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Gender Differentiated Impacts of Commodity Price Shocks on Households' Consumption Behavior: A Natural Experiment

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Abstract:

Using information collected from more than 29,000 households by the Bangladesh Bureau of Statistics, the present study examines the gender-differentiated impacts of the commodity price hikes in 2008-09 on food and non-food consumption behavior based on the sex of the household head. Applying the difference-in-difference estimation procedure in a natural experiment setting, this study demonstrates that, in general, commodity price hikes more adversely affected the female-headed households. In 2010, they were forced to reduce expenditures on food and non-food items, and particularly cereal, non-cereal, health and education expenditures, more than the male-headed households. However, this study clearly shows that the impacts of commodity price hikes were lower on the female-headed households headed by educated females and those who owned larger pieces of land, received remittances, and allocated labor to non-farm sectors. These sub-sets were not affected by the commodity price shocks in 2010 compared to 2000. The findings strongly suggest that the provision of both human and physical capital is instrumental in developing countries to empower female headed-households to withstand economic shocks.

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JEL Codes: D61, D41

#2480



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Abstract

Using information collected from two rounds of household expenditure and survey (HIES) data 2005 and 2010, by the Bangladesh Bureau of Statistics, the present study examines the gender-differentiated impacts of the commodity price hikes in 2008-09 on food and non-food consumption behavior based on the sex of the household head. Applying the difference-in-difference estimation procedure in a natural experiment setting, this study demonstrates that, in general, commodity price hikes more adversely affected the female-headed households. In 2010, they were forced to reduce expenditures on food and non-food items, and particularly cereal, non-cereal, and education expenditures, more than the male-headed households. However, this study clearly shows that the impacts of commodity price hikes were lower on the female-headed households headed by educated females and those who owned larger pieces of land, received remittances, and allocated labor to non-farm sectors. These sub-sets were not affected by the commodity price shocks in 2010. The findings strongly suggest that the provision of both human and physical capital is instrumental in developing countries to empower female headed-households to enhance buffering capacity to withstand economic shocks.

Key words: expenditure; female-headed households; food; impacts; non-food; price hikes

JEL classifications: C90, D1, D130, Q12, Q54

Gender Differentiated Impacts of Commodity Price Shocks on Households' Consumption Behavior: A Natural Experiment

1. Introduction

It is increasingly recognized that the global economic downturn and the unprecedented commodity price hikes in 2008 led to an increase in the absolute numbers of impoverished people globally (FAO, 2008a, 2011; Harttgen and Klasen, 2012). For example, due to the increase in the price of food baskets in Bangladesh and Ethiopia, the incidence of rural poverty has increased in both countries (e.g., Gelaw and Sileshi, 2013; Balagtas et al., 2014). Between 2006 and 2008, due to the hikes in commodity prices, the producers' prices of maize increased by 50.5% (from USD250.1/ton to USD376.4/ton); the rice price increased by 34.8% (from USD394.1/ton to USD531.4/ton) and the wheat price increased by 65.2% (from USD205.9/ton to USD340.2/ton - FAO, 2016; Figure 1). Global commodity prices have remained relatively high compared to the level before 2008 (Figure 1).

Questions remain in relation to the fall-out of the commodity price hike. For instance, did the commodity price hikes generate similar negative impacts on households' welfare irrespective of the sex of the household head? More specifically, were there any gender differentiated impacts of the commodity price hikes? Did the female-headed households respond differently from male-headed households in relation to food and non-food expenditures in the face of commodity price hikes? A clearer understanding of these issues is important to ensure the welfare of female-headed households in developing countries, and gender parity as per the Sustainable Development Goals (SDGs) of the United Nations (UN) by 2030. Unfortunately,

only a few empirical studies address this important issue (e.g., FAO, 2008a; Barker, 2008; Coon, 2008; Quisumbing et al., 2008; Compton et al., 2011; Kumar and Quisumbing, 2011; Quisumbing et al., 2017).

There is a consensus in the literature that in general, female-headed households are in the poorest-of-the-poor group in developing countries (Fuwa, 2000; Elmelech and Lu, 2004; Coon, 2008; Bastos et al., 2009; Mallick and Rafi, 2010, World Bank, 2012). Women in developing countries are mostly excluded from inheriting land and land ownership, even despite existing national laws on women's rights to land (Quisumbing, 1995; World Bank, 2009; 2012; FAO, 2011; Kieran et al., 2015). For example, women in Bangladesh own significantly fewer agricultural production assets than men (Quisumbing et al., 2001; Quisumbing and Maluccio, 2003; Quisumbing et al., 2013; Economist, 2013), and have less access to information and agricultural extension services (Quisumbing, 2010) and are more socially constrained (Seymour, 2017).

Poor households, in general, spend proportionally more on food items. Consequently, one may expect the welfare loss of the female-headed poor households due to the commodity price hikes to be higher than the loss in the male-headed households (FAO, 2008a; Campos and Garner, 2012). Kumar and Quisumbing (2011) use Ethiopia as a case to demonstrate the effects of the commodity price hikes in 2007-08. They show that female-headed households in Ethiopia experienced price shocks more frequently, were more vulnerable to the shocks, and were also less able to recover their welfare losses than male-headed households, mainly because of the pre-crisis inequality in access to land and other resources. Compton et al. (2011) demonstrate that among the poor and marginal food consumption groups, female-headed households were 1.6 times more food insecure than male-headed households due to the commodity price hikes in

2007-08. Unequal access to land and other resources including agricultural extension services are the major causes behind the gender differentiated impacts of the commodity price hikes on household's welfare (Quisumbing et al., 2008; 2011; Kumar and Quisumbing, 2011).

To date few studies have assessed the gender-differentiated fall-out of the commodity price hikes in 2008 on food and non-food expenditures and mitigating factors: e.g. the influence of physical capital, such as land and agricultural equipment ownership; and the influence of remittance income and labor allocation to the non-farm sector. Note that such welfare impacts of price hikes on female-headed households are likely to be heterogeneous across countries given the heterogeneous social status of women and associated access to both physical and human capitals. It necessitates conducting country-specific case studies on the gender-differentiated impacts of the commodity price hikes. Using information collected from more than 22,000 households by the Bangladesh Bureau of Statistics (BBS) in 2005, and 2010 and applying the difference-in-difference estimation procedure, the present study examines the impacts of commodity price hikes on the expenditure on food and non-food items by the households based on the sex of the household head in Bangladesh. As the commodity prices spiked in 2008¹, the present study treats the 2005 data sets as 'before the shock' and the 2010 data sets as 'after the shock' information (Figure 1).

[Insert Figure 1 here]

The case of Bangladesh is worth investigating for several reasons. First, it is widely documented that, women in Bangladesh own significantly fewer agricultural production assets than men (Quisumbing et al., 2001; Quisumbing and Maluccio, 2003; Quisumbing et al., 2013; Economist, 2013; Sraboni et al., 2014) and in general, have fewer access to information and

¹ From June 2006 to June 2008, the wholesale and retail prices of coarse-grain rice, the major food staple of Bangladesh had increased by 78% and 82% (FAO/WFP, 2008b)

agricultural extension services than men (Quisumbing, 2010) and are more socially constrained (Seymour, 2017). Despite the recent changes in the participation of women in the formal labor force in Bangladesh (e.g., Mottaleb and Sonobe, 2011), in many cases the religious and social norms constrain women's participation in the mainstream labor force. Particularly, rural women in Bangladesh are mostly contribute as unpaid family labor and engage in jobs within house or adjacent areas to their homestead (Kabeer et al., 2011), such as post-harvest activities (Zaman, 1995; Hossain et al., 2004). Some recent changes, however can be observed in terms of the participation of the women into formal labor market, in which young women from the poor families are increasingly migrating to the urban and semi-urban areas mainly to work as garment industry workers (Mottaleb and Sonobe, 2011). Also, the participation of women into agricultural labor force from the poor families has increased significantly (Rahman, 2010; Jaim and Hossain, 2011; World Bank, 2012).

Second, Bangladesh's recent achievement in reducing gender gap in social, political, cultural, and educational attainments is remarkable in South Asia. It is reflected by the fact that the average number of children per woman has decreased to two from seven; girls' school enrollment has increased dramatically; and, since 1990, female labor participation has doubled (World Bank, 2012). For all these reasons, Bangladesh is ranked the highest in terms of gender gap index among all Islamic as well as South Asian countries (World Bank, 2012). Importantly, mainly to delay motherhood and adolescent girls' marriage and to increase the female students' school attainment, jointly with the World Bank and Asian Development Bank, the government of Bangladesh initiated the Female Secondary School Assistance Project (FSSAP) in 1994. Under this program, tuition-free education, book allowances, a monthly stipend, and free secondary school examination are provided to every female student in grades 6–10 (e.g., Mottaleb et al.,

2015). In this backdrop, it would be interesting to examine the impacts of education and socio-economic status of the female on their food and non-food expenditure behavior under the commodity price hikes regime.

One of the novelties of the present study is that, this is the first attempt to econometrically examine the impacts of market shocks on the food and non-food expenditure behavior of female-headed households, controlling for the pre-existing socio-economic conditions, such as land ownership. Importantly, although the present study focuses on Bangladesh, the issues that are examined in this study are closely replicated in millions of households across South Asia, where similar to Bangladesh the socio-economic and the educational status of the women in general are lower than the male. This collocation of the status of the female in the society highlights the similarity between Bangladesh and other South Asian countries. The policy implication of the present study therefore, to some extent can be applied in other South Asian countries. The study is organized as follows: Section 2 presents data sources and descriptive findings; Section 3 specifies the difference-in-difference estimation procedure applied in this study; Section 4 presents the econometric findings and Section 5 presents the conclusions and policy implications.

2. Data and setting

2.1 Data

This study uses data from three successive Household Income and Expenditure Surveys (HIES) conducted in 2005 and 2010 by the Bangladesh Bureau of Statistics (BBS). After independence in 1971, the BBS conducted the first round of HIES in 1973-74. Since then until the HIES 2010 rounds, the BBS has successfully conducted 15 rounds of HIES, but information on consumption was not included until 2000 round. Since the HIES 2000, BBS started including detailed

information on household incomes and particularly expenditures on food and non-food items. The expenditure on food and nonfood items includes both in kind expenditures in the form of monetary value of the self-produced item and also non-farm food bought from market. With the financial and technical support of the World Bank, the BBS uses a two-stage stratified random sampling process in which, in the first stage, the BBS selects primary sampling units (PSUs) consisting of specific geographical areas both in the rural and urban areas, and in the second stage, randomly selects 20 households from each PSU.

The HIES 2005 survey included 504 PSUs and 10,080 households randomly selected from eight divisions, 64 districts and 364 sub-districts. Finally, the HIES 2010 survey randomly selected 1000 PSUs and 12,240 households from all nine administrative divisions, 64 districts and 372 sub-districts. However, out of the aggregate 22,320 sampled households across two waves, nine households had to drop for the lack of information on food and non-food expenditures. The present study, is thus based on information collected from 22,311 households in 2005 and 2010, of which 9,036 were from urban areas and 13,275 were from rural areas; 7,789 households were headed by females and 19,522 were headed by males.

2.2 Descriptive findings

By definition, in a household, the eldest male or female earner is considered as the head of the household (BBS, 2017). However, in the case where a husband works as migrant worker, the spouse can be the household head even though she is not directly involved in income generating activities by working outside her house. The distribution of the 22,311 sampled households and the share of female-headed households in the seven administrative divisions of Bangladesh is presented in Figure 2. Dhaka (13.5%), Chittagong (17.9%) and Sylhet (15.3%) divisions stand

out for having relatively more female-headed households. This is linked to the pervasiveness of overseas male migrant workers from these divisions, as mainly male family members go abroad as migrant workers leaving extended family members in the country. In 2013 there were 1.53 million foreign remittance recipient households in Bangladesh, of which nearly 33% were from Dhaka division and 30% were from Chittagong division (BBS, 2014). On the other hand, Sylhet is well-known in Bangladesh for sending migrant workers particularly to the United Kingdom (UK).

[Insert Figure 2 here]

Descriptive statistics of the sample households are presented in Table 1. On average, more than 25% of the total sampled households received remittances amounting to BDT 11,540 annually². On average, a sample household had 0.69 acres of land³, and the value of the agricultural equipment, and assets owned by each household was worth BDT 2,320. In HIES 2005 and 2010, the monetary value of 19 different agricultural machinery and assets were available. The value of agricultural asset ownership has constructed from that information. On average, a sampled household was headed by a 45-year-old head with 3.73 years of formal schooling, and the average years of schooling of the spouse was nearly three years. Each household consisted of 4.81 family members on average. Table 1 shows that 63% of the sampled households allocated a portion of their labor to the non-farm sector, and nearly 62% of the sampled households were from the rural areas.

[Insert Table 1 here]

Compared to male-headed households, the percentage of remittance-receiving households was higher among the female-headed households, and the female-headed households received

² In 2005 and 2010 the exchange rate between US\$ and BDT were USD1=BDT53.96, USD1=BDT61.34 USD1=BDT69.18 (GOB, 2017).

³ One hectare= 2.47105 acres of land.

higher remittances in all three sampled years (Table 1). A female-headed household had fewer years of schooling, fewer family members and less agricultural equipment compared to a male-headed household across the sampled years (Table 1). On average, the female-headed households were less likely to allocate labor to the non-farm sector than the male-headed households, and more likely to reside in the rural areas. The descriptive findings generally support previous findings that women in Bangladesh owned significantly fewer productive agricultural assets and less land than men (Quisumbing and Maluccio, 2003, Quisumbing et al., 2013). In the econometric estimation procedure, the present study explicitly includes pre-existing situations to examine their influence on the expenditure behavior of female-headed households under market price shocks compared to male-headed households.

The expenditure pattern of the sample households over the years are presented in Table 2 in per capita yearly basis. On average across 2005 and 2010, a sampled household spent BDT 19,529 on food items per capita annually, split into BDT 11,768 on non-cereal food items (such as fish, meat, vegetables, oil and so on), and BDT 7,760 on cereals (such as rice, wheat, puffed rice, and flour). On average, a member of a sampled household consumed 266.2 kilograms of cereals annually in which rice is the principal cereal item. On average, a sampled household spent per capita annually BDT 11,332 on non-food items, including BDT 884.5 on health-related expenditures and BDT 1,116.3 on education.

[Insert Table 2 here]

Strikingly, female-headed households had higher expenditures on per capita food and non-food items in 2005 (Table 2); and the differences widened in 2010 in disfavoring female-headed households (Table 2). In 2005, on average, a female-headed household spent BDT 500 and BDT 2,090 in per capita yearly more than a male-headed household, and the differences

were statistically significant at 1% level. In 2010, these differences further widened to BDT 1,300 and BDT 2,300. Expenditure on non-cereal food items was also higher and statistically significant in the case of a female-headed household both in 2005 and 2010. Expenditure on cereal food, cereal consumption, health and education expenditure yearly per capita was not statistically significant between female- and male-headed households in base year 2005.

However, in 2010, female headed household consumed on average, 5 kg less cereal yearly per capita, but spent BDT 177.3 more on health issues than a male-headed household.

One might be wondering on why female-headed households had higher food and nonfood per capita expenditure compared to a male-headed household? This is probably because of the economies of scale effect due to strong household size effect, in which the numbers of family members' in a female-headed household, on average were significantly lower than a male-headed household (Table 1). Deaton and Paxson (1998), Vernon (2004), and Koohi-Kamali (2008) confirmed the influence of family size on poverty due to the scope for economies of scale in consumption. Particularly, Vernon (2004) confirmed that doubling the size of a household reduces per capita food expenditure by 30%. Also, with more family members', male-headed households may pay lower prices for similar foods, because they can exploit the benefits of bulk purchase, compared to the female-headed households, which were consisted of significantly less family members than male-headed households.

3. Model specification

The discussion in the previous section indicates that, in addition to pre-existing conditions, such as heterogeneous access to land and other productive assets by sex, the commodity prices and household sizes can generate gender differentiated impacts. In addition, female-headed households, on average receive more remittance than a male-headed household (Table 1). The poverty reducing impacts of remittance and the impacts of remittances on the households' ability to absorb price shock is widely recognized in the literature (e.g., Adams and Page, 2005; Taylor et al., 2005).

We applied the difference-in-difference (DID) estimation approach to examine the impacts of food price hikes in 2008 on food and non-food expenditures of female and male-headed households considering all the facts. Econometrically, to disaggregate the effects of the commodity price hikes from the other effects on expenditure behavior of the female-headed household compared to the male-headed households, the equation is specified as:

$$Y_{DiT} = \beta_0 + \beta_1(DY2010) + \beta_2(DFHH)_i + \beta_3(DFHH)_i * DY2010 + (Z_i)\theta_i + \xi_{it} \text{-----}(1)$$

where Y_{DiT} is a vector of dependent variables that includes yearly total expenditure on non-food items and, separately, expenditure on health and education; expenditure on total food items; and separately on cereal and non-cereal food items. $DFHH_i$ is the dummy for a treatment household that assumes a value of 1 if a household is headed by a female, or 0 otherwise. $DY2010$ is the dummy variable for year 2010 that assume a value 1 if the year is 2010, and 0 for the year 2005, which is the base. The Z_i is a vector of variables that include: the average cereal price (BDT/kg) calculated at the household level; age of the household head, the number of family members, a rural household dummy that assumes a value of 1, if a household is located in the rural area, and 0 otherwise; a non-farm labor allocation dummy that assumes a value of 1, if a household

allocates a portion of its labor to the non-farm sector, or 0 otherwise; the size of land operated in acres; a dummy for a remittance-recipient household that assumes a value of 1 if a household received remittances, and 0 otherwise; and the monetary value of the agricultural equipment and assets owned by the household. The vector Z_i includes a series of multiplicative dummies, which were generated by multiplying the female-headed household dummy with year dummies and the variables of interests, such as years of schooling, the monetary value of the agricultural equipment and assets, and remittance recipient household dummy, and the size of the land holdings. These multiplicative dummies are supposed to capture the heterogeneous impacts of commodity price shocks on the female-headed households. β_0 is a scalar parameter; β_i and θ_i are the parameters to be estimated; i stands for individual; t stands for year ($t = 2005, 2010$); and ξ is the random error term. From Equation (1):

$$\widehat{\beta}_0 = (y|Year = 2005, DFHH = 0)$$

$$\widehat{\beta}_1 = (y|Year = 2010, DFHH = 0) - (y|Year = 2005, DFHH = 0)$$

$$\widehat{\beta}_2 = (y|Year = 2000, DFHH = 1) - (y|Year = 2005, DFHH = 0)$$

$$\widehat{\beta}_3 = [(y|Year = 2010, DFHH = 1) - (y|Year = 2005, DFHH = 1)] - [(y|year=2010, DFHH=0) - ((y| year=2005, DFHH=0)]$$

Essentially, $\widehat{\beta}_3$ is equal to $(DFHH_{(10)} - DFHH_{(05)}) - (MHD_{(10)} - MHD_{(05)})$, which is the DID estimator, where MHD is the dummy for a male headed household.

Note that as the HIES datasets are cross-sectional in nature, the application of the conventional panel data estimation procedure by applying a Fixed-effect or Random-effect estimation procedure is not possible. However, taking the opportunity of the repeated presence of

at least 461 sub-districts in three surveys, this study formed a pseudo panel at the sub-district level and applied the sub-district level Fixed-effect estimation procedure in estimation Equation (1).

4. Econometric findings

Table 3 presents the estimated function applying a sub-district level Fixed-effect estimation procedure explaining food and non-food expenditures, with separate functions for cereal and non-cereal food. Compared to the base 2005, households in 2010, in general, spent more on food and on cereal food in particular, and less nonfood items. Probably with the decrease in real income of the sampled households in the face of the increase in commodity prices, households first reduced the consumption of non-food items, to ensure the minimum food requirements per capita. In addition, in 2010, the sampled households are in general spend more on cereal food items, probably as cereals are relatively more affordable than costly non-cereal food items, by switching to cereals, households can ensure the required calorie intake to maintain body fitness.

[Insert Table 3 here]

Crucially, Table 3 shows that while in general, per capita yearly food and non-food expenditure and expenditure on non-cereal food, education and health were higher, expenditure on both food, and non-cereal food items, and education expenditure by the female-headed households in 2010 were significantly lower than the male-headed households. As straightforwardly β_3 is the DID estimator, in 2010, a female-headed household compared to a male-headed household, on average, thereby had:

- Lower total food expenditure by BDT 2,650 per capita annual, including a decrease of BDT 2,920 for non-cereals;

- Lower education expenditure by BDT 620 per capita.

The findings give a clear indication that in general, female-headed households were more negatively affected by the commodity price shocks than their male counterparts. Due to the price shock, female headed households were forced to reduce non-cereal food expenditure and also reduced education expenditure to adjust to the shock in 2010.

Table 3 presents the heterogeneous impacts of commodity price shocks based on the pre-existing socio-economic conditions of the female-headed households. A household head with more years of schooling spends more than others on all food and non-food items and particularly on education and health. A relatively more educated household head spends more on food items, particularly on non-cereal food items, such as meat fish, eggs and vegetables, and importantly spends less on cereal food items. In general, a higher education of the household head translates into a higher and more lucrative income, mostly out of the farm sector. As higher income households are in general spending less on cereals relative to non-cereal food expenditure yearly per capita (Table 3). Importantly, Table 3 demonstrates that in 2010, a relatively highly-educated female-headed household spent significantly more on all non-food items, particularly on education, and on all food items, especially non-cereal food items. These findings demonstrate the importance of general education in general and particularly for females to enhance the market-related shock absorption capacity of the female-headed households.

Findings show that the value of the agricultural assets owned by the sampled households has positive impacts on both food and non-food expenditures (Table 3); and even more so in the case of female-headed households, similar to the findings of Doss (2006). Although in Bangladesh the ownership of agricultural assets and machinery by female-headed households is low (e.g., Mottaleb et al., 2016), the agricultural asset ownership by female-headed households

still enhances their well-being. The agricultural asset ownership did generate significant positive impacts in 2010 and allowed spending more on food items, including both cereal and non-cereals. The finding indicates that the shock absorption capacity of the female-headed households can be enhanced through the provision of the ownership of the productive agricultural assets.

In general, the households that are associated with the non-farm sector by allocating a portion of their labor were not better off than other households, as is reflected by significantly lower level of per capita yearly food expenditure (Table 3). Although in general, the non-farm labor allocation is positively associated with cereal food expenditure, it did not pay off to the female-headed households in 2010. This is probably because of the type of non-farm work in which female-headed households were mostly day-laborer in the non-farm sector. Affiliation to non-farm sector may thus have limited shock-absorbing capacity, particularly when they are owned by female-headed households in Bangladesh. However, the status in the non-farm sector must be considered before drawing any strong conclusion.

In general, the households that operate more land spend more on both food and non-food items, and each of the differentiated expenditure categories. Interestingly, although the size of the land operated by female-headed households has no significant influence on both food and non-food expenditures in general, the influence was markedly positive in 2010, particularly for food, and for both cereal and non-cereal expenditures. Ensuring female land ownership can thus

reduce the economic vulnerability of the female-headed households due to market volatility in developing countries.

Finally, Table 3 shows that in general the remittance-recipient households spend more on food and non-food items, and each of the differentiated food expenditure categories. However, whereas in general, female-headed households receiving remittances had lower food expenditures (and lower non-cereal expenditures), they spend markedly more on food items in 2010 (including on non-cereals). This finding indicates that the access to remittance income can enhance the shock-absorbing capacity of the female-headed households. Overall similar in line with the findings of Hoddinott and Haddad, (1995), Quisumbing and Maluccio, (2003), Doss (2006) and Sraboni et al., (2014), the present study demonstrates that, when female headed households have more control over resources, the households manage to achieve higher levels of well-being including higher level of market shock absorbing capacity.

5. Conclusion and policy implications

Female-headed households are the poorest-of-the-poor in developing countries and, in general, poor households spend a higher percentage of their income on food items than less poor groups. Consequently, female-headed households are set to have higher welfare losses due to the commodity price hikes than the male-headed households. Using information collected from more than 22,000 households in Bangladesh and applying a difference-in-difference estimation procedure, this study presented the gender-differentiated impacts of the commodity price hikes on the food and non-food expenditures by households in Bangladesh. In the face of higher commodity prices, the female-headed households, in general, reduced their food and non-food expenditure more in 2010 compared to the male-headed households. The findings of this study

thus clearly show that, in general, the impacts of the commodity price hikes in 2008 generated more negative impacts on the female-headed households than the male-headed households in 2010 compared to 2005.

The present study, however, vividly also demonstrates that the conditional impacts of the commodity price hikes on the welfare of the female-headed households is highly heterogeneous based on the socio-economic conditions of the female, such as education of the female-household head, the size of the land operated, agricultural assets ownership and remittance income. The present study shows that the female-headed households headed by relatively highly-educated heads, owned more agricultural assets, operating more land and receiving remittance income, were to a large extent buffered and their expenditure on food and non-food items less affected at the time of the commodity price hikes.

Knowing that which factors that enhance the market shock absorption capacity of the female headed households in the developing countries can help in designing the appropriate policy intervention to achieve the gender parity as per the Sustainable Development Goals of the United Nations. Based on the findings, the present study strongly suggests the provision of general education for all in developing countries. As education enhances the capability of a person to deal with disequilibria (Schultz, 1975), the provision of general education can enhance the capacity of the resource-poor households in general in developing countries to perform better even in the less-favored situations brought about by market volatility. In the case of the older strata, this may call for the provision of practical need-based training. Based on the findings, this study also calls for ensuring access to land and agricultural assets by females in developing countries, as to enhance the shock-absorbing capacity of the female-headed households caused

by market volatility. This study also suggests removing barriers to the inflow of remittance income for female-headed households in developing countries.

Finally, to protect the overall well-being of the female-headed households in developing countries against economic shocks, the present study specifically calls for enhancing their human and physical capital. The provision of such targeted human and physical capital can mitigate the fallout of economic shocks such as commodity price hikes and enhance the resilience of female-headed households in developing countries. Coordinated efforts between international donor agencies and national governments can better target such provisions and ensure inclusiveness of female-headed households, who are generally more vulnerable to market shocks.

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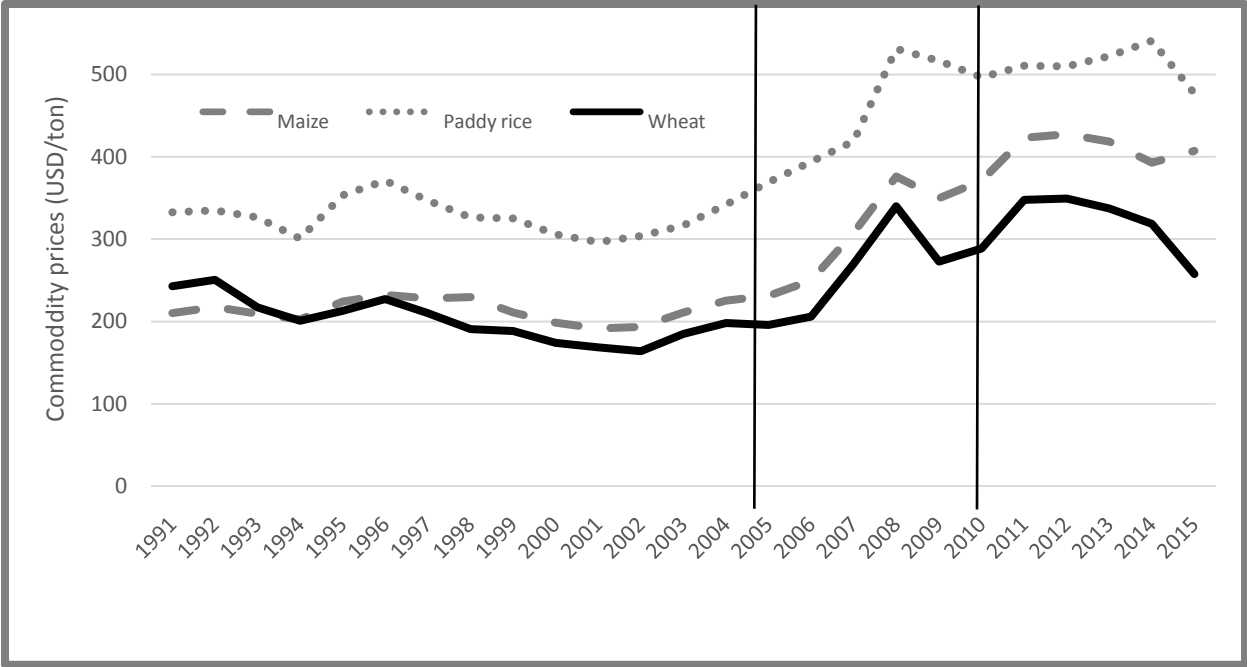


Figure 1: International prices (USD/ton) of wheat, maize and paddy rice, 1991-2015.

Source: FAO (2016).

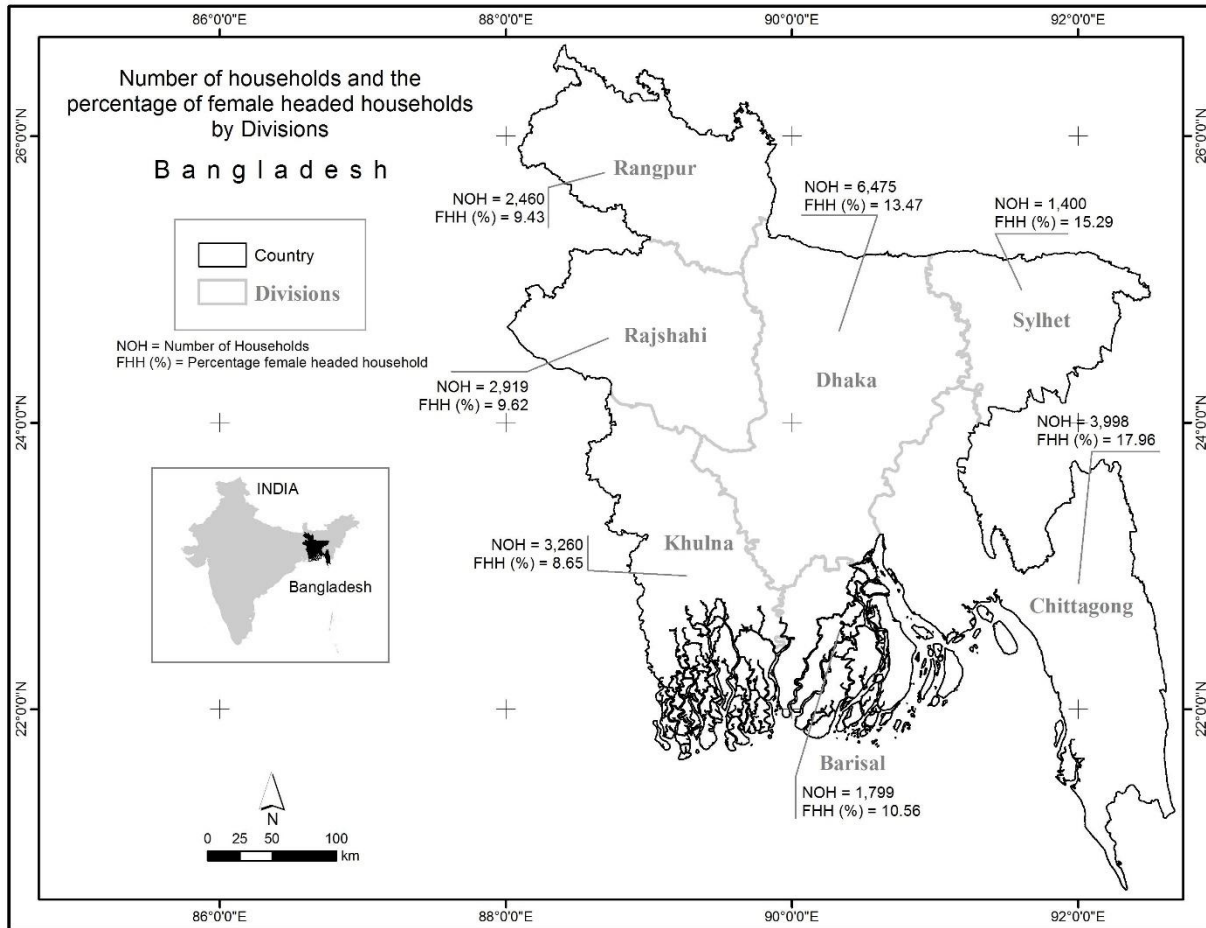


Figure 2: Sample size (# of households, NOH) and share of female-headed households (FHH, %) by division, Bangladesh.

Sources: Bangladesh Bureau of Statistics (BBS): HIES 2005 and HIES 2010.

Table 1: Characteristics of the sampled household over the years by the sex of the household head

Household headed by	All	Female		Male		Mean difference (Male – Female) ^a	
		2005	2010	2005	2010	2005	2010
Sample year							
No. of households	22,311	1,040	1,749	9,032	10,490		
% Received remittances	25.12 (43.37)	53.37 (49.91)	55.46 (49.72)	25.83 (43.77)	16.64 (37.25)	-27.53*** (-18.91)	-38.82*** (-38.26)
Remittance received ('000, BDT)	13.39 (69.94)	30.18 (64.48)	59.26 (173.63)	5.94 (25.93)	10.48 (62.87)	-24.24*** (-23.03)	-48.77*** (-21.52)
Land operated (acres)	0.66 (1.41)	0.30 (1.07)	0.28 (0.80)	0.76 (1.58)	0.69 (1.34)	0.46*** (9.15)	0.41 (12.39)
Value of agricultural assets owned ('000, BDT)	2.78 (21.18)	0.21 (1.94)	0.91 (6.70)	1.64 (14.59)	4.32 (27.53)	1.43*** (3.15)	3.41*** (5.16)
Age of the household head	45.74 (13.72)	46.61 (14.03)	46.37 (14.70)	45.27 (13.44)	45.95 (13.74)		
Years of schooling of the household head	3.83 (4.48)	2.15 (3.50)	2.68 (3.84)	3.99 (4.51)	4.05 (4.56)	1.84*** (12.72)	1.38*** (11.93)
No. of family members	4.68 (1.98)	3.53 (2.02)	3.44 (1.80)	5.01 (2.03)	4.73 (1.84)	1.48*** (22.31)	1.29*** (27.22)
Years of schooling of the spouse	3.16 (3.98)	2.55 (3.80)	2.85 (3.98)	3.03 (3.92)	3.38 (4.03)		
% Households allocated labor for non-farm economic activities	63.36 (48.18)	45.48 (49.82)	38.54 (48.68)	66.31 (47.27)	66.73 (47.12)	20.8*** (13.38)	28.2*** (23.06)
% Rural households	59.50 (49.09)	62.88 (48.33)	63.46 (48.17)	59.59 (49.07)	58.43 (49.29)		

Sources: Bangladesh Bureau of Statistics (BBS). HIES 2005 and HIES 2010

^a Numbers in parentheses are t-statistics. ***, **, and * indicate 1%, 5%, and 10% levels of significance, respectively.

Table 2: Yearly consumption expenditure of food and non-food items per capita/year by the sampled houses over the years and by the sex of the household head

Household headed by	All	Female		Male		Mean difference (Male – Female) ^a	
		2005	2010	2005	2010	2005	2010
Expenditure on all food items ('000, BDT)	19.53 (16.51)	7.84 (5.14)	30.64 (19.21)	7.33 (3.69)	29.34 (15.67)	-0.50*** (-3.98)	-1.30*** (-3.11)
Expenditure on non-cereal food items ('000, BDT)	11.77 (12.63)	4.72 (4.29)	19.14 (15.90)	4.23 (3.19)	17.73 (13.72)	-0.48*** (-4.45)	-1.41*** (-3.89)
Expenditure on cereal food items ('000, BDT)	7.76 (5.25)	3.12 (1.27)	11.50 (5.19)	3.10 (0.99)	11.61 (3.89)	-0.02 (-0.57)	0.11 (1.00)
Cereal consumption (kg)	266.18 (127.08)	173.03 (68.94)	337.21 (142.57)	173.94 (55.34)	342.98 (113.71)	0.91 (0.49)	5.77* (1.89)
Expenditure on non-food items ('000, BDT)	11.33 (17.51)	9.30 (16.76)	16.52 (22.76)	7.21 (10.84)	14.22 (20.22)	-2.09*** (-5.49)	-2.30*** (-4.34)
Expenditure on health (BDT)	1116.34 (3957.30)	617.12 (2104.59)	1673.98 (3805.05)	567.18 (1574.33)	1545.69 (5272.85)	-4.46 (-0.08)	-177.31* (-1.56)
Expenditure on education (BDT)	884.55 (3466.33)	511.34 (1053.31)	1346.94 (4087.89)	506.88 (1691.28)	1169.63 (4466.04)	-49.94 (-0.93)	-128.30 (-0.98)

Sources: Bangladesh Bureau of Statistics (BBS). HIES 2005 and HIES 2010

^a Numbers in parentheses are t-statistics. ***, **, and * indicate 1%, 5%, and 10% levels of significance, respectively.

Table 3: Estimated functions applying a fixed-effect estimation procedure explaining per capita yearly expenditure on different food and non-food items at the household level in Bangladesh

Dependent variables	All food expenditure ('000 BDT)	Expenditure on non-cereal food items ('000, BDT)	Expenditure on cereal food items ('000 BDT)	All nonfood expenditure ('000 BDT)	Education expenditure ('000, BDT)	Medical expenditure ('000, BDT)
Year 2010 (DY2010, dummy, yes=1)	3.67** (1.78)	-1.34 (1.52)	5.00*** (0.35)	-6.86*** (1.98)	-0.97 (0.60)	0.027 (0.16)
Female-headed household (DFHH, dummy, yes=1)	1.82*** (0.39)	2.05*** (0.34)	-0.23** (0.10)	1.26 (1.49)	0.38*** (0.11)	0.14* (0.08)
DFHH x DY2010	-2.65*** (0.80)	-2.92*** (0.65)	0.26 (0.27)	-0.093 (1.78)	-0.62*** (0.17)	-0.042 (0.14)
Age of the household head	0.077*** (0.01)	0.052*** (0.01)	0.026*** (0.00)	0.099*** (0.01)	0.017*** (0.00)	0.012*** (0.00)
Rural household (dummy, yes=1)	-0.81** (0.40)	-1.18*** (0.37)	0.37*** (0.10)	-2.78*** (0.50)	-0.32*** (0.10)	-0.11* (0.07)
Household allocates labor to non-farm works (DNFH, dummy, yes=1)	-0.64*** (0.21)	-0.26 (0.18)	-0.38*** (0.05)	-0.18 (0.27)	-0.032 (0.04)	-0.047 (0.04)
DNFH x DFHH	-0.16 (0.43)	-0.57 (0.37)	0.40*** (0.10)	-0.23 (1.07)	-0.25* (0.13)	-0.072 (0.09)
DNFH x DFHH x DY2010	-1.60* (0.87)	-0.75 (0.72)	-0.85*** (0.27)	-1.05 (1.52)	0.16 (0.20)	-0.076 (0.17)
Years of schooling of the household head (YSH)	0.34*** (0.03)	0.36*** (0.02)	-0.023*** (0.01)	0.86*** (0.04)	0.14*** (0.01)	0.045*** (0.00)
YSH x DFHH	-0.18*** (0.06)	-0.23*** (0.05)	0.046*** (0.01)	-0.13 (0.17)	-0.00067 (0.04)	-0.025* (0.01)
YSH x DFHH x DY2010	0.52*** (0.14)	0.59*** (0.11)	-0.068* (0.04)	0.54** (0.25)	0.18*** (0.07)	0.020 (0.04)
Value of agricultural assets owned (AGAS, '000, BDT)	0.029*** (0.01)	0.023*** (0.01)	0.0060*** (0.00)	0.032*** (0.01)	-0.00015 (0.00)	0.0026** (0.00)
AGAS x DFHH	-0.33*** (0.06)	-0.23*** (0.07)	-0.10*** (0.02)	-1.52 (1.06)	0.0016 (0.02)	-0.020 (0.02)
AGAS x DFHH x DY2010	0.32*** (0.09)	0.21** (0.09)	0.11*** (0.02)	1.48 (1.06)	0.00029 (0.02)	0.0065 (0.02)
Land operated (LAND, acres)	0.65*** (0.12)	0.46*** (0.10)	0.20*** (0.03)	0.73*** (0.13)	0.083*** (0.02)	0.043** (0.02)
LAND x DFHH	0.089 (0.19)	0.16 (0.17)	-0.068 (0.04)	5.51 (4.09)	-0.065 (0.04)	0.037 (0.06)
LAND x DFHH x DY2010	1.20** (0.51)	0.88** (0.40)	0.32** (0.15)	-4.41 (4.14)	0.11 (0.11)	0.051 (0.10)
Remittance receiving household (DRRH, dummy, yes=1)	1.24*** (0.31)	1.03*** (0.28)	0.21*** (0.06)	2.15*** (0.36)	0.016 (0.06)	0.34*** (0.06)
DRRH x DFHH	-1.20** (0.47)	-1.17*** (0.43)	-0.027 (0.10)	1.82* (1.01)	0.19 (0.13)	-0.17 (0.11)
DRRH x DFHH x DY2010	3.60*** (1.02)	3.55*** (0.85)	0.045 (0.30)	-0.030 (1.61)	0.097 (0.25)	0.35 (0.23)
Average cereal price BDT/kg	1.12*** (0.11)	0.91*** (0.10)	0.21*** (0.02)	0.86*** (0.13)	0.12*** (0.04)	0.041*** (0.01)
Constant	-17.5*** (2.24)	-15.5*** (1.94)	-1.98*** (0.44)	-15.6*** (2.64)	-2.78*** (0.82)	-1.00*** (0.28)
No. of observations	22311	22311	22311	22311	22311	22311
F(21,435)	210.64	102.08	595.54	52.33	31.24	13.49
Prob > F	0.00	0.00	0.00	0.00	0.00	0.00
sigma_u	3.92	3.77	0.97	4.56	0.91	0.55
sigma_e	10.15	8.59	2.85	14.96	3.70	3.41
Rho	0.13	0.16	0.10	0.08	0.06	0.03

Source: Authors' estimation

Note: Numbers in parentheses are robust standard errors calculated clustering observations at the subdistrict level. *Significant at the 10% level. **Significant at the 5% level. ***Significant at the 1% level.