-Income Countries: Evidence from an International Food Net-Export Price Index," *World Development*, 61(C):142-153.

Ashraf, A., Machiavello, R., Rabbani, A., Woodruff, C., 2015. "The Effect of Political and Labour Unrest on Productivity: Evidence from Bangladeshi Garments." Mimeograph.

Bellemare, Marc F. (2015), "Rising Food Prices, Food Price Volatility, and Political Unrest," *American Journal of Agricultural Economics* 97(1): 1-2

Marc F. Bellemare, Christopher B. Barrett, David R. Just; The Welfare Impacts of Commodity Price Volatility: Evidence from Rural Ethiopia, *American Journal of Agricultural Economics*, Volume 95, Issue 4, 1 July 2013, Pages 877–899

Bruckner, M. and A. Ciccone (2010a). "International Commodity Price Shocks, Growth, and the Outbreak of Civil War in Sub-Saharan Africa." *Economic Journal* 120: 519-534.

Brinkman, H. and C. Hendrix (2010). "Food Insecurity and Conflict: Applying the WDR Framework." in World Development Report 2011.

Barrett, C.B., and P.A. Dorosh (1996). 'Farmers' welfare and changing food prices: nonparametric evidence from rice in Madagascar'. American Journal of Agricultural Economics, 78(3): 656-69.

Collier, Paul, V.L. Elliott, Havard Hegre, Anke Hoeffler, Marta Reynal-Querol, and Nicholas Sambanis. 2003. Breaking the Conflict Trap: Civil War and Development Policy (Policy Research Reports). World Bank; Oxford University Press.

Deaton, A. (1989). 'Rice prices and income distribution in Thailand: A non-parametric analysis'. Economic Journal, 99: 1-37.

Ivanic, Maros, and Will Martin (2008), "Implications of Higher Global Food Prices for Poverty in Low-Income Countries," Agricultural Economics 39(s1): 405-416.

Miguel, E., S. Satyanath, and E. Sergenti (2004). "Economic Shocks and Civil Conflict: An Instrumental Variables Approach." *Journal of Political Economy* 112: 725-753.

Machiavello, R., Morjaria, A., 2015. "The Value of Relationships: Evidence from a Supply Shock to Kenyan Rose Exports." American Economic Review, 105(9): 2911−2945.

Minten B, Murshid KAS, Reardon T (2013) Food Quality Changes and Implications: Evidence from the Rice Value Chain of Bangladesh. World Development 42: 100–113.

Rahman, M. 2004. "Foodgrain Quality, Grades, and Standards in the Bangladesh Foodgrain Trade." In The 1998 Floods and Beyond: Towards Comprehensive Food Security in Bangladesh, edited by P. Dorosh, C. del Ninno, and Q. Shahabuddin, 127–154. Washington, DC: International Food Policy Research Institute.

Ravallion, M. (1990). 'Rural welfare effects of food price changes under induced wage responses: Theory and evidence for Bangladesh'. Oxford Economic Papers, 42: 574-85.

Shonchoy, A.S., Tsubota, K., 2015. "Economic Impact of Political Protests (Strikes) on Manufacturing Firms: Evidence from Bangladesh." IDE Discussion Paper No. 523.

Vu, L., and P. Glewwe (2011). 'Impacts of rising food prices on poverty and welfare in Vietnam'. Journal of Agriculture and Resource Economics, 36(1): 14-27.

APPENDIX

Figure A1: Procurement Sources of Wholesalers in Dhaka during Hartal and Non-*hartal* Period (2010-2016)

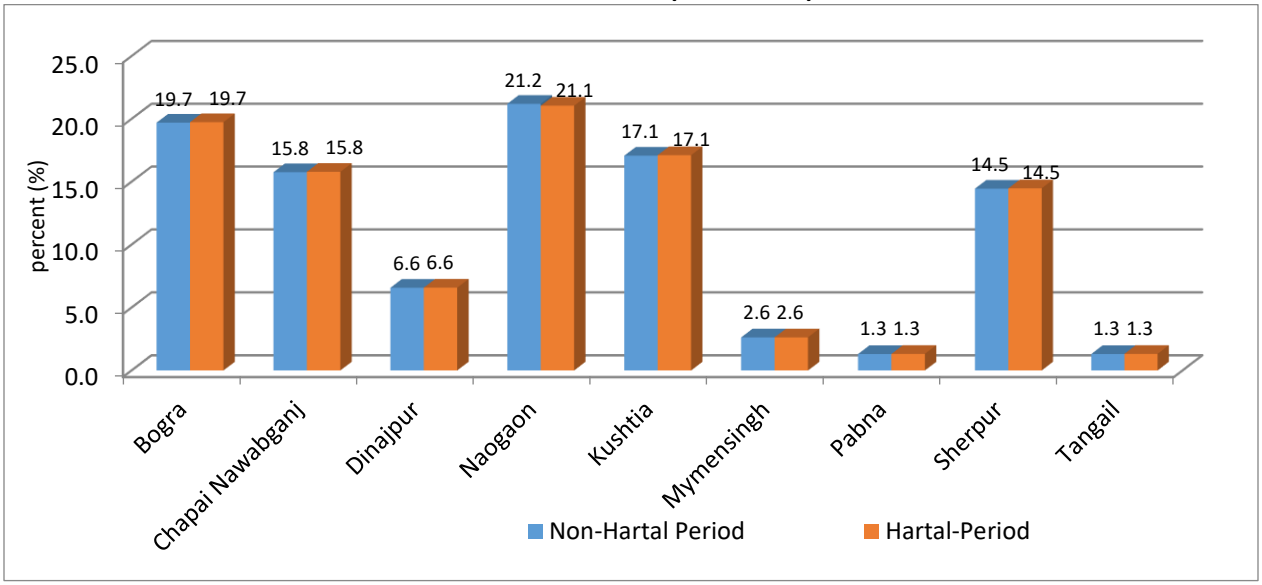


Figure A2: Stated reasons for calling strike

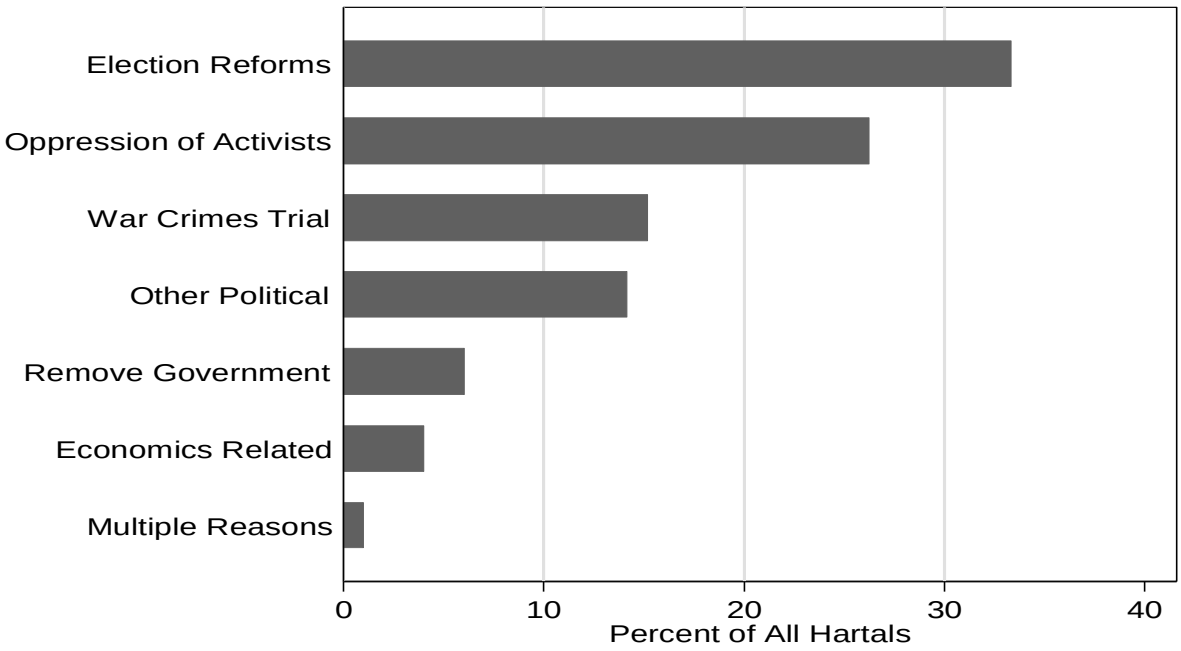
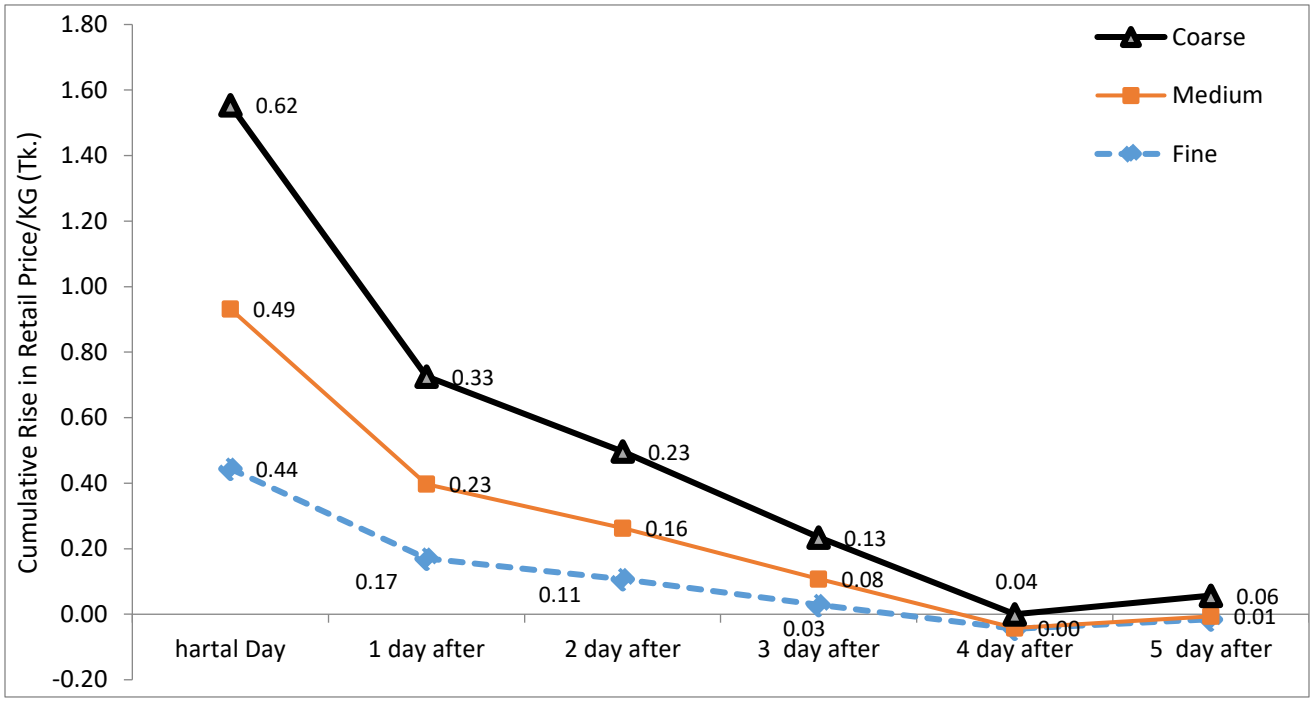


Figure A3: Adjustment Process, by Quality Types



Note: Impact of hartal on the day of hartal shows statistical significance across varieties. However, cumulative impacts of hartal turn out to be statistically significant for coarse rice only up to day 1. No other cumulative impact coefficients exhibit statistical significance